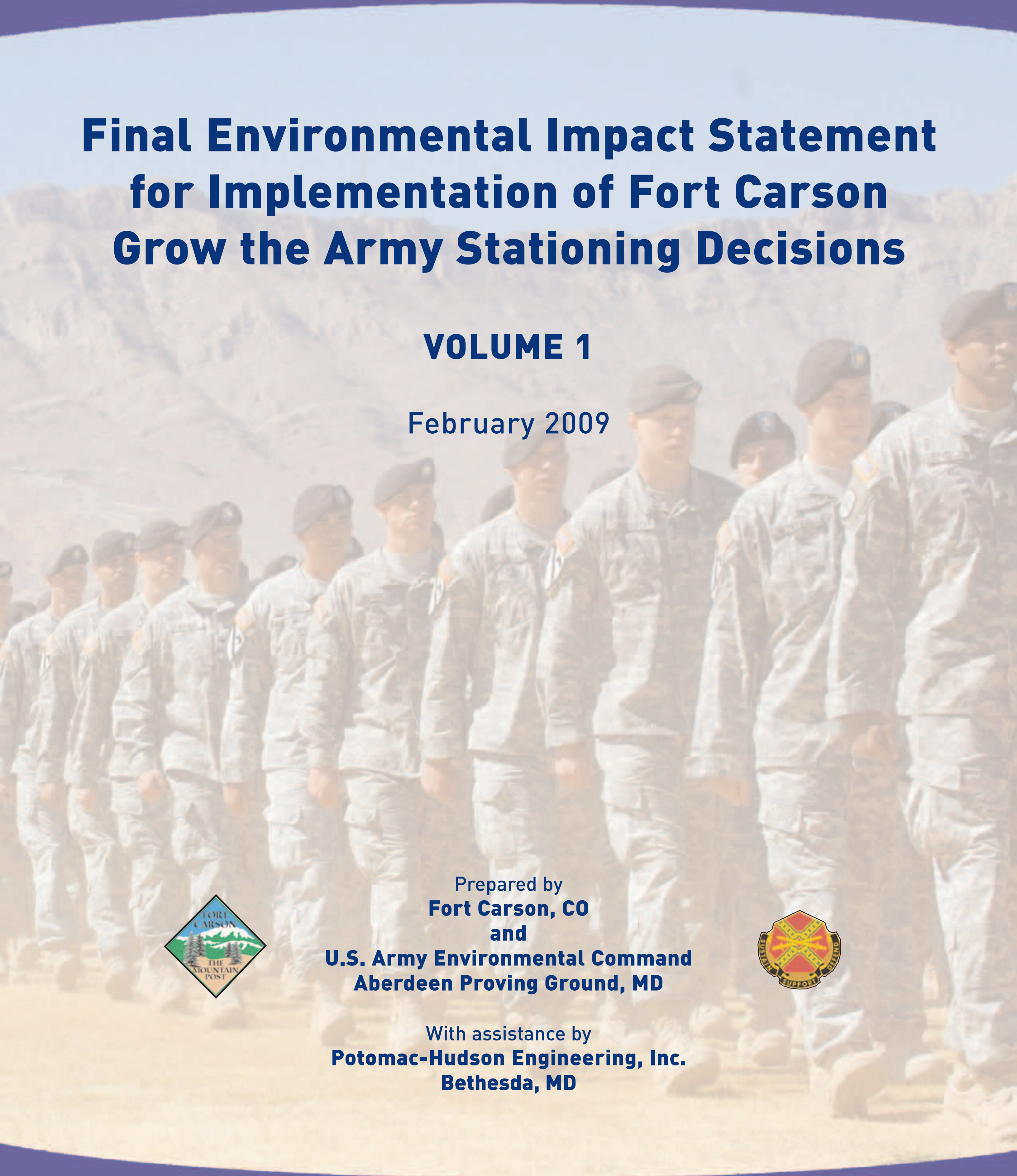

Final Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions

VOLUME 1

February 2009

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Final Environmental Impact Statement

for

Implementation of Fort Carson Grow the Army Stationing Decisions

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Organization of the Final Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions

Consistent with Council of Environmental Quality regulations for implementing the National Environmental Policy Act (42 USC 4321 et seq.) regulations, this Draft Fort Carson Grow the Army Stationing Decisions Environmental Impact Statement (Fort Carson GTA EIS) is organized into the following sections and chapters:

Executive Summary briefly summarizes the Proposed Action, the project alternatives analyzed; the affected environment and environmental consequences to the physical, natural resources, cultural and socioeconomic environment, cumulative impacts and mitigation measures on Fort Carson and Piñon Canyon Maneuver Site presented in this EIS.

Chapter 1 Purpose, Need, and Scope describes the purpose and need for the Proposed Action and outlines the scope of the analysis presented in this EIS.

Chapter 2 Alternatives describes the Proposed Action and identifies alternatives to achieve the Proposed Action.

Chapter 3 Fort Carson Affected Environment and Environmental Consequences describes the existing physical, natural, cultural, and socioeconomic environment at Fort Carson and within the region of influence; and identifies and describes the environmental impacts of implementing the project alternatives, and mitigation measures.

Chapter 4 Piñon Canyon Maneuver Site Affected Environment and Environmental Consequences describes existing environmental and socioeconomic conditions at and within the region of influence; and identifies and describes the environmental and socioeconomic impacts of implementing the project alternatives; and presents available mitigation measures.

Chapter 5 Cumulative Impacts identifies and describes the impacts of the Proposed Action when combined with other past, present, and reasonably foreseeable future actions.

Chapter 6 Mitigation provides existing and proposed mitigation measures for Fort Carson and PCMS.

Chapter 7 References provides bibliographic information for sources cited in this EIS.

Chapter 8 List of Preparers identifies the individuals who prepared this EIS and their disciplines.

Chapter 9 Acronyms provides a list of all acronyms and abbreviations used in this EIS.

Chapter 10 Index provides definitions of selected terms used in the document and lists the pages on which key terms are used.

Appendices provide information and studies used to support the analysis in this EIS.

Appendix A-Regulation Management Plans

Appendix B-Fort Carson Construction Projects

Appendix C-Air Quality Supporting Documentation

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E.1. Introduction

The Army identified the need to increase its overall size while continuing to restructure its forces, in order to meet increased national security and defense requirements, while maintaining a sustainable balance between training readiness and operational mission requirements. On December 19, 2007, the Army signed a Record of Decision (ROD) documenting its decision to proceed with growth of the Active and Reserve components of the Army by 74,200 Soldiers through establishment of several new Brigade Combat Teams (BCTs) and Combat Support and Combat Service Support (CS/CSS) units. The Army growth decision will result in Fort Carson receiving an Infantry BCT (IBCT) and additional CS/CSS personnel. This Environmental Impact Statement (EIS) analyzes the impacts of these stationing actions.

Fort Carson may also receive a Combat Aviation Brigade (CAB) in the future as it is a divisional Army post that will have five BCTs. Most installations in the Army with four or more BCTs also have aviation assets such as a CAB. Therefore, the Army is including analysis of the impacts of implementing the stationing of a CAB in this EIS. Prior to actually stationing a CAB at Fort Carson, the Army will make an official decision as to the location of such a unit, supported by required analysis under the *National Environmental Policy Act* (NEPA).

Fort Carson is preparing this EIS in compliance with its responsibilities under NEPA to assess the environmental direct, indirect, and cumulative impacts of implementing this growth at Fort Carson. The Proposed Action would involve constructing new facilities to support additional Soldiers and their Families, constructing and/or upgrading ranges, and supporting additional training of the IBCT, CAB, and CS/CSS units.

E.2. Installation Setting and Mission

Fort Carson is located south of Colorado Springs, Colorado, east of the Rocky Mountain Front Range, and occupies portions of El Paso, Pueblo, and Fremont counties. Fort Carson is generally bounded by State Highway 115 on the west and by Interstate 25 and mixed development on the east. The City of Pueblo lies approximately 10 miles south of Fort Carson's southern boundary. The City of Fountain is located east of Fort Carson. Fort Carson comprises approximately 137,000 acres and ranges from 2 to 15 miles from east to west and up to 24 miles from north to south.

Fort Carson is responsible for supporting the living and training requirements of Army troops stationed at the installation. Soldier support facilities are provided in the cantonment area, which contains most of the facilities on Fort Carson such as troop and family housing; and administrative, maintenance, community support, recreation, classroom, supply, and storage facilities. Fort Carson's downrange area is used for weapons qualification and field training. The downrange area comprises the land area outside the cantonment area, including firing ranges, training areas, and impact areas. Training lands at Fort Carson are actively managed to maintain sustainability of the area for continued use in supporting the Army's training mission.

Piñon Canyon Maneuver Site (PCMS) is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Fort Carson. PCMS is bounded by US Highway 350 (US 350) to the west, Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. Nearby cities include Trinidad to the southwest and La Junta to the northeast. PCMS includes a small cantonment area at the entrance gate on US 350, containing austere facilities to support training.

E.3. Proposed Action

The Proposed Action is to implement the Fort Carson portions of the December 2007, ROD for the 2007 Programmatic EIS for Army Growth and Force Structure Realignment and the possible stationing of a CAB at Fort Carson. The Proposed Action includes three primary components: supporting increased troop levels, facility demolition and construction, and training the additional IBCT, CS/CSS units, and CAB. Implementation of the Proposed Action would commence as soon as possible after a decision is made and would finish by 2012. Changes associated with each of these are summarized as follows. The Proposed Action is the Army's preferred alternative.

Fort Carson would gain approximately 6,700 Soldiers under the Proposed Action; 3,500 in the IBCT, 400 in the CS/CSS units, and 2,800 in the CAB (Further references in this EIS to the additional IBCT include the CS/CSS units and personnel unless otherwise indicated). Fort Carson's end-state military population would be approximately 29,000 Soldiers (without a CAB) and 32,000 Soldiers (with a CAB) by the end of 2012. Military Families, civilian, and contractor worker populations supported by Fort Carson would also increase. In total, Soldiers, their Families, and Fort Carson support personnel would increase by approximately 11,000 (without a CAB) or about 19,000 (with a CAB) at the end of the implementation of the Proposed Action.

Twenty construction and renovation projects at Fort Carson are included as part of the Proposed Action for the IBCT; no construction at PCMS is involved. Most of the construction would occur at the Operational Readiness Training Center (ORTC) area, which is south of Fort Carson's cantonment area, with only two of the projects occurring within the cantonment area. Demolition of several buildings (total of approximately 52,000 square feet [SF]) would be necessary as part of this action. Most of the construction would be anticipated to be completed by March 2011. There are no construction projects programmed to support a CAB, as the final determination for stationing of the CAB has not yet been made; however, the general area that is proposed to support the construction of CAB facilities was included in the analysis of this EIS. If Fort Carson is determined to receive a CAB, supplemental NEPA analysis would be completed prior to implementation of that decision.

The training of the additional IBCT and the CAB is also part of the Proposed Action. The types of training and maneuver activities that would occur under this action would be consistent with Fort Carson's current training activities. Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commander's intent for the training exercise and/or the availability of limited training resources (maneuver area and firing range availability). Support of training will include live-fire weapons qualification, maneuvers, and construction of additional training ranges.

This action does not include expansion of PCMS. This action can be accomplished without the expansion of PCMS; possible expansion of PCMS would be the subject of separate NEPA analysis.

E.4. Alternatives

E.4.1. Alternative Locations for the Infantry Brigade Combat Team Complex

In terms of training and location of the facilities for the CS/CSS units and the CAB, these alternatives are the same as the Proposed Action. The one component that is different in these alternatives is the location for construction of IBCT facilities. Screening criteria used to identify a range of potential construction locations included sufficient size to construct the facilities within reasonable cost parameters, provision for unit cohesiveness, consideration of Fort Carson's sustainability principles, and land and environmental constraints.

Two alternatives met these criteria and were assessed in this EIS (Figure EX-1).

- Alternative 1 proposes construction of the IBCT facilities within the cantonment area at Training Area Bravo; and
- Alternative 2 would place the IBCT facilities downrange, west of the ORTC area, at a location referred to as Tent City.

E.4.2. No Action Alternative

Under the No Action Alternative, the addition of the IBCT and potential CAB at Fort Carson would not be implemented. Force structure, personnel, and equipment would be as they exist after the implementation of the Transformation activities studied in the 2007 Fort Carson and PCMS Transformation EISs (i.e., Base Realignment and Closure [BRAC] 2005, Global Defense Posture Realignment [GDPR], and Army Modular Force [AMF]). Therefore, the No Action Alternative does not include construction of new facilities to support the IBCT or CAB. The No Action Alternative provides a baseline condition from which to assess the comparative environmental impacts of alternatives.

E.5. Public Outreach

Fort Carson has invited public participation in the NEPA process. The Fort Carson and PCMS NEPA Coordinators have been available throughout the process to answer questions about the scope, status, and progress of the EIS. Contact information is:

- Fort Carson NEPA Coordinator – phone number (719) 526-4666; fax number (719) 526-1705; or carsdecamnepa@conus.army.mil.
- PCMS NEPA Coordinator – phone number (719) 526-0912; fax number (719) 526-1705; or carsdecampcmsnepa@conus.army.mil.

On May 7, 2008, the Department of the Army issued in the *Federal Register* a Notice of Intent (NOI) to prepare an EIS for Grow the Army (GTA) Actions at Fort Carson, Colorado (73 *Federal Register* 25686). In addition, individual letters invited agencies to a scoping meeting, and notice of public meetings was publicized in local papers and a public service announcement.

Agencies with permitting review responsibilities and other interested parties were invited to the agency scoping meeting held at Fort Carson, Colorado, on May 19, 2008, from 1:00 to 3:00 p.m.

Three public scoping meetings were held May 20, 21, and 22, 2008, in Trinidad, La Junta, and Colorado Springs, Colorado, respectively. Approximately two weeks before these meetings, a notice was published in general circulation newspapers on the background and purpose of the Proposed Action, requesting public comment, and providing information about the meetings. In addition, Fort Carson released a public service announcement to all local major media on May 8, 2008 regarding these meetings.

During the public scoping period, comments and questions were related to water quality and quantity, economic and recreational impacts to the Front Range, additional monitoring to ensure proper management of resources, necessity to bring more Soldiers to Fort Carson, inclusion of reasonable alternatives, changes in training due to the potential CAB, more virtual training opportunity, traffic congestion, noise, dust, and inclusion of Tribal consultation.

A Notice of Availability for the Draft EIS (DEIS) was published in the *Federal Register* on October 10, 2008, announcing a 45-day public comment review period. Federal, state, and local agencies were sent letters providing information on the availability of the DEIS, the request for review and comment on the DEIS, and details regarding the public review meetings.

FORT CARSON

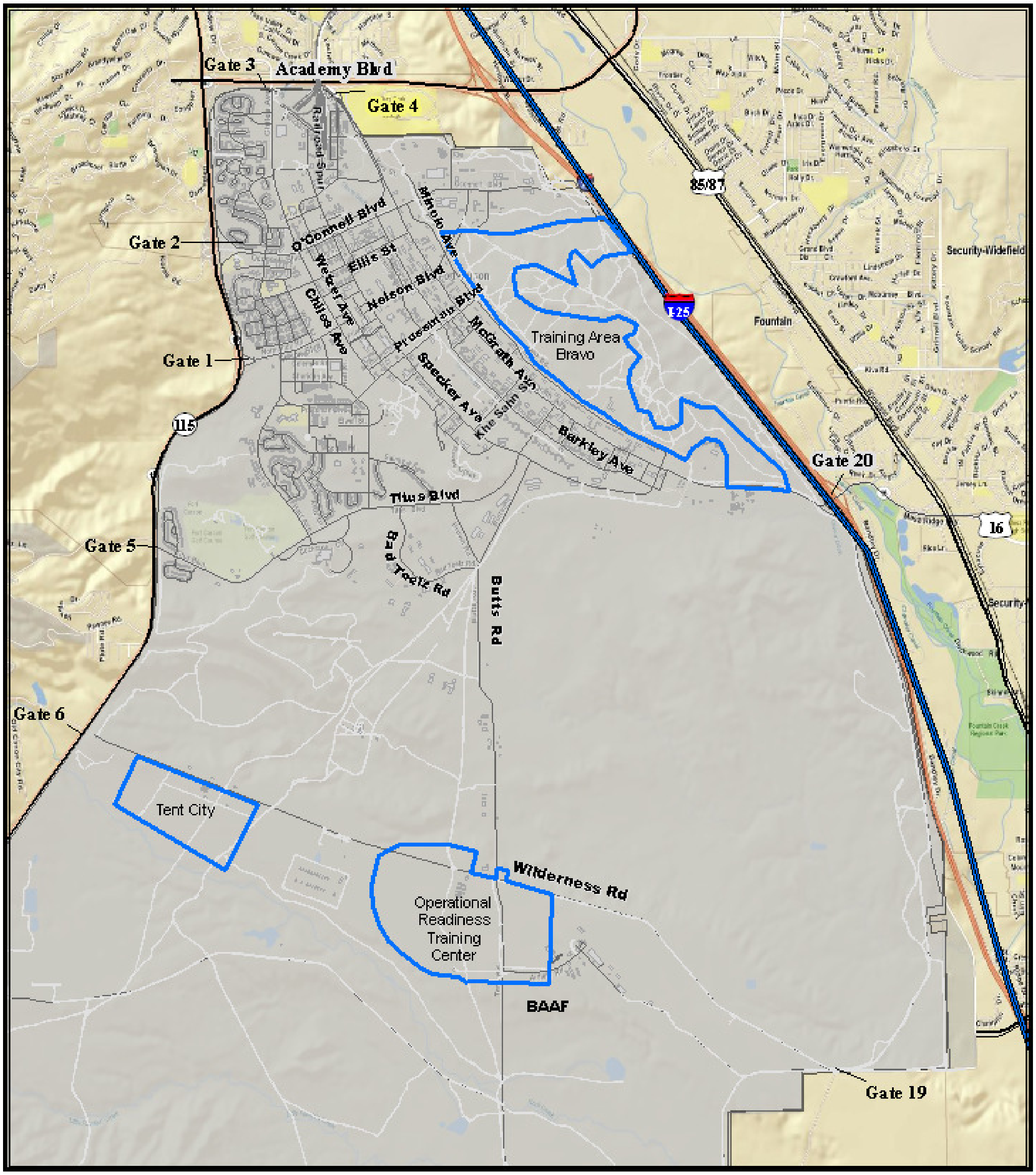

Figure EX-1 Fort Carson

Three public meetings were conducted during the public comment period in the following locations: Trinidad at Trinidad State Junior College, October 27, 2008; La Junta at Otero Junior College, October 28, 2008; and Colorado Springs at the Crowne Plaza Springs Hotel, October 29, 2008. The 45-day public comment review period ended on November 24, 2008.

All comments received during the public comment period, whether in person at the public meetings or otherwise, were considered in the preparation of the FEIS. All comments, including the transcripts of the public review meetings, and the Army's responses to those comments are provided in Appendix I. In some cases, comments prompted clarifications from the DEIS that are reflected in this FEIS.

E.6. Environmental Impacts

Environmental impacts are discussed in detail in Chapters 3 and 4 of the EIS, and are summarized below.

E.7. Land Use

E.7.1. Fort Carson

Under the Proposed Action, approximately 200 acres currently designated as training area would be converted to unit administrative buildings and barracks. Some training activities and facilities would need to be relocated on Fort Carson, such as the parachute drop zone "Range Control," and the Tactical Unmanned Aerial Vehicle (TUAV) training facility. Aviation operations and the buildup of the Wilderness Road site could cause conflicts between use of Butts Army Airfield (BAAF) to support aviation operations and sensitive noise receptors such as the child development center proposed for construction in that area. All land use changes would be within the boundaries of Fort Carson.

E.7.2. Piñon Canyon Maneuver Site

Training elements of the IBCT and the potential CAB at PCMS would not change land use under the Proposed Action or the alternatives.

E.8. Air

E.8.1. Fort Carson

Air quality impacts would occur from the construction and operation of stationary sources for the IBCT and CAB facilities, and the associated tactical equipment sets and weapons systems involved in the training requirements for the new units under the Proposed Action and alternatives. Air emissions from construction activities would include construction traffic and equipment and would be temporary in nature.

Operations of the IBCT and CAB (excluding the above-mentioned training) would result in air emissions from boilers, emergency generators, equipment maintenance, and traffic from employees and deliveries. The region that Fort Carson's main cantonment area lies within is classified as a maintenance area for carbon monoxide; therefore, this federal action would need to comply with the Clean Air Act (CAA) general conformity rule and the Colorado clean air plans to maintain air quality standards in the region.

The direct and cumulative air impacts of implementing the Proposed Action and alternatives would not contribute significantly to the degradation of air quality in the region. Implementation of the Proposed Action or alternatives would not require General Conformity mitigation, Prevention of Significant Deterioration (PSD) permitting, and it would not produce violations to air quality (based on modeling).

E.8.2. Piñon Canyon Maneuver Site

Air quality impacts are limited to fugitive dust emissions under the Proposed Action or alternatives at PCMS.

E.9. Noise

E.9.1. Fort Carson

There would be significant noise impacts on the ORTC site facility occupants. Most of the proposed construction footprint, including barracks, for the IBCT and CAB is located within Noise Zone (NZ) II and III (65-75, and >75 decibel A-weighted DNL [ADNL], respectively) of the BAAF noise contour. A proposed chapel and child development center would be located in the NZ I/II transition area. The noise level within NZ III is considered so severe that noise-sensitive land uses should not be considered therein. Exposure to noise within NZ II is considered significant, and use of land within this zone should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. Noise mitigation features would be incorporated into the siting and construction of the main receptor facilities such as the barracks, chapel, and child development center.

E.9.2. Piñon Canyon Maneuver Site

Frequency in use of the small arms ranges would most likely increase; however, there would be no change to the small-caliber weapons noise contours under the Proposed Action or the alternatives because of the distance between the proposed range facilities and PCMS boundary. The addition of a potential CAB would increase helicopter training at PCMS; however, peak noise levels would remain the same and the noise contours would not change.

E.10. Soils

Impacts to Fort Carson and PCMS soils are anticipated to be significant, but mitigatable for all alternatives considered in this EIS. Temporary impacts to soils are anticipated as a result of construction activities at Fort Carson. Under Alternative 1, the temporary loss of soils during construction at the Training Area Bravo site is expected to be greater than at the ORTC or Tent City construction sites. The steeper slopes of the Training Area Bravo construction site are more susceptible to water erosion and would require more soils disturbance to shape the site for facilities construction. This site disturbance would destabilize soils and lead to increased wind and water erosion. The ORTC and Tent City construction sites both have low erosion potential. Best management practices (BMPs) for stormwater management and restoration of vegetative cover would be implemented, as a part of each construction project to establish and cover exposed sites to limit erosion.

The primary impacts to soils are predicted to result from maneuver training of the IBCT and aviation maneuvers of the CAB at both Fort Carson and PCMS. To mitigate impacts to soils in training areas, the installation would continue to implement the *Integrated Natural Resource Management Plan* (INRMP) (Reference No. 6) and *Integrated Training Area Management* (ITAM) (Reference No. 174) program to monitor and manage the installation's vegetative cover to retain soil stability and implement land rehabilitation projects within the installations training areas. The installation would continue to manage fuel loads and work to prevent wildfires to prevent erosion.

E.11. Geology

Implementation of the Proposed Action or any of the alternatives is not predicted to cause significant impacts to the geological character of Fort Carson or PCMS.

E.12. Water

E.12.1. Fort Carson

Based on regulatory requirements identified as a result of hydrologic modeling, impacts to water flows and flooding within the watersheds would be minimal.

E.12.2. Piñon Canyon Maneuver Site
There would be no significant impacts associated with the ranges and training areas due to the Proposed Action or the alternatives.

E.13. Biological Resources

E.13.1. Fort Carson Construction
The Fort Carson cantonment area and BAAF are highly disturbed and developed, and vegetation consists primarily of non-native ornamental landscaping. Wildlife species that occur within the cantonment area are mostly urban-adapted species such as red fox and pigeons. The potential CAB facility construction would remove minimal wildlife habitat at BAAF. No significant impacts to biological resources are anticipated under the Proposed Action or the alternatives for these areas.

Construction at the ORTC area under the Proposed Action and at the Tent City area (Alternative 2) would have some impact to existing native vegetation, which is considered to be in "fair" condition as defined in the EIS. The affected wildlife habitat is a common habitat type on Fort Carson; thus, effects to wildlife would not be significant. There are no federally-protected species or Species of Special Concern that use the sites on a regular basis. No construction activities would occur within wetlands. Impacts from surface water flow and sedimentation could occur to Rock Creek.

The construction of facilities for the IBCT at Training Area Bravo under Alternative 1 would have minor impacts to vegetation and wildlife. The area is highly disturbed. The current condition of the existing native vegetation is considered "fair" to "poor." Training Area Bravo supports a colony of more than 2,000 prairie dogs. Construction activities at this site could indirectly impact the burrowing owl (a sensitive species) by removing some nesting habitat (prairie dog burrows). Active management of the Training Area Bravo prairie dog colony would be required to prevent costly construction delays due to compliance conflicts with the Migratory Bird Treaty Act and state laws protecting the owls. No wetlands would be affected by this alternative.

Under the Proposed Action and alternatives, there would be no construction at PCMS and, therefore, no construction-related impacts to biological resources.

E.13.2. Fort Carson and Piñon Canyon Maneuver Site Training
Disturbance to plants and wildlife occurs at both Fort Carson and PCMS as a result of both maneuver and live-firing exercises. This disturbance is caused by human and vehicular activity, weapons firing, noise, and wildland fire. Under the Proposed Action and alternatives, these training activities would increase, as would the potential for disturbance to plants and wildlife. Current management practices such as restrictions on training, observance of buffer zones, compliance with management plans, controlling fleas (vectors of plague), and using prescribed burns would be continued. As a result, the effects of the impacts on plants and wildlife are not expected to be significant.

Additional aircraft at BAAF on Fort Carson would increase the chances of an aircraft-wildlife strike, which could result in loss of life or significant damage to aircraft.

E.14. Cultural Resources
Construction, demolition, and renovation activities at Fort Carson under the Proposed Action and the alternatives are not expected to involve adverse effects to cultural resources. Necessary consultation would be accomplished through the National Historic Preservation Act process. There will be no construction at PCMS.

There is minimal potential for impacts to unrecorded archaeological resources during training activities. The potential exists for inadvertent impacts to known cultural resources during increased training activities.

E.15. Socioeconomics

E.15.1. Fort Carson

The Economic Impact Forecast System (EIFS) analyses indicated that the Proposed Action will produce no major adverse socioeconomic effects in the Region of Influence (El Paso, Fremont, and Pueblo counties). The stationing of a CAB cannot currently be analyzed as the amount and timing of construction expenditures and employee relocations cannot currently be defined. If the decision is made to station a CAB at Fort Carson, a new EIFS analysis would be conducted at that time.

E.15.2. Piñon Canyon Maneuver Site

Local purchases of goods and services may potentially increase and could have a beneficial economic impact.

E.16. Transportation

E.16.1. Fort Carson

The growth at Fort Carson under the Proposed Action would contribute approximately 5 percent of the projected overall regional population increase and would result in several short-term, minor impacts to include: increasing on-post and regional traffic and altering traffic patterns, temporary construction disturbances, increased rail use related to training at PCMS, potential increased transit ridership, and potential increase in rail and aviation for deployment.

E.16.2. Piñon Canyon Maneuver Site

IBCT convoys to PCMS would not cause significant traffic increases above those discussed in the 2007 PCMS Transformation EIS. Some wheeled support vehicles would accompany CAB helicopters that would fly to PCMS to train; this is also not expected to have significant impacts.

E.17. Utilities

E.17.1. Fort Carson

Implementation of the Proposed Action or alternatives would not cause significant impacts to the infrastructure for potable water, wastewater, energy sources, communications and solid waste management. Upgrades and extensions would be required to meet the increased utility demands from additional population and facilities.

E.17.2. Piñon Canyon Maneuver Site

The Proposed Action or alternatives would not impact utilities at PCMS.

E.18. Hazardous and Toxic Substances

Construction and operation of new facilities (at Fort Carson only) and increased training would result in an increase in the use of hazardous materials, use of petroleum-based products, and proper disposal of hazardous waste. The demolition of facilities creates the potential for the generation of lead, asbestos, polychlorinated biphenyls (PCBs), and chlorofluorocarbon wastes.

E.19. Sustainability

Implementation of the Proposed Action or the alternatives would not cause a significant negative impact on *Fort Carson's 25-Year Sustainability Goals* (Reference No. 274). Sustainability initiatives will be implemented as part of all alternatives. These wastes will be disposed of properly.

E.20. Cumulative Impacts

Cumulative impacts include past, present, and reasonably foreseeable future actions that are discussed in Chapter 5. The actions considered in the cumulative impact analysis included actions both within Fort Carson and PCMS and from the neighboring communities. At Fort Carson, cumulative impacts to soils, water resources (surface water), and biological resources (wildlife and vegetation), are predicted to be significant. Impacts to sustainability are also predicted to be potentially significant. At Fort Carson, the economic benefit from the Proposed Action and alternatives would be significant but short-term, with the most benefit occurring during the construction period. At PCMS cumulative impacts to soils are predicted to be significant.

E.21. Mitigation

Mitigation for environmental impacts is described in Chapter 6. Potential mitigation measures in addition to current practices are listed for virtually all resource areas.

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1. Environmental Impact Statement for Fort Carson Grow the Army Stationing Actions

1.1. Introduction

This Environmental Impact Statement (EIS) documents the site-specific analysis of stationing an Infantry Brigade Combat Team (IBCT) (consisting of approximately 3,500 Soldiers), Combat Support (CS) units (totaling approximately 400 Soldiers), and the potential stationing of a Combat Aviation Brigade (CAB) (consisting of approximately 2,800 Soldiers), at Fort Carson. This EIS includes the construction of the facilities necessary to support these units and the siting alternatives of the Proposed Action at Fort Carson (no construction will be conducted at Piñon Canyon Maneuver Site [PCMS]). The decision to station the IBCT at Fort Carson was analyzed in the 2007 Final Programmatic EIS (PEIS) for Army Growth and Force Structure Realignment (Reference Number [No.] 1), and was one of the implementing stationing actions announced in the December 2007 Record of Decision (ROD) (Reference No. 2). The ROD stated that the Army will proceed with its preferred alternative identified in the PEIS, Alternative #3, to:

1) Implement realignments and associated activities between fiscal years 2008-2013 to support the Army's Modular Transformation and Global Defense Posture Realignment (GDPR) decisions;
2) Add approximately 30,000 CS and Combat Service Support (CSS) Soldiers to the Active and Reserve components of the Army to address critical shortfalls in high-demand military skills; and
3) Grow the Army (GTA) by up to six Active Brigade Combat Teams (BCTs).

In its discussion of specific stationing decisions, the GTA ROD stated:

> Fort Carson is being selected for this stationing action because it ranks favorably in possessing the capabilities and attributes the Senior Army Leadership has determined to be necessary to support this stationing action. Key capabilities the Army assessed as part of this stationing decision included the ability to support growth, training, Soldier and Family well being, and power projection. While most Army installations are experiencing considerable training land deficits, Fort Carson's deficit is smaller than a majority of Army installations, allowing it to best support the additional training requirements of this IBCT. It has the capability to support current and future operations of this IBCT and provides a robust and modernized training range and training simulations infrastructure. Moreover, Fort Carson has the ability to handle increased communications traffic required to support military operations and has considerable potential to support future military training requirements. The installation is also one of the most highly requested stationing locations in the Army, has adequate schools and medical facilities, and supports a high quality of Soldier and Family life. These reasons have led the Army to select Fort Carson as the stationing location for the Growth IBCT #5 (Reference No. 2).

The stationing actions analyzed in the GTA PEIS were made with the understanding that site-specific National Environmental Policy Act (NEPA) analysis to implement those decisions would be undertaken at affected installations. This EIS provides decision-makers, regulatory agencies, and the public information on the potential environmental and socioeconomic effects of the implementation of the stationing decision. Decision-makers will be able to compare implementation alternatives and assess environmental and socioeconomic impacts from the stationing actions at Fort Carson and hence make informed decisions.

On October 12, 1999, the Secretary of the Army and the Army's Chief of Staff articulated a vision for the Transformation of the Army to ensure it remained an effective and relevant operational force in the 21st century. The leadership of the Army recognized the emerging need to shift from a Cold War focus to meet new unconventional threats to national security. A decision was made to begin the 30-year process of transforming the Army, which is described in the 2002 ROD for the PEIS for Army Transformation.

Since that decision, the Army has completed the initial phases of this Transformation effort and is continuing to implement those actions which are needed to field a force that is best configured to meet the evolving national security and defense requirements of the 21st century.

As part of the overall Army Transformation effort, the Army has transitioned to a modular, or standardized, force structure. That is, transition from large, powerful, fixed organizations constituted at the Division level (10,000 to 12,000 personnel) to smaller, standardized, self-contained, and rapidly deployable BCTs. There are three types of BCTs with differing equipment, training, maneuver, and support needs: Heavy BCTs (HBCTs), IBCTs and Stryker BCTs (SBCTs).

Since 2002, a series of programs have affected the composition and location of Army forces, in addition to the wars in Iraq and Afganistan. These programs have included Base Realignment and Closure (BRAC), GDPR, and implementation of the Army Modular Force (AMF). The 2007 Fort Carson and PCMS Transformation EISs discussed the implementation of these initiatives at each location. Decisions made and the resulting conditions described in those EISs generally serve as the baseline conditions for this EIS.

The 2007 GTA PEIS analyzed the environmental effects of an addition of units (Army Modularity and GDPR, and growth of new units by up to six Active component BCTs). This growth is intended to mitigate shortages in units, Soldiers, and time to train that would otherwise inhibit the Army from meeting readiness goals and supporting strategic requirements.

In December 2007, following completion of the PEIS, the Deputy Chief of Staff of the Army, G-3/5/7 (Operations, Plans, and Training), signed the ROD validating the Army's plan to grow by approximately 74,200 Active and Reserve component Soldiers and to station these additional Soldiers at various specified installations. This growth decision included the stationing at Fort Carson of an additional IBCT consisting of approximately 3,500 additional Active Duty Soldiers.

Also included in the PEIS and the ROD was the decision to station the 2nd BCT, 2nd Infantry Division (2BCT-2ID) permanently at Fort Carson. (The 2BCT-2ID was reflagged to become the 4th BCT, 4th ID [4BCT-4ID] in March 2008.) The 2BCT-2ID had been stationed at Fort Carson temporarily in 2005, and NEPA analysis for the impacts of stationing it at Fort Carson was included in the 2007 Fort Carson and PCMS Transformation EISs. As a result, in this EIS, the stationing of 2BCT-2ID (reflagged as 4BCT-4ID) will be considered as part of the baseline conditions rather than as part of the Proposed Action.

This EIS will also analyze the potential restationing of a CAB (approximately 2,800 Soldiers) to Fort Carson.

1.2. Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to implement the decisions made in the 2007 GTA PEIS ROD. Fort Carson must provide for the training readiness, deployments, administrative functions, and Soldier and Family quality of life elements for those Soldiers slated for stationing at Fort Carson. The Army has established October 2010 as the effective date for standing up the new IBCT. This date reflects the urgent need to balance training readiness with mission requirements while allowing the Army to improve Soldiers and Family quality of life, and other goals defined in the GTA PEIS.

The GTA PEIS ROD directed the stationing at Fort Carson of a new IBCT, plus the following units:

- 573rd Transportation Detachment (Movement Control Team)
- Area Test, Measurement, and Diagnostic Equipment Support
- 52nd Engineer Battalion Headquarters (Horizontal Construction)

- 615th Engineer Company (Horizontal Construction)
- 46th Engineer Detachment (Concrete)
- 497th Horizontal Engineer Company
- 544th Vertical Engineer Company
- 40th Engineer Survey Design Team
- 167th Transportation Detachment (Movement Control Team)
- Quartermaster Company
- Engineer Company

The stationing of most of the units listed above was analyzed in the 2007 Fort Carson and PCMS Transformation EISs. The Quartermaster Company and the Engineer Company, however, were not known stationing actions at the time or were actions that were to occur after the time analyzed in those EISs. Therefore, these two support units will be included with the new IBCT in the analysis throughout this EIS. Like the 4BCT-4ID, the other support units listed above will be considered as part of the baseline conditions, rather than as part of the Proposed Action.

In addition to these new unit stationing actions at Fort Carson, the growth of the installation may include the restationing of a CAB. The CAB is the standard design for Army aviation brigades under the modular force plan. Formerly called the multi-functional aviation brigade, the CAB is part of Army Transformation. Fort Carson would be the home station of five BCTs, the 10th Special Forces Group (Airborne) (hereafter referred to as Special Forces), and various support units. Fort Carson is the only installation with four or more BCTs without a CAB. The stationing of a CAB to support these units would support and enhance integrated training at Fort Carson. The Army is considering Fort Carson and several other locations for the stationing of a CAB in the 2008-2013 timeframe. Because of this, the Army has included an evaluation of the potential impacts of stationing a CAB at Fort Carson in this EIS.

Implementing these requirements would involve constructing new facilities to support additional Soldiers and their Families, upgrading and constructing ranges, and continuing the use of training ranges and maneuver areas. Facilities for training, garrison operations, and Soldiers' quality of life are critical for supporting the operations of the new units that would be stationed at Fort Carson. Adequate facilities do not currently exist to accommodate the new units; therefore, construction of facilities would be required.

1.2.1. Army Training Strategy and Doctrine

Current training needs have been shaped by AMF and Transformation, operational experience in Afghanistan and Iraq, and new equipment capabilities. Training requirements are outlined in Training Circular (TC) 25-1, *Training Land* (Reference No. 3), and TC 25-8, *Training Ranges* (Reference No. 4).

Training in the current operational environment requires large maneuver or training areas of varying characteristics with complex terrain. The Army also has an increased need to conduct urban training operations. Trends toward greater urbanization in operational theaters across the globe require the Army to provide security, stability, and counterinsurgency operations in populated urban environments. The military's experiences from Iraq and Afghanistan have demonstrated that Special Forces operations, intelligence gathering, and the use of joint multi-service and multinational (sister service and coalition) assets are also critical to mission success and defeat of a dispersed and poorly defined enemy force. It should be noted, however, that the Army is making progress in its efforts to emphasize urban, Special Forces, intelligence gathering, and joint and multinational training at Fort Carson and PCMS to ensure current and future mission success. In addition to these increased training requirements, the Army must retain its ability to train on mechanized force-on-force training tasks.

Training needs must also consider contingencies that Soldiers may face in future conflicts, taking into account weapons and communications capabilities and the full range of potential enemies.

High-quality training that prepares Soldiers for the operational environment is essential to ensuring the success of the nation's strategic defense objectives, national security, and the safety of Soldiers. Home stations, such as Fort Carson, must prepare Soldiers for operational deployments and missions. This preparation includes live-fire mission support and maneuver training, each of which is discussed as follows in the context of needs of an IBCT and a CAB.

1.2.2. Installation Sustainability

On October 1, 2004, the Secretary of the Army and the Army Chief of Staff issued the *Army Strategy for the Environment* (Reference No. 5), which focuses on the interrelationships of mission, environment, and community. A sustainable installation simultaneously meets current and future mission requirements, safeguards human health, improves quality of life, and enhances the natural environment. A sustained natural environment is necessary to allow the Army to train and maintain military readiness. This strategy is implemented by Army Regulation (AR) 200-1, Environmental Protection and Enhancement, which reinforces the Army's commitment to applying sustainable policies and practices to safeguard the environment. It builds upon the numerous environmental plans and policies that have been developed and implemented to protect environmental resources at Fort Carson. As an installation, Fort Carson has developed Master Planning Strategy Smart Growth Principles that provide ten specific goals for facility siting and usage that guide conservation at Fort Carson. Appendix A summarizes key plans and policies, including the Smart Growth Principles, in place at Fort Carson.

Fort Carson has implemented numerous voluntary programs to achieve a more sustainable installation. Several goals have been established, both for short-term and long-term implementation, in areas such as energy/water, transportation, air quality, buildings, green procurements, zero waste, and training ranges. Fort Carson has received numerous awards and recognition from both the military community and external organizations for its commitment to the environment and its sustainability program.

Fort Carson has committed to achieving a higher level of environmental performance through continued progress toward its sustainability goals. The progress toward implementation of these voluntary measures depends on available funding.

Additional information regarding Fort Carson's sustainability achievements and future goals can be found at http://sems.carson.army.mil/.

The Army recognizes that a unit executing training for its current mission, or to doctrinal standards to maintain its overall readiness, affects training lands. To manage training lands in a sustainable manner, the Army has instituted land and environmental management programs to support sound natural resource management practices and provide stewardship of its training lands.

The impacts to land from military training are a particular focus of Fort Carson's sustainability effort. The ITAM (Reference No. 174) program establishes a uniform land management program, elements of which include inventorying and monitoring land condition, integrating training requirements with land carrying capacity while training to standard, educating land users to minimize adverse impacts, and prioritizing and implementing rehabilitation and maintenance projects. ITAM is governed by AR 350-19, The *Army Sustainable Range Program* and Fort Carson (FC) Regulation 350-9, *Integrated Training Area Management* (Reference Nos. 173 and 174, respectively). Other important resource management programs and procedures are provided in Fort Carson's *Integrated Natural Resource Management Plan* (INRMP) (Reference No. 6), and *Integrated Cultural Resource Management Plan* (ICRMP) (Reference No. 7). These programs seek to optimize training while providing sustainable land management that will ensure that training lands continue to be available to support the Army's mission.

1.3. Scope of the Analysis

This EIS addresses environmental and socioeconomic impacts at Fort Carson and PCMS as a result of stationing additional units at Fort Carson. In this EIS, environmental impacts associated with the additional units are analyzed under the assumption that all Fort Carson units could be present and active at Fort Carson and/or the PCMS (an assumption unlikely under current wartime conditions, but likely in future peacetime). Should the Proposed Action or Alternatives be implemented, this scenario is both realistic and conservative. This site-specific EIS has been developed in accordance with NEPA; the regulations issued by the Council on Environmental Quality (CEQ), 40 Code of Federal Regulations (CFR) (42 USC 4321 et seq.); and the Army's implementing procedures published in 32 CFR Part 651, Environmental Analysis of Army Actions. The potential stationing of a CAB is also analyzed in this document for the reasons stated in Section 1.2. Any decision by the Department of the Army to station a CAB at Fort Carson would have to be preceded by NEPA analysis, and, depending on how much time passes, its implementation at Fort Carson could require additional NEPA analysis. The Army is actively preparing to make a decision concerning the stationing of a CAB and the effects of stationing such a unit at Fort Carson can be meaningfully evaluated.

This EIS incorporates the analysis of the 2007 GTA PEIS and 2007 Fort Carson (Reference No. 9) and PCMS Final Transformation EISs (Reference No. 119), by reference, and provides the baseline conditions of the No Action Alternative. The scope of the EIS does not include potential land acquisition for expansion of PCMS. The relationship of this Proposed Action and potential PCMS expansion is discussed in Chapter 2.

1.4. Public Involvement

As required by NEPA regulations, the Army invited public participation in the EIS process. Comments from all interested persons were considered to promote open communication and enable better decision-making. All agencies, organizations, and members of the public with a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, were provided the opportunity to participate in the decision-making process.

1.4.1. Overview of the Public Involvement Process

Public participation opportunities for this EIS and decision-making on the Proposed Action were guided by 32 CFR Part 651. The EIS process began by involving the public, agencies, and other interested parties in the scoping process to identify the issues to be addressed in the EIS. Subsequently, a Draft EIS (DEIS) was prepared and filed with the US Environmental Protection Agency (EPA), and the Army published a Notice of Availability (NOA) in the Federal Register and in newspapers near Fort Carson and PCMS.

A 45-day comment period began on the date EPA announced the availability of the DEIS in the Federal Register. During the 45-day comment period, but after at least 15 days following publication of the NOA, public meetings were held to provide an opportunity for the public, organizations, and regulatory agencies to provide comments on the DEIS. A Final EIS (FEIS) was then prepared that addresses all comments received on the DEIS. The FEIS was filed with EPA and made available to the public through an NOA published in the Federal Register.

A final decision on the Proposed Action will be documented in a ROD. The Army will issue the ROD after a 30-day waiting period. The NOA of the ROD will then be published in the Federal Register.

Throughout this process, the NEPA Coordinator (phone number: 719-526-0912; fax number: 719-526-1705; or email: carsdecamnepa@conus.army.mil or carsdecampcmsnepa@conus.army.mil) was available to answer questions regarding the scope, status, and progress of the EIS and to receive comments.

1.4.2. Scoping and Public Notice

On May 7, 2008, the Department of the Army issued in the Federal Register a Notice of Intent (NOI) to prepare an EIS for GTA actions at Fort Carson, Colorado (73 Federal Register 25686). In addition, individual letters were sent to invite agencies to an agency scoping meeting, and notices of three public scoping meetings were publicized in local papers and through a public service announcement made available to local news media outlets.

1.4.2.1. Agency Scoping

Agencies with permitting review responsibilities and other interested parties were invited to the agency scoping meeting held at Fort Carson, Colorado, on May 19, 2008, from 1:00 to 3:00 p.m. Of the 28 invited organizations, representatives from the following nine agencies attended the scoping meeting:

- US Army Corps of Engineers (USACE), Southern Colorado Regulatory Office
- US Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)
- USDA, Forest Service (USFS)
- Colorado Division of Wildlife (CDOW)
- El Paso County Department of Health and Environment (EPC Health)
- US Department of Interior (DOI), US Geological Survey (USGS)
- DOI, US Fish and Wildlife Service (USFWS)
- DOI, US Bureau of Land Management (BLM)
- EPA

The Fort Carson Program Manager for this EIS briefed the attendees on the general nature of the Proposed Action and the process for the EIS.

Attendees raised general questions or issues for consideration in the EIS during a question and answer period following the presentation. Specific comments or concerns were related to water impacts (i.e., stormwater, water quality, water runoff, wastewater, wetlands, etc.), continued agency access through PCMS to USFS lands, additional monitoring of resources (i.e., wildlife, air quality, erosion control), and socioeconomic impacts on the Front Range to include recreation (e.g., campgrounds, Pikes Peak National Forest, Arkansas River). No written agency comments were received.

1.4.2.2. Public Scoping

Public scoping meetings were held at Trinidad Community College in Trinidad, Colorado, on May 20, 2008, the Crowne Plaza Hotel in Colorado Springs, Colorado, on May 21, 2008, and at Otero Junior College in La Junta, Colorado, on May 22, 2008. All three scoping meetings were conducted during the hours of 6:30 to 8:30 p.m. Approximately two weeks before the public scoping meetings, notices of the meetings were published in the following ten general circulation papers: The Gazette, Fountain Valley News, Pueblo Chieftain, La Junta Tribune-Democrat, Bent County Democrat, Fowler Tribune, Trinidad Chronicle, Rocky Ford Daily Gazette, Ordway New Era, and Ag Journal. These public notices provided information on the background and purpose of the Proposed Action, requested public comments, and provided information on the public scoping meetings. In addition, on May 8, 2008, Fort Carson released a public service announcement to all local major media outlets (newspapers, television, and radio) regarding the public scoping meetings.

At each meeting, the Army was represented by Fort Carson staff. Approximately 78, 52, and 70 members of the public, including local media representatives, attended the three meetings, respectively.

At each of the meetings, the members of the public were greeted upon arrival, requested to sign an attendance record form listing their name, address, affiliation (if any), and given an information sheet. All attendees were provided with comment forms to provide written comments or concerns that they would like addressed in the EIS. They were asked to either complete and return the forms before leaving the meeting or return the forms to the Army no later than the close of the scoping period on June 6, 2008. The meetings were conducted in a roundtable discussion format and lasted approximately two hours each. Individuals and organizations provided written or verbal comments on the scope of the EIS during the public scoping period. Comments received generally addressed potential effects regarding water supplies and biological resources on and around the installation, and noise effects from aircraft on private landowners. Additional details regarding the meeting, as well as transcripts of all public comments, are available in the *Fort Carson Grow the Army EIS Scoping Meeting Summary Report* (Reference No. 8).

1.4.3. Review of the Draft Environmental Impact Statement

A NOA for the DEIS was published in the Federal Register on October 10, 2008, announcing a 45-day public comment review period. Federal, state, and local agencies were sent letters providing information on the availability of the DEIS, the request for review and comment on the DEIS, and details regarding the public review meetings. Three public meetings were conducted during the public comment period in the following locations: Trinidad at Trinidad State Junior College, October 27, 2008; La Junta at Otero Junior College, October 28, 2008; and Colorado Springs at the Crowne Plaza Springs Hotel, October 29, 2008. The 45-day public comment review period ended on November 24, 2008.

The public meetings were conducted from 6:30 p.m.to 8:30 p.m. The meetings began with an informal session/open house conducted from 6:30 p.m. to 7:00 p.m. with poster exhibits. Fort Carson, PCMS and AEC representatives were available to answer questions. A brief slideshow presentation addressing the NEPA process, meeting format and agenda, provisions for providing comments on the DEIS, and the Proposed Action and Alternatives evaluated in the DEIS was presented by the Army. Following the presentation, the public was invited to provide verbal comment on the DEIS. Comment forms were also provided at each meeting for attendees to submit written comments on the DEIS. The facilitator noted that all comments submitted (verbally, electronically, or via mail) on the DEIS received during the comment period would be addressed in the FEIS.

There were 90 people in attendance, and 15 chose to provide verbal comments. Details of the three public meetings are as follows: 41 people attended the Trinidad meeting of which 7 individuals provided oral comments and 5 comment forms were submitted; 34 attended the La Junta meeting of which 6 individuals provided oral comments and 2 comment forms were submitted, and 15 attended the Colorado Springs meeting of which 2 individuals provided oral comments and 1 comment form was submitted. All public comments were transcribed by a court reporter and are provided in Appendix I.

Additional comments received during the public comment period were considered in the preparation of the FEIS. All comments, including the transcript of the public review meetings, and the Army's responses to those comments are provided in Appendix I. In some cases, comments prompted clarifications from the DEIS that are reflected in this FEIS.

The following is a summary of major changes made to this EIS based on comments received on the DEIS.

Chapter 2, Alternatives

- A discussion of MIMs methodology as been added to Chapter 2, Section 2.2.4 Training.

Chapter 3, Fort Carson Affected Environmental and Environmental Consequences

- Section 3.3 Air Quality, Section 3.3.4.1. Proposed Action and Alternatives has been updated to include additional discussion on air dispersion modeling.
- Section 3.6 Water Quality, Section 3.6.1.2 Modeling/Program Background has been updated to include a discussion of stormwater modeling.
- Section 3.8 Cultural Resources, Section 3.8.1.1 Prehistoric and Historic Background has been updated to provide additional discussion on the AAP. Additionally, Section 3.8.2 Environmental Consequences has been updated.

Chapter 4, Piñon Canyon Maneuver Site Affected Environment and Environmental Consequences

- Chapter 4, Section 4.7.1.1 Proposed Action –Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade has been updated to include discussion regarding public hunting.
- Section 4.3 Air Quality Section 4.7.1.1 Regional Ambient Air Quality under Current Air Permits and Plans has been updated to include a discussion of dust palliatives.
- Section 4.4.3 Environmental Consequences has been updated to include the results of three modeling analyses (AERMOD, DUSTRAN, CALPUFF).
- Section 4.5 Geology and Soils, Section 4.7.1.1 Chemical Constituents in Soil has been updated to provide further discussion on selenium. Under Section 4.7.1.1.1 Local Setting additional discussion has been provided regarding soil erosion control activities and monitored water quality.
- Section 4.6 Water Resources, Section Table 4.6-1 Stream Classifications and Water Quality Standards for Segment 7 has been updated. Section 4.7.1.1.1 303(d) Listed Waters has been updated. Section 4.6.111 In-Stream Water Quality additional discussion of the Purgatoire River has been added. Section 4.6.1.3.2 Local Setting has been updated to include a discussion of the Dakota Sandstone and Purgatoire Formation. Section 4.6.1.5 Stormwater has been updated to include a discussion of hydrologic models.
- Section 4.7 Biological Resources, Section 4.7.1.1.1 Vegetation has been updated to include the discussion of wildland fires and additional discussion of noxious weeds is included in Section 4.7.2.1.2 Noxious Weeds.
- Section 4.8 Cultural Resources, Section 4.8.5 Environmental Consequences has been updated to include information concerning training activities.
- Section 4.10 Utilities, Section 4.11.1.1.2 Project Setting includes additional discussion concerning the City of Trinidad potable water transmission to PCMS. Section 4.11.1.2 Wastewater System and Section 4.11.1.3 Energy Sources have also been updated.

Chapter 5, Cumulative Impacts

- Section 5.2.1.4.2 Air Quality has been updated to include the results of the CALPUFF modeling.
- Section 5.2.1.4.6 Biological Resources has been updated to include a discussion of natural resources management agency coordination.
- Section 5.2.1.4.9 Transportation has been revised.
- Section 5.2.2.2.2 Air Quality has been updated to address AERMOD, DUSTRAN and CALPUFF modeling information.
- Section 5.2.2.2.5 Water Resources has expanded the discussion to provide additional information regarding the Purgatoire and Arkansas Rivers.

Chapter 6, Mitigation Summary

- This is a new chapter which presents existing and proposed additional mitigation measures for Fort Carson and PCMS. Mitigation has been deleted from Chapters 3 and 4.

Appendices

- Appendix C Air Quality Supporting Documentation now includes the following air quality final reports:
    1. Final Clean Air General Conformity Analysis and Determination for U.S. Army Garrison Fort Carson
    2. Final Air Quality Analysis Modeling Report for U.S. Army Garrison Fort Carson
    3. Final Prevention of Significant Deterioration Applicability Analysis for Infantry Brigade Combat Team U.S, Army Garrison Fort Carson
    4. Final Prevention of Significant Deterioration Applicability Analysis for Combat Aviation Brigade, U.S., Army Garrison, Fort Carson
    5. Final Air Quality Analysis Modeling for the Piñon Canyon Maneuver Site

- Appendix E Stormwater Stimulations now includes the Stormwater Simulations for Fort Carson and Piñon Canyon Maneuver Site.
- Appendix F Biological Resources Supporting Documentation now includes the Anthropod Species Known to Occur at the PCMS.
- Appendix G Cultural Resources Supporting Documentation now includes the signature page for the Comprehensive Agreement.
- Appendix H Socioeconomics Economic Impact Forecast System now includes data on PCMS.
- Appendix I Public Comments and Responses on the Fort Carson GTA EIS has been added to the EIS.

1.5. Legal Framework

The scope of this EIS is to evaluate the environmental and socioeconomic impacts of the Proposed Action (Section 1.2). The timing for implementing the Proposed Action is contingent on numerous factors, such as mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations at Fort Carson and PCMS, AR 200-1, *Environmental Protection and Enhancement* (Reference No. 41), mandates compliance with all applicable federal, state, and local environmental regulations and requirements of environmental permits; Executive Orders (EOs) that establish standards and provide guidance on environmental and natural resources management and planning; and Army and Fort Carson regulations that define overall management of the land at Fort Carson and PCMS. Many of these guiding statutes and regulations are discussed throughout Chapter 3 and 4, where applicable, for the resources evaluated in this EIS.

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2. Alternatives

2.1. Introduction

This section describes the alternatives considered and the alternative selection criteria used for this EIS. The No Action Alternative, as required by NEPA (40 CFR 1508.25[b]), is also described.

2.1.1. General

The range of alternatives for this EIS is dictated in large part by the preceding events. As described in Section 1.1, the decision to station the IBCT and the support units at Fort Carson has already been the subject of a PEIS and final decision. The Department of the Army has not yet made a stationing decision for the CAB. This EIS analyzes the effects of implementing the stationing of the IBCT, the two support units, and the CAB at Fort Carson (i.e., the impacts of bringing the units and Soldiers to Fort Carson).

2.1.2. Limited Alternatives

For many aspects of the stationing, there are no true alternatives. For example, increased numbers of Soldiers and Families, the need for and location of new facilities, and the need for training, are all necessary elements or results of the stationing actions. There are, however, alternative building locations for necessary construction on the Fort Carson cantonment area, which are described in this EIS. Analysis of alternatives focuses on the impacts on the natural and human environments from these actions. Appropriate mitigation measures are also presented in this EIS.

2.1.3. Essential Character of Fort Carson and Piñon Canyon Maneuver Site

It is important to note that implementing the Proposed Action would not alter the essential nature of Fort Carson or PCMS, which would remain as military installations on which Soldiers train, work, and live, and on which there are facilities to support those activities.

2.1.4. Location

Fort Carson is located south of Colorado Springs, Colorado, east of the Rocky Mountain Front Range, and occupies portions of El Paso, Pueblo, and Fremont counties (Figure 2-1).

Fort Carson is generally bounded by State Highway (SH) 115 on the west and by Interstate 25 (I-25) and mixed development to the east (Figure 2-2). The City of Pueblo lies approximately 10 miles south of Fort Carson's southern boundary. The City of Fountain is located east of Fort Carson. Fort Carson comprises approximately 137,000 acres and ranges from 2 to 15 miles in width from east to west and up to 24 miles in length from north to south.

Soldier support facilities are provided in the cantonment area. This built-up area, located in the northern tip of Fort Carson, contains troop and family housing, administrative, maintenance, community support, recreation, supply and storage facilities, utilities, and classroom and simulation training facilities. Fort Carson's downrange area serves as an active military training facility for both weapons qualification and field training. The downrange area comprises the land area outside the cantonment area, including firing ranges, training lands and impact areas.

PCMS is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Fort Carson (Figure 2-1). PCMS is bounded by US Highway 350 (US 350) to the west, Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. Nearby cities include Trinidad to the southwest and La Junta to the northeast.

PCMS includes a small cantonment area at the entrance gate on US 350, containing austere facilities to support training.

FORT CARSON & PIÑON CANYON MANEUVER SITE

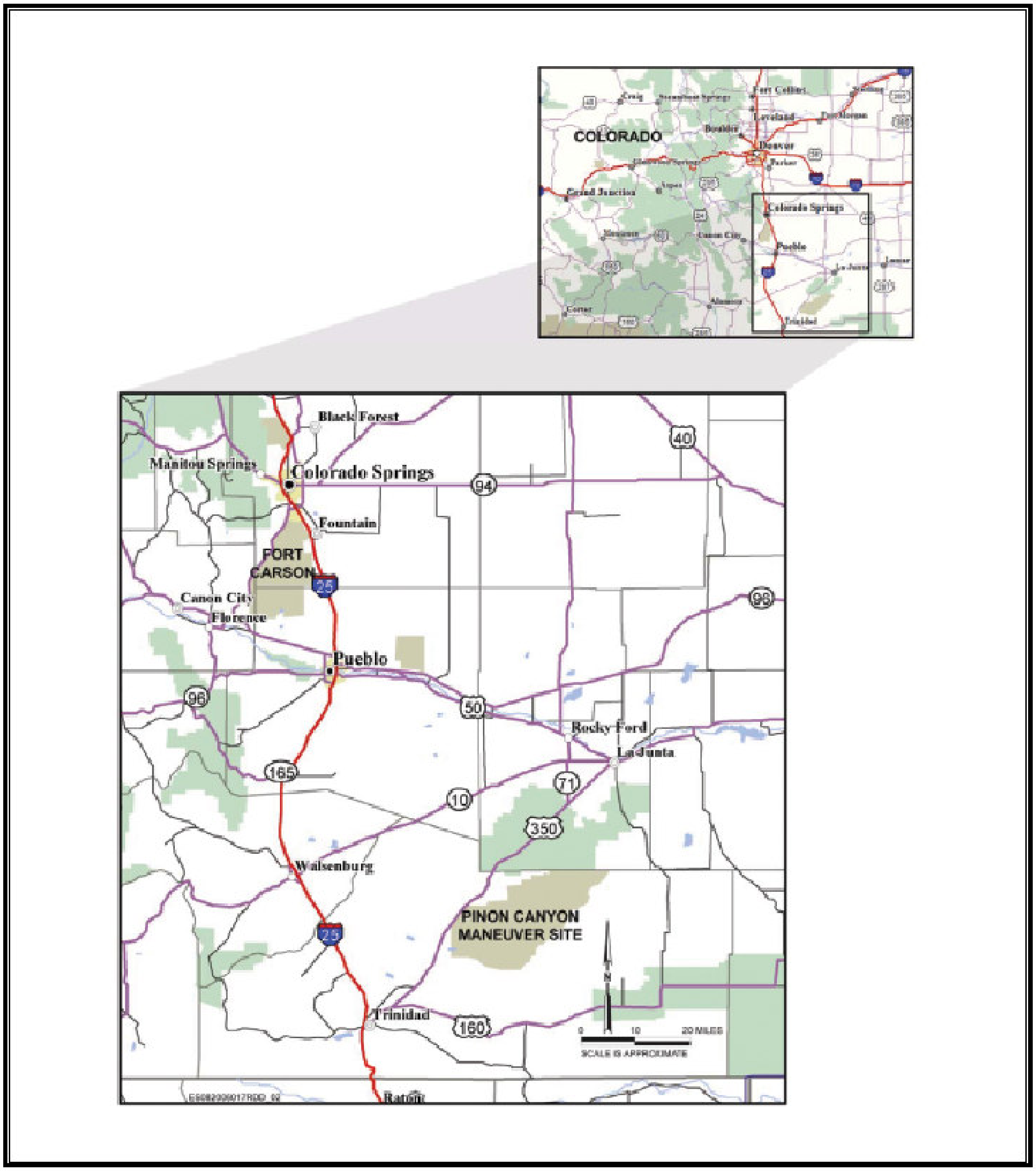

Figure 2-1 Fort Carson and Pinon Canyon Maneuver Site

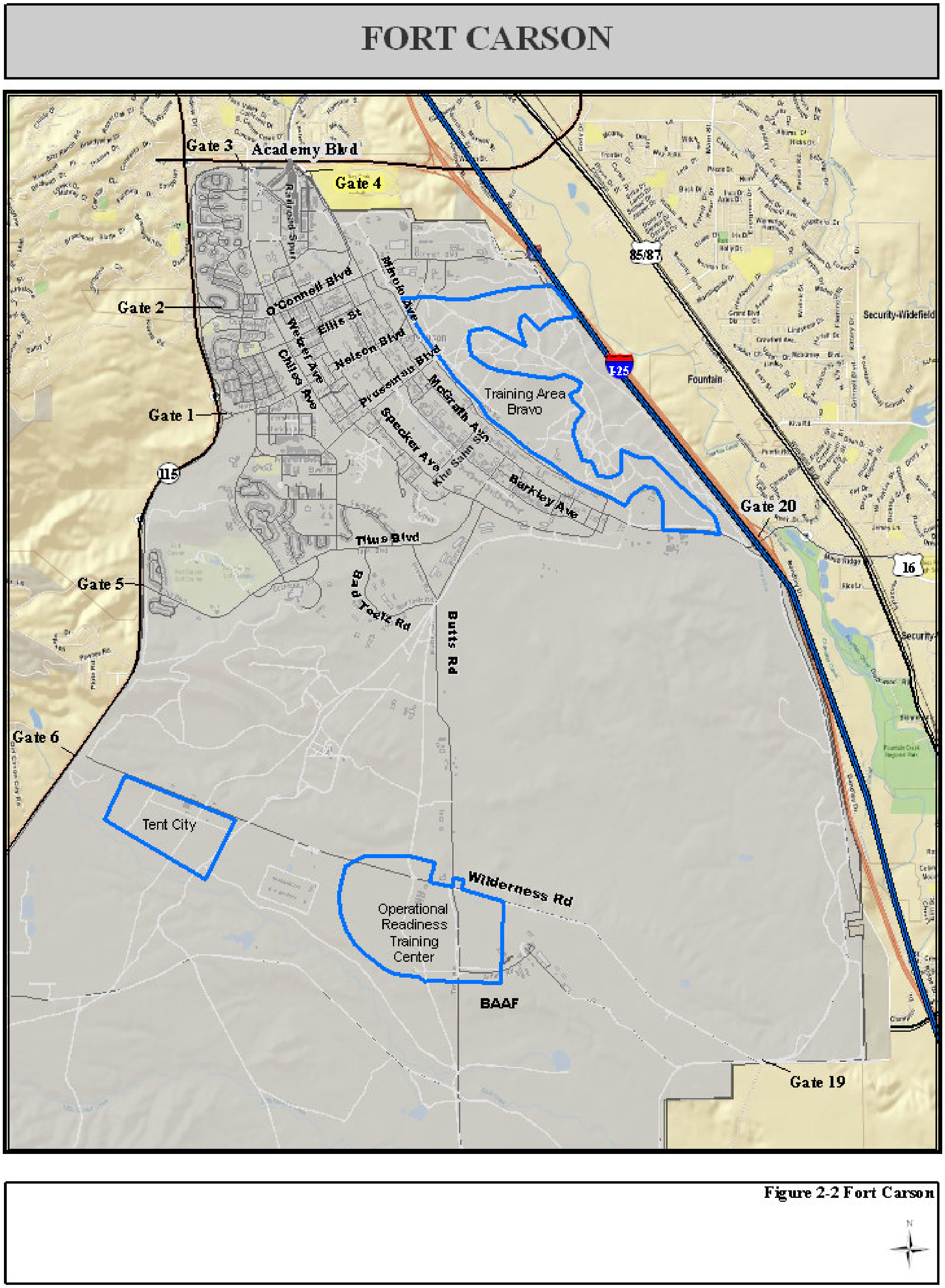

Figure 2-2 Fort Carson

2.1.5. Study Area

The majority of construction associated with the Proposed Action and alternatives would occur outside the Fort Carson cantonment area along Wilderness Road, with additional construction of several small-scale range projects planned for the downrange area. No construction would occur at PCMS.

The primary study area includes all land within the Fort Carson and PCMS boundaries. Baseline conditions and impacts to areas surrounding Fort Carson and PCMS are described and considered as appropriate in Chapters 3 and 4, respectively, based on the Region of Influence (ROI) for environmental resource areas. For instance, impacts to biological and cultural resources would primarily occur within the boundaries of Fort Carson and PCMS, but impacts to other resource areas, such as socioeconomics, utilities, and transportation, could be regional in nature. Cumulative impacts involve a more extensive analysis of resource areas, combining a historic perspective with present and anticipated future impacts for each resource area. Cumulative impacts consider Fort Carson, PCMS, and surrounding areas.

2.1.6. Relationship between Army Growth and the Potential for Future Expansion of Piñon Canyon Maneuver Site

GTA decisions, including the assignment of the IBCT to Fort Carson, were made in light of the overall Army training land shortfall on all installations and on the premise that receiving installations would be limited to their existing lands to accommodate these additional units. The GTA PEIS states:

> This analysis examines installations in their current boundaries. It does not consider possible expansion of land holdings at installations. The process of land acquisition for Federal Agencies is a long one, requiring multiple approvals, a series of environmental and real estate planning studies, and funding of appropriations. Because of these uncertainties, there are no installation expansion actions that are included in the scope of this analysis.

The Army's position is that the present facilities at Fort Carson and PCMS marginally provide sufficient land to train assigned Soldiers and units adequately, including the IBCT and CAB being studied in this EIS, for *current* missions. As stated in the 2007 Fort Carson Transformation EIS, however, even with just the assignment of the baseline units and Soldiers, it will be necessary for the Army to deviate from its doctrinal training standards, which are designed to address the multiple contingencies that its forces may face, both now and in the future, not just current missions. With the addition of the new units at Fort Carson, the Army would have to introduce more work-arounds and deviate further from doctrinal training standards, which would have associated costs and implications. These could include greater environmental impacts, less time for Soldiers with their Families at home station, increased expenses, and sub-optimal training.

Thus, the Proposed Action is a stand-alone action within the rules set out in CEQ regulation 40 CFR 1508.25. That is, the contemplated expansion of PCMS is not a connected action to the Proposed Action because the Proposed Action will not automatically trigger expansion, the Proposed Action can proceed without expansion, and the Proposed Action and expansion are not interdependent parts of a larger action.

The need to implement the GTA ROD stationing decisions expeditiously is similar to the situation the Army faced in the 2007 Fort Carson Transformation EIS. In that document, the Army stated:

> Because of the immediate need for implementing the transformation actions, expansion is neither a reasonable component of the [proposed action] nor a reasonable and feasible alternative to it. . . . The transformation . . . can be implemented as a stand-alone action . . . that does not require expanding the PCMS boundaries. That is, land acquisition is not necessary or proposed to implement the [proposed action].

After due consideration in the GTA PEIS, and as stated in the GTA ROD, the Army determined that a new IBCT and other units were to be stationed at Fort Carson. A main justification for creation of the new GTA units was to provide relief to existing forces from the demands of the current operational tempo, particularly short turn-around times between deployments. Thus, implementation of the decisions recorded in the GTA ROD, including the Proposed Action, must occur quickly. In contrast, any potential expansion of PCMS will have to await a longer period of consideration and execution.

Whether, when, where, to what extent, and how PCMS expansion may occur are, at present, not determined. This uncertainty results largely from the considerable community and political concern that has been expressed about this issue, including several legislative measures at both the state and federal level. In light of this uncertainty, the Army has not yet been able to formulate either a proposed action or a set of reasonable alternatives for potential expansion. Both of these are required before the Army may publish a NOI to start the EIS process. Thus, potential PCMS expansion simply has not arisen to the level of a “proposal” within the meaning of NEPA and is not ripe for NEPA analysis.

For all of the reasons discussed above, potential PCMS expansion is not analyzed in this EIS. The Army is not trying to avoid the environmental impact scrutiny required by NEPA. If and when PCMS expansion arises to the level of a proposal that is ripe for NEPA analysis, it will be the subject of separate NEPA analysis with all required opportunities for public participation. Should that point be reached, the analysis would consider the cumulative effects of the Proposed Action in combination with the effects of potential expansion.

2.2. Proposed Action

The Proposed Action is to implement the stationing of an additional IBCT and the two support units (as decided in the Fort Carson portions of the GTA ROD) and the CAB (anticipating its possible stationing at Fort Carson). The Proposed Action is the Army’s preferred alternative and would include the following:

- **Troop-Level Increase.** Accommodate an overall increase in Soldiers who would work, live, and train at Fort Carson and PCMS. Under the Proposed Action, approximately 3,900 Soldiers (a new IBCT plus support units) or approximately 6,700 Soldiers (the new IBCT and support units plus a CAB) would be stationed at Fort Carson.
- **Facility Removal and Construction/Renovation.** Remove facilities and infrastructure that are no longer needed, relocate facilities to support new construction, construct new facilities and infrastructure, and renovate existing facilities and infrastructure to support the new population and training activities. All construction under the Proposed Action would take place at Fort Carson. See Appendix B for further information.
- **Live-Fire Training and Maneuvers.** Provide for training activity for existing and new units stationed at Fort Carson, which incorporates the need to balance any additional or different maneuver training, live-firing, and environmental management to meet the Army’s integrated goals of maintaining military training readiness and sustaining lands for continued use (Section 1.2.2). Live-fire training and maneuver activities under the Proposed Action would be similar to those described for the No Action Alternative (Section 2.4.4). The training requirements of an additional IBCT, however, could result in increased frequency of use of training ranges. PCMS is anticipated to support the maneuver training requirements at the battalion level and above.
- **Training Strategy.** Training under the Proposed Action would occur throughout Fort Carson and PCMS in accordance with the suitability of the land for different training activities (e.g., maneuver or live-fire) and the ability to sustain the land.
- **Staged Stationing of Troops.** The restationing and Transformation of Fort Carson’s force structure are expected to continue (Reference No. 9). Implementation of the full restationing and Transformation is expected to be complete by 2012. As the Army proceeds with Transformation planning, the total unit strength may vary throughout the implementation period (although these

variations relate to smaller units below the BCT level). Troop arrival schedules at Fort Carson from restationing, deployment, and standing up the new IBCT would affect the timing of implementing new training requirements.

- **Timing of Construction Projects.** The timing of construction projects would be contingent upon funding availability and priorities, and projects would likely be constructed in phases throughout the implementation period.
- **Environmental and Training Conditions.** Factors beyond the Army's control, such as world stability, troop deployments, and climatic conditions, affect the implementation of training. Because environmental and training conditions are dynamic, training activity under the Proposed Action is a process, by which the Army would monitor and respond to changing conditions, to sustain the land for training and provide maximum troop readiness.

2.2.1. Changes in Force Structure and Population

This section presents changes in force structure and population that would be the result of implementation of the Proposed Action. These are additions to the force structure anticipated as the end state determined in the 2007 Fort Carson Transformation EIS.

As announced in the GTA ROD, Fort Carson was selected to receive a new IBCT recently named as the 5th Brigade, 4th ID (5BCT-4ID). For purposes of this EIS, this unit will be referred to as the IBCT. Fort Carson will also gain new support units beyond those studied in the 2007 Fort Carson and PCMS Transformation EISs; a Quartermaster Company and an Engineer Company, for a combined total of about 400 Soldiers.

2.2.1.1. Infantry Brigade Combat Team

The existing force structure at Fort Carson is described in Section 2.4.1 in the No Action Alternative. Under the Proposed Action, the addition of the IBCT would result in an increase of approximately 3,900 Soldiers and their Families. The IBCT stationing is expected to be completed by 2012. Fort Carson would experience a net gain of units and personnel under the Proposed Action.

Based on data from the May 2008 Army Stationing and Installation Plan and information obtained from the Fort Carson Force Integration Office, Table 2-1 shows the projected population increases for the IBCT and their Families, as well as civilian personnel. Families are estimated using the multiplier supplied by the *2008 Pikes Peak Area Council of Government (PPACG) Fort Carson Regional Growth Coordination Plan* (Reference No. 10).

Table 2-1 Summary of Projected Fort Carson Population Increase for Infantry Brigade Combat Team

Personnel	No Action Alternative	Proposed Action (End of Implementation in 2012)	Total Population Increase
Military	25,100	29,000	3,900
Civilian Employees/Contractors	5,124	5,140	16
Military Family Members	46,937	54,230	7,293
Total	**77,161**	**88,370**	**11,209**

Source: Families: Reference No. 10
All Others: Reference No. 11

2.2.1.2. Combat Aviation Brigade

There is also the potential for the stationing of a CAB. This would result in an additional increase of approximately 2,800 Soldiers and their Families.

Table 2-2 shows the projected combined population increases for the IBCT and the CAB, their Families, and civilian personnel.

Table 2-2 Summary of Projected Fort Carson Population Increase for Infantry Brigade Combat Team and Combat Aviation Brigade

Personnel	No Action Alternative	Proposed Action (End of Implementation in 2012)	Total Population Increase
Military	25,100	31,800	6,700
Civilian Employees/Contractors	5,124	5,151	27
Military Family Members	46,937	59,466	12,529
Total	**77,161**	**96,417**	**19,256**

Source: Families: Reference No. 10
All Others: Reference No. 11

2.2.2. Equipment

The IBCT is divided primarily into two infantry battalions, a reconnaissance and surveillance battalion, a fires battalion, a support battalion, and a special troops battalion consisting of CS units. Authorized major equipment includes towed M119A1 105-mm artillery, light engineer equipment, light tactical equipment, and medium/large cargo trucks. All vehicles are capable of on-road and off-road maneuver. See Section 2.2.4.2 for a more comprehensive description of an IBCT's equipment.

The equipment used by the new IBCT would not differ substantially from that used by currently assigned units. More of the same types of equipment, however, would be maintained and stored at Fort Carson because each BCT is assigned their own equipment (i.e., units do not share equipment).

A CAB is divided primarily into two attack/reconnaissance battalions, an assault battalion, a general support aviation battalion, an aviation support battalion (medium), and an air traffic service company. The CAB is authorized 116 helicopters. Additionally, a CAB is accompanied by approximately 700 tactical vehicles (e.g., light trucks, fuelers, and transport vehicles).

2.2.3. Construction of Support Facilities at Operational Readiness Training Center

2.2.3.1. Infantry Brigade Combat Team

To support the IBCT stationing, the Army would construct facilities at the Operational Readiness Training Center (ORTC) along Wilderness Road at Fort Carson. An IBCT complex, including infrastructure, would be constructed. This would include facilities such as battalion headquarters, barracks, company operations, tactical equipment maintenance facilities, and a dining facility. The proposed location would also require construction of support facilities to include a fire station, a central vehicle wash facility, a physical fitness center, a child development center, a dental clinic, and access control improvements at Gate 6, Gate 19, and relocation of the Crow's foot access control point. The total acreage analyzed for this action, which encompasses existing ORTC facilities and a portion of Butts Army Airfield (BAAF), is approximately 575 acres, of which about 130 acres consists of previously disturbed ground. The IBCT footprint is estimated to be approximately 200 acres.

The area of the construction projects is displayed in Figure 2-3, and additional details regarding the scope and projected timing of these construction projects are included in Appendix B.

2.2.3.2. Combat Aviation Brigade

As part of the Proposed Action, if the CAB were stationed at Fort Carson, the Army would co-locate facilities at the ORTC site along with the proposed IBCT facilities as well as within the BAAF to support this unit. The CAB complex would include headquarters, barracks, company operations, classrooms, and vehicle maintenance facilities, as well as renovation to existing facilities. The construction of the CAB facilities would be located within the approximate 575 acres indicated for the IBCT in the ORTC (Figure 2-3).

2.2.3.3. Combat Support Units

To support the Quartermaster Company, facilities would be constructed in two locations on previously disturbed ground within the cantonment area (approximately 289,000 square feet [SF] total). Company Operations facilities would be constructed north of Barger Street and west of Specker Avenue. The Tactical Equipment Maintenance facilities and hardstand would be constructed between Magrath and Minick Avenues, south of O'Connell Boulevard, and north of Ellis Street. The proposed location of these construction projects is displayed in Figure 2-4.

To support the Engineer Company, facilities would be constructed within the cantonment area south of Barger Street and between Wetzel Avenue and Specker Avenue on previously disturbed ground. Facilities would include Company Operations facilities, organizational vehicle and Privately Owned Vehicle (POV) parking, oil and deployed equipment storage, Tactical Equipment Maintenance facilities, and covered hardstand (for a total of approximately 326,000 SF). Construction of the new facilities would also include the removal of approximately 41,000 SF of existing facilities. The proposed location of these construction projects is displayed in Figure 2-4.

These locations facilitate administrative control of these units and they support the Army's new standard for how companies operate with their facilities tied with maintenance facilities. These facilities are co-located with existing parent units and allow for effective command and control. There are no other locations for these units in the Fort Carson cantonment area that meet these requirements.

2.2.3.4. Ground Disturbance for Facility Construction

Permanent ground disturbance would include all impervious areas, including buildings, sidewalks, and parking lots. Temporary disturbance would include areas likely to be affected by construction activities, such as staging and trenching areas. Much of the large areas of temporary disturbance in the downrange and airfield areas would be attributed to installation of new utilities. All utilities would be underground, and disturbed areas would be restored after completion of construction. The construction of and/or upgrades to ranges are described in Section 2.2.4.3.1 and are listed in Appendix B.

2.2.4. Training

As part of the Proposed Action, the Army would increase its live-fire training activities by approximately 27 percent through the stationing of the IBCT, CAB, and select CS units. The stationing of the IBCT would account for approximately 20 percent of the increased live-fire activities at Fort Carson and the CAB would account for an additional 6.5 percent increase in the firing activities at Fort Carson. All firing would take place on designated range facilities or into existing impact areas. The vast majority (more than 95 percent) of increased firing activities would be small arms and machine gun munitions from qualification activities that Soldiers must conduct twice per year.

As part of the Proposed Action, the Army would increase the frequency of its maneuver training activities by approximately 20-25 percent through the stationing of the IBCT, CAB, and select CS units. Implementation of maneuver training as part of the Proposed Action would result in an approximate 15 percent increase in the aggregate number of Maneuver Impact Miles (MIMs) at Fort Carson.

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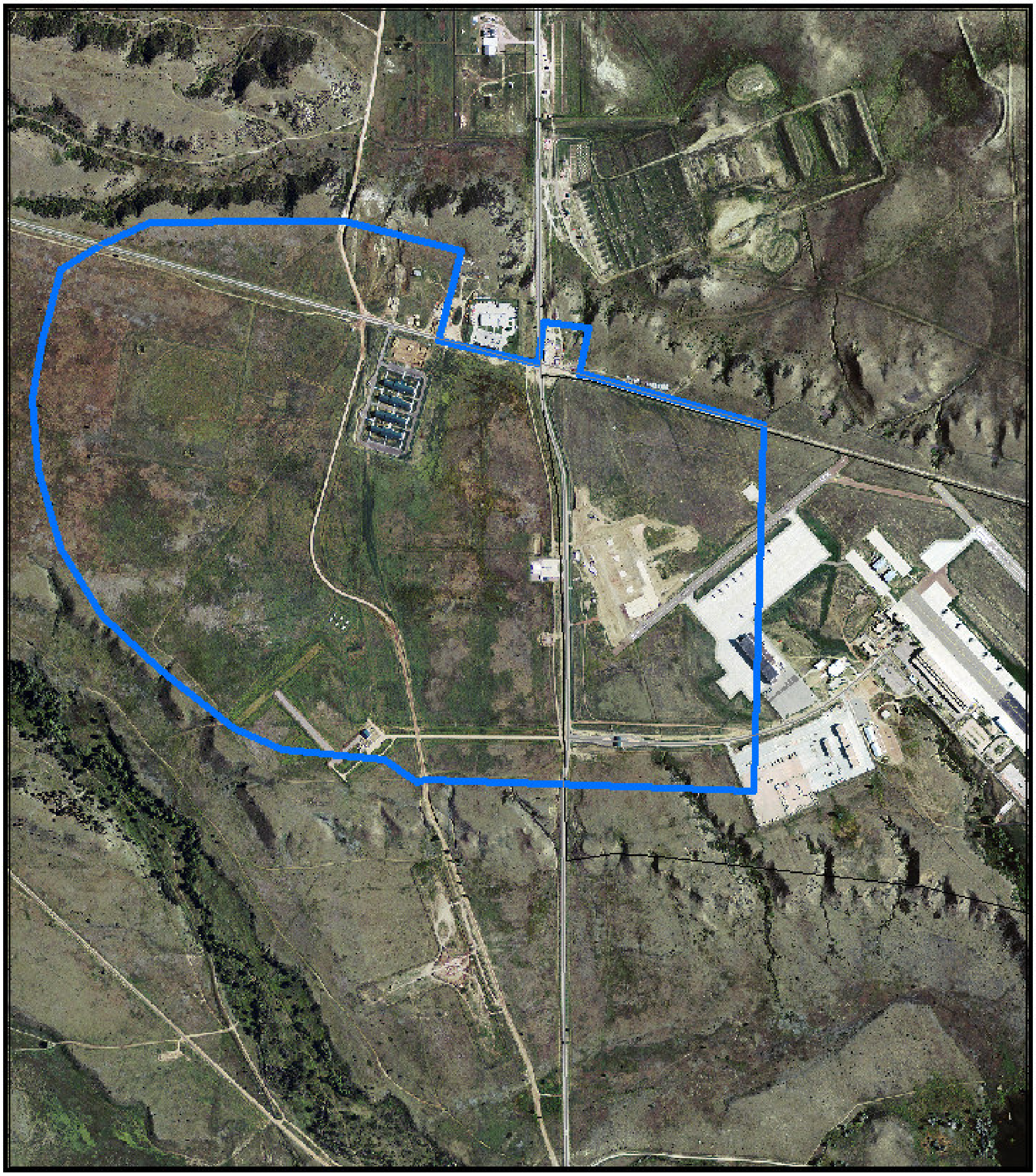

Figure 2-3 Approximate Area of Disturbance near the Butts Army Airfield and Operational Readiness Training Center

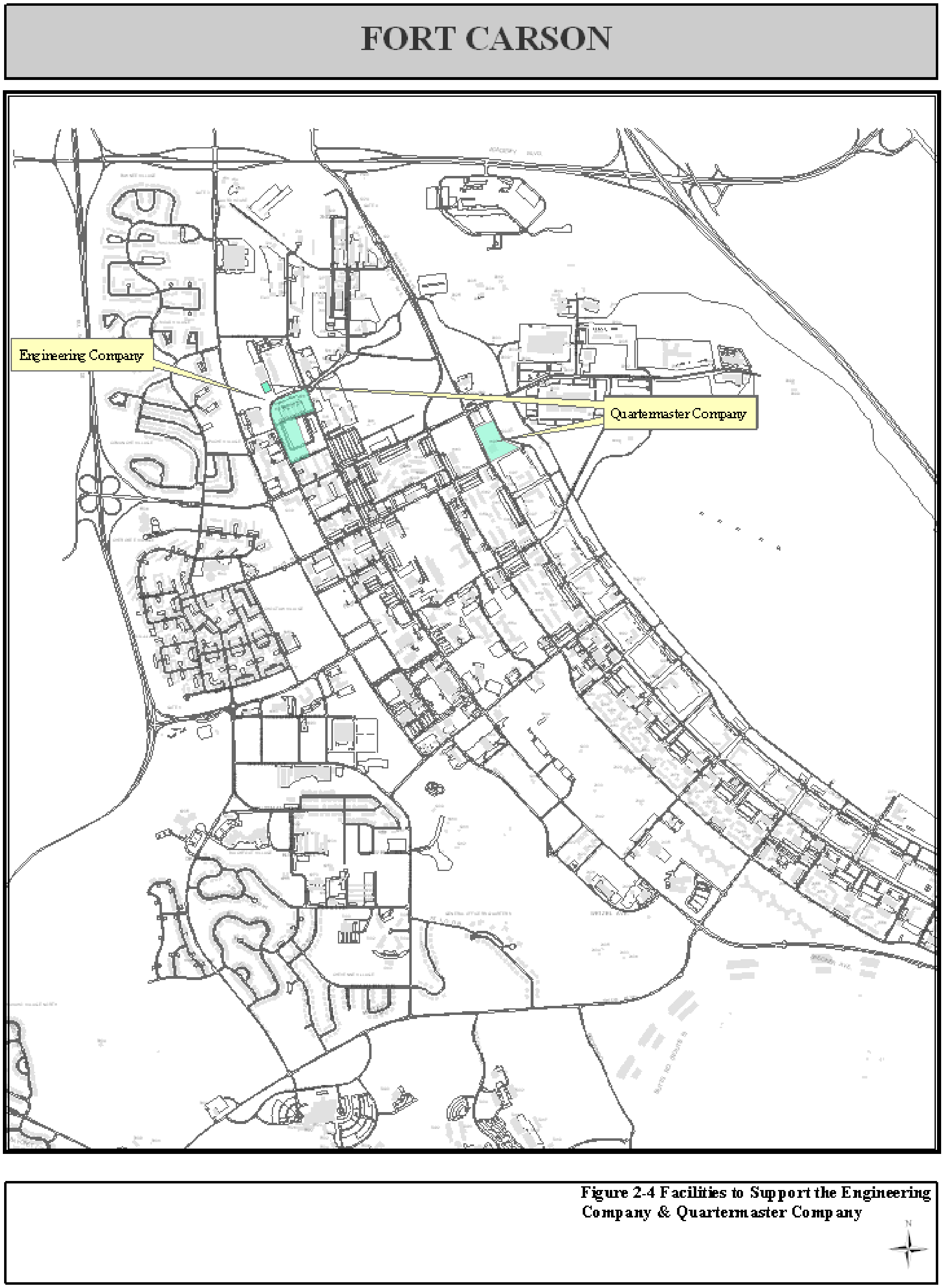

Figure 2-4 Facilities to Support the Engineering Company & Quartermaster Company

The Army, in collaboration with scientists from the Natural Resource Conservation Service (NRCS), the Construction and Engineering Research Laboratory, and US Army Environmental Command, developed the MIMs methodology in 1999 and have continued to refine this approach to reflect the best observational and scientific data available. A detailed description of the MIMs methodology is provided in ***Integrating Multi-criteria Analysis and GIS for Land Condition Assessment: Part I- Evaluation and Restoration of Military Training Areas*** (Reference No. 252). The MIMs methodology is a scientifically based methodology that has been uniquely developed for the Army to understand the increases in training load that will occur in association with unit stationing. The methodology incorporates the number of vehicles, vehicle weights, ground contact pressures, operational training requirements and other factors to best capture the training load associated with an Army unit and its vehicle fleet. This methodology allows for a comparative analysis of Army training loads and allows for an assessment of baseline training conditions compared to future projected training loads. The MIMs approach has been developed with the best scientific data and is used in conjunction with vegetation and soils monitoring programs to better understand and validate the installations assessment of predicted environmental impacts given the installations specific environmental conditions.

The use of the MIMs methodology is widely accepted across the Army and has been used in numerous documents since its development. The presentation of MIMs in this EIS is intended to provide the public with the ability to better understand the increase in maneuver training loads that will occur in conjunction with Proposed Army stationing actions.

The stationing of the IBCT and other support units would result in an approximate 9-percent increase in relative MIMs and the CAB would result in an additional 6.5-percent increase. GTA units would conduct battalion and brigade level training at PCMS and would conduct company level and smaller unit training at Fort Carson. A majority of the eastern portion of Fort Carson would be dedicated to supporting the live-fire activities. Because of this, a majority of maneuver activities associated with the Proposed Action would occur on the western half of the installation south of Turkey Creek. In 2008, a decision was made to conduct all training exercises for battalion- and brigade-size units primarily at PCMS to help alleviate overcrowding at Fort Carson.

The IBCT would be projected to conduct its maneuver training in the more ruggedly contoured areas of PCMS to the northern and western portions of the maneuver training site. The IBCT would conduct additional dismounted maneuvers in the dismounted maneuver areas depicted in Figure 4.2-1. The flat plains areas are not ideally suited for executing mounted or dismounted infantry tasks and are more suitable for conventional force on force training exercises of heavy armored vehicles. The IBCT is capable of conducting mounted and dismounted operations in areas with more contour and steeper slopes and would utilize more rugged terrain not accessible or capable of supported mounted operations of armored vehicles. The central and southern plains areas would be more heavily utilized by HBCT units to support mechanized armored engagements.

Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited training resources (e.g., maneuver area and firing range availability). To support additional training requirements of new units, existing land and environmental management programs would continue to be implemented. The ITAM program would continue to monitor training activities, institute projects to minimize training damage, and educate units to limit damage to training lands. In addition, installation environmental managers would continue to coordinate with range managers and units to ensure training requirements are balanced with environmental sustainability and compliance.

Because the condition of training lands is highly variable, depending on the amount and type of training and the climatic conditions during training, the ITAM program does not set specific ratios for land rest to sustain training lands. Instead, the ITAM program provides a process by which the post directorates work together to provide input regarding the training needs and the environmental condition of the training lands.

Environmental plans would continue to be followed to manage environmental resources in conjunction with increased unit training requirements in a manner that complies with environmental laws and regulations and avoids unnecessary environmental damage. Decisions on training activities would continue to balance current training needs and protection measures to maximize the training mission and sustainability of training lands.

The process for balancing training requirements and sustainability does not differ across alternatives evaluated in this analysis.

Training is an Army unit's highest priority when not deployed, and commanders train their units to be combat ready. The Army trains Soldiers in individual skills, units on collective tasks, and different levels of units through multi-echelon training. The Army trains as it fights, as a combined arms team. Training ranges and training lands are the Army's classroom, and "Commanders take every opportunity to move Soldiers out into the field, to fire weapons, maneuver as a combined arms team and incorporate protective measures against enemy actions." (Reference No. 12).

"Battle Focus" is a concept used to derive training requirements, and units train according to their Mission Essential Task List (METL). This is derived from wartime operational plans (why they fight); unit-specific combat capabilities (how they fight); the operational environment (where they fight); directed missions (what they must do); and any higher headquarters training guidance. Battle focus recognizes that a unit may not attain proficiency to standard on every task possible due to time or other resource constraints. Commanders can, however, achieve a successful go-to-war training program by narrowing the training focus to the tasks essential to wartime mission accomplishment.

Army doctrinal training for all BCTs is based on developing the basic skills to meet the needs of the Army for any battle, and changes as Army units, weapons systems, and need for resources change (Reference No. 13). Training requirements are outlined in TC 25-1, ***Training Land*** (Reference No. 3), and TC 25-8, ***Training Ranges*** (Reference No. 4). The 2007 Fort Carson and PCMS Transformation EISs addressed training by all units at Fort Carson under general Army doctrinal guidance.

As described above, METL training centers on current missions. Doctrinal training, in contrast, addresses the broader range of all potential missions upon which the Army may be called.

2.2.4.1. Infantry Brigade Combat Team

Infantry training involves training with a variety of weapons as individual Soldiers, crews, teams, and squads practice and qualify with a variety of weapons. Weapons in an infantry battalion include: pistols, rifles, shotguns, sniper rifles, grenade launchers, light-medium-heavy machine guns, anti-tank weapons, grenades, demolitions, and mortars. Weapons qualification is a semi-annual requirement. Practice firing is completed as time, ammunition, and other resources permit. This weapons firing occurs on fixed ranges, as described in Army TC 25-8, ***Training Ranges*** (Reference No. 4). Infantry units, from squad to company, also participate in quarterly and semi-annual live-fire exercises that include all weapons systems on a large and more complex range.

The broad categories of infantry collective (unit) maneuver training events include reconnaissance and security (patrolling and security operations), offense, defense, and stability and support operations. Infantry units can incorporate airborne, airmobile, and air assault operations into their training. The IBCT's smaller subordinate units will train on a specific event up to four times per 12 months; the larger units such as the battalion may train up to twice per 12 months. Smaller units will break a training event, as an entire unit, down into situational training exercises or drills that are focused on a specific task and can be repeated until the unit achieves proficiency. When the smaller units train, they may not have an opposing force of similar size; larger units usually will.

It is anticipated that a majority of platoon and company IBCT maneuver training would be conducted in training areas 20, 24, 25, 28, and 29, which consist of more ruggedly contoured terrain. Collectively, these training areas are referred to as the "California Strip." The California Strip consists of training areas located along the western boundary of the installation (Figure 2-5). IBCT company and platoon maneuvers could each occur up to five weeks per year.

Training areas 30, 31, 39, and 40 are collectively known as Sullivan Park (Figure 2-5). Sullivan Park is more suitable for mounted armored maneuver training activities than IBCT training and is not anticipated to be the primary training area that would be used to support IBCT squad, platoon, and company training. Much of the maneuver training capacity of Sullivan Park is projected to be needed to support training of Fort Carson's HBCTs.

An IBCT is already stationed at Fort Carson thus, the stationing of an additional IBCT would not qualitatively change the types of maneuver training that currently take place at Fort Carson and PCMS, though the frequency of training events could increase. On- and off-road maneuvers of units company-sized and below would continue using IBCT types of equipment and vehicles already found at Fort Carson. The same would be true for battalion and brigade maneuvers at PCMS. Current training activities include the use of light and medium trucks and other tactical military vehicles on trails, unimproved roads, and off-road areas.

2.2.4.2. Combat Aviation Brigade

Aviation units must train to fight collectively with supported and supporting units in joint and combined arms environments. Likewise, to support or be supported efficiently by aviation forces, non-aviation forces need the requisite training. A critical aspect of the battle-focused concept is understanding the responsibility for and linkage between collective, mission-essential, crew, and individual tasks.

Training would involve execution of day-to-day support operations and routine joint military training at nearby training lands and ranges (Reference No. 12). Units perform primarily three modes of flight:

- Low-level flight is conducted at a selected altitude at which detection or observation of an aircraft is avoided or minimized. The route is preselected and conforms generally to a straight line and a constant air speed and indicated altitude.
- Terrain or Contour is at low altitude conforming generally to the contours of the earth. This type of flight takes advantage of available cover and concealment in order to avoid observation or detection of the aircraft and/or its points of departure and landing.
- Nap-of-the-earth (NOE) requires flight as close to the earth's surface as vegetation or obstacles will permit. Air speed and altitude are varied as influenced by the terrain, weather, and enemy situation.

Units conduct aerial gunnery at the ranges with the Observation Helicopter (OH)-58D (Kiowa) and the Attack Helicopter (AH)-64 (Apache). Door gunnery live-fire training tasks would be conducted from the Cargo Helicopters (CH)-47 (Chinook) and Utility Helicopters (UH)-60 (Blackhawk). The Chinook and Blackhawk helicopters are used to conduct sling load operations (delivering munitions), assault landings, rappelling, etc., and conduct flight training under day, night, and night-vision goggle conditions. Field exercises involve establishing Forward Area Rearming and Refueling Points (FARRPs) and tactical areas for field environments.

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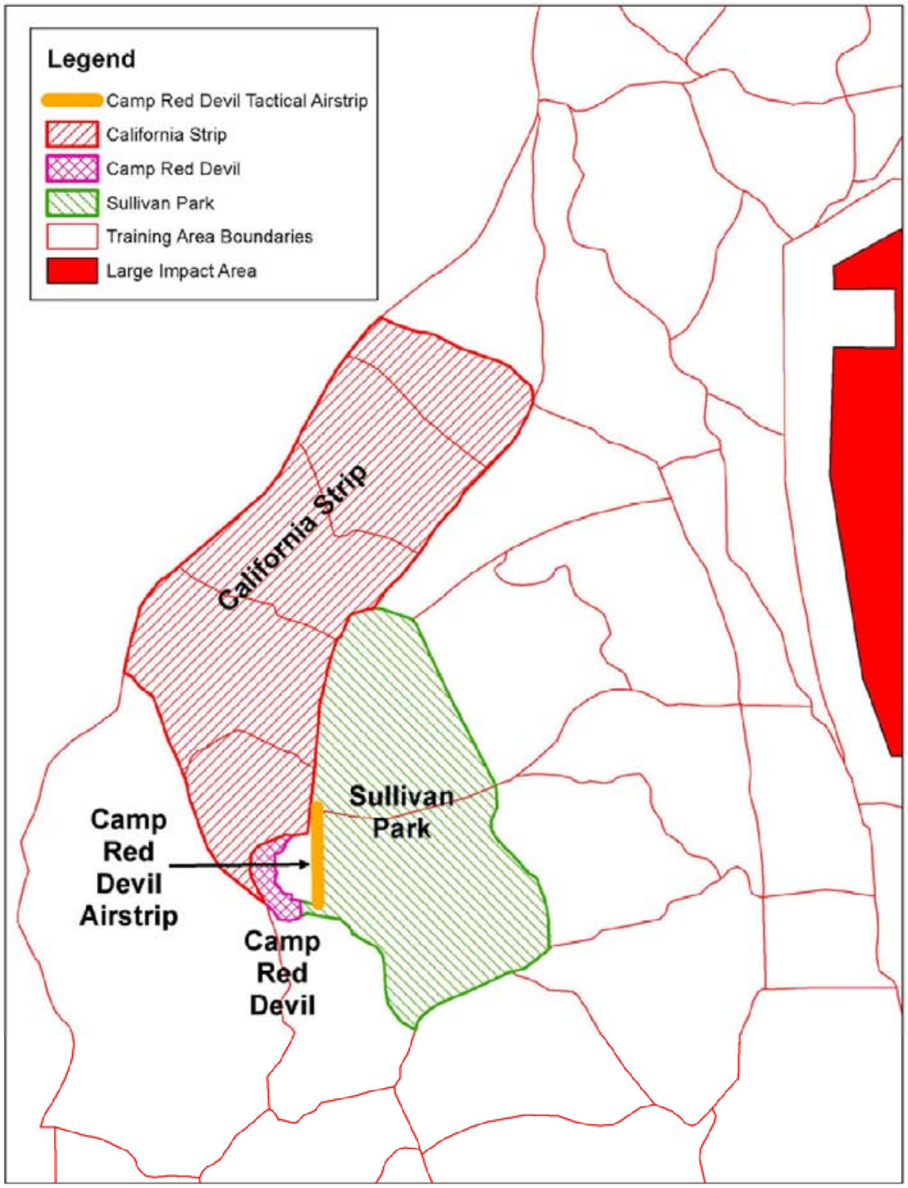

Figure 2-5 Selected Training Areas and Facilities
Map Provided by Fort Carson Range Control ITAM

Weaponry, which is used primarily for Force Protection perimeter guarding, includes the Mark 19, 40-mm grenade launching machine gun, (MK19), M2 .50 Caliber, M240B machine gun, Squad Automatic Weapon, and personal weapons (i.e., M16 rifle, 9-mm Pistol, and .45 Pistol). Table 2-3 provides a more complete description of this weaponry and Figure 2-6 presents some representative photographs. Gunnery training is conducted at least twice per year, but training is conducted throughout the year, to include personal weapon training as well as aircraft gunnery. Field exercises could be combined with gunnery training. Training includes convoying to site, perimeter security, FARRP Operations, and Forward Tactical Operations.

The CAB logistics and command and control elements include ground unit vehicles from the Family of Medium Tactical Vehicle (FMTV), Heavy Expanded Mobility Tactical Truck (HEMTT), High Mobility Multipurpose Wheeled Vehicle (HMMWV), and wheeled support element vehicles (Table 2-3).

Table 2-3 Equipment Assigned to Fort Carson

Category	Equipment	Mission	Type of Training
Tracked Vehicles	M1 Abrams Main Combat Tank	Provides heavy armor superiority on the battlefield (120mm main gun)	Maneuver and Live-fire
	M2/M3 Bradley Fighting Vehicle	Provides protected transport of an infantry squad and over watching fires to support the dismounted infantry (25mm main gun)	
	M109 Paladin Self-Propelled Howitzer	Provides the primary artillery support for armored and mechanized units (155mm artillery round)	
	M113 Armored Personnel (Mortar) Carrier. This includes the variant M-577 command post vehicle.	Provides a highly mobile, survivable, and reliable tracked-vehicle platform that is able to keep pace with Abrams and Bradleys. The M577 provides a mobile command capability.	
	M1117 Armored Security Vehicle	Fills the Army's armored wheeled vehicle requirements for one with a turret and armament system designed to meet the security mission requirements of the Military Police Corps.	
Wheeled Vehicles	FMTV	Fills the Army's medium tactical vehicle requirements for mobility and resupply, and transportation of equipment and personnel	Maneuver
	Heavy Expanded Mobility Tactical Truck	Provides heavy transport capabilities for re-supply of combat vehicles and weapons systems	
	High-Mobility Multipurpose Wheeled Vehicle	Provides a common light tactical vehicle capability	
	Palletized Loading System	Performs line haul and unit resupply Rapid movement of combat configured loads of ammunition and all classes of supply, shelters and containers	
Engineer Equipment	Dozers, Scrapers, Loaders, Excavators, Dump Trucks	Performs horizontal construction to ensure mobility and base support for strike, sustainment, and logistics forces	Maneuver; Engineering (excavation, clearing, grubbing)
Aerial Vehicles	TUAVs	Used to support integral intelligence, reconnaissance, and target acquisition at distances of up to 125 km; detects and identifies targets from a range of 3-5 km and offers automatic target tracking	Maneuver

Table 2-3 Equipment Assigned to Fort Carson (continued)			
Category	**Equipment**	**Mission**	**Type of Training**
Aerial Systems	UAS	Provides real-time data, intelligence, surveillance, and reconnaissance support for base perimeter defense and convoy protection	Maneuver
Indirect Fire	Towed Howitzer	Provides long-range destructive, suppressive and protective indirect and direct field artillery fires	Maneuver and Live-fire
	Mortars	Provides long- and medium-range indirect fire support	
Anti-Armor Weapons	Javelin Anti-Tank Missile	Provides a man-portable, highly survivable medium anti-tank weapon system	Maneuver and Live-fire
	Tube-launched, Optically-Tracked, Wire-Guided Missile System	Defeats threat armored vehicles and urban enclosed threats at extended ranges in all expected battlefield conditions	
Individual and Crew-Served Weapons	M2 .50-Caliber Machine Gun	Engages targets with accurate automatic direct fire (.50 caliber)	Live-fire
	MK19 Automatic Grenade Launcher	Engages targets with accurate automatic indirect fire (40mm grenades)	
	M240B Machine Gun	Engages targets with accurate direct automatic fire (7.62mm)	
	M249 Squad Automatic Weapon	Engages targets with accurate direct automatic fire (5.56mm)	
	M4 Carbine	Engages targets with accurate direct fire (5.56mm)	
	M9 Pistol	Engages targets with accurate direct fire (5.56mm)	
	M16 Rifle	Engages targets with accurate direct fire (5.56mm)	
	M203 Grenade Launcher	Engages targets with accurate grenade fire (5.56mm)	

Source: Reference No. 9
FMTV = Family of Medium Tactical; km = kilometer; mm = millimeter; TUAV = Tactical Unmanned Aerial Vehicle Systems; UAS = Unmanned Aircraft System

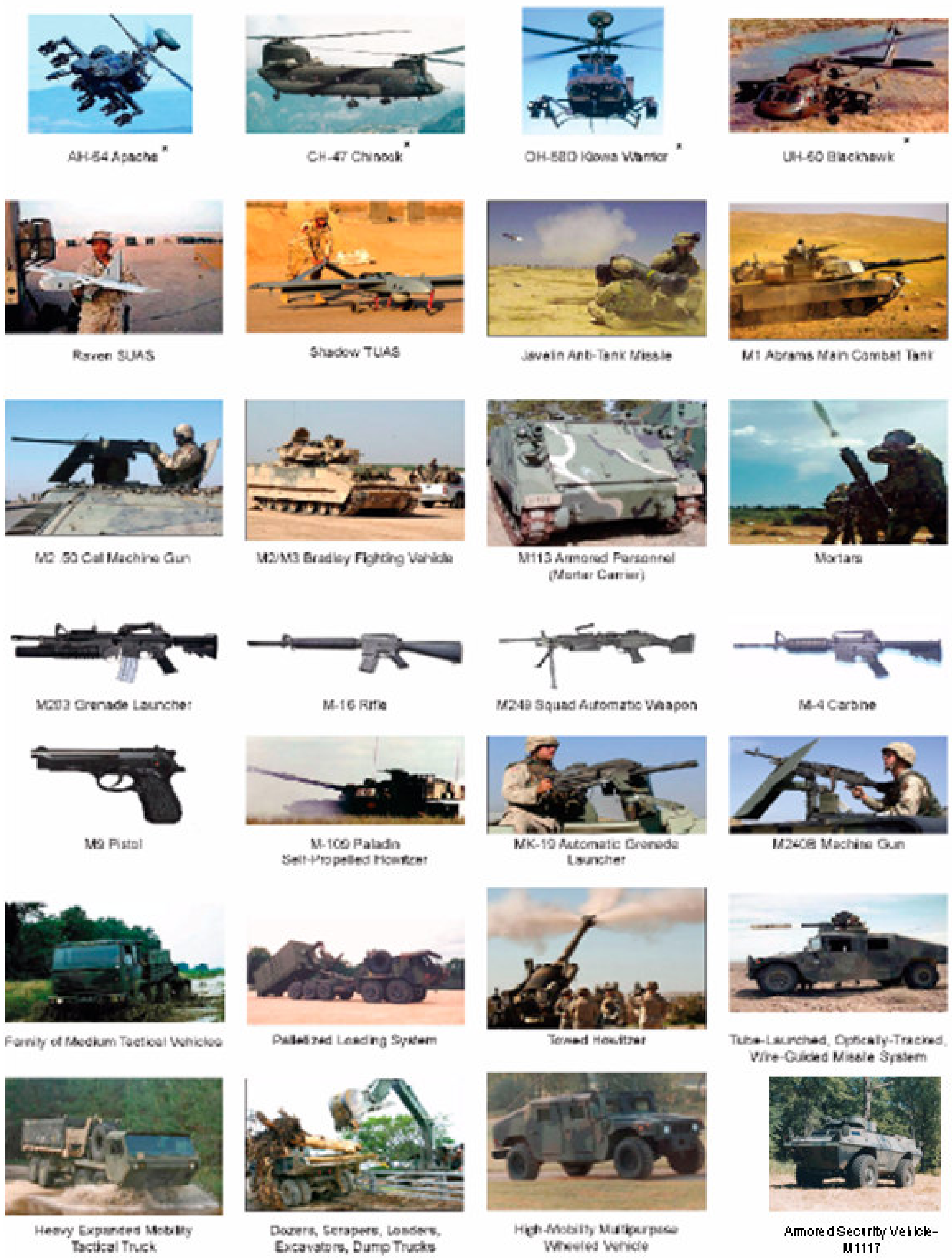

Figure 2-6 Equipment Used at or Assigned to Fort Carson and Piñon Canyon Maneuver Site

2.2.4.3. Training Facilities and Range Construction/Upgrades

The implementation of Army Transformation has required the Army to overhaul and modernize its training lands and training facilities infrastructure. TC 25-8, ***Training Ranges*** (Reference No. 4), describes the standard designs and requirements of the Army's Sustainable Range Program for training modular Army units to standard. A suite of ranges, as discussed in the GTA PEIS, is required to support Army BCTs and ensure that they can meet all pre-deployment training requirements.

Live-fire training is an essential component of Army training. Fort Carson has approximately 92 ranges and facilities in its range inventory for use by all units that train there. The range types span from individual weapons qualifications to heavy artillery live-fire. To be operationally effective, Soldiers must have the skills and experience necessary to operate and maintain their weapons. Live-fire involves both munitions and explosives that would be used in combat and non-explosive training rounds designed to meet Soldiers' training needs. All Soldiers qualify with their individual weapon (rifle or pistol) at least twice annually. Crew-served weapons (machine guns and other automatic weapons) qualification varies by type of unit. This training is usually accomplished at the company level on fixed ranges described in TC 25-8, ***Training Ranges*** (Reference No. 4). Weapons system training (Abrams Tank, Bradley Fighting Vehicle, and AH) consists of a series of "tables" and occurs on large range complexes.

In addition, platoons, companies, and battalions of BCTs must conduct collective live-fire training exercises on firing ranges to ensure they have rehearsed and coordinated battle procedures and are prepared to deploy to support wartime operations. Various weapons systems use different types of munitions. Where possible, weapons systems use inert training rounds, which have less environmental impact, as a substitute for the firing of live rounds.

Every range on which live-fire exercises are conducted has a surface danger zone (SDZ), also called "range safety fan," associated with it, and is active whenever that range is in use. The safety fan comprises the entire surface area in which munitions could possibly land, taking into account the whole spectrum of stray rounds. When Fort Carson and PCMS ranges are in use on any given day, their safety fans often effectively stop the capability to provide maneuver training on the open expanses and can also impact training on adjacent ranges when range safety fans are activated and overlap, as shown in Figure 2-7. The Proposed Action would increase use of live-fire ranges which would in turn increase the frequency of activation of SDZs. There would be no new SDZs created other than those shown on Figure 2-7.

2.2.4.3.1. Infantry Brigade Combat Team and Range Facilities

The Proposed Action would include constructing and/or upgrading several ranges and range facilities at Fort Carson required to meet training readiness standards of the additional units. The Proposed Action does not include any new construction of ranges at PCMS. Existing ranges to be upgraded and newly constructed ranges/range facilities at Fort Carson would include:

- Qualification Training Range (QTR) - Range 115
- Scout Reconnaissance (RECCE) Gunnery - Upgrade Range 127
- Convoy Live-Fire Training Facility - Upgrade Range 127A and Range 129
- Modified Record Fire (MRF) Ranges - Upgrade Range 65 and Range 63
- Automated Multi-Purpose Machine Gun (MPMG) - Upgrade Range 121C
- Urban Assault Course (UAC) - Training Area 51

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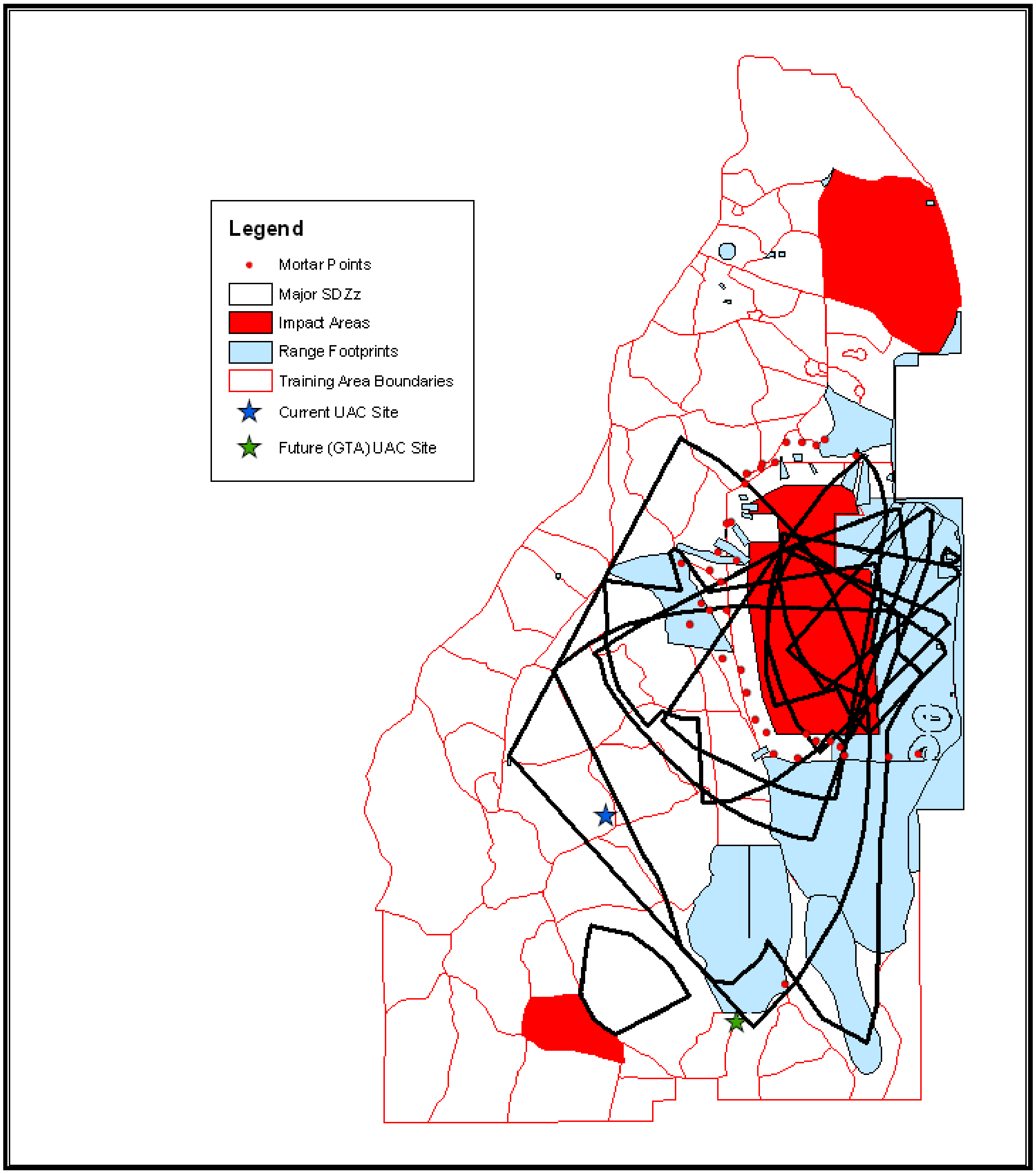

Figure 2-7 Surface Danger Zones on Live Fire Ranges on Fort Carson
Map Provided by Fort Carson Range Control ITAM

A brief description of each proposed range construction/upgrade and how the range would be used is listed below. The location of each proposed range project is shown in Figure 2-8. Due to land constraints new ranges have been sited on existing outdated ranges with the exception of the UAC, which was sited to accommodate Army training requirements.

Qualification Training Range. A QTR is a multi-functional range that can meet the weapons qualifications requirements for IBCT weapons systems. This range combines the capabilities of the MRF Range, Sniper Field Fire Range, Combat Pistol Qualification Course, MK-19 (Automatic Grenade Launcher/Machine Gun) Range, and the MPMG Range to centralize training and reduce land, maintenance, and unit overhead requirements. Under the Proposed Action, this would overlay Range 115. Primary features would include stationary infantry targets, Combat Pistol Qualification lanes, stationary armor targets, Sniper Field Fire lanes, moving infantry targets, MRF lanes, stationary infantry emplacements with target mechanisms, MPMG lanes, and Rifle/Machine Gun Zero lanes. All targets would be fully automated and the event-specific target scenario, computer-driven.

Scout Reconnaissance Range. A RECCE range provides combat platforms with all constituent elements in digital war fighting operations. It is used to train and evaluate crews and dismounted infantry squads on the skills necessary to detect, identify, engage, and defeat stationary infantry and stationary/moving armor targets in a tactical array. In addition to live-fire, this complex can also be used for training with subcaliber and laser training devices. Under the Proposed Action, this would be an upgrade to Range 127, to include one lane with two course roads with crossover capability, target maintenance access roads, site development, improvements, and drainage, electrical power, and targetry data cabling. Supporting facilities for the project would include electrical, access road, and associated site development and improvements.

Convoy Live-Fire Training Facility. This facility provides the ability to train and evaluate the unit during a live-fire exercise. Units are trained and evaluated on their ability to move tactically, engage targets, react to improvised explosive devices, and practice target discrimination. Under the Proposed Action, a Convoy Live-fire training facility would be constructed on Range 127A and Range 129. Primary facilities would include the convoy route, roads, drainage, multiple stations, operations and storage building, vault latrine, and building information systems. Supporting facilities for the project would include electric service, information systems, and site improvements.

Modified Record Fire Range. The MRF range is used to train and evaluate individual Soldiers on the skills necessary to identify, engage and defeat stationary infantry targets for day/night qualification requirements with the M16 & M4 rifles. This range combines the capabilities of Automated Field Fire, Automated Record Fire, and the Automated Night Fire to reduce land and maintenance requirements and increase efficiencies. All targets are fully automated and the event specific target scenario is computer driven. The Proposed Action includes the need for two MRF ranges. This would be accomplished by upgrading the targetry at Range 65 and Range 63. Range upgrades would include a range operation and control area, range control tower, range operations and storage building, classroom building, latrine, covered mess shelter, ammunition breakdown building, bleacher enclosure, and building information systems.

Multipurpose Machine Gun Range. The MPMG range is designed to train Soldiers to engage stationary infantry and mobile vehicular targets with the full range of Army machine guns to include the M249, M60, M240, and .50 caliber machine guns. Under the Proposed Action, this would be an upgrade to Range 121C to include site development, a general instruction building, ammunition breakdown building, bleacher enclosure, range operations tower, range operations and storage building, latrine, covered mess and building information systems.

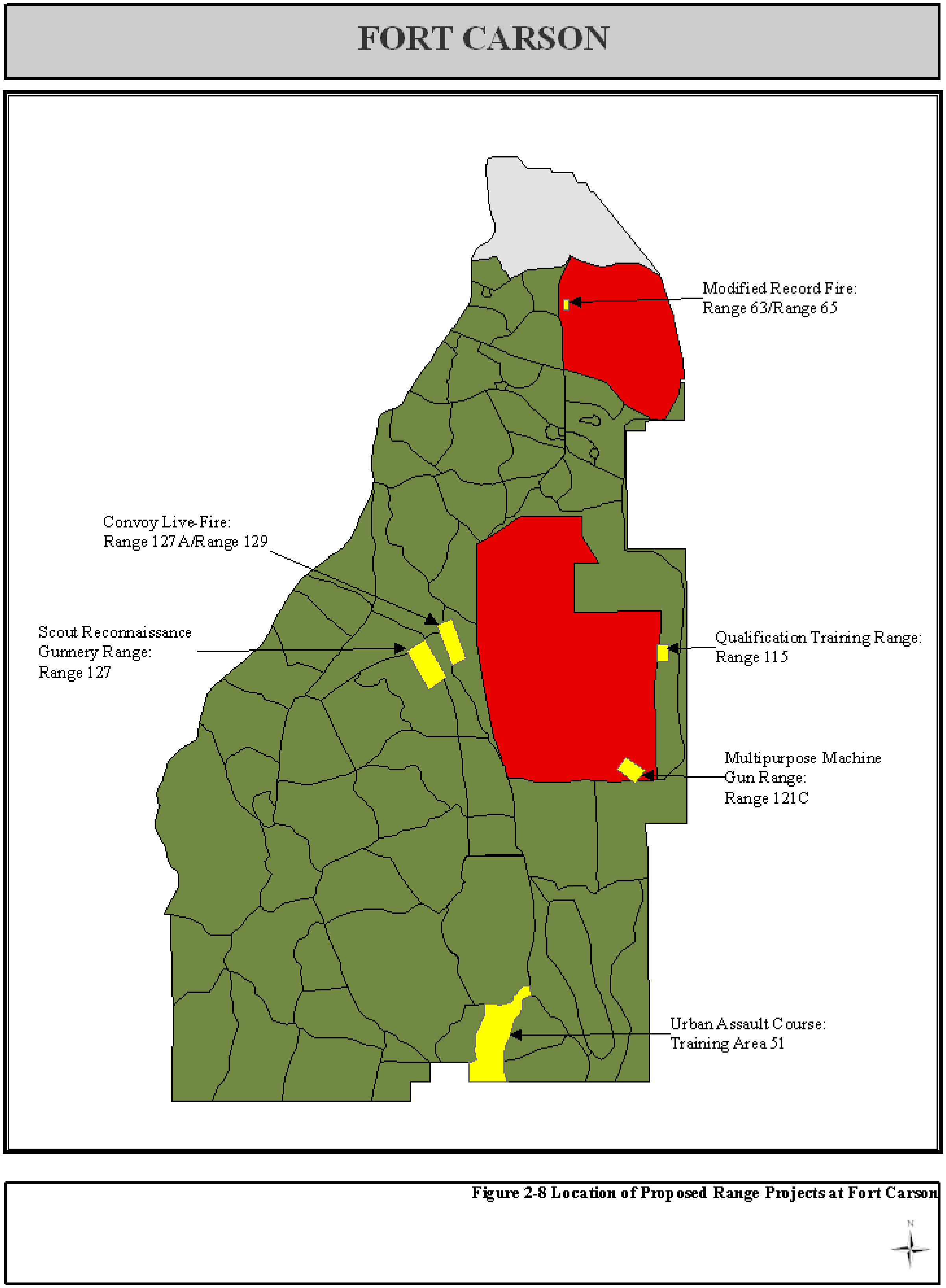

Figure 2-8 Location of Proposed Range Projects at Fort Carson

Urban Assault Course. The UAC is used to train individual Soldiers, squads, and platoons on tasks necessary to operate within a built-up/urban area. Under the Proposed Action, construction would occur at Training Area 51 and would include range operations and control area, downrange electrical, operations and storage building, ammunition breakdown building, latrine, and building information systems.

In summary, TC 25-8, *Training Ranges* (Reference No. 4), clearly defines the training range infrastructure required to ensure the IBCT can adequately prepare for operational deployment. Provision of the proper training range infrastructure is a critical component of need for the Proposed Action.

2.3. Alternatives with Different Locations for the Infantry Brigade Combat Team Complex

As stated in Section 2.1.2, many of the elements of the Proposed Action are not amenable to the development of alternatives. The one component that does include alternatives is the location for construction of the IBCT support facilities.

2.3.1. Screening Criteria Used to Identify Range of Potential Construction Locations

2.3.1.1. Military Construction Limitations

Reasonable alternatives must:

1) Include sites that have the space capable to construct the facilities within reasonable cost parameters;
2) Provide unit cohesiveness;
3) Consider Fort Carson's sustainability principles (Section 1.2.2); and
4) Consider feasibility of timely completion of Military Construction (MILCON).

2.3.1.2. Land/Environmental Constraints

Reasonable alternatives must consider:

1) Topography (buildable space and ability to train);
2) Wetlands;
3) Threatened and endangered species and/or habitat;
4) Cultural resources;
5) Contaminated sites under the management of the Installation Restoration Program;
6) Off-limits training/restriction areas;
7) Unexploded ordnance (UXO); and
8) Impacts to existing infrastructure and maneuver lands.

Figure 2-9 depicts known major land and/or environmental constraints for future development on the Fort Carson cantonment area.

2.3.2. Alternative 1 – Construction of Infantry Brigade Combat Team Support Facilities at Training Area Bravo

Under Alternative 1, the Proposed Action would be conducted as described in Section 2.2.3, except that the IBCT support facilities would be constructed at Training Area Bravo (Figure 2-10) instead of the ORTC site described in Section 2.2.3. Currently, five hot refuel pads are located within the footprint of the proposed construction. Under this alternative, the two northern hot refuel pads would have to be demolished. The total acreage analyzed for Alternative 1 is approximately 700 acres, of which approximately 80 acres is a landfill site and approximately 250 acres is previously disturbed ground. Approximately 200 acres within this Area of Interest (AOI) would be required to support the construction of the IBCT Complex.

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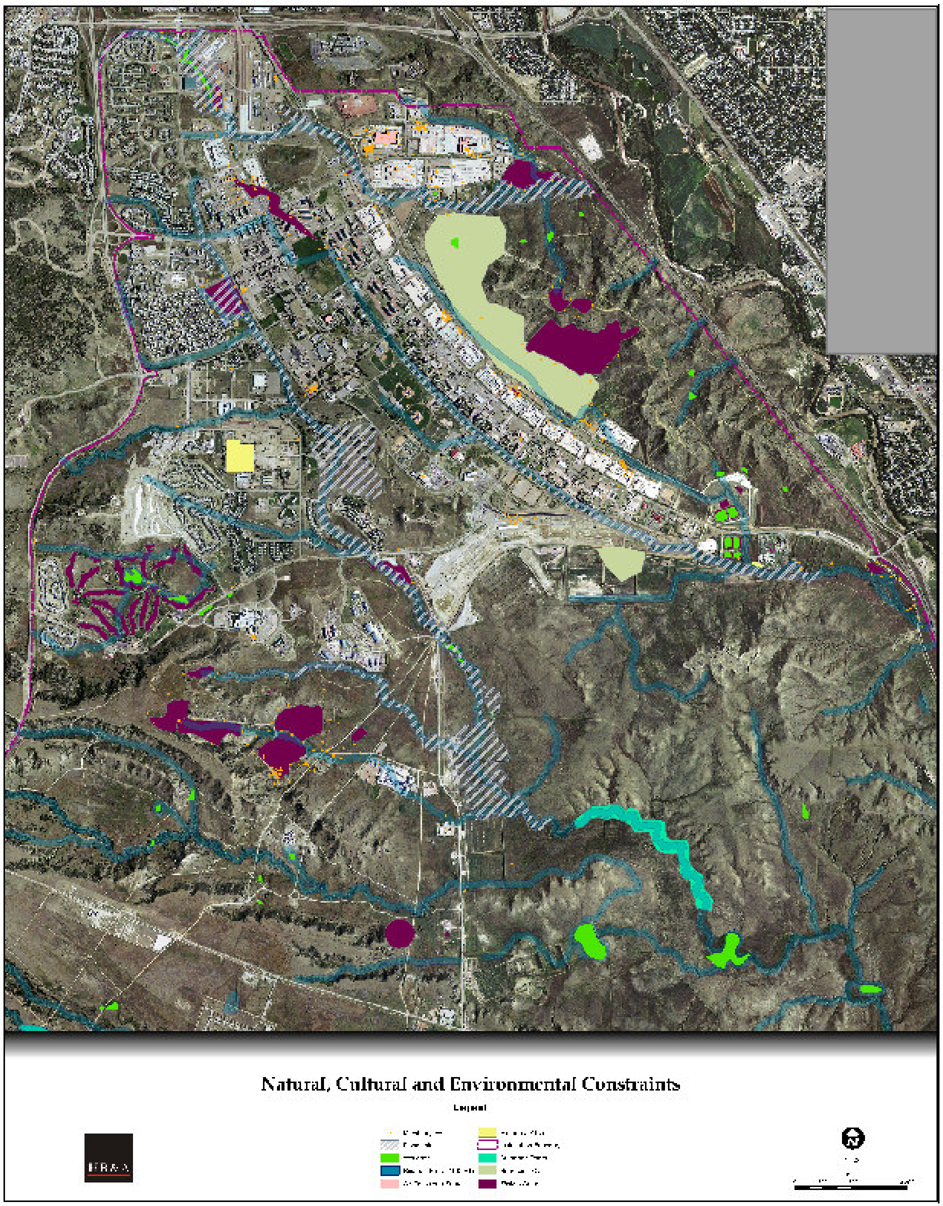

Figure 2-9 Constraints on Future Development on the Fort Carson Cantonment Area
Map Provided by HB&A

FORT CARSON

Figure 2-10 Area of Interest for Alternative 1, Training Area Bravo

2.3.3. Alternative 2 – Construction of Infantry Brigade Combat Team Support Facilities at Tent City

Under Alternative 2, the Proposed Action would be conducted as described in Section 2.2.3, except that the IBCT support facilities would be constructed at Tent City[1], near Gate 6 (Figure 2-11) instead of the ORTC site described in Section 2.2.3, and would require the removal of two shower/latrine facilities (vault latrine), four single-story, pre-engineered metal buildings, and six tuff sheds. The total area analyzed for Alternative 2 is approximately 250 acres, of which approximately 50 acres is previously disturbed ground. It would require approximately 200 acres within the AOI to support the construction of the IBCT complex.

2.4. No Action Alternative

Under the No Action Alternative, the addition of a new IBCT and support units and the potential CAB at Fort Carson would not be implemented. Force structure, assigned personnel, and equipment would be as they exist after the implementation of the Transformation activities studied in the 2007 Fort Carson and PCMS Transformation EISs (i.e., BRAC 2005, GDPR, and Army Modular Force). Facility construction and training activities would occur as needed to support those Transformation activities and would undergo separate NEPA review if such analysis has not already occurred prior to implementation in accordance with regulations and current practice. Therefore, the No Action Alternative does not include construction of new facilities to support the IBCT, support units, or potential CAB.

This alternative is included as required by CEQ and Army NEPA-implementing regulations. The No Action Alternative, however, is not feasible. The decision to increase the size of the Army has been made, after NEPA review. That decision included the study of the possible locations within the Army for stationing of the new units. Fort Carson was chosen as a stationing location as part of that process. The additional GTA units and Soldiers will be coming to Fort Carson, and actions must be taken to accommodate their requirements. Likewise, if the Army decides to station a CAB at Fort Carson, the installation must implement that decision. Therefore, the No Action Alternative is included in this EIS only to provide a benchmark to compare the magnitude of the environmental effects of the Proposed Action and the other alternatives.

2.4.1. Force Structure

Force structure and population is based on the best information currently available; however, the number of Soldiers assigned to Fort Carson may vary on a daily basis based on unit movements, personnel actions, and other factors. The Army is in a constant state of flux (e.g., deployments, restationing, modularizing, converting, activating), and population changes are to be expected. Therefore, the baseline for the No Action Alternative considers the force structure that will be in place following implementation of Transformation as stated in the 2007 Fort Carson Transformation EIS.

This baseline establishes a measure to compare the No Action Alternative with the Proposed Action. The baseline is realistic in terms of overall troop levels and training needs. The stationing of units, however, is dynamic, and the description of the force structure described here might not depict the actual conditions at Fort Carson and related training schedules at PCMS at any given time. Additionally, deployments in Iraq and Afghanistan mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS. Despite these overseas deployments, some Families of deployed Soldiers continue to be supported by Fort Carson and civilian employees and contractor personnel continue working at the installation.

[1] The Tent City alternative includes the Wilderness Road Complex.

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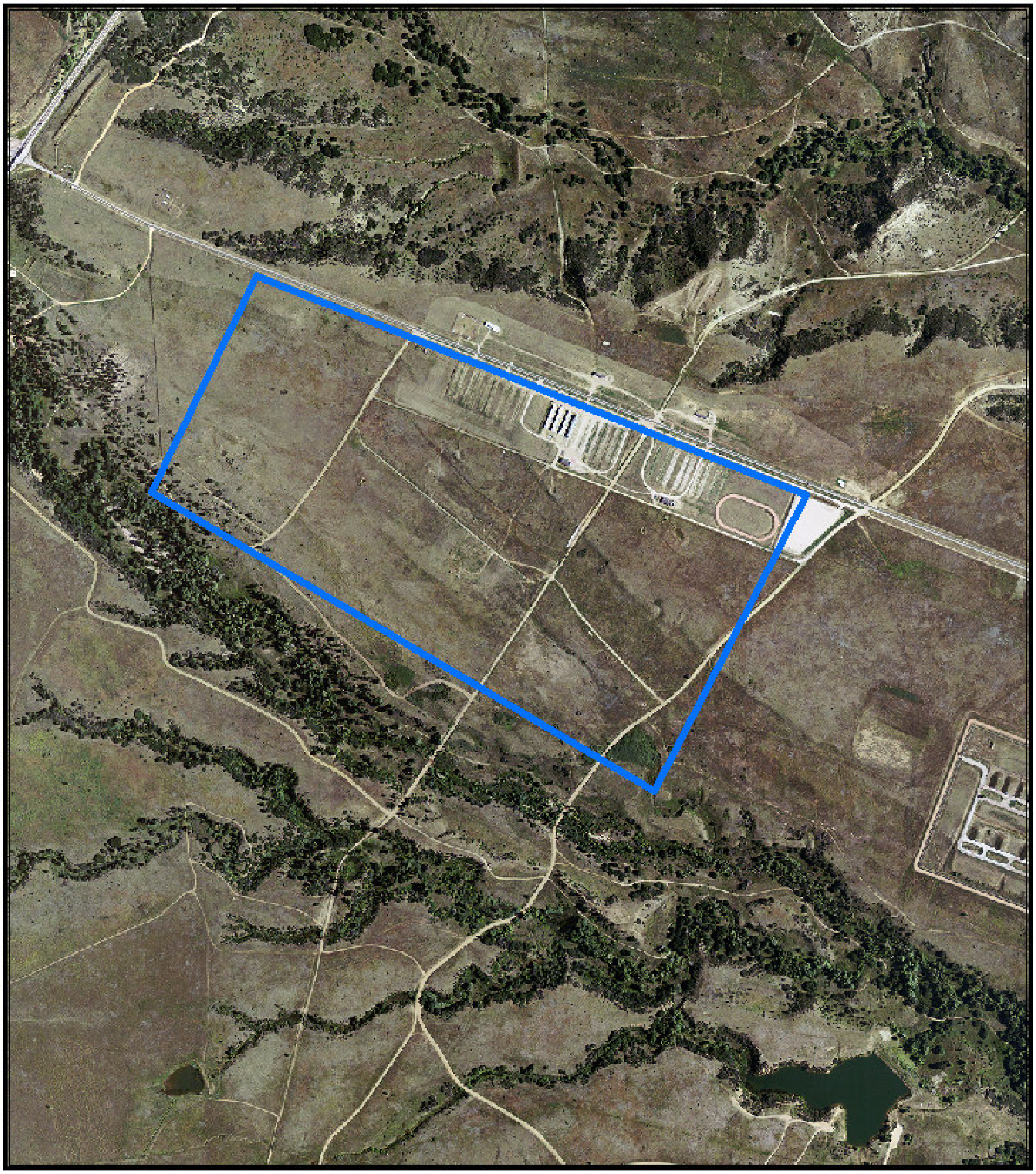

Figure 2-11 Area of Interest for Alternative 2, Tent City

Under the No Action Alternative, the following major units would be assigned to Fort Carson:

- Headquarters, 4th Infantry Division (4ID) with 3BCT-4ID, 2BCT-4ID, 4BCT-4ID (formerly 2BCT-2ID), and 1BCT-4ID
- 43rd Sustainment Brigade
- 10th Special Forces Group (Airborne)
- 10th Combat Support Hospital
- Headquarters, 71st Explosive Ordnance Disposal Group
- 4th Engineer Battalion
- 759th Military Police Battalion
- 1st Squadron 6th Cavalry

The force structure under the No Action Alternative equates to a total military troop population of approximately 25,100. The baseline total population of Fort Carson under the No Action Alternative is 77,161, which includes the 25,100 military troops, along with 5,124 civilian and contract employees, and 46,937 military Family members.

The units stated above were either included in the 2007 Fort Carson and PCMS Transformation EISs or have been the subject of subsequent separate NEPA review since. The numbers of the respective types of personnel are based on the most current information and, thus, for the reasons stated above, vary somewhat from the approximate numbers cited in the 2007 Fort Carson and PCMS Transformation EISs. All such numbers are stated as approximate figures and are subject to some variation throughout the implementation period.

2.4.2. Equipment

Under the No Action Alternative, three HBCTs (Heavy or armored BCT) and an IBCT are stationed at Fort Carson. The equipment authorized for one HBCT consists of approximately 360 tracked vehicles, 900 wheeled vehicles, 380 trailers, four TUAVs, and other non-combat vehicles. Tracked vehicles, such as tanks, use rotating tracks for mobilization, whereas wheeled vehicles use rubberized tires on wheels for travel. An IBCT is authorized approximately 930 wheeled vehicles, two tracked vehicles, 430 trailers, and four TUAVs. The types and equipment used at Fort Carson are described in Table 2-3 and shown in Figure 2-6.

2.4.3. Construction

Under the No Action Alternative, maintenance and repair of Fort Carson's existing infrastructure would continue. Other projects planned for or under construction would be completed. The Army has conducted environmental review under NEPA for these planned and under-construction facilities and determined that no significant impact on the environment would occur from completing these projects (e.g., 2007 Fort Carson Transformation EIS). Any new facility construction in support of the IBCT or the potential CAB would not be accomplished on Fort Carson under the No Action Alternative. Any new facility construction unrelated to the Proposed Action would be subject to separate NEPA review.

2.4.4. Training

This section discusses factors that influence how training is implemented and describes the typical training activities with the potential to result in impacts to the environment.

2.4.4.1. Training Needs

Under the No Action Alternative training would be conducted as outlined in the 2007 Fort Carson and PCMS Transformation EISs. Fort Carson would primarily continue to support maneuver training of platoon and company-sized units assigned to Fort Carson and other units as required. PCMS would continue to support the maneuver training of higher-level units.

2.5. Alternatives Considered but Dismissed

2.5.1. Train Troops at Other Locations

The GTA ROD decision to station an IBCT at Fort Carson was based on the training resources at Fort Carson and PCMS. Studying an alternative to conduct regular installation-level training at locations other than Fort Carson and PCMS would essentially constitute re-examining the GTA ROD stationing decision and, therefore, is not within the scope of this EIS.

Supplementing training at Fort Carson and PCMS with training at other Department of Defense DoD installations or facilities was determined not to be efficient or practical. Those other areas are already being used at capacity.

Some small-scale, specialized training already occurs on non-DoD lands, such as the Pike National Forest. For the majority of training activities conducted at Fort Carson and PCMS, there are no suitable non-DoD lands of sufficient size or proximity to Fort Carson with routine availability to address safety, security, and environmental concerns.

Fort Carson's primary mission is to meet the live-fire and small-unit maneuver requirements for units up to the company level (and primarily for the platoon-level training). These units have limited numbers of vehicles, minimal logistical support requirements, and a small amount of equipment. No training sites are present in the vicinity of Fort Carson, with the exception of PCMS, that can be reached by a convoy of tactical vehicles of combat units to meet maneuver requirements. In addition, even if there were training timing available, it would not be practical to transport equipment by rail to other, more distant training facilities because of lost training time and inefficient use of training dollars spent on extensive logistics and substantial transportation costs.

Home station training is extremely important both to prepare Soldiers for combat and for morale. Utilization of Fort Carson and PCMS training ranges allows Soldiers to learn the basic skills necessary to meet qualification standards to travel to larger training events elsewhere for their pre-deployment training or to deploy directly. Utilization of Fort Carson and PCMS training ranges also reduces the time Soldiers are away from their Families, a particularly important factor in times, like present, when Soldiers are subjected to frequent deployments to combat.

2.5.2. Construction of Infantry Brigade Combat Team Support Facilities in the Area of the Ammunition Supply Point

The Ammunition Supply Point (ASP) is the designated facility for the distribution of ammunition to Units preparing to train. The current ASP facility is located directly south of Wilderness Road, between Tent City and BAAF and includes ammunition storage igloos. The surrounding area is large enough to support construction of the IBCT complex and a potential CAB complex. Relocation of the ASP would be necessary. The relocation site would need to meet the requirements of an ASP, to include safety distances, accessibility to the Soldiers, and security. The ASP has an "exclusion zone" around it for safety reasons, where development cannot take place. This exclusion zone extends above the ASP into airspace, and effectively creates a column around which aircraft have to fly. The ASP would have to be moved elsewhere outside the cantonment area or built-up area of Fort Carson, for safety reasons.

Thus, the relocation would displace valuable training or maneuver area downrange. The ASP requires sufficient size and proximity to an external gate to receive shipments of ammunition. Its relocation further downrange would likely require creating an additional gate, involving extensive construction and additional security costs. Construction of a new ASP would cost approximately $37 million. For all of these reasons, this alternative is not considered feasible.

2.5.3. Lease/Purchase Land Near Fort Carson

Acquiring land to eliminate the problems of land constraints is an alternative that would meet the demand for construction of facilities, increased training, and avoid the encroachment on BAAF and ranges. There are, however, no large areas of undeveloped lands adjacent to Fort Carson that could be easily acquired. The area surrounding Fort Carson is populated and developed, and expansion of training land at Fort Carson would be incompatible with this surrounding development due to safety concerns, community impacts, and encroachment on training values such as low light levels necessary for effective night training. Even if satisfactory land were available, the timeframe involved in purchasing land would not meet the Purpose and Need as described in Section 1.2. The Army does not have the authority, funding, or plans to expand Fort Carson.

2.5.4. Construction of Facilities for the Combat Aviation Brigade at Different Sites

Due to the aviation mission requirements and new standard Army operational requirements (Unified Facilities Criteria 4-140-01), the CAB must be either co-located with or within close proximity to the airfield. This siting requirement is needed to ensure that Soldiers can adequately maintain their equipment and administrative control of the unit. Therefore, other locations for siting facilities to support the CAB will not be analyzed. The configuration of the CAB in the Proposed Action is the only one possible. This is due to wetlands to the south of the BAAF, an impact area to the north, and the installation boundary to the east.

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3. Fort Carson Affected Environment and Environmental Consequences

3.1. Introduction

This chapter describes the affected environment and environmental consequences of implementing the Proposed Action or any of the alternatives. This chapter qualitatively and quantitatively evaluates the potential environmental impacts of proposed unit siting alternatives on Fort Carson. The affected environment and associated environmental impacts have been determined using the criteria in the *Army NEPA Guidance Manual* 2007 (Reference No. 14). Existing and proposed additional mitigation measures for environmental impacts resulting from the Proposed Action and Alternatives 1 and 2 are presented in Chapter 6.

3.1.1. Resources Analyzed

This chapter analyzes and discloses the direct and indirect impacts for the following resource areas (Cumulative Impacts are addressed in Chapter 5):

- Land Use (Section 3.2)
- Air Quality (Section 3.3)
- Noise (Section 3.4)
- Geology and Soils (Section 3.5)
- Water Resources (Section 3.6)
- Biological Resources (Section 3.7)
- Cultural Resources (Section 3.8)
- Socioeconomics, including Environmental Justice (Section 3.9)
- Transportation (Section 3.10)
- Utilities (Section 3.11)
- Hazardous and Toxic Substances (Section 3.12)
- Sustainability (Section 3.13)

Potential effects to the visual and aesthetic resources on and around Fort Carson were considered but not included for detailed analysis. Construction of new facilities and implementation of increased training frequency could introduce new elements to the visual landscape, but these changes either would not be visible from off-post or are consistent with the character of a military installation. Therefore, there would be no adverse visual or aesthetic impacts resulting from increased density of buildings or frequency and duration of training activities, and visual and aesthetic impacts are not discussed further in the EIS. The potential for decreased visibility or increased fugitive dust emissions (which has potential for visual and aesthetic impacts) is addressed under the Air Quality analysis (Section 3.3 of the EIS).

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3.2. Land Use, Plans, and Policies

This section discusses land use in and around Fort Carson and management plans that provide guidance on operations, and also identifies the environmental consequences to land use and compliance with management plans resulting from additional troops, training, construction, and operation on the cantonment and downrange areas.

The affected environment discussion addresses current military uses of live-fire and maneuver training and non-military uses involving recreational, wildlife habitat, and mining. Additionally, land use planning, surrounding off-post land use, and prime farmlands are addressed.

3.2.1. Affected Environment

3.2.1.1. Geographic Setting and Location

Fort Carson is located in central Colorado at the foot of the Rocky Mountains in El Paso, Fremont, and Pueblo counties (Figure 2-1). Fort Carson covers approximately 137,000 acres, and extends between 2 and 15 miles east to west and approximately 24 miles north to south. The cantonment area, located in the northern portion of the installation, covers approximately 6,000 acres. Fort Carson is bounded by I-25 and mixed development to the east and SH 115 to the west. Colorado Springs and Denver lie approximately 8 miles and 75 miles, respectively, to the north, while the City of Pueblo is located approximately 35 miles south of the cantonment area.

3.2.1.2. Climate

Fort Carson is located near the border of the Great Plains and the Front Range of the Rocky Mountains. The climate is moderate and semi-arid, with an average July temperature of 71 degrees Fahrenheit (°F) and an average January temperature of 29°F. Mean precipitation is about 17 inches per year. Rainfall ranges from approximately 12 inches (southern Fort Carson) to 15 inches (northern Fort Carson) per year, with about 80 percent falling between early April and late September. Average annual snowfall is approximately 36 inches. Snow and sleet usually occur from September to May, with the heaviest snowfall registered in March and trace accumulations recorded as late as June (Reference No. 6).

3.2.1.3. Existing Land Use

Land is used almost exclusively for military purposes and non-training uses. In addition, the Army maintains easements and special use permits on private lands. These easements and permits allow Fort Carson to maintain water rights, conduct monitoring on buffer lands, and use other federal properties for military purposes.

3.2.1.3.1. Military Uses

Fort Carson is an active military training facility for both weapons qualification and field training. Land use falls generally into one of two broad categories: the cantonment area, which consists of developed land and a high density of urban uses; and the downrange area, which consists of open land used for training purposes; and land specified for non-training uses, which are designated in various areas and are accessible by the public.

Cantonment Area

The cantonment area comprises approximately 6,000 acres and contains most of the infrastructure, such as Soldier and family housing; administrative, maintenance, community support, recreation, supply, and storage facilities; utilities; and classroom and simulation training facilities. Principal industrial operations include the repair and maintenance of vehicles. These operations mostly occur within the vicinity of the "banana belt" (so called because it is a banana-shaped arc of brick buildings) located within the north and east sides of the cantonment area (Reference No. 15).

Downrange Area

The downrange area consists of approximately 131,000 acres of unimproved or open lands that are used for large caliber and small-arms live-fire individual and collective training; aircraft, wheeled and tracked vehicle maneuver operations; and mission readiness exercises. Additionally, BAAF is located in the northeast quadrant of the downrange area and is used for command and control of flight operations as well as maintenance and repair of aircraft. Remaining land is used for recreation and other purposes (Reference No. 6). The primary training activities that occur within the downrange area include live-fire and maneuver training. Other areas within the downrange area are restricted from training. Each of these categories is described as follows.

- **Live-Fire Training.** Live-fire training is conducted at firing ranges. Exclusion areas, such as SDZs, are identified to protect personnel during weapons training, and are based on the maximum possible distance traveled by each weapon system's munition. Areas outside of established SDZs would be available for maneuver training when live-fire activities are not occurring. In addition, the installation has designated impact areas that are comprised of approximately 30,000 acres that cannot be used for any other purpose.
- **Maneuver Training.** Maneuver training is conducted to train and reinforce small and large unit movement techniques in a simulated battlefield environment. The magnitude of a maneuver area ultimately affects the size of a maneuver unit that can effectively use the area (i.e., brigade-sized maneuvers will require more area than a company-sized maneuver). Maneuver training occurs in areas based on topography and other environmental conditions. Many of the training areas within Fort Carson are limited in size and not appropriate for large maneuver activities. The largest contiguous area appropriate for maneuver training, known as Sullivan Park, is located in the southwestern portion of the downrange area in Training Areas 30, 31, 39, and 40 (Figure 2-5). Land rest and rehabilitation are required in areas where maneuver training occurs, and these areas are not continuously available to support training activities. Maneuver training activities also can be limited during live-fire exercises, which are incompatible (because of safety) with maneuver training. Some developed areas, such as Camp Red Devil and the Military Operations on Urban Terrain, are used for maneuver training, but mechanized travel is generally restricted to existing roads and trails. Some maneuver training areas are only appropriate for dismounted (non-mechanized) training. Dismounted training includes Soldiers moving on foot only and conducting activities such as surveying, placing of communication equipment, bivouacking, and rappelling.
- **Restricted Areas.** Portions of the downrange area are restricted from use or are available for limited training to protect natural and cultural resources, fragile soils, recreation areas, or other environmental concerns.

3.2.1.3.2. Non-Training Areas

Although Fort Carson's primary land use is for military training, the lands also support recreational activities, wildlife habitat, and the operation of two small clay mines near Stone City. Two permits have been issued by the State of Colorado to mine refractive clay on Fort Carson, near the Stone City site. Fort Carson is required by law to allow mining at existing sites provided permit conditions continue to be met by permittees (Reference No. 6).

Recreational uses include hunting, fishing, dog training, and activities such as picnics and trail rides. Recreational uses occur at the following locations:

- Bird Farm Recreation Area
- Wildlife Demonstration Area

- West Haymes Wildlife Conservation Area
- Turkey Creek Recreation Area
- Turkey Creek Protected Species Area
- Townsend, Northside, Teller, and Womack Reservoirs
- Large and Small Bird Reservoirs
- Camp Falcon

Figure 3.2-1 depicts the location of the recreational areas within Fort Carson.

Military training is generally off limits at these sites, and the intensity, level, and type of recreational activities vary by site. Most of the sites that support recreational uses are also waterfowl nesting refuges; some sites also protect other species, including fish. Hunting is allowed in designated training ranges during regulated seasons (Reference No. 6).

3.2.1.3.3. Land-Use Planning

Land-use planning is the responsibility of the Directorate of Public Works (DPW) Master Planning Division. This Division continuously assesses the need for new facilities and how these facilities can be sited to complement existing land uses. Fort Carson has developed Master Planning Strategy Smart Growth Principles that provide ten specific goals for facility siting and usage that guide conservation. Relevant environmental management plans are referenced in Appendix A.

3.2.1.3.4. Surrounding Off-Post Land Use

Developed land and land planned for future development border the northern one-third of Fort Carson. These lands are part of unincorporated El Paso County to the west, the City of Colorado Springs to the north and west, and Security-Widefield and the City of Fountain to the east. The Town of Penrose is located to the west of the southwest corner of Fort Carson.

Land bordering the southern and southeastern portion of Fort Carson is generally comprised of undeveloped agricultural and ranch land. Under the Army's Compatible Use Buffer (ACUB) Program, a collaborative effort among the Army, The Nature Conservancy (TNC), El Paso County, and the USFWS, a number of conservation real estate interests have been obtained from willing sellers in this area. These interests minimize land use that is incompatible with Fort Carson's mission and enhance preservation of valued environmental aspects associated with the land involved.

The ultimate goal of Fort Carson's ACUB efforts is to establish a buffer zone against encroachment around as much of the installation perimeter as possible. The City of Pueblo is located southeast of Fort Carson and extends up to the agricultural and ranch land previously mentioned.

El Paso County recognizes Fort Carson as a special land use dedicated for military training. Several areas in El Paso County including Turkey Canyon Ranch, Red Rock Valley Estates, El Rancho, and Midway Ranch are located adjacent to Fort Carson and zoned as a residential land use. These areas are considered noise-sensitive land uses and are described in further detail in Section 3.4 of this EIS. El Paso County is responsible for regulating land use in these communities.

The City of Colorado Springs future land-use plan indicates that the City plans to annex land adjacent to the western boundary of Fort Carson near Gate 2. Land uses planned include general residential use to the west and north of Fort Carson, existing park/open space, and community activity centers (Reference No. 16).

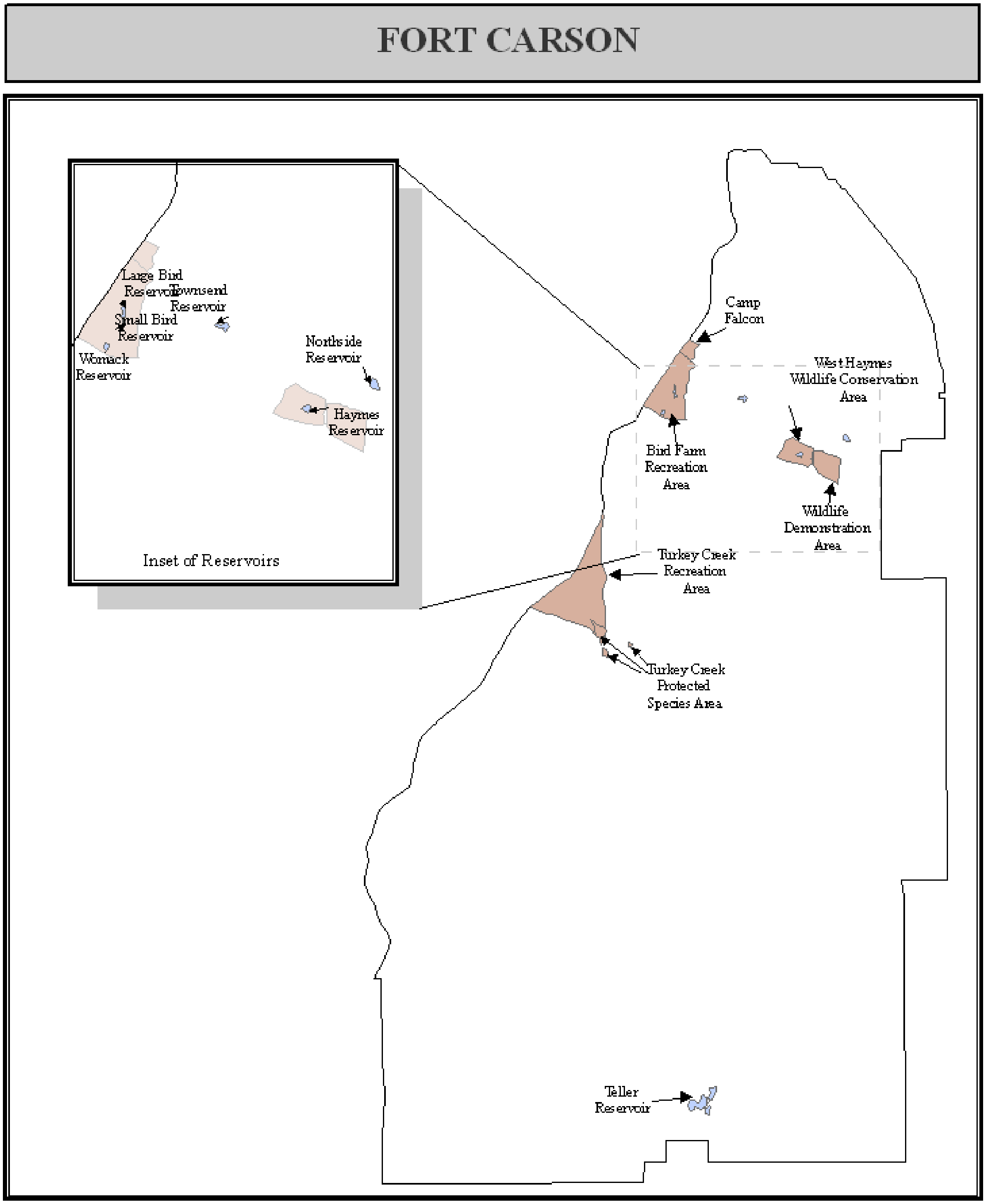

Figure 3.2-1 Recreation Map

The City of Fountain's future land-use plan indicates that business park, industrial, and parks and open-space uses will abut the east boundary of Fort Carson. While several small pockets of residential land use will be maintained near Fort Carson according to this plan, most of the existing land zones for residential use near the installation's eastern boundary will be changed to industrial or open-space uses in the future (Reference No. 17).

The City of Pueblo's comprehensive future land-use plan indicates that future development will potentially abut the southeast boundary of the conservation easements. This area is currently designated for country residential development, and is not planned to be one of Pueblo's two long-term growth areas. One growth area is located northeast of Pueblo around the Baculite Mesa, and the other wraps around southwest of Pueblo from the Arkansas River to I-25, and includes portions of South Pointe (Reference No. 18). Neither of these two areas is located in the vicinity of Fort Carson.

Federal, state, and other public lands provide recreational uses near Fort Carson, including Pike National Forest (USFS), the Beaver Creek Wilderness Study Area (BLM), Cheyenne Mountain State Park [Colorado Department of Natural Resources (CDNR)], Fountain Creek Regional Park (El Paso County), North Cheyenne Cañon Park (City of Colorado Springs), and Bear Creek Regional Park (El Paso County).

3.2.1.4. Prime Farmland

The Farmland Protection Policy Act (FPPA) of 1981 requires federal agencies to consider the impact of any activity that would convert prime or unique farmlands to non-agricultural uses. The NRCS regulates compliance with the law (7 CFR Part 658). According to the NRCS (Reference No. 19), prime farmland designations occur within El Paso, Fremont, and Pueblo counties. Historic records indicate that farming has never occurred on Fort Carson. Between 1960 and 1973, Fort Carson leased approximately 35,000 acres of land for grazing but grazing leases have not been issued since 1974 because of potential conflicts with proper land management criteria and the military mission (Reference No. 6). Because Fort Carson has not used land for agricultural use since 1973, farmlands would not be converted as part of the Proposed Action. Therefore, no action is required under the FPPA, and prime farmland is not analyzed further in this EIS.

3.2.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and the alternatives, including the environmental analyses performed, that are common to all the scenarios. Land use changes included in the Proposed Action and alternatives would impact internal military land use only and are not anticipated to impact public land use. The impacts from these changes would be expected to be less than significant.

3.2.2.1. Proposed Action and Alternatives

The facility construction for the CS units would occur within the cantonment area as described in Section 2.2.3 for the Proposed Action and Alternatives 1 and 2. There would be no change in land use from this construction.

3.2.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.2.2.2.1. Cantonment Area

The land use within the cantonment area would not change under the Proposed Action.

3.2.2.2.2. Downrange Area

Operational Readiness Training Center

The Proposed Action would change the current land use from training area to administrative and operational use. Both the IBCT and potential CAB facilities sets would be placed in the vicinity of the ORTC, which is located southwest of the Wilderness Road and Butts Road intersection (Figure 2-2). Buildup of Wilderness Road at ORTC site would directly remove approximately at least 200 acres of training area due to facilities location. The following training land use changes would occur due to the Proposed Action:

- TUAV facility relocation;
- Loss of maneuver training area; and
- Reduction of current training areas and flight corridors due to light encroachment.

Past training that has occurred in that area includes mock Patriot missile site, National Guard training, dismounted land navigation, parachute drop zone "Range Control" dismounted maneuver, heavy maneuver, field training exercises and TUAV training.

Fort Carson continues to deploy the ACUB program with the operational premise of preventing encroachment and incompatible land use adjacent to training areas. The Proposed Action would expand and encroach on the training areas by cantonment sprawl.

Indirect training impacts from buildup at the ORTC area are discussed as follows.

Butts Army Airfield

Land use at BAAF would not change as a result of the Proposed Action. The BAAF complex would require new construction and renovation activities to support the potential CAB and its equipment. The current airfield complex land use and size would remain unchanged and be used for additional airfield-related facilities such as maintenance facilities, hangars, and office buildings for the CAB. The buildup of the Wilderness Road ORTC site, however, would impact operations at BAAF due to light encroachment and creating the presence of sensitive noise receptors such as barracks, child development center and chapel. BAAF operations will impact Wilderness Road residents due to flight patterns and safety zones, noise, dust and night training.

Ranges and Training Areas

There would be some change to land use on the range and training areas under the Proposed Action (as described in Section 3.2.2.2.2). The indirect impacts from implementing the Proposed Action would be:

- Increased utilization of range facilities, which in turn would decrease the availability of maneuver land area at Fort Carson due to range surface danger zone activation while the ranges are in use.
- The need to move several training facilities in the Wilderness Road area would create a domino effect with the loss of more training lands as these facilities would be relocated downrange to accommodate the buildup. For example, the existing TUAV facility (would impact training capability in that the new TUAV facility would have to be constructed within restricted airspace further downrange and would impede field artillery training and create conflicts with aviation routes and altitudes while the TUAVs were in use), the ASP (which removes entire blast zone and airspace above it and the ability to fire artillery over it, from training), BAAF night vision range, and the ORTC function would likely be moved to the Tent City area.
- The need for more housing in the cantonment area could cause other facilities to be pushed downrange, creating "cantonment sprawl" and more loss of training lands.

- The buildup of Wilderness Road and the possibility of moving the security fence (necessary for securing the cantonment area) would create isolation of maneuver Training Areas 1, 2, 3, and 4, Korean Valley, Range 60 (instrumented Military Operations on Urban Terrain site), Improvised Explosives Device-Defeat (IED-D) training lanes, Range 71 Land Mine Detection range, and would create logical future infill of additional training areas that have been made non-contiguous.
- Traffic pattern changes would impact use of training areas.
- Physical training (PT) running routes could present safety concerns and could potentially adversely affect traffic patterns through road closures or tank trail closures during PT times. Physical training routes could also present a conflict to urban operations, land mine detection and IED-D lane training in Training Areas 1 through 4 if utilized for PT.

3.2.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Under this alternative, the Army would construct the IBCT facilities set within the cantonment area at Training Area Bravo (Figure 2-2). The potential CAB facilities set would remain at the ORTC site. Range construction, live-fire, and maneuver training activities would be the same as those described for the Proposed Action.

3.2.2.3.1. Cantonment Area

The land use at Training Area Bravo would change from training area to administrative use under this alternative, but only within the proposed construction footprint (approximately 200 acres). Training Area Bravo would still be used for light impact training (e.g., road marching, individual movement techniques, and signal operations) for small units in areas unaffected by construction.

Under this alternative, Landfill Number 2 would be considered for remediation and potential reuse either in whole (approximately 80 acres) or in part.

3.2.2.3.2. Downrange Area

Operational Readiness Training Center

This alternative would change the current land use from training area to administrative and operational use, but only within the proposed construction footprint (200 acres). Only the CAB facility set would be placed in the vicinity of the ORTC under this alternative and would require less than an approximate 50-acre construction footprint. The proposed footprint lies within the vicinity of the TUAV training area, and would have the same impacts as for the Proposed Action as described in Section 3.2.2.2.2.

Butts Army Airfield

Land use at BAAF would be the same as for the Proposed Action.

Ranges and Training Areas

There would be some change to land use on the range and training areas under this alternative as described under the Proposed Action in Section 3.2.2.2.2.

3.2.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Under this alternative, the Army would construct facilities for the IBCT at Tent City, near Gate 6, also located on Wilderness Road. The location and facilities are further discussed in Section 2.3.3 (Figure 2-11). The potential CAB would remain at the ORTC site.

3.2.2.4.1. Cantonment Area

Under this alternative, land use in the cantonment area would not change.

3.2.2.4.2. Downrange Area

Operational Readiness Training Center

Land use would change as described under the Proposed Action in Section 3.2.2.2.2.

Butts Army Airfield

Land use at BAAF would not change.

Ranges and Training Areas

Under this alternative, impacts would be the same as the Proposed Action, but would include additional impacts to training areas and the additional loss of a parachute drop zone. The Tent City site is currently used as a bivouac area for units to stage prior to moving downrange for maneuvers or other training operations. The land use for this site would change to administrative and operational use to support the IBCT; this would create an indirect impact by requiring its current function to be moved elsewhere on the installation.

3.2.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Implementation of the No Action Alternative would result in no change to land use.

3.3. Air Quality

This section describes the affected environment and environmental consequences to air quality associated with the Proposed Action on Fort Carson. Also described in this section are the various air quality analyses that were performed for different pollutants that will be emitted during the construction and operation phases associated with the stationing actions of the IBCT and a potential CAB. Minimal comments or concerns regarding regional air quality were raised at the 2008 public scoping meetings for this EIS; however, public and regulatory comments received during the 2007 Fort Carson Transformation EIS process in 2006 were reviewed and integrated in this section.

3.3.1. Regulatory Background

In Colorado, air quality is regulated by the Colorado Department of Public Health and Environment (CDPHE) and the EPA Region VIII. The Clean Air Act (CAA) of 1970, 42 United States Code (U.S.C.) 7401 *et seq.*, amended in 1977 and 1990, is the primary federal statute governing air pollution. The CAA established the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) to protect human health and welfare, allowing for an adequate margin of safety (Table 3.3-1). Primary and secondary NAAQS have been established for six air pollutants, known as criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and two types of particulate matter (PM_{10} is coarse particulate matter [10 micrometers or less in diameter] and $PM_{2.5}$ is fine particulate matter [2.5 micrometers or less in diameter]). Federal regulations designate Air Quality Control Regions, or airsheds, that cannot attain compliance with the NAAQS as non-attainment areas; areas meeting NAAQS are designated as attainment areas. Areas that have improved air quality from former non-attainment status to attainment are designated maintenance areas for a certain time period. Areas that lack monitoring data to demonstrate attainment or non-attainment status are designated as unclassified, although they are treated as attainment areas for regulatory purposes.

Table 3.3-1 Federal National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS	NAAQS Violation Determination [PPACG 2008(a)][2]
O_3	8-hour	0.075[1] ppm	3-year average of the annual 4th highest daily maximum 8-hour average concentration
CO	8-hour	9.0 ppm	Not to be exceeded more than once per calendar year
	1-hour	35.0 ppm	Not to be exceeded more than once per calendar year
NO_2	Annual arithmetic mean	0.053 ppm	Annual average
SO_2	Annual arithmetic mean	0.03 ppm	Not to be exceeded more than once per calendar year
	24 hour	0.14 ppm	Not to be exceeded more than once per calendar year
	3 hour	0.5 ppm	Not to be exceeded more than once per calendar year
PM_{10}	Annual arithmetic mean	Revoked[3]	Expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 cannot be exceeded more than once per year on average over a three year period
	24-hour	150 µg/m^3	

Table 3.3-1 Federal National Ambient Air Quality Standards (continued)			
Pollutant	**Averaging Time**	**NAAQS**	**NAAQS Violation Determination [PPACG 2008(a)][2]**
$PM_{2.5}$	Annual arithmetic mean	15 µg/m^3	Three year average of annual arithmetic mean
	24-hour	65 µg/m^3	Three year average of 98th percentile of the 24-hour values determined for each year
Pb	Quarterly average	1.5 µg/m^3	Quarterly arithmetic mean

[1]New 8-hour standard effective May 30, 2008.

[2]A NAAQS violation results in the re-designation of an area; however, an exceedance of the NAAQS does not always mean a violation has occurred.

[3]Revoked annual PM_{10} standard December 2006.

µg/m^3 = micrograms per cubic meter
CO = carbon monoxide
NA = not applicable
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
O_3 = ozone
PPACG = Pikes Peak Area Council of Governments
Pb = lead
$PM_{2.5}$ = particulate matter (≤ 2.5 µm)
PM_{10} = particulate matter (≤ 10 µm)
ppm = parts per million
SO_2 = sulfur dioxide

Although the Colorado Springs Urbanized Area in El Paso County is currently in attainment for all criteria pollutants, it was classified as a maintenance area for CO in October 1999 due to a previous violation of the 8-hour CO standard in 1988 (Reference No. 20). This designation is currently set to run through 2015 (Figure 3.3-1). Both Fremont and Pueblo counties are in attainment for all criteria pollutants (Reference No. 21).

The CAA, as amended in 1990, mandates that states with regions that violate the NAAQS submit State Implementation Plans (SIPs) to EPA. These plans detail the steps that the state is taking to bring its air quality into compliance with the standards. The applicable SIP for Colorado Springs is the *Carbon Monoxide Maintenance Plan for the Colorado Springs Attainment/Maintenance Area*, approved by EPA on November 8, 2004 (Reference No. 22).

Section 176(c) of the CAA requires that federal actions in any non-attainment or maintenance areas conform to a SIP to ensure the actions do not interfere with achieving attainment of the NAAQS. In 1993, EPA established two conformity regulations (40 CFR Parts 51 and 93) for transportation and non-transportation projects, which are incorporated by reference in the CDPHE Air Quality Control Commission Regulation 10, Criteria for Analysis of Conformity. If the action is not exempt under the rule, then its emissions must be analyzed to ensure conformity with the applicable SIP; this is called a Conformity Applicability Analysis. If the emissions exceed either the ***de minimis*** or regional significance level, then a Conformity Determination must be performed.

Conformity to a SIP, as defined in the CAA, means the proposed activity would not:

- Cause or contribute to a new violation of the NAAQS;
- Increase the frequency or severity of an existing violation; or
- Delay attainment of any standard, interim emission reduction, or milestone.

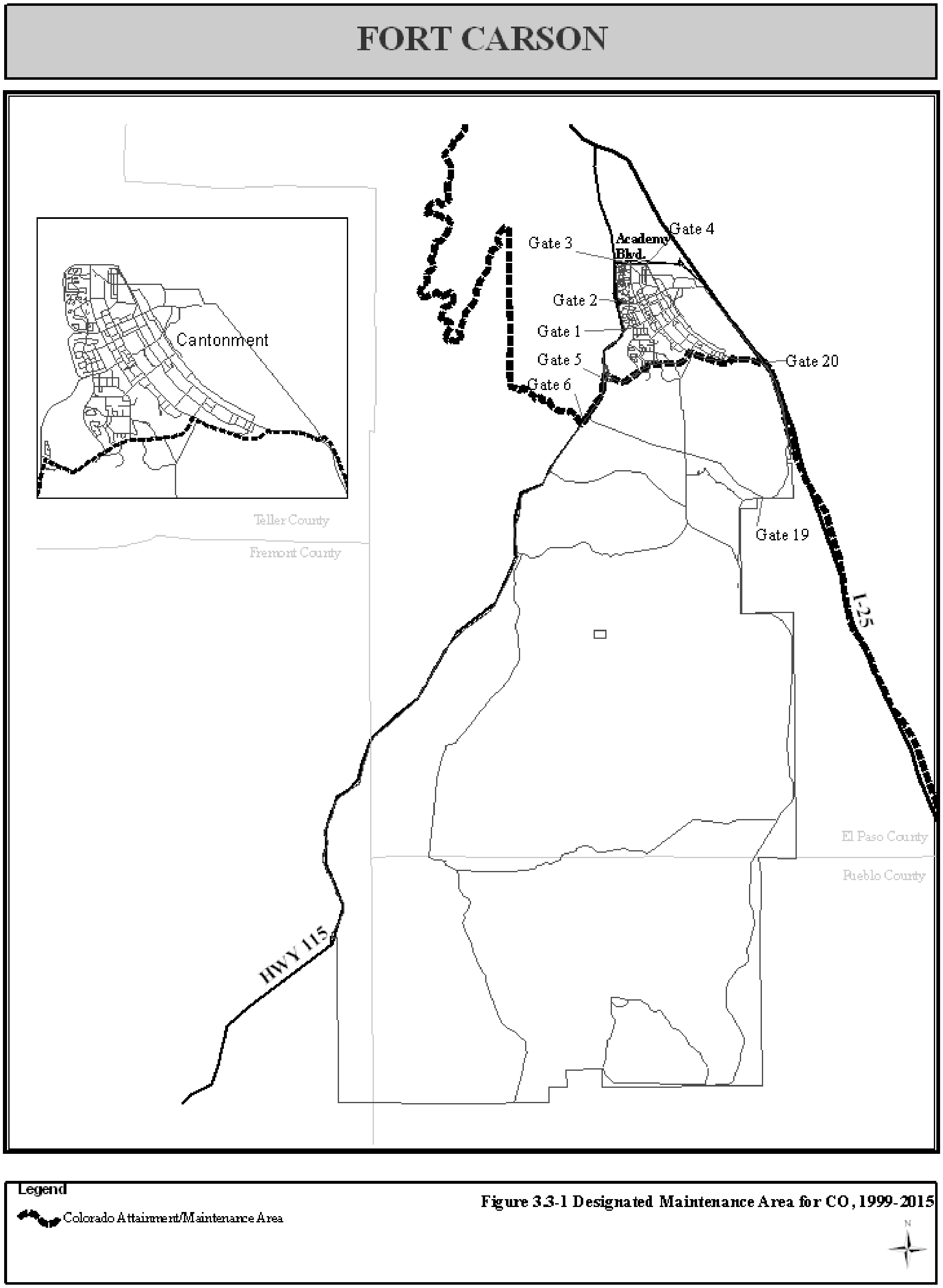

Figure 3.3-1 Designated Maintenance Area for CO, 1999-2015

To continue to protect air quality in designated attainment areas for criteria pollutants, a Prevention of Significant Deterioration (PSD) applicability analysis must be conducted. Any significant net increase of criteria pollutants for which the area is designated attainment would subject Fort Carson to the PSD review requirements per Colorado Air Quality Control Commission (AQCC) Regulation No. 3, Part D, Stationary Source Permitting and Air Pollutant Emission Notice Requirements (40 CFR 52.21; 5 Colorado Code of Regulations [CCR] 1001-5). Section 3.3.2.3 provides further details on PSD.

The emissions of PM, CO, and SO_2 are regulated by Colorado AQCC Regulation No. 1, Emission Control For Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides, which contains opacity limits (5 CCR 1001-3). These limits are set to help ensure that visibility is not impacted in the long term. Part IID of the regulation pertains to Fort Carson's military training with smokes and obscurants.

Non-criteria pollutants, which include but are not limited to pollutants that impair visibility, total suspended particulates, nitric oxide, and air toxics, do not have any current NAAQS.

In 1990, the Colorado AQCC established a visibility standard for the Front Range cities from Fort Collins to Colorado Springs based on the public's definition of unacceptable amounts of haze. The standard applies from 8:00 a.m. to 4:00 p.m. and is a measure of atmospheric extinction with a value of 0.1223 per mile. This means that 12.23 percent of the light in one mile of air is absorbed or scattered and essentially never reaches the viewer. Visibility, meteorological conditions, and pollutant concentrations that have NAAQS, are all used to determine the need for mandatory and voluntary restrictions (Reference No. 23).

Although there is no quantitative visibility standard for Colorado's pristine and scenic rural areas, Section 169a of the 1977 CAA Amendments requires EPA to create regulations to make progress towards the national goal of the "prevention of any future, and the remedying of any existing impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution." As such, EPA is responsible for monitoring visibility trends in mandatory federal Class I and sensitive Class II areas (i.e., applicable national parks and wilderness areas that have varying levels of protection from air pollutants). These trends are created using a haze index for the annual average of the 20 percent worst and best visibility days. EPA requires states with mandatory Class I areas to amend their SIP to include visibility protection.

In 2005, the EPA issued the final Regional Haze Rule to provide guidance for determining implementation of Best Available Retrofit Technology (BART). However, Fort Carson is not a BART-eligible source as it was constructed prior to the rule's applicable 1962-1977 timeframe.

3.3.2. Regional Air Emissions

Regional air quality is a function of the emission sources, amount of pollutants emitted, size and topography of the air basin, and prevailing meteorological conditions. Although Colorado does not identify airsheds (geographical areas that share the same air mass due to topography, meteorology, and climate), it divides the state into five multi-county monitoring areas based on topography: the Eastern Plains, the Northern Front Range, the Southern Front Range, the Mountain counties, and the Western counties (Reference No. 23).

There are twelve non-attainment or attainment/maintenance areas in Colorado. Colorado Springs, Longmont, Greeley, and Fort Collins have been re-designated attainment/maintenance for CO. Metropolitan Denver has been re-designated attainment/maintenance for CO, sulfur oxides ($SO_{x)}$, and PM_{10}, and non-attainment for the O_3 8-hour standard. Aspen, Steamboat Springs, Pagosa Springs, Lamar, Telluride, and Canon City are attainment/maintenance for PM_{10}.

Most criteria pollutants are emitted directly from sources; however, ground-level O_3 is formed by complex photochemical reactions in the atmosphere among nitrogen oxides (NO_x), volatile organic compounds (VOCs), and the hydroxyl radical (OH). Additionally, acid deposition is the result of gaseous emissions of SO_2 or NO_x that undergo complex reactions in the atmosphere resulting in the formation of sulfuric and nitric acid, respectively. The primary man-made sources of SO_2 are the burning of fossil fuels (e.g., coal, fuel oil, and diesel) and of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Visibility-affecting pollutants include NO_x, SO_2, PM, VOCs, and ammonia.

$PM_{2.5}$ is formed mostly in the atmosphere when gases from motor vehicles and industrial activities undergo chemical reactions. PM_{10} is directly emitted into the atmosphere from crushing or grinding operations, dust from construction sites, landfills and agriculture, wildfires and brush/waste burning, windblown dust from open lands and unpaved roads, etc.

CO is produced by the partial combustion of carbon compounds in environments with reduced available oxygen. Nationwide, over 50 percent of all CO emissions come from motor vehicles. Other significant sources of CO emissions include industrial processes such as metals processing and chemical manufacturing, residential wood burning, and natural sources such as forest fires. Approximately 3,000 to 10,000 acres on Fort Carson are affected annually by prescribed burns, which support training, ground maintenance, and the health of surrounding forest areas (Reference No. 24).

Ammonia gas (NH_3) can react to form ammonium (NH_4) particles that when combined with sulfate and/or nitrate cause visibility impairment. NH_4 may travel over long distances before being deposited. The primary sources of NH_3 emissions include native soil processes, livestock waste, fertilizer application, biomass burning, and fossil fuel combustion.

Based on the most recent data available from regional county emission inventories, the following emissions of criteria pollutants were reported from both point and non-point sources (Reference No. 25), as presented in Table 3.3-2.

Table 3.3-2 2001 Air Emissions Data from Point and Non-Point Sources in Counties Near to and Far[1] from Fort Carson

County	CO	NO_X	SO_2	VOC	PM_{10}	$PM_{2.5}$
El Paso	148,257	23,499	14,020	20,658	18,928	5,815
Fremont	18,633	4,741	5,030	2,185	5,007	1,551
Pueblo	61,114	13,624	16,717	6,399	8,018	2,771
Las Animas	20,966	2,861	164	1,684	2,823	1,328
Larimer	93,079	13,528	1,942	11,851	18,250	4,614
Saguache	8,417	639	67	827	2,924	906
Pitkin	10,043	1,059	101	1,147	2,023	551
Gunnison	11,312	824	109	1,277	2,410	916
Alamosa	6,592	823	104	862	2,453	550
Eagle	31,880	4,239	241	2,486	5,598	1,381
Summit	17,607	2,090	120	1,622	4,008	931
Montrose	20,581	2,874	1,556	1,781	6,399	1,670
Teller	9,239	859	58	1,123	2,921	854
Moffat	14,791	20,583	9,779	1,799	5,419	3,381
Huerfano	11,635	1,777	109	889	1,045	399

Source: Reference No. 25
[1] Near is defined as less than 31 miles and far as less than approximately 125 miles.
CO = carbon monoxide; NO_x = nitrogen oxide; PM = particulate matter; SO_2 = sulfur dioxide;
VOC = volatile organic compound

3.3.2.1. Regional Ambient Air Monitoring Results

Sources of O_3 are a concern in El Paso County (Reference No. 26); however, local monitoring results demonstrate that this region is in attainment with the new 8-hour O_3 standard that was promulgated in March 2008. (CDPHE will issue attainment designations in March 2009.)

There are no air quality monitoring stations located on Fort Carson, but ambient air quality data for criteria pollutants are measured actively at seven locations in the Colorado Springs Urbanized Area (Table 3.3-3). For CO, The Woodmen Valley and US 24/I-25 monitoring stations are the only two that currently monitor this pollutant on a daily basis. The local Metropolitan Planning Organization, PPACG, reports that pollutant concentrations are below the current standards. CO concentrations have been less than 50 percent of the standard for approximately the last five years and seem to have stabilized (i.e., no discernible upward or downward trend). Although O_3 levels have increased in this urbanized area (1998-2003), the concentrations appear to have also stabilized over the last five years (2003-2007). Local data shows that SO_2 levels are well below all three NAAQS and are less than 10 percent of the annual standard. Similarly, NO_2 levels are currently less than 30 percent of the annual standard; current levels of Pb are less than 5 percent of the standard; PM_{10} concentrations are less than 50 percent of the national standard; and $PM_{2.5}$ levels are also below the standard.

Table 3.3-3 Active 2008 Air Quality Monitoring Stations in Colorado Springs

Site Name	Pb	CO	SO_2	NO_2	O_3	PM_{10}	$PM_{2.5}$
Nixon Base[1]			X	X			
Woodmen Valley[1]		X	X	X			
Colorado College[2]						X	X
Regional Bldg	X					X	X
Manitou Springs					X		
Air Force Academy					X		
US 24 & I-25		X					

Source: Reference No. 27
[1] Collected CO, SO_2 and NO_2 until 2004.
[2] Started collecting $PM_{2.5}$ and PM_{10} in 2008. This monitor is a continuous read monitor.
CO = carbon monoxide; I = Interstate; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter (≤ 2.5 µm); PM_{10} = particulate matter (≤ 10 µm); SO_2 = sulfur dioxide; US = US Highway

Furthermore, PPACG believes that the air quality trends show that of all the pollutants, O_3 will likely be the pollutant of most concern, due also to the pending change in the standard. Its recommendation is for dispersion modeling for O_3 to occur for the Colorado Springs Urbanized Area to assist with identifying such sources to target effective mitigation programs (Reference No. 27). Real-time information for all of the pollutants can be found at: http://colorado.gov/airquality/air_quality.aspx and http://colorado.gov/airquality/aqi.aspx. Additionally, Tables 3.3-4 and 3.3-5 provide information on all of Colorado's ambient air quality monitors.

Table 3.3-4 Statewide Continuous Monitors in Operation for 2006

County	Site Name	Location	CO	SO_2	NO_X	O_3	Met
Eastern Plains Counties							
Prowers	Lamar - POE	7100 Hwy 50					X
Northern Front Range Counties							
Adams	Commerce City	7101 Birch St.					X
	Welby	3174 E. 78th Ave.	X	X	X	X	X
Arapahoe	Highland Res.	8100 S. University Blvd.				X	X
Boulder	Boulder	1405½ S. Foothills Hwy.				X	
	Longmont	440 Main St.	X				
Denver	Auraria Lot R	12th St. & Auraria Parkway					X
	Denver CAMP	2105 Broadway	X	X	X	X	X
	Denver Carriage	2325 Irving St.	D			X	X
	Denver NJH	14th Ave. & Albion St.	D				
	DESCI Building	1901 13th Ave. (Visibility)					
	Firehouse #6	1300 Blake St.	X				
Douglas	Chatfield Res.	11500 N. Roxborough Pk. Rd.				X	X
Jefferson	Arvada	9101 W. 57th Ave.	D			X	X
	NREL	2229 Old Quarry Rd.				X	
	Rocky Flats	16600 W. Hwy. 128				X	X
		9901 Indiana St.					X
	Welch	12400 W. Hwy. 285				X	X
Larimer	Fort Collins	708 S. Mason St.	X			X	X
		300 Remington St. (Visibility)					
		4407 S. College Ave.	X				
		3416 LaPorte Ave.				X	
Weld	Greeley	905 10th Ave.	X				
		3101 35th Ave.				X	
Southern Front Range Counties							
El Paso	Colorado Springs	1098 Glenn Ave.	D				
		USAFA Rd. 640				X	
		690 W. Hwy. 24	X				
	Manitou Springs	101 Banks Pl.				X	
Teller	Cripple Creek	2nd St. & Warren Ave.					D
Western Counties							
Mesa	Grand Junction	645¼ Pitkin Ave.	X				X

Source: Reference No. 23
X = Monitors continued in 2006; D = Monitors discontinued in 2006;
CO = carbon monoxide; SO_2 = sulfur dioxide; NO_X = nitrogen oxide; O_3 = ozone; Met = meteorological

Table 3.3-5 Statewide Particulate Monitors in Operation for 2006

County	Site Name	Location	TSP	Pb	PM_{10}	$PM_{2.5}$
Eastern Plains Counties						
Elbert	Elbert	Wright-Ingraham Inst.				X
Prowers	Lamar	100 2nd St.			X	
		104 Parmenter St.			X	
Northern Front Range Counties						
Adams	Brighton	22 S. 4th Ave.			D	
	Commerce City	7101 Birch St.	D	D	X	X/H/S
	Globeville	5400 Washington St.	D	D		
	Welby	3174 E. 78th Ave.			X/H	

Table 3.3-5 Statewide Particulate Monitors in Operation for 2006 (continued)						
County	**Site Name**	**Location**	**TSP**	**Pb**	**PM_{10}**	**$PM_{2.5}$**
Arapahoe	Arapahoe Comm. College	6190 S. Santa Fe Dr.				X
Boulder	Longmont	350 Kimbark St.			X	X/H
	Boulder	2440 Pearl St.			X	X
		2102 Athens St.				H
Denver	Denver CAMP	2105 Broadway	D	D	X/H	X/H
	Denver NJH	14th Ave. & Albion St.				H
	Denver Visitor Center	225 W. Colfax Ave.			X	
	Lowry	8100 Lowry Blvd.			D	
	Denver Animal Shelter	678 S. Jason St.	A	A	A/H	A
	Swansea Elementary Sch.	4650 Columbine St.				X
Douglas	Chatfield Reservoir	11500 Roxborough Rd.				X/H
Larimer	Fort Collins	251 Edison St.			X	X
Weld	Greeley	1516 Hospital Rd.			X	X/H
	Platteville	1004 Main St.				X/S
Southern Front Range Counties						
Alamosa	Alamosa	208 Edgemont Blvd.			X	
		425 4th St.			X	
El Paso	Colorado Springs	3730 Meadowlands			D	D
		101 W. Costilla St.	D	D	X	X/S
Fremont	Cañon City	128 Main St.			X	
Pueblo	Pueblo	211 E. D St.			X	X
Teller	Cripple Creek	209 Bennett Ave.			D	
Mountain Counties						
Archuleta	Pagosa Springs	309 Lewis St.			X	X
Gunnison	Crested Butte	603 6th St.			X	
	Gunnison	221 N. Wisconsin St.			D	
	Mt. Crested Butte	19 Emmons Rd.			X	X
Lake	Leadville	510 Harrison St.	D	D		
Pitkin	Aspen	120 Mill St.			X/H	
Routt	Steamboat Springs	136 6th St.			X	
Summit	Breckenridge	501 N. Park Ave.			X	
Western Counties						
Delta	Delta	560 Dodge St.			X	D
Garfield	Parachute	100 E. 2nd St.			X	
	Rifle	144 E. 3rd Ave.			X	
	New Castle	402 W. Main St.			X	
	Silt – Bell Ranch	512 Owens Dr.			X	
	Silt – Daley Ranch	884 County Rd. 327			X	
	Silt – Cox Ranch	5933 County Rd. 233			X	
	Glenwood Springs	109 8th St.			X	

Table 3.3-5 Statewide Particulate Monitors in Operation for 2006 (continued)						
County	**Site Name**	**Location**	**TSP**	**Pb**	**PM_{10}**	**$PM_{2.5}$**
La Plata	Durango	1060 2nd Ave.			D	
		56 Davidson Creek Rd.			D	
		1235 Camino del Rio			X	
		117 Cutler Dr.			D	
Mesa	Grand Junction	650 South Ave.			X	X/H/S
		645 ¼ Pitkin Ave.			H	
San Miguel	Telluride	333 W. Colorado Ave.			X	D

Source: Reference No. 23
X = Monitors continued in 2006; A = Monitors added in 2006; D = Monitors discontinued in 2006;
H = Hourly particulate monitor; S = Chemical Speciation;
Pb = iron; $PM_{2.5}$ = particulate matter (≤ 2.5 µm); PM_{10} = particulate matter (≤ 10 µm); TSP = total suspended particular

3.3.3. Affected Environment

The majority of Fort Carson, including all of the cantonment area is located in El Paso County, although portions of the installation lie within Pueblo and Fremont counties. The majority of Fort Carson's cantonment area (north of Titus Boulevard and Specker Avenue) is located within the Colorado Springs maintenance area for CO.

3.3.3.1. Sources of Air Pollutants

Pollutants affecting air quality in any region can be characterized as being emitted from either stationary sources (e.g., fuel burning equipment and chemical processing operations), mobile sources (e.g., cars), or are fugitive (i.e., emissions that could not reasonably pass through a stack or tailpipe). Annually, Fort Carson prepares an emissions inventory for its stationary and fugitive emission sources, which can be generalized as follows: boilers, high temperature hot water generators, furnaces/space heaters, emergency generators, paint spray booths, fuel storage and use operations, facility-wide chemical use, and military smoke/obscurants.

3.3.3.2. Current Air Permit Requirements

Title V Operating Permit. Facilities located in an attainment area and have the potential to emit (PTE) (i.e., the maximum emissions a facility could emit given physical, enforceable, and permitting constraints) more than 100 tons per year (tpy) of a criteria pollutant must obtain a Title V Operating Permit. Since 1998, Fort Carson's PTE has exceeded this threshold for several pollutants, therefore the facility has a Title V permit (No. 95OPEP110) (Table 3.3-6). As a major Title V source, Fort Carson must submit a permit application for renewal every five years and recently received a new permit in July 2007.

The Title V permit limits the amount of pollutants from significant emission sources in various ways, depending on the source type (such as restricting operating hours, fuel type and throughput amount, emission rates, etc.).

Table 3.3-6 Fort Carson Stationary Sources Baseline Potential to Emit					
	Pollutant (tpy)				
Emission Unit	**PM_{10}**	**NO_x**	**CO**	**SO_x**	**VOC**
Boilers, Hot Water Generators, and Exempt Miscellaneous External Combustion Units [1]	26.58	261.88	241.17	38.91	16.15
Internal Combustion Units[1]	4.81	113.00	29.24	7.61	7.07
Paint Booths	1.13	0.00	0.00	0.00	17.15

Table 3.3-6 Fort Carson Stationary Sources Baseline Potential to Emit (continued)					
	Pollutant (tpy)				
Emission Unit	**PM_{10}**	**NO_x**	**CO**	**SO_x**	**VOC**
Categorically Exempt Storage Tanks and Associated Operations	0.00	0.00	0.00	0.00	19.68
Military Smoke Training	31.82	0.00	0.00	0.00	31.82
Abrasive Blasting	0.07	0.00	0.00	0.00	0.00
Fire Training	0.02	0.11	0.04	0.00	0.06
Installation-Wide Total Stationary Source PTE	**55.20**	**312.29**	**210.56**	**65.73**	**94.58**

[1] Includes units that are categorically exempt from permitting requirements under AQCC Regulation 3, Part A. PTE includes permit restrictions, size, and hours-run operational exemptions, and 24 hours × 365 days maximum fuel input operational scenarios. The baseline represents the No Action Alternative.

CO = carbon monoxide
NO_x = nitrogen oxides
O_3 = ozone
PM_{10} = particulate matter (≤ 10 µm)
tpy = tons per year
SO_x = sulfur oxides
VOC = volatile organic compounds

Hazardous Air Pollutants (HAPs), also regulated by the Title V Operating Permit, are pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects. The CAA Amendments of 1990 originally proposed that 188 HAPs should be regulated under the National Emission Standards for Hazardous Air Pollutants Program (NESHAPs); currently, there are 186 regulated HAPs. Due to Fort Carson's efforts in its air quality management, sustainability, and pollution prevention programs, the installation continues to be permitted as a minor (area) source of HAPs as it does not emit more than 8 tons of any single HAP or 20 tons of total HAPs per year.

New Source Review. New Source Review (NSR) this is a CAA permitting program that regulates the construction of new major stationary sources of air pollution and major modifications to existing major sources (e.g., boiler replacement, addition of new equipment). It has two components: the PSD permitting program for criteria pollutants in attainment areas and the non-attainment NSR permitting program applicable to pollutants in non-attainment areas. Sources that trigger either major modification threshold must obtain an air pollution permit prior to the construction of new stationary sources or modification of existing sources, and must comply with applicable pollution control technology and other requirements.

Fort Carson is considered a major stationary source under PSD review requirements (40 CFR 52.21) as its installation-wide stationary source PTE for NO_x is greater than 250 tpy (Table 3.3-6). Furthermore, the boilers and hot water generators are also considered a major listed source category because they are in one of the 28 individually regulated PSD categories (i.e., fossil fuel boilers [or combination thereof] totaling more than 250 million British thermal units [MMBtu] per hour heat input), which has a PTE of 100 tpy. As such, Fort Carson's boilers are a major stationary source because they have a PTE of more than 100 tpy for NO_x and CO (40 CFR 52.21[b][1][i][a]).

Minor Source Permits. The AQCC Regulation No. 3, Part B requires facilities to obtain construction permits for new stationary emission sources if emission rates will be exceeded (10 tpy for CO, SO_2, NO_x, 5 tpy for VOC and PM_{10}, and 200 pounds per year for Pb). Sources with emissions less than these emission rates are generally exempt from the requirements to obtain a construction permit. An Air

Pollutant Emission Notice (APEN) however, may need to be filed for those sources if emissions exceed 2 tpy. Typically, APENs are renewed every five years or when there is a significant change in emissions.

Prescribed Burn Permits. Prescribed fire is used as a management tool to support the installation's readiness mission and ecosystem health. Fort Carson submitted a Prescribed Fire Planning Document to CDPHE in 2003, which expires in ten years based on the Colorado AQCC Regulation No. 9 (Reference No. 24). This regulation requires significant users (those who own or manage more than 10,000 acres per year and plan to use prescribed fire that will generate more than 10 tons of PM_{10}) to submit a planning document.

Annually, Fort Carson staff prepares the CDPHE and El Paso County prescribed burn permit applications in the first quarter and submits the applications to the respective regulatory agency. The required notifications are filed with the state, prior to and after each burn. The state then invoices Fort Carson each year for the previous year's actual acreage of burns and subsequent PM emissions.

Also, Fort Carson has an ***Integrated Wildland Fire Management Plan*** (IWFMP), "to reduce wildfire potential, effectively protect and enhance valuable natural resources, integrate applicable state and local permit and reporting requirements, and implement ecosystem management goals and objectives on Army installations" (Reference No. 28). This plan must be updated annually and revised at a minimum once every five years.

Other Permits. Fort Carson oversees numerous other permits that project proponents obtain, such as CDPHE/El Paso land development permits for excavation, land clearing, road grading, and construction activities (depending on the size and duration of the project); open burning; demolition; abrasive blasting; and asbestos permits.

3.3.3.3. Air Compliance Status

CDPHE conducts an inspection of Fort Carson's air program annually. This inspection may involve a field inspection, a records review, or both. CDPHE delegates some compliance inspections to the county health departments (e.g., El Paso County conducts biennial O_3 depleting chemical inspections and frequent inspections on demolition and land development projects). Any type of enforcement action is taken seriously by the installation personnel and acted upon immediately. The EPA Enforcement and Compliance Online (ECHO) website records the compliance status for each permitted facility. In the last three years, Fort Carson has been in compliance and has not been subject to formal enforcement actions in the last five years (Reference No. 29).

3.3.4. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.3.4.1. Proposed Action and Alternatives

Due to activities associated with IBCT and potential CAB, the number of personnel at Fort Carson and constructed support facilities would increase. Consequently, emissions would increase as a result of the following activities:

- Installation of new emission sources consisting of boilers, miscellaneous external combustion equipment, and stationary internal combustion engines;
- Training an additional IBCT and CAB; and
- Increased travel on paved and unpaved roads in the downrange areas.

Personnel. Additional military personnel (approximately 6,700) and their Family members (approximately 12,500) would be relocated to Fort Carson over a period of several calendar quarters as a result of the Proposed Action (Reference No. 30). The increase in Soldiers and Families would cause increased vehicle travel and an anticipated increase in traffic congestion if no transportation/road infrastructure mitigation efforts are implemented. Increases in population, excess fuel consumption/engine idling due to congestion, and additional vehicles are all factors that can impact air quality (Reference No. 30).

In support of the 2007 Fort Carson Transformation EIS, a detailed transportation study was performed in 2005 and updated in 2008, which used a larger increase in population than what was included in the 2007 Fort Carson Transformation EIS Proposed Action. The results of the 2005 study indicated that areas with the highest traffic congestion would be below the thresholds that would trigger an air quality analysis and therefore, off-post traffic increases would not exceed regulatory thresholds (Reference No. 31). The 2008 study considered changes in population and proposed land development. The goal of that study was to provide recommendations on ways to improve traffic flow and safety, and to assist in future planning efforts. One such recommendation highlighted the importance of maintaining traffic control (e.g., signs, traffic signals, pavement markings to sustain safe and efficient traffic flow). Maintaining traffic control adequately is critical as for instance, faulty traffic signals can lead to degraded air quality and increased fuel consumption (Reference No. 32).

Construction and Operation of Emission Sources. Emissions from mobile and stationary sources were evaluated in the General Conformity and PSD analyses for activities associated with the stationing of IBCT and the potential re-stationing of the CAB. Pollutants would be emitted from these sources during the construction and operation of new facilities, such as from vehicular exhaust, unpaved areas/roads, boilers/emergency generators etc. Construction-related impacts are expected to be short-term and limited to the duration and area of the construction activities. All disturbed areas greater than one acre must have, and comply with, an El Paso County land development permit; if a construction site/project is more than 25 acres or disturbed for more than six months then a state permit is required. For the construction activities associated with this EIS, the construction contractor would be held responsible for preparing and filing land development permit applications prior to beginning the land development work, and complying with all permit conditions. Permit conditions typically include dust suppression methods, such as daily watering of disturbed surfaces and soil stockpiles, covering stockpiles, temporary chemical stabilization, and track-out controls to minimize windblown and vehicular-borne fugitive dust from construction sites.

For the proposed stationary source activities associated with this EIS, Fort Carson would be responsible for preparing and filing a permit to construct applications prior to installing any stationary sources, and complying with all permit conditions. Fort Carson must include these units in its Title V operating permit as a significant activity. An application to revise the Title V operating permit must be submitted no later than twelve months after startup (Regulation No. 3, Part C.III.B.2). Based on similar construction that is occurring in support of Fort Carson Transformation activities, it is anticipated that most of the construction associated with this EIS would involve APEN-exempt boilers and water heaters, along with a few emergency generators. Due to the State of Colorado's recent adoption of New Source Performance Standards (Subpart IIII—Standards of Performance for Stationary Compression Ignition Internal Combustion Engines), the exemptions for such units in Regulation 3 (Stationary Source Permitting) are no longer available for any source subject to Part A of Regulation No. 6 (New Source Performance Standards). Therefore, the diesel-fired emergency generators will require APENs, construction permits, and inclusions in the Title V operating permit.

Due to the construction activities (and associated land preparation work), installation/operation of stationary sources, military training maneuvers and vehicular traffic associated with the IBCT and CAB stationing/re-stationing activities, there would be impacts to the regional and local air quality. Therefore, in accordance with federal and state air laws and regulations, several analyses were performed to assess these short- and long-term impacts from the air emissions associated with these activities, as well as cumulative impacts from numerous other Army directives/initiatives that have occurred or would occur in the foreseeable future. The No Action Alternative is the baseline for comparison of air quality impacts.

General Conformity. For federal actions occurring on Fort Carson within the CO maintenance area, the installation must assess, prior to the action occurring, if an action is subject to the Conformity Rule. Since the Proposed Action would not receive federal highway funds, the transportation conformity regulations do not apply. However, the general conformity regulations described in the rule for Determining Conformity of Federal Actions to State or Federal Implementation Plans do apply. A General Conformity Analysis was performed to estimate both direct and indirect actual CO emissions from all mobile, stationary, and area sources associated with the Proposed Action. In order to account for the worst case actual CO emissions and to follow conformity criteria, the potential re-stationing of a CAB, which is reasonably foreseeable and has known activities, was included in this analysis with IBCT (i.e., they were considered as one federal action for the purposes of this analysis).

Three possible locations were considered for the federal action. The IBCT is the only unit to change location between the siting alternatives; its facilities could be set either:

1) South of Titus Boulevard and the CO maintenance area, on Wilderness Road at the ORTC site, identified as the Proposed Action;
2) Within the main cantonment area (i.e., at Training Area Bravo on the eastern side), referred to as Alternative 1; or
3) South of Titus Boulevard and the CO maintenance area, on Wilderness Road at the Tent City site, referred to as Alternative 2.

For each alternative scenario, the CS/CSS facilities would be constructed in the main cantonment area (i.e., inside the CO maintenance area) and the CAB facilities would be constructed outside these areas, at the ORTC site and BAAF (directly adjacent to the ORTC site).

To determine if the impacts from the Proposed Action and alternatives would exceed the regulatory *de minimis* threshold, the CO emissions were calculated using various tools and data. Emissions from mobile, stationary, and area sources were quantified using AP-42 emission factors (Reference No. 33) and by employing two versions of the *Air Conformity Applicability Model* (ACAM), version 4.3.3 and version 4.3.31 (Reference No. 34). The latest vehicular emission model, *MOBILE6.2* (Reference No. 36), was used as an input file to ACAM. For additional details of the General Conformity Analysis and Determination, see Appendix C.

PSD Applicability Analyses. Two PSD applicability analyses were performed for the potential emissions associated with the stationary sources anticipated for IBCT and CAB activities. The analyses yielded results indicating that neither IBCT nor CAB activity would be subject to PSD permitting requirements under NSR regulations as the emissions increase from each activity would be less than the applicable major modification threshold for all criteria pollutants (Table 3.3-8 and Table 3.3-9 in Section 3.3.4.2.2). For additional details of the PSD applicability determinations, see Appendix C.

Air Dispersion Modeling. Air Dispersion Modeling (ADM) was completed to assess the cumulative impacts on ambient air quality from existing, proposed, and recently added emission sources at Fort Carson, and also includes quantification of PM emissions from maneuvers training. The modeling includes new and proposed emissions from Transformation, GTA, and ongoing Army MILCON and DPW projects.

The near-field/off-post concentrations of criteria pollutants were determined using the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) (Version 07026).

Near-field 24-hour PM concentrations were determined using the dust transport atmospheric modeling system (DUSTRAN). This model was developed by the US Department of Energy's Pacific Northwest National Laboratory to assist the DoD in addressing PM air quality issues at military training installations. DUSTRAN is based on Environmental System Research Institute's ArcMap geographical information system (Version 9.x), the EPA-approved California puff air quality dispersion modeling system (CALPUFF) and the widely used California grid dispersion model (CALGRID). The California meteorological (CALMET) model provides meteorological parameter values for the CALPUFF and CALGRID models. For this analysis, average Colorado Springs airport meteorological monitored values were input to CALMET, and a 2.5-mile resolution meteorological grid was created.

The far-field (greater than 31 miles) air quality related value (AQRV) impacts were analyzed using the CALPUFF dispersion model. AQRV impacts include comparison of modeled pollutant concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation for the appropriate Class I and sensitive Class II federal areas. The CALPUFF models were created using meteorological years 2001, 2002, and 2003 CALMET output derived from over 40 surface, 50 precipitation, and two upper-air raw data sets that are located throughout the modeling domain.

None of the AERMOD predicted ambient concentrations of criteria pollutants (i.e., modeled maximum concentration plus background concentration) exceeded the corresponding NAAQS or Colorado ambient air quality standards (CAAQS).

DUSTRAN-modeled 24-hour PM concentrations did not exceed the applicable NAAQS and CAAQS.

CALPUFF results showed that maximum modeled 24-hour PM_{10} concentrations were slightly above the Class I SIL at the La Garita Wilderness Area, Great Sand Dunes National Park, and the Weminuche Wilderness Area during one of the three years modeled. However, the predicted cumulative 24-hour PM_{10} concentrations at these locations were below the NAAQS. All other maximum modeled pollutants' (NO_x, SO_x and PM_{10}) annual average concentrations and short-term concentrations were below their respective Class I increment SILs. The maximum predicted nitrogen and sulfur deposition rates were below the deposition analysis threshold of 0.004 pounds per acre per year for all Class I or sensitive Class II federal areas that were modeled.

The CALPUFF results also predicted there would be no noticeable visibility impacts to the Class I and sensitive Class II areas modeled. The visibility assessment is expressed as the number of days for each modeled year that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; therefore, greater deciview levels represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals. No visibility changes of greater than one deciview were observed for the modeled Class I and sensitive Class II areas. For additional details on the ADM analysis and results, see Appendix C.

Training. Due to Fort Carson's topography, semi-arid climate conditions, soil types, and training requirements based on Army doctrine to train Soldiers to specific readiness standards, long-term impacts can be expected from the increased personnel and their equipment and therefore, increased training activities in the downrange area (in terms of frequency, additional vehicles, and type of training). Fort Carson's ability to provide a wide variety of training causes a military-unique problem of generating PM from non-traditional sources. Such sources include PM from training activities (e.g., extensive mounted and dismounted maneuver training and military convoy travel on unpaved roads, airborne training, cannon artillery practice, gunnery ranges, mortar firing, weapons impact testing, smoke and obscurant training), open burning/open detonation, and prescribed burning (although the latter is an ecosystem management tool that assists training). Since the nature of training activities post 9/11 has shifted towards an increase in urban warfare training and is not smoke/obscurant intensive, it is anticipated that there would not be a need to increase the use of smoke/obscurants in excess of the existing permit limits, which provides sufficient buffer to account for increased training loads.

To determine the effect that training an additional IBCT and potential CAB would have on air quality, PM near-field concentrations were estimated using air dispersion modeling to assess the cumulative impacts from existing, proposed, and recently added emission sources on Fort Carson (Chapter 5). Additionally, military personnel increases were used to estimate expected increases in small arms munitions use from training activities, and thus extrapolate HAPs emissions increases.

3.3.4.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.3.4.2.1. Cantonment Area

CS/CSS facilities would be constructed in the main cantonment area (i.e., inside the CO maintenance area). The Proposed Action includes the necessity to demolish six buildings.

General Conformity

The construction of new facilities to support additional Soldiers, aircraft and support equipment, and an increase in POV/government-owned vehicle (GOV) traffic were evaluated under the General Conformity requirements. Downrange area construction would cause indirect impacts to the maintenance area (Figure 3.3-1). The duration of construction activities was estimated and the various associated phases (site preparation, grading, facility construction, and the first year of facility operation) were analyzed.

Building space was estimated for this alternative based on the most current Department of Army planning documents.

Maximum CO emissions for this alternative are estimated to occur in calendar year 2012 (Table 3.3-7). These maximum emissions are well below the ***de minimis*** threshold for CO emissions, which is 100 tpy. Furthermore, as these maximum emissions are not considered regionally significant, as the established emissions inventory for 2015 in the SIP is 409.35 tpy (Reference No. 22), no further analysis (i.e., a Conformity Determination) was required for the Proposed Action. A Record of Non-Applicability was prepared and is in Appendix C.

3.3.4.2.2. Downrange Area

Operational Readiness Training Center

Facilities and support facilities for the IBCT and CAB would be constructed outside the main cantonment area (outside of the CO maintenance area) at the ORTC site. PSD Applicability Analysis Results from the construction of stationary sources are illustrated in Tables 3.3-8 and 3.3-9.

Table 3.3-7 Summary of Total CO Emissions from Federal Action Scenario 1 at Fort Carson Cantonment Area (tpy)

Emissions Source[1]	2009	2010	2011	2012	2013
Construction (worker trips, mobile equipment, stationary equipment, dust-generating equipment)	30.59	13.06	11.67	6.74	0
Mobile (POV)	0	0	0	53.99	53.99
Mobile (GOV)	0	0	0	3.49	3.49
Mobile (Aircraft)	0	0	0	0.05	0.05
Boilers	0	0.13	0.13	0.39	0.64
Total Estimated CO Emissions	**30.59**	**13.19**	**11.8**	**64.66**	**58.18**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

[1]Categories of emergency generators and miscellaneous are not in this table because in this scenario they are outside of the CO maintenance area.
GOV = government-owned vehicle
POV = privately owned vehicle
tpy = tons per year

Table 3.3-8 Potential to Emit Increase from Proposed GTA Stationary Sources at Fort Carson (tpy)

Potential Point Source Emissions	PM_{10}	NO_x	CO	SO_x	VOC	Pb
Proposed Stationary Point Sources	3.04	16.93	34.17	0.35	2.31	negligible
Major Modification Threshold	15	40	100	40	40	0.6

CO = carbon monoxide
NO_x = nitrogen oxides
Pb = lead
PM_{10} = particulate matter (≤ 10 µm)
SO_x = sulfur oxides
tpy = tons per year
VOC = volatile organic compounds

Table 3.3-9 Potential to Emit Increase from Proposed Combat Aviation Brigade Stationary Sources at Fort Carson (tpy)

Potential Point Source Emissions	PM_{10}	NO_x	CO	SO_x	VOC	Pb
Proposed Stationary Point Sources	2.46	14.22	27.80	0.30	1.90	negligible
Major Modification Threshold	15	40	100	40	40	0.6

CO = carbon monoxide
NO_x = nitrogen oxides
Pb = lead
PM_{10} = particulate matter (≤ 10 µm)
SO_x = sulfur oxides
tpy = tons per year
VOC = volatile organic compounds

Butts Army Airfield

The CAB facilities would be constructed at the ORTC site and at BAAF. Renovations to existing buildings at BAAF would also occur under the Proposed Action. Both areas are located outside of the CO maintenance area.

Ranges and Training Areas

The construction/upgrades to ranges under the Proposed Action would occur downrange (outside the CO maintenance area).

3.3.4.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.3.4.3.1. Cantonment Area

General Conformity

The direct impacts to the CO maintenance area involving the construction of new facilities to support additional Soldiers, aircraft and support equipment, and an increase in POV/GOV traffic were evaluated under the General Conformity requirements. The duration of construction activities was estimated and the various associated phases (site preparation, grading, facility construction, and the first year of facility operation) were analyzed. Building space was estimated for this alternative based on the most current Department of Army planning documents.

Table 3.3-10 shows the total direct and indirect CO emissions for each applicable source for Alternative 1. The maximum CO emissions from all emissions sources are expected to occur in 2012 at 153.23 tpy. The year with the greatest emissions is used to determine whether the emissions that result from the federal action exceed the specified regulatory ***de minimis*** levels. Since the threshold for CO emissions under General Conformity is 100 tpy, the maximum emissions do exceed this threshold however, Fort Carson can demonstrate that Alternative 1 complies with the General Conformity Rule requirements in the following ways:

- The FY 2008 Through FY 2013 Transportation Improvement Program for the Colorado Springs Urbanizing Area allows a "sufficient margin of safety to the mobile source emissions budget[2] buffer to maximize the flexibility for determining conformity in future years due to mobile source growth beyond projected levels for future years or for model changes that revise projected emissions" (Reference No. 30). The PPACG updated the Transportation Improvement Program (TIP) by significantly revising its travel demand model for forecasting traffic and specifically, Fort Carson has been attributed enough growth in the TIP to allow for a total population of 30,000 active duty troops by calendar year 2015 (Reference No. 37). As the Soldier numbers used in this Conformity Analysis are rounded up to be conservative, the worst case total active duty troop population for Fort Carson after this proposed action (fiscal year 2013) is estimated to be 32,000 Soldiers. However, "…deployments overseas mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS" (Reference No. 38). Therefore, there is a low probability that Fort Carson will ever realize that population potential for any sustained period of time. Based on discussions with PPACG, it is asserted that their TIP will be able to accommodate Fort Carson's growth based on the remaining available budgeted emissions for the region. Therefore, the 96.43 tpy of POV emissions meet the requirements and

[2] Emissions budgets are "those portions of the applicable SIP's projected emissions inventories that describe the levels of emissions (mobile, stationary, area, etc.) that provide for meeting reasonable further progress milestones, attainment, and/or maintenance for any criteria pollutant or its precursors" (EPA 1993).

criteria for demonstrating conformity (per 40 CFR 93.158[a][5][ii]), as those emissions will be certified as accounted for in the TIP by PPACG.

- The remaining emissions (i.e., 59.62 tpy) related to GOVs, facility construction, stationary sources (i.e., boilers and generators), and miscellaneous area source emissions, are less than the regulatory thresholds outlined for General Conformity at 40 CFR 93.158(c)(1) and are considered to be *de minimis*. These emissions are also not considered regionally significant; therefore, demonstration of conformity has been shown and official public and agency notification of the availability of the General Conformity Analysis and public comment period will be given. .

Table 3.3-10 Summary of Total CO Emissions from Federal Action Scenario 2 at Fort Carson Cantonment Area (tpy)

Emissions Source	2009	2010	2011	2012	2013
Construction	92.2	43.09	11.51	6.74	0
Mobile (POV)	0	0	0.16	96.43	96.43
Mobile (GOV)	0	0	0	34.09	34.09
Mobile (Aircraft)	0	0	0	0.05	0.05
Boilers	0	1.68	2.97	3.23	3.49
Emergency Generators	0	0	0.21	0.27	0.27
Miscellaneous	0	0	0	15.23	15.23
Total Estimated CO Emissions	**92.2**	**44.77**	**14.85**	**156.05**	**149.57**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

GOV = government-owned vehicle POV = privately owned vehicle tpy = tons per year

See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

3.3.4.3.2. Downrange Area

Operational Readiness Training Center

Facilities for the CAB would be constructed outside the main cantonment area (outside of the CO maintenance area) at the ORTC site. Support facilities (e.g., chapel, child development center) would not be necessary under this alternative because Soldiers would have access to nearby facilities already existing within the cantonment area. See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

Butts Army Airfield

The CAB facilities would be constructed at the ORTC site and at BAAF. Renovations to existing buildings at BAAF would also occur under the Proposed Action. Both areas are located outside of the CO maintenance area. See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

Ranges and Training Areas

The construction/upgrades to ranges under the Proposed Action would occur downrange (outside the CO maintenance area). Training related activities that would be conducted to support Alternative 1 are the same as discussed for the Proposed Action. See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

3.3.4.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Alternative 2 impacts, for the purposes of air quality analysis, would be the same as those discussed for the Proposed Action. The close proximity of these sites are not predicted to result in different impacts to air quality. Tent City and ORTC sites are less than 1 mile apart.

3.3.4.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, but their impacts have been included as part of the No Action Alternative.

Construction. Similarly, if the Proposed Action were not to occur, the construction activities would not increase over those existing or currently planned for; therefore, no additional air emissions would be generated from construction.

Training. Training activities would also be expected to remain as described in the 2007 Fort Carson Transformation EIS, which is the basis for the No Action Alternative. This assumes the rotation of units continues at the same rate; current land-based training restrictions would not change; maneuver damage prevention would continue to be implemented (i.e., the same training lands need to be rested to recover between significant military exercises); topography limitations remain; and SDZs (Figure 2-7) for ranges remain unchanged.

Prescribed burn activities would continue and are dependent on uncontrollable climate factors such as drought and meteorological conditions. As required by both CDPHE and El Paso County regulations, Fort Carson would continue to adhere to the regulatory requirements and ensure that conditions are acceptable for prescribed fires and that air quality is not compromised (Reference No. 39).

The use of hand-held smoke grenades and mechanical generators for large area obscurant training would continue to be limited by the Title V Operating Permit emission rates and administrative operational controls would remain in place as per AQCC Regulation No. 1, Part II.D to ensure no off-property transport of visible emissions from any smoke or obscurants.

The No Action Alternative would not result in increased air quality impacts from training.

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3.4. Noise

This section describes the affected environment and environmental consequences of noise generating activities associated with the Proposed Action on Fort Carson.

Noise is generally defined as unwanted sound. It can be any sound that is undesirable because it interferes with communications or other human activities, is intense enough to damage hearing, or is otherwise annoying. Human response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day.

The most widely used metric for noise is the day-night average sound level (DNL), which is the metric recommended by EPA and used by most federal agencies to measure environmental noise. The DNL represents energy-averaged sound levels measured by summing and averaging sound exposure level values during a 24-hour period. A penalty of 10 decibels (dB) is assigned to noise events (including aircraft operations) occurring between 10:00 p.m. and 7:00 a.m. The 10-dB penalty compensates for generally lower background noise levels and increased annoyance associated with events occurring at night.

DNL is a useful descriptor for noise in two respects. First, it is an average, and it fits intuitive concepts when dealing with continuous noise, such as that from a busy highway. Second, because it is a summation of sound energy over a 24-hour period, it is a cumulative metric. For intermittent sound, it represents the total sound being received rather than the sound level at any given time. Noise from transportation sources, such as vehicles and aircraft, and from continuous sources, such as generators, is assessed using the A-weighted DNL (ADNL). The ADNL significantly reduces the measured pressure level for low-frequency sounds while slightly increasing the measured pressure level for some high-frequency sounds. Noise from small arms ranges is assessed using the ADNL. Impulse noise resulting from armor, artillery, and demolition activities is assessed in terms of the C-weighted DNL (CDNL). The CDNL is often used to characterize high-energy blast noise and other low-frequency sound capable of inducing vibrations in buildings or other structures. The C-weighted scale does not substantially reduce the measured pressure level for low-frequency components of a sound.

The Army seeks to minimize the impact or annoyance of unwanted noise produced by military operations on communities surrounding its installations. Under its Environmental Noise Management Program (ENMP) (formerly known as the Installation Compatible Use Zone Program) (Reference No. 40), the Army evaluates the impact of noise that may be produced by ongoing and proposed Army actions and activities. To evaluate the potential effects of noise associated with military operations, the Army conducts noise studies and generates noise contours. The ENMP characterizes noise into three primary zones (Noise Zones [NZ] I-III) as shown in Table 3.4-1. NZ I is typically suitable for all types of land uses and is located the furthest from the noise source. NZ II and NZ III are generally considered incompatible for noise-sensitive land uses.

Table 3.4-1 Noise Zones

	Noise Limit				
Noise Zone	**Population Highly Annoyed (percent)**	**Transportation (ADNL)**	**Large-Caliber Weapons (CDNL)**	**Small-Caliber Weapons (ADNL)**	**Small-Caliber Weapons (PK15[met])**
LUPZ	9-15	60-65	57-62	60-65	NA
Zone I	<15	<65	<62	<65	<87
Zone II	15-39	65-75	62-70	65-75	87-104
Zone III	>39	>75	>70	>75	>104

Source: Reference No. 40
ADNL = A-weighted day-night average sound level
CDNL = C-weighted day-night average sound level
LUPZ = Land Use Planning Zone
PK15(met) = contours

In addition to the contours discussed above, other metrics used to create noise contours include the Land Use Planning Zone (LUPZ) and the PK15(met) contours. The LUPZ encompasses an area during which periods of increased operations can lead to increased community annoyance levels associated with above average training activities. The PK15(met) contour shows the peak noise level that is expected to be exceeded by only 15 percent of the events and gives personnel a truer indication of the maximum level they are likely to hear during training activities. The PK15(met) thresholds of complaints associated with large-caliber weapons noise are shown in Table 3.4-2.

Table 3.4-2 PK15(met) Large-Caliber Weapons Noise Contours

Complaint Level	Decibel Range for Large-Caliber Weapons
Low Risk	<115
Moderate Risk	115-130
High Risk	>130

Source: Reference No. 41

3.4.1. Affected Environment

Noise-sensitive areas adjacent to Fort Carson consist of numerous communities and residential developments. To the north, these areas include Cheyenne Mountain State Park and the communities of Colorado Springs, Security, Widefield, and Fountain. Other noise-sensitive areas include Turkey Canyon Ranch and Red Rock Valley Estates along the western boundary, and El Rancho and Midway Ranch along the eastern boundary. Noise-sensitive locations adjacent to the southern boundary of Fort Carson include the communities of Penrose and Pueblo, which are located to the southwest and southeast, respectively. Noise-sensitive areas within Fort Carson are limited to the cantonment area.

Sources of noise associated with Fort Carson include aircraft and traffic as well as large- and small-caliber weapons. The primary sources of noise are the firing of weapons, specifically large-caliber weapons such as artillery and tank main guns, as well as the operation of military aircraft at BAAF.

Secondary sources of noise include motor vehicle traffic, consisting of cars, trucks, and tracked vehicles. Fort Carson operates in accordance with the *Installation Environmental Noise Management Plan*, *Fort Carson, CO* (Reference No. 40) and FC Regulation 95-1, *Army Aviation : General Provisions and Flight Regulations* (Reference No. 42). The ENMP outlines the policies and procedures for managing and limiting noise impacts to the surrounding communities. FC Regulation 95-1 prescribes specific noise abatement requirements for aviation personnel.

In accordance with the ACUB Fort Carson has delineated a 1.5- to 2-mile buffer around the installation boundary. The purpose of the buffer is to limit further development and encroachment in areas adjacent to the installation likely to experience noise impacts. The program provides a natural buffer between military training lands and noise-sensitive residential and commercial land uses, thereby protecting noise-sensitive areas from the negative effects of noise pollution resulting from training activities. El Paso County is responsible for recording noise disclosures and regulating land use on private lands surrounding Fort Carson. A more detailed description of the ACUB program is described in Section 3.2.1.3.4.

3.4.2. Environmental Consequences

The US Army Center for Health Promotion and Preventive Medicine (CHPPM) evaluated potential noise impacts associated with the Proposed Action and alternatives at Fort Carson in June 2008. The evaluation compared Fort Carson's 2006 noise study against potential future actions, and resulted in no significant change. The 2006 study evaluated large and small-caliber weapon noise as well as aircraft noise. The following discussions describe elements of the Proposed Action and the alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.4.2.1. Proposed Action and Alternatives

Noise contours would remain unchanged as a result of the Proposed Action or alternatives. However, there would be increased occurrence of noise generating training activities on the installation. This increased occurrence would occur regardless of the facility siting alternative chosen. The additional noise generating episodes would occur during training events, and are entirely independent of facility set placement.

3.4.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.4.2.2.1. Cantonment Area

Additional building and roadway maintenance and construction would occur under the Proposed Action, potentially resulting in elevated noise levels at noise-sensitive locations adjacent to the construction sites. Elevated noise levels during construction would not be expected to extend outside the boundaries of Fort Carson and would be temporary and short term in duration.

3.4.2.2.2. Downrange Area

Operational Readiness Training Center

Noise levels would not increase at the ORTC under the Proposed Action. Personal, commercial and military vehicle use (both ground and aviation) is authorized and occurs on this site as well as on the adjacent Wilderness Road. Vehicle use in and around the ORTC and Wilderness Road would significantly increase but would not raise overall noise levels within this area.

In contrast, the Proposed Action would have significant noise impacts on facility occupants. Most of the proposed construction footprint for the IBCT and CAB is located within NZ II and III (65-75, and >75 db ADNL, respectively) of the BAAF noise contour (Figure 3.4-1). The noise level within NZ III is considered so severe that noise-sensitive land uses should not be considered therein. Exposure to noise within NZ II is considered significant, and use of land within this zone should normally be limited to activities such as industrial, manufacturing, transportation, and resource production; however, if planners determine that land in NZ II areas must be used for residential purposes, then noise level reduction features of 25 to 30 dB should be incorporated into the design of the construction project (Reference No. 40).

Butts Army Airfield

Noise levels would not change at BAAF under the Proposed Action as existing noise contours for BAAF currently account for similar CAB flight activities.

Ranges and Training Areas

Noise contours would not change as both ground and aviation equipment in the Proposed Action have been accounted for in previous studies.

3.4.2.2.3. Large-Caliber Weapons Noise

Noise contours for large-caliber weapons would not change under the Proposed Action. However, noise generating activities associated with live-fire training is expected to increase occurrence by 26.9 percent (IBCT - 20.5 percent, and CAB – 6.4 percent) (Reference No. 43). The projected increase in occurrence would not change existing noise contours, however, because weapon systems, range locations, and SDZs would not differ from those in the No Action Alternative.

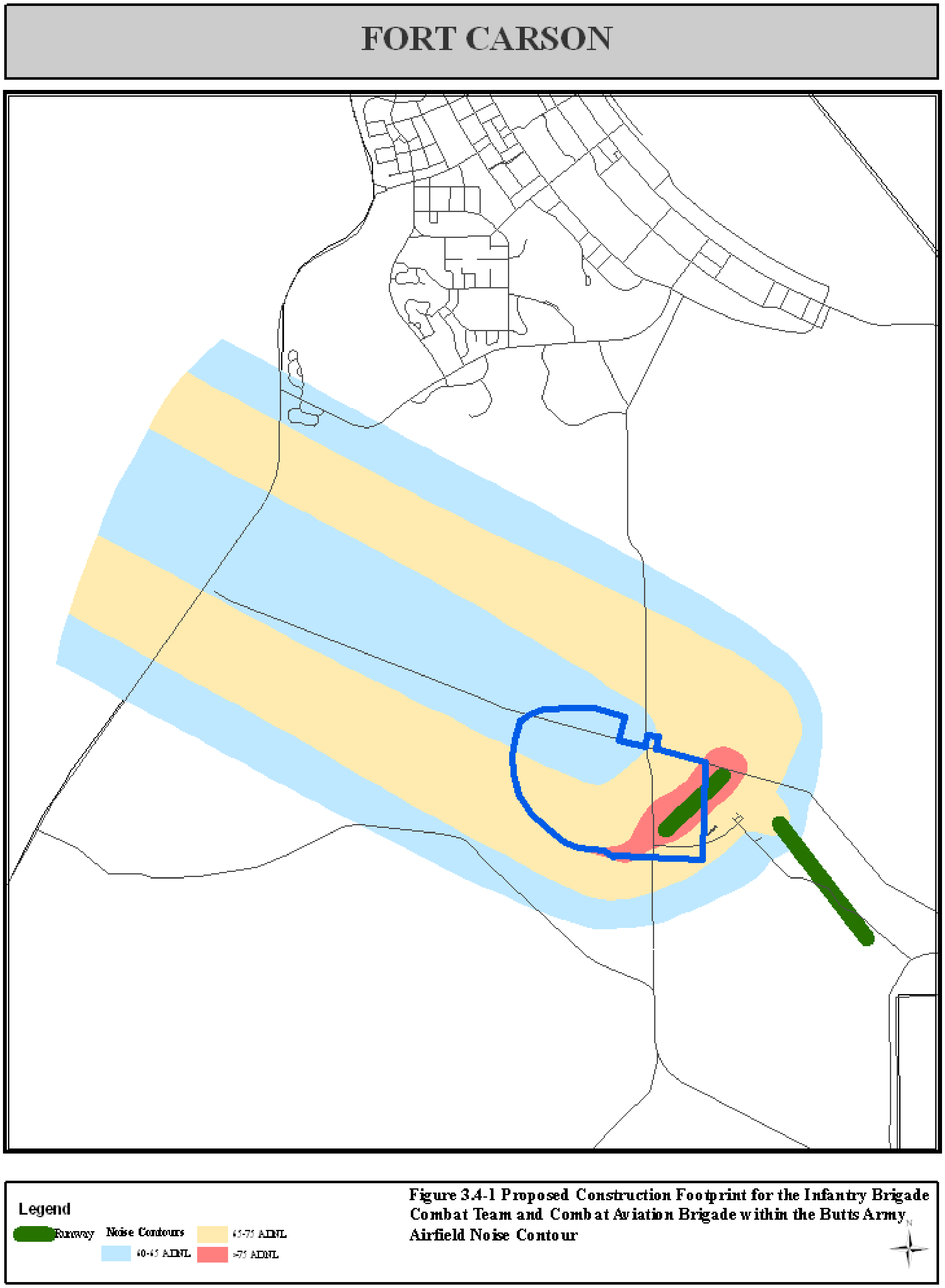

Figure 3.4-1 Proposed Construction Footprint for the Infantry Brigade Combat Team and Combat Aviation Brigade within the Butts Army Airfield Noise Contour

Table 3.4-3 provides a summary of existing NZs II and III resulting from large-caliber weapons.

Table 3.4-3 Large-Caliber Weapons Noise Contours

		Distance into Noise-Sensitive Area (meters)	
	Land Use-Planning Zone	**NZ II**	**NZ III**
Noise Sensitive Area	**Existing**	**Existing**	**Existing**
Turkey Canyon Ranch	Completely encompasses	700	400
Fountain	Completely encompasses	1,300	500
El Rancho	Completely encompasses	4,000	400
Midway Ranch	Completely encompasses	4,000	N/I

Source: Reference No. 9
N/I = no impact
NZ = noise zone

3.4.2.2.4. Small-Caliber Weapons Noise

There would be no change in small-caliber weapon use under the Proposed Action. Therefore, the noise contours for the Proposed Action and No Action Alternative are the same.

3.4.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.4.2.3.1. Cantonment Area

Noise levels would not increase within the cantonment area as a result of the Proposed Action. Personal, commercial, and military vehicles routinely travel in and around the Training Area Bravo footprint and are currently subject to low posted speed limits which help mitigate for noise. The Proposed Action may, however, increase the duration of traffic-related noise due to a significant increase in Soldier population density in the area. This noise is not anticipated to travel beyond the cantonment area and installation boundaries, and would only potentially impact areas currently used as motor pools or other industrial operations.

3.4.2.3.2. Downrange Area

Operational Readiness Training Center

This alternative would have the same impacts as the Proposed Action, but only for the proposed CAB facilities within the ORTC footprint.

Butts Army Airfield

Noise levels would be the same as for the Proposed Action.

Ranges and Training Areas

Noise levels would be the same as for the Proposed Action.

3.4.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

This alternative would have the same noise related impacts as discussed in the Proposed Action for the cantonment and downrange areas.

3.4.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of the No Action Alternative.

3.4.2.5.1. Aircraft and Traffic Noise

Noise contours generated for BAAF indicate that the NZ III contour (greater than 75 ADNL) does not extend beyond the boundary of Fort Carson or into any noise-sensitive areas within Fort Carson. Noise contours for NZ II (65-75 ADNL) and the LUPZ (60-65 ADNL) extend beyond the western boundary of Fort Carson.

A supplemental annoyance buffer for the NOE flight corridor was generated. The 0.25-mile-wide buffer on both sides of the NOE flight corridor was determined to be sufficient to account for possible annoyances outside the actual NOE flight corridor. The supplemental annoyance buffer extends into noise-sensitive areas, including El Rancho, Turkey Canyon Ranch, and Red Rock Valley Estates, by as much as 0.25 miles. It should be noted that the buffer does not surround the entire installation because the NOE flight corridor is located at varying distances from the boundary and does not follow the full length of the installation boundary.

There would be no change to the NOE flight corridor under the Proposed Action; therefore, a discussion of noise resulting from the NOE flight corridor is not included in the following analysis. Noise from aerial maneuvers, however, is likely to be more frequent under the Proposed Action because there would be additional permanently assigned aircraft or helicopters associated with the CAB.

3.4.2.5.2. Large-Caliber Weapons Noise

Noise contours were generated for noise associated with the firing of large-caliber weapons (see Appendix D). Under the No Action Alternative, the NZ III (70 CDNL) contour extends beyond the western boundary into Turkey Canyon Ranch. The NZ III contour extends past the eastern boundary into a portion of El Rancho. The NZ II (62 CDNL) and LUPZ (57 CDNL) contours extend beyond the western boundary into Turkey Canyon Ranch and beyond the eastern boundary into Midway Ranch, Fountain, and El Rancho. Specifically, the LUPZ contour nearly encompasses both El Rancho and Midway Ranch.

In addition, the PK15(met) contours for large-caliber weapons noise were generated for Fort Carson and are shown in Appendix D. Under the No Action Alternative, both the PK15(met), 130-dB contour and the PK15(met), 115-dB contour extend past the western, northern, and eastern boundaries into Turkey Canyon Ranch, Red Rock Valley Ranch, Midway Ranch, and El Rancho; the PK15(met), 115-dB contour also extends into the community of Fountain.

The PK15(met) noise levels associated with training activities under the No Action are expected to be the same as the Proposed Action (see Section 3.4.2.4). Although the frequency of training activity would increase as a result of increased training requirements, the types of noise-generating equipment and the noise levels from equipment use would not change (i.e., no new large-caliber firing systems would be used).

3.4.2.5.3. Small-Caliber Weapons Noise

The noise contours for small-caliber weapons shown in Appendix D currently extend outside the eastern boundary; the NZ II (PK15[met], 87-dB) contour extends less than 2,300 feet into the community of Fountain. The NZ III (PK15[met], 104-dB) contour also extends past the eastern boundary, but barely beyond I-25.

3.4.2.5.4. Construction Noise

Noise from construction activities, such as routine maintenance of buildings and roads, would not extend outside the boundaries of Fort Carson. The majority of these activities would be limited to the cantonment area and would result in temporary and short-term impacts to sensitive locations within that area. These impacts would be minor.

No adverse effects to noise-sensitive areas resulting from routine maintenance of buildings and roadways would occur under the No Action Alternative.

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3.5. Geology and Soils

This section describes the affected environment and environmental consequences to geology and soils associated with the Proposed Action on Fort Carson.

Several sources of information were used in this analysis of geology and soils impacts. These sources of information included collaboration with the regional branch of the NRCS, soil surveys information from the NRCS web mapper, studies from the Center for Environmental Management of Military Lands (CEMML), information from Army environmental and Geographic Information System (GIS) professionals employed by Fort Carson, and peer-reviewed studies. These sources of information were used to predict the impacts to Fort Carson's soils and geology, which may result from GTA stationing actions and the potential stationing of a CAB.

Projected impacts from the Army's Proposed Action would result from four general categories of action that the Army would need to undertake to support new unit stationing as a part of GTA or other actions. These four categories of action include:

1) Cantonment area and downrange area construction;
2) Training range and infrastructure construction/upgrades;
3) Live-fire training activities; and
4) Maneuver training activities.

The analysis of impacts and discussion of environmental consequences are organized by these four categories. Discussion of environmental consequences within this analysis focuses mainly on projected maneuver impacts, as this is the military activity that is projected to have the greatest impact on the existing soils and geologic conditions.

In conducting the analysis of soils and geology impacts within this document, installation range managers provided an overview of the type and geographic extent of live-fire and maneuver training activities that would take place at Fort Carson and PCMS to support the stationing of an IBCT, the CAB, and other GTA units. This information was used to generate 5,000- to 10,000-acre plots to analyze existing conditions and the projected impacts of military maneuvers. The NRCS web mapper tool was used to provide an assessment of compatibility and suitability of soil conditions in relation to military vehicle use associated with stationing actions, projected intensity of use, and location.

The most substantial impacts from stationing of military units (in terms of geographic extent and intensity) to the existing environment would result from maneuver training. The prediction of soil impacts requires the consideration of several variables. These variables include soil texture (fine- vs. coarse-grained material) important to wind and water erosion potential, soil strength, slipperiness in connection with surface shear, stickiness, stone content, aggregation, and slope. The NRCS web mapper tool was used to evaluate lightweight truck, heavy four-wheel truck, aviation, foot traffic, and light digging impacts at plots selected based on likely areas for military training. The analysis assumes repeated (50 passes of a vehicle) use and does not assume one-time use of land for vehicle movement. The geographic areas evaluated in this analysis include, but are not limited to, the central southwestern training areas of Fort Carson referred to as the California Strip, Sullivan Park and training maneuver areas at the extreme southern portion of Fort Carson that are projected to be most intensively used by the IBCT to support training. Analysis of impacts of a CAB at Fort Carson focuses on the use of live-fire training ranges in the south and northeastern portions of Fort Carson. Live-fire training certification in these areas would be the major training activities the CAB would engage in on the installation. Both the IBCT and CAB would engage in maneuvers at PCMS (see Section 4.0).

To make a determination of level of impacts to soils, NRCS soil loss threshold (T) value ratings (maximum tons per acre per year) of soil erosion an area can sustainably lose were used in concert with NRCS hydrologic soils ratings, wind erodibility index values, and soils properties to ascertain whether the proposed Army activities would likely exceed maximum sustainable rates of soil loss. The T factor is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting vegetative productivity over a sustained period. The rate is in tons per acre per year. Figure 3.5-1 shows that Fort Carson exhibits high geographic variability in sustainable soil loss thresholds (T factor variation) across the installation.

Significant impacts were assessed if Army training activities were projected to result in the loss of more soils than a training area could sustain. A rating of significant but mitigable was used if mitigating actions were thought to be able to reduce soil loss to within sustainable soil loss parameters. If the proposed Army activities would not cause significant erosion, they were rated as either less than significant, minor, or no impact.

3.5.1. Affected Environment

3.5.1.1. Geology and Physiography

The eastern portion of Fort Carson lies within the Colorado Piedmont section of the Great Plains Province, while the western portion is located in the foothills of the Rampart Range section of the Southern Rocky Mountains Province. The Colorado Piedmont section differs from the High Plains to the east and north by its lack of former Tertiary sedimentary deposits, which have been removed by the alluvial forces of the Platte and Arkansas stream systems when they cut valleys several hundred feet below the level at which they formerly flowed (Reference No. 44).

The Rampart Range section commonly refers to the portion of the Colorado Front Range between the South Platte River and the Colorado Springs area, which is interspersed with fault-bounded blocks of Precambrian granites, schists, and gneisses bordered on the east by a belt of Paleozoic and Mesozoic rock foothills 2 to 4 miles wide that dip steeply eastward toward the Denver Basin. Dominant landforms on Fort Carson consist of high plains on the southeastern, west central, and western portions of Fort Carson (5,400 to 6,400 feet), low plains on the eastern portion of Fort Carson dominated by Fountain Creek and its tributaries (5,400 to 6,200 feet), and steep terrain including Timber Mountain (6,897 feet), Wild Mountain (6,695 feet), and Booth Mountain (6,454 feet) (Reference No. 45).

The region is characterized by rolling plains, tablelands, and occasional valleys, canyons, and buttes. The lowest point on Fort Carson is Beaver Creek Valley. The high plains region consists primarily of gently rolling uplands, sharp crested hills, and rocky outcrops located in the southeast, west-central, and western portions of Fort Carson. The cantonment area is located within the high plains region of the post, while Fountain Creek and its tributaries are located on the eastern portion of Fort Carson within the low plains region. The maximum relief on the installation is 1,840 feet (Reference No. 6). The topography of the western portion of Fort Carson is characterized by moderately rolling and strongly dissected plains interrupted by scattered rocky escarpments. On the eastern portion of the installation, foothills gradually slope to the east to a relatively flat grassland that is characteristic of the western edge of the Great Plains (Reference No. 46). The eastern portion of the post is drained by Fountain Creek and its tributaries (Reference No. 6).

The geology of the area includes Upper Cretaceous (146 million years ago [Ma] to 65.5 Ma) sandstone, shale, and, in some areas, a loose veneer of Pleistocene (1.8 Ma to 12,000 years before the present) gravel overlaying older shale. According to the Colorado Geological Survey (CGS) (1999), the state has approximately 90 potentially active faults (some of which may be located near Fort Carson). A review of USGS and CGS databases indicates that faults in the area could have a low-to-moderate potential for damaging earthquakes (Reference Nos. 47 and 48). It is estimated that several thousand faults within the state have not been extensively mapped or studied; therefore, an accurate estimation of timing or location of potentially dangerous earthquakes is not possible (Reference No. 48).

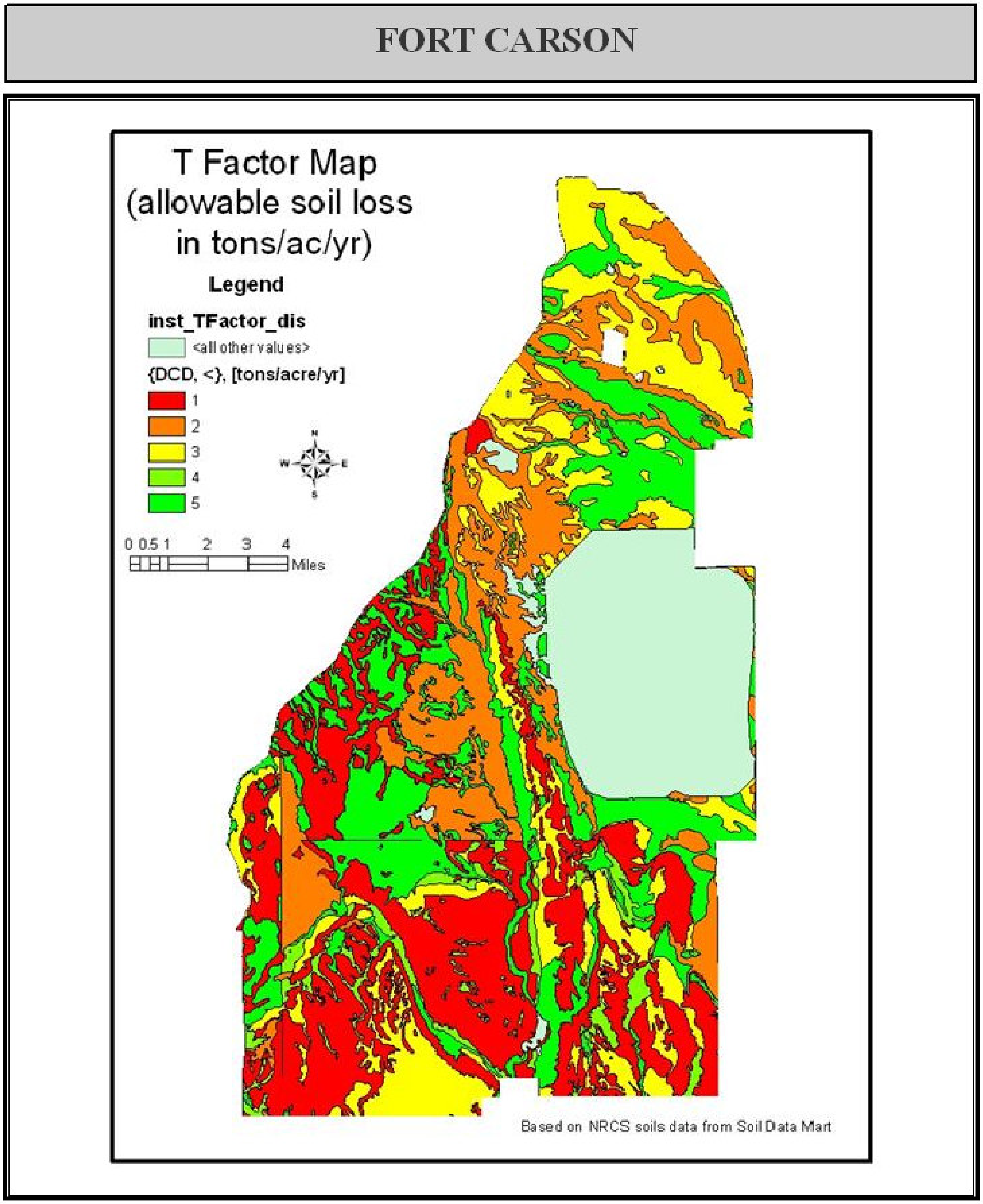

Figure 3.5-1 T Factor Map
Source NRCS

Three main faults, Ute Pass, Rampart Range, and Oil Creek, exist within the region (Reference No. 6), although none cross into Fort Carson (Reference Nos. 47 and 49). Small earthquakes are known to occur in the region with generally undetectable effects (Reference No. 6). The Oil Creek fault, located northeast of Fort Carson, is possibly associated with the Divide earthquake that occurred in the vicinity in 1979. The Oil Creek fault may have possible associations with other nearby faults based on its present-day orientation in a northeast-southwest-directed stress regime (Reference No. 50).

Geologic units identified at Fort Carson range in age from the Quaternary period (1 Ma before present to recent) to the Pennsylvanian period (200 to 250 Ma before present) (Reference No. 6). During the Quaternary period, both consolidated and unconsolidated sediments were deposited in the region. Unconsolidated sediments consist primarily of fluvial and alluvial sands, silts, and gravels, as well as wind-deposited silts and sands. Consolidated sediments include shale, limestone, hard sandstone, siltstone, claystone, and conglomerate sandstone and shale (Reference No. 6).

Fort Carson is located with Seismic Zone 1, an area of low seismic risk (Reference No. 6). Since 1973, most earthquakes within 60 miles of Fort Carson registered at a magnitude of less than 4.0. The largest earthquake in the area recorded was at a magnitude 4.0 at a distance of approximately 75 miles from the center of Fort Carson (Reference No. 47). Although some faults are located within the vicinity of Fort Carson, none crosses through the post.

3.5.1.2. Soils

Soil types commonly occurring in the region are aridisols (dry, desert-like soils) and entisols (soils that do not show any profile development and which are largely unaltered from their parent rock) (Reference No. 51). These soil types are characterized by moderate-to-severe erodibility, landslides, and unstable clay formation movement due to variations in moisture content and temperature (Reference No. 51).

NRCS has identified 34 soil categories and 65 soil associations on Fort Carson. The predominant soil categories found on Fort Carson include four complexes; the Penrose-Minnequa, Penrose-Rock, Schamber-Razor, and Razor-Midway (Reference No. 52). Additional information on Fort Carson soil types can be found in the INRMP (Reference No. 6) and information specific to El Paso, Fremont, and Pueblo counties can be obtained from the NRCS Soil Surveys. Figure 3.5-2 shows the soil types and geographic arrangements of soils within the boundaries of Fort Carson. Table 3.5-1 lists the dominant soil associations and percentages found on the installation.

Soil erosion has been a documented problem on Fort Carson, particularly erosion caused by surface water runoff. Soils that present the greatest potential for runoff erosion are clays, silty clays, and clay loams (Reference No. 53). The eastern portion of Fort Carson, located within the Fountain Creek Watershed, contains soils that have been identified as having a moderate to high potential for erosion. Specific soil types on Fort Carson of greatest concern for erosion are Wiley-Kim, Penrose-Manvel, and Rizozo-Neville (Reference No. 6). The Razor-Midway complex and Schamber-Razor complex soils range from clay to clay loam and are highly erosive (Reference No. 54). The western portion of the installation also consists of soils on steeper slopes, which have reduced water absorption capacity and, therefore are prone to erosion. Figure 3.5-3 shows the hydrologic soils ratings of existing soils at Fort Carson and provides insight into the ability of soils to absorb surface water runoff from rainfall events and susceptibility of Fort Carson's soils to surface water erosion. Factors influencing surface water absorption capability include soil surface texture (high clay means less absorption) (Figure 3.5-4), depth to bedrock, percent organic matter, and slope (Reference No. 55).

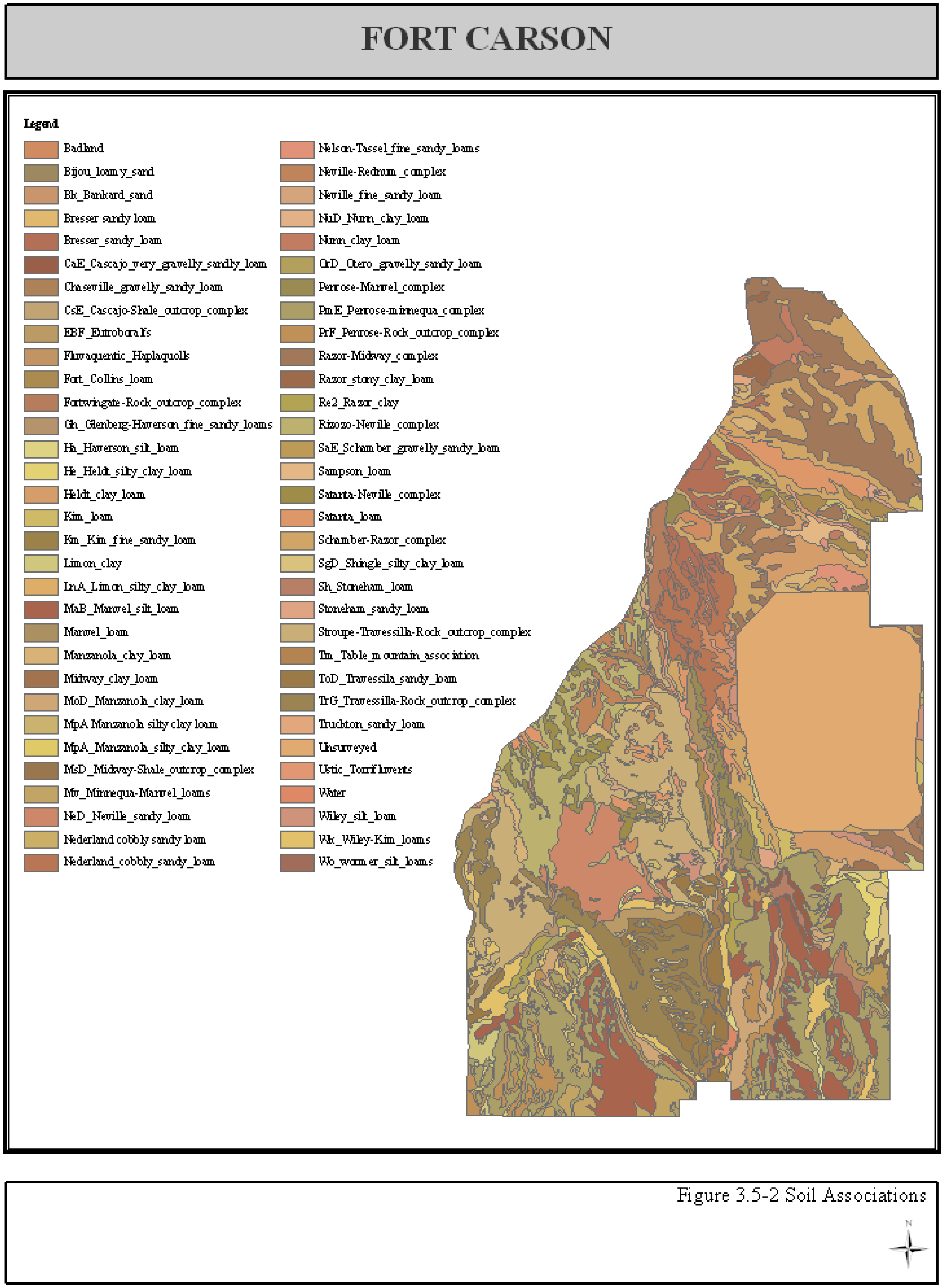

Figure 3.5-2 Soil Associations

Table 3.5-1 Fort Carson Soil Association Category Symbols and Descriptions

Symbol	Description and Slope	Percent Slope	Percent Cover
4	Badland	N/A	0.82
5	Bijou loam sand, 1-8 percent slopes	1-8	0.11
12	Bresser sand loam	3-5	1.58
13	Bresser sandy loam	5-9	0.66
16	Chaseville gravelly sandy loam	1-8	0.17
29	Fluvaquentic Hapliquolls, nearly level	N/A	0.01
30	Fort Collins loam	0-3	0.52
31	Fort Collins loam	3-8	0.4
32	Fortwingate-Rock outcrop complex	15-60	0.59
33	Heldt clay loam	0-3	2.2
43	Kim loam	1-8	0.81
47	Limon clay	0-3	0.59
50	Manvel loam	3-9	1.03
52	Manzanola clay loam	1-3	0.3
53	Manzanola clay loam	3-9	1.07
54	Midway clay loam	3-25	0.16
55	Nederland cobbly sandy loam	9-25	2.6
56	Nelson-Tassel fine sandy loams	3-18	0.37
57	Neville fine sandy loam	3-9	0.25
58	Neville-Rednum complex	3-9	1.19
59	Nunn clay loam	0-3	0.55
64	Penrose-Manvel complex	3-45	1.12
74	Razor stony clay loam	5-15	0.35
75	Razor-Midway complex	N/A	6.76
76	Rizozo-Neville complex	3-30	4.17
78	Sampson loam	0-3	0.38
79	Satana loam	0-3	1.43
80	Satana loam	3-5	0.53
81	Satana-Neville complex	3-8	1.19
82	Schamber-Razor complex	8-50	6.9
86	Stoneham sandy loam	3-8	0.26
88	Stroupe-Travessilla-Rock outcrop complex	9-90	7.58
97	Truckton sandy loam	3-9	0.07
101	Ustic Torrifluvents, loamy	N/A	0.81
108	Wiley silt loam	3-9	0.62
116-Bk	Bankard sand	N/A	0.01
118-CaE	Cascajo very gravelly sandy loam	5-25	0.57
119-CsE	Cascajo-shale outcrop complex	5-30	0.03
122-EBF	Eutroboralfs, steep	N/A	0.19
126-Gh	Glenberg-Haverson fine sandy loams	N/A	0.19
127-Ha	Haverson silt loam	N/A	0.24
128-He	Heldt silty clay loam	2-6	0.43
131-Km	Kim fine sandy loam	N/A	0.02
136-LnA	Limon silty clay loam	0-2	0.01
141-MaB	Manvel silt loam	1-5	4.89
144-MoD	Manzanola clay loam	0-2	1.38

Table 3.5-1 Fort Carson Soil Association Category Symbols and Descriptions (continued)

Symbol	Description and Slope	Percent Slope	Percent Cover
145-MpA	Manzanola silty clay	0-2	0.27
146-MsD	Midway-Shale outcrop complex	1-9	0.19
147-Mv	Minnequa-Manvel loams	N/A	1.1
149-NeD	Neville sandy loam	3-9	2.81
152-NuD	Nunn clay loam	5-9	0.1
157-OrD	Otero gravelly sandy loam	3-9	0.27
160-PmE	Penrose-Minnequa complex	1-15	9.14
161-Prf	Penrose-Rock outcrop complex	25-65	2.73
164-Re2	Razon clay, eroded	N/A	0.63
168-SaE	Schamber gravelly sandy loam	5-25	0.34
169-SgD	Shingle silty clay loam	1-9	0.53
170-Sh	Stoneham loam	N/A	0.46
172-Tm	Table mountain association	N/A	0.33
173-ToD	Travessilla sandy loam	1-9	2.43
174-TrG	Travessilla-Rock outcrop complex	30-90	4.75
181-Wk	Wiley-Kim loams	N/A	2.73
182-Wo	Wormer silt loam	N/A	0.06
183	Unsurveyed	N/A	14.6
184	Water	N/A	0.17
	Total		**100.00**

Source: Reference No. 52

FORT CARSON

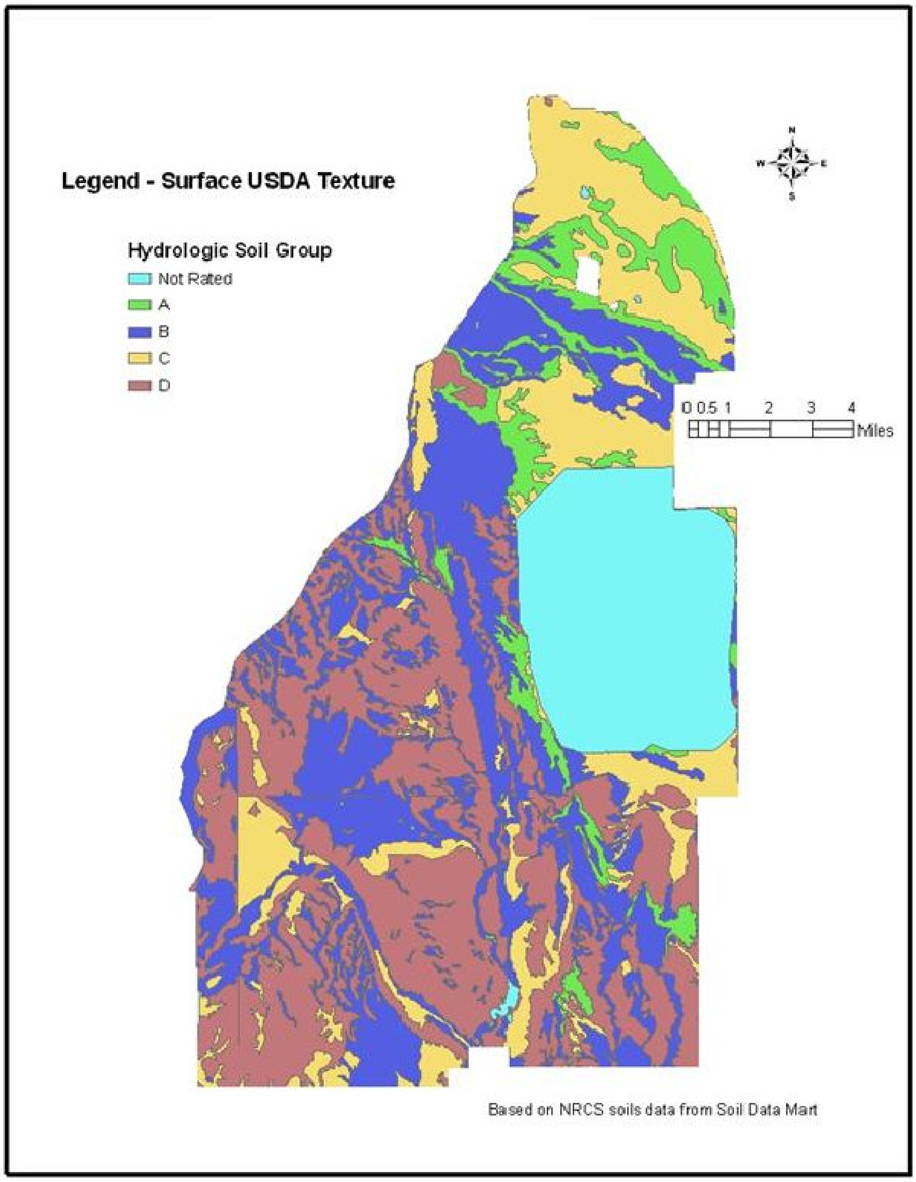

Figure 3.5-3 Hydrologic Soil Ratings of Fort Carson Soils
Source NRCS

FORT CARSON

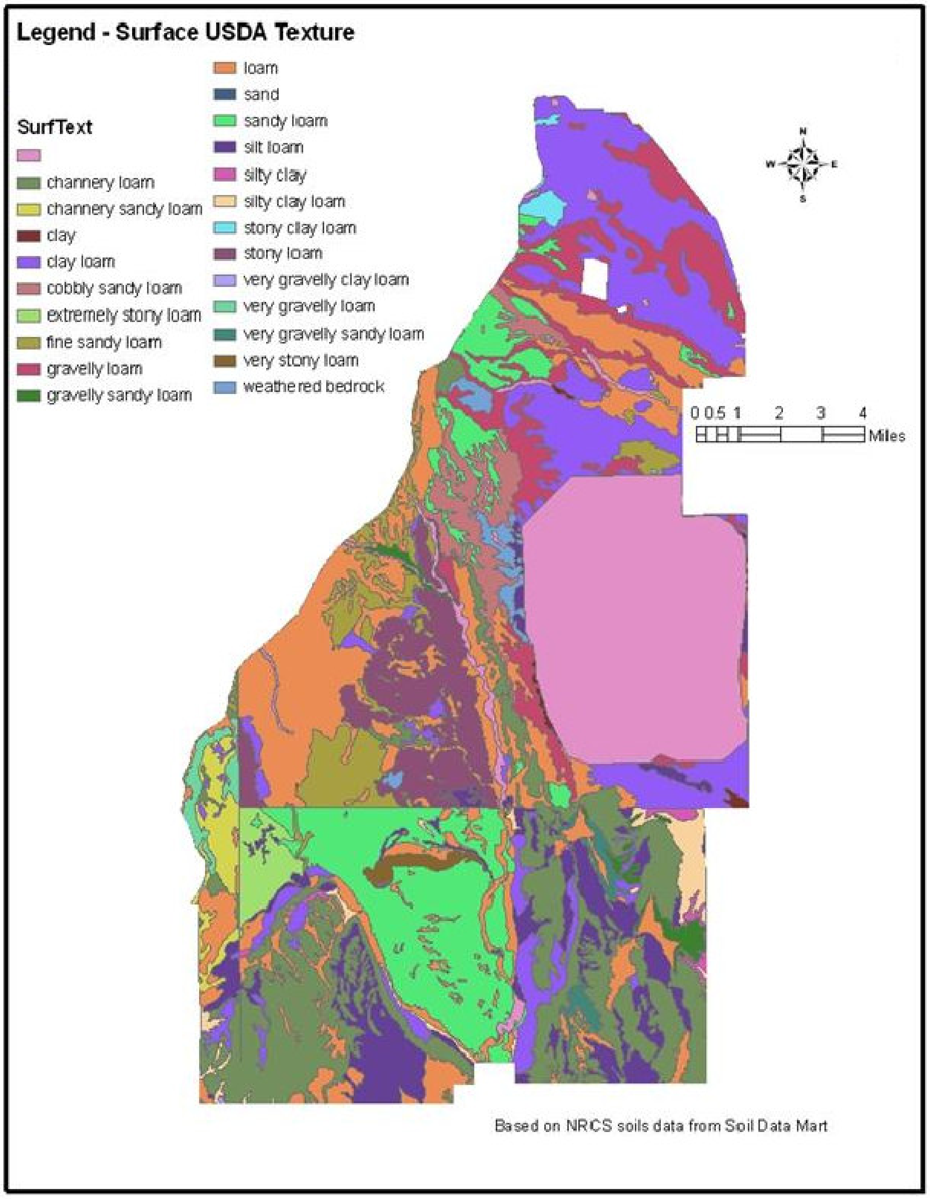

Figure 3.5-4 Surface Texture Map
Source NRCS

Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. These soils have high surface water absorption potential. Group B soils have moderately low runoff potential. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Group C soils have moderately high runoff potential. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Group D soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is slow or very slow. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas they also have a high shrink-swell potential. Some soils are in this group because the depth to a restrictive layer is less than 20 inches. These soils are capable of absorbing less than 0.14 inches of water per hour.

Soil erosion is greatest in areas where vegetation has been removed and soils have been disturbed due to construction or training activities. Soils occurring at Fort Carson exhibit high shrink-swell potential because montmorillonitic clays dominate the composition of most of the soil associations on the installation. Shrink-swell potential relates to the loss or gain of moisture in soil, which causes the potential for soil to change volume. Increasing soil moisture results in increasing volume and the opposite effect results from decreasing soil moisture. Soils with high shrink-swell potential can result in problems with building foundations and stability (Reference No. 53).

3.5.1.2.1. Cantonment Area

Training Area Bravo

Undisturbed soils and native vegetation occur throughout the cantonment area, primarily in the southern end of the cantonment, and are broken up by local areas of disturbed soils resulting from construction of post housing and other support facilities. Figure 3.5-5 depicts the existing soils within the footprint of the proposed construction site in Training Area Bravo (Alternative 1). The proposed construction site consists of two predominant soil types, Razor-Midway complex and Schamber-Razor complex. A majority of construction would be projected to take place on Razor-Midway soils in areas of reduced slope on which these soils are found (blue areas on Figure 3.5-5). The slope of the potential construction site ranges from 3 and 15 percent. Much of the Schamber-Razor soil complexes depicted in red are located in areas with a slope greater than 10 percent.

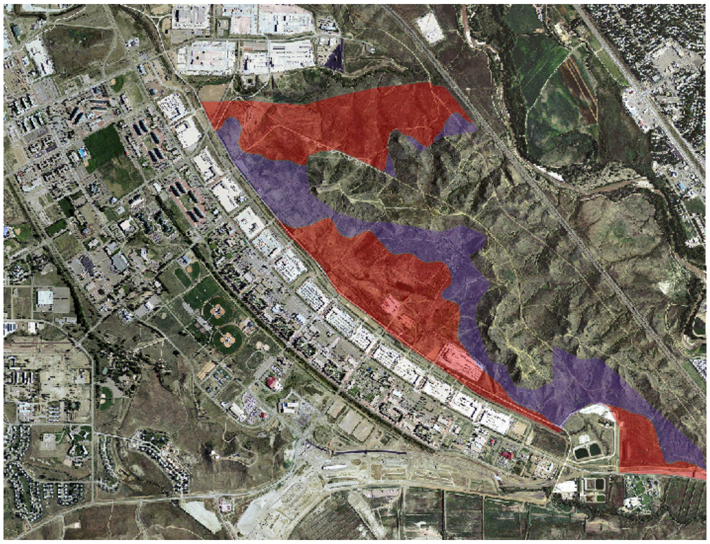

Figure 3.5-5 Soil Associations of the Infantry Brigade Combat Team's Proposed Cantonment Area Construction Footprint, Alternative 1

The Razor-Midway soils are alkaline soils, which exhibit high corrosivity to concrete and steel (Reference No. 56). Soils in the proposed construction site are moderately susceptible to sheet and rill erosion from surface water and is moderately resistant to wind erosion. The soil is well drained but the depth to bedrock is typically only 20-40 inches and means the soils have reduced capacity to absorb surface water. In addition, the soil has limited water conductivity because of its high clay content. The Razor-Midway soils are 28.9 percent silt, 28.1 percent sand, and 43 percent clay.

3.5.1.2.2. Downrange Area

The proposed construction sites of the ORTC and BAAF areas consist almost exclusively of a soil association known as Satanta loam represented by the blue shaded area in Figure 3.5-6. The construction area is extremely flat with slopes ranging from 0 to 3 percent in most areas. Satanta loam is a non-acidic soil type, which exhibits low corrosivity to concrete and steel and is ideal for construction. It is moderately susceptible to sheet and rill erosion from surface water and is moderately resistant to wind erosion. The soil is well drained and there are no restrictive layers restricting water flow within 80 inches of the soil surface. The Satanta loam soil association consists of 17.5 percent clay; 43 percent sand, and 39.5 percent silt (Reference No. 56).

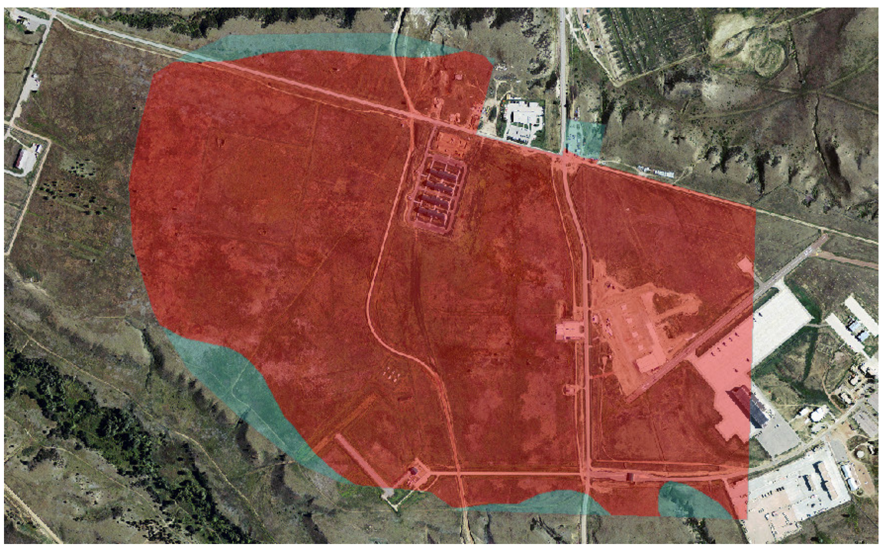

Figure 3.5-6 Existing Soil Associations of the Operational Readiness Training Center and Butts Army Airfield

Butts Army Airfield

BAAF, located on the eastern side of the post adjacent to and south of Wilderness Road, is semi-developed. The airfield contains a landing strip, paved areas, and support facilities. The land surrounding BAAF contains native soils and vegetation that are broken up by local areas of disturbance. The least-disturbed soils at BAAF occur in the southwestern portion of the airfield. Figure 3.5-6 depicts BAAF and shows that a majority of soils in the proposed construction footprint are characterized as Satanta loam soil associations.

Tent City

The Tent City site consists of four predominant soil types, Bresser sandy loam (12), Satanta loam (79), Schamber Razor complex (82), and Nederland cobbly sandy loam (55). Figure 3.5-7 depicts the existing soils associations. Bresser sandy loam complex comprises 121 acres and more than 40 percent of the construction site. A majority of the site is flat, consisting of slopes of between 0 – 5 percent though portions of the site are steeply sloping up to 25 percent slope or more.

Figure 3.5-7 Soil Associations of the Infantry Brigade Combat Team's Proposed Cantonment Area Construction Footprint, Alternative 2

Satanta loam is a non-acidic soil type, which exhibits low corrosivity to concrete and steel and is ideal for construction. It is moderately susceptible to sheet and rill erosion from surface water and is moderately resistant to wind erosion. The soil is well drained and there are no restrictive layers restricting water flow within 80 inches of the soil surface. The Satanta loam soil association consists of 17.5 percent clay; 43 percent sand, and 39.5 percent silt.

Bresser sandy loam is a non-acidic soil, which exhibits low corrosivity to concrete and steel. It is moderately susceptible to sheet and rill erosion. The soil is well drained with more than 6.5 feet to any soil layers that would impede water flow. Bresser Sandy loam has a high sand content (65.2 percent) as the name implies with a moderate silt content of 19 percent and a low clay content of 15.8 percent.

Nederland cobbly sandy loam and Schamber Razor complex occur in more steeply sloped areas depicted in Figure 3.5-7.

3.5.1.2.3. Ranges and Training Areas

The range and training areas on Fort Carson cover the majority of land on-post and have the largest percentages of undisturbed soils on the installation. A description of existing conditions of training areas which may be affected by the Proposed Action and alternatives is provided as follows.

Soil textures of the northern and central range complexes include an array of loams, clay loams, and gravelly loams. The southern end of the central range complex consists predominantly (more than 40 percent) of Heldt clay loam on a topography consisting of slopes of less than 3 percent grade (Reference No. 56). These soils have good depth to restrictive drainage layers and are well drained. In the central range complex, the depth to soil layers preventing migration of water is more than 80 inches and soils are classified as well drained (Reference No. 56). A majority of soils that would be affected by range construction are rated by the NRCS as A-C hydrologic soils meaning that the soil has at least some permeability to impeded surface water flow (Figure 3.5-3).

Soil surveys have not been conducted in the impact areas as potential UXO issues preclude the ability to conduct soil surveys. However, inferences have been drawn from surrounding soil type and topography to generate an assessment of firing activity impacts. A majority of rounds from firing activities are projected to fall in Fort Carson's impact areas where there is a lack of steep slopes and a majority of land is between 0 and 15 percent. A majority of live-fire activities would occur on the eastern side of the installation which receives less precipitation and has a more arid climate which reduces the potential for soil loss from water erosion, though the more arid climate increases wind erosion potential (Reference No. 58). Soils within the northern impact area are not rated as highly erodible by the NRCS (Figure 3.5-9).

The Digital Range Multi-Purpose Range Complex (DMPRC) range to the south of the central impact area consists of predominantly Manvel silt loam soils (approximately 20-25 percent) of the soil association of the range. These soils are susceptible to wind-based erosion because of their fine particle size, though they have at least some permeability and the ability to absorb surface water flow (Figure 3.5-3).

Existing soils of the California Strip maneuver areas consist primarily of loam, fine sandy loam soil, and gravelly sandy loam soil textures (Figure 3.5-8). Over 75 percent of the soils in the area consist of three soil associations. The dominant soil association (approximately 50 percent) is a Rizozo-Neville complex existing on slopes of 3-30 percent. Rizozo is a soil of low strength with sticky slippery properties and an average of 21 percent clay content.

Figure 3.5-8 Physiography of the California Strip

The area has low soil depth to lithic bedrock (10-20 inches) and has a hydrologic soil rating of D, which means it does not have a large capacity to absorb surface water. Neville, which is deeper, consists of less clay and more sand with deeper soil cover to bedrock. This soil association is a well-drained and deep soil with more than 80 inches to restrictive drainage layers. Neville is on shallower slopes and is a calacareous loamy alluvium. Other soil associations in the California Strip include Rednun clay loams and Satanta loams, both of which have good depth to bedrock (more than 80 inches) and are characterized by the NRCS as well-drained soils (Reference No. 56). The California Strip soils are a mix of highly erodible soils, potentially erodible, and non-highly erodible soils (Figure 3.5-9). Ability to absorb water also varies greatly across soil types and land contour in the training areas. Some areas and Rednun clay soil and Rizozo soil associations have limited capacity to absorb water while the loamy soils located in areas of reduced slope areas demonstrate a greater surface water absorption capacity (Figure 3.5-3).

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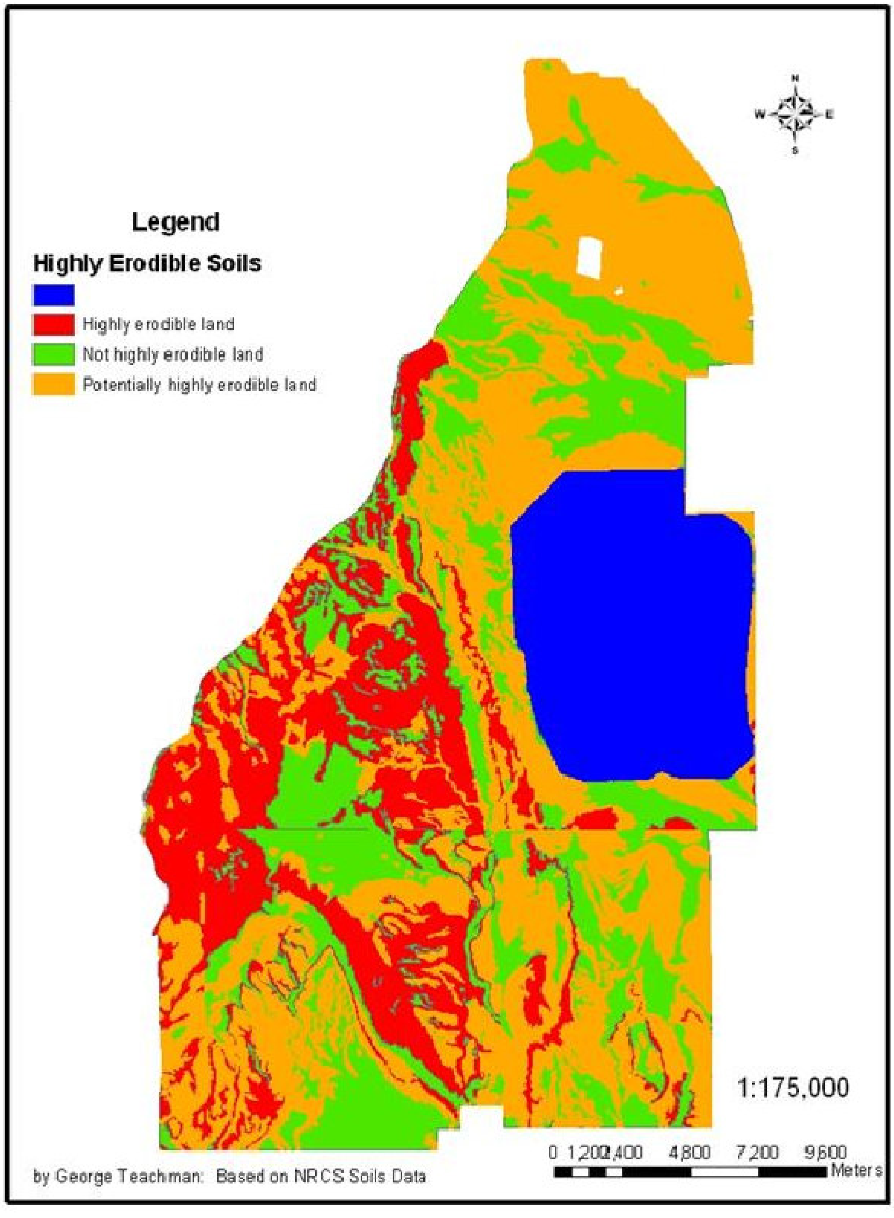

Figure 3.5-9 Classifications of Highly Erodable Soils on Fort Carson
Source NRCS

There is already an IBCT stationed at Fort Carson. Thus, the stationing of an additional IBCT would not qualitatively change the types of maneuver training that currently take place in the California Strip. Training activities have resulted in localized soil erosion, particularly in areas underlain by soils on steep slopes adjacent to gulches. Training activities have impaired vegetation growth, resulting in gully erosion, which increases in severity as the gullies broaden. This erosion has resulted in some soil loss, ultimately depositing soils downslope or downstream.

3.5.1.3. Chemical Constituents in Soils

As described in the INRMP, Fort Carson and the PCMS have some of the highest naturally occurring documented levels of selenium in the US. Naturally occurring selenium can acutely and chronically impact both aquatic and terrestrial wildlife when land disturbances, such as military mechanized maneuvers, and excessive erosion occur. Selenium that has leached into lower soil profiles over millions of years is exposed by land disturbance and taken up by selenium receiving plants that are uniquely adapted to these sites. The two most common plants indicators of selenium are two native species, the desert princess plume (***Stanleya pinnata***), and two-grooved milkvetch (***Astragalus bisulcatus***). When selenium-loaded soils are exposed to water, selenium can directly enter surface water systems and biologically accumulate in the systems of aquatic and terrestrial animals. Deep-rooted, selenium receptor plants can also redistribute selenium onto the ground surface and into the soil. Other heavy metals naturally occurring at high levels on Fort Carson, such as mercury, follow the same geological and biological pathways as selenium.

There are no government standards or regulations for terrestrial and non-point source selenium, because the understanding of selenium distribution in soil and plant communities is complex and studies are limited. The Directorate of Environmental Compliance and Management (DECAM) completed and implemented a selenium reception study in 1998 in conjunction with the University of Wyoming. The study defined the distribution of selenium in soils and vegetation, and subsequent academic work defined the relationship of selenium concentrations to geologic distribution (Reference No. 57). Additional academic study is ongoing, including a study conducted by the University of California, Riverside in 1999, for which known selenium plant receptor tissues collected from all over the US led to the observation that princess plume plant tissues from Fort Carson had the highest levels of selenium accumulation. The university then collected genetic material from Fort Carson princess plume populations in 2000 and 2001 to establish a strain of superior selenium receptors for use in biological soil amendments. Additional academic work has quantified selenium in aquatic systems at Fort Carson. Selenium study results provided DECAM managers with site-specific selenium knowledge. Resulting management decisions ensure that land user activities do not create a selenium environmental reception hazard.

In 1998, the DECAM initiated its first major selenium remediation project that dramatically reduced aquatic selenium reception in Training Area 11. About 136,000 cubic yards of selenium-contaminated soil were buried and stabilized (Reference No. 6). Selenium management is a byproduct of good watershed management considering current knowledge of the issue. Thus, selenium exposure is controlled through the implementation of projects within watershed management plans.

With regard to high levels of naturally occurring selenium, U.S. Department of Health and Human Services studies have not revealed adverse health effects to US populations (Reference No. 259). Fort Carson has supported studies to map and assess locations where selenium concentrations are highest on the installation (Reference No. 260). To date, similar studies have not been conducted at PCMS to evaluate selenium concentrations or levels of naturally occurring uranium. The installation continues to look for opportunities to partner with local universities and government agencies to study naturally occurring levels of selenium at PCMS.

3.5.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.5.2.1. Proposed Action and Alternatives

In order to understand the potential impacts to soils and geology that would result from the implementation of the Proposed Action and alternatives it is necessary to understand the current configuration of Fort Carson's training areas, how they are currently managed and how they would be managed in the future to support various alternatives. Figure 3.5-10 shows the current configuration of Fort Carson's training areas. It is also necessary to understand the susceptibility of various areas of the installation to wind and water erosion. A brief description of these types of erosion is provided as follows.

Water Erosion

Soil erosion caused by water includes raindrops striking the earth's surface and sheet and rill (channeled) flow of surface water. The rate of water erosion of soils depends primarily on the slope of the area in question, properties of the soil, climate/precipitation patterns, and vegetative cover (Reference No. 55). The greater the slope of the construction site the more force surface water can generate to move soil particles and top soils from naturally occurring locations and the greater potential for channeling and cuts into the soil.

Wind Erosion

Wind movement of soils is often of greater concern than water erosion in the semi-arid southwest (Reference No. 58). Wind erosion of soils occurs when the force of the wind overcomes the stabilizing factors that hold soil in place. Factors influencing wind erosion of soils include natural properties of the soil (stickiness, aggregate content, and organic matter content), climate of an area, and amount of surface disturbance (Reference No. 55). In dry environments, there tends to be less organic matter in the soils and less soils aggregation to prevent loss of soil. Finer soil particles, particularly silt, which lacks cohesion of clays, are prone to wind erosion.

3.5.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Bridge Facilities at Operation Readiness Training Center Site

3.5.2.2.1. Cantonment Area

The implementation of cantonment area construction activities, as part of the Proposed Action, is projected to have only minor impacts on soils within the existing cantonment area. Construction would involve the demolition and new construction of facilities within previously disturbed areas in Fort Carson's cantonment area. Disturbance to soils from demolition activities in the existing cantonment area to support CS units would expose soils to wind and water erosion. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover, primarily grasses, during construction would also result in an increase in water erosion potential at the construction site. The impacts to loss of soils attributed to wind erosion would be temporary impacts during the construction. Following completion of construction, surface vegetation would be restored and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease.

The implementation of the Proposed Action is not anticipated to have any significant impacts on Fort Carson's geology or topography within the cantonment area.

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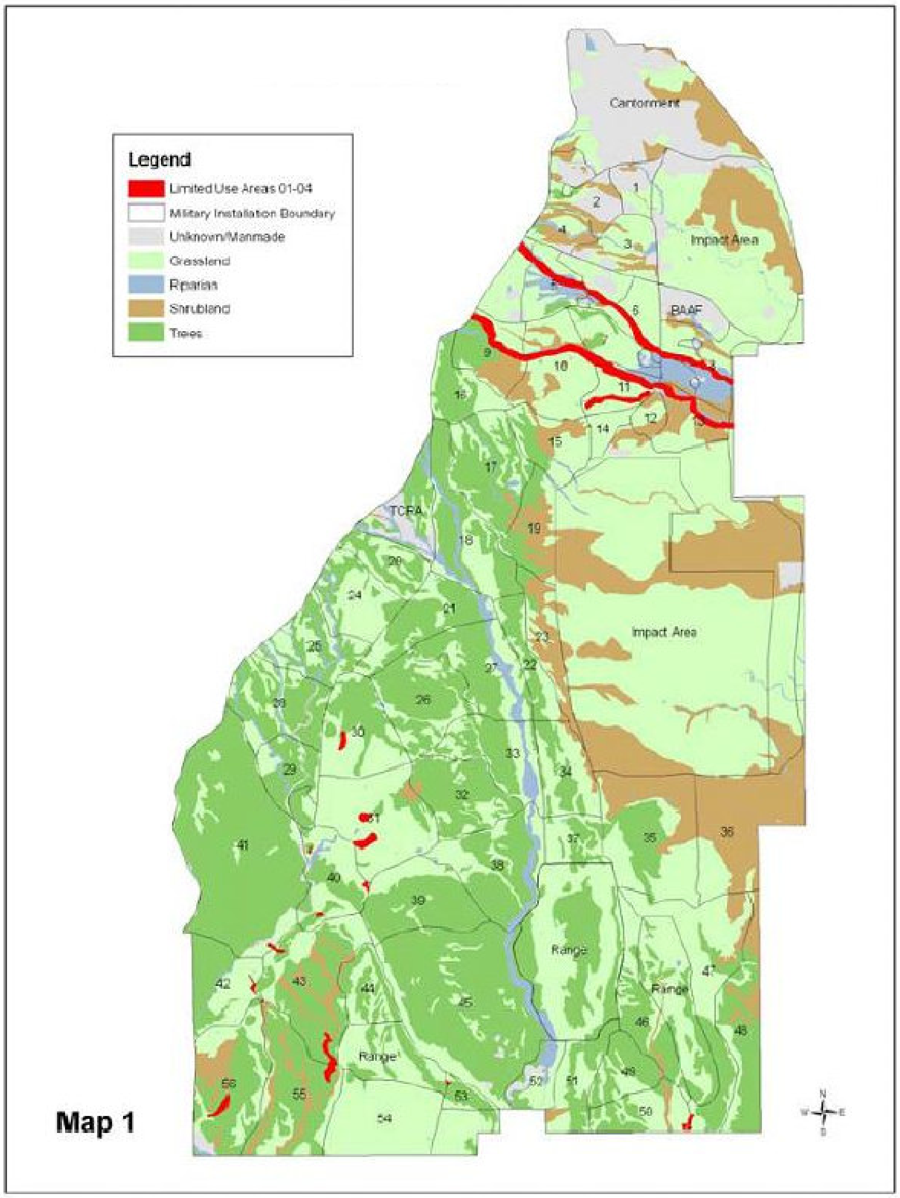

Figure 3.5-10 Fort Carson Training Areas and Vegetative Cover
Source US ARMY

3.5.2.2.2. Downrange Area

Operational Readiness Training Center

Under the Proposed Action, construction of barracks facilities, administrative facilities, equipment maintenance facilities and the extension of utilities would be required for new personnel. These facilities for the IBCT and CAB would be constructed in the relatively flat footprint of the current ORTC. Additional administrative and operational facilities for the CAB would be constructed at BAAF in previously disturbed footprints.

The implementation of construction activities as part of the Proposed Action is projected to have only minor impacts on soil erosion as the ORTC site is almost exclusively between 0 and 3 percent slope. This relative flat surface for construction would prevent water from being channeled and carrying off large amounts of soil during rain events. Shallow slopes considerably reduce the potential for water erosion of soils (Reference No. 55), and soils within the construction footprint of the Proposed Action consist primarily of Satanta loam, which is well drained and exhibits ability to hold and conduct water well through soil pores. Other natural properties of the soil to include its aggregation limit the potential for water erosion at the construction site. The ORTC site does not receive excessive precipitation that would lead to soil saturation and consistently high volumes of surface water run-off. Soils within the construction footprint for the Proposed Action are rated as non-highly erodible land by the NRCS (Figure 3.5-9).

Water erosion at the construction site would have some minor impacts. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover, primarily grasses, during construction is predicted to result in a minor increase in loss of soils attributable to water erosion.

Butts Army Airfield

The implementation of construction and renovation activities at BAAF as part of the Proposed Action is projected to have only minor impacts on soil erosion. Disturbance to soils from renovation activities in the existing airfield complex to support the CAB would expose soils to wind and water erosion. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover, primarily grasses, during construction would also result in an increase in water erosion potential at the construction site. The impacts to loss of soils attributed to wind erosion would be temporary impacts during the construction timeframe. Following completion of construction, surface vegetation would be reestablished and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease.

The implementation of the Proposed Action within the downrange area is not anticipated to have any significant impacts on Fort Carson's geology or topography.

Ranges and Training Areas

In order to understand the potential impacts to soils that would result from the Proposed Action it is necessary to understand the current configuration of Fort Carson's training areas, how they are currently managed and how they would be managed in the future to support various alternatives. Figure 3.5-5 presents a visual depiction of Fort Carson's training land management units. To support the stationing of Soldiers as discussed in the 2007 Fort Carson Transformation EIS and additional Soldiers discussed as part of the Proposed Action, installation training land east of Turkey Creek would primarily be dedicated to live-fire training and the SDZs that must be maintained for safety reasons. With the increase in training requirements from the 2007 Fort Carson Transformation EIS implementation, Fort Carson will have limited options in managing maneuver and live-fire training activities. The Proposed Action and alternatives involve the same activities and will have the same predicted impacts across all alternatives.

Range Construction

As part of the Proposed Action, range construction/upgrades would be built around Fort Carson's two existing impact areas in the northeast and central eastern portions of the installation (Figure 2-6). A majority of range construction would be sited within the footprints of existing outdated ranges to minimize surface disturbance. Range construction activities would include the emplacement of new targetry, grading of roads and trails, and in some cases the emplacement of fiber-optic cable from range control towers to targetry locations.

The implementation of range construction/upgrade activities as part of the Proposed Action is projected to have less than significant impacts on soil erosion. Range construction would take place primarily in areas where slopes are between 0 and 15 percent and have low potential for soil erosion from water run-off. As the proposed range construction areas are on the eastern side of the installation and further removed from the mountains, they receive less precipitation and have a more arid climate further reducing the potential for soil loss from water erosion. The loamy and gravelly textures of the soils are less prone to wind erosion in these areas than silts and other finer textured soils. Given that a majority of ranges would be built on existing range sites, the implementation of the Proposed Action is not projected to result in significant loss of vegetative cover or large amounts of disturbance to previously undisturbed soils. In addition, soils within range construction footprints are not classified as highly erodible.

Water erosion at firing range construction sites would have minor impacts from surface water erosion. The soils at the construction sites would be locally compacted by construction equipment and less infiltration of water during significant rain events would likely occur resulting in higher volumes of surface water flow and greater rates of soil erosion. Range construction would result in construction of additional tank trails, range maintenance trails, parking areas and other impervious surface, which can increase surface water flows from the sites and lead to sheet and rill erosion. Loss of vegetative cover during construction would also result in an increase in water erosion potential at the construction site.

Wind erosion at the construction site is projected to have some minor impacts. Construction equipment traffic and construction activities would result in a loss of vegetative cover in the construction footprint. Soils at the construction site would be more susceptible to wind erosion because of the temporary disturbance caused by construction activities and vehicle traffic, which would expose individual soil particles, and soil aggregates to wind erosion. This effect would occur only temporarily on the construction site and in the localized area of construction where vehicles operate and vegetation is lost during construction and the soil properties should serve to minimize wind erosion effects.

Wind movement of soils is more likely in the areas of range construction than water based erosion because of the semi-arid climate (Reference No. 58). Soils in the areas of proposed range construction consist predominantly of loams, clay loams, and gravelly loams, which are less susceptible to wind erosion than silts. The balanced surface texture of the loam soils, binding properties of clays and larger particle sizes of gravelly loams would offset some impacts of natural wind erosion at range construction sites. The NRCS classifies a majority of the soils that could be affected by range construction activities as a 4 on a 1-8 rating scale of soil wind erodibility (Reference No. 56).

Live-Fire Training

As part of the Proposed Action, the Army would increase its live-fire training activities by approximately 27 percent through the stationing of the IBCT, CAB and select CS units. All firing would take place on designated range facilities and impact areas.

Range firing activities under the Proposed Action are projected to have less than significant impacts on soil erosion. Impacts to soils from firing activities would occur predominantly as a result of munitions landing or otherwise impacting the soil surface and exposing the soils to sheet and rill water erosion. Increased volume of live-fire activities would marginally increase loss of vegetative cover on ranges and impact areas through the physical impact of munitions. Surface disturbance caused by munitions impact would result in larger areas of bare ground than observed under current conditions. Munitions impact can directly create craters and remove patches of vegetation, which normally protects soil from erosion by slowing runoff, intercepts raindrops before they reach the soil surface, and anchors the soil. Compaction in the craters caused by larger ordnance explosions can alter the permeability and water-holding capacity of the soils and harden silty clays affecting the ability of vegetation to recover in those areas. The areas of bare ground and exposed soils are susceptible to wind and water erosion, which can indirectly lead to removal and redeposition of soils, gullying, or unstable slopes in areas of steep slopes and rapid runoff. Although weapons training events would be periodic, long-term impacts would be expected because soil disturbance typically requires time and effort to amend. In addition to these impacts, increased live-fire activities on Fort Carson's ranges would increase potential for fires from training activities to remove vegetative cover. Indirectly, fires caused by live-fire training could result in loss of vegetative cover, which would increase susceptibility of the soils to water and wind erosion (Reference No. 55).

Potential for soil loss would be amplified on Fort Carson's maneuver and live-fire ranges such as the DMPRC, MPTR (Ranges 109 and 111) and other maneuver live-fire ranges. The DMPRC range to the south of the central impact area consists of Manvel silt loam soils, which are projected to be more severely impacted by water and wind erosion. Aviation training on the DMPRC would be projected to further exacerbate soil loss from wind erosion because of high velocity winds generated by helicopter rotor wash.

Despite the potential impacts, existing soils, topography, and climate conditions are such that significant impacts are not anticipated. A majority of rounds from firing activities are projected to fall in Fort Carson's impact areas where there is a lack of steep slopes and a majority of land is between 0 and 15 percent. A majority of live-fire activities would occur on the eastern side of the installation which receives less precipitation and has a more arid climate which reduces the potential for soil loss from water erosion, though the more arid climate increases wind erosion potential (Reference No. 58). Most soils, with the exception of some soils associations of the DMPRC, are of loamy or gravelly soil texture and are less prone to wind and water erosion than silts and finer textured soils. Soils within the northern impact area are not rated as highly erodible by the NRCS (Figure 3.5-9). In the central range complex, the depth to soil layers preventing migration of water is assumed to be more than 80 inches and soils are assumed to be well drained like the surrounding soil types, though soil surveys in the impact area have not been conducted due to potential UXO issues. A majority of soils have at least some permeability and the ability to absorb surface water flow to prevent excessive water erosion of soils.

Maneuver Training

Implementation of maneuver training as part of the Proposed Action or alternatives would result in an approximate 15 percent increase in the aggregate number of MIMs at Fort Carson. The stationing of the IBCT and other support units would result in an approximate 9 percent increase in relative MIMs and the CAB would result in an additional 6.5 percent increase. GTA units would conduct battalion and brigade level training at PCMS and would conduct company level and smaller unit training at Fort Carson

Implementation of maneuver training as part of the Proposed Action and alternatives is predicted to result in significant but mitigable impacts to Fort Carson's soils. Maneuver training of the CAB would increase the susceptibility of Fort Carson's soils to wind erosion, but this is predicted to be mitigable to less than significant though the implementation of measures identified in Chapter 6.

Infantry Brigade Combat Team Maneuver Training

The maneuver training of the IBCT is predicted to result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased intensity of use of the California Strip by the IBCT for maneuvers would result in increased ground surface disturbance and would result in an increase in the loss of vegetative cover. A majority of IBCT off-road maneuvers would occur in topographic areas of reduced slope that permit wheeled vehicle maneuvers. Elevated locations might experience isolated surface disturbance events because of construction of individual fighting positions and establishment of observation points on areas of observation with good fields of view. Loss of vegetative cover and surface disturbance would make soils in the California Strip more prone to wind and particularly water erosion given the steep slopes and topography of the area.

Soil Compaction and Rutting. Soils in training areas would be subject to similar levels of compaction as under the No Action Alternative. Most of these effects have already occurred and in most cases, the IBCT units would follow existing trails and pathways. However, continued maneuver training would reduce the ability of soils to recover from these effects.

Reduced Infiltration. The ability of water to infiltrate soils would be somewhat reduced because of the additional training load the training areas would experience. With less recovery time and increase loss of vegetation, less root matter and organic matter would be available to absorb water and reestablish soil pores. Reduced infiltration would lead to increased surface water erosion of soils (Reference No. 189).

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic (man-made) fire. Use of artillery simulators, smoke obscurants, and catalytic converters from use of vehicles would have some potential to start fires. The increased frequency of maneuver training would elevate the risk of anthropogenic fire and the potential for loss of vegetative cover. This would indirectly increase the potential for wind and water erosion of soils.

Combat Aviation Brigade Maneuver Training

Aviation maneuver training at Fort Carson would occur primarily in the vicinity of the DMPRC to the south of the central impact area, in Sullivan Park (Figure 3.5-10), and in support of infantry and special operations exercises in the California Strip. The CAB would engage in troop transport and insertion, equipment transport, and combat aviation gunnery tasks. The CAB would include ground vehicles and light and medium tactical trucks for logistics support and command and control operations.

Maneuver Training of the proposed CAB would result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased frequency and intensity of use of the DMPRC, Sullivan Park and the California Strip training areas by the CAB would result in increased ground surface disturbance from rotor wash in flat areas designated as helicopter landing areas. In addition, this rotor wash would result in an increase in the loss of vegetative cover. Potential for soil loss would be amplified on Fort Carson's DMPRC, which has soils of finer consistency and texture, such as silt are more prone to impacts from wind erosion. Approximately 20-25 percent of soils in the DMPRC consist of Manvel silt loam soils. Aviation training on the DMPRC would be projected to further exacerbate soil loss from wind erosion because of high velocity winds generated by helicopter rotor wash. Loss of vegetative cover and surface disturbance would make soils in the California Strip and Sullivan Park more prone to wind and water erosion. This is particularly true of the California Strip given the steep slopes and topography of the area. Sullivan Park is less prone to erosion because of better-drained soils of more resilient texture, which is on flat ground or gently rolling slopes.

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic fire. The use of training simulators, smoke obscurants, and catalytic converters from use of the CAB's ground vehicles would have some potential to start fires. The increased frequency of maneuver training would elevate the risk of anthropogenic fire and the potential for loss of vegetative cover. This would indirectly increase the potential for wind and water erosion of soils. Chapter 4 discusses a vast majority of CAB maneuver activities that would take place at PCMS to support BCT battalion and brigade-level maneuver training.

The implementation of the Proposed Action at Fort Carson from construction activities would not have significant negative impacts on Fort Carson's geology or topography.

3.5.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Support Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.5.2.3.1. Cantonment Area

Under Alternative 1, the additional CS personnel facilities would be the same as the Proposed Action. Facilities for the IBCT would be constructed in the Fort Carson cantonment area referred to as Training Area Bravo.

The implementation of construction activities as part of this alternative is projected to have significant but mitigable soil erosion impacts. The potential impacts from surface water erosion to soil from cantonment area construction activities are moderately high. This is true for several reasons. First, the footprint for the IBCT construction site is located in an area with slopes of between 3 and 15 percent and ridges and steeper slopes leading into the proposed construction site in certain areas. The steeper slopes would result in channeling of surface water into the construction site during rainfall events which would move more soils off site. Secondly, soils within the construction footprint of Alternative 1 would consist primarily of Razor-Midway complex. This soil association at this alternative site has a reduced depth to bedrock (20-40 inches) and higher clay content, which has reduced capacity to hold and conduct water through soil pores. This would mean that more of the surface water in the area would flow over the construction site and reduce absorption.

Despite these factors, the climate of the site experiences a lack of precipitation that would offset some of the less desirable soils characteristics of the construction site and would limit loss of soils through water erosion. Water erosion at the construction site would have minor impacts. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover during construction would also result in an increase in water erosion potential at the construction site. Disturbance to soils from demolition activities in the existing cantonment area to support CS units would expose soils to wind and water erosion.

The Schamber-Razor soil association with its high silt and low clay content is considerably more vulnerable to wind erosion than the high clay soils of Razor-Midway complex. A majority of construction would take place on Razor-Midway soils in areas of reduced slope, thus reducing this vulnerability. These soils are rated as moderately susceptible to wind erosion by the NRCS (rating of 4 on scale of 1-8).

The loss of soils attributed to wind erosion would be a temporary impact during the construction timeframe, which is expected to last 1-2 years. Following completion of construction, surface vegetation would remain in place and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease. Wind erosion at the construction site would have temporary minor impacts. Construction equipment traffic and construction activities would result in a loss of vegetative cover in the construction footprint. Soils at the construction site would be more susceptible to wind erosion because of the temporary disturbance caused by construction activities and vehicle traffic, which would expose individual soil particles, and soil aggregates to wind erosion. This effect would occur in the localized area of construction where vehicles operate and vegetation is lost during construction and the soil properties should serve to minimize wind erosion effects.

The implementation of Alternative 1 is not anticipated to have any significant impacts on Fort Carson's geology or topography.

3.5.2.3.2. Downrange Area

Operational Readiness Training Center

Elements of construction activities for the CAB under Alternative 1 would remain the same as for the Proposed Action.

Butts Army Airfield

Elements of construction activities for the CAB under Alternative 1 would remain the same as for the Proposed Action.

Ranges and Training Areas

Elements of training construction and training activities under Alternative 1 would remain the same as for the Proposed Action.

3.5.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Support Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.5.2.4.1. Cantonment Area

Under Alternative 2, the construction of facilities in the cantonment area for engineer and quartermaster units would take place as discussed as part of the Proposed Action.

3.5.2.4.2. Downrange Area

Under this alternative, facilities for the IBCT would be constructed in the area of Fort Carson south of Wilderness Road referred to as Tent City. Minor impacts to soils from surface water erosion resulting from construction activities would occur. This is true for several reasons. First, the footprint for construction site would mostly consist of land which is between 0 and 5 percent slope, meaning that surface water would not be channeled or generate force required to move significant amounts of soil. Secondly, soils within the construction footprint of this alternative consist primarily of Satanta loam and Bresser sandy loam, which are well-drained soils and exhibit ability to hold and conduct water well through soil pores. Other natural properties of the soil to include its aggregation limit the potential for water erosion at the construction site. Finally, the area does not receive excessive precipitation that would lead to soil saturation and consistently high volumes of surface water run-off. Soils within the construction footprint for this alternative are rated as non-highly erodible land by the NRCS (Figure 3.5-7).

Water erosion at the construction site is predicted to have minor impacts. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover during construction would also result in an increase in water erosion potential at the construction site.

While the Satanta loam soil association is a high percentage (39.5 percent) silt, the NRCS wind erodibility index classifies the soil as moderately resistant to wind erosion (rated a 5 on a 1-8 scale, with 8 being least susceptible to wind erosion). Bresser Sandy loam in the southern half of the construction site is moderately susceptible to wind erosion, however (rated 3 on a 1-8 scale by NRCS).

The loss of soils attributed to wind erosion would be a temporary impact during the construction timeframe, which is expected to last 1-2 years. Construction equipment traffic and construction activities would result in a loss of vegetative cover in the construction footprint. Soils at the construction site would be more susceptible to wind erosion because of the temporary disturbance caused by construction activities and vehicle traffic, which would expose individual soil particles, and soil aggregates to wind erosion. Following completion of construction, surface vegetation would remain in place and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease.

The implementation of Alternative 2 is not anticipated to have any significant impacts on Fort Carson's geology or topography.

Operational Readiness Training Center

Elements of construction activities for the CAB under Alternative 2 would remain the same as for the Proposed Action.

Butts Army Airfield

Elements of construction activities for the CAB under Alternative 2 would remain the same as for the Proposed Action.

Ranges and Training Areas

Elements of training construction and other training activities under Alternative 2 would remain the same as for the Proposed Action.

3.5.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of the No Action Alternative.

Under the No Action Alternative, Fort Carson stationing decisions connected with growth and realignment of the Army would not occur. Construction projects and training activities needed to support these actions would also not occur. Levels of live-fire and maneuver training at Fort Carson would not increase in comparison to training levels that would be realized at the installation following implementation of stationing actions in support of BRAC 2005, GDPR, and AMF decisions. Therefore, under the No Action Alternative, there would be no impacts to geology or soils above those assessed in the 2007 Fort Carson Transformation EIS (Reference No. 9).

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3.6. Water Resources

This section describes the affected environment and environmental consequences to water resources, including surface water, stormwater, groundwater, hydrogeology, and floodplains, within the Fort Carson cantonment area, BAAF, and downrange area.

3.6.1. Affected Environment

As outlined in *FC Regulation 200-1* (Reference No. 62), it is the policy of Fort Carson to eliminate or minimize the degradation of all water resources on Fort Carson and ensure compliance with all applicable federal, state and local water quality standards. As described in the INRMP (Reference No. 6) water resources at Fort Carson are managed in coordination with the USGS, NRCS, USFWS, US Department of Justice (DOJ), USACE, and the Colorado State Division of Water Resources. The Water Resources Management Program on Fort Carson includes watershed/sedimentation monitoring and management, and project reviews to address erosion and sediment control issues.

3.6.1.1. Surface Water

The northern and eastern portions of the installation are located within the Fountain Creek watershed of the Arkansas River Basin and drain southeasterly into Fountain Creek.

Stormwater runoff in the northern portion of the installation flows into one of four main drainages: B-Ditch, Clover Ditch, Unnamed Ditch, or Rock Creek, which are all tributaries to Fountain Creek. The southern and western portions of the installation drain directly into the Arkansas River to the south (Figure 3.6-1).

These northern drainages have historically been considered ephemeral or intermittent, in which no flow occurs in some reaches of these drainages for long periods of time during the year, and with the high flow occurring between April and September. Modern day conditions within the watershed, however, have changed the system dynamics, which now typically exhibit perennial flows in most areas of these northern-most drainages. The majority of flows in these drainages consist of runoff from precipitation and snowmelt, which has been increased due to the higher percentages of impervious areas within the watershed. Groundwater seepage and return flows also contribute to baseflows in these drainages.

The cantonment area is located in the Lime Kiln Valley watershed, a sub-watershed to the Fountain Creek watershed.

The *Section 404 Regional Permit* (Reference No. 63) issued by the USACE streamlines coordination and reporting requirements and improves accomplishment of erosion control projects. The regular Section 404 permitting process is used for nonstandard projects (Reference No. 61).

Teller Reservoir, the largest downrange water body, has been listed as an impaired water body on Colorado's Section 303(d) list and has recently been placed on Colorado's Monitoring and Evaluation List to be re-evaluated. The impairment is the result of a fish consumption advisory that has been imposed because of a biological accumulation of mercury in soil, plants, and fish tissues. Fort Carson has mandated a catch-and-release fishing program in this body of water to reduce the potential for a public health issue. Although the Teller Reservoir has a capacity of approximately 2,600 acre-feet, it frequently contains no water and had been dry since 2002. Recent observations indicate the reservoir currently contains approximately two feet of water as a result of baseflow (ground water seepage). Water levels in the Teller Reservoir will continue to be monitored.

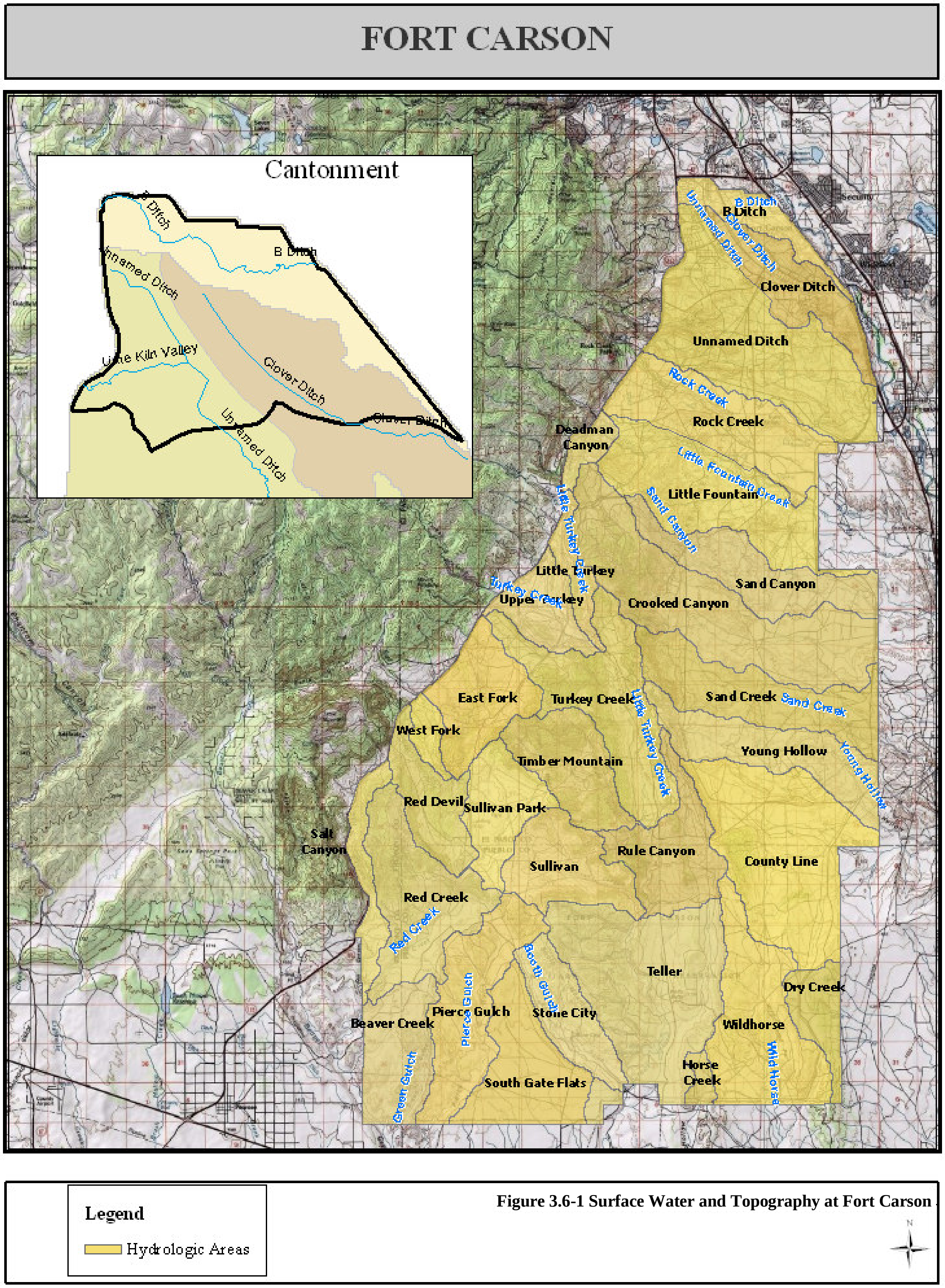

Figure 3.6-1 Surface Water and Topography at Fort Carson

Fort Carson retains 34 surface water rights as specified by the Colorado Division of Water Resources. Of these surface water rights, 20 are surface diversion ditches and 14 are reservoir storage rights (Reference No. 6). The USGS installed ten surface water-gauging stations on or near Fort Carson streams and reservoirs for continuous monitoring of the water flow. By October 1989, however, surface water gauging was discontinued at five of these stations. Year-round monitoring is conducted at Rock Creek above Fort Carson, Rock Creek near Fort Carson, Turkey Creek near Fountain, Turkey Creek above Teller Reservoir, and Turkey Creek near Stone City (Reference No. 6). Wild Horse Creek, on the southern border of the installation has been identified as warranting monitoring and evaluation for nitrite/ nitrate as prescribed in the Section 303(d) listing for impaired waters for Colorado. In addition, this creek has been listed for selenium and *E. coli* on the 303(d) list.

Although the quality of the surface water on Fort Carson is good, it is not a source of domestic water at Fort Carson (Reference No. 6). Water from most streams and surficial aquifers on the western portion of the installation is suitable for irrigation. Surface water that flows eastward across Fort Carson accumulates sediments (i.e., suspended solids) that are then concentrated through evaporation. Water from the eastern portion of Fort Carson, however, is still suitable for irrigation with proper management practices.

3.6.1.2. Stormwater

3.6.1.2.1. Modeling/Program Background

Baseline hydrologic models have recently been completed for the B- Ditch, Clover Ditch, Unnamed Ditch, and Rock Creek watersheds. This information provides the installation with a realistic representation of floodplains and peak flows for pre-development, existing, and future proposed conditions. Modeling has been conducted for the three alternatives being considered in this EIS and was presented during the public meetings held in October 2008. The modeling assessment was conducted based on the following scenarios, and is included in its entirety as Appendix E:

Training Area Bravo

- Baseline conditions for B Ditch and Clover Ditch
- Existing 2007 conditions for B Ditch and Clover Ditch
- NEPA Alternative Analysis
    - Scenario 1 - 100 percent of IBCT discharging to B Ditch
    - Scenario 2 - 100 percent of IBCT discharging to Clover Ditch
    - Scenario 3 - 50 percent of IBCT discharging to B Ditch and 50 percent discharging to Clover Ditch

Tent City

- Baseline conditions for Rock Creek
- Existing 2007 conditions for Rock Creek
- NEPA Alternative Analysis
    - Scenario 4 - 100 percent of IBCT discharging to Rock Creek

Operational Readiness Training Complex

- Baseline conditions for Rock Creek
- Existing 2007 conditions for Rock Creek
- NEPA Alternative Analysis
    - Scenario 5 - 95 percent IBCT discharging to Rock Creek and 5 percent discharging to Central Unnamed Ditch; no CAB placement
    - Scenario 6 - 100 percent CAB discharging to Rock Creek and no IBCT placement
    - Scenario 7 - 95 percent IBCT discharging to Rock Creek and 5 percent discharging to Central Unnamed Ditch and 100 percent CAB discharging to Rock Creek

3.6.1.2.2. Regulations

The 1972 amendments to the Federal Water Pollution Control Act (FWPCA, also referred to as the Clean Water Act or [CWA]) prohibited the discharge of any pollutant to waters of the US from a point source, unless the discharge was authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Early on, efforts to improve water quality under the NPDES program focused on reducing pollutants in discharges of industrial process wastewater and from municipal sewage treatment plants. In response to the need for more comprehensive NPDES requirements for stormwater discharges, Congress amended the CWA in 1987, which required the EPA to establish phased NPDES requirements for stormwater discharges. To implement these requirements, EPA published the initial permit application requirements for storm water discharges associated with certain types of industrial activity and for discharges from municipal separate storm sewer systems located in municipalities with a population of 100,000 or more on November 16, 1990 (55 Federal Register 47990). The municipalities impacted by these initial NPDES requirements are referred to as “Phase I” or “Large” Municipal Separate Storm Sewer Systems (MS4) facilities. In addition, EPA promulgated a final rule addressing Phase II sources on August 7, 1995 (60 Federal Register 40230) (Reference No. 64). Fort Carson is considered a “Phase II” or “Small” MS4 permitted facility.

The Fort Carson Stormwater Program increased efforts in response to EPA’s Phase II requirements and the initiation of the *NPDES General Permit for Stormwater Discharges from Federal Facility “Small” MS4 in Colorado MS4 Permit* (Reference No. 302) in 2003 The program’s main objective is to protect surface waters from pollution when precipitation from rain or snowmelt flows over the ground, as stormwater runoff can pick up debris, chemicals, dirt, and other pollutants and flow untreated into a storm sewer system or directly to a pond, creek, river or wetland. In addition, stormwater controls, floodplains, and drainage structures are also assessed on a watershed level scale during project planning phases.

Three permit types are utilized at Fort Carson under the EPA stormwater program: the *NPDES Construction General Permit* (Reference No. 301), the *Multi-Sector General Permit* (Reference No. 288), and the MS4.

Construction General Permit

Construction projects on Fort Carson are authorized to discharge stormwater runoff from construction sites under a *NPDES Construction General Permit* (Reference No. 301) To obtain coverage under the general permit, contractors performing work at Fort Carson must submit a NOI for each construction project that disturbs one acre or more of land. In addition, contractors must develop and implement a Stormwater Pollution Prevention Plan (SWPPP) for each project and comply with the additional BMPs set forth in Fort Carson’s *Draft Stormwater Management Plan* (Reference No. 283).

Multi-Sector General Permit

The *Multi-Sector General Permit* (Reference No. 288) provides facility-specific requirements for many types of industrial facilities within one overall permit. The permit outlines steps that facility operators must take prior to being eligible for permit coverage, including development and implementation of a SWPPP. Some types of industrial facilities at Fort Carson covered under this permit are motor pools, the airfield, and the wastewater treatment plant.

Municipal Separate Storm Sewer System

Under the NPDES stormwater program, operators of large and small regulated MS4s require authorization to discharge pollutants under a NPDES permit. Fort Carson is a regulated small MS4. The EPA’s Phase II MS4 permit for federal facilities in Colorado expired in June 2008. A new individual permit is anticipated to be issued to Fort Carson in February 2009, so this expired permit has been administratively continued until that time.

The federal stormwater regulations and ***MS4 Permit*** (Reference No. 302) language require Fort Carson to develop, implement, and enforce a Stormwater Program and Management Plan, which is designed to reduce the discharge of pollutants from the installation stormwater system to the maximum extent practicable to protect water quality. EPA has determined that the program must implement six minimum control measures, as listed below:

1) Public Education and Outreach – distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality;
2) Public Participation/Involvement – providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel;
3) Illicit Discharge Detection and Elimination – developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system;
4) Construction Site Runoff Control – developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one or more acres of land;
5) Post-Construction Runoff Control – developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas; and
6) Pollution Prevention/Good Housekeeping – developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations, including municipal staff training on pollution prevention measures and techniques.

3.6.1.3. Hydrogeology and Groundwater

Groundwater at Fort Carson exists in both alluvial and bedrock aquifers. Alluvial aquifers are formed from unconsolidated deposits of stream alluvium, colluvium, and residuum derived from Pierre Shale that are moderately permeable. The alluvial aquifers can provide well yields from 10 to more than 100 gallons per minute (gpm) (Reference No. 65). In much of the Arkansas River Basin, hydraulic heads are lower in the deep bedrock aquifers than those in the shallow formations, which indicates that deep bedrock aquifers are not in hydrological connection with the shallow formations. The primary bedrock aquifer at Fort Carson is the Dakota-Purgatoire aquifer, which can yield 10 gpm, although local fracturing can increase permeability and yield more than 200 gpm. Precipitation and stream flow infiltration recharge the bedrock aquifers (Reference No. 65).

In general, the quality of groundwater on Fort Carson is good with the exception of localized areas of elevated nitrates, high dissolved solids, and sulfates exceeding secondary drinking water standards. Nitrates have recently been detected in the groundwater at multiple locations greater than the regulatory standard of 10 milligrams per liter (mg/L). Currently, Fort Carson and CDPHE are collaborating to evaluate the possibility that elevated concentrations of nitrates may be naturally occurring as a result of groundwater coming in direct contact with the shale bedrock (Reference No. 66). This work is ongoing and may not be completed for this environmental evaluation.

The Army has 16 subsurface water rights, including nine wells for domestic or military use, at Fort Carson. Seven wells classified as future wells are planned to be installed when needed (Reference No. 6). Water rights directly support the training mission by ensuring adequate water supplies for the support and rehabilitation of natural resources on Fort Carson, and to provide training capabilities and fire suppression.

3.6.1.4. Floodplains

Fort Carson is located near the border of the Great Plains and the Front Range of the Rocky Mountains. The climate is moderate and semi-arid, with an average July temperature of 71°F and an average January temperature of 29°F. Mean precipitation is about 17 inches per year. Rainfall ranges from approximately 12 inches (southern Fort Carson) to 15 inches (northern Fort Carson) per year, with about 80 percent falling between early April and late September. Average annual snowfall is approximately 36 inches. Snow and sleet usually occur from September to May, with the heaviest snowfall registered in March and trace accumulations recorded as late as June (Reference No. 6). Typical storms that occur at Fort Carson correlate to the Soil Conservation Service's Type II storm event, which tend to be brief and intense.

100-year floodplains are associated with all three of the drainages within the cantonment area. Details on how the EIS alternatives relate to these areas can be found in the stormwater simulations document, located in Appendix E.

3.6.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.6.2.1. Proposed Action and Alternatives

Effects to the water supply are addressed in Section 3.11 of this EIS.

3.6.2.1.1. Surface Water, Stormwater, and Floodplains

The threshold of significance for impacts to water resources would be if the Proposed Action or the alternatives would cause a violation of state water quality criteria, a violation of NPDES discharge permits, potential degradation of an aquifer, and/or non-compliance with Fort Carson's *MS4 Permit* (Reference No. 302) conditions.

The threshold of significance for adverse impacts to the floodplains would be if the Proposed Action or the alternatives were to be constructed within a known floodplain and without following protocol outlined in EO 11988.

There would be no significant impacts associated with the ranges and training areas, due to the Proposed Action or any of the alternatives.

3.6.2.1.2. Hydrogeology and Groundwater

Training, construction and operation of new facilities would increase the use of fuels, solvents, and other hazardous and toxic substances (Section 3.12), which could result in an indirect effect to groundwater if accidentally released into the environment.

3.6.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.6.2.2.1. Cantonment Area

Hydrogeology and Groundwater

Construction and operation of new facilities would increase the use of fuels, solvents, and other hazardous and toxic substances (Section 3.12), which could result in an indirect effect to groundwater if accidentally released into the environment.

Surface Water, Stormwater, and Floodplains

This assessment is addressed under Scenarios 5, 6, and 7 in the Stormwater Simulations for Grow the Army EIS, Fort Carson and PCMS, which is located in Appendix E. A majority of the proposed activities would lie within the Rock Creek drainage. Overall, these scenarios increase the peak discharge and impervious area in Rock Creek by 1 percent or less and the footprint of the ORTC/CAB scenarios is located outside the 100-year floodplain.

3.6.2.2.2. Downrange Area

Hydrogeology and Groundwater

Groundwater from nine existing wells is used at Fort Carson for natural resource support and rehabilitation, support of training capabilities, and fire suppression. With increased training activities under the Proposed Action, groundwater use may increase. The increase, however, can be accommodated under existing subsurface water rights, including seven wells that are classified as future wells to be installed when required. The Proposed Action would not release any water, which demonstrates poor water quality directly into the aquifers at Fort Carson. Therefore, the Proposed Action would have no direct adverse effect on groundwater at Fort Carson.

Increased training would increase the use of fuels, solvents, and other hazardous and toxic substances (Section 3.12), which might result in an indirect effect to groundwater if released into the environment in an area where infiltration to groundwater could result.

The types of impacts associated with the Proposed Action would be the same for the ORTC, BAAF, and the Range and Training Areas.

Surface Water, Stormwater, and Floodplains

The discussion provided in Section 3.6.2.2.1 also applies to the ORTC and BAAF. Increased training would increase soil erosion, resulting in possible impacts on stormwater and surface water.

3.6.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Site

3.6.2.3.1. Cantonment Area

Hydrogeology and Groundwater

The types of impacts associated with construction and operational activities would be the same as those described for the Proposed Action. Shallow groundwater conditions may exist in this area, which would require additional planning and management to avoid adverse impacts to this resource.

Surface Water, Stormwater, and Floodplains

The assessment for Training Area Bravo is addressed under Scenarios 1, 2, and 3 in the Stormwater Simulations for Grow the Army EIS, Fort Carson and PCMS. These proposed activities will lie within the B-Ditch and Clover Ditch drainages. Overall, these scenarios increase the impervious area in these drainages between 9 and 14 percent and the peak discharge between 2 and 4 percent. The footprint of the Training Area Bravo scenarios is located outside of the 100-year floodplain, even though flooding does occur from the northern tributary and upstream in Clover Ditch. The CAB assessment is summarized in Section 3.6.2.2.1.

3.6.2.3.2. Downrange Area

Hydrogeology and Groundwater

The types of impacts associated with training an additional IBCT and potential CAB activities would be the same as for the Proposed Action for the ORTC, BAAF, and the Range and Training Areas.

Surface Water, Stormwater, and Floodplains

Section 3.6.2.2.2 discusses impacts on the ORTC and BAAF. Increased training would increase soil erosion, resulting in possible impacts on stormwater and surface water.

3.6.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.6.2.4.1. Cantonment Area

Hydrogeology and Groundwater

The types of impacts associated with construction and operational activities would be the same as for the Proposed Action.

Surface Water, Stormwater, and Floodplains

The assessment for Tent City is addressed under Scenario 4 in the Stormwater Simulations for Grow the Army EIS, Fort Carson and PCMS. These proposed activities would lie within the Rock Creek drainage. Overall, this scenario would increase the peak discharge and impervious area in Rock Creek by 1 percent or less and the footprint of the Tent City scenario is located outside the 100-year floodplain. The CAB assessment is summarized in Section 3.6.2.2.1.

3.6.2.4.2. Downrange Area

Hydrogeology and Groundwater

The types of impacts associated with training an additional IBCT and CAB activities would be the same as for the Proposed Action for the ORTC, BAAF, and the Range and Training Areas.

Surface Water, Stormwater, and Floodplains

The discussion provided in Sections 3.6.2.2.1 and 3.6.2.4.1 also apply to the ORTC and BAAF. Increased training would increase soil erosion, resulting in possible impacts on stormwater and surface water.

3.6.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action

Alternative. Many of the actions proposed in 2007 have not yet been implemented, however, their impacts have been included as part of the No Action Alternative.

No construction to support an additional IBCT or CAB would occur under the No Action Alternative. Therefore, there would be no impacts to surface water, stormwater, or floodplains beyond those described in the 2007 Fort Carson Transformation EIS.

Training an additional IBCT and a CAB would not occur under the No Action Alternative. Therefore, there would be no impacts to hydrology and groundwater resources beyond those described in the 2007 Fort Carson Transformation EIS under the No Action Alternative.

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3.7. Biological Resources

This section describes the affected environment and environmental consequences of the Proposed Action, alternatives, and the No Action Alternative for biological resources on Fort Carson. This includes vegetation, wildlife, sensitive species, and wetlands. Information on the occurrence and distribution of natural resources on Fort Carson was obtained from a variety of sources, chiefly the latest INRMP (Reference No. 6) and Fort Carson GIS data.

3.7.1. Affected Environment

3.7.1.1. Vegetation

Fort Carson is located at the western edge of the Central Shortgrass Prairie Ecoregion, which includes all the plains of Colorado east of the Rocky Mountains as well as parts of Wyoming, Nebraska, Kansas, Oklahoma, Texas, and New Mexico. The Central Shortgrass Prairie is characterized by rolling-to-undulating plains and tablelands of low relief that are traversed by streams and contain canyons, buttes, badlands, and isolated mountains. Shortgrass prairie, mixed-grass prairie, and sand-sage prairie community types dominate the Central Shortgrass Prairie Ecoregion (Reference No. 67).

Fort Carson is within upper regions of the Prairie Grasslands Plant Zone, an area characterized by generally treeless terrain dominated by plants belonging to the grass family (Reference No. 6). Figure 3.7-1 shows vegetation types on Fort Carson.

A reference plant collection (herbarium) was developed for species found on Fort Carson. This herbarium includes a laminated sample of each plant species with pertinent information on each laminated sheet. The entire collection has been digitized (Reference No. 6). Existing data on plant species present on Fort Carson are available in greater detail in the INRMP (Reference No. 6). A plant species[3] list for Fort Carson, including scientific names, is provided in Appendix F.

Grasslands comprise about 45 percent of Fort Carson and the majority of this cover includes two major types: shortgrass prairie and foothills grassland. Blue grama-dominated shortgrass prairie occupies low relief sites, primarily in the southern half of Fort Carson. Cholla is a frequent component of Fort Carson short grass prairie, providing significant structure to grasslands where this species is abundant. Foothills grasslands are interspersed throughout uplands, primarily in the northern and western portions of Fort Carson. Foothills grasslands are generally composed of blue grama mixed with taller grasses: wheat grass, needle-and-thread, dropseed, ryegrass, bluestems and sleepy grass. In the absence of fire, foothills grasslands support deciduous shrubs, primarily skunkbush and yucca.

Although occupying less area, saline soil alkaline sacaton grasslands found along the eastern boundary of Fort Carson are a significant ecological resource. Sacaton is a densely tufted perennial bunchgrass and, if unburned, forms dense and nearly pure stands or stands with four-winged saltbush. Numerous sensitive wildlife species are found in the sacaton grasslands of Fort Carson, more than any other habitat type on the installation.

[3]Scientific names of plants on Fort Carson are in Appendix F.

Figure 3.7-1 Vegetation Types on Fort Carson

Shrublands, typically with grass understory, comprise about 14 percent of Fort Carson vegetation cover. North slopes and moist sites are dominated by montane shrubs: mountain mahogany, skunkbush, or gambel oak. Semi-desert shrublands occupy lowland flats and creek benches, primarily on saline soils. These sites are typically dominated by shadscale or four-winged saltbush. Frankenia shrublands are found on Niobrara barrens, primarily in central and southern Fort Carson, often on high relief sites. Frankenia shrublands support several Species of Special Concern. Relatively rare willow thickets in perennial and intermittent water courses provide significant cover for wildlife, reduce erosion, and slow the speed of water associated with storm events. Several deciduous shrubland types are found on Fort Carson, and these are often restricted to special edaphic (soil-related) conditions (Reference No. 68).

Forest/Woodlands constitute about 37 percent of Fort Carson. Ponderosa pine, Pinyon pine, and one-seed juniper are dominant species and are found in mountainous and high relief sites on Fort Carson, primarily on coarse or rocky soils. Ponderosa pine occurs in pure stands or mixed with pinyon, gambel oak, and Rocky Mountain juniper, depending upon relative seral stage of the site. Oneseed juniper dominates low relief hills and mesas primarily in the southern half of Fort Carson, occasionally invading adjacent grasslands. Oneseed juniper stands are a valuable training resource on Fort Carson and play a significant role in the training mission. Pinyon pine is frequently a significant component in juniper-dominated communities, where it can comprise 15-30 percent of the tree canopy. Recent drought and bark beetles have been a significant source of pinyon mortality. Oak and pinyon are the significant mast producing species on Fort Carson and are of considerable ecological importance to the sustainability of biodiversity in woodland communities.

Riparian woodlands are rare on the installation and are best developed in major drainages. Riparian woodlands provide significant cover for a variety of wildlife species and are important in the regulation of storm water run-off, erosion, and abatement of downstream flooding.

Fort Carson experienced a wildland fire in mid-April 2008 that burned more than 9,000 acres. The fire scorched the downrange area located about 11 miles southwest of Fort Carson's cantonment area in southern El Paso County, near SH 115. SH 115 served as a firebreak, which helped the firefighters keep the fire from spreading off-post into the rugged terrain to the west. The fire caused people and animals to evacuate from Turkey Creek Ranch and temporary closure of SH 115 from Fort Carson's Gate 6 south. Fort Carson is actively restoring this area. As well as rehabilitation efforts, Fort Carson is actively removing trees that pose a human safety risk to assist in reopening public areas.

3.7.1.1.1. Noxious Weeds

There are currently 58 state-listed weed species designated for containment, control, or eradication. At least 28 state-listed and 17 other county-listed (El Paso, Pueblo, Fremont, and Las Animas[4] counties) noxious weeds have invaded both natural and urbanized landscapes (Reference No. 6). There are 22 noxious weeds known to occur on Fort Carson. Only one, myrtle spurge (*Euphorbia myrsinites*) is considered a List A species in Colorado. List A species are those considered so potentially damaging (and not yet widespread throughout the state) that they are designated for eradication. List B weed species are species for which state management plans are developed to stop their continued spread.

There are 14 known List B weed species on Fort Carson. They are Canada thistle (*Cirsium arvense*), common teasel (*Dipsacus fullonum*), diffuse knapweed (*Centaurea diffusa*), hoary cress (*Cardaria draba*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), musk thistle (*Carduus nutans*), redstem filaree (*Erodium cicutarium*). Russian olive (*Elaeagnus angustifolia*), salt cedar (*Tamarix chinensis, T. parviflora,* and *T. ramosissima*), scotch thistle (*Onopordum acanthium*), spotted knapweed (*Centaurea maculosa*), perrenial pepperweed (*Lepidium latifolium),* and yellow toadflax (*Linaria vulgaris*).

[4] Las Animas County is for PCMS noxious weeds.

List C weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, would develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans would not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species. List C weed species known to occur at Fort Carson include: common burdock (***Arctium minus***), common mullein (***Verbascum thapsus***), common St. Johnswort (***Hypericum perforatum***), downy brome (***Bromus tectorum***), field bindweed (***Convolvulus arvensis***), jointed goatgrass (***Aegilops cylindrica***), poison hemlock (***Conium maculatum***), and puncturevine (***Tribulus terrestris***). List C species are those that have become so widespread that eradication is impossible and species-specific control would be extremely difficult if not impossible. Therefore, measures for control of these species apply to all weeds in general and are geared towards education and BMPs to help suppress populations. On Fort Carson, the weed species of most concern are myrtle spurge, dalmation and yellow toadflax, leafy spurge, and scotch thistle.

3.7.1.1.2. Cantonment Area

The cantonment area on Fort Carson is highly disturbed and developed, and vegetation consists primarily of non-native ornamental landscaping, including bluegrass turf and landscape trees. Only small areas of native vegetation remain within the cantonment area.

3.7.1.2. Wildlife

Wildlife habitats on Fort Carson are diverse and cover large tracts of relatively undeveloped land. Although land use impacts are different than those typically found in the region (e.g., housing development, livestock grazing, mineral extraction), maintaining wildlife habitats within the regime of military training is not completely incompatible but does require active management by Fort Carson. Habitats that are disappearing in the vicinity of these installations due to development are maintained, sometimes in a relatively natural state, in large tracts on Fort Carson. Eberly (Reference No. 265) provides many military installation examples where such quality habitats are helping maintain populations of prairie birds.

Dominant terrestrial habitat types on Fort Carson are grasslands (45 percent), shrublands (14 percent), and woodlands (37 percent). Aquatic habitats on Fort Carson are very limited and consist of wetlands, riparian corridors, and open water. Data on wildlife species and descriptions of wildlife habitats present on Fort Carson were obtained from the INRMP (Reference No. 6). A wildlife species list for Fort Carson is presented in Appendix F.

3.7.1.2.1. Mammals

Common large mammals include mule and white-tailed deer[5], elk, pronghorn, mountain lion, coyote, and black bear (Reference No. 6). Many of these species are more common in mountainous areas, but all were native to the Great Plains at one time and have been extirpated from large areas. While most are not considered species of concern, maintaining this representation of Great Plains biodiversity may require active management at Fort Carson.

3.7.1.2.2. Birds

Numerous bird species are known to occur on Fort Carson. Twenty-seven species of hawks and owls are known to use Fort Carson, including the Mexican Spotted Owl, Bald Eagle, and Peregrine Falcon (Reference No. 6). Of these, 17 species breed on Fort Carson; 19 species are winter residents; and eight species are classified as federally- or state-listed or as species of special concern. Raptors on Fort Carson have a wide range of ecological tolerance and requirements. Currently, the Golden Eagle is the most

[5] Scientific names of animals on Fort Carson are in Appendix F.

vulnerable nesting species on Fort Carson. The 24 active eyries on Fort Carson annually contribute significantly to the sustainability of the regional breeding population. Currently, recreation, construction, maintenance projects, and dismounted training constitute the greatest risk to nesting eagles. The Prairie Falcon, Ferruginous Hawk, and Swainson's Hawk are sensitive species and are relatively rare as nesting species on Fort Carson. They can be impacted by the same threats as for the Golden Eagle.

3.7.1.2.3. Fish

Native and non-native fish can be found in reservoirs on Fort Carson (Reference No. 68), eight of which are normally managed for sport fishing (Reference No. 6). In recent years, only three reservoirs, Haymes, Womack, and Townsend, held enough water to sustain fisheries (Reference No. 6). Historically, other reservoirs have supported populations of native fish, water birds, and amphibians. Streams, especially spring-fed streams, also support native fish species on Fort Carson (Reference Nos. 68 and 69).

3.7.1.2.4. Reptiles and Amphibians

Western rattlesnake, triploid checkered whiptail, and coachwhip are typical reptiles found on Fort Carson. Wetlands support several reptile and amphibian species found on Fort Carson, including plains leopard frog, northern leopard frog (petitioned for federal listing as a threatened species in 2006), and painted turtle.

3.7.1.3. Sensitive Species

Federally-listed threatened and endangered plant and animal species are protected under the Endangered Species Act. The Migratory Bird Treaty Act implements US commitments to international conventions for the protection of migratory birds. Bald and Golden Eagles are protected by the Bald and Golden Eagle Protection Act. Other sensitive wildlife species include those listed by the CDOW, Colorado Natural Heritage Program (CNHP), USFWS Birds of Conservation Concern, Partners in Flight, and the Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (now called the Shortgrass Prairie Partnership). Sensitive plant species include those identified by the CNHP as Colorado Species of Concern.

NatureServe (Reference No. 266) identified Species at Risk for DoD facilities. This list was comprised of plant and animal species that are not federally-listed as threatened or endangered under the Endangered Species Act, but that are either federally-listed as candidates or are ranked by NatureServe as critically imperiled or imperiled throughout their range. This list imparts no compliance implications (AR 200-1 provides guidance and directs action) but is used as a tool to conserve species proactively to avoid the need for listing. The original 2004 list from Fort Carson and PCMS included the round-leaf four o'clock, Arkansas Valley evening primrose, rayless goldenweed, and triploid checkered whiptail. Since then, additional species have been considered Species at Risk based on expertise from the natural resource managers at the facilities and other regional experts. Surveys have been conducted for all of these species.

3.7.1.3.1. Federally-Listed Species

The Endangered Species Act defines an endangered species as any species in danger of extinction throughout all or a major portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Table 3.7-1 presents federally-listed endangered, threatened, and candidate species for counties in which Fort Carson is located (El Paso, Pueblo, and Fremont counties). No critical habitat for these species has been designated or proposed for designation in these counties (Reference Nos. 70 and 71).

Table 3.7-1 Federally-Listed Endangered, Threatened, and Candidate Species of Counties[1]

Species	Scientific Name	Species Type	Status	Distribution on Fort Carson
Arkansas darter[2]	***Etheostoma cragini***	Fish	C	Occurs in Turkey Creek (introduced population)
Greenback cutthroat trout[2]	***Oncorhynchus clarki stomias***	Fish	T	Occurred in Lytle Pond, now dry (introduced population)
Black-footed ferret	***Mustela nigripes***	Mammal	E	Not known to occur
Preble's meadow jumping mouse	***Zapus hudsonius preblei***	Mammal	T	Not known to occur; 1995 and 1996 surveys did not find evidence of this species
Mexican Spotted Owl^	***Strix occidentalis***	Bird	T	Winter resident
Ute ladies'-tresses	***Spiranthes diluvialis***	Plant	T	Not known to occur, surveys (1994-1996) found no evidence

[1]Species for which no reasonably suitable habitat exists on Fort Carson are not included.
[2]Species occurring on Fort Carson are also state-listed.
C – Candidate, E – Endangered, T – Threatened,

The following two federally-listed wildlife species are known to use Fort Carson:

The ***Mexican Spotted Owl*** nests in rugged mountainous-forested canyons west of the Fort Carson boundary. It is a rare winter resident on Fort Carson known only from Rock Creek, Little Fountain, and Red Creek canyons. The species is not suspected to breed on Fort Carson. The *Biological Assessment and Management Plan for the Mexican Spotted Owl on Fort Carson* contains more information on this species (Reference No. 72).

The ***Greenback Cutthroat Trout*** is the only trout endemic to headwaters of the South Platte River and Arkansas River systems. Fort Carson is on the eastern edge of the historical distribution of the species. It was introduced into Lytle Pond in the Turkey Creek Protected Species Area. The Turkey Creek population was one of the first recovery efforts for this species by the USFWS within the Arkansas River drainage (Reference No. 6).

3.7.1.3.2. State-Listed Species and Species of Concern

Table 3.7-2 presents the special status wildlife species that occur (i.e., have been observed) on Fort Carson. These species are tracked by CDOW, CNHP, USFWS, Partners in Flight, and the Shortgrass Prairie Partnership. State threatened and endangered wildlife species are protected by Colorado state law, but Species of Concern are identified for planning purposes only. The distribution of sensitive wildlife species habitats on Fort Carson is depicted in Figure 3.7-2.

Table 3.7-2 Special Status Wildlife Species Observed on Fort Carson

Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Southern redbelly dace	***Phoxinus erythrogaster***	Fish	SE	CDOW, CNHP, CSP
Arkansas darter	***Etheostoma cragini***	Fish	T	CDOW, CNHP, CSP, USFWS
Greenback cutthroat trout	***Oncorhynchus clarki stomias***	Fish	ST	CDOW, USFWS
Flathead Chub	***Platygobio***	Fish	SC	CDOW
Northern leopard frog	***Rana pipiens***	Amphibian	SC	CDOW, CNHP, CSP
Painted turtle	***Chrysemys picta***	Reptile	SC	CNHP
Short-horned lizard	***Phrynosoma douglassi***	Reptile	C	CNHP, CSP
Triploid checkered whiptail	***Aspidoscelis neotessalatus***	Reptile	SC	CDOW, CNHP, CSP, SAR
Black-tailed prairie dog	***Cynomys ludovicianus***	Mammal	SC	CDOW, CNHP, CSP
American White Pelican	***Pelecanus erythrorhynchos***	Bird	SC	CNHP
Snowy Egret	***Egretta thula***	Bird	SC	CNHP
White-faced Ibis	***Plegadis chihi***	Bird	SC	CNHP
Mississippi Kite	***Ictinia misisippiensis***	Bird	SC	PIF
Bald Eagle	***Haliaeetus leucocephalus***	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Northern Harrier	***Circus cyaneus***	Bird	SC	PIF, USFWS
Northern Goshawk	***Accipiter gentilis***	Bird	SC	CNHP
Swainson's Hawk	***Buteo swainsoni***	Bird	SC	PIF, USFWS
Ferruginous Hawk	***Buteo regalis***	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Rough-legged Hawk	***Buteo lagopus***	Bird	SC	PIF
Golden Eagle	***Aquila chrysaetos***	Bird	SC	USFWS
Peregrine Falcon	***Falco peregrinus***	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Prairie Falcon	***Falco mexicanus***	Bird	SC	CNHP, PIF, USFWS
Scaled Quail	***Callipepla squamate***	Bird	SC	PIF
Mountain Plover	***Charadrius montanus***	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Solitary Sandpiper	***Tringa solitaria***	Bird	SC	USFWS
Black-necked Stilt	***Himantopus mexicanus***	Bird	SC	CNHP
Long-billed Curlew	***Numenius americanus***	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Willet	***Catoptrophorus semipalmatus***	Bird	SC	CNHP
Wilson's Phalarope	***Phalaropus tricolor***	Bird	SC	CNHP
Forester's Tern	***Sterna forsteri***	Bird	SC	CNHP
Band-tailed Pigeon	***Patagioenas fasciata***	Bird	SC	CNHP
Yellow-billed Cuckoo	***Coccyzus americanus***	Bird	SC	USFWS
Northern Pygmy-Owl	***Glaucidium gnoma***	Bird	SC	CNHP, PIF
Burrowing Owl	***Athene cunicularia***	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS

Table 3.7-2 Special Status Wildlife Species Observed on Fort Carson (continued)

Species	Scientific Name	Species Type	Status	Authority
Mexican Spotted Owl	***Strix occidentalis***	Bird	ST	CDOW, PIF, USFWS
Short-eared Owl	***Asio flammeus***	Bird	SC	CNHP
Common Poorwill	***Phalaenoptilus nuttallii***	Bird	SC	PIF
Black Swift	***Cypseloides niger***	Bird	SC	CNHP
White-throated Swift	***Aeronautes saxatalis***	Bird	SC	PIF
Black-chinned Hummingbird	***Archilochus alexandri***	Bird	SC	PIF
Calliope Hummingbird	***Stellula calliope***	Bird	SC	PIF
Rufous Hummingbird	***Selasphorus rufus***	Bird	SC	PIF
Lewis 'Woodpecker	***Melanerpes lewis***	Bird	SC	CNHP, PIF, USFWS
Red-headed Woodpecker	***Melanerpes erythrocephalus***	Bird	SC	USFWS
Yellow-bellied Sapsucker	***Sphyrapicus varius***	Bird	SC	PIF
Williamson's Sapsucker	***Sphyrapicus thyroideus***	Bird	SC	USFWS
Olive-sided Flycatcher	***Contopus cooperii***	Bird	SC	PIF
Willow Flycatcher	***Empidonax trailii***	Bird	SC	CHNP
Dusky Flycatcher	***Empidonax oberholseri***	Bird	SC	PIF
Gray Flycatcher	***Empidonax wrightii***	Bird	SC	PIF
Cassin's Kingbird	***Tyrannus vociferans***	Bird	SC	PIF
Western Kingbird	***Tyrannus verticalis***	Bird	SC	PIF
Northern Shrike	***Lanius excubitor***	Bird	SC	PIF
Loggerhead Shrike	***Lanius ludovicianus***	Bird	SC	USFWS
Western-Scrub Jay	***Aphelocoma californica***	Bird	SC	PIF
Pinyon Jay	***Gymnorhinus cyanocephalus***	Bird	SC	USFWS
Clark's Nutcracker	***Nucifraga columbiana***	Bird	SC	PIF
Juniper Titmouse	***Baeolophus ridgwayi***	Bird	SC	PIF
Carolina Wren	***Thyrothorus ludovicianus***	Bird	SC	PIF
Western Bluebird	***Sialia mexicana***	Bird	SC	PIF
Mountain Bluebird	***Sialia currucoides***	Bird	SC	PIF
Veery	***Catharus fuscescens***	Bird	SC	CNHP
Brown Thrasher	***Toxostoma rufum***	Bird	SC	PIF
Curve-billed Thrasher	***Toxostoma curvirostre***	Bird	SC	CNHP
White-eyed Vireo	***Vireo griseus***	Bird	SC	PIF
Blue-headed Vireo	***Vireo solitarius***	Bird	SC	PIF
Blue-winged Warbler	***Vermivora pinus***	Bird	SC	PIF
Golden-winged Warbler	***Vermivora chrysoptera***	Bird	SC	PIF
Virginia's Warbler	***Vermivora virginiae***	Bird	SC	PIF, USFWS
Black-throated Gray Warbler	***Dendroica nigrescens***	Bird	SC	PIF, USFWS

Table 3.7-2 Special Status Wildlife Species Observed on Fort Carson (continued)

Species	Scientific Name	Species Type	Status	Authority
Black-throated Green Warbler	***Dendroica virens***	Bird	SC	PIF
Worm-eating Warbler	***Helmitheros vermivorus***	Bird	SC	PIF
Hooded Warbler	***Wilsonia citrina***	Bird	SC	PIF
Grace's Warbler	***Dendroica graciae***	Bird	SC	CNHP, USFWS
Lazuli Bunting	***Passerina amoena***	Bird	SC	PIF
Indigo Bunting	***Passerina cyanea***	Bird	SC	PIF
Dickcissel	***Spiza americana***	Bird	SC	PIF
Green-tailed Towhee	***Pipilo chlorurus***	Bird	SC	PIF
Canyon Towhee	***Spiza americana***	Bird	SC	PIF
Cassin's Sparrow	***Aimophila cassinii***	Bird	SC	CNHP, CSP, PIF, USFWS
American Tree Sparrow	***Spizella arborea***	Bird	SC	PIF
Rufous-crowned Sparrow	***Aimophila ruficeps***	Bird	SC	CNHP
Brewer's Sparrow	***Spizella breweri***	Bird	SC	PIF, USFWS
Black-throated Sparrow	***Amphispiza bilineata***	Bird	SC	PIF
Lark Bunting	***Calamospiza melanocorys***	Bird	SC	PIF, USFWS
Grasshopper Sparrow	***Ammodramus savannarum***	Bird	SC	PIF, USFWS
Fox Sparrow	***Passerella iliaca***	Bird	SC	PIF
Lincoln's Sparrow	***Melospiza lincolnii***	Bird	SC	PIF
White-throated Sparrow	***Zonotrichia albicollis***	Bird	SC	PIF
Harris 'Sparrow	***Zonotrichia querula***	Bird	SC	PIF
McCown's Longspur	***Calcarius mccownii***	Bird	SC	CNHP
Lapland Longspur	***Calcarius lapponicus***	Bird	SC	PIF
Chestnut-collared Longspur	***Calcarius ornatus***	Bird	SC	CNHP, USFWS
Bobolink	***Dolichonyx oryzivorus***	Bird	SC	CNHP
Brown-capped Rosy Finch	***Leucocsticte australis***	Bird	SC	CNHP
Cassin's Finch	***Carpodacus cassinii***	Bird	SC	PIF

CDOW = Colorado Division of Wildlife; CNHP – Colorado Natural Heritage Program
CSP = Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (Reference No. 73) (now called the Shortgrass Prairie Partnership)
PIF = Partners in Flight (Reference No. 74), SAR = Species of Concern
USFWS = US Fish and Wildlife Service (Reference No. 75)
SE = Colorado State Endangered, ST = Colorado State Threatened, SC = Species of Special Concern

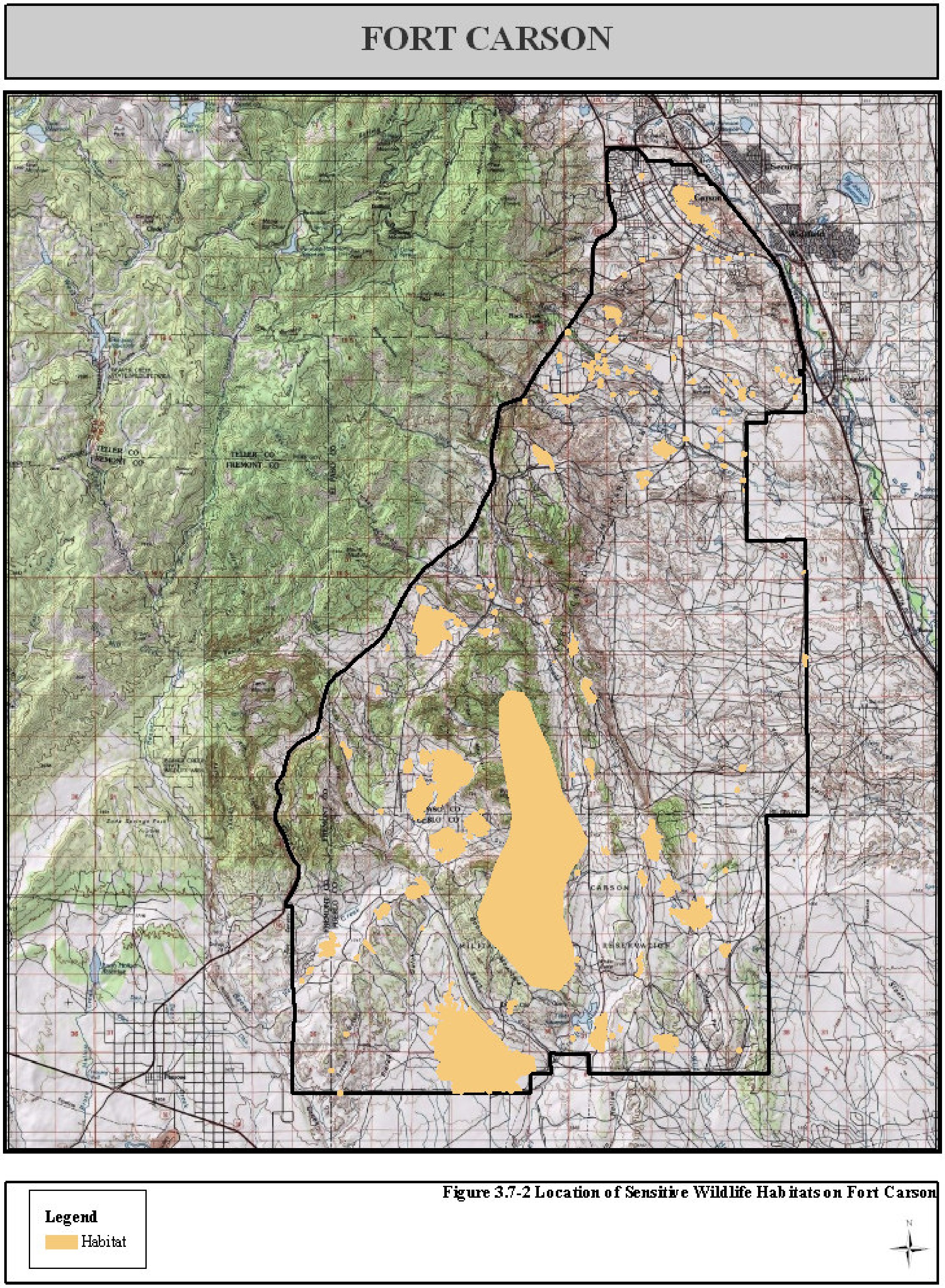

Figure 3.7-2 Location of Sensitive Wildlife Habitats on Fort Carson

Southern redbelly dace, a Colorado Endangered species, was introduced into Stone City Quarry Reservoir from the US Army Pueblo Chemical Depot by Fort Carson and USFWS in the mid-1990s. By 1995 the population was well established. Fort Carson is actively involved with state recovery efforts for this species by providing dace to the CDOW for transplanting elsewhere in the Arkansas River drainage. In 2001 dace captured at Quarry Pond were transferred to the J.D. Mumma Native Aquatic Species Restoration Facility, in Alamosa, Colorado, where they were bred in captivity as part of a state-wide recovery effort (personal communication, Gary Dowler, CDOW Aquatic Biologist, as stated in USACE (Reference No. 6). Progeny of the Quarry Pond dace bred at the facility were recently released in the Arkansas River drainage.

The Arkansas darter (which is also a candidate species for federal listing) was introduced into Lytle Pond in 1980 and has since been stocked in Training Areas 5, 8, 21, 33, 38, and the Small Impact Area. A population established itself in a perennial portion of Turkey Creek, probably as a result of a flood event at Lytle Pond. Fort Carson is actively involved with state recovery efforts for this species by providing darters to the CDOW for transplanting elsewhere in the Arkansas River drainage (Reference No. 6).

Mountain Plovers are rare on Fort Carson, and only a small percent of available habitat is occupied; Mountain Plovers are known to occupy black-tailed prairie dog colonies on Fort Carson only during the breeding season (Reference No. 76).

The Burrowing Owl is a small, burrow-dwelling owl nesting underground in unoccupied prairie dog burrows. The Burrowing Owl has never been common on Fort Carson, and the number of prairie dog colonies annually occupied by this species is low. Much more habitat exists than is used by this species. The Training Area Bravo colony is a long standing site for nesting Burrowing Owls, a state-listed species. In 2007 the prairie dog colony supported eight nests. Surveys have confirmed the presence of Burrowing Owls in 2008. Although sylvatic plague does not directly influence nesting Burrowing Owls, they generally do not nest in colonies where all prairie dogs have been killed by plague, but large colonies partially killed by plague are those often used for nesting by Burrowing Owls on Fort Carson.

The black-tailed prairie dog, a former candidate for federal listing, is common on Fort Carson, occupying approximately 7,700 acres in 78 colonies. It is listed as a Species of Special Concern in Colorado by the CDOW. Frequently referred to as a keystone species of the shortgrass prairie ecosystem, the prairie dog plays a significant role in life cycles of several Species of Special Concern on Fort Carson: the Ferruginous Hawk, Bald and Golden Eagles, Mountain Plover, and the state-listed Burrowing Owl. Prairie dogs are managed on Fort Carson according to prescriptions detailed in the installation prairie dog management plan (Reference No. 77). The plan balances conservation with human health and property loss and details circumstances for lethal control of the species on Fort Carson.

Surveys conducted in 2007 indicate the black-tailed prairie dog colony in Training Area Bravo is approximately 255 acres and supports more than 2,000 adult prairie dogs. Except for the Mountain Plover, all above listed Species of Special Concern are present in or in the vicinity of the colony annually.

Lethal control of prairie dogs is not permitted on Fort Carson at any site occupied by the Burrowing Owl or the Mountain Plover. The Burrowing Owl is generally present on nesting territories late March through September or early October. The Mountain Plover also arrives in March, but generally migrates in August. Multiple pre-lethal control surveys are generally conducted if either species is suspected to be present.

Fumatoxin, selective shooting (recreational shooting is not allowed), and trapping and moving/euthanasia are currently the only methods that are permitted to be deployed to control prairie dogs on Fort Carson. Baiting is not permitted. Due to the size of the colony, Fumatoxin would be the only cost effective choice for eliminating the Training Area Bravo colony. Fumatoxin is a poisonous gas that can be used only when the underground soil temperature is above 55°F. Weather conditions are generally suitable for using Fumatoxin about April through October, but appropriate conditions are occasionally met other times of the year.

The State of Colorado does not list threatened or endangered plant species. The following Colorado Species of Special Concern plants are either known to occur or have the potential to occur on Fort Carson (updated from Reference No. 6).

- Dwarf milkweed (*Asclepias uncialis*) – Small population in southeastern corner of Fort Carson (Reference No. 78).
- Arkansas River feverfew (*Bolophyta tetraneuris*) – Large populations in southeastern and southwestern portions of Fort Carson (Reference No. 78).
- Bird-bill dayflower (*Commelina dianthifolia*) – Rare and known from only a few sites.
- Brandegee wild buckwheat (*Eriogonum brandegei*) – Searches of Morrison formations in 1995 found none (Reference No. 78).
- Rocky Mountain bladderpod (*Lesquereula calcicola*) – Rare in shale barrens of Fort Carson.
- Golden blazing star (*Mentzelia chrysantha*) – Common in southern and southwestern portions of Fort Carson (Reference Nos. 78 and 79).
- Arkansas Valley evening primrose (*Oenothera harringtonii*) – Uncommon in southern portions of Fort Carson; most records from and adjacent to shale barrens.
- Round-leaf four o'clock (*Oxybaphus rotundifolius*) – Large populations in southern portions of Fort Carson (Reference Nos. 78 and 79).
- Degener penstemon (*Penstemon degeneri*) – 1995 searches found none (Reference No. 78).
- Ute ladies' tresses (*Spiranthes diluvialis*) – Searches of wetlands in 1994 and 1995 found none, and 1995 and 1996 searches of Turkey Creek found none (Reference No. 80). No historic records on Fort Carson.
- Pueblo goldenweed (*Oonopsis puebloensis*) – Common Niobrara shale barren endemic, primarily in southeastern portions of Fort Carson (Reference No. 79).
- Rocky Mountain phacelia (*Phacelia denticulata*) – Single record from central Fort Carson.
- Twinevine (*Scarcostemma crispum* – Found in 2005.
- Fendler's Townsend-daisy (*Townsendia fendleri*) – Uncommon in shale barrens of Fort Carson.

Chalk-shale barrens on Fort Carson host several of these sensitive plants, including Arkansas Valley feverfew, dwarf milkweed, and Colorado endemics golden blazing star, round-leaf four o'clock, and Pueblo goldenweed (Reference No. 81). Fort Carson barrens communities are characterized by exposed bedrock formations and generally low plant cover; they largely are restricted to the southern one-third of the installation. The distribution of these habitats is depicted on Figure 3.7-3. Approximately 45 percent of the known range (acres) of the round-leaf four o'clock, approximately 10 percent of the known range of Pueblo goldenweed, and 27 percent of the known range of golden blazing star occur on Fort Carson (Reference No. 79).

3.7.1.4. Wetlands

In 2002, the USACE issued a Regional Permit Under Section 404 of the CWA (33 U.S.C 1344) for *Fort Carson and the PCMS Erosion Control Activities* (Reference No. 82). This regional permit was reissued in 2007 and authorizes Fort Carson to conduct erosion control activities that may result in minimal individual and cumulative impacts to wetlands from dredge and fill activities. Typical erosion control measures include erosion control and stock watering impoundments, banksloping of erosion courses, check dams, rock armor, hardened crossings, culverts and bridges, erosion control terraces and water diversions, water turnouts, and other erosion control activities approved by USACE.

FORT CARSON

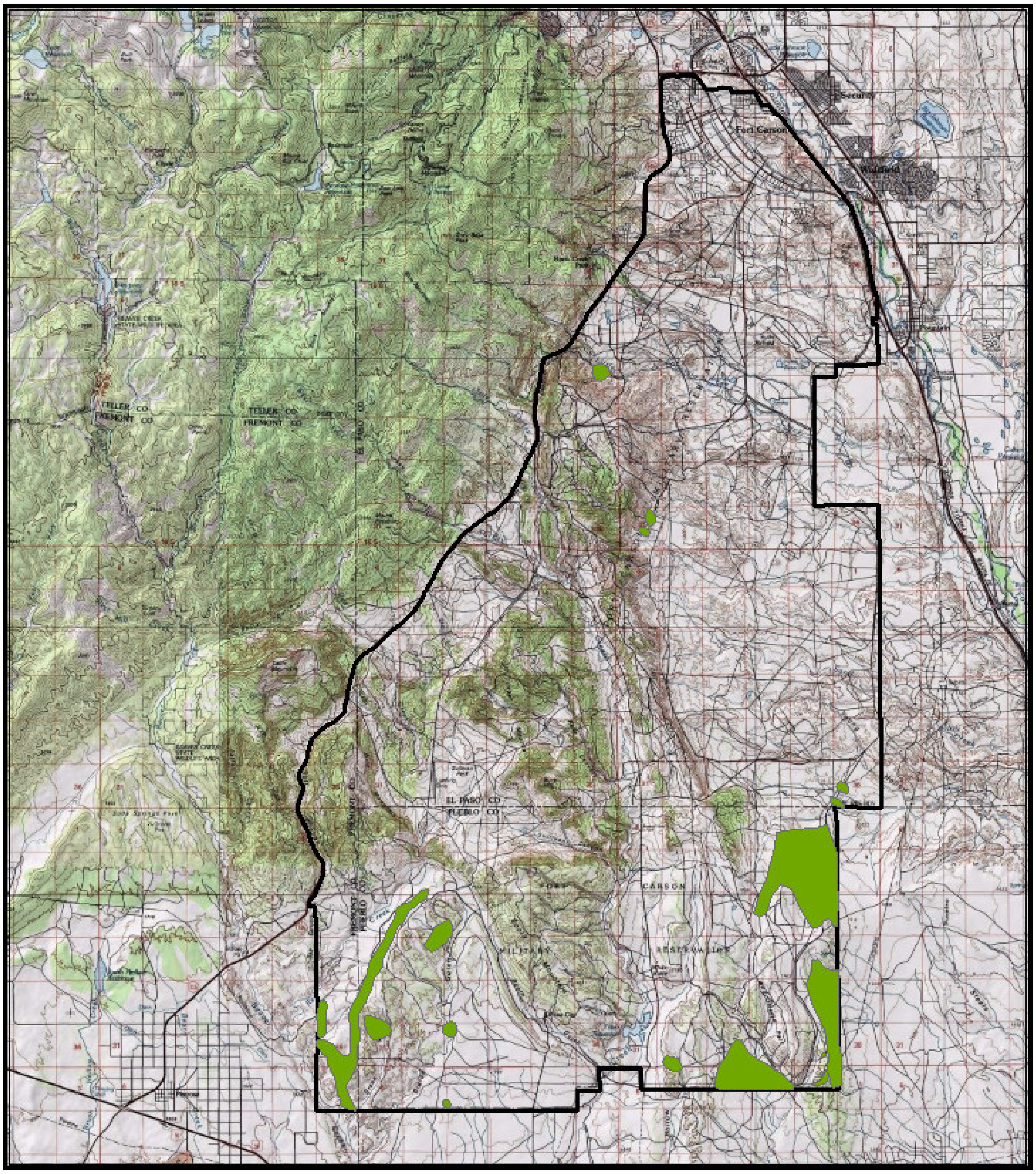

Figure 3.7-3 Location of Sensitive Plant Species on Fort Carson

Fort Carson is included in the National Wetlands Inventory database maintained by the USFWS. Original data showed 487.9 acres of wetlands on Fort Carson. There has been considerable ground-truthing of sites to improve the quality of the original data. The current estimate of wetlands on Fort Carson is approximately 1,028 acres (Reference No. 6).

Wetlands on Fort Carson are generally characterized as linear (e.g., streambeds) or small and isolated. Linear wetlands occur along intermittent and perennial stream channels and tributaries, primarily Rock, Little Fountain, Turkey, Little Turkey, Red, Sand, and Wild Horse creeks. Isolated wetlands usually occur where a dam has been built for erosion control or for water storage; most are only 1-2 acres in size. The largest downrange wetland is on the upper reaches of Teller Reservoir, encompassing approximately 100 acres. In addition to cattails, common wetland species are cottonwood and willow. Some wetlands have been invaded by tamarisk, a noxious weed of primary wetland management concern. About six springs occur on Fort Carson, and they have very small associated wetlands. There are also a number of wetland areas scattered throughout the cantonment area, typically in natural or stormwater runoff drainages and in an area south of BAAF (Reference No. 6).

3.7.2. Environmental Consequences

The following discussions describe the elements of the Proposed Action and the alternatives, including the environmental analyses performed, that are common to all scenarios.

3.7.2.1. Proposed Action and Alternatives

The facility construction for the CS Units would occur as described in Section 2.2.3 within the cantonment area for the Proposed Action and Alternatives 1 and 2. The cantonment area on Fort Carson is highly disturbed and developed, and vegetation consists primarily of non-native ornamental landscaping, including bluegrass turf and landscape trees. Only small areas of native vegetation remain within the cantonment area. Wildlife species that occur within the cantonment area are mostly urban-adapted species such as red fox, pigeons, etc.

Facility construction and renovation of existing facilities to support the CAB would occur as described in Section 2.2.3 for the Proposed Action and Alternatives 1 and 2 at the ORTC site and BAAF. The BAAF is developed area and primarily consists of non-native ornamental landscaping. Due to aircraft operational needs and to reduce the occurrence of Bird Air Strike Hazards (BASH), large trees within flight pattern zones are removed. The vegetation within the ORTC site is described in Section 3.7.2.2.2 and is devoid of any trees.

Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited training resources (maneuver area and firing range availability). This does not change with the IBCT and CAB facilities siting alternatives, and remains constant across all alternatives depending on the units training at Fort Carson and PCMS at any given time. Therefore, impacts from training as discussed under the Proposed Action apply to all the alternatives.

Types of impacts from training expected to occur to vegetation, wetlands, and wildlife and their habitats under the Proposed Action would be similar to the No Action Alternative (implementation of Transformation); however, impact intensities would be expected to increase.

3.7.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

This site would include construction of facilities for both the CAB (due to its proximity to BAAF) and the IBCT. Virtually all lands within the site footprint would be highly disturbed (i.e., used for buildings, roads, sidewalks, etc. or urban landscaping) (Figure 2-3).

3.7.2.2.1. Cantonment Area

The construction/renovation of facilities for the CS Units would be on previously disturbed and developed areas within the cantonment area and would not have any effects on wildlife or vegetation.

3.7.2.2.2. Downrange Area

Operational Readiness Training Center

Vegetation

Within the 575-acre area of interest, the following vegetation species occur and approximately 200 acres within that study area would be needed to build the facility set. This area is comprised of approximately 130 acres of disturbed land, 254 acres of Western wheatgrass/Blue grama, 140 acres of Small soapweed/Blue grama, 45 acres of Big bluestem/Little bluestem and 6 acres of Skunkbrush sumac-Small soapweed/Blue grama. Current condition of the existing native vegetation is considered fair (Reference No. 83). This is determined by groundcover where:

- *Excellent* – 0.75 or more seedlings per SF;
- *Good* – 0.5 to 0.74 seedlings per SF;
- *Fair* – 0.25 to 0.49 seedlings per SF; and
- *Poor* – less than 0.25 seedlings per SF.

Noxious weeds that have been noted in the ORTC area include field bindweed, musk thistle, and Canada thistle in the lower depressions.

Wildlife

Landscaping associated with the Proposed Action would have minimal positive effects on native wildlife and its habitat. Affected habitats are common habitat types on Fort Carson; thus, effects to wildlife would not be significant. In addition, operation of facilities would create disturbance around these facilities. Urban wildlife species would adapt reasonably well to this disturbance as has been shown by similar types of disturbance elsewhere on Fort Carson.

Sensitive species

There are no listed species or Species of Special Concern that use the ORTC site on a regular basis.

Wetlands

No construction activities would occur within wetlands. The ORTC site, however, is adjacent to Rock Creek. Indirect impacts from surface water flow and sedimentation could occur. Section 3.6 provides more information on the potential impacts to Rock Creek from stormwater runoff.

Butts Army Airfield

Vegetation

Any proposed renovation/construction on BAAF would occur within existing structures and/or already disturbed ground. There would be minor impacts associated with the Proposed Action on vegetation.

Wildlife

This alternative would remove wildlife habitat ranging from poor (except for roosting trees for common species) at BAAF to fair in the remainder of the ORTC site. Additional aircraft on the installation would increase the chances of an aircraft-wildlife strike, which could result in loss of life or significant damage to aircraft. A wildlife hazard assessment and a BASH, if required, would be developed.

Sensitive species

There are no listed species or Species of Special Concern that use this site on a regular basis.

Wetlands

No wetlands are located in proximity to the proposed BAAF construction and/or renovation site; therefore no impacts would occur.

Ranges and Training Areas

The addition of the IBCT as part of the Proposed Action is predicted to increase overall maneuver training impacts by 8.6 percent which accounts for the type of unit and number of Soldiers involved. Live-fire requirements are anticipated to increase by approximately 20 percent. Maneuver training of the CAB impacts would be projected to increase by an additional 7 percent and live-fire would increase by approximately 6 percent. In 2008, a decision was made to conduct training exercises for battalion- and brigade-size units primarily at PCMS to better utilize training resources at both Fort Carson and PCMS (Reference No. 83).

Vegetation

Training an additional IBCT and CAB at Fort Carson under the Proposed Action could increase potential impacts to vegetation (see Soils Section, 3.5). Impacts to dismounted training areas and maneuver training areas could increase under the Proposed Action, in extent (number of acres), magnitude (severity), or a combination of both, as previously described and depending on land sustainability considerations.

Risks of accidental wildfires caused by training in live-fire and maneuver training areas would increase under higher training loads.

The greater potential for noxious weed infestations under the Proposed Action would continue to be addressed by the weed prevention strategies and weed control methods that are part of the *Fort Carson Invasive Species Management Plan* (Reference No. 84).

Maneuvers

Restricted areas (e.g., soil protection sites, eagle nesting sites, greenback cutthroat trout protection area), which have been designated to protect resources on particular sites from training impacts, are subject to various constraints to training. To the extent that training is excluded from these areas, there would be minimal impacts to vegetation in restricted areas from training under the No Action Alternative.

Vegetation studies conducted at PCMS to assess effects of training maneuvers on vegetation are applicable to assessing potential impacts of mechanized military training. The studies indicate that grasslands, woodlands, and shrublands have been affected by prior maneuver training on the basis of readily visible imprints of tracks on the soil (tracking) compared with untracked sites. Grassland vegetation ground cover decreased and bare ground increased at tracked compared to untracked sites (Reference Nos. 85 and 86). Surface pitting, caused by tracked vehicle passage, allows for surface water retention, increasing water infiltration into the soil. Reseeding efforts reduce the overall recovery period by allowing succession to shorten the initial weedy stage. Impacts to grasslands, shrublands, and forested areas vary considerably from year to year, and the same is true of mitigation efforts, primarily due to weather and varying training intensities.

Direct impacts associated with maneuver training include tracked vehicles crushing herbaceous and woody vegetation, which might not resprout or otherwise recover, and injury to shallow roots, which might kill the plants or retard development. Pivoting of tracked vehicles can create high shear stress between the tracks and vegetation, resulting in loss of aboveground plant parts and vegetation uprooting, both of which can create bare ground conditions. Disturbance of the soil crust in arid ecosystems can also accelerate erosion, decrease water retention, disrupt plant nutrient cycling at the microbial level, and expose the reservoir of weed seeds in the soil to conditions favorable for germination (Reference No. 87). Indirect impacts from movement of tracked vehicles can result from vegetation loss, soil disturbance, disaggregation, compaction, and consequently erosion, each of which can change the nature and availability of microsites for seed germination (Reference Nos. 85 and 86).

Juniper woodland communities are important for military training because they offer concealment cover for tracked vehicles during maneuvers. PCMS studies (Reference Nos. 85 and 86) indicate that the density of juniper in tracked areas was reduced by 7 percent over a 2-year training period. In these studies understory species in the juniper woodlands were even more seriously impacted than trees due to tracked vehicles maneuvering between larger trees. These actions result in soil compaction with root damage, mechanical damage to woody vegetation, and soil scarification and erosion, which together can result in an immediate reduction in biomass.

A Fort Carson study showed tree decline in specific watersheds attributable to training, and another study showed 17 percent damage to trees (Reference Nos. 79 and 80). Some damage to trees at Fort Carson and PCMS was the result of porcupine feeding.

Decreases in density and cover of woody plants are especially significant in juniper woodlands because they typically occur on steep slopes, have low initial cover, and highly erodible soils. Such effects on woodland understory vegetation may be less severe at Fort Carson than was indicated by PCMS studies because it has many established trails on which tracked vehicles may travel through the woodland areas (Reference Nos. 81).

Accidental wildfires result from mechanized military training in maneuver training areas. Fires have been caused by hot mufflers and hot exhaust from tracked and wheeled vehicles and by field illumination flares, star clusters, tracer rounds, and grenade simulators.

Hardened or paved road surfaces increase runoff, which can alter plant species composition. Roadside margins are generally permanently disturbed and may provide conduits for invasion by weedy species (Reference No. 88). Ongoing impacts from travel on roads and trails would be expected to increase 8.6 percent under the Proposed Action.

For dismounted training areas, direct impacts to vegetation result mainly from pedestrian traffic. For grasses and herbaceous cover, as well as cryptobiotic soils, these impacts range from negligible to substantial, depending on the numbers of dismounted troops traversing a particular area, how they move across the landscape, and the sensitivity of the resources in those areas to disturbance. Direct damage to shrubs and trees from dismounted training is expected to be minimal.

Live-Fire Training

Direct impacts to vegetation from live-fire training include damage by rounds striking or igniting vegetation. Indirect impacts to vegetation (i.e., those arising from soil disturbance) include those previously described for maneuver training. Fire impacts from live-fire training would remain at similar levels as under the No Action Alternative. Impacts described for live-fire training are less than those associated with maneuver training because maneuver training (potentially more damaging) does not occur in impact areas during live-fire activities.

Fort Carson has Prescribed Fire Permit Areas, which are separated into several Project Blocks, which are further divided into Burn Units. PCMS has one Prescribed Fire Permit Area, which is divided in a similar manner (Reference No. 6). Fire is suppressed or controlled where necessary for safety and to protect high-value resources.

Wetlands

Few direct impacts to wetlands occur from ongoing training activities. If future training has the potential to affect wetlands, the Army would coordinate with the USACE to assess impacts and mitigation for disturbance of wetland areas as is the current practice. Training an additional IBCT and CAB could result in indirect impacts to wetlands from erosion and sedimentation processes in drainages upstream of man-made erosion control dams. Sediments could silt in these small wetlands, changing their nature or converting them to upland habitats if erosion-control dams are not properly maintained.

Most direct impacts to wetlands are avoided, and those that cannot be avoided are mitigated through the Section 404 process (through complying either with the Fort Carson/PCMS regional permit or by applying for coverage under a nationwide or individual permit). Impacts to soils resulting from training are discussed in Section 3.5.

Wetland and riparian area buffers are generally protected from vehicular and mechanized training due to the surrounding topography, which makes these areas unsuitable for this type of training. Because of avoidance and minimization efforts Fort Carson currently implements as part of its INRMP and ITAM procedures, direct effects to wetlands do not occur. Erosion control measures described in Sections 3.5 and 3.6 are protective of surface water, including wetlands and riparian areas.

During 1996-97, a Legacy grant was used to study wetland community constituents and their distribution as well as various physical parameters at ten sites on Fort Carson[6] and five sites on PCMS[7]. No decline was noted in representative wetlands, and no statistically significant increases in measured constituents were identified. These studies would be used to provide baselines for future wetland evaluations (Reference No. 6).

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[6] Wetland Program for Fort Carson, Colorado, 1996.
[7] Wetlands Monitoring Program for Piñon Canyon Maneuver Site (PCMS), Model, Colorado, 1998.

Wildlife

The following impacts to wildlife from military training currently occur and would occur at a higher frequency due to training an additional IBCT and potential CAB as part of the Proposed Action.

Military training can reduce wildlife populations indirectly by damaging soils and vegetation, potentially leading to altered plant communities that are unsuitable as habitat for the wildlife species that once used them. Dismounted military training can flush or startle small mammals, ground nesting birds, and reptiles. This may lead to increased predation on young or the displacement and death of eggs or young. Impacts to reproductive success can cause decreased populations (Reference No. 90).

Mule deer, elk, pronghorn, and many species of raptors are more readily flushed or displaced by pedestrians than by moving vehicles. Wildlife species can be affected by mounted military training through direct disturbance and by indirect alteration of their habitat. Small animals that den, nest, or live exclusively on the ground can suffer death from maneuver training. Eggs and young of ground-nesting birds can be destroyed. Human presence and noise from training exercises can disrupt wildlife species from foraging or reproducing. For example, some raptors abandon nests or territories as a result of human presence in the vicinity (Reference No. 90).

Limited research exists on the indirect, habitat-related impacts of mounted military training on reptiles, amphibians, or aquatic species (Reference No. 90). However, military training results in the creation of two-track roads and wider corridors cleared of vegetation. Effects of these types of vegetation removal and surface disturbance on wildlife have been studied extensively (References Nos. 91, 92, 93, 94, 95, 96, 97, 98, 99, and 100).

Training an additional IBCT and CAB as part of the Proposed Action would increase potential impacts to wildlife. In general, species adapted to reduced vegetation, bare ground, or disturbance would be increasingly favored. Depending on training frequency and intensity, species which prefer these conditions, such as the Mountain Plover, might be attracted into the area in greater numbers.

Training an additional IBCT and CAB might displace maneuvers on the grassland/pinyon-juniper interface farther into current pinyon-juniper habitat, which would exacerbate impacts to species using this habitat. Direct disturbance to wildlife species would increase in areas where vehicular activity, fire, and noise increase, which would occur during both maneuver and live-fire training exercises.

Increased dismounted training activity of the IBCT would increase disturbance of wildlife species sensitive to human presence. Species that are more tolerant of human presence, vehicular activity, and noise would be increasingly favored in areas where military training occurs, while species that are less tolerant of these factors would decline.

Pronghorn

The IBCT and CAB training activities have the potential to impact pronghorn populations. Studies conducted on PCMS indicate that movements or temporary shifts in home ranges caused by military training activities did not have measurable effects on pronghorn productivity or physical condition (Reference No. 101). Pronghorn groups have been alarmed by low jet and helicopter overflights, as shown by studies in other locations. This could contribute to less over-winter survival for individuals, poor condition entering the breeding season, reduced reproductive success and recruitment, and eventual population declines (Reference Nos. 92 and 93). Pronghorn are especially vulnerable during fawning season (May 1 to June 30) and in severe winters (Reference No. 94); however, Fort Carson and PCMS herds are stable to increasing. Hunting on Fort Carson and PCMS is regulated by CDOW and, with input from Fort Carson wildlife staff, is used as a tool to manage pronghorn populations.

Mule Deer

Potential impacts to mule deer from mechanized military training maneuvers could occur. One mule deer study (not on Fort Carson or PCMS) demonstrated that if harassed, mule deer exhibit increased overall activity levels, increased use of cover, increased sensitivity to vehicles, increased flight distance, and decreased reproduction the following spring (Reference Nos. 102 and 90). Mule deer may habituate to maneuvers and off-road vehicles if they are not actively pursued (Reference No. 102). In severe winters and during late gestation and lactation periods, helicopter disturbance could adversely affect deer (Reference No. 103). Training restrictions during severe winters and the fawning season (June 20 to August 20) could minimize impacts to mule deer. Fawns are especially vulnerable at this time to mortality from accidents, abandonment, increased predation, and depletion of energy reserves from excessive movement.

Coyote

Coyotes are moderately affected by military training. Most changes in coyote movement from military activity are temporary, and coyotes resume their previous activity patterns and occupy similar home ranges after military activity ends (Reference Nos. 103, 104, and 105).

The IBCT and CAB training activities have the potential to impact coyote populations. The coyote is demonstrably a resilient and widespread species on Fort Carson, but the species is vulnerable to disturbance during the denning period. Significant population perturbations due to military training are not anticipated; therefore, specific management objectives are not indicated for the projected increase in training.

Birds (General)

Goran et al. (Reference No. 290) documented declines in avian biomass (numbers of birds in general) in intensively used maneuver sites on Fort Carson. Diersing and Severinghaus (Reference No. 289) found that bird community composition in prairie habitat on Fort Carson was affected only slightly by training activities. The biomass of seed-eating, open-field species was higher in areas with training while the biomass of omnivorous, open-field species was higher on areas not exposed to training. In woodlands, woodland bird species declined while open-field and edge species increased.

Factors influencing the impacts of military training maneuvers on bird populations include changes in vegetation structure, composition, and development from military maneuvers; responses of birds to changes in vegetation characteristics at many different scales; training-related behavioral changes, which may lead to site abandonment or colonization; seasonal timing of training activities; total displacement of sensitive or secretive species; and attraction of exotic and disturbance-tolerant species to disturbed areas (Reference No. 90).

Studies on changes in the avian community in response to military training for Fort Carson indicate that overall biomass and abundance of prairie habitats were not substantially decreased compared with control sites. The biomass of seed-eating, open-field species was higher on the training site, while the biomass of omnivorous, open-field species was higher on the undisturbed control site. The destruction of trees, shrubs, and ground cover in forests generally results in an increase in open-field, edge, or disturbance-adapted species and a decrease in secretive, woodland, and/or ground-feeding species (Reference No. 90).

Most species in Fort Carson and PCMS grassland habitats, nest on the ground and breed from mid-April to mid-July. Nesting begins in mid-April for several species and is well underway for most species by mid-May. Eggs and nestlings can be destroyed by vehicular traffic, and concentrated training activities can result in abandonment of territories and nests. By mid-fall, most young-of-the-year would be out of nests, although some species continue to nest into fall (Reference No. 103).

Songbirds are particularly susceptible to noise. Male neotropical migrant birds that breed in short-grass prairie, sagebrush, and riparian communities use songs to establish and defend breeding territories and attract females. The volume and frequency of the noise interferes with this ability (Reference Nos. 106, 107, and 108). Waterfowl, especially geese, have been flushed by helicopter overflights; in some cases, normal feeding behavior was substantively disrupted (Reference No. 90).

The area of disturbance varies by species and training activity. Limits on military training during the breeding season reduce impacts on the bird community.

The DOI issued a rule on February 28, 2007, exempting the DoD from the Migratory Bird Treaty Act for the incidental take of migratory birds during readiness activities. Although this exemption would apply to Fort Carson, incidental take of migratory birds from military readiness under the Proposed Action Alternative is not anticipated to be substantial. A military activity is defined as "…all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." Fort Carson takes the protection of migratory birds into account during standard operations such as mowing, burning, tree removal, maintenance, and noxious weed management.

Managing for the persistence of breeding avifauna (bird) communities, including sensitive grassland bird species, such as grasshopper sparrow, Cassin's sparrow, and lark bunting, directly conflicts with military training that tends to create large areas of bare soil and reduced grass and shrub cover. These birds nest in grassland sites, a habitat that also supports most maneuver off-road training on the installation, however, surveys indicate that these species are widespread. In contrast, reduced cover and more bare ground support other native species which prefer those conditions, some of which are species of concern, such as the Mountain Plover.

Raptors

Many raptors are intolerant of high levels of human activity, especially during the breeding season (April through June). When disturbed by humans (on foot or in vehicles), by a gas-operated engine, or the sound of a rifle, fewer ferruginous hawks had successful nests, and fewer young fledged from those nests (Reference No. 112).

Some species of raptors can habituate to high levels of human activity. Short-term impacts on raptors from military training include nesting failures, lowered nesting success, displacement, and changes in wintering distribution and behavior (Reference Nos. 113 and 114). These short-term responses can lead to long-term community changes, such as changes in breeding density and species composition.

Resident raptors located where military training occurred shifted the center of their home range and activity areas, made movements outside of areas where they had previously been confined, and increased the size of the area they used. Birds located in areas not exposed to training did not exhibit these changes to the same extent. In general, birds appeared to increase the size of their home range during periods of military activity. An alternative response to disturbance might have been to seek out areas within the home range but isolated from the disturbance (Reference No. 112).

The addition of a CAB to Fort Carson would result in changes in the disturbance regime experienced by nesting raptors, which constitute the most vulnerable group on the installation. Cliff and tree-top nesting species would experience an increase in disturbance associated with noise and the sudden presence of low flying aircraft in the immediate vicinity of nests or eyries. Raptors nesting on the installation possess individual and species differences in response to disturbance. Individuals nesting in populated sections of Fort Carson or raptors nesting in the vicinity of the aircraft bombing range have demonstrated a greater tolerance to specific types of disturbance, a tolerance that may not be present in conspecifics nesting elsewhere on the installation.

Surveys and anecdotal data collected on Fort Carson identify large mature deciduous trees in riparian or small isolated stands, cliffs, and the pinyon-juniper/grassland ecotone as the most important large birds of prey nesting habitats. Most frequently used trees are plains cottonwood and Siberian elm (Reference No. 76). Fort Carson biologists provide G-3 with wildlife information and recommendations for minimizing potential impacts to nesting raptors. Most tree-nesting raptors nest just inside treelines in pinyon-juniper or similar woodland islands, the same locations where troops prefer for visual access to open areas.

Jet overflights have not been shown to influence nesting success of Red-tailed Hawks. Over time, these birds habituate to low-level air traffic and the intensity of avoidance behavior decreases. For example, many raptor species that nest along prominent landscape features, such as cliffs in open country, are easily disturbed during the nesting season, often resulting in nest abandonment (Reference No. 114). Golden Eagles prefer to nest away from human disturbances, including roads, and experience reduced nesting success in nests located closer to roads than in nests farther from roads (Reference No. 115).[8]

Small Mammals

Impacts from military training on small mammals are similar to those on bird communities; species adapted to reduced vegetation, bare ground, or disturbance are favored, while more sensitive woodland species or those requiring intact short-grass prairie ecosystems decline. Studies of small mammal community compositions at Fort Carson indicate that, in prairie habitats, small mammal species that prefer sandy soils and eat seeds of weedy plants replaced other species (Reference No. 90).

Diersing and Severinghaus (1984) found that in Fort Carson prairie, small mammals that preferred sandy soils and eat seeds of weedy plants replaced other species in areas disturbed by training. In woodland, woodland small mammal species were replaced by open-field, disturbance-adapted species. Goran et al. (1983) found four small mammal species declined and three species were unaffected in intensively used maneuver sites on Fort Carson.

Elk

Many elk found on Fort Carson and PCMS are part of resident populations, and these elk spend all or most of the year on the installations. Development of water resources and recovering/reseeding grasslands adjacent to known elk wintering areas reduce impacts from military training on elk (Reference No. 76). It is notable that elk moved onto PCMS after acquisition and initiation of military training.

Sensitive Species

The following impacts to sensitive species from military training occur on Fort Carson and would continue to occur and with higher frequency under the Proposed Action. Fort Carson regularly coordinates with the USFWS and CDOW to determine potential impacts and mitigation for sensitive species. Fort Carson implements measures outlined in several biological assessments to minimize impacts to protected species. Figure 3.7-2 depicts sensitive wildlife species habitat on Fort Carson.

Black-tailed Prairie Dog

Training an additional IBCT and CAB would likely increase prairie dog burrow damage, and direct mortality could increase from increased maneuver training in prairie dog habitat. Impacts to prairie dogs from increased military training would directly and indirectly affect associated species, including the

[8] Studies have not been conducted on Fort Carson or PCMS.

Burrowing Owl, Mountain Plover, and Bald and Golden Eagles. Disturbance and destruction of prairie dog habitat would directly affect Burrowing Owls and Mountain Plovers if these species were present in the colony and would reduce suitable habitat in areas not currently occupied by these species. If prairie dog populations significantly decline on Fort Carson or PCMS, use of the installation for foraging and/or nesting by Ferruginous Hawks could decline or be eliminated. In 2004, Black-tailed prairie dogs were removed from the USFWS Candidate species list, however black-tailed prairie dogs would continue to be managed according to the *Biological Assessment and Management Plan for the Black-tailed Prairie Dog on Fort Carson and the PCMS* (Reference No. 77).

Prairie dogs prefer vegetation with low structure and height. Disturbances that reduce vegetation structure and height (direct training impacts, bivouac areas, fires, etc.) may allow prairie dogs to colonize disturbed areas, potentially resulting in an increase in occupied habitat. This may have the net effect of increasing habitat for associated species.

Destruction of active burrows from large-caliber weapons firing (on Fort Carson only) or mine plows is the greatest threat to the prairie dogs from military training. Prairie dog burrows usually have multiple entrances and are generally deeper than the surface disruption from mine plows; therefore, mine plow deployment within a colony would have little long-term effect on the colony. Off-road vehicles could damage burrow entrances or kill prairie dogs caught in the open during a maneuver; however, it is unlikely these activities would permanently damage burrows or kill occupants of a burrow. Trench obstacles dug within prairie dog colonies could damage burrows and kill prairie dogs.

Equipment and personnel drops may have a short-term direct adverse effect on prairie dogs and a negligible effect on the long-term viability of a colony. Live small-arms-caliber munitions firing poses minimal to no threat to prairie dogs. However, prairie dog burrowing activities on small-arms ranges with electronic targeting mechanisms have caused problems with buried electrical power wires.

The number of colonies and total occupied acreage of black-tailed prairie dogs can vary substantially from year to year because of sylvatic plague outbreaks. Results of Fort Carson surveys suggest that plague exerts greater control over prairie dog populations than do mechanized and off-road vehicular training.

Burrowing Owl

Burrowing Owls (state-listed as Threatened) use active prairie dog colonies and other dens in Fort Carson and PCMS. Military training impacts to Burrowing Owls are similar to those of prairie dogs, but actions like establishing bivouacs in close proximity to nest burrows can result in nest abandonment. The USFWS recommends maintaining a 0.8- to 1.6-kilometer buffer around active nest burrows (Romin and Muck 1999). Generally, these buffers can be accommodated for establishment of bivouac sites, but in some cases, training may require occasional encroachment of nesting areas.

Mountain Plover

Dismounted troops and off-road vehicle traffic are the greatest direct threats to Mountain Plovers on Fort Carson and PCMS. People walking across the prairie or exiting vehicles caused Mountain Plovers to perform their distraction display or flush and fly a short distance. Plovers rarely responded to military convoys and other traffic by flushing unless the Plovers were near the roadway. Prolonged human presence near breeding territory would likely disrupt egg incubation or chick brooding, resulting in death of the eggs or chicks (Reference No. 116). Vehicles traveling cross-country, including travel contiguous to roads, could kill juveniles sheltered in tall vegetation adjacent to the road and destroy nests on the open prairie. Effects of military helicopter overflights on nesting Mountain Plovers are unknown, but jet overflights did not alter or interrupt the normal behavior routine of adult Plovers (Reference No. 116).

The Mountain Plover was proposed for listing as a threatened species in 1999, but the USFWS withdrew the proposal in 2003. Because the Mountain Plover is no longer proposed for listing, the ***Biological Assessment and Management Plan for the Mountain Plover on Fort Carson*** (Reference No. 72), which required a 660-foot radius buffer zone around each Mountain Plover nest site during the breeding season, is no longer in force.

Military training impacts to Mountain Plovers would be similar to those of prairie dogs. Off-road vehicles and resource management activities can negatively affect nesting Mountain Plovers by killing eggs and young birds. Plovers are sometimes struck by vehicles operating on roads traversing prairie dog colonies. Dismounted training, recreationists, and employees can destroy eggs in cryptic nests or cause increased predation of juvenile birds. Plovers successfully nest in the primary breeding colony while facing these threats. Significant population perturbations due to military training are not anticipated; therefore, specific management objectives are not indicated for the projected increase in training. Fort Carson would continue to annually monitor the presence of plovers on Fort Carson and take appropriate management actions as required, including monitoring breeding success of the plovers.

Sylvatic plague in prairie dogs is probably the greatest indirect threat to Mountain Plovers on Fort Carson by lowering the occurrence of suitable habitat for nesting. On Fort Carson, Mountain Plovers exclusively nest in prairie dog colonies because habitat conditions for nesting Plovers are maintained by soil disturbing and foraging behaviors of the prairie dog.

Bald and Golden Eagles

Impacts to the Bald Eagle from military training are primarily related to the availability of black-tailed prairie dogs as prey. No training restrictions are associated with the management of the Bald Eagle. Available research indicates variable Bald Eagle response to disturbance (Reference No. 90). The loss of prairie dogs from sylvatic plague and prolonged activities, such as bivouacking, in prairie dog colonies are sources of secondary impacts to Eagles.

Golden Eagles nest on Fort Carson and PCMS. During breeding season, the Golden Eagle is sensitive to human disturbance, particularly dismounted troops, recreationists, approaching vehicles, and many land management activities.

Triploid Checkered Whiptail

Surveys conducted on Fort Carson and PCMS in 2006 (Reference No. 117) indicate this species is fairly common in southeastern Colorado juniper woodland and savanna, Pinyon-juniper woodland, western great plains riparian woodland and shrubland, inter-mountain basins wash, and invasive southwestern riparian woodland and shrubland. Impacts to triploid checkered whiptails (Species at Risk) from military training would be similar to those described for small mammals and ground-nesting birds. Habitat may be disturbed, and animals may be killed during training maneuvers. Specific impacts of military training on this species are difficult to determine at this time.

Mexican Spotted Owl

Military training effects on Mexican Spotted Owls roosting and foraging are unknown, but disturbance to Mexican Spotted Owls from dismounted troop movement, vehicle maneuvering, cross-country movement, bivouac, and aircraft support has been evaluated to be minimal (Reference No. 72).

Delany et al. (Reference No. 267) recommended a 105-meter buffer zone for helicopter overflights year-round (Holloman Air Forces Base, New Mexico). Spotted Owls are known to winter on Fort Carson, primarily within impact safety fans for aircraft and large munitions firing. Because the owls use multiple day roost locations within a wintering area, generally changing roost sites daily, avoiding individual sites is not feasible.

Arkansas Darter

Arkansas darters are found in areas that are open to the public but are restricted from military training. There are no known impacts from military training to the Arkansas darter.

Greenback Cutthroat Trout

Restricted training zones exist around greenback cutthroat trout ponds, and there is a no-dig zone near the underground pipeline connecting Lytle and Duck ponds. The total land area designated as buffer zones and removed from training is approximately 20 acres, and the duration of military training restrictions at the ponds is indefinite (Reference No. 6). There are no impacts from military training to the greenback cutthroat trout.

Southern Redbelly Dace

Stone City Quarry, where the southern redbelly dace is found, is restricted from training because of its historical significance, and no military training takes place in this area (Reference No. 6). There are no known impacts from military training to the southern redbelly dace.

Impacts to sensitive plant species from increased military training on Fort Carson under the Proposed Action would generally be similar to those described above for vegetation within the particular type or types of training areas in which they occur.

3.7.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

Vegetation

Virtually all lands within the site footprint would be highly disturbed (i.e., used for buildings, roads, sidewalks, etc. or urban landscaping) (Figure 2-10). Within the 700-acre AOI, the following vegetation species occur and approximately 200 acres within that study area would be needed to build the facility set. This area is comprised of approximately 250 acres of disturbed land, 215 acres of Western wheatgrass/Blue grama, 232 acres of Skunkbrush sumac/Small soapweed/Blue grama and 2 acres of Common cattails/Mesic graminoids. Current condition of the existing native vegetation is considered fair or poor (described in Section 3.7.2.2.2).

Noxious weeds noted in the Training Area Bravo area are tamarisk, Russian olive, hoary cress, spotted knapweed, and Canada thistle (noted in low-lying areas or depressions). Giant pepperweed has been noted near Training Area Bravo and is suspect for this area.

Wildlife

Landscaping associated with this alternative would have minimal positive effects on native wildlife and its habitat. In addition, operation of facilities would create disturbance around these facilities. Urban wildlife species would adapt reasonably well to this disturbance as has been shown by similar types of disturbance elsewhere on Fort Carson.

Sensitive Species

Construction activities at the Training Area Bravo site could indirectly impact the burrowing owl by removing nesting habitat (prairie dog burrows). Proactively addressing the Training Area Bravo colony would be required to prevent costly construction delays due to compliance conflicts with the Migratory Bird Treaty Act and state laws protecting the owls. Presence of the owls and the toxicant use weather requirements dictate that lethal control at the site be conducted August-September prior to beginning construction. Fort Carson maintains a contract to control prairie dogs when necessary. Control is only used when the prairie dog colony can cause damage to structures or risk of plague spread is possible. In addition to potential project delays, failure to address the Training Area Bravo colony would create pest management issues at sites in the vicinity of the project site.

Training Area Bravo in its entirety (approximately 700 acres) conservatively supports a prairie dog colony of more than 2,000 individuals. Approximately 200 acres are proposed to support the construction site, and, depending on the final siting, part of the colony would most likely be affected. There is no way to predict where they would go when construction begins, but they would likely immigrate to turf grass and bare soil in the nearby populated areas of the cantonment area, creating human health concerns. Following completion of construction, prairie dog mortality would likely increase due to traffic and decisions to remove prairie dogs as previously described.

Wetlands

No wetlands would be affected by this alternative.

3.7.2.3.1. Cantonment Area

The construction of facilities for the CS Units would be on previously disturbed and developed areas within the cantonment area and would not have any measurable effects on flora or fauna.

3.7.2.3.2. Downrange Area

Operational Readiness Training Center

This alternative would have the same impacts as described in the Proposed Action in Section 3.7.2.2.2

Butts Army Airfield

Impacts from the construction/renovations under this alternative at BAAF would be the same as for the Proposed Action.

Ranges and Training Areas

Impacts under this alternative would be the same as for the Proposed Action.

3.7.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Vegetation

Within the 265-acre AOI, the following vegetation species occur and approximately 200 acres within that study area would be needed to build the facility set. This area is comprised of approximately 50 acres of disturbed land, 175 acres of Small soapweed/Blue Grama, 21 acres of Big bluestem/Blue grama, 16 acres of Ponderosa pine/gambel oak/Riparian woodland, 2.5 acres of Big bluestem/Little bluestem and 0.5 acres of Common cattails/Mesic graminoids.

Wildlife

Landscaping associated with the Alternative 2 would have minimal positive effects on native wildlife and its habitat. Affected habitats are common habitat types on Fort Carson; thus, effects to wildlife would not be significant. Operation of facilities would create disturbance around these facilities. Urban wildlife species would adapt reasonably well to this disturbance as has been shown by similar types of disturbance elsewhere on Fort Carson.

Sensitive Species

The only Species of Special Concern that uses this site on a regular basis is the black-tailed prairie dog. This area is a designated prairie dog suppression area, so there would be no new effects on this species. The Burrowing Owl and Mountain Plover have not been known to occur at this site.

Wetlands

There would be no direct impacts to wetlands from this alternative. However, indirect impacts to wetlands or riparian areas are currently being assessed in the Fort Carson's ***Draft Stormwater Management Plan*** (Reference No. 283), which should be finalized prior to implementation of the proposed project.

3.7.2.4.1. Cantonment Area

The construction of facilities for the CS Units would be on previously disturbed and developed areas within the cantonment area and would not have any measurable effects on vegetation or wildlife.

3.7.2.4.2. Downrange Area

Operational Readiness Training Center

Only the CAB facility set would be placed in the vicinity of the ORTC under this alternative and would require an approximate 50-acre construction footprint. This alternative would have the same impacts as described in the Proposed Action in Section 3.7.2.2.2

Butts Army Airfield

Impacts from the construction/renovations under this alternative at BAAF would be the same as for the Proposed Action.

Ranges and Training Areas

Impacts under this alternative would be the same as for the Proposed Action.

3.7.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson associated with Transformation would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities already analyzed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, however, they are on schedule and their implementation is assumed as part of the No Action Alternative.

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson. Therefore, no construction to support these units would occur, and impacts from construction and operation of facilities would not occur.

Impacts to vegetation, wildlife, and wetlands from training as described under the Proposed Action currently occur at Fort Carson and would continue to occur under the No Action Alternative. Fort Carson already trains an existing IBCT and has had aviation training ongoing in different formations over the years, based on stationing and National Guard/Reserve training. Impacts from the increased frequency from training the additional IBCT and CAB would not occur, however, under the No Action Alternative.

3.8. Cultural Resources

3.8.1. Affected Environment

Cultural resources management on Fort Carson (this also includes management of PCMS) encompasses conservation of resources of significance to the history or prehistory of the United States or of traditional, religious, or cultural importance to Native Americans. These resources consist of the material manifestations of the knowledge, beliefs, art, morals, laws, and customs particular to a people or society. Fort Carson manages cultural resources associated with all major prehistoric and historic cultural periods recognized on the southern Great Plains and Rocky Mountains.

Archeological and historical studies have been conducted on the land encompassed by Fort Carson for the past 60 years. Prehistoric, historic, and multi-component sites eligible for inclusion in the National Register of Historic Places (National Register) are known to occur throughout the installation. Evaluative studies of Fort Carson's built environment (historic structures) have also been conducted or are in progress, to include World War II (WWII) temporary wood structures, Capehart and Wherry Era (1949-1962) family housing, and Cold War Era facilities.

Between April 14, and Aug 12, 2008, Fort Carson experienced four wildland fire events covering 9,461 acres. The TA-25 fire was the largest, encompassing 9,064 acres. Fort Carson's CRM and Senior Archaeologist were on-site as Resource Advisors (RA) and conducted immediate cultural resources site assessments following the Department of Interior (DOI) Burned Area Emergency Response/Rehabilitation (BAER) Standards. The assessments identified 44 archaeological sites eligible for inclusion in the National Register, including two Native American burial sites and three historic grave sites. Thirty of these sites require further evaluative sub-surface testing to determine appropriate levels of site stabilization. The Center for Environmental Management on Military Lands (CEMML) at Colorado State University began evaluative testing in July 2008 under the direction of the CRM and the Deputy Garrison Commander, PCMS. In addition, Fort Carson cultural resources personnel have conducted a 100 percent Phase I/II Archaeological Inventory of both un-surveyed and previously surveyed lands within the fire perimeters. To date, 250 additional archaeological sites have been identified. A report detailing these assessments will be forwarded to the COSHPO, the ACHP, and Tribes upon completion. Consultation efforts will be initiated as appropriate for the level of stabilization, site monitoring, and further Phase II evaluation as needed.

3.8.1.1. Prehistoric and Historic Background

Three general stages of prehistory have been documented for southeastern Colorado: the Paleoindian, Archaic, and Late Prehistoric. An earlier stage, the Pre-Clovis, has been proposed, but direct evidence of this stage in the region is lacking. The Paleoindian, Archaic, and Late Prehistoric stages in southeastern Colorado are each subdivided into three periods. These periods represent specific changes or innovations in the material culture of prehistoric peoples that suggest broader changes in environmental conditions and/or political and socioeconomic structure. These periods span from approximately 11,500 Before Present (B.P.) to 225 B.P.

The historic era of southeastern Colorado spans the first 16th century European incursions into the area to the present. The cultural chronology includes occupations during the Spanish, Mexican, and Euroamerican eras, such as trapping/trading sites, 19th century Hispanic and Euroamerican settlements, early 20th century homesteading and ranching complexes, and WWII and Cold War era military sites.

Appendix G contains a detailed description of the prehistoric and historic cultural sequences, as well as sections specifically covering the settlement of the Fort Carson region and the historic development of Camp/Fort Carson.

3.8.1.2. Section 106 Compliance and the Army Alternate Procedures

Management of cultural resources hinges on the identification and eligibility of resources for inclusion in the National Register. Both historic and prehistoric archaeological sites, as well as buildings and structures are referred to as *historic properties.* A separate class of cultural resources is the ***traditional*** *cultural property* (TCP), which may be eligible for inclusion in the National Register because of traditional, religious, and/or cultural importance to Native American tribes or other cultural groups. This designation also incorporates and considers Native American sacred sites. Coordination with Native American tribes regarding TCPs and sacred sites, and those identified to date on Fort Carson are discussed in Section 3.8.1.7.

The foundation of broad legislation for preservation of cultural resources is the National Historic Preservation Act (NHPA) of 1966 (36 CFR Part 800). The NHPA calls upon the federal government to be a leader in preservation and outlines roles of the National Register, the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP) in overseeing management of cultural resources.

Of particular importance to military installations are Sections 106 and 110 of the NHPA. Section 110 of the NHPA, part of a 1980 revision, requires federal agencies to institute programs to identify and evaluate cultural resources eligible for inclusion in the National Register under their care. Section 110 inventories identify cultural resources using literature review and physical/pedestrian survey. Documentation on each inventoried resource is submitted to the Colorado SHPO (COSHPO). These inventories, however, may not provide sufficient information to assess the historic significance, ***i.e.***, National Register eligibility, of identified resources.

Evaluative studies constitute the mechanism by which inventoried resources are assessed against criteria of the National Register and upon which all subsequent management actions are based. Section 106 requires federal agencies to consider effects of *undertakings* on resources listed in, or eligible for inclusion in, the National Register through a process of consultation. The process for compliance with Section 106 consists of the following steps:

1) ***Identification of cultural resources*** located within the Area of Potential Effect (APE) of a proposed undertaking is accomplished through review of existing documentation and field surveys.
2) ***Cultural resources evaluation*** is conducted using National Register criteria (36 CFR Part 63). Properties that meet the criteria are considered *eligible* for listing in the National Register and are subject to further review under Section 106. Properties that do not meet the criteria are considered *not eligible* for inclusion in the National Register and are generally not subject to further Section 106 review.
3) ***Determination of effect*** of the proposed undertaking is assessed on properties that are determined to meet the National Register criteria. One of the following effect findings will be made: *No Historic Properties Affected*, *No Adverse Effect*, or *Adverse Effect*.
4) ***Resolution of adverse effects/mitigation*** occurs when adverse effects are found. Consultation continues between the federal agency and consulting parties to attempt resolution. Successful consultation results in an agreement of the efforts to be taken to avoid or mitigate adverse effects.

Fort Carson has maintained a CRM Program since the late 1970s. CRM Program personnel have developed and implemented various management plans and agreement documents to guide overall cultural resources identification, treatment, and preservation strategies for compliance with the NHPA and all federal, state, DoD, and Army laws, regulations, and policies provisions regarding cultural resources management. To date, the two most significant guidance documents are a Memorandum of Agreement (MOA) between Fort Carson, the COSHPO, and the ACHP (1980) (Reference No. 268, and included in Appendix G), and the *Integrated Cultural Resources Management Plan, 2002-2006* (Reference No. 7).

In July 2007, Fort Carson's Garrison Commander made the decision to comply with Section 106 of the NHPA through implementation of the Army Alternate Procedures (AAP) in lieu of 36 CFR Part 800. The AAP will allow Fort Carson to be more efficient, consistent, and comprehensive in its compliance with Section 106, while providing better management of the Army's historic properties through a planning approach to compliance, closer integration with the military mission, and by encouraging new and innovative means for stakeholder involvement.

The NHPA allows an agency to develop procedures to implement Section 106 and substitute them for subpart B as long as they are consistent with Section 106 regulations (36 CFR 800.14[a]). The AAP approaches the installation's management of historic properties programmatically, instead of on a project-by-project review as prescribed by the regulations of the ACHP, and is intended to be a proactive planning and management approach to historic preservation.

The ACHP approved the AAP in 2001, and the Army published the final AAP in the Federal Register (67 Federal Register 10138-10165) on March 6, 2002. Since this original publication, the Army has undergone internal reorganization that required the AAP to be revised. In November, 2003, the ACHP approved an amendment allowing the ACHP chairman to make technical or administrative changes to these procedures provided that they do not alter the role of consulting parties. An amended AAP was subsequently published in the ***Federal Register*** (69 Federal Register 20576-20588) on April 16, 2004.

The AAP involves consultation input from the COSHPO, Native American tribes, other consulting parties, and the public to develop a set of SOPs for the consideration and treatment of historic properties. Identified consulting parties for Fort Carson's AAP efforts are the COSHPO, the Colorado Council of Professional Archaeologists (CCPA), Colorado Preservation, Inc. (CPI), the Colorado National Trust for Historic Preservation, preservation specialists from Las Animas, Huerfano, and Otero counties, and the 12 Native American tribes with a cultural affiliation to Fort Carson administered lands.

As part of the AAP, a Historic Properties Component (HPC) is developed in consultation with all appropriate parties. Once completed and certified by the ACHP, the HPC replaces several chapters in the installation ICRMP. As such, implementation of the AAP serves as both a Programmatic Agreement for Section 106 compliance and a management document to direct day-to-day operations for CRM. At present, Fort Carson anticipates completion of the HPC and certification by the ACHP in late 2009. Until that time, the case-by-case Section 106 compliance review stipulated in the 1980 MOA with the COSHPO and ACHP, and the basic management principles outlined in the 2002-2006 ICRMP, will remain as the governing guidance.

Appendix G contains a copy of the 1980 MOA, a complete list of cultural resources related laws, regulations, and EOs, and the full text of the AAP (2004, as amended). A copy of the 2002-2006 ICRMP may be reviewed at the Fort Carson Curation Facility, Building 2420.

3.8.1.3. Cultural Resources Investigations

3.8.1.3.1. Archaeological Resources

The history of archaeological research on Fort Carson and in the surrounding area dates from the 1930s. Archaeological research has intensified over the last two decades in association with the development of the CRM Program at Fort Carson and the acquisition of the PCMS. The listing of Fort Carson's archaeological investigations, reports, and publications is summarized in Appendix G; however, it is not an inclusive list of all Section 106 compliance actions since only large-scale archaeological investigations generate full reports. Since the Army's objectives have evolved to meet the changing military training strategies that have emerged through the Global War on Terrorism, such large-scale projects have not taken place on Fort Carson since 2001.

As such, the CRM Program initiated a programmatic shift in 2004/2005 to the use of in-house archaeological services for the majority of the annual workload requirements. The internal focus has allowed for the accomplishment of a much larger percentage of field work and a greater concentration on resource management. The majority of undertakings at Fort Carson pertain to the cantonment area, with other project-specific activities occurring due to upgrades to ranges, maintenance of training land, or from utilities-type work. These projects are generally forwarded to the COSHPO via letters or letter-reports. Although Fort Carson makes every attempt to be proactive in its pedestrian surveys and historic property re-evaluations, most work is based on a current requirement and is conducted by Fort Carson archaeological personnel on a project-by-project basis in conjunction with the NEPA process.

Approximately 75 percent of Fort Carson has been inventoried for cultural resources, with historic properties identified in the following categories: districts, buildings, structures, and historic, prehistoric, and multi-component archaeological sites. A total of 1,605 archeological sites have been recorded on Fort Carson to date. Of these, 108 are currently determined to be eligible for inclusion in the National Register, with 1,497 sites determined to be not eligible. Prehistoric sites number 1,319; historic sites number 240, of which 46 sites are multi-component (i.e., having both prehistoric and historic components); and approximately 50 sites contain either historic or prehistoric rock art. The cantonment area of Fort Carson has been surveyed 100 percent for cultural resources and is devoid of known prehistoric sites.

Prehistoric encompass 82 percent of the total number of sites recorded to date. Prehistoric site types include defensive fortifications, open architectural sites, open and sheltered camp sites, lithic scatter assemblages and food procurement or processing sites, quarry locations, and game drives. Historic sites date to the late 1860s and include 19th/20th century ranching, homestead, and town complexes with numerous building types and functions, and small mining and stone/clay quarry operation sites. Both prehistoric and historic rock art is found on Fort Carson, again, with prehistoric elements predominating. Most rock art is located within the designated Turkey Creek Rock Art District, but some isolated panels exist. Of the 108 sites on Fort Carson determined to be eligible for inclusion in the National Register, 88 are prehistoric, 14 are historic, and 6 are multi-component.

Site investigations have resulted in the collection of over 1,000 cubic feet of curated materials from Fort Carson investigations, which include material culture, faunal remains, and associated scientific documentation. The archaeological collection is housed in Fort Carson's Curation Facility. Artifacts and all associated documentation are curated in accordance with 36 CFR Part 79, Curation of Federally-owned Archaeological Resources and 48 Federal Register 44716, Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines.

3.8.1.3.2. Paleontological Resources

Although not strictly classified as cultural resources, paleontological resources are managed by the Fort Carson Cultural Resources Program, as the management issues surrounding paleontological locales and collections are essentially consistent with those of archaeological resources. To date, 53 paleontological localities have been identified on Fort Carson.

3.8.1.4. Architectural Properties

All extant buildings and structures on Fort Carson that are not documented as historic archaeological sites were constructed during military ownership and occupancy, with the exception of the Corley House, the remnants of Stone City, and the Turkey Creek Ranch. The Corley House (ca. 1910s-1920s), was evaluated in 1999 and determined not eligible for inclusion in the National Register (SHPO concurrence 6 DEC 1999). Stone City (ca. 1906-1959) was a small town created around the industry of clay and gypsum mining and stone quarrying. The remains of the town and quarries were evaluated in 1985 and re-evaluated in 1988/89 and 1997, and are currently protected as a historic archaeological site. Details on Turkey Creek Ranch (Spencer Penrose, ca. 1912-1939) are provided in the discussion on historic districts in Section 3.8.1.5. Architectural evaluations on 43 historic building sites over or approaching 50 years of age have been completed. Four historic districts are located on Fort Carson: the Old Hospital Complex, the Incinerator Complex, the Turkey Creek Recreation Area, and the Turkey Creek Rock Art District. A total of 68 buildings on Fort Carson are contributing properties of these historic districts.

Fort Carson has completed the inventory and evaluation of WWII era architectural properties and historic architectural investigations are focused on the built environment from the Cold War Era. In 2000, the US Army Environmental Command (USAEC) produced the ***Thematic Study and Guidelines: Identification and Evaluation of U.S. Army Cold War Era Military-Industrial Historic Properties*** (Reference No. 122) that established a historic context for the Army's Cold War mission and outlined significance standards for evaluation of these properties for National Register eligibility. Under this guidance, properties on Fort Carson have little potential for qualification to the National Register under *Criteria Consideration "g"* for properties less than 50 years of age. National Register eligibility determinations will be assessed for all properties approaching 50 years of age.

The inventory of Fort Carson's historic Cold War Era properties began in 2002. To assist in evaluating the installation's built environment, *The Cold War and Fort Carson: A Historic Context* was completed in 2003 (Reference No. 123). The inventory will be completed in three phases. The first phase will address the built environment of Fort Carson from the beginning of the Cold War in 1947 to the Berlin Crisis of 1961. The Cold War Phase I (1947-1961) Buildings Inventory of 55 buildings and structures is currently in process with a completion date projected for the end of 2008. The second phase will cover the period from 1962-1979 with an estimated 334 buildings and structures scheduled for inventory beginning in 2012. The third, and final, phase will cover the period from 1980-1989 with an estimated 120 buildings and structures scheduled for inventory in 2030.

On May 21, 2007, the Army published a notice in the Federal Register (Vol. 72, No. 97) to adopt the ACHP Program Comments (18 August 2006), for Cold War Era (1946-1974) Unaccompanied Personnel Housing, WWII and Cold War Era (1939-1974) Ammunition Storage Facilities, and WWII and Cold War Era (1939-1974) Army Ammunitions Production Facilities and Plants as a programmatic compliance mechanism under 36 CFR 800.14(e).

These comments include treatment measures for the following undertakings: ongoing operations; maintenance and repair; rehabilitation; renovation; mothballing; cessation of maintenance; new construction; demolition, deconstruction, and salvage; remediation activities and transfer, sale, lease, and closure of the facilities. To ensure that the effect of these undertakings is taken into account, the Army will execute the steps identified as treatment measures in the Program Comments, Sections II.A., relating to each property type. Properties on Fort Carson that are affected by the Program Comments include 36 Cold War Era (1946-1974) Unaccompanied Personnel Housing (UPH) buildings and 13 WWII and Cold War Era (1939-1974) Ammunition Storage Facilities on Fort Carson. The Army submitted lists of properties in each state, drawn from the Integrated Facilities System (IFS) 4th Quarter fiscal year 2006 data, affected by the Program Comments to the COSHPO.

In 1996, the DoD initiated a program to privatize family housing in an effort to facilitate refurbishing current quarters and to build new housing. In November 1999, Fort Carson became one of the first DoD installations to award a 50-year contract to privatize on-post family housing, which was awarded to Fort Carson Family Housing, LLC, Colorado. The purpose of the contract was to revitalize, maintain and manage the existing 1,826 housing units, and develop, maintain and manage new housing units. Of the existing units, 301 were constructed in 1957 and 1958 as part of the Capehart military housing program established in 1955 to improve living conditions for military personnel and their Families. Under a collaborative effort between the federal government and private industry, the program provided financial incentives to private companies for the construction of family housing units on or near military installations.

Due to the high percentage of family housing units that would be reaching the 50-year age criteria for National Register consideration on military installations, the DoD began consultation with the ACHP to discuss options to streamline compliance of Capehart and Wherry properties in April 2001. Following a request for program comments (January 2002) on the Army's proposed program for management of these properties, the ACHP published a NOI to issue a Program Comment (March 2002), with approval on 31 May 2002. Section 106 compliance was, therefore, completed for Army properties through the Program Comment for the Capehart and Wherry Era Army Family Housing and Associated Structures and Landscape Features (1949-62). This agreement between the DoD, Army, and the ACHP allows installations to proceed with renovation, demolition, or privatization of these housing units without any additional consultation or SHPO notification. Military housing on Fort Carson is currently managed by Balfour Beatty Communities, Limited Liability Company.

3.8.1.5. Historic Districts

Fort Carson manages four historic districts: the Old Hospital Complex, the Incinerator Complex, Turkey Creek Ranch Historic District, and the Turkey Creek Rock Art District. The Old Hospital Complex and Incinerator Complex, both WWII era properties, are located on the cantonment area. The Turkey Creek Ranch Historic District is located in the Turkey Creek Ranch Recreation Area, which is open to the public and is located along the southwest parameter of Fort Carson. The Turkey Creek Rock Art District is located downrange on Fort Carson in Turkey Canyon.

The Fort Carson Military Reservation Old Hospital Complex represents the largest hospital complex, one of only nine built on military installations in the nation during WWII. The Carson Hospital Center opened in August 1942 to provide medical care for Camp Carson’s Soldiers. The combined general and convalescent hospitals had a 2,000-bed capacity with 11 square miles of floor space, where more than 30,000 patients were cared for over the course of the war. Many of the former hospital center buildings have either undergone extensive renovations during the past fifty years or have been demolished. Buildings 6236 and 6237 represent the most extant remains of the Old Hospital Complex, and both have been adapted for reuse. Building 6237 was recently restored to represent as closely as possible the building's WWII appearance. A 2002 amended MOA with the COSHPO was developed concerning treatment of the Old Hospital Complex Historic District. Certain stipulations of the MOA have bearing on proposed construction adjacent to the Complex. The specific stipulations are covered in the Environment Assessment for Additional Family Housing Units, Fort Carson, Colorado, 2006 (Reference No. 54).

The Incinerator Complex (ca. 1942) consists of three extant buildings (3850, 3851, and 3852) and is located near Gate 20 along the southwest boundary of the former WWII era Waste Water Treatment Plant (WWTP). The remaining two-story concrete block and brick buildings with brick smokestacks are distinctive in architecture from the other buildings constructed on Camp Carson during WWII. Constructed from standard military plans, the incinerators burned medical waste and military documents. Today the buildings have been converted to serve as engineering offices and administrative facilities.

Turkey Creek Ranch is a historic district eligible for inclusion in the National Register for its association with Spencer Penrose, mining magnate, tourism entrepreneur, and developer of Colorado Springs community projects (ca. 1912-1939). The historic district consists of seven contributing buildings and structures. The architectural centerpiece of the district is a Spanish Revival style residence, the Penrose House (ca. 1912), built by architects MacLaren and Thomas of Colorado Springs. The roughly hewn log cabin (ca. 1912) with large stone fireplace was the first building constructed on the property by Penrose.

Other structures include the former milk house that played a role in Penrose's dairy operation, a riding stable, and two barns, each unique in its distinctive architecture that is representative of a Wisconsin Dairy Barn and Traverse Frame Barn. Today, the historic district is part of the Turkey Creek Recreation Area, which provides Fort Carson and the community with camping, trail rides, and special events hosted within the historic district, especially in the Penrose House.

The Turkey Creek Rock Art District was listed on the National Register in 1976 and is also known as the "Turkey Canyon District," and is listed on the Colorado Historical Society Office of Archaeology and Historic Preservation database as "Indian Petroglyphs and Pictographs – Turkey Creek Canyon." Although lacking well-defined boundaries, the district contains 31 archaeological sites, only five of which are known to have rock art.

3.8.1.6. Former Historic Districts

The former WWII era WWTP was determined as a historic district eligible for inclusion in the National Register in 1996, as the facility was facing an extensive upgrade to comply with Colorado mandates for effluent and water quality that required construction of new facilities. Many of the former WWII structures had previously been upgraded and renovated (1960s, 1970s, and 1980s), some extensively altered during the 50-year operation of the facility. Upon completion of the 1990s upgrade, and in accordance with the requirements stipulated in the 1996 MOA between the ACHP, the COSHPO and Fort Carson, the former obsolete WWII buildings and structures were demolished or abandoned. Thus, the WWTP was determined as not eligible as a historic district.

The former WWII era Warehouse and Utility District is situated in the railhead area in the northeast corner of Fort Carson. Many of the WWII temporary buildings and structures, covered by the Programmatic MOA between the DoD, the ACHP, and the National Council of SHPOs (1986, amended May 1991), have been demolished through the years. On August 4, 2000, the COSHPO concurred with Fort Carson's recommendation that the District was no longer eligible for inclusion in the National Register.

3.8.1.7. Native American Consultation Status and Initiatives

Ethnohistoric research to identify Native American tribes having traditional ties to Fort Carson administered lands began in the 1980s as part of the cultural resources surveys in support of Army acquisition of the PCMS. Although no specific Fort Carson or PCMS locations were identified at that time, the study described the southeastern Colorado region as an "inter-tribal and peripheral area rather than a core territory" with the exception of the Apachean groups that utilized the region for a long period of time.

In 1998, a comprehensive ethnohistoric study of Fort Carson and the PCMS was conducted to provide a basis for future consultation with Native American tribes to identify traditional cultural properties. This study identified seven general tribal cultures with 13 points of contact for consultation. It also recorded sites on both installations that had potential tribal significance that could assist in the identification of traditional cultural properties.

Also in 1998, an extensive Native American oral history project was initiated to create a record of traditional Native American use of Fort Carson and the PCMS and support identification of traditional cultural properties. While this project was to include all tribes expressing interest in Fort Carson or the PCMS, it was only completed for the Cheyenne-Arapaho Tribe of Oklahoma.

Beginning in 2002, Fort Carson initiated a project to complete the required Native American consultation in accordance with Section 106 of the NHPA, the American Indian Religious Freedom Act (AIRFA) of 1996, and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990. Nine sessions of field visitation occurred at the PCMS and Fort Carson, with 23 tribal representatives from ten federally-recognized tribes participating. All consultation efforts were conducted in accordance with the Presidential Memorandum, Government to Government Relations with Native American Tribal Governments (April 29, 1994); EO 13175, Consultation and Coordination with Indian Tribal Governments (November, 2000); and the DoD Annotated American Indian and Alaska Native Policy (27 October 1999).

In November 2004, a Comprehensive Agreement (CA) Regarding Tribal Access, Privacy and Information Sharing, and Inadvertent Discovery and Intentional Excavation of Native American Human Remains and Cultural Items Culturally Affiliated with the Following Indian Tribes: Apache Tribe of Oklahoma; Cheyenne and Arapaho Tribes of Oklahoma; Comanche Nation of Oklahoma; Kiowa Tribe of Oklahoma; Northern Arapaho Tribe; Northern Cheyenne Tribe; Oglala Sioux Tribe of the Pine Ridge Reservation; Shoshone Tribe (Eastern Band); Southern Ute Indian Tribe; and the Ute Mountain Ute Tribe, Within Federal Lands Owned or Controlled by Fort Carson, Colorado was signed in a ceremony held on Fort Carson. The Jicarilla Apache Nation signed a separate, but identical, CA in May 2005. Appendix G contains a copy of the Agreement.

TCPs and sacred sites were also identified during the consultation process, the results of which are presented in *Our Footprints Are There: Report of Native American Consultation to Identify Traditional Cultural Properties and Sacred Sites on Land Administered by Fort Carson, Colorado* (Reference No. 121). On Fort Carson, one sacred site was identified, located within the Turkey Creek Rock Art District. Although only one site was identified as having direct, religious significance for culturally affiliated tribes, the sacred site associated with this District may be expanded in the future depending on consultation with other tribes that expressed an interest in the area, but have thus far been unable to complete a site visit.

Native American consultation will not be necessary for the cantonment area unless human remains are discovered during ground disturbing activities, but will continue for downrange area projects with the potential to impact cultural resources significant to Fort Carson affiliated tribes. In the event that human remains are discovered, either through construction activities, training, or natural processes, *Fort Carson's Inadvertent Discovery of Archaeological Resources or Burials SOPs* (Reference No. 269, and included in Appendix G) will take effect, resulting in further consultation with the appropriately identified Native American tribe(s) as outlined in the NAGPRA CA. Fort Carson has inventoried its collection and has completed repatriation of all human remains in accordance with NAGPRA.

Native American tribes are not the only groups that may have an interest in properties located on Army administered lands for cultural or traditional reasons. Other ethnic groups, such as those of Hispanic, Italian, or German descent, etc., also have historic ties to southern Colorado. Fort Carson makes every attempt to include these groups/individuals in background research and decision-making processes when they can be identified. On Fort Carson, such groups have included "Keeping History Alive," an association with a preservation interest in the Harkin's Grave site off SH 115, as well as oral histories and document sharing with former residents of the Turkey Creek Ranch and Stone City. Cultural resources personnel respond to all Family and community inquiries for access to or information about historic properties located on Fort Carson.

3.8.2. Environmental Consequences

The following discussions describe the elements of the Proposed Action and alternatives, including the environmental analysis performed, that are common to all scenarios.

3.8.2.1. Proposed Action and Alternatives

The locations and actions analyzed in this EIS as the Proposed Action and alternatives are detailed in Section 2.0. Fort Carson's CRM has determined that these actions constitute undertakings in accordance with Section 106 (36 CFR 800.16[y]) of the NHPA. Three alternative locations are being considered for this federal undertaking. The proposed IBCT is the only unit to change location between the three siting alternatives; its facilities could be set either:

1) South of Titus Boulevard on Wilderness Road at the ORTC site (identified as the Proposed Action);
2) The eastern part of the main cantonment area at Training Area Bravo (referred to as Alternative 1); or
3) South of Titus Boulevard on Wilderness Road at the Tent City site (referred to as Alternative 2).

For each alternative scenario, the facilities for the CS units would be constructed in the cantonment area and the CAB facilities would be constructed at the ORTC site and BAAF (directly adjacent to the ORTC site).

The cultural resources reviews for the Proposed Action and alternatives pertain primarily to construction related actions.

3.8.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

As stated above, proposed construction/renovation sites for the CS Units would be in the cantonment area and construction of potential CAB facilities would be at the ORTC site and BAAF. This would not change with the IBCT siting alternatives. Fort Carson has completed an internal review to identify historic properties and assess the effect of this undertaking on those properties for the Proposed Action. The Fort Carson CRM has made an initial determination that the APE for the ORTC site is the extent of the ground disturbance necessary for the proposed construction activities. Phase I archaeological inventories have been completed, and no historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within this area. Section 106 consultation in accordance with the NHPA has been initiated with the COSHPO, the ACHP, and Tribes regarding this undertaking. As such, no construction activities for the Proposed Action will commence until the Section 106 consultation process has been finalized.

3.8.2.2.1. Cantonment Area

The facility construction for the CS Units would occur within the cantonment area in two general locations (Figure 2-4). The proposed construction to support the Engineer Company would require the demolition of the existing buildings that reside within the proposed APE. There are eight buildings within the APE of the Engineer Company potential siting. These buildings were constructed in 1956 as motor pool facilities. Fort Carson completed the Architectural Inventory Evaluation documentation for these buildings, and it was determined that they are not eligible for the National Register. Consultation was initiated with the COSHPO in a letter dated April 15, 2008 (Reference No. 270). Fort Carson has assumed COSHPO concurrence under 36 CFR 800.3(c)(4), as no official response was received within 30 days of receipt of the letter.

The proposed construction to support the Quartermaster Company would require no demolition of existing facilities and would occur on previously disturbed ground. Fort Carson has completed an internal review to identify historic properties and assess the effect of this undertaking on those properties. The Fort Carson CRM has made an initial determination that the APE for activities to support the Quartermaster Company is the extent of the ground disturbance necessary for the proposed construction.

Phase I archaeological inventories have been completed, and no historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within this area. Section 106 consultation in accordance with the NHPA has been initiated with the COSHPO, the ACHP, and Tribes regarding this undertaking. As such, no construction activities for the Proposed Action will commence until the Section 106 consultation process has been finalized.

3.8.2.2.2. Downrange Area

Operational Readiness Training Center

As stated in Section 3.8.2.2, Section 106 consultation in accordance with the NHPA has been initiated with the COSHPO, the ACHP, and Tribes regarding this undertaking. As such, no construction activities for the Proposed Action will commence until the Section 106 consultation process has been finalized.

Butts Army Airfield

Fort Carson has completed an internal review to identify historic properties and assess the effect of this undertaking on those properties for the Proposed Action. The Fort Carson CRM has made an initial determination that the APE for the BAAF site is the extent of the ground disturbance necessary for the proposed construction activities. Phase I archaeological inventories have been completed, and no historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within this area. Section 106 consultation in accordance with the NHPA has been initiated with the COSHPO, the ACHP, and Tribes regarding this undertaking. As such, no construction activities for the Proposed Action will commence until the Section 106 consultation process has been finalized.

Ranges and Training Areas

The impacts from training an additional IBCT and potential CAB at Fort Carson could directly and indirectly affect nearly all available training areas within the boundaries of Fort Carson. Military training activities have the potential to result in adverse impacts to cultural resources. The demands of training these additional units combined with Transformation actions of training three HBCTs, one IBCT, 43rd Sustainment BCT, Special Forces and Reservists, make cultural resource protection a very important component of the overall environmental protection and sustainable principles adhered to by Fort Carson.

3.8.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Fort Carson has completed an internal review to identify historic properties and assess the effect of this undertaking on those properties for Alternative 1. Should the decision-maker choose Alternative 1 over the Proposed Action, Section 106 consultation in accordance with the NHPA will be initiated with the COSHPO, the ACHP, and Tribes regarding this undertaking. No construction activities for Alternative 1 will commence until the Section 106 consultation process has been finalized.

3.8.2.3.1. Cantonment Area

Under this alternative, impacts on the cantonment area would be the same as for the Proposed Action.

3.8.2.3.2. Downrange Area

Under this alternative, impacts on the downrange area would be the same as for the Proposed Action.

3.8.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Fort Carson has completed an internal review to identify historic properties and assess the effect of this undertaking on those properties for Alternative 2. Should the decision-maker choose Alternative 2 over the Proposed Action, Section 106 consultation in accordance with the NHPA will be initiated with the COSHPO, the ACHP, and Tribes regarding this undertaking. No construction activities for Alternative 1 will commence until the Section 106 consultation process has been finalized.

3.8.2.4.1. Cantonment Area

Under this alternative, impacts on the cantonment area would be the same as for the Proposed Action.

3.8.2.4.2. Downrange Area

Under this alternative, impacts downrange area would be the same as for the Proposed Action.

3.8.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of the No Action Alternative.

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3.9. Socioeconomics

This section describes the affected environment and environmental consequences to the following:

- Demographics
- Housing
- Economic development
- Public finance
- Quality of life
- Environmental justice in minority and low-income populations
- Protection of children from environmental health risks and safety risks

Implementing the Proposed Action could have impacts that are concentrated in a geographical area referred to as the ROI. The definition of the ROI considers local residential, shopping, and commuting patterns. The ROI is intended to encompass the geographical area within which linkages are strongest between businesses involved in construction activities and the long-term operation of the new facilities.

The ROI for the Proposed Action at Fort Carson comprises three counties: El Paso, Fremont, and Pueblo. The area of Fort Carson, where all of the construction activity would occur, is located in southern El Paso County. Virtually the entire Colorado Springs urbanized area is located north of the installation and contained within El Paso County. Adjacent portions of surrounding counties are also a part of the Colorado Springs functional economic region, including Fremont County to the southwest, and Pueblo County to the south. Socioeconomics and the ROI for PCMS are discussed in Section 4.9.

3.9.1. Affected Environment

3.9.1.1. Demographics

3.9.1.1.1. Region of Interest

The estimated population of the ROI totaled 777,806 in 2006, an increase of more than 11.6 percent since 2000. Two large communities are located in the ROI: the City of Colorado Springs, located north of Fort Carson, with a population of just over 370,000 in 2006; and the City of Pueblo, located southeast of Fort Carson, with a population in 2006 of approximately 104,000 residents (Reference No. 124).

More than 5,100 civilian workers are employed at Fort Carson (appropriated, non-appropriated, contractor, and others). Assuming each is a head of household, this would represent a population of over 14,600 persons (applying an average household size of 1.87 as estimated by the PPACG, 2008 [Reference No. 125]). The 25,100 active duty military personnel are accompanied by approximately 46,900 Family members, which results in a total connected population of about 77,000 persons, or nearly 10 percent of the entire 2006 population of the ROI (Table 2-1).

3.9.1.2. Housing

3.9.1.2.1. On-Post

Fort Carson has on-post housing units for both unaccompanied and accompanied personnel. There are currently 2,664 family housing units of various types contained in numerous clusters or “villages.”

According to the 2008 Housing Market Analysis, there is a validated on-post housing requirement for 4,012 family housing units by 2013 (Reference No. 126). With a current inventory of 2,664 family housing units, a serious housing deficiency exists on-post that will continue to grow over the next five years. The analysis anticipated that another 952 units would be needed by 2013. The construction of 952 family housing units may not be realized however, due to limited space and land constraints within the cantonment area on Fort Carson.

Fort Carson Family Housing, LLC, the installation's public/private housing provider, plans to construct at least 400 additional family housing units (dependent upon land availability and funds). This project will be the subject of an EA, prior to project initiation.

Unaccompanied personnel are accommodated in barracks that collectively provide 5,672 spaces, of which 372 are Wounded Warrior spaces. Of these, 72 spaces are used for personnel newly arrived at the installation. Because of the severe shortfall in barracks spaces, a number of projects are planned or underway to provide more billeting for unaccompanied Soldiers. By 2013, an additional 4,346 barrack spaces should be available (Reference No. 127).

3.9.1.2.2. Off-Post

As of July 2007, an estimated 329,800 housing units were located in the ROI (Reference No. 124). The proportion of owner-occupied housing units was 68 percent, with the lowest concentration in El Paso and Pueblo County (68 percent in 2006) and highest concentration in Fremont (76 percent in 2000; 2006 information unavailable for this County). Overall, the quality of housing in the ROI is considered good. The proportion of units lacking complete plumbing and kitchen facilities (a surrogate measure for quality) is low for all counties of the ROI.

The off-post population in the Fort Carson market area (within a 20-mile commute of the installation's main work areas) currently totals 535,167 persons, having increased at an average annual rate of 1.8 percent since 2000. Population is forecast to grow 2.3 percent per year, for a projected market area population of 598,428 persons in 2013. The area's housing stock is currently estimated to total 225,277 units. Owner-occupants claim 64.9 percent of occupied homes, while renters occupy the remaining 35.9 percent (Reference No. 126).

Vacancy rates and rentals in all areas within the Colorado Springs metropolitan area are highly cyclical. The rental vacancy rate was estimated to be 8.8 percent, up from 4.8 percent in 2000 (Reference No. 124). The influx of military personnel into the Fort Carson area will lead to declining vacancy rates over the next five years. Vacancy rates for 2013 are projected to be 6.5 percent in the rental market (Reference No. 126).

3.9.1.3. Economic Development

Characteristics of economic development include employment and its distribution across industrial sectors, unemployment, earnings and sources of income, and the contribution made to the regional economy by the military installations, their personnel, and retired service members.

3.9.1.3.1. Employment

In 2006, the Colorado Department of Labor and Employment (Reference No. 130) indicated that there were more than 2.2 million jobs in Colorado, of which about 351 thousand were military and federal/civilian jobs.

More than 400,000 people were employed in the ROI in 2005, 79 percent of whom worked in El Paso County (Reference No. 129). In El Paso County, the largest share of employment is concentrated in the federal government, with 11 percent accounted for by military and civilian jobs. The retail trade sector employed 11 percent and state and local government accounted for a 9 percent share. In Fremont and Pueblo counties, employment in state and local government contributes substantially to both economies. The largest employers in El Paso County are the major military installations, with the proportion of military employment in the county being much higher than the ROI and the state.

The unemployment rate in all counties of the ROI gradually increased from an average low of three percent in 2000 to an average of six percent in 2005. In 2000, the unemployment rate of the State of Colorado was approximately three percent and in 2005 it was approximately five percent (Reference No. 130).

3.9.1.3.2. Earnings and Income

Total non-farm wage and salary earnings in the ROI totaled nearly $17.6 billion in 2006, approximately 84 percent of which was contributed by El Paso County (Reference No. 128). The contribution to total earnings by the military sector is highly concentrated in El Paso County, where it reaches approximately 18 percent compared to 2 percent for the state and 1 percent for the other ROI counties, collectively.

3.9.1.3.3. Military Activities

Five major military installations are within the ROI, including Fort Carson, USAFA, Schriever Air Force Base (AFB), Peterson AFB, and the Cheyenne Mountain Air Station. These installations are important to the health and stability of the regional economy and support businesses and jobs through 1) payroll expenditures by military and civilian personnel; 2) direct procurement of goods and services by the installations for operations and maintenance functions; and 3) government contract awards to private firms located in the region.

Personnel (Active Duty and Civilian)

According to the US Department of Commerce (Bureau of Economic Analysis), the estimated total economic impact of the military in Colorado for 2007 was $3.39 billion. This represents about one third of the total state economy.

According to an article by John Hazlehurst in 2007 (Reference No. 131), direct military payrolls totaled $2.32 billion in 2006. Construction, services, and procurement of materials, equipment, and supplies injected $1.3 billion into the regional economy and, according to the Chamber, the dollar value of jobs created was $960 million. Fort Carson alone accounts for 10 percent of the region’s economy, before the scheduled troop increases. The local economic impact of Fort Carson is nearly $1 billion annually, including $662.1 million in military payroll, $147.4 million in civilian payroll, $60 million in operations, $13 million in utilities, $167.1 million in military procurement, and $40 million for TriCare health insurance. Statewide, the post will account for almost 53,000 jobs, almost all in the Pikes Peak region (including troops). Employee compensation and gross business income will increase to approximately $2 billion. State and local tax revenue attributable to the post will increase from $87.4 million to about $192 million.

The total Fort Carson related population as of 2006 was approximately 36,000 (Reference No. 132).

Payroll

Earnings paid to personnel (active duty and civilian) at Fort Carson totaled over $1 billion in 2007 (Reference No. 10).

Procurements

Expenditures on grants and contracts by the installations vary measurably from year to year. The value of grants and contracts for Fort Carson, as reported by the DoD, ranged between $191 and $334 million annually for the period 2004-2008.

In 2007, operating expenditures at Fort Carson that had the greatest effect on the local economy (after salaries) were local purchases and contracts (approximately $204 million), utilities (approximately $17 million), and rent and lease payments (approximately $3 million) (Reference No. 10).

The large majority (greater than 99 percent) of DoD prime contracts awarded to firms in the ROI have been made to companies located in El Paso County, accounting for over 54 percent of all DoD awards statewide. The value of prime contract awards in El Paso County totaled more than $2.2 billion in 2006 (Reference No. 133).

Multiplier Effects

The injection of funds into a regional economy has what is referred to as a direct effect. This spending creates a demand for goods and services that, in turn, increases output and employment in numerous support industries. This is referred to as the induced effect, and the link between the two is the multiplier effect.

3.9.1.4. Public Finance

The primary sources of revenue for the three counties of the ROI are 1) sales taxes, 2) property taxes, 3) transfers from the state government, and 4) transfers from the federal government (Reference No. 134). In El Paso and Fremont counties, property taxes contribute a relatively small share of total revenues (under 17 percent) in comparison to Pueblo County (30 percent). Sales tax revenues are especially important for El Paso County and are attributable to its role as the major commercial hub of the ROI. Revenues derived from state and federal government transfers are important to all counties in the ROI, and particularly in Fremont County, where the revenue comprises approximately 45 percent.

The major operating expenditure categories for the counties are 1) public safety, 2) general government, 3) social services, and 4) health. The provision of social services consumes approximately 30 percent of operating expenditures in Pueblo and Fremont counties but is much lower in El Paso County at approximately 21 percent. Expenditures on public safety comprises approximately 25 percent of the operating expenditures for each county (Reference No. 134).

3.9.1.5. Quality of Life

3.9.1.5.1. On-Post

Numerous facilities and services located on Fort Carson contribute to the quality of life of on-post residents and military personnel and their Families residing off-post.

Child Care

The childcare programs at Fort Carson are available for children six weeks to eleven years of age. These services are provided at six on-post centers: the Southwest Center, located by Gate 5 offers hourly care and well as full-day care; the East and West Centers are located near Gate 1. The Southeast Center is located near Gate 20, and the North Center is near Gate 3. Before and after school care is offered for infants up to 11 years. Of these six centers, one is for school age (first grade through sixth grade); the other five centers are for infants through kindergarten. Most of the centers are at capacity and together support about 970 children. Four additional childcare facilities are planned for construction over the next several years.

Health Care

Evans Army Community Hospital is located on-post and has about a 400-bed capacity. Most of the rooms at Evans Army Community Hospital are semiprivate (two beds), although there are a limited number of private rooms, and four bed rooms as well. The hospital is comprised of two distinct buildings separated by a glassed Commons Area. The five-story Tower at the front of the hospital houses all Inpatient Units, the Operating Suite, the Delivery Suite, Nursery, Radiology, Occupational Therapy, Physical Therapy, Emergency Room, and the Nutrition Care Division. The two-story Clinic Building contains all Outpatient Clinics, the Command Suite, and other administrative support functions. The Commons Area, which provides the main entries into the building, also houses patient service activities such as Outpatient Records, Outpatient Pharmacy, Admissions and Dispositions, Hospital Treasurer, Post Exchange, Barber Shop and Chapel. The hospital provides service to Soldiers, retirees, and their Families. Care is supplemented by dental clinics and other medical clinics.

Public Schools

Located 7 miles southwest of the City of Colorado Springs, Fountain-Fort Carson School District 8 encompasses the City of Fountain, Fort Carson, Rock Creek, and nearby rural areas. There are 11 schools within District 8, of which three elementary schools and one middle school are located on Fort Carson. Most of the enrollment in the on-post schools comes from on-post and off-post military dependents, with a small percentage of non-military children. High school students residing on-post are bused to the nearby Fountain-Fort Carson High School.

Other Facilities

There are also a number of additional on-post facilities, including a commissary, Post Exchange, recreation facilities, chapel, mini-mall, dental clinics, and many other support facilities.

3.9.1.5.2. Off-Post

The communities that surround Fort Carson provide numerous recreational, medical, retail, food, and other community services and facilities. Of the wide array of off-post services and facilities, public schools are highly important.

Community Public Schools

There are 20 school districts in the ROI with a total combined student membership in 2007 of 138,019 (Reference No. 135).

Personnel assigned to Fort Carson reside throughout the ROI and their children make up sizeable portions of the student membership in some school districts. There can be substantial fiscal implications for school districts that have a high proportion of their student members residing on military installations. The major installations in the region include Fort Carson, Peterson AFB, Air Force Academy, and Schriever AFB.

School districts rely on a number of funding sources, especially local property tax assessments, funds from the state, and federal funds. Military installations are exempt from local taxes and, thus, local school districts are eligible for federal impact aid funds. These payments are designed to offset the potential loss of property tax payments to affected school districts. The impact aid received is highly weighted in proportion to the students who reside on the military installations, not in the communities.

The number of federally connected students, primarily the children of military and appropriated fund civilian personnel in this area, is highly concentrated in Fountain-Fort Carson School District 8, adjacent to Fort Carson, which also operates the four on-post schools. For 2008, this school district's average daily attendance (ADA) was 5,340.84, of which 3,012.99 consisted of federally connected students (Reference No. 136).

Smaller, yet noticeable, concentrations are evident in the Academy School District (21 percent of ADA), Widefield School District 3 (15 percent of ADA), and El Paso County School District 3 (15 percent of ADA).

Although the share of ADA that federally connected students comprise is high, the impact aid contribution to the budget in these three school districts is smaller. This is explained by the fact that the great majority of the students do not reside on the military installation; thus, less impact aid is directed to these school districts. Their contribution to the school district budgets is through property tax payments associated with their places of residence in the community.

3.9.1.6. Environmental Justice

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires each federal agency to identify and address any disproportionately high and adverse environmental or economic effects that its programs and policies might have on minority or low-income populations.

Environmental Justice: Guidance Under the National Environmental Policy Act defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, or Hispanic (Reference No. 137). According to the guidance, a minority population should be identified where the minority population of the affected area either exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.

According to US Census Bureau (Reference No. 138), the percentage of minority populations within the ROI are approximately 20 percent in El Paso County, 18 percent in Pueblo County, and 11 percent in Fremont County. The population of the census tracts including and immediately adjacent to Fort Carson has a higher percentage of minority population than El Paso County and the ROI. The proportion of minority population, however, was less than the 50 percent threshold. Fort Carson's residential population, as with other military populations, contributes to that higher minority percentage in the immediate area of the post. Of the total US Military, 38 percent of active duty members identify themselves as minorities (Reference No. 139).

Low-income populations are identified using the Census Bureau's statistical poverty threshold, which varies by household size and number of children. For example, the poverty threshold for a Family of four with two children was $17,463 in 2000 and rose to $21,027 by 2007. Nationwide, the proportion of people in poverty was 11.3 percent in 2000 and 12.5 percent in 2007. The Census Bureau defines a "poverty area" as a census tract or block numbering area where 20 percent or more of the residents have incomes below the poverty threshold (Reference No. 140).

Both Pueblo and Fremont counties have poverty levels that exceed or are equivalent to 20 percent; Pueblo County at approximately 31 percent and Fremont County at approximately 20 percent. El Paso County's poverty level is approximately 15 percent. While each county does not meet the definition of a poverty area (census tracts or blocks), there are small geographical areas within each county where more than 20 percent of the population lives below the poverty level (Reference No. 140).

3.9.1.7. Protection of Children

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," seeks to protect children from disproportionately incurring environmental health or safety risks that might arise from government policies, programs, activities, and standards.

Children are present on Fort Carson in a number of settings, including family housing neighborhoods, three elementary schools, one middle school, day care centers, and recreational areas. During the 2007-2008 school year, there were 2,322 children enrolled in the schools on Fort Carson. Of the 2,322 children enrolled, 1,817 were in elementary and 505 were in Middle school (Reference No. 141).

3.9.2. Environmental Consequences

3.9.2.1. Proposed Action

3.9.2.1.1. Economic Measures of Project Effects

A number of measures are used to assess the economic effects that the project could have on the regional economy. Attention is focused on the project-induced effects on population, employment, income, and sales volume.

The initial step in estimating socioeconomic effects is to characterize aspects of the construction and operational phases of the Proposed Action. With the aid of economic impact modeling techniques (described as follows), the economic effects of each aspect of the Proposed Action are translated into measures such as jobs and income.

The primary catalyst for changes to socioeconomic resources is a change in economic activity, i.e., industrial output (value of goods and services), employment, and income. Changes in employment have the potential to affect population, housing, and associated community services and infrastructure.

A distinction is made between direct effects and secondary effects, the latter comprising both indirect and induced effects:

- Direct effects are defined as changes in expenditures on goods and services directly related to construction and operation. For example, an increase of $25 million in the final demand for construction inputs such as concrete block and brick will cause that manufacturing sector to increase output by $25 million worth of concrete block and brick.
- Indirect effects are defined as backward linkages through expenditures on intermediate goods or services required by the direct industry in order to increase output. These include construction or operation labor and other inputs. For example, $25 million worth of additional concrete block and brick would require increased output by the cement-producing industry (to produce an additional $2.5 million worth of cement) and aggregate industry (to produce $0.5 million worth of sand/gravel).
- Induced effects are defined as forward linkages derived from employees (both direct and indirect) spending wages within a region. For example, if additional employees were hired to work in the industries supporting and providing inputs to the construction sector, their personal consumption expenditures will induce employment.

The differentiation among direct, indirect, and induced effects contributes to the concept of the "economic multiplier." The larger and more highly urbanized the area, the more complex and integrated the economy is likely to be. Thus, more of the additional economic activity will likely occur within the area and increase the size of the multiplier.

The US Army's Economic Impact Forecast System (EIFS) model is used to assess the economic effects of GTA recommendations. In this case, the model was used to assess economic effects of all Transformational activities, to include 2007 Fort Carson Transformation EIS, BRAC 2005, IGPBS, and AMF, and also includes estimates for projects previously analyzed under NEPA that would be constructed during the Transformation implementation period. Results are compared to rational threshold values (RTVs) to evaluate the significance of these effects in relation to the regional economy. RTVs are positive and negative percent changes in population, employment, sales volume, and income that represent an acceptable range around the maximum historic fluctuations within the ROI over approximately the last 20 years. RTVs represent the degree of economic change that the ROI has absorbed in the past. The EIFS model, its inputs, outputs, and significance measures are discussed in more detail in Appendix H.

3.9.2.1.2. Economic Impacts of Construction and Operations

Implementation of the Proposed Action at Fort Carson requires completion of a number of construction projects at the ORTC site, cantonment area, BAAF, and training ranges. Although the potential CAB is included in the Proposed Action, it was not included in the EIFS analysis, as too many assumptions would have to be made. If the decision is made to bring the CAB to Fort Carson, a new EIFS will be conducted at that time and disclosed in follow-on NEPA documentation.

In all, 20 construction projects are planned at Fort Carson, including 2 projects in the cantonment area and 6 range projects on training land. The total estimated cost of these projects between fiscal year 2009 and fiscal year 2012 is approximately $525.2 million. Projects that would serve the post population include a physical fitness center, a child development center, a fire station, a central vehicle wash facility, a dining facility, and access control improvements at Gate 6, Gate 19, and the Crow's foot. There are also a number of construction projects already underway at Fort Carson, including large troop complexes that have been previously analyzed under NEPA, i.e., the 2007 Fort Carson and PCMS Transformation EISs. Although the actual schedules of all the proposed construction projects are still subject to change, available information indicates that the year when the greatest construction expenditures at the Fort Carson would occur is 2010. Economic modeling used construction expenditure estimates for all of the projects that are currently anticipated for fiscal year 2009 through fiscal year 2012, as well as the increase in military and civilians. This approach provides the largest annual inputs and resulting economic effects. Actual annual effects may be somewhat less than those shown. It is anticipated that the large majority of economic effects associated with the proposed construction projects would be experienced in the ROI.

Demographics

No population changes are anticipated. The construction projects at Fort Carson are not expected to trigger a temporary movement of workers from outside the ROI to fill the supply of construction job opportunities.

Economic Development

Implementation of the Proposed Action would result in an increase in active duty military employment of approximately 3,800 for the IBCT between 2009 and 2012. In addition to the increase in active duty personnel, the Proposed Action is expected to result in the addition of approximately 16 civilian jobs on Fort Carson. Moreover, the increase in both the personnel and residential population on Fort Carson would require increased operational expenditures for purchases of goods, contracting of services, utilities, and rent and lease payments. Increases in on-post contractors are accounted for under operational expenditures, rather than as employment.

Table 3.9-1 shows the results of the EIFS model associated with the increase in personnel (active duty military and civilian) and construction and operational expenditures on Fort Carson.

Table 3.9-1 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 under the Proposed Action

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
2009	**Direct Sales Volume**	$57,189,530		
	Total Sales Volume	$158,415,000	0.62	-4.00 to 5.64
	Direct Income	$11,922,920		
	Total Income	$33,026,480	0.22	-3.62 to 5.63

Table 3.9-1 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 under the Proposed Action (continued)

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
	Direct Employment	380		
	Total Employment	1,052	0.27	-3.95 to 4.04
	Local Population	0		
	Local Off-Post Population	0	0	-1.59 to 3.17
2010	**Direct Sales Volume**	$145,319,900		
	Total Sales Volume	$402,536,200	1.57	-4.00 to 5.64
	Direct Income	$35,857,550		
	Total Income	$89,482,190	0.59	-3.62 to 5.63
	Direct Employment	1,126		
	Total Employment	2,834	0.72	-3.95 to 4.04
	Local Population	401		
	Local Off-Post Population	200	0.06	-1.59 to 3.17
2011	**Direct Sales Volume**	$111,863,300		
	Total Sales Volume	$309,861,300	1.21	-4.00 to 5.64
	Direct Income	$149,083,400		
	Total Income	$190,362,200	1.26	-3.62 to 5.63
	Direct Employment	4,380		
	Total Employment	5,695	1.45	-3.95 to 4.04
	Local Population	9,056		
	Local Off-Post Population	4,548	1.36	-1.59 to 3.17
2012	**Direct Sales Volume**	$12,742,680		
	Total Sales Volume	$35,297,220	0.14	-4.00 to 5.64
	Direct Income	$9,253,979		
	Total Income	$13,956,170	0.09	-3.62 to 5.63
	Direct Employment	276		
	Total Employment	425	0.11	-3.95 to 4.04
	Local Population	476		
	Local Off-Post Population	238	0.07	-1.59 to 3.17

Reference No. 250

The economic benefits resulting from increased employment and operational expenditures are long term. The changes in specific economic parameters would fall well within historical fluctuations, as represented by the RTVs shown in Table 3.9-1, and would be considered minor. One exception is that the projected change in off-post population slightly exceeds historical changes in population within the ROI.

Demographics

Table 3.9-2 shows the total population directly associated with Fort Carson (No Action) and after the Proposed Action minus the CAB (2012).

Table 3.9-2 Fort Carson Projected Population Increase			
	After Implementation of Proposed Action (2012)	**Total Population Increase**	**No Action Alternative**
Military Personnel	29,000	3,900	25,100
Civilian Employees/Contractors	5,140	16	5,124
Military Family Members	54,230	7,293	46,937
Total	**88,370**	**11,209**	**77,161**

Source: Families: Reference No. 10
All Others: Reference No. 11

The on-post workforce population (all military, civilian, and on-post contractor personnel) would result in population increases of 3,900 persons to approximately 29,000.

Because there would be an increase in on-post and off-post population, an increase in demand for private and public services would result from implementing the Proposed Action, as follows.

Housing, On-Post

Fort Carson has a current authorized military personnel strength of 18,477 active-duty permanent-party members, and is responsible for housing troops as well as supporting the needs of Soldiers and their Families. Of these Soldiers and Family members, 6,105 unaccompanied personnel and 10,403 families require housing. Using the criteria and methods approved by Headquarters, Department of the Army, and current guidance by the Office of the Secretary of Defense (OSD) regarding market analyses for military housing, it is projected that in 2013, there will be 9,396 unaccompanied personnel and 15,933 families requiring housing at Fort Carson. Currently, there is a total unaccompanied housing requirement of 6,258 units, and a projected total unaccompanied housing requirement of 9,529 units in 2013. There is a total military family housing requirement of 4,188 units and a projected total requirement of 4,012 units in 2013. Due to this shortfall in military family housing, the demand for off-post housing in the local housing market would increase.

Property taxes are not applicable to on-post housing at Fort Carson. Property tax revenues, however, could increase in local jurisdictions, with an increase in the construction of housing units to meet the higher demand for off-post housing.

Housing, Off-Post

The majority of the new military personnel are expected to live off-post, creating an increased demand for off-post housing. Based on the ***Fort Carson Regional Growth Plan, Economic Impacts Technical Report*** (Reference No. 132) under the Expected Growth Scenario, housing demand would require approximately 12,500 new homes to be built in the primary housing impact area or ROI. It is projected that the housing market should be able to absorb the Fort Carson growth by 2012. These units would be located primarily in southern Colorado Springs, Fountain, and Security/Widefield (all within El Paso County). Approximately 97 percent of Fort Carson’s Soldier population lives in El Paso County. It is likely that between 5,200 and 8,600 new units would be built by fiscal year 2009, which would match the demand for new units (Reference No. 10).

According to the Fort Carson Regional Growth Plan, Economic Impacts Technical Report, an estimated 800 residential housing units have been built, or are under construction as of the spring of 2007. Approximately 6,400 lots with infrastructure would likely be completed by the end of 2007, and over

14,000 lots are currently being reviewed under the local government approval process. Thus, the region could potentially include over 21,000 for-sale single family units and townhome units and there would be adequate off-post housing units to accommodate military personnel and their families as well as population growth from other sources (Reference No. 132).

Quality of Life

The Proposed Action would result in an increase in both the on-post and off-post population, with a resulting proportionate increase in demand for schools and childcare facilities, public safety, medical, and other services as discussed as follows.

Schools

School enrollment would increase as a result of the increase in regional population. Some of the additional school-age children whose families move to Fort Carson can be expected to attend the on-post elementary and middle schools. Those whose families settle outside these attendance areas would attend off-post schools.

Growth projections for student enrollment prepared recently for advanced planning purposes by Fountain-Fort Carson District 8, a net military personnel increase of 12,500 (this included the approximately 8,500 personnel anticipated in the 2007 Fort Carson Transformation EIS was assumed to occur by the 2009-2010 school year.

Based on existing attendance patterns, population increases at Fort Carson are expected to result in additional students at the three on-post elementary schools and the on-post middle school, from families living on-post. Enrollment increases are anticipated at Fountain-Fort Carson District 8 off-post as well.

Enrollment changes would be expected to occur in the other school districts that serve Fort Carson and surrounding areas. These school districts, however, receive federal impact aid as an offset for the costs of providing public education to dependents of military personnel. In addition, not all students would attend public schools; some may attend private school or be home-schooled.

Child Care Services, On-Post

The expected increase in population associated with Fort Carson could result in an increased demand for childcare services. The military personnel that are projected to live on-post, as well as many who live off-post, would increase the demand for childcare services. This increased demand would likely be met by the four child development center projects that are anticipated by fiscal year 2011. Three of these centers were addressed in the 2007 Fort Carson Transformation EIS. The other will be considered as part of this Proposed Action: Child Development Center (Project Number 71171, FY 2010).

Child Care Services, Off-Post

Demand for off-post child care services is not expected to rise significantly, as many of the military personnel commuting to work at Fort Carson would likely first look on-post (near their place of employment) for preschool child care services, rather than off-post. As with any population increase, the services provided through the private sector would be expected to respond to any increased demand by increasing supply.

Family Support and Retirement Services

Services would continue to be provided to residents and retirees by the Army Community Support Center, the Family Connection, Family Readiness Groups, and the Retirement Services Office.

No immediate increase in the retiree population is anticipated. Although some of the older active duty personnel may possibly choose to retire or settle in this area after discharge or retirement, most of the new troops are typically younger and many will likely serve at other posts before discharge or retirement, or return to their place of origin. It is unlikely that the Proposed Action would have an impact on the retiree population.

Shops and Services, On-Post

The additional on-post and off-post population would increase demand for on-post retail, food, and related services such as Fort Carson's commissary and retail outlets in the Post Exchange. On-post impacts would include the need for a greater level of Sustainability, Restoration, and Modization) (SRM) funding for support facilities that would be required by the Proposed Action (construction of facilities on Wilderness Road). This would include the construction of several support facilities (chapel, dental clinic, child care facility, Troop Store [mini-mall], etc.) and additional utilities and road infrastructure that would be required if facilities were sited on Wilderness Road.

The Army Air Force Exchange Service (AAFES) is currently developing plans for a lifestyle village on Fort Carson. Fort Carson has plans to increase the size of its current commissary and Post Office. These projects are being assessed in an EA and are included in Section 5.0 of this EIS.

Shops and Services, Off-Post

Off-post, the services provided through the private sector can be expected to respond to the increased demand by increasing supply. Currently, the City of Fountain is planning a retail village to be constructed just to the east of Fort Carson's Gate 20. Colorado Springs is also developing plans for a retail village just north of Fort Carson's Gate 4.

Recreation

Demand for recreational facilities would increase with the additional population residing on-post and off post.

The Proposed Action would provide additional on-post community and recreational facilities. A Physical Fitness Center is included in the Proposed Action, which will include a gym, swimming pool, exercise and weight rooms, indoor track, and climbing wall/indoor ropes course. The center would also include administrative offices, locker rooms, sauna/steam room, etc.

The increase in off-post population would also increase the demand for off-post recreational facilities. The demand for some facilities, such as gyms and pools, may be moderated by the use of the new on-post facilities. Nevertheless, as with any population increase, the services provided through the private sector can be expected to respond to the increased demand by increasing supply. Thus, recreation centers and other facilities that offer recreational opportunities can be expected to increase in number to meet any additional demands.

Environmental Justice

Construction impacts are temporary in nature, but they can range from annoying to detrimental for those living near a construction site. Because most of the construction activity would be carried out in the core of the installation, few adverse impacts to low-income and minority communities are expected.

Impacts from noise, dust, and traffic generated by construction would be minimized by careful construction planning. Fugitive dust emissions would be minimized throughout the construction period by use of conventional dust suppression, BMPs, and mitigation techniques, such as soil erosion and sedimentation control, restrictions on where vehicles can travel on site, speed controls for construction vehicles and equipment, and watering of exposed soil and demolition debris to control dust. Noise from construction equipment would be controlled by use of appropriate sound mitigation techniques and BMPs. Construction traffic during peak hours would be reduced by the use of using centralized construction staging areas.

Therefore, no disproportionately high and adverse effects on minority and low-income populations are anticipated.

3.9.2.1.3. Protection of Children

There is a potential for minor short-term adverse impacts to children. Because construction sites can be appealing to children, construction activity could be an increased safety risk. This analysis evaluates the potential impacts to the children in general terms. None of the IBCT or CAB facilities siting alternatives are located near family housing areas. Only the proposed construction for the CS/CSS units would be located within the cantonment area near family housing areas. Gate 3 used by construction vehicles could pose a risk as it is near housing and a school. The majority of the construction vehicles for the IBCT/CAB construction would access the area through Gate 6 or Gate 19 (family housing areas near these two gates are not present).

3.9.2.2. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Construction of the IBCT facilities at Training Area Bravo would result in a lesser socioeconomic impact from construction compared to the Proposed Action and Alternative 2. Several support facilities (chapel, dental clinic, child care facility, Troop Store [mini-mall], etc.) and additional utilities that would be required if facilities were sited on Wilderness Road would not be necessary or would be of lesser scope if the IBCT facilities were constructed at Training Area Bravo Site in the cantonment area.

Socioeconomic impacts off-post would be similar to the Proposed Action. On-post impacts would include less SRM funding for support facilities that would not be required by this alternative.

Table 3.9-3 shows the results of the EIFS model associated with the increase in personnel (active duty military and civilian) and construction and operational expenditures on Fort Carson under Alternative 1.

Table 3.9-3 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 Under Alternative 1

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
2009	**Direct Sales Volume**	$44,463,000		
	Total Sales Volume	$123,162,500	0.48	-4.00 to 5.64
	Direct Income	$9,269,681		
	Total Income	$25,677,020	0.17	-3.62 to 5.63
	Direct Employment	295		
	Total Employment	818	0.21	-3.95 to 4.04
	Local Population	0		
	Local Off-Post Population	0	0	-1.59 to 3.17

Table 3.9-3 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 Under Alternative 1 (continued)

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
2010	**Direct Sales Volume**	$108,152,000		
	Total Sales Volume	$299,581,200	1.17	-4.00 to 5.64
	Direct Income	$28,108,760		
	Total Income	$68,018,060	0.45	-3.62 to 5.63
	Direct Employment	879		
	Total Employment	2,150	0.55	-3.95 to 4.04
	Local Population	401		
	Local Off-Post Population	200	0.06	-1.59 to 3.17
2011	**Direct Sales Volume**	$98,018,510		
	Total Sales Volume	$271,511,300	1.06	-4.00 to 5.64
	Direct Income	$146,197,000		
	Total Income	$182,366,900	1.21	-3.62 to 5.63
	Direct Employment	4,288		
	Total Employment	5,440	1.39	-3.95 to 4.04
	Local Population	9,056		
	Local Off-Post Population	4,548	1.36	-1.59 to 3.17
2012	**Direct Sales Volume**	$12,742,680		
	Total Sales Volume	$35,297,220	0.14	-4.00 to 5.64
	Direct Income	$9,253,979		
	Total Income	$13,956,170	0.09	-3.62 to 5.63
	Direct Employment	276		
	Total Employment	425	0.11	-3.95 to 4.04
	Local Population	476		
	Local Off-Post Population	238	0.07	-1.59 to 3.17

Reference No. 250

3.9.2.3. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Temporary socioeconomic impacts from construction revenues would be greater for both the Proposed Action and Alternative 2. This would be due to the construction of several support facilities (chapel, dental clinic, child care facility, Troop Store [mini-mall], etc.) and additional utilities and road infrastructure that would be required if facilities were sited on Wilderness Road. These facilities and infrastructure requirements would be of lesser scope if the IBCT facilities were constructed at Training Area Bravo Site in the cantonment area.

Socioeconomic impacts would be similar to the Proposed Action. Table 3.9-1 represents the impacts for the Proposed Action and Alternative 2. On-post impacts would include the need for a greater level of SRM funding for support facilities that would be required by both this alternative and the Proposed Action.

3.9.2.4. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of the No Action Alternative.

No new construction activity beyond that described in the 2007 Fort Carson Transformation EIS would be anticipated under the No Action Alternative.

No changes related to ongoing operations at Fort Carson are anticipated under the No Action Alternative. All upgrading and replacements that were decided in the 2007 Fort Carson Transformation EIS would continue. Normal upgrading and replacement of recreational facilities, schools, and other quality-of-life resources will be necessary over time.

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3.10. Transportation

This section describes the affected environment and the environmental consequences of the Proposed Action and the alternatives on transportation resources on and surrounding Fort Carson.

3.10.1. Affected Environment

This section addresses existing regional transportation involving the roadway network, average daily traffic (ADT) and daily levels of service (LOS); installation transportation involving transportation planning, the roadway network and traffic as well and other transportation modes to include rail, aviation and transit.

3.10.1.1. Regional Transportation

3.10.1.1.1. Roadway Network

Fort Carson is located on the southern edge of the City of Colorado Springs and is bounded by I-25 to the east, SH 115 to the west, and Academy Boulevard to the north (Figure 3.10-1). I-25 is a north-south highway that bisects the Colorado Springs metropolitan area and is a major north-south highway along Colorado's Front Range. Fort Carson provides access from the external roadway network through six entry control facilities:

- Gate 1 (visitor's entry) at western boundary;
- Gate 2 at western boundary;
- Gates 3 (commercial vehicle entry) and 4 at northern boundary;
- Gate 5 (access to housing facilities and golf course) at western boundary; and
- Gate 20 at eastern boundary, just southeast of the cantonment area.

In addition to I-25, the primary north-south routes in Colorado Springs are along Academy Boulevard and Powers Boulevard. The Colorado Springs roadway network offers few continuous east-west routes, with this movement primarily accommodated by Fountain Boulevard, Platte Boulevard, Austin Bluffs Parkway, and Woodmen Road. The only access from Colorado Springs to the west is on US 24, while the primary access to the east of Colorado Springs is provided along US 24 and SH 94.

3.10.1.1.2. Traffic

Existing traffic data for select Colorado Springs area roadways were collected from the PPACG. The existing 2005 ADT volumes and corresponding daily LOS are summarized in Table 3.10-1, along with roadway classification, number of through lanes, posted speed limit on roadways surrounding Fort Carson, and daily volume to capacity (v/c) ratios (Reference No. 132).

LOS is a measure by which transportation planners determine the quality of service on transportation devices, or transportation infrastructure. LOS is a holistic approach, which measures traffic density (or a measure of congestion) and time.

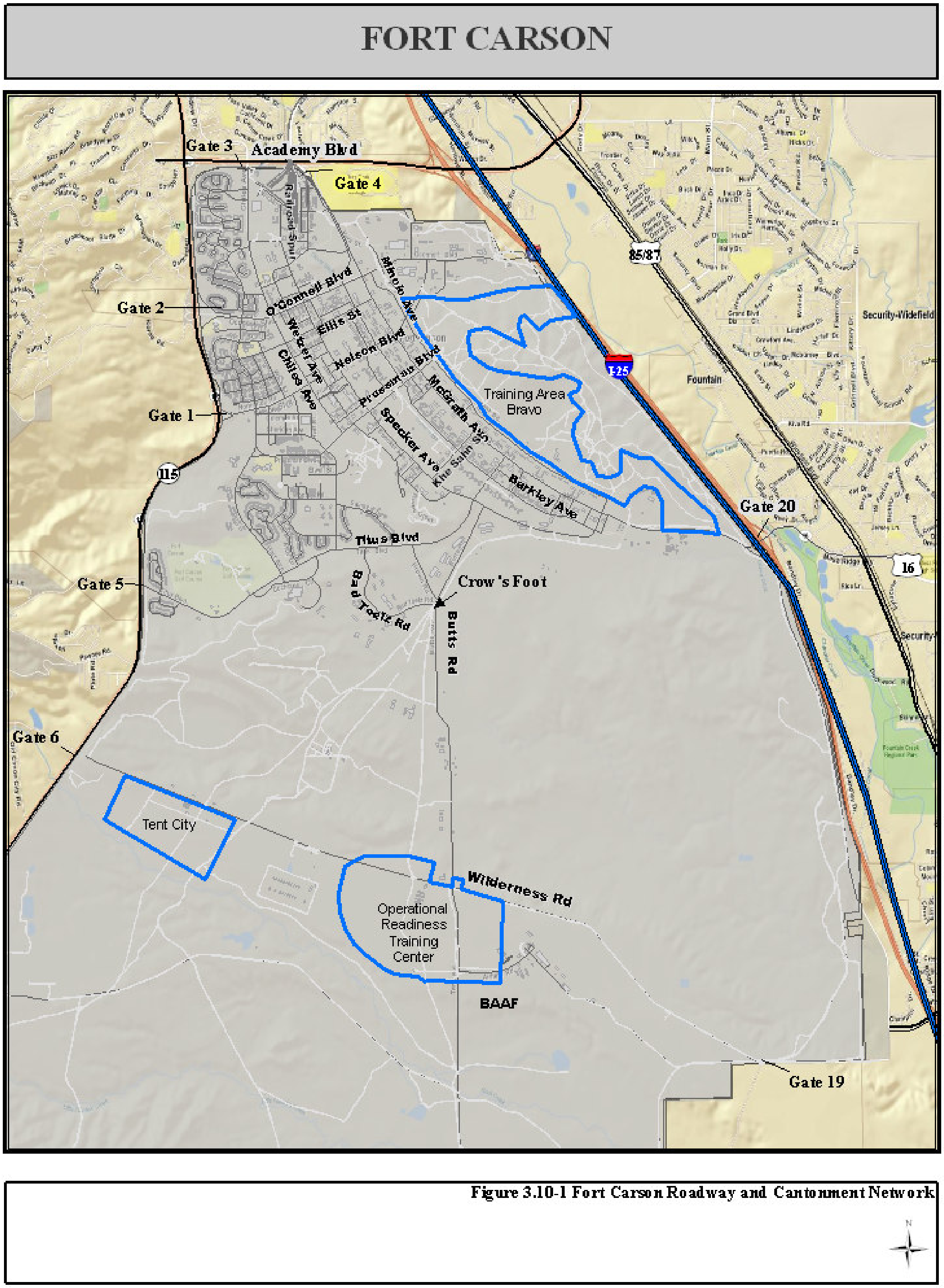

Figure 3.10-1 Fort Carson Roadway and Cantonment Network

Table 3.10-1 2005 Traffic Volumes for Select Colorado Springs Area Roadways

Roadway Classification	Roadway	Number of Through Lanes	Posted Speed (mph)	ADT	v/c	LOS
Interstate	**I-25 (south of SH 16)**	4	75	41,300	0.43	B
	I-25 (north of SH 16)	4	75	73.400	0.77	D
	I-25 (north of Academy Boulevard)	4	65	72,100	0.77	D
	I-25 (north of Nevada Avenue)	5	55	96,700	0.90	E
	I-25 (north of Bijou Street)	6	55	98,500	0.73	D
Expressway	**US 24 (west of I-25)**	4	35	45,500	0.79	D
	US 24 (east of Powers Boulevard)	4	55	44,200	0.71	D
Primary Arterial	**Academy Boulevard (west of I-25)**	5	45	46,000	0.62	C
	Academy Boulevard (east of I-25)	5	50	46,200	0.57	C
	US 24 Bypass/Fountain Boulevard (east of I-25)	4	55	20,900	0.24	A
	SH 115 (south of Gate 1)	2	60	17,600	0.49	B
	SH 115 (north of Gate 1)	4	55	25,300	0.35	B
	SH 115 (north of Star Ranch Road)	4	50	31,000	0.65	C
	SH 16 (east of I-25)	2	45	31,600	1.58	F
	SH 85/87 (south of Academy Boulevard)	4	50	24,500	0.60	C
	Academy Boulevard (north of Constitution Avenue)	6	35	43,500	0.85	D
Minor Arterial	**SH 94 (east of Marksheffel Road)**	2	60	15,600	0.44	B

Source: Reference No. 132
ADT = average daily traffic
LOS = level of service
SH = State Highway
v/c = volume to capacity

The transportation LOS system uses the letters A through F, with A being best and F being worst.

- LOS A is the best, described as conditions where traffic flows at or above the posted speed limit and all motorists have complete mobility between lanes.
- LOS B is slightly more congested, with some impingement of maneuverability; two motorists might be forced to drive side by side, limiting lane changes.
- LOS C has more congestion than B, where ability to pass or change lanes is not always assured. LOS C is the target for urban highways in many places. At LOS C most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained.
- LOS D is perhaps the level of service of a busy shopping corridor in the middle of a weekday, or a functional urban highway during commuting hours: speeds are somewhat reduced, motorists are hemmed in by other cars and trucks.

- LOS E is a marginal service state. Flow becomes irregular and speed varies rapidly, but rarely reaches the posted limit.
- LOS F is the lowest measurement of efficiency for a road's performance. Flow is forced; every vehicle moves in lockstep with the vehicle in front of it, with frequent drops in speed to nearly zero miles per hour (mph).

The Colorado Department of Transportation (CDOT) completed an EA in July 2007 and issued a Finding of No Significant Impact (FNSI) in September 2007 for transportation improvements for the SH 16 and I-25 interchange (Reference No. 142). The study evaluated solutions, including capacity improvements on SH 16 and the reconstruction of the SH 16 and I-25 interchange, to alleviate the substantial congestion that occurs along SH 16 near Gate 20 during the morning peak period. The selected alternative includes the widening of SH 16 to four lanes from Fort Carson Gate 20 to Syracuse Street, replacing the interchange with I-25, and reconstructing the interchange with US 85. The selected alternative, which is currently under construction, will reduce congestion and improve traffic operations by providing additional lanes and improving interchange configurations. Based on the PPACG traffic demand model forecasting, daily traffic volumes are expected to increase to 36,000 vehicles per day along SH 16. The existing ADT on SH 16 listed in Table 3.10-1 results in an unacceptable daily LOS, contributing to this is the high morning peak hour traffic demand that occurs at Fort Carson’s Gate 20. The CDOT project will help to alleviate the significant congestion that occurs along SH 16 near Gate 20 during the morning peak and improve the LOS along SH 16. In addition, improvements are also going to be made to I-25 and US 85 as required due to the construction of the new interchanges. The limits of the SH 16 project extend from Fort Carson Gate 20 on the west to Syracuse Street on the east.

PPACG uses the Regional Travel Demand Model to forecast traffic volumes on roadways in the Colorado Springs area for the current planning horizon, the year 2030, to assist with future infrastructure analysis and planning. The PPACG Regional Growth Plan base-year model (year 2005) indicates that Fort Carson contributes approximately 56,100 trips to the regional roadway network on a daily basis and predicted an increase of approximately 43,600 trips per day by the year 2015 (Reference No. 132). According to a 2005 travel survey (Reference No. 144), 46 percent of Soldiers reside in the four ZIP codes near the post. Three of the ZIP codes border Fort Carson immediately to the west, north, and east (80906, 80817, and 80911) and the fourth (80916) is slightly to the northeast off-post. Much of the traffic generated by Fort Carson is concentrated on roadways to and from these areas, including SH 115, SH 16, and Academy Boulevard. The Fountain ZIP code (80817), meanwhile, accounts for the second largest population of Soldiers residing off-post.

3.10.1.2. Installation Transportation

3.10.1.2.1. Transportation Planning

Fort Carson has undertaken several transportation studies over the past few years associated with the growth and development occurring at Fort Carson. In 2005, Fort Carson funded the *Fort Carson Comprehensive Transportation Study* (Reference No. 31). The study assessed existing conditions and identifies short- and long-term transportation needs to meet future demand. The study focused on intersections, roadway corridors, and entry control facilities within the cantonment area and the recommendations are intended to improve traffic flow and safety on the Installation. The study’s recommendations included roadway expansion (two to four lanes), new construction, realignment of existing roadways, and upgrades to other traffic-related infrastructure. Sustainable initiatives were also identified to reduce automobile dependency on the installation and included pedestrian connectors, bus and bicycle facility improvements, and parking lot minimization.

The *4th Infantry Headquarters Complex Supplemental Traffic Study* (Reference No. 145) provided further recommendations to address traffic impacts resulting from the relocation of the 4th ID Headquarters Complex.

The *Fort Carson Comprehensive Transportation Study* was recently updated in May 2008 (Reference No. 32) and looked at the future potential increase in population at Fort Carson as well as analyzed the following:

- 4/4 ID (Light BCT) Site Plan, Infrastructure
- Infrastructure Capacity Analysis for Fort Carson, CO
- 4th ID Headquarters Complex
- Fort Carson Traffic Study for Automated Installation Entry Information
- Fort Carson Lifestyle Village Traffic Impact Study
- IBCT unit to be stationed at Fort Carson
- Proposed CAB unit to be stationed at Fort Carson

3.10.1.2.2. Roadway Network

The roadway network at Fort Carson consists of approximately 696 miles of roads, of which approximately 266 miles are paved and approximately 433 miles are unpaved. Access to Fort Carson is provided through the following six active entry control points: Gates 1, 2, and 5 on SH 115; Gates 3 and 4 on Academy Boulevard; and Gate 20 on I-25.

Cantonment area roadways generally form a grid pattern that is laid out in a crescent shape from northwest to southeast. Primary east-west access within the cantonment area is provided by O'Connell Boulevard, Prussman Boulevard and Titus Boulevard, while primary north-south access within the cantonment area is provided by Specker Avenue and two one-way roads (Magrath Avenue and Barkeley Avenue). Butts Road provides access from the cantonment area to the downrange area. A map of the cantonment area roadways is shown on Figure 3.10-1.

The cantonment area roadway system can be classified into the following three categories.

- *Arterial highways* – serve the region and have minimal levels of access to adjacent properties;
- *Collector roadways* – feed arterial highways and have moderate levels of access to adjacent properties; and
- *Local roadways* – provide direct access to adjacent properties and service both collector and arterial roadways.

Butts Road, Magrath Avenue, and Barkeley Avenue are classified as arterials. Collector roadways within Fort Carson include O'Connell Boulevard, Ellis Street, Nelson Boulevard, Prussman Boulevard, Titus Boulevard, Specker Avenue, Chiles Avenue, and Wilderness Road. Local roadways throughout Fort Carson serve as the direct connections to parking lots and adjacent properties.

The road network in the cantonment area is generally well maintained and adequate for supporting assigned mission activities. Nearly all major roads within the cantonment area have bituminous surfaces and are capable of accommodating all types of wheeled vehicles. The main roads in the downrange area, with the exception of Route 1 which is paved, are unpaved and reasonably well maintained, while secondary roads in the downrange area are maintained to varying degrees (Reference No. 6).

3.10.1.2.3. Traffic

A majority of installation roadways have one lane for each direction of travel with the exception of Magrath Avenue and Barkeley Avenue which have two one-way lanes and Specker Avenue (between Titus Boulevard and Magrath Avenue) as well as Magrath Avenue (between Specker and Gate 20) which are both four lane roadways. The posted speed limit throughout the cantonment area is generally 30 mph, although some cantonment area and downrange area roadways have posted speed limits of 40 mph. Existing traffic data indicate that congestion exists on select installation roadways during peak periods, and that all signalized intersections operate at acceptable levels of service according to 2008 traffic volumes. Traffic volumes on select cantonment area roadway segments are summarized in Table 3.10-2.

Traffic-volume data were collected when approximately 55 to 60 percent of the active duty military personnel stationed at Fort Carson were deployed. As such, existing traffic-volume counts on the installation were found to be noticeably less when compared to a normal pre-deployment condition. The existing volumes in Table 3.10-2 reflect an adjusted ADT count to represent normal pre-deployment rates.

Table 3.10-2 2008 Average Daily Traffic on Select Cantonment Area Roadways Fort Carson Comprehensive Transportation Study

Roadway Classification	Roadway	Average Daily Traffic
Arterials	Magrath Avenue (between Prussman Boulevard and Yano)	2,451
	Barkeley Avenue (between Hogan Street and Khe Sanh Street)	2,965
	Butts Road (near Mates Facility Access)	2,036
Collector Roadway	Ellis Street (between Wallace Street and Pershing Drive)	2,266
	Nelson Boulevard (between Barkeley Avenue and Pershing Drive)	2,110
	Prussman Boulevard (between Iron Fighter Drive and Specker Avenue)	5,608
	Titus Boulevard (at Sheridan Avenue)	6,802
	Specker Avenue (between Ellis Street and Evans Street)	7,566
	Chiles Avenue (between Ellis Street and O'Connell Boulevard)	8,520
	Wilderness Road (west of Butts Road)	615

The amount of use of downrange area roadways fluctuates due to the nature of the maneuver training, deployments, and variations of training mission requirements.

Traffic volumes at the six active entry control points were collected in 2008 and are representative of the morning peak hour. Figure 3.10-2 shows the 2008 distribution of the traffic to each active entry control point. The distribution indicates that the morning peak-traffic demand on Gate 4 is the highest, followed by Gate 20. Peak commuting periods on Army installations differ from traditional morning, afternoon, and evening peaks on off-post roadway systems. At Fort Carson, inbound peaks occur prior to morning physical training (usually before 6:00 a.m.), during morning off-post commuter times for the on-post civilian workforce, mid-morning as the Soldiers return to the installation for the day, and at the end of the lunch hour. Outbound peaks generally occur in the morning after physical training, at the beginning of the lunch hour, and again at the end of the day prior to evening off-post commuter peak periods.

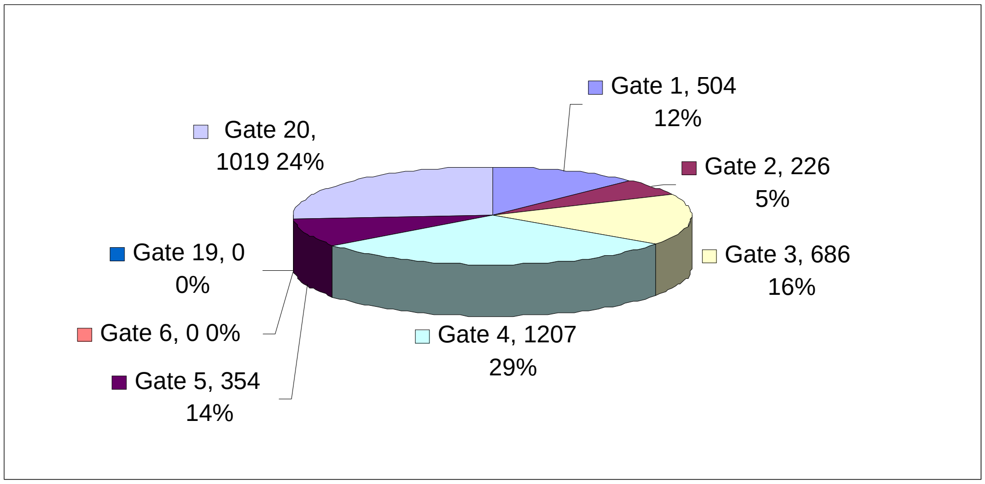

Figure 3.10-2 Traffic Distribution at Fort Carson's Active Entry Points, 2008

3.10.1.2.4. Other Transportation

Alternative modes of transportation at Fort Carson include transit service, pedestrian and bike routes, and freight rail access. Bus transit is provided by the Mountain Metropolitan Transit (Routes 30 and 33) which provides hourly weekday and Saturday service between Fort Carson and Pikes Peak Community College at 50-minute intervals. There are numerous pedestrian and bike routes on Fort Carson that are often utilized for physical fitness, but to a lesser degree as an alternative mode of transportation. Freight rail service is provided to and from the north between Gates 3 and 4.

Descriptions of the rail, aviation, and transit systems that serve Fort Carson are presented as follows.

Rail

Fort Carson is served by a freight rail line, located between Gates 3 and 4, in the northern portion of the cantonment area. The access railroad is 2.1 miles in length and connects Fort Carson to the main line of the Union Pacific and the Burlington Northern Santa Fe Railroads at Kelker Junction in Colorado Springs. Fort Carson is responsible for approximately 7.1 miles of rail track and has a total loading footage availability of approximately 2.8 miles of track. The railhead area has sufficient capacity to move 270 rail cars per day.

Aviation

Aviation facilities at Fort Carson are located at BAAF, approximately 4 miles south of the cantonment area and immediately south of the Small-Arms Impact Area along Butts Road. First established in 1949, BAAF houses operations and administrative functions for several units, contractor maintenance and support personnel, and rotary-wing aircraft. The existing permanent aircraft population is thirty, none of which is fixed-wing aircraft. Nearly all fixed-wing aircraft that land at Fort Carson are C-130s, C-12s, or USAFA training aircraft, and the landing strip is not sufficient in length to accommodate larger types of aircraft. In addition to BAAF, there is a tactical airstrip at Camp Red Devil, located at the south-west corner of Fort Carson.

Transit

Public transit on Fort Carson is provided by Mountain Metropolitan Transit, which also serves the Colorado Springs metropolitan area. Routes 30 and 33 provide service within the cantonment area and connect to the regional bus system at the Pikes Peak Community College Transfer Station, immediately north of Fort Carson. Bus service is offered Monday through Friday from 8:15 a.m. to 6:15 p.m., and Saturday from 7:05 a.m. to 6:15 p.m. Transit service operates on 50-minute intervals (Reference No. 146).

3.10.2. Environmental Consequences

This section outlines the potential transportation impacts for the Proposed Action and alternatives set forth in this EIS. Although transportation impacts associated with each alternative differ, training activities/concepts do not change across the alternatives. The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all scenarios.

3.10.2.1. Proposed Action and Alternatives

3.10.2.1.1. Regional Traffic

Under the Proposed Action, traffic volumes on the regional roadways network would increase because of the relocation of troops and their Families. Results from the *PPACG Regional Travel Demand Model* (year 2035) estimate traffic growth using a Soldier population of 30,000 which was the upper bound projections for Fort Carson's Soldier population (Reference No. 147). The implementation of the Proposed Action would result in the stationing of approximately 32,000 Soldiers at Fort Carson. PPACG's traffic study was used to extrapolate an estimate of traffic impacts within this section.

The area in which traffic attributable to Fort Carson results in a noticeable increase over the No Action Alternative is defined as the traffic AOI. The traffic AOI for the Proposed Action at Fort Carson extends to Constitution Avenue (east of I-25) to the north, the southern boundary of Fort Carson to the south, Marksheffel Road (south of Airport Road) to the east, and approximately 1 mile west of SH 115 (between Academy Boulevard and I-25). Table 3.10-3 summarizes the PPACG troop increase scenario LOS and v/c ratios and ADT for 2035.

Table 3.10-3 Projected 2035 Traffic Conditions for Selected Colorado Springs Area Roadways

		PPACG 2035 Scenario with 10,000 Troop Increase		
Roadway Classification	**Roadway**	**ADT**	**v/c**	**LOS**
Interstate	I-25 (south of SH 16)	82,400	.86	E
	I-25 (north of SH 16)	142,900	1.49	F
	I-25 (north of Academy Boulevard)	140,000	1.0	E
	I-25 (north of Nevada Avenue)	167,500	.85	D
	I-25 (north of Bijou Street)	163,400	.69	C
Expressway	**US 24 (west of I-25)**	73200	.84	D
	US 24 (east of Powers Boulevard)	76,400	1.23	F
Primary Arterial	**Academy Boulevard (west of I-25)**	66,200	.89	E
	Academy Boulevard (east of I-25)	76,500	.93	E

Table 3.10-3 Projected 2035 Traffic Conditions for Selected Colorado Springs Area Roadways (continued)				
		PPACG 2035 Scenario with 10,000 Troop Increase		
	US 24 Bypass/Fountain Boulevard (east of I-25)	34600	.39	B
	SH 115 (south of Gate 1)	31,700	.44	B
	SH 115 (north of Gate 1)	41,100	.57	C
	SH 115 (north of Star Ranch Road)	37,000	.77	D
	SH 16 (east of I-25)	59,300	1.48	F
	SH 85/87 (south of Academy Boulevard)	44,500	.93	E
	Academy Boulevard (north of Constitution Avenue)	43,500	.85	D
Minor Arterial	**SH 94 (east of Marksheffel Road)**	27,600	.39	B

Source: Reference No. 148
ADT = average daily traffic SH = State Highway
LOS = level of service v/c = volume to capacity

In general, the patterns of traffic increase on the major roadways show larger increases closer to Fort Carson and smaller increases further away from the installation as people filter to minor arterials and collectors to enter their neighborhoods. Because access to Fort Carson is provided off I-25, Academy Boulevard, SH 16, or SH 115, these roadways experience the largest daily traffic-volume increases on their segments adjacent to the installation. These roadway segments, however, do not necessarily have the largest percent daily traffic-volume increases. The daily traffic-volume increases on the higher-volume roadways can often result in smaller percentage increases. Likewise, lower-volume roads often experience a higher percent increase in daily volume due to the additional troops even though the actual volume increase is not as great as on the major roadways. The greatest change in v/c ratio occurs on I-25 north of SH 16 and on US 24 east of Powers Boulevard.

The v/c trend is further explained by comparing the daily LOS between the current 2005 conditions and the 2030 PPACG scenario. The eight roadway segments that experience a drop in daily LOS due to higher v/c ratios are I-25 south of SH 16, SH 115 north of Gate 1, SH 115 north of Star Ranch Road, SH 85/87, US 24 Bypass/Fountain Boulevard, US 24 east of Powers Boulevard, Academy Boulevard west of I-25 and Academy Boulevard east of I-25. The drops in LOS result in unacceptable daily LOS along four of the eight segments. Those segments that drop to unacceptable LOS are SH 85/87; Academy Boulevard east of I-25; Academy Boulevard west of I-25 (currently being widened); and US 24 east of Powers Boulevard.

The roadway network in the southeast area in and around Fountain experiences the highest percent traffic-volume increase. This is to be expected because the 2005 travel survey indicates that the Fountain area houses the second highest number of troops, and it contains areas that are currently undeveloped and can accommodate growth. Several of the areas north and west of Fort Carson (highest percentage of current Soldiers) cannot accommodate additional development or additional troops.

Improvements to the regional roadway network programmed in the 2008-2013 TIP or currently underway would help in accommodating the traffic growth resulting from the Proposed Action.

3.10.2.1.2. Other Transportation

Rail

Under the Proposed Action and alternatives, use of the rail system would increase to accommodate increased troop deployments and training at the PCMS. A typical BCT would require four train shipments to the PCMS (one per day for four days) consisting of 225 cars total. All vehicles shipped by train are shipped back to Fort Carson at the conclusion of the training rotation. Rail shipments to and from the PCMS and Fort Carson would not be projected to exceed one shipment per day for a total of 40 days per year for BCT training rotations. Shipments of vehicles for battalion units occur over the course of one to two days. These shipments would not be projected to exceed one shipment per day for a total of 60 days per year for battalion training rotations. It is assumed that all company operations would take place in conjunction with BCT or battalion training deployments.

The stationing of the CAB at Fort Carson would not increase the use of the rail system for training as all of the CAB support vehicles are wheeled and would travel to PCMS on the local roadway system and not by rail. Therefore, no additional training related increase on the rail system would occur as a result of the CAB being stationed at Fort Carson with the exception of wheeled vehicles using rail transportation during operational deployment overseas.

Air

When deploying overseas, units would utilize military and commercial aircraft departing from an existing area adjacent to the Colorado Springs Municipal Airport. The airport is located adjacent to Peterson AFB approximately 10 miles to the northeast of Forth Carson.

Transit

The Proposed Action would not affect transit services at Fort Carson, although the realignment of troops to Fort Carson may minimally increase transit ridership on-post and region-wide. The current transit system is not compatible with some aspects of Soldiers' schedules, such as morning physical training. Therefore, it is unlikely that future transit demand would exceed available system capacity.

3.10.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.10.2.2.1. Cantonment Area

The majority of the construction traffic associated with the Proposed Action would likely enter the post through Gates 6 and/or 19 to mitigate the impact of that traffic on the main cantonment area. This special provision is currently in use at Gate 6 and 20 in support of other major construction projects on post. The remaining construction traffic will enter the regular commercial gate (Gate 3) and be routed from Chiles onto Hare to Specker. Specker is the primary north/south truck route through post and the primary route for commercial and construction traffic. This route was established in large part to mitigate the impacts to the elementary school located on Chiles.

Traffic volumes at signalized intersections on-post would increase under the Proposed Action. All signalized intersections, however, would have sufficient capacity to accommodate the increased demand. Table 3.10-4 summarizes the additional a.m. and p.m. peak traffic trips generated on Fort Carson as a result of the Proposed Action in relation to the total additional a.m. and p.m. peak trips generated due to currently proposed and projected development at Fort Carson as indicated in the *Fort Carson Comprehensive Transportation Study* (Reference No. 32).

Table 3.10-4 Additional A.M. and P.M. Peak Trips

Peak Hour Trips	Future Total peak trips [1]	IBCT Trips	IBCT Percent of total future trips	CAB Trips	CAB Percent of total future trips	Total IBCT and CAB Trips	Total Percent of IBCT and CAB Trips
A.M. Trips	8,954	1,134	13	904	10	2,038	23
P.M. Trips	9,422	1,015	11	809	9	1,824	19
A.M. and P.M. Trips Total	18,376	2,149	12	1,713	9	3,862	21

[1]Future total peak trips were based on the information provided in Exhibit 8.1 which identified projected and planned development for Fort Carson and trip generations for those developments.
CAB = Combat Aviation Brigade; IBCT = Infantry Brigade Combat Team

Table 3.10-5 shows the percentage of ADT growth on select cantonment area roadways as a result of the Proposed Action and other Fort Carson growth predictions from 2005 to 2013. The large percentage increase on these selected cantonment area roads is not solely a result of the Proposed Action but rather is cumulative as the result of the Proposed Action in conjunction with other proposed and projected development projects on Fort Carson.

Table 3.10-5 Future Traffic Volumes for Select Cantonment Area Roadways

Roadway Classification	Roadway	Average Daily Traffic Growth (percent)
Arterials	Magrath Avenue (between Prussman Boulevard and Yano)	283
	Barkeley Avenue (between Hogan Street and Khe Sanh Street)	146
	Butts Road (near Mates Facility Access)	212
Collector Roadway	Ellis Street (between Wallace Street and Pershing Drive)	117
	Nelson Boulevard (between Barkeley Avenue and Pershing Drive)	240
	Prussman Boulevard (between Iron Fighter Drive and Specker Avenue)	112
	Titus Boulevard (at Sheridan Avenue)	192
	Specker Avenue (between Ellis Street and Evans Street)	103
	Chiles Avenue (between Ellis Street and O'Connell Boulevard)	155
	Wilderness Road (west of Butts Road)	1,074

3.10.2.2.2. Downrange Area

Regional Traffic

Under the Proposed Action traffic on roads on Fort Carson and surrounding the post would increase temporarily due to construction activities associated with the stationing of the IBCT and potential stationing of the CAB at the ORTC site. Construction traffic would consist of construction vehicles and equipment, including bulldozers, graders, backhoes, excavators, dump trucks, cement trucks, and scrapers. Transport vehicles would move the construction equipment to and from work sites.

Installation Traffic

Under the Proposed Action, traffic volumes on Fort Carson's roadway system would increase because of the realignment of troops and their families. Additionally, the facilities that would be constructed to accommodate the new troops would change travel patterns on the installation.

Traffic growth is expected to be the greatest on roadways that run through the less densely developed areas of Fort Carson. A sharp increase is expected on Wilderness Road, which currently has low existing traffic volumes. The increase in traffic on Wilderness Road would require additional entry control point access onto Fort Carson. Gates 6 and 19 would be opened and enhanced to accommodate the additional traffic demand. Traffic at the active entry control points is expected to increase as a result of the stationing actions under the Proposed Action but also due to ongoing and future actions not related to the Proposed Action. Figure 3.10-3 shows the 2008 adjusted future morning peak hour distribution at each active control point and includes the activation of Gate 6 and Gate 19. The change in travel patterns to and on Fort Carson would make traffic volumes at Gate 20 the highest, followed by Gate 4.

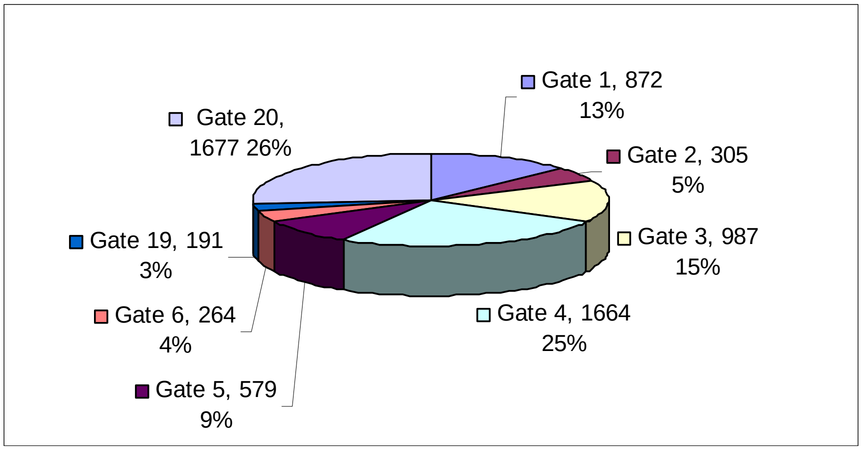

Figure 3.10-3 Future Traffic Distribution at Fort Carson's Active Entry Points

The stationing actions of the IBCT and CAB would contribute an additional 6,205 trips per day by active military personnel on Fort Carson. A majority of these trips would be along Wilderness Road. The current ADT volume along Wilderness Road is 619 trips. The stationing actions as well as other proposed and planned development is expected to increase total daily trips to approximately 7,220, an increase of 6,601 trips along Wilderness Road. Assuming all of the approximate 6,205 trips made by the IBCT and potential CAB are along Wilderness Road this would account for nearly 94 percent of the future trips forecasted for Wilderness Road.

Expansion projects for Gates 6 and 19 are currently planned in order to adequately accommodate the increased traffic volumes associated with the Proposed Action and reduce the impact to other entry control points. Currently, both Gate 6 and 19 are closed and do not meet the needed requirements for operational active entry points. The expansion project for Gate 6, located approximately 2 miles from Gate 1 would support approximately 3,860 vehicle trips per day and provide a direct expressway connection between Wilderness Road, Fort Carson's main cantonment area, and the Colorado Springs Metro Area. In addition, this expansion would require improvements to the intersection of Wilderness Road and SH 115. Those needed intersection improvements are currently under design by CDOT as part of the planned SH 115 capacity and safety improvement project.

Gate 19 is located directly east of BAAF at the intersection of Wilderness Road and Charter Oak Ranch Road. The expansion project for Gate 19 would provide direct access between the Wilderness Road/BAAF area, Interstate 25 and the City of Fountain and would support approximately 2,500 vehicles trips per day. The expansion would require reconstruction of approximately 1 mile of Charter Oak Ranch Road which is owned by El Paso County. Currently, funding for the reconstruction of Charter Oak Road is being requested through the Defense Access Road (DAR) Program.

The activation and expansion projects for both gates and potential roadway improvements would coincide with the proposed construction of the IBCT facilities and potential CAB facilities in the Wilderness Road area with an expected completion date of mid-2011.

3.10.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Regional Traffic

Under Alternative 1, traffic volumes on the regional roadways networks would increase because of the realignment of troops and their Families. That increase and associated impact would be the same under this alternative as previously described under the Proposed Action. During construction, traffic on roads on Fort Carson and surrounding the post would increase temporarily as previously stated under the Proposed Action.

Installation Traffic

Installation traffic under this alternative would essentially be the same as previously mentioned in the Proposed Action. Under this alternative the IBCT would be stationed at Training Area Bravo along Minick Avenue and not along Wilderness Road as identified under the Proposed Action. Therefore, the trips associated with the IBCT under the Proposed Action and Alternative 1 would be relocated to Minick Avenue. Currently, no information exists for the current average daily traffic volumes along Minick Avenue. The stationing of the IBCT along Minick Avenue would increase daily trips of active military personnel along this road by 3,452 assuming that 100 percent of all the forecasted IBCT trips were made along Minick Avenue.

Other Transportation

Under this alternative conditions and impacts to rail, aircraft and transit would be the same as described under the Proposed Action.

3.10.2.3.1. Cantonment Area

Cantonment area traffic would be the same as described in Section 3.10.2.3, Installation Traffic.

3.10.2.3.2. Downrange Area

As a result of stationing the IBCT at Training Area Bravo only the CAB would be stationed along Wilderness Road. Therefore, the forecasted traffic volumes on Wilderness Road would only increase by 3,149 trips instead of the 6,601 trips previously stated. Trips generated from the CAB stationed along Wilderness Road would then account for 87 percent of the total 3,149 additional trips along Wilderness Road under this alternative.

3.10.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.10.2.4.1. Regional Traffic

Under Alternative 2, traffic volumes on the regional roadways networks would increase because of the realignment of troops and their dependants. That increase and associated impact would be the same under this alternative as previously described under the Proposed Action.

3.10.2.4.2. Other Transportation

Under this alternative, conditions and impacts to rail, aircraft and transit would be the same as for the Proposed Action.

3.10.2.4.3. Cantonment Area

During construction, traffic on roads on Fort Carson and surrounding the post would increase temporarily as previously stated under the Proposed Action.

3.10.2.4.4. Downrange Area

Installation traffic under this alternative would be the same as previously mentioned in the Proposed Action, although the stationing of the IBCT and CAB would be at two different sites on Fort Carson. The sites would still be located along Wilderness Road less than 2 miles apart. Therefore, the installation traffic conditions and impacts stated in the Proposed Action would remain the same under this alternative.

3.10.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions, to include unit stationing proposed in 2007, have not yet occurred; however, their impacts to transportation been included as part of the No Action Alternative.

The Army utilized the 2008 PPACG report to extrapolate potential impacts of the No Action Alternative. Approximately 55 percent of the transportation impacts cited in that report were a result of BRAC 2005 and other Army Transformation actions (Table 3.10-6).

Table 3.10-6 Future Traffic Volumes for Select Cantonment Area Roadways Under the Proposed Action

Roadway Classification	Roadway	Average Daily Traffic Growth (percent)
Arterials	Magrath Avenue (between Prussman Boulevard and Yano)	240
	Barkeley Avenue (between Hogan Street and Khe Sanh Street)	124
	Butts Road (near Mates Facility Access)	180
Collector Roadway	Ellis Street (between Wallace Street and Pershing Drive)	100
	Nelson Boulevard (between Barkeley Avenue and Pershing Drive)	205
	Prussman Boulevard (between Iron Fighter Drive and Specker Avenue)	96
	Titus Boulevard (at Sheridan Avenue)	164
	Specker Avenue (between Ellis Street and Evans Street)	88
	Chiles Avenue (between Ellis Street and O'Connell Boulevard)	132
	Wilderness Road (west of Butts Road)	240

3.10.2.5.1. Regional Traffic

Under the No Action Alternative, traffic volumes for the 2030 regional planning horizon on the regional roadway systems would increase by at least one-third in the vicinity of Fort Carson. According to the PPACG regional travel demand model (year 2030), I-25 volumes north of Academy Boulevard would grow by 53 percent. SH 115 traffic would grow by 50 percent north of Gate 1 and 67 percent south of the gate, while US 24 traffic would grow by 26 percent west of I-25. Academy Boulevard traffic in the vicinity of Fort Carson would grow by 26 percent and 36 percent further north near its intersection with

Airport Boulevard/west Peterson AFB entrance. Powers Boulevard traffic would grow by 64 percent near Drennan Road/Colorado Springs Airport, and by 47 percent further north near Airport Boulevard (Reference No. 147).

The roadways in the southeast Colorado Springs area would experience greater daily volume growth between existing conditions and year 2030 under the No Action Alternative. The east side of Colorado Springs is currently the least densely developed portion and is the primary growth area for the Colorado Springs metropolitan area. I-25 traffic would grow by 80 percent south of Academy Boulevard and then by 86 percent south of SH 16/Gate 20. South of the SH 85/87 Fountain interchange, the percent-volume traffic increase is nearly 200 percent. Likewise, Powers Boulevard and Marksheffel Road south of Bradley Road experience a 350 percent traffic growth. On the eastern edge of Colorado Springs, US 24 traffic would grow by 460 percent and SH 94 traffic would increase by 285 percent. SH 16 traffic would grow by 94 percent east of its interchange with I-25 and then by 680 percent closer to its junction with Powers Boulevard. South of SH 16, the daily traffic-volume would increase by 225 percent on SH 85/87 and by 420 percent on Link Road. Furthermore, most of the roadways in the Fountain area experience significant daily traffic-volume growth (Reference No. 147).

The general area in which traffic attributable to Fort Carson results in a noticeable increase (1 percent or more) over the No Action Alternative is defined as the traffic “area of influence.” The traffic area of influence for the Proposed Action at Fort Carson extends north to Constitution Avenue/Fontanero Street and south to the southern boundary of Fort Carson. It extends east to Marksheffel Road/Link Road and west to a line extended north and south of 7th Street. Table 3.10-3 summarizes the PPACG projected 2035 traffic conditions for select Colorado Springs Roadways which includes the PPACG scenario.

Under the No Action Alternative, Army Transformation projects would continue to be implemented and associated construction impacts would occur to transportation both on- and off-post.

3.10.2.5.2. Other Transportation

Under the No Action Alternative, there would be increased use of rail and other transportation systems resulting from additional unit stationing.

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3.11. Utilities

This section describes the existing utilities at Fort Carson associated with potable water, wastewater, energy sources, communications, and solid waste, and describes the environmental consequences for these utilities from additional personnel and the construction and operation of new facilities. The environmental consequences for utilities include assessing the need for upgrades and any secondary impacts associated with those upgrades.

3.11.1. Affected Environment

Utilities at Fort Carson are operated in accordance with the base operations performance work statement and guided by the DPW. Potable water resources are controlled by the *Fort Carson Water Resources Management Plan* (Reference No. 271). Energy reduction efforts are guided by energy conservation programs detailed in the ***Energy Management Plan*** (Reference No. 149) and installation policy letters. The ***Energy Management Plan*** supports the Energy Policy Act (EPACT) of 2005 which requires federal installations to meet multiple goals in the areas of energy conservation, reducing greenhouse gas emissions, renewable energy implementation and water conservation. Key resources for Army utility management include:

- Safe Drinking Water Act
- CWA, NPDES;
- EO 13423, Strengthening Federal Environmental, Energy and Transportation Management;
- EPACT 2005; and
- AR 420-1, Army Facilities Management.

Solid waste management at Fort Carson is conducted in compliance with all applicable regulations. Key resources for Army solid waste management include:

- Resource Conservation and Recovery Act (RCRA);
- EPA's non-hazardous solid waste regulations codified in 40 CFR Parts 240-258;
- EO 13423, Strengthening Federal Environmental, Energy and Transportation Management;
- AR 200-1, Environmental Protection and Enhancement;
- 10 U.S.C 2577, Disposal of Recyclable Materials;
- Department of Defense Instructions (DoDI) 4715.4, Pollution Prevention; and
- 6 CCR 1007-2, Part 1, Regulations Pertaining to Solid Waste Sites and Facilities.

3.11.1.1. Potable Water Supply

Colorado Springs Utilities (CSU) supplies water to residents and businesses in Colorado Springs and also to some entities outside the city limits, including Fort Carson and other area military facilities. Potable water is purchased by Fort Carson from CSU for domestic, industrial, and irrigation use in the cantonment area. A portion of the water purchased by Fort Carson is also supplied to the Cheyenne Mountain Air Force Station. The current capacities of CSU are shown in Table 3.11-1.

Table 3.11-1 Colorado Springs Utilities Capacities

Function	Capacity
Firm yield of raw (untreated) water	119,000 acre-feet per year (106 mgd)
Storage capacity of raw water	188,000 acre-feet
Delivery capacity	196,000 acre-feet per year (175 mgd)
Treatment capacity of raw water	230,000 acre-feet per year (205 mgd)
Storage capacity of treated water	322 acre-feet (105 million gallons)

Source: Reference No. 150
mgd = million gallons per day

As presented in Table 3.11-1, the constraining factor for CSU is the firm yield of raw water. CSU has developed a population-based “planning forecast,” which “represents a water demand forecast for which actual water demands will be at or below the forecast at least 95 percent of the time.” (Reference No. 150) The CSU planning forecast will be nearing the capacity constraints of firm yield of raw water by 2012 (Reference No. 150). To mitigate the effects of population growth and increased water demand, CSU is working to reduce demand through conservation, as described in its ***2008 – 2012 Water*** *Conservation Plan* (Reference No. 151). CSU is also looking to increase supply of raw water by accessing existing rights in the Arkansas River basin. These activities are described in the ***Southern*** *Delivery System Draft Environmental Impact Statement* (Reference No. 150).

In 2006, CSU delivered approximately 26 billion gallons (79,800 acre-feet) of potable water to 417,000 persons. Deliveries to the 116,100 single-family residences totaled 11.44 billion gallons (35,108 acre-feet) (Reference No. 151). At 2.83 persons per household (Reference No. 150), approximately 328,600 persons living in single-family residences received an average of 95 gallons of potable water per person per day. Assuming a 3 percent annual growth rate from 2006 to 2008, which is the expected population growth rate during these years (Reference No. 152), it is estimated that in 2008 CSU will deliver approximately 27.6 billion gallons (84,650 acre-feet) of potable water to 443,000 persons.

Fort Carson-related potable water use is distributed among military and industrial use on-post, and domestic water use both on- and off-post. Fort Carson on-post use of water (including residential) from CSU for 2008 is approximately 2.1 mgd (6.4 acre-feet per day or 2,350 acre-feet per year), which is approximately 2 percent of Colorado Springs’ firm yield of 119,000 acre-feet per year (Reference No. 150). This is used by approximately 25,100 military and 5,100 civilians performing their jobs at Fort Carson, and also approximately 18,500 persons residing on-post. Of those residing on-post, approximately 5000 live in barracks or Bachelor Officers Quarters and 3,000 military live in family housing (10,500). The remainder of the military (17,100) and their Families (31,977) live off-post.

Estimates of residential use of potable water, at 95 gallons per person per day, by Fort Carson affiliated personnel living off-post are shown in Table 3.11-2.

Table 3.11-2 Off-Post Residential Use of Potable Water

Category	Number[1]	Water Usage (gpd)[2]
Civilian employees	5,124	486,780
Civilian employee Family	8,220	780,900
Military	17,100	1,624,500
Military Dependents	31,977	3,037,815
Total	62,421	5929,995

[1] Number of individuals as presented in Section 3.9.
[2] Calculated at 95 gpd per person.

For purposes of the analysis, all off-post personnel are assumed to reside in the CSU service area, which is a conservative assumption that would result in relatively higher impacts. Total off-post water usage by Fort Carson-affiliated personnel is approximately 5.9 mgd (6,629 acre-feet per year) and would represent approximately 5.6 percent of firm yield. Total 2008 water usage for all Fort Carson affiliated personnel, both on- and off-post, is estimated at 8,979 acre-feet per year, which is approximately 7.5 percent of the firm yield for raw water. This amount would be approximately 10 percent of the total Colorado Springs usage.

In 1975, CSU set the maximum water supply of 14 mgd for Fort Carson, but the maximum historical daily water demand on the installation is only 5.5 mgd (Reference No. 153). Fort Carson has actually reduced overall water use on the installation by approximately 45.9 percent since 2002 (Reference No. 154). Water reduction has been achieved through installation of low-flow fixtures in some facilities, waterless urinals in new facilities, single-bay washes inside motor pools, and other conservation efforts. Reduced troop levels as a result of deployments are also a factor.

Potable water is delivered to Fort Carson through two 20-inch-diameter lines that enter the installation from the north and feed the eastern and western sides of the cantonment area. The 50-year-old water lines within the cantonment area are deteriorated and are being replaced. Two 6-inch water lines run down Butts Road from the cantonment area to BAAF, and a 20-mile, 6-inch water line extension from BAAF near Route 1 to the multi-purpose range complex at the southern end of Fort Carson. The potable water supply system at BAAF is an outdated system which requires chemical modification. An 8-inch line from BAAF extends east to the Range Control Complex and the ORTC barracks facilities along Wilderness Road. The potable water storage system at Fort Carson consists of seven water storage tanks that provide capacity during emergency conditions.

Tributaries for which Fort Carson retains water rights are Little Fountain Creek, Little Turkey Creek, Red Creek, Rock Creek, Sand Canyon Creek, Turkey Creek, and Wild Horse Creek (Figure 3.6-1). Fort Carson has 16 subsurface water rights for nine installed wells. Decreed use categories include irrigation, recreation, fish maintenance, fire fighting, military, livestock, domestic, and industrial. Potable water for consumption during training activities in the downrange area is trucked from the cantonment area, while at the multi-purpose range complex, potable water is piped from the cantonment area.

3.11.1.2. Wastewater System

Fort Carson operates and maintains a wastewater collection and treatment system for both sanitary and industrial wastewater components. Forty-seven miles of lines service the cantonment area, the family housing area, BAAF, and Cheyenne Mountain Air Station. Effluent discharges from the sewage treatment plant are regulated under EPA NPDES Permit Number Permit No. CO-0021181 (Reference No. 272), which is effective until September 30, 2010. CDPHE allows Fort Carson to discharge only 3.02 mgd into Clover Ditch (Reference No. 153). The Fort Carson golf course is irrigated, in part, by the effluent (Reference No. 155).

The sanitary sewage treatment plant, which was re-constructed in 1998, has a 4.0-mgd design capacity with a peak historical flow of 2.6 mgd. The current wastewater load for the entire system is 1.3 mgd (Reference No. 153).

The Colorado Water Quality Control Commission (WQCC) adopted new EPA ammonia discharge standards (EPA-823-F-99-024); the new standards were put into effect in October 2007. Fort Carson, which discharges into Clover Ditch, a tributary of Fountain Creek, is in the process of determining how to achieve compliance with these standards. Based on a review of the current permit limits for Fort Carson, it has been concluded that the facility is in compliance with the current ammonia effluent limits. The annual average total ammonia concentration in the effluent is approximately 0.50 mg/L. Under the proposed regulations, if future ammonia standards require facility upgrade, Fort Carson will have until calendar year 2012 to accomplish implementation.

The original sanitary system, constructed in 1942, comprises numerous areas of old, deteriorated lines that have been identified and replaced or programmed for replacement. Deteriorated sewer lines along Titus Road were recently replaced to facilitate sewage flow for construction projects on the southern end of the cantonment area. These upgrades also facilitated flow to the sewer lines running along Butts Road.

Portable toilets, dry vault, and self-composting latrines are used in the downrange area when septic tanks/leach fields are not available (e.g., during training activities on the downrange area).

An industrial wastewater treatment plant (IWTP) is located directly north of the sanitary sewage plant, near Gate 20. The IWTP was designed and constructed to treat petroleum-contaminated water from the motor pools in the cantonment area. The IWTP collection sewer extends down Minick Avenue behind the motor pools and delivers industrial wastewater to the IWTP. Wastewater is conveyed using both lift stations and gravity flow. IWTP effluent is combined with the sanitary sewage water entering the sewage plant. Treated IWTP effluent is discharged directly into “I” Ditch (Clover Ditch), which is one of Fort Carson’s three main ditches.

BAAF, the Colorado Army National Guard Centennial Training Site, and the Special Forces Complex along Wilderness Road are not connected to the IWTP. These facilities all use an oil-water separation system (OWS) to pre-treat industrial wastewater before it is drained into the main wastewater system.

3.11.1.3. Energy Sources

Fort Carson purchases natural gas and electricity from CSU. The installation obtains 2.3 percent of its energy needs from solar panels and is currently researching other sources of renewable energy for future use. Further details on renewable energy sources can be found in Section 3.13.

Electrical services are provided through two aerial 34.5-kilovolt, three-phase supply lines, which terminate at three power substations in the cantonment area. The peak historical electrical demand at Fort Carson is 27.9 mega volt ampere (MVA) while the total capacity of transmission lines available to the installation is 57.4 MVA and the total capacity of transformers is 37.9 MVA. Two of the transformers are close to capacity and the Titus Road substation is planned for an upgrade so that it would have 10 circuits. This substation upgrade would support electricity demand on the cantonment area and two to four feeders would also extend from Titus Road down to Butts and Wilderness Roads.

Electrical supply lines to BAAF were upgraded in 1986 and are now operating at peak capacity. Upgrades to the electrical system at BAAF would be necessary to continue to meet electrical demands for this area. Power for maneuvers and target training within the downrange area is supplied locally by battery or generator.

Fort Carson receives natural gas from CSU via two feeds at the north end of the installation, near Gate 4. CSU is installing an additional 10-inch steel gas line along SH 115 to be completed by the end of 2008. The natural gas is metered and piped through a series of gas mains and distribution lines to Fort Carson’s four central heating plants, BAAF, and the family housing area. The peak historical daily consumption of natural gas at Fort Carson is 9,329 million cubic feet (mcf)/day (Reference No. 153). CSU’s maximum delivery capacity to the installation is 24,000 mcf/day (Reference No. 153). Recent upgrades to lines within the cantonment area and the additional 10-inch steel line would adequately support gas demands within the cantonment area, but upgrades would be required in the downrange area.

The existing gas line servicing BAAF does not have the capacity to accommodate additional gas service to the downrange area or facilities located on Wilderness Road. There is a planned 4-inch gas line extension upgrade from Titus Road down Butts Road to the BAAF. Additional gas line upgrades and extensions would be required to provide facilities along Wilderness Road with sufficient gas supplies.

3.11.1.4. Communications

The primary communication infrastructure at Fort Carson consists of cable lines that run throughout the cantonment area, seven ranges, and BAAF. The communication system around the cantonment area is sufficient to meet the current needs for personnel and operations. However, as the number of Soldiers and support personnel at Fort Carson increases, significant upgrades to the existing communications infrastructure will be required several years in the future. Cable extensions are currently being built for various new construction projects underway within the cantonment area. Basic administrative analog telephone and low-speed data are available along Wilderness Road and the downrange area locations using copper and leased fiber lines.

3.11.1.5. Solid Waste

The *Integrated Solid Waste Management Plan* (ISWMP) (Reference No. 156) contains details of the Solid Waste Management Program at Fort Carson. The ISWMP complies with AR 200-1 and is consistent with AR 420-49 and other applicable guidance on solid waste management. Fort Carson intends to achieve a 50 percent annual reduction/diversion rate of solid waste by 2010 through recycling, reuse, and reduction (based on a 1992 baseline generation rate), while ensuring that integrated non-hazardous solid waste management programs provide an economic benefit when compared with disposal using landfills and incineration alone. Refuse, construction-related solid waste, and recyclable materials are all managed by DPW.

Until 1998, Fort Carson operated a 50-acre sanitary landfill, located south of the cantonment area, for the disposal of municipal solid waste. Construction and demolition waste was placed in an adjacent 20-acre landfill that ceased operations in 2002. Since that time, waste has been shipped off site for disposal in local landfills by a waste disposal contractor (Reference No. 156).

Currently, all solid waste from Fort Carson, including waste from the housing units, is shipped 15 miles to offsite landfills, including the Midway Landfill in Fountain, Colorado by a licensed contractor. Midway Landfill and other landfills are permitted Subtitle D landfills.

Fort Carson operates a recycling center located near Gate 3. In addition to the recycling center, there are three additional large drop-off facilities located in the cantonment area. Smaller recycling bins are located near all facilities. As expansion continues on the installation, additional recycling containers would be placed at all new facilities. Recyclable materials collected at these sites include paper, plastic, glass, cardboard, wood pallets, aluminum and scrap metal.

3.11.2. Environmental Consequences

The following discussions describe the environmental consequences of the Proposed Action and the alternatives as they relate to utilities.

3.11.2.1. Proposed Action and Alternatives

3.11.2.1.1. Potable Water

The Proposed Action and alternatives would result in an increase in Fort Carson employment of approximately 6,700 Soldiers which is an increase of approximately 27 percent by 2012. In addition, there would be an increase of approximately 12,500 military dependents (Section 3.9). The military would experience an on-post increase of approximately 2,200 unaccompanied personnel and approximately 560 personnel living in family quarters. There will be an estimated increase of approximately 1,050 military dependents living in family quarters. Personnel and Families living on-post would increase by approximately 21 percent. Based on the increase in post employment, water usage would increase by approximately 22 percent over the period ending in 2012, an amount equal to approximately 462,000 gallons per day (gpd) (520 acre-feet per year), which would be approximately 0.4 percent of firm yield. Total usage at Fort Carson in 2012 would be approximately 2,562,000 gpd (2,870 acre-feet per year). The total on-post use would be approximately 2.4 percent of the CSU firm yield.

The increase in estimated residential use of potable water caused by the increase in Fort Carson affiliated personnel living off-post are shown in Table 3.11-3.

Table 3.11-3 Change In Off-Post Residential Water Usage, 2012

Category	Number[1]	Water Usage (gpd)[2]
Civilian employees	27	2,565
Civilian employee Family	51	4,845
Military	3,940	374,300
Military Dependents	11,450	1,087,750
Total	15,468	1,469,460

[1] Number of individuals as presented in Section 3.9.
[2] Calculated at 95 gallons per day (gpd) per person.

The increase in off-post water usage by Fort Carson affiliated personnel would be approximately 1.5 million gallons per day (mgd) (1,679 acre-feet per year), or approximately 1.4 percent of firm yield. Total water usage for off-post personnel in 2012 would be approximately 2.7 billion gallons (8,308 acre-feet), which would be approximately 6.9 percent of firm yield.

Total annual water usage for all Fort Carson affiliated personnel in 2012 is estimated at 9.6 mgd (10,742 acre-feet per year). The total amount of water used by all Fort Carson affiliated persons would be approximately 9 percent of the firm yield for raw water, an increase of 1.8 percent of firm use as a result of the Proposed Action and alternatives. Therefore, water usage would be closer to the firm yield for raw water by 2012.

The existing water lines on-post, which are deteriorated and require replacement, cannot support the additional personnel and operations at ORTC and operations at BAAF. According to Fort Carson utility planning, the estimated annual flow for 2009 is 2.3 mgd, which is less than a 10 percent increase over the estimated annual flow for 2008. Without upgrades, the current potable water infrastructure at Fort Carson cannot handle the increased water demands from the additional IBCT, CS personnel, and potential CAB.

3.11.2.1.2. Wastewater System

The addition of Soldiers to Fort Carson would increase the load on the sanitary wastewater system requiring extensions and upgrades to the wastewater treatment system to handle the increased load of IBCT and CAB personnel and operations.

3.11.2.1.3. Energy Sources

Electrical upgrades would be needed to facilitate the overall growth at Fort Carson as described in the Proposed Action and alternatives and would increase energy demand from new facilities as well.

3.11.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center

Under the Proposed Action, extension of utilities would be required for personnel and the specific operational facilities for the IBCT and potential CAB at the ORTC. Personnel facilities (barracks, dining facility, etc.) would be required for the CAB at the ORTC. Additional administrative and operational facilities for the CAB would be constructed adjacent to BAAF.

Large (linear) areas of temporary disturbance around the proposed sites would be attributed to the installation of new utilities. These disturbed areas would be re-graded and seeded with ground vegetation in order to restore these sites in accordance with BMPs for new construction.

3.11.2.2.1. Cantonment Area

Potable Water

Increased CS personnel under the Proposed Action would cause infill construction (demolition and new construction) in the Fort Carson cantonment area. This would result in increased demand to utilities, but only minor utility upgrades in the form of line tie-ins would be required to support this growth in the cantonment area.

Wastewater System

The addition of approximately 400 CS Soldiers to Fort Carson would increase the load on the sanitary wastewater system. However, the extension of sanitary sewer lines and industrial wastewater lines from the existing infrastructure would handle the additional flow in the cantonment area.

Energy Sources

The addition of approximately 400 CS Soldiers to Fort Carson would increase energy demand from new facilities within the Fort Carson cantonment area. The installation of additional electrical feeders and the extension of natural gas piping to the new CS facilities would be adequate to meet the additional energy demand for these units. Under the Proposed Action, there would be no adverse impact on the electric and natural gas system at Fort Carson.

3.11.2.2.2. Downrange Area

Operational Readiness Training Center

Potable Water

As part of the Proposed Action, a 500,000-gallon elevated water storage tank would be installed on the west end of Wilderness Road near Gate 6. A water pump station (1,500 gpm) with additional pump capacity would also be installed for this area of Wilderness Road. Construction of 15,000 LF of 8-inch water main, and two to ten pressure-reducing valves and vaults, would be necessary between Gate 1 and Gate 6. The two existing waterlines which run down Butts Road to the BAAF do not require upgrades to meet the demands of these new facilities. Another 8-inch water main would be extended from BAAF to the Wilderness Road sites. Water line extensions would connect these mains to each of the facilities to be constructed under the Proposed Action.

The potable water system would be installed underground, and disturbed areas would be restored after the construction of the new service lines. Under the Proposed Action, no adverse effect to the potable water system at Fort Carson would occur.

Wastewater System

The Proposed Action would require extensions and upgrades to the wastewater treatment system to handle the increased load of IBCT and CAB personnel and operations An extension of a 12-inch sewer line from BAAF along Wilderness Road to Gate 6 would be constructed to support the new facilities at the ORTC. In addition, each of the proposed buildings would have a wastewater line and a cleanout. The sanitary wastewater would be conveyed to the WWTP. The wastewater system would be installed underground, and disturbed areas would be restored after completion of the projects.

Construction and operation of new motor pools (including seven vehicle maintenance shops) for the IBCT at the ORTC would require a dedicated industrial collection system and lift stations to support the increased industrial wastewater. New industrial wastewater lines would be installed along Butts Road and along the southern portion of the new facilities at the ORTC.

No IWTP would be added at Wilderness Road because pre-treatment OWSs would be used and pretreated water would then be discharged into regular sewer lines. The installation of OWSs would minimize the impacts of construction and operation of new motor pools and aircraft maintenance facilities on the wastewater system at Fort Carson.

It is anticipated, based on the low levels of ammonia in the effluent, that the wastewater treatment plant can reasonably be expected to meet new ammonia effluent limitations, even with the increase in wastewater that would be generated under the Proposed Action. As noted in the Fort Carson Transformation plans, any required facility upgrades required to meet the new standard, must be completed by 2012.

Under the Proposed Action, no adverse effect to the wastewater system at Fort Carson would occur.

Energy Sources

In addition to the planned electricity upgrades needed to facilitate overall growth at Fort Carson, several electric utilities upgrades would be completed under the Proposed Action. According to Fort Carson utility planning, estimated peak electricity demand for the entire installation in 2009 is approximately 45 MVA, which is a 45 percent increase over current demand. The increase in personnel and operations at the ORTC/BAAF would require the installation of a new substation along Wilderness Road to supply electricity to the IBCT/CAB facilities. This substation would have between eight and ten circuits with feeder lines connecting to all of the new facilities at the ORTC. As mentioned in Section 3.11.1.3, the Titus Road substation must be upgraded to support increased electricity demand in the cantonment area. Along with the upgrade of the Titus Road substation, two to four feeders would also extend to the ORTC. A portion of these feeders would connect to an existing circuit east of BAAF to assure power reliability, which would require manholes every 500 feet. Electric lines would be connected to each new facility at the ORTC and BAAF.

With the construction of a new electricity system along Wilderness Road, the existing above-ground power lines would be removed. The new lines would be installed underground, and disturbed areas would be restored after completion of the projects.

Upgrades and coordination with CSU would provide the power and capacity to support additional personnel and operations at the ORTC and BAAF under the Proposed Action.

Increased personnel and operations would result in increased natural gas demand at ORTC and BAAF. According to Fort Carson utility planning, estimated peak demand for the installation in 2009 is 18,661 thousand cubic feet (Reference No. 157). The current natural gas system is inadequate to meet the current and future personnel needs in the downrange area. The Proposed Action would require the extension of an 8-inch line along SH 115 to the dirt road and then to Gate 6 and connecting to Wilderness Road. An extension upgrade would be required for a 4-inch line along Titus Road, which extends to Butts Road. A gas line would be constructed to connect the line from Butts Road to the new line from Gate 6. Gas lines would be connected to the new facilities at the ORTC and BAAF. The natural gas system upgrades would be installed underground, and disturbed areas would be restored after completion of the projects.

3.11.2.2.3. Communications

Under the Proposed Action, the basic communications infrastructure along Wilderness Road would require considerable upgrades to support IBCT and CAB facilities at the ORTC and BAAF. New cables would be installed along Wilderness Road and connect to the existing lines along Butts Road. A two by four duct bank system, which currently connects the Range Control facility to the south side of Wilderness Road, would be upgraded. In addition, five new duct banks and 27 new manholes would be installed at the ORTC. Copper and strand fibers would connect to each new facility. The communication lines would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, there would be no adverse impact on the communications system at Fort Carson under the Proposed Action.

3.11.2.2.4. Solid Waste

Solid waste generation at the ORTC and BAAF would increase under the Proposed Action; construction of required facilities would also increase the amount of solid waste generated. Solid waste generated from implementation of the Proposed Action would be managed in accordance with the existing ISWMP. Solid wastes would be collected and transported to appropriately permitted disposal facilities off-post. Large and small recycling containers would be placed at the new facilities and existing recycling procedures would be implemented. Therefore, no adverse effect to solid waste would occur due to implementation of the Proposed Action.

Butts Army Airfield

Potable Water Supply

Installation of a looped potable water supply would improve the water quality and reliability of water delivery at BAAF.

Wastewater System

The Proposed Action would include upgrades to the industrial wastewater system that would adequately handle the additional wastewater generated by the new activities at BAAF.

The oil water separator requirement and ammonia levels would be the same as under the Proposed Action. Therefore, under the Proposed Action, no adverse effect to the wastewater system at Fort Carson would occur.

Energy Sources

Impacts would be the same as for the Proposed Action in Section 3.11.2.2.2.

Communications

Impacts would be the same as for the Proposed Action in Section 3.11.2.2.2.

Solid Waste

Impacts would be the same as for the Proposed Action in Section 3.11.2.2.2.

Ranges and Training Areas

No utilities upgrades would be required for the improvement of ranges.

3.11.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Under this alternative, extension of utilities would be required for the facilities set for the IBCT at Training Area Bravo. Linear areas of temporary disturbance around the proposed sites would be attributed to installation of new utilities.

The CAB infrastructure would remain at the ORTC and BAAF; and the CS units would remain at the Fort Carson cantonment area. The utilities upgrades and extensions for just the CAB at the ORTC would remain the same as discussed in Section 3.11.2.2. The utilities upgrades and extensions for the CS units would also remain the same as discussed in Section 3.11.2.2 for the BAAF.

3.11.2.3.1. Cantonment Area

Potable Water Supply

The existing water lines within the cantonment area could support the additional personnel and operations at Training Area Bravo. A new 500,000-gallon elevated tank would be built along Minick Avenue to provide sufficient water flows for fire. IBCT facilities would be tied into the potable water system from the main cantonment area. Extension of service lines would be sufficient to support the development of IBCT facilities at Training Area Bravo. The potable water system would be installed underground, and disturbed areas would be restored after the construction of the new service lines. Under Alternative 1, no adverse effect to the potable water system at Fort Carson would occur.

Wastewater System

A further detailed analysis of the impacts of increased wastewater flow in Training Area Bravo must be completed prior to the development of IBCT facilities at this location. Sanitary sewer lines would extend from the Training Area Bravo to the cantonment area infrastructure. The wastewater system would be installed underground, and disturbed areas would be restored after completion of the projects.

Construction and operation of new motor pools (including seven vehicle maintenance shops) for the IBCT at Training Area Bravo would increase industrial wastewater. New industrial wastewater lines would be installed along Minick Avenue. These new lines would connect to the existing IWTP located along Minick Avenue in the cantonment area. Under Alternative 1, no adverse effect to the potable water system at Fort Carson would occur.

As discussed in the Proposed Action, the wastewater treatment plant can reasonably be expected to meet new ammonia effluent limitations even with the increase in wastewater that would be generated under Alternative 1. Any required facility upgrades required to meet the new standard, must be completed by 2012.

Energy Sources

Increased personnel and operations would result in increased electricity demand at Training Area Bravo. According to Fort Carson utility planning, estimated peak electricity demand for the entire installation in 2009 is approximately 45 MVA, which is a 45-percent increase over current demand. Upgrade of the substation, transformer, and coordination with CSU to provide additional capacity would provide the power and capacity to support additional personnel and operations at Training Area Bravo under Alternative 1.

A new substation was just added off of Magrath Avenue. This substation would provide sufficient electric supply to IBCT facilities at Training Area Bravo. The installation of new electrical feeders connecting Training Area Bravo to this substation would meet electrical demand generated by additional personnel and operations at Training Area Bravo. Electrical lines would be installed along Minick Avenue and throughout the new Training Area Bravo infrastructure. The electrical system upgrades would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, no adverse effect to electricity would result from implementation of the Alternative 1.

Increased personnel and operations would result in increased natural gas demand at Training Area Bravo. The current natural gas system off of Minick Avenue is adequate to meet the current and future personnel needs in the area east of the cantonment area. A new gas line extension would be constructed along Minick Avenue to supply natural gas to IBCT facilities at Training Area Bravo. The natural gas system upgrades would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, no adverse effect to gas system would result from implementation of the Alternative 1.

Communications

Under Alternative 1, the IBCT facility at Training Area Bravo would require cable line extensions from the existing communications system within the cantonment area. New cables would be installed along Minick Road. In addition, new duct banks and new manholes would be installed at Training Area Bravo. Copper and strand fibers would connect to each new facility. The communication lines would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, there would be no negative impact on the communications system at Fort Carson under Alternative 1.

Solid Waste

Solid waste generation at Training Area Bravo would increase under the Proposed Action; construction of required facilities would also increase the amount of solid waste generated. Solid waste is managed in accordance with the ISWMP. Solid wastes are collected and transported to appropriately permitted disposal facilities off-post. Solid waste generated from implementation of the Proposed Action would be managed in accordance with the existing ISWMP. Large and small recycling containers would be placed at the new facilities and existing recycling procedures would be implemented. Therefore, no adverse effect to solid waste would occur due to implementation of the Alternative 1.

3.11.2.3.2. Downrange Area

Operational Readiness Training Area

Utility requirements would be similar to the Proposed Action to support CAB facilities; however support facilities and IBCT facilities would not be constructed at the ORTC area, thus requiring less.

Butts Army Airfield

Impacts would be the same as for the Proposed Action in Section 3.11.2.1 for the BAAF.

Ranges and Training Areas

No utility upgrades would be required for the improvement of ranges.

3.11.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Construct Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.11.2.4.1. Cantonment Area

The CAB infrastructure would remain at the ORTC and BAAF; and the CS units would remain at the Fort Carson cantonment area. The utilities upgrades and extensions for just the CAB at the ORTC would remain the same as discussed in Section 3.11.2.2. The utilities upgrades and extensions for the CS units would also remain the same as discussed in Section 3.11.2.2.

3.11.2.4.2. Downrange Area

Operational Readiness Training Area

Utility requirements would be similar to the Proposed Action to support CAB facilities; however support facilities and IBCT facilities would be constructed at Tent City. Due to the close proximity of both ORTC and Tent City sites, utility upgrades would be the same as the Proposed Action. Regardless of the construction site location, utilities would be tied into existing lines along Butts Road and new lines constructed between Gate 6 and Gate 1, thus creating a closed loop.

Butts Army Airfield

Impacts would be the same as under the Proposed Action in Section 3.11.2.1 for the BAAF.

Ranges and Training Areas

No utility upgrades would be required for the improvement of ranges.

3.11.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. As a result of the implementation of the No Action Alternative there would be no change to land use. This increase under the No Action Alternative would impact utilities at Fort Carson. Details on the impacts to potable water system, wastewater system, energy sources, communications and solid waste from the No Action Alternative can be found in the 2007 Fort Carson Transformation EIS.

3.12. Hazardous and Toxic Substances

This section describes the affected environment and environmental consequences to hazardous and toxic substances including uses of hazardous materials, storage and handling areas, hazardous waste disposal, site contamination and cleanup, and special hazards within the cantonment area, BAAF, and the downrange area.

3.12.1. Affected Environment

In accordance with the RCRA, 6 CCCR 1007-2 and 1007-3, DoDI, Department of the Army Regulations, and *Part B Permit No. CO-06-09-29-01* (Reference No. 273), Fort Carson has a comprehensive program to address the management of hazardous waste, hazardous materials and toxic substances. This includes the proper handling, and disposal of hazardous waste and procurement, use, storage, and abatement (if necessary) of toxic substances. Additionally, a systematic approach is employed to investigate and remediate known or suspected contaminated sites across the installation until closure or receipt of a No Further Action (NFA), if necessary.

Hazardous and toxic materials used at Fort Carson include gasoline, batteries, paint, diesel fuel, oil and lubricants, explosives, JP-8 jet fuel, pyrotechnic devices used in military training operations, radiological materials at medical facilities, radioactive materials, pesticides, and toxic or hazardous chemicals used in industrial operations (Reference No. 155). Some of these materials end up as wastes, either through certain processes, or as a result of process changes whereby the material no longer meets required specifications, or becomes contaminated and unusable. The Part B Permit (Attachment 3, *Waste Analysis Plan*, 29 September 2006) displays the estimated quantity of hazardous waste (pounds per year) that are either typically or may potentially be generated annually at Fort Carson.

To reduce the amount of hazardous waste generated on Fort Carson, a Hazardous Material Control Center (HMCC) was established in an effort to centralize and control purchases of hazardous materials and employ affirmative procurement practices. To minimize hazardous waste disposal, Fort Carson maximizes recovery of waste for reuse and recycles applicable materials according to the *Installation Recycling Plan* (Reference No. 158), *Pollution Prevention (P2) Plan* (also known as *the Waste Minimization Plan*) (Reference No. 159), and the ISWMP, (Reference No. 156). The *Hazardous Waste Management Plan* (HWMP) (Reference No. 170), updated in September 2007, also supports waste reduction efforts and is currently being revised to incorporate additional sustainable principles. A description of the applicable management programs and plans implemented at Fort Carson is included in Appendix A.

3.12.1.1. Uses of Hazardous Materials

3.12.1.1.1. Cantonment Area

The principle industrial operations and activities involving the use of hazardous materials and petroleum-based products at Fort Carson are painting, repair and maintenance of vehicle and aircraft at the consolidated maintenance facility (Building 8000) and various other motorpools. Additionally, Fort Carson operates an IWTP, an Army Oil Analysis Program Laboratory (AOAPL), medical and dental facilities and engages in solvent recycling. All of the above activities represent the majority of the following hazardous waste generated at Fort Carson: paint thinner, paint booth filters, paint related rags and solvents, Chemical Oxygen Demand (COD) and laboratory reagents, heptanes, kerosene, methanol, ethanol and solvent distillation sludges.

As required by DoD policies, Fort Carson emphasizes integrated pest management. Pesticides and herbicides are required for insect and rodent control in select structures and in the control of undesired vegetation including noxious weeds (Reference No. 160).

Asbestos-containing materials were prevalent in building construction until the 1970s; although the use of asbestos has declined dramatically, asbestos is occasionally found in new building materials (Reference No. 161). Specifically, asbestos can potentially be found in floor tiles, pipe wrappings, ceilings, and insulation.

Lead-based paint is no longer used but may be found in older structures (Reference No. 162). Lead can potentially be found in chipped or cracking painted walls or in surrounding soils. Paint in liquid form can also contain hazardous lead concentrations.

Transformers manufactured prior to 1976 and light ballasts manufactured before 1979 are assumed to contain polychlorinated biphenyl (PCB) waste (Reference No. 163). There are 16 transformers and possible existing ballast light fixtures within the cantonment area that potentially contain PCB dielectric fluid (Reference No. 54). These transformers are scheduled for removal and proper disposal during a project to upgrade the electrical substation. Expected timeframe for removal is by the end of calendar year 2008. Ballast in light fixtures removed during renovations/demolitions are turned in to the Hazardous Waste Storage Facility (HWSF) for proper disposal.

3.12.1.1.2. Downrange Area

Butts Army Airfield

The principal industrial operations at BAAF involving the use of hazardous materials and petroleum-based products include the painting, repair, and maintenance of aircraft and their supporting wheeled ground vehicles. Aircraft maintenance hangars, one hot-refuel point, and one outdoor wash rack are utilized to perform standard vehicle maintenance. Additionally, painting operations are conducted at a paint booth within one of the old hangars.

Pesticides and herbicides are required for insect and rodent control in select structures at BAAF and in the control of undesired vegetation including noxious weeds (Reference No. 160). Lead-based paint and asbestos-containing materials may be found in older facilities at BAAF (Reference No. 54). Possible transformers and existing ballast light fixtures that potentially contain PCB dielectric fluid may also exist (Reference No. 164).

The only use of hazardous materials outside of BAAF in the downrange area is the use of petroleum-based products required during the repair and maintenance of vehicles and replacement of obsolete or malfunctioning targetry systems such as lifters that contain hydraulic fluids (Reference No. 155).

3.12.1.2. Storage and Handling Areas

3.12.1.2.1. Cantonment Area

Hazardous materials are stored securely in maintenance areas, flammable storage lockers/areas, and mobile transfer units (tank trucks) (Reference No. 159). Petroleum products are stored in numerous aboveground storage tanks (ASTs) within the cantonment area and include newly constructed contractor-owned, contractor-operated bulk and retail fuel facilities that provide fuel to all military units on Fort Carson. Three commercial gas stations are operated on Fort Carson and each station contains three USTs (Reference No. 159). Lists B-1 through List B-7 within the *Spill Prevention Control and Countermeasures Plan* (SPCCP*)* (Reference No. 165) provide a detailed chemical inventory and contain chemical storage locations areas within Fort Carson.

Lead-acid batteries are managed under the installation battery procurement and exchange program, whereby the vendor delivers new batteries in exchange for used batteries for recycle. Used batteries are stored at individual units and maintenance facilities until the vendor provides the exchange services, which usually occurs within 30 days.

Building 3708 is used to store and mix pesticides (Reference No. 165). Minor amounts of consumer pesticides are also stored and distributed at the commissary, Post Exchange, and the veterinary clinic (Reference No. 160).

3.12.1.2.2. Downrange Area

Butts Army Airfield

Petroleum-based products are stored in several ASTs and at the hazardous cargo loading area at BAAF located at the south end of the runway.

Ranges and Training Areas

Petroleum-based products used in the repair of malfunctioning targetry systems and service vehicles are stored at established locations throughout the downrange area including Buildings 9300, 9550, Range 123 and the MPRC.

Petroleum-based products used in the repair of malfunctioning military vehicles during maneuvers are stored at various locations throughout the downrange area. Each of these areas are inspected and cleared of materials and debris at the conclusion of each tactical exercise.

3.12.1.3. Waste Disposal

All hazardous waste generated at Fort Carson (including the cantonment and downrange areas, and BAAF) is transported to the (HWSF, Building 9248, for storage and eventual shipment offsite for proper disposal. Currently, there are seven satellite accumulation points (SAPs) on Fort Carson for the collection and temporary controlled onsite storage of hazardous waste (Reference No. 54).

The installation has no active landfills, and all sanitary waste is disposed of off-post at commercial landfills (Reference No. 156).

3.12.1.4. Site Contamination and Cleanup

Fort Carson is not listed on the EPA's National Priority List (NPL), which designates high-priority cleanup sites under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), more commonly known as the Superfund Program. Investigation and cleanup of Fort Carson is conducted under the Corrective Action portion of their RCRA Part B Permit (Reference No. 273).

Investigation and cleanup of Fort Carson's contaminated sites is conducted in accordance with the RCRA Part B permit requirements. Typical contaminants of concern include organics (solvents, petroleum hydrocarbons, etc.), explosives residues (trinitrotoluene [TNT], cyclotrimethylenetrinitramine [RDX], etc).

For the 170 Solid Waste Management Units (SWMUs) within ***Fort Carson's Corrective Action Program*** (Reference No. 273), site investigation and cleanup are being performed in accordance with applicable Army, state, and federal requirements to achieve established cleanup goals and schedules.

Figure 3.12-1 shows the location of SWMUs at Fort Carson, regardless of cleanup status, at the cantonment area, BAAF, and downrange area.

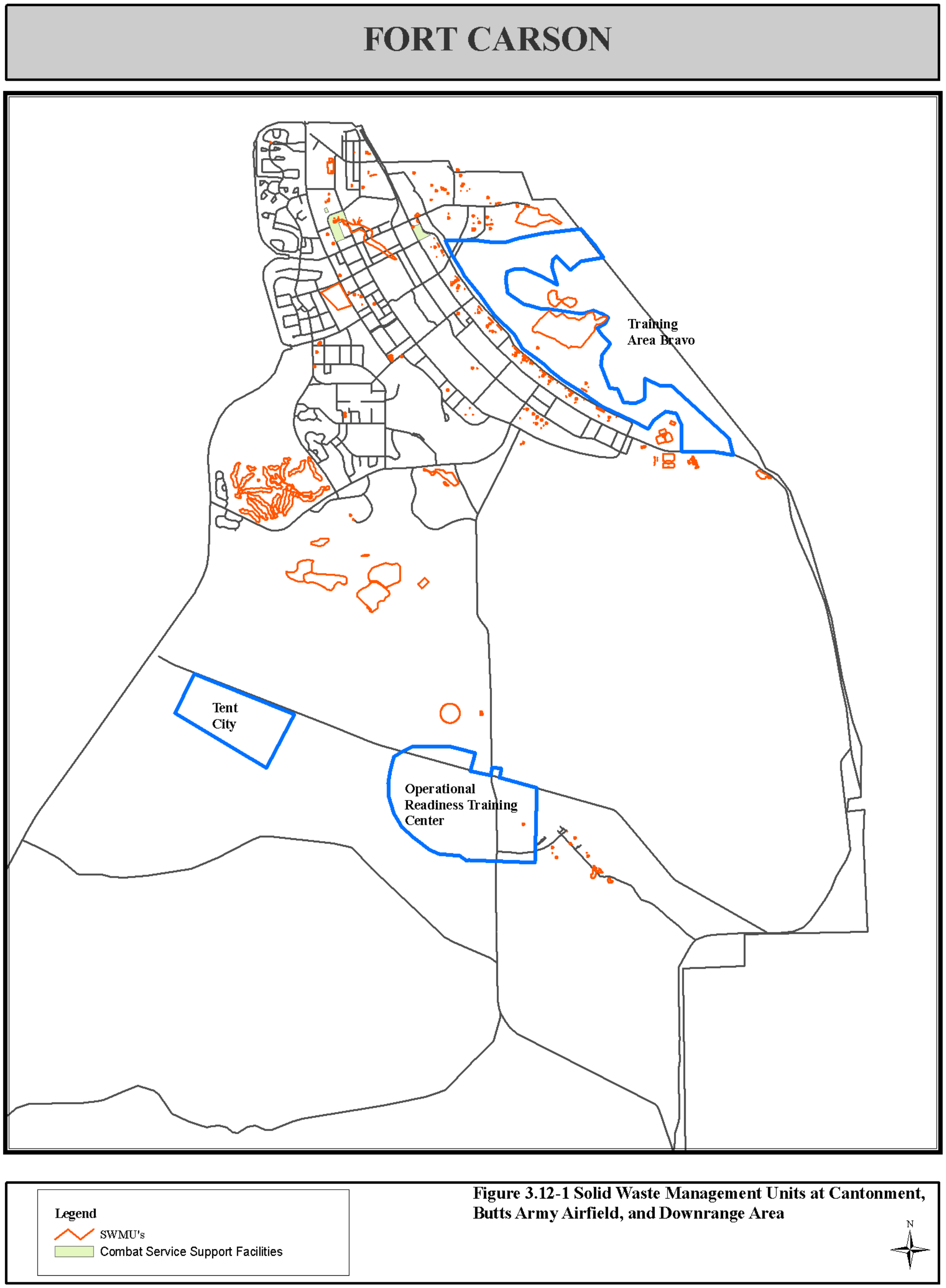

Figure 3.12-1 Solid Waste Management Units at Cantonment, Butts Army Airfield, and Downrange Area

To the extent practical, all SWMUs are avoided during construction projects. Fort Carson manages the SWMUs according to all federal, state, and local regulations, and Fort Carson's RCRA Part B permit (Reference No. 273).

3.12.1.5. <u>Special Hazards</u>

3.12.1.5.1. Cantonment Area

The cantonment area is an area of high concern for radon potential (Reference No. 54) and requires monitoring and engineering precautions to limit radon exposure. Unserviceable components are sent off-post for repair or disposal Building 8000 is over 1 mile from existing and proposed family housing sites (Reference No. 54). The *Radioactive Materials Management Plan* (Reference No. 166) for Fort Carson provides the requirements for handling these materials.

3.12.1.5.2. Downrange Area

Ammunition is stored at the ASP located just north and east of Townsend Reservoir and is classified as Class V material according to the Army's supply categories. The ASP contains 20 standard ammunition storage igloos, two aboveground magazines, the ASP office, and a utility building (Reference No. 167). Lead is found at gun and artillery practice ranges where lead munitions are used (Reference No. 168). UXO is found in the large impact area, which is the only authorized area on Fort Carson where dud-producing ammunition can be fired. UXO deemed unsafe to detonate in place are transported to Range 121 for treatment via open detonation (OD). The OD unit is currently operating in interim status while a Subpart X permit is being prepared by CDPHE.

Recent research indicates there may be a potential increase in the mobility of lead when it is found in conjunction with tungsten fired as part of the Army's "Green Ammunition" program. For a few years in the last decade, Green Bullets, also known as tungsten nylon bullets, were part of the Army's small arms portion of this program, an effort to provide Soldiers with ammunition that would be more environmentally sustainable than traditional munitions with lead cores. In this ammunition, tungsten metal and nylon were pressed together into the form of a bullet. These tungsten bullets were used at Fort Carson's small arms ranges, although that practice has now been halted. (The best information available indicates the tungsten bullets were not used at PCMS.)

Tungsten metal that was used for the manufacture of small caliber ammunition was originally thought to be inert and insoluble. However, it now appears that forms of tungsten (Tungstate) could potentially enter the ground water. Tungsten in wet soils reacts with oxygen to form tungsten oxides, which dissolve in water as tungstate. This tungstate form has a greater potential to migrate into groundwater than previously thought. Additional research is underway through various Army agencies to determine potential health and ecological effects of tungstate.

In the process of forming tungstate, soil PH is temporarily reduced and becomes more acidic. The lower PH allows for easier transport of lead. The extent of this problem is not really known and continues to be studied by the Army. No remedial action has been determined to be required at this time.

3.12.2. <u>Environmental Consequences</u>

The following discussions describe elements of the Proposed Action and alternatives including the environmental analysis performed, that are common to all the scenarios.

3.12.2.1. <u>Proposed Action and Alternatives</u>

Adding personnel as projected under the Proposed Action would result in an increase in the use of hazardous materials and subsequent generation, handling, storage, and disposal of hazardous waste. An increase in minor spills would be anticipated, but due to extensive outreach and training efforts on spill prevention, major site contamination and cleanup or other special hazards resulting from increases in personnel would not be anticipated at the cantonment or downrange areas. All parties would continue to implement the *P2 Plan* (Reference No. 159), HWMP (Reference No. 170), SPCCP (Reference No. 165), and the *Installation Pest Management Plan* (Reference No. 160) for waste minimization, spill prevention, and proper hazardous waste management. No additional mitigation actions with regard to use of the hazardous materials and subsequent generation of hazardous wastes would be necessary if the Proposed Action were implemented.

The training of an additional IBCT and potential CAB would result in an increase in special hazards as described as follows. No changes would occur to the use of hazardous materials, storage and handling areas, waste disposal or site contamination, and cleanup resulting from additional training. Under the Proposed Action, existing management plans would continue to be followed and would be updated as necessary, as described further in Section 3.12.2.2.

Construction and operation of facilities as projected under the Proposed Action would result in an increase in the use of hazardous materials and petroleum-based products at the cantonment area, BAAF, and downrange area.

Construction and operation of facilities projected under the Proposed Action would result in a potential increased risk in the cantonment and downrange areas to the exposure of naturally occurring radon. All parties would continue to implement the *Radon Management Plan* (Reference No. 169) in all new facilities and would comply with indoor air monitoring and radon remediation technology, and no additional mitigation actions would be necessary if the Proposed Action were implemented.

3.12.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center

3.12.2.2.1. Cantonment Area

The increase in construction and operations would result in an increase in the use of hazardous materials and subsequent generation and disposal of hazardous waste, site contamination and cleanup, and special hazards. No changes would occur to the storage and handling areas or waste disposal resulting from increases in construction and operation. Under the Proposed Action, existing management plans would continue to be followed and would be updated as necessary. Increases in waste volume associated with the Proposed Action would be managed by corresponding increases in the number of personnel at the hazardous waste storage facility who would be assigned to handle and manage the additional waste.

Special Hazards

Construction and operation of facilities projected under the Proposed Action would not result in an increase in the production of radiological materials within the cantonment area from the construction of combat service support unit facilities. Operational management of radiological materials are conducted in accordance with the existing *Radioactive Materials Management Plan for Fort Carson* (Reference No. 166).

Use of Hazardous Materials

Construction, demolition and operation of facilities as projected under the Proposed Action would result in an increase in the generation of lead, asbestos, PCBs, and chlorofluorocarbon wastes within the cantonment area. Demolishing unused buildings to construct facilities and upgrading utilities would be potential sources for generating these wastes Fort Carson would continue to implement the *Asbestos*

Management Plan (Reference No. 161), *Lead Management Plan* (Reference No. 161), and *PCB Management Plan* (Reference No. 163) for handling, transporting, and disposing of these wastes.

Site Contamination and Cleanup

Construction of facilities as part of the Proposed Action may result in the disturbance of SWMUs within the cantonment area. If construction within the boundary of a SWMU were proposed, coordination with Installation Restoration personnel including consultation with CDPHE, would be required to address design features, avoidance measures, or other aspects of construction project siting to avoid or minimize disturbance of existing contaminated sites and prevent new spills.

3.12.2.2.2. Downrange Area

Operational Readiness Training Center

Use of Hazardous Materials

Construction and operation of facilities as projected under the Proposed Action would result in an increase in the use of hazardous materials and petroleum-based products Vehicle maintenance and storage facilities would be constructed and used for vehicle storage to perform routine oil changes and lubes, wash-downs, and refueling. Hazardous wastes typically generated from construction activities and vehicle maintenance operations are described in the Part B Permit (Attachment 3 Waste Analysis Plan, September 2006).

Butts Army Airfield

Use of Hazardous Materials

Construction, demolition and operation of facilities as projected under the Proposed Action would result in an increase in the generation of lead, asbestos, PCBs, and chlorofluorocarbon wastes at the BAAF. Demolishing unused buildings to construct facilities and upgrading utilities would be potential sources for generating these wastes.

Site Contamination and Cleanup

Construction of facilities as part of the Proposed Action may result in the disturbance of SWMUs at the BAAF. If construction within the boundary of a SWMU were proposed, coordination with Installation Restoration personnel including consultation with CDPHE, would be required to address design features, avoidance measures, or other aspects of construction project siting to avoid or minimize disturbance of existing contaminated sites and prevent new spills.

Ranges and Training Areas

Use of Hazardous Materials

Increased use of hazardous materials and subsequent generation of hazardous waste at the downrange area would occur at the qualification training ranges and urban assault course.

Special Hazards

The training of an additional IBCT and potential CAB as projected under the Proposed Action would result in an increase in special hazards, specifically munitions and UXO. Fort Carson's munitions storage areas would accommodate the increased storage requirement of the additional throughput on existing ranges, range construction, upgrades, and improvements.

Increased live-fire activities associated with the Proposed Action or alternatives would result in the generation of additional expended small arms ammunition UXO (.50 cal and below). Small arms munitions consist primarily of brass bullet casings and lead bullet cores. A majority of brass bullet casings are picked up and turned in. Following live-fire training activities, lead bullet cores can be found in earthen berms behind firing targets. There is limited potential for migration or leaching of this lead off firing ranges. Many research programs and site characterizations have occurred on Army ranges since the 1990s in order to both understand the fate and transport of lead associated with small arms ranges and manage that lead, keeping it on the small arms ranges and not migrating away from those ranges. Reference Numbers 277 – 282 provide general summaries of that work and examples of how the Army can manage that lead with best management practices, and many other references exist.

Lead is inherently immobile in groundwater due to very slow dissolution rate and high capacity to adsorb onto clays, metal oxides, and organic material (Reference No. 277). Even though groundwater flows through highly permeable material, tracer tests show that lead is quickly attenuated and does not move readily through groundwater.

Lead may be transported in surface water or wind in the absence of maintenance and management of the berms at firing ranges.

3.12.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

A change in location of proposed facilities and operations would not impact hazardous and toxic substances differently. Impacts would be the same as for the Proposed Action.

3.12.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

A change in location of proposed facilities and operations would not impact hazardous and toxic substances differently. Impacts would be the same as for the Proposed Action

3.12.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, however, their impacts have been included as part of the No Action Alternative.

The No Action Alternative would result in no additional personnel, training, or construction and operation at Fort Carson beyond those actions covered in the 2007 Fort Carson Transformation EIS. Fort Carson would continue to comply with applicable laws and regulations and implement the BMPs described in the management plans and programs listed in Appendix A. Therefore, no impacts due to the use and storage of hazardous materials and subsequent generation and disposal of hazardous waste or creation of special hazards are anticipated under the No Action Alternative.

3.13. Sustainability at Fort Carson

This section describes the existing Fort Carson sustainability initiatives that derive from Fort Carson's adoption of *25-Year Sustainability Goals in 2002* (Reference No. 274) and the Army's 2004 Strategy for the Environment, which emphasizes a triple bottom line of ***Mission, Environment*** and ***Community.*** According to the Army's Strategy, "a sustainable Army simultaneously meets current as well as future mission requirements worldwide, safeguards human health, improves quality of life, and enhances the natural environment," (Reference No. 172).

Fort Carson's *25-Year Sustainability Goals in 2002* (Reference No. 274) represent a sustainable development approach for both current operations and future planning. The goals specifically call for achieving the following performance levels by 2027:

- Training Lands: Training ranges are capable of supporting current and future military training to standard.
- Energy: Sustain all facility and mobility systems from renewable sources with the capacity to generate all facility energy on post.
- Water: Total water purchased from outside sources will be reduced by 75 percent from the 2001 baseline.
- Procurement: All DoD and Fort Carson procurement actions support sustainability by 2027.
- Transportation: Reduce automobile dependence and provide balanced land use and transportation systems.
- Land Use: Further integrate sustainability principles into the Fort Carson land use planning, Real Property Master Planning, and MILCON, Military Construction Army (MCA) programming processes.
- Buildings: All applicable facilities at Fort Carson will be high performance buildings that meet or surpass the Platinum Standard of SPiRiT or Leadership in Energy and Environmental Design (LEED) by 2027.
- Solid and Hazardous Wastes: The total weight of solid and hazardous waste disposed of is reduced to zero.
- HAPs: The total weight of HAP emissions is reduced to zero.

Fort Carson also adopted a Sustainability and Environmental Management System (SEMS) to manage compliance and performance. To support the goals and the SEMS, Fort Carson's sustainability experts created a Sustainable Development Checklist as a "Smart growth" evaluation tool for area and site planning and development.

The following section describes the existing conditions at Fort Carson for each of these initiatives. It also includes an evaluation of the environmental consequences for these initiatives from additional personnel, construction, increased training, and operation of new facilities under the Proposed Action and the alternatives.

3.13.1. Affected Environment

This section addresses the mission and sustainability goals for Fort Carson training lands, energy, water, procurement, transportation, land use, buildings, solid and hazardous waste, hazardous air emissions, community of one and partnership, and SEMS Training.

3.13.1.1. Training Lands

As part of the Army's training mission requirements, Fort Carson must maintain and maximize training land use in order to achieve and maintain mission readiness now and in the future.

The Army uses the ***Sustainable Range Program*** (Reference No. 173) to improve the way it designs, manages, and uses ranges and to ensure that current and future doctrinal requirements are met. The goal of the Sustainable Range Program is to maximize the capability, availability, and accessibility of ranges and training land to support training and testing requirements. It consists of two core programs: the Range and Training Land Program, which consists of range modernization and range operations, and the ITAM program, which consists of land management, rehabilitation, and maintenance activities. The ITAM program essentially acts as an ongoing mitigation program for Army training and testing activities by repairing and preventing damage to soils and maintaining vegetative cover. It is the Army's formal strategy for focusing on sustained use of training and testing lands, and it provides the Army with the sound planning and execution mandatory to protect Army land as an essential asset for training. The intent of the ITAM program is to provide a uniform training land management capability across the total Army in order to manage its lands in a manner to ensure no net loss of training capabilities and to support current and future training and mission requirements. The integration of stewardship principles into training land and conservation management practices ensures that the Army's lands remain viable to support future training and mission requirements. ITAM establishes a systematic framework for decision-making and management of Army training lands. It integrates elements of operational, environmental, master planning, and other programs that identify and assess land use alternatives. The ITAM program also supports sound natural and cultural resources management practices and stewardship of land assets while sustaining those assets to support training, testing, and other installation missions. ITAM is governed by AR 350-19 and FC Regulation 350-9 (Reference Nos., 173 and 174, respectively).

In addition to proper management and rehabilitation protocols for training lands at Fort Carson, the installation is actively involved in the ACUB program. ACUB establishes buffer areas around Army installations to limit effects of encroachment by incompatible private development and maximize available post land in support of the installation's mission. At Fort Carson, the ACUB Program has leased approximately 65,000 acres along 15 miles of the perimeter of the installation under annual conservation easement leases through the spring of 2009. In addition, approximately 16,000 acres of permanent conservation easements are held under this program. The Nature Conservancy serves as a main Fort Carson ACUB partner holding leases and easements and negotiating requirements of these land transactions. El Paso County is also a valued ACUB partner, negotiating, purchasing, and managing fee interests in numerous properties near the eastern border of Fort Carson that would otherwise be developed as residential sites.

3.13.1.2. Energy

The Army's Strategy for the Environment guides all Army installations to improve energy efficiency and pursue renewable energy sources from new and on-installation sources. In addition, EO 13423 requires the federal government to reduce its energy intensity annually.

Fort Carson's sustainable energy goal is to use 100 percent renewable energy. The installation began on-post generation of solar energy with the development of a 2-megawatt solar photovoltaic system that annually produces enough energy to power 540 Fort Carson homes. The solar array, the sixth largest solar project in the US at the time, was completed in early 2008.

In fiscal year 2007, total energy consumption for Fort Carson was reduced by 8.36 percent from the fiscal year 2003 baseline. This energy reduction was partly the result of improved energy efficiency in all new buildings on the installation (the Army's current design standard is for new facilities to achieve 30 percent less energy use than current building codes). These energy efficient buildings comply with LEED Standard Silver guidelines, which are provided in more detail as follows.

As part of the sustainable energy goal, a 50-meter meteorological tower and a sonic detection and ranging system have been installed in the southeastern portion of Fort Carson in order to analyze wind energy potential on the installation.

Another future sustainable energy action is to implement a detailed energy survey under an Energy Savings Performance Contract (ESPC) and initiate several projects that are cost effective such as lighting retrofits and utility control system expansions.

3.13.1.3. Water

As part of Fort Carson's sustainability goals, the installation aims to reduce water use by 75 percent from outside sources within 25 years. Fort Carson reduced its annual water use by 45.9 percent between fiscal year 2002 and fiscal year 2007.

Fort Carson's water conservation success is attributed to the reuse of non-potable water to irrigate various sites, such as the golf course. Over 90 rain sensors were installed in a two-year period, reducing water consumption by approximately 80,000 million gallons per year.

Facility improvements, such as the installation of waterless urinals and energy efficient clothes washers in barracks also contribute to purchased water reduction.

The Stormwater Program for Fort Carson and PCMS is being managed on a watershed scale rather than on a site-by-site basis. This enables a more comprehensive understanding of how the processes in the hydrologic cycle are connected, which facilitates more effective, sustainable watershed management versus compartmentalized assessment. Low-impact design development therefore is encouraged for all construction projects.

3.13.1.4. Procurement

The goal is to achieve 100 percent sustainable procurement by 2027, which will minimize long-term cost/budget impacts and negative impacts on global natural capital. Under this initiative, Fort Carson is currently using 95 percent environmentally-friendly cleaning products at Evans Army Community Hospital. A Medical Department Activity (MEDDAC) Plan requires Soldiers to follow LEED Standard Silver Guidelines for products used in new MEDDAC barracks.

Fort Carson has also increased the use of higher-post-consumer-recycle-content and chlorine-free office paper. Fort Carson is implementing a Sustainable Procurement System that will focus on 15 products or services to fiscal year 2012 and development of tools/systems that will help procurement actions achieve sustainability performance. These initiatives support the DoD *Green Procurement Policy* (Reference No. 176) and the sustainable procurement requirements of EO 13423.

3.13.1.5. Transportation

EO 13423 set the goal of reducing petroleum use and an increasing the use of alternative fuels. Fort Carson's 2027 sustainable transportation goal (Reference No. 274) aims to reduce automobile use by 40 percent and to provide an innovative alternative transportation system to support all of the sustainability goals (renewable energy, reducing HAPs, etc.). A short-term objective is to reduce single-occupancy vehicles 25 percent per capita by 2012.

At Fort Carson, large-scale roadway improvements and realignments have recently occurred to reduce traffic bottlenecks. In addition to reducing traffic congestion on the installation, Fort Carson has committed to helping state and regional transportation agencies in the development of transportation projects in the surrounding community that directly affect Fort Carson traffic flow.

Fort Carson's Transportation Motor Pool administrative fleet currently maintains 48 percent alternatively fueled vehicles (AFVs), though it should be noted that only gasoline hybrids actually reduce fuel consumption per mile. The Transportation Motor Pool administrative fleet has seen a 50 percent reduction in the number of vehicles using unleaded fuel; while the number of AFVs in the fleet using E-85 fuel has jumped from 23 to 143 in five years.

A public transit system is being planned (to be completed early fiscal year 2009) for personnel traveling around the cantonment area. Smart-growth land development reduces dependency on automobile, increases access to the community, reduces congestion, and improves physical activity and health through walkability (Section 3.2).

As part of its sustainable transportation goal (Reference No. 274), Fort Carson is analyzing a Personal Rapid Transit (PRT) system that might be constructed for future use within the cantonment area and connected to appropriate destinations in the community. This type of rapid transit system is estimated to use ten times less energy per passenger mile than present automobiles.

3.13.1.6. Land Use

Sustainability goals adopted by Fort Carson aim to avoid 'sprawl' development that increases life-cycle infrastructure costs and degrades overall quality of life on the installation. Proper land use planning is critical for smart growth and helps protect the training lands, open space, and unique ecological habitats of Fort Carson. Master Planning and SEMS personnel evaluate sites for development including the following smart growth principles in the ***Fort Carson Sustainable Development Checklist*** (Reference No. 275) for area planning and development:

- Proximity to infrastructure and services
- Protection of land
- Development density/mixed land use
- Transportation options

As part of a sustainable land use plan, Fort Carson aims to make the most of limited public resources and builds on public investments already made. A site is more sustainable if it is developed in close proximity to existing utility and road infrastructure. As distance from the existing infrastructure increases, the less sustainable a site becomes and the more economic and material resources are required for construction and operations of the site. The co-location of various buildings also facilitates co-use of existing utilities (water lines, gas lines, electricity, etc.).

Another critical aspect of the sustainable land use initiative at Fort Carson is the preservation of open space and ecologically valuable lands. Land protection conserves environmentally sensitive areas, watersheds, important habitat, urban forest, and other green infrastructure. By creating high-density development in the cantonment area, this allows more open space to remain undisturbed. This type of sustainable land use is also correlated with the sustainability initiative for training lands due to the lower risk of development encroachment onto training lands.

Smart growth land use creates high-density, mixed use areas to reduce square footage per acre of development. The cantonment area is designed for high density co-mingled living facilities that are in close proximity to ancillary facilities (e.g., banks, commissaries). This smart growth design also promotes mass transit, improves walkability and provides critical density to support current and future transit needs.

3.13.1.7. Buildings

Fort Carson has established a goal for all applicable facilities for high performance buildings that meet or surpass the LEED Standard Platinum Guidelines by 2027. Currently, all new buildings at Fort Carson are designed to achieve LEED Silver ratings while achieving a 30 percent energy savings from current building codes. Achieving energy savings includes integrating applications such as more efficient heating, ventilating, and air conditioning (HVAC) systems, increased amounts of insulation, proper facility orientation, and installing advanced lighting systems. New Brigade and Battalion Headquarters being constructed are designed to maximize the use of natural daylight and solar efficiency. As previously mentioned, water-conserving fixtures will be installed in these new facilities. Such water-conservation LEED design standards include drip irrigation systems, water-less urinals, water efficient appliances, and xeriscaping on the grounds surrounding these buildings.

LEED ratings also support the storage and collection of recyclable materials. Fort Carson is using recycled-content construction materials on a new headquarters building along Specker Avenue. This building is also designed to maximize open space and energy efficiency.

Fort Carson's ***Sustainable Development Checklist*** (Reference No. 275*)* further evaluates the sustainability of new facilities in terms of the durability of construction materials and interior furnishings (wall systems, roofing materials, etc). Many of the materials used in construction also have established requirements for a minimum content of recycled materials. Fort Carson is using recycled-content construction materials in construction of several facilities including the new headquarters building. Facilities are also being designed with locations in each facility to collect recyclables.

Department of Army policy requires a minimum of 50 percent of construction debris waste be recycled. Construction of new facilities must meet this requirement. Most construction projects on Fort Carson divert, at minimum, concrete, metals, and asphalt.

Water conservation is another area of focus when designing new facilities. Water-conserving fixtures will be installed in new facilities.

Installation of renewable energy systems for facilities is not pursued in most cases due to high initial costs. When designing and constructing new facilities, however, potential renewable energy systems are being considered. Where feasible, orientation of the long axis of a facility to face south is an important requirement that helps for future solar and daylighting applications. New Brigade and Battalion Headquarters being constructed are designed to maximize the use of natural daylighting and solar efficiency.

3.13.1.8. Solid and Hazardous Waste

Fort Carson's sustainability goal aims to reduce the total weight of solid and hazardous waste disposed to zero by 2027.

Solid and hazardous waste reduction achievements at Fort Carson include a fiscal year 2007 addition of a recycle/refuse Post Exchange collection point. In fiscal year 2007, the installation saved $582,000 in landfill fees by recycling. The current estimated solid waste recycling rate at Fort Carson is 42 percent.

All new site designs are evaluated to provide accessibility to recycling, composting, or other waste removal options.

3.13.1.9. Hazardous Air Pollutants

As part of Fort Carson's ***25-Year Sustainability Goals in 2002*** (Reference No. 274) , the total weight of HAPs is to be reduced to zero. Approximately 80 percent of the HAPs emissions generated by Fort Carson are from transportation activities.

In order to achieve this goal, an installation-wide mobile emissions tracking system was created to evaluate fleet vehicle emissions on an annual basis. Each mile of travel in an auto represents 450 grams of HAPs emissions (benzene, acrolein, acetaldehyde, 1,3 butadiene, formaldehyde, carbon dioxide).

These emissions could be dramatically reduced through proper implementation of transportation and sustainability planning.

Fort Carson has also started a transition, wherever possible, of all products containing HAPs to those without HAPs. Further analysis is being done to replace products containing VOCs with those containing less reactive or non-reactive organic compounds. Use of low/no VOC- and HAP-containing paint products for paint stripings are encouraged through Fort Carson's Sustainable Development Checklist. Also, the checklist encourages low NO_x and low SO_x emitting HVAC systems.

3.13.1.10.Community of One and Partnerships

The SEMS is not just an environmental program (sustainability can be defined as maximizing both social and environmental performance of an organization), and its benefits will reach outside Fort Carson boundaries. The system will drive sustainability performance by making sustainable actions and thinking a part of everyone's daily job responsibilities. For this reason, one of Fort Carson's sustainability goals is to improve communication and encourage external stakeholder input from the Pikes Peak regional community.

Fort Carson is working with various community leaders, organizations and resource users in the region to promote sustainable development. These "Community of One" partnerships are designed to assist Fort Carson's achievement of its sustainability goals and to help the region capture the quality of life and economic advantages offered by sustainability.

The PPACG is another critical partner in helping local governments to understand the likely economic, social, and other impacts resulting from the additional Soldiers to be stationed Fort Carson over the next five years, through its Military Impact Planning Program (www.ppacg.org).

Fort Carson initiated the Pikes Peak Sustainability Indicators Project (PPSIP) in 2003 to educate the regional stakeholders on the installation's sustainability goals and about the importance of using sustainability indicators on a regional basis to promote sustainable development of southeastern Colorado (report available at www.ppacg.org).

Organizations collaborating with Fort Carson to promote regional sustainability include many local governments, state government, federal government agencies, plus the following regionally based non-profits or educational institutions.

- Educational Institutions:
  - 6-1 The University of Colorado in Colorado Springs
  - 6-2 Colorado State University, Pueblo
  - 6-3 Colorado College
- Organizations:
  - 6-4 Colorado Association for Recycling
  - 6-5 Colorado Alliance of Sustainable Business Associations
  - 6-6 Clean Cities Coalition
  - 6-7 Climate Change Coalition
  - 6-8 The Nature Conservancy
  - 6-9 Southern Colorado Chapter, US Green Building Council
  - 6-10 Southern Colorado American Institute of Architects
  - 6-11 Sierra Club
  - 6-12 Catamount Institute
  - 6-13 Peak to Plains Alliance
  - 6-14 Southeast Colorado Renewable Energy Society
  - 6-15 Green Cities project of the Pikes Peak Peace and Justice Coalition

3.13.1.11. Sustainability and Environmental Management System Training

Under this goal, Fort Carson aims to provide sustainability training to both internal and external stakeholder groups in order to promote compliance and motivation in sustainability practices.

SEMS training is currently provided to all military and civilian staff at Fort Carson via monthly installation newspaper columns and email. In addition, SEMS Awareness Training is available online to all personnel at Fort Carson and is required annually. SEMS Competence Training is provided every 2-3 years to management personnel. Army units of approximately battalion size will be developing their own SEMS systems and training for system performance throughout fiscal year 2009.

SEMS training for Fort Carson personnel and community stakeholders is intended to produce a culture throughout Fort Carson and the surrounding community that values sustainability. The SEMS training program is designed to create an awareness of:

- The importance of conforming to the Sustainability and Environmental Policy.
- The significant sustainability (environmental and social) aspects of work activities and the benefit of improved personal performance.
- Roles and responsibilities in the SEMS and for emergency preparedness and response to environmental spills and accidents.
- The operational controls that are in place to ensure the proper management of environmental and social aspects associated with duties and the potential consequences of not following specified controls.
- The importance of global sustainability and individual actions that promote it.
- The sustainability strategies, policies, and procedures of the US government (especially the DoD and Army) and local governments relevant to the installation.

3.13.2. Environmental Consequences

This section describes the environmental consequences of each siting alternative in relation to Fort Carson's *25-Year Sustainability Goals in 2002* (Reference No. 275*)* as described in Section 3.13.1.

3.13.2.1. Proposed Action and Alternatives

Several Fort Carson Sustainability Goals would be equally affected by the Proposed Action and alternatives due to either being installation-wide policy or procedural based. Example goals meeting these criteria include Energy, Water, Procurement, Buildings, Solid and Hazardous Waste, Community of One Partnerships, and SEMS Training. Sustainability Goals that would be affected by the different siting alternatives include Training Lands, Transportation, Land Use, and HAPS. A discussion of the Sustainability Goals that are equally affected by the Proposed Action and alternatives is presented in this section. Sustainability Goals that are impacted differently by each of the siting alternatives are addressed separately in Sections 3.13.2.2 through 3.13.2.4. Table 3.13-1 provides a general comparison of each Sustainability Goal relative to each siting alternative as determined by Fort Carson sustainability staff. The results of this comparison are described in more detail in subsequent sections.

Table 3.13-1 Proposed Action Versus Alternatives Sustainability Performance Comparison

Sustainability Goal	Proposed Action Operational Readiness Training Center	Alternative 1 (Training Area Bravo)	Alternative 2 (Tent City)
Training Lands	◔	◑	◔
Energy	◔	◔	◔

Table 3.13-1 Proposed Action Versus Alternatives Sustainability Performance Comparison (continued)

Sustainability Goal	Proposed Action Operational Readiness Training Center	Alternative 1 (Training Area Bravo)	Alternative 2 (Tent City)
Water	◔	◔	◔
Procurement	●	●	●
Transportation	◔	◕	◔
Land Use	○	◑	○
Buildings	◑	◑	◑
Solid and Hazardous Waste	◔	◔	◔
Hazardous Air Pollutants	◔	◑	◔
Community of One and Partnerships	●	●	●
Sustainability and Environmental Management Systems Training	●	●	●

● Full Conformance ◕ Substantial Conformance ◑ Partial Conformance ◔ Nominal Conformance ○ Non-Conformance

Energy

All facility sets would have the same energy requirements and design standards regardless of specific development location. Therefore, no distinct advantage exists among the Proposed Action and the alternatives.

In accordance with the Army's sustainability standards, the new IBCT and CAB facility designs would meet fundamental energy efficiency requirements for the LEED Silver Ratings (Reference No. 176).

Each siting alternative has potential renewable energy opportunities (passive/active solar, geothermal). Renewable energy, however, is not currently proposed as part of the design to power these new facilities.

Despite the LEED Silver Energy Design, this action would not meet Fort Carson's 100 percent renewable energy goal because of the lack of renewable energy use. Therefore, all three alternatives would be nominal with the installation's energy goal.

Water

Facilities would have the same water requirements and design standards regardless of specific development location. The Soldier and civilian population is the same regardless of which site is chosen. Therefore, no distinct advantage exists among the Proposed Action and the alternatives.

Water efficiency design standards would be used in the development of the IBCT and potential CAB facilities to satisfy LEED Silver Ratings. Water efficient appliances, water-less urinals, and single-bay motor pools would all help to reduce water use for these facilities. Although Fort Carson has reduced water consumption rates by 45.9 percent since 2002 (Reference No. 154), these rates would still increase due to an increase in population as described in Section 3.11. The Proposed Action and the alternatives would immediately have an adverse affect on Fort Carson's 75 percent water use reduction goal. Therefore, all three alternatives would nominally conform.

Procurement

Green procurement would not be influenced by the specific development location as the 100 percent sustainable procurement goal is an installation-wide process. Therefore, no distinct advantage exists between the Proposed Action and the alternatives. All three alternatives are anticipated to conform.

Buildings

Sustainable building performance is not expected to differ among the Proposed Action and the alternatives. Materials and resources used to develop construct facility sets would meet LEED Silver Ratings. As previously mentioned, these facilities could potentially be designed for renewable energy use.

Although the LEED Silver ratings would comply with the Army's sustainability goals, they would not meet Fort Carson's sustainability goal of LEED Platinum Ratings. Therefore, the Proposed Action and alternatives would partially conform.

Solid and Hazardous Wastes

Increase in solid and hazardous waste generation would be commensurate with the increase in Soldier and civilian populations under the Proposed Action and alternatives.

There is no reason to anticipate a per capita increase in solid waste and recycling generation as a result of the increases in personnel. However, there would be overall increases in both.

While the Proposed Action and the alternatives are anticipated to increase solid and hazardous waste generation, Fort Carson's goal of zero solid and hazardous waste generation would still be achievable by 2027. Fort Carson's existing management practices would still be in place. Therefore, the Proposed Action and the alternatives would nominally conform.

Community of One Partnerships

There is no substantial difference in the three siting alternatives. All would result in continued conformance with this goal.

Sustainability Training

There is no difference between the Proposed Action and alternatives for Fort Carson's 100 percent sustainability training goal. Sustainability training would continue in order to reduce community and regional negative social impacts that may be associated with population growth on the installation. The Proposed Action and the alternatives would not likely change the present sustainability training commitments. Providing training and monitoring compliance with the training requirement would require additional resources. Therefore, the Proposed Action and the alternatives would continue to result in conformance.

3.13.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.13.2.2.1. Training Lands

The ORTC footprint is currently used as training area for TUAVs and a night-vision course for rotary-winged aircraft. Construction of IBCT facilities and potential CAB barracks within the ORTC footprint would require the removal of the TUAV training facility and movement of the TUAV training function to a separate range. This construction would also adversely affect night-vision training for BAAF aircraft due to increased lighting associated with a brigade-sized building complex.

Implementation of the Proposed Action would replace existing training area with administrative and operational uses. This would result in a net loss of training lands and additional pressure on existing training ranges, which could cause scheduling challenges and/or training area overuse. These potential impacts could compromise some unit METL training, and limit range rehabilitation programs.

The IBCT facilities and CAB barracks would be co-located, which would reduce support facility needs. The co-use of facilities between the IBCT and CAB personnel would reduce overall developed acreage, leaving more open space for training land at other locations. Co-use of support facilities, such as dining facilities, physical fitness facilities, and child development centers, supports the sustainable development strategy.

The Proposed Action supports the sustainability goal of training lands because it would require less of an overall footprint for personnel and operational facilities than if the IBCT and potential CAB were placed in separate locations. In contrast, though, use of this site encroaches on other training lands in the downrange area, which does not support the sustainability goal because it causes a net loss of training land. Thus, the Proposed Action only nominally supports the sustainability goal for training lands.

Land Use

The Proposed Action would not receive any LEED site placement points because the new IBCT/CAB facilities would be built on previously undeveloped land. Selection of the ORTC site would not promote sustainable development standards of high density development because it is more than 6 miles away from the cantonment area.

This site would require significant extension of existing utility lines (Section 3.11.2.2.2) and, thus, would not promote sustainable land use.

Mass transit system opportunities would not be encouraged under the Proposed Action due to significant population dispersions between the cantonment area and the ORTC site. Any mass transit system used in the cantonment area would not benefit from the demands of the additional IBCT and CAB personnel.

Transportation

Fort Carson's sustainability goal of 40 percent reduced automobile dependency would not be supported under the Proposed Action. According to the 2008 Traffic Plan, an additional 6,250 trips would be made daily to Fort Carson and an additional 6,600 trips specifically to Wilderness Road. Many of these POVs are anticipated to drive the approximate 11-mile roundtrip from the ORTC to the cantonment area for ancillary facilities (e.g., restaurants, banks, commissary, etc.). Not only does the locating of the IBCT and potential CAB facilities at the ORTC increase dependence on vehicle transport, it would also cause an adverse impact in regard to HAPs.

A mass transit system for the Wilderness Road area is unlikely to occur due to the lack of population density. Additionally, the stationing of 6,700 Soldiers downrange does not support mass transit expansion within the existing cantonment area. Additionally, other stationing of Soldiers along Wilderness Road or the airfield area in the future would provide greater density of residents and workers that may cost-effectively support mass transit service.

Gate improvements for Gates 6 (SH 115) and 19 (I-25 exit 128) would potentially be required to handle the increased traffic volumes associated with the additional Soldiers and other personnel. Also in consideration under the Proposed Action is a road expansion at the intersection of Wilderness Road and SH 115 and along Charter Oak Ranch Road. Such improvements would not support Fort Carson's sustainable development principles for the transportation infrastructure, as it does not reduce automobile dependency or the average daily commute miles and does not provide for alternative means for travel.

One benefit to the locating of facilities at the ORTC is the proximity to training lands in the downrange area. As part of the federal government's sustainability goals of EO 13423, there must be a reduction in fleet petroleum use by 2 percent per year and an increase in fleet biofuels use 10 percent per year. The IBCT unit's tactical vehicle fleet would be approximately 6.5 miles closer to downrange training areas than from Alternative 1 (Training Area Bravo), which would reduce tactical fleet fuel consumption since there are approximately 960 vehicles in an IBCT unit and most vehicles have significantly lower fuel economies than most POVs.

The CAB is already in existence and is stationed at another installation. Therefore, no net change in petroleum use on the Army-wide level would occur for the CAB fleet. On the other hand, the ORTC's proximity to BAAF would enable CAB personnel to walk to and from work; which would assist in reducing vehicle dependency at Fort Carson.

Other than the potential decrease in petroleum consumption, the other above factors do not support Fort Carson's transportation sustainability goal. Therefore, the Proposed Action only nominally supports this goal.

Hazardous Air Pollutants

Emissions from construction, operations and maintenance activities should not differ among the Proposed Action and the alternatives. The HAPs emitted from automobile use, however, differ significantly between the Proposed Action and Alternative 1.

As was discussed under Transportation, placement of the IBCT and CAB facilities at the ORTC would require an extended commute from support facilities in the cantonment area to the downrange area of Fort Carson.

Each mile of travel in an auto represents 450.91 grams of HAP emissions. While determination of miles traveled per POV to the ORTC is difficult, there would be a significant increase in HAPs given the 6,605 estimated trips per day to Wilderness Road. This overall increase in HAP emissions would not support Fort Carson's zero hazardous air emissions goal.

Despite the increase in POVs under the Proposed Action, 5.9 fewer kilograms per trip of HAPs would result from approximately 13 fewer miles travelled to and from training areas (see transportation goal) as compared to driving the tactical fleet from Training Area Bravo. Reduction in HAPs emissions from the tactical vehicle fleet would be a benefit of developing the IBCT and CAB facilities at the ORTC. However, the reduced fleet emissions would not facilitate achievement of compliance with Fort Carson's HAPs emissions goal because they would not offset the significant increase in emissions from POVs as tactical vehicle use is infrequent and sporadic. Therefore, the Proposed Action would only nominally support the installation's HAPs goal.

3.13.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Support Facilities at Training Area Bravo and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.13.2.3.1. Training Lands

Training Area Bravo is located within the cantonment area and is used infrequently for individual and squad level training. It is currently one of the least used training sites on Fort Carson, and its scheduling is not managed by Range Control due to infrequent training conflicts. As such, Soldiers and small units may use the site on a first-come first-served basis.

Under Alternative 1, construction of IBCT facilities at Training Area Bravo is predicted to have less impact on Fort Carson's training land resources as compared to other training areas. In addition, construction of CAB barracks at the ORTC under this alternative would require a small construction footprint (<50 acres). Facilities and operations conducted within this footprint would have a minimal impact on training activities routinely conducted in vicinity of this site. Alternative 1 would be in partial conformance with the Training Land goal as it maximizes training area land use in comparison to other alternatives, but would still cause an overall net loss in total installation training area acreage.

Transportation

Siting an IBCT facilities set at Training Area Bravo would increase the amount traffic in the cantonment area by 3,452 trips per day. Additionally, 2,753 trips per day would be made to the Wilderness Road area for the CAB personnel. Although the overall POV fuel use would not be discernible, Training Area Bravo is located in closer proximity to support facilities in the cantonment area than the ORTC site. This would reduce the amount of POVs traveling the additional miles south to Wilderness Road to just CAB personnel. This alternative would cause increased congestion in the cantonment area, primarily at Gates 2, 4, and 20, the splitting of the IBCT and CAB facilities would reduce the POV congestion along Wilderness Road.

Cantonment area siting would reduce POV use under this alternative because of the close proximity to ancillary facilities and the public transportation system. With the increased density in the cantonment area, it would be more likely that there would be a greater demand for public transportation, expediting the development of a highly fuel efficient personal rapid transit system. In addition to public transit, the location would promote walkability to community areas and operational facilities.

The approximate 6.5 additional miles between the IBCT facility at Training Area Bravo and the downrange area would increase the petroleum use by tactical vehicles as compared to the sites along Wilderness Road. The increase in petroleum use, however, would be offset by the significant reduction in dependence on POVs in the cantonment area.

Due to the reduced POV use and potential increase in mass transit use, this alternative would support Fort Carson's sustainability goal of reducing automobile use by 49 percent.

Land Use

As with the two potential sites on Wilderness Road, Training Area Bravo is an undeveloped location; thus, no LEED points would be received for site placement. The former landfill which had an approximate 80-acre footprint within the Training Area Bravo site is not technically classified as Brownfield site, but its use would meet Fort Carson's sustainable development principles through land reuse. If the approximate 80-acre landfill area were included in the developed area on Training Area Bravo, this would reduce the overall impacts on undisturbed land.

Training Area Bravo would promote additional sustainable development standards of high-density development on the installation because its location is directly within the main cantonment area. As previously mentioned, the development of IBCT facilities within the cantonment area allows for use of existing ancillary facilities, utilities, and a mass transit system. These existing facilities would not be as readily accessible to the CAB, which would still be placed along Wilderness Road.

Infrastructure upgrades would require less than 1 mile of linear extension, promoting sustainable land use.

This location, while not of particular ecological sensitivity, would spread development into previously undeveloped wildlife habitat. Development within the cantonment area, however, could protect the amount of contiguous undeveloped wildlife habitat in the downrange area.

In regard to stormwater runoff, the B Ditch is located adjacent to Training Area Bravo, which has a general slope of greater than 15 percent slope in some areas. Under this Alternative, B Ditch could realize increased runoff from the IBCT facilities into the surrounding riparian area.

Alternative 1 would involve more new development that the Proposed Action because the IBCT and CAB facilities would be at different sites. Yet this alternative would involve less outward sprawl from the cantonment area and encroachment onto previously undeveloped lands. Therefore, Alternative 1 partially conforms to Fort Carson's land use goal.

Hazardous Air Pollutants

The key difference between Alternative 1 and the other alternatives in terms of meeting Fort Carson's sustainability goal for hazardous air emissions is in the amount from automobiles. An additional 5.9 kg of HAP emissions per tactical vehicle would result from additional miles travelled to and from the downrange training areas as compared to the Wilderness Road locations. These emissions would cause a cumulative impact on air quality, but do not increase the air emissions as much as the thousands of POVs driving on a daily basis.

While the determination of miles traveled per POV to Training Area Bravo is difficult, there would be a reduced use of POVs and reduced travel distance from the residential areas north of the cantonment area. This would be a reduction in HAPs given the 3,452 estimated trips per day to Training Area Bravo instead of to Wilderness Road. An estimated 2,753 trips per day would still be made to the CAB facilities along Wilderness Road. This number, however, is an approximate 60 percent reduction from the number of trips made under the Proposed Action or Alternative 2.

This overall decrease in HAP emissions would better facilitate conformance with Fort Carson's zero HAP emissions goal than the Proposed Action and Alternative 2 because of the overall reduction in miles driven by POVs. Therefore, Alternative 1 partially supports the HAPs Goal.

3.13.2.4. Alternative 2 – Infantry Brigade Combat Team Support Facilities at Tent City and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Sites

3.13.2.4.1. Training Lands

Under this alternative, sustainability impacts would be about the same as the Proposed Action, but would include additional impacts to training areas and the additional loss of a parachute drop zone. The Tent City site is currently used as a bivouac area for units to stage prior to moving downrange for maneuvers or other training operations. The land use for this site would change to administrative and operational use to support the IBCT; this would create an indirect impact by requiring its current function to be moved elsewhere on the installation.

There is potential for co-use of facilities between IBCT and CAB personnel at Tent City. It would reduce overall developed acreage on Fort Carson, leaving more open space for training land at other locations.

Alternative 2 would nominally support Fort Carson's Training Land Goal due to the potential co-use of support facilities. However, the encroachment of cantonment area facilities on Wilderness Road, and the net loss of training area minimize Alternative 2's favorable characteristics.

Transportation

As the location of Tent City is in close proximity to the ORTC along Wilderness Road, there is no discernable difference between the Proposed Action and Alternative 2. Thus, Alternative 2 only nominally supports the HAPs goal.

Hazardous Air Pollutants

As the location of Tent City is in close proximity to the ORTC along Wilderness Road, there is no discernable difference between the Proposed Action and Alternative 2, and this alternative therefore only nominally supports the HAPs goal.

3.13.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers and the completion of projects and activities would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Many of the actions, to include unit stationing, proposed in 2007 have not yet occurred; however, their impacts to sustainability have been included as part of the No Action Alternative.

Under the No Action Alternative, Fort Carson would continue to comply with the Army's triple bottom line sustainability regulations. The installation would also continue to implement SEMS guidelines in order to achieve the Fort Carson ***25-Year Sustainability Goals in 2002*** (Reference No. 274).

3.14. Unavoidable Adverse Impacts

Most potential adverse impacts identified in this EIS would either be less significant or would be less than significant after employment of mitigation measures as outlined in Chapter 6. Some unavoidable adverse impacts, however, could result from implementation of the Proposed Action or alternatives. These are described in this section and listed in Table E-1 in the Executive Summary.

Some open space on Fort Carson would be lost to support the construction and use of new facilities to support increased numbers of troops and their Families. Similarly, currently undeveloped land in the surrounding communities would be developed for residential housing to accommodate troops and their families, although there is sufficient and adequately zoned land to do so. Furthermore, additional training activities on Fort Carson would likely reduce the availability of the downrange area for recreational uses.

Implementation of the Proposed Action or alternatives would create an additional net loss in training lands on the installation. Military training functions and activities performed on each of the proposed siting alternatives would be required to move to another location. This action would effectively reduce training land capacity and increase overall training demand for existing ranges. With an increase in personnel and training demands, some unit METL training could be compromised due to range scheduling conflicts.

Air quality would be adversely affected by increased emissions of criteria pollutants associated with operation of new facilities (additional external combustion sources such as boilers and water heaters, increased use of paint booths, and increased personnel travel). Air quality and visibility would be adversely affected during training exercises due to increased vehicle exhaust emissions, use of materials that cause smoke, and additional troop movements that cause more fugitive dust emissions. Construction of facilities would increase fugitive dust and equipment emissions during the construction period. The concentration levels of these pollutants, however, when added to background air concentrations, would be below the applicable air quality standards and, therefore, would not significantly affect regional air quality. Visibility could be unavoidably reduced during conduct of training exercises but impacts would remain local and short term.

Noise associated with additional training activities would increase noise levels in communities surrounding Fort Carson, including El Rancho, Midway Ranch, Turkey Canyon Ranch, and Fountain. There may also be minor noise increases associated with increases with roadway traffic surrounding Fort Carson.

The increase of maneuver training on Fort Carson would unavoidably increase the potential for direct adverse impacts to soils, such as compaction and rutting, and indirectly increase potential for soil erosion due to loss of vegetative cover.

Increased training activities could result in unavoidable increases in soil erosion, sedimentation of surface water and potential for hazardous material spills.

Vegetated areas within building and other paved construction footprints would be unavoidably and permanently converted to impervious surface, which typically increases stormwater runoff.

Vegetative areas and terrestrial habitats throughout Fort Carson could be disturbed during training exercises, particularly in maneuver areas.

Wildlife would be affected by loss of habitat, increased human and vehicular activity in the training area, increased traffic throughout maneuver areas, and noise. Less mobile and burrowing species (such as amphibians, some reptiles, and small mammals) could be affected during training exercises or from vegetation clearing and other site preparation activities for construction. Species that are more tolerant of human presence, vehicular activity, and noise would be increasingly favored in areas of military training, while those species that are less tolerant would decline. Training activities would likely and unavoidably increase prairie dog burrow damage, and directly increase mortality. Species associated with prairie dog colonies would also be directly and indirectly affected, including the burrowing owl, mountain plover, and bald and golden eagles.

The risk of accidental wildfires caused by military training would likely increase under the Proposed Action or alternatives, despite Fort Carson's continued implementation of wildfire prevention efforts.

Additional training activities have the potential to unavoidably affect previously unidentified archaeological and paleontological resources. Most current training areas on Fort Carson have been heavily disturbed and the likelihood of discovering intact resources is small. The potential for adverse impacts to paleontological resources is low because most training exercises will occur in locations where these resources are not known to exist.

Traffic volumes on Fort Carson would unavoidably increase on most roadways within the cantonment area. Increased traffic volume would result in congestion and delay on some roadways, although congestion is not expected to be significant.

Traffic volumes in the region are projected to increase with and without the increased population at Fort Carson. Independent of the Proposed Action or alternatives, roadways in the vicinity of Fort Carson are expected to experience more than 30 percent increase in traffic volume by 2030, and many area roads are projected to become more congested. Under the Proposed Action or alternatives, local and regional roadways would experience an additional increase in traffic volume.

There would be unavoidable increases in energy and water demand under the Proposed Action or alternatives, as well as the generation of wastewater and stormwater runoff. Utility service could be temporarily interrupted with implementation of the improvements included in the Proposed Action or alternatives.

Waste generation, including wastes associated with vehicle maintenance, construction and demolition, and medical and dental procedures, would unavoidably increase as a result of increased use of hazardous materials under the Proposed Action or alternatives.

3.15. Irreversible or Irretrievable Commitment of Resources

Irreversible or irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy from hydrocarbons and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored after implementing a Proposed Action (e.g., extinction of threatened or endangered species).

Construction of facilities would consume construction materials, such as concrete and steel, which would become irretrievable resources in the short-term but could be recycled after their effective life. Although the materials could be recycled, some permanent loss of energy would be expected in the manufacture and recycling processes, and would be considered an irreversible effect.

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4. Piñon Canyon Maneuver Site Affected Environment and Environmental Consequences

4.1. Introduction

This chapter describes the affected environment and environmental consequences of implementing the Proposed Action or any of the alternatives (Since Alternatives 1 and 2, which are alternative locations for siting the GTA IBCT at Fort Carson, are identifical to the Proposed Action with respect to PCMS, all references to the Proposed Action in this chapter will be deemed to include Alternatives 1 and 2). This chapter qualitatively and quantitatively evaluates the potential environmental impacts of the additional training of new units at PCMS as described under the Proposed Action. The affected environment and associated environmental impacts have been determined using the criteria in the *Army NEPA Guidance Manual 2007* (Reference No. 14). Existing and proposed additional mitigation measures for environmental impacts resulting from the Proposed Action are presented in Chapter 6.

4.1.1. Resources Analyzed

This chapter analyzes and discloses the direct and indirect impacts for the following resource areas (Cumulative Impacts are addressed in Chapter 5):

- Land Use (Section 4.2)
- Air Quality (Section 4.3)
- Noise (Section 4.4)
- Geology and Soils (Section 4.5)
- Water Resources (Section 4.6)
- Biological Resources (Section 4.7)
- Cultural Resources (Section 4.8)
- Socioeconomics, including Environmental Justice (Section 4.9)
- Transportation (Section 4.10)
- Utilities (Section 4.11)
- Hazardous and Toxic Substances (Section 4.12)
- Sustainability (Section 4.13)

Under the Proposed Action, construction of new facilities would not occur at PCMS (There is construction associated with the No Action Alternative – none of the construction studied in the 2007 PCMS Transformation EIS has been built yet). The majority of impacts would occur as a result of training activities associated with the implementation of the Proposed Action and alternatives. A discussion of the No Action Alternative is also presented in this Chapter.

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4.2. Land Use, Plans, and Policy

This section describes the affected environment and environmental consequences to land use at PCMS.

4.2.1. Affected Environment

4.2.1.1. Geographic Setting and Location

PCMS is an approximately 235,000-acre Army site dedicated to training units stationed at, or otherwise under the responsibility of, Fort Carson. PCMS is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Fort Carson. PCMS is bounded by US 350 to the west, Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. Nearby cities include Trinidad to the southwest and La Junta to the northeast.

4.2.1.2. Climate

PCMS has a moderate, dry climate. Average monthly maximum temperatures range from 46.9°F in January to 88.9°F in July. Average monthly minimum temperatures range from 16.7°F in January to 58.6°F in July. Average annual precipitation is about 13 inches, with the majority falling as rain in the summer months (May through August). Snowfall has occurred in every month except June, July, and August and is heaviest in November, December, and March.

From 2001 to 2005 (with the exception of 2004), PCMS experienced severe to extreme drought conditions (Reference No. 177).

4.2.1.3. Existing Land Use

4.2.1.3.1. Military Use

Las Animas County recognizes PCMS land use as a military training facility. Land use on PCMS has been divided into the cantonment area and training areas. The cantonment area consists of developed land; the training areas consist of open land.

Cantonment Area

The cantonment area comprises approximately 1,660 acres of PCMS. The cantonment area provides limited, administrative and Soldier support facilities. Military training is restricted in this area.

Training Areas

The training areas consist of unimproved or open lands used for military training maneuvers and small arms live-fire activities. PCMS terrain varies widely from open, rolling prairies to semi-arid, basaltic hills. To a large degree, the terrain defines the suitability of training activities that occur in the training areas. The four main training land use types within the training areas include maneuver training, dismounted training, small-arms live-fire ranges, and restricted areas.

- **Maneuver Training.** Maneuver training lands comprise the majority of training land at PCMS. Maneuver training areas are appropriate (based on topography and other environmental conditions) for equipment and personnel tactically maneuvering against an opposing force throughout the area. Land rest and rehabilitation are required in maneuver training areas to recover them from maneuver training activities. Training areas can also be limited in the vicinity of small arms live-fire ranges if the ranges are being used for training activities.
- **Dismounted Training.** Dismounted training includes non-vehicular training activities such as offensive and defensive training certification of Soldiers on infantry tasks to include urban operations.

- **Small-arms Live-fire Ranges.** Small arms live-fire ranges include SDZs identified to protect personnel during weapons training. The SDZs are available for maneuver training when live-fire activities are not occurring.
- **Restricted Areas.** Restricted areas protect lands that support wildlife, ecosystems, soils, facilities, and cultural resources. Varying degrees of training use are allowed in restricted areas. For example, in lands with known occurrences of buried cultural resources, digging is not permitted.

4.2.1.3.2. Recreational Use

Some areas within PCMS are accessible to the public for recreational use when training activities do not occur. The recreational use on PCMS includes hunting and camping (hunters only). Recreational use is allowed in the training areas at a campground near the intersection of Military Supply Routes (MSRs) 1 and 3 (Reference No. 178).

PCMS offers the largest contiguous parcel of public lands available for hunting in the region. The abundance of game, the timing of hunting seasons (close to the rut), and the hunt success rate make PCMS a highly desirable hunting area. Licenses are granted to hunt on PCMS annually. On average, 300 to 500 licenses are issued each year.

4.2.1.3.3. Land Use Planning

Land use planning at PCMS is the responsibility of Fort Carson's DPW Master Planning Division, in coordination with the Directorate of Plans, Training, Mobilization and Security and the PCMS Deputy Garrison Commander. Master planning at PCMS is tied to Fort Carson because facility and training requirements at PCMS are dependent upon the troops stationed at Fort Carson. The Master Planning Division assesses the need for new facilities and how new facilities can be incorporated to complement existing land uses at PCMS through its master planning process.

4.2.1.3.4. Surrounding Off-Site Land Use

PCMS is surrounded on three sides by land that is zoned for agricultural uses and dryland cattle grazing. The Comanche National Grassland, which is managed by the USFS, lies immediately north of PCMS and consists of undeveloped open land and recreation sites. Small communities are located near PCMS along US 350, including Model, Timpas, Thatcher, Houghton, and Delhi, all of which have populations of less than 50. Trinidad, which has a population of less than 10,000, is located approximately 40 miles southwest of PCMS, and La Junta, with a population of approximately 7,000, is located approximately 42 miles to the northeast.

Comprehensive planning and land uses in Las Animas County are governed by the *Las Animas County Development Guide* (Reference No. 179). The *Draft Cimarron and Comanche National Grasslands Land Management Plan* (Reference No. 180) is being updated. This plan describes existing conditions, identifies desired conditions, and articulates the management goals for the Comanche National Grassland. Both plans recognize PCMS as a military training installation.

4.2.1.3.5. Prime Farmland

The Farmland Protection Policy Act of 1981 requires federal agencies to consider the impact of any activity that would convert prime or unique farmlands to non-agricultural uses. PCMS is entirely a military installation; therefore, this action does not involve the conversion of any prime farmland.

4.2.2. Environmental Consequences

4.2.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

There would be no changes to PCMS land use due to the maneuver training of the additional IBCT. Fort Carson has an IBCT that conducts training at PCMS. Training elements of the potential CAB at PCMS would not change land use. Aviation units have trained at PCMS since its inception.

As discussed in Section 2.2.4, the frequency of maneuver training activities is projected to increase by up to 20 to 25 percent with the stationing of the IBCT, CAB, and select CS units. It could reasonably be assumed that this will reduce the availability of PCMS for hunting use. However, Fort Carson will continue to work with the public and the Colorado Division of Wildlife (CDOW) to maximize availability of PCMS for public hunting.

4.2.2.2. No Action Alternative

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No changes to land use would result from the No Action Alternative.

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4.3. Air Quality

This section describes the affected environment and environmental consequences to air quality at PCMS. Appendix C details the approach to the air quality analysis in this EIS.

4.3.1. Regulatory Background

Most air regulations described in Section 3.3.1 for Fort Carson apply to PCMS. PCMS, however, is located in Las Animas County, which is in an attainment area for all criteria pollutants. Therefore, the General Conformity Rule does not apply. Also, the Proposed Action does not require any new construction, renovation, or demolition of stationary sources at PCMS. Since none of these activities would be performed at PCMS, the PSD regulations do not apply.

In general, the CAA (as adopted in 1970 and amended in 1977 and 1990) established programs and permitting processes to protect and improve air quality. Air quality regulations are published in 40 CFR Parts 50 through 97 and 1048 through 1068. As mandated by the CAA, EPA has established NAAQS for the criteria pollutants in Table 4.3-1.

The CDPHE has obtained delegated authority from EPA and is the lead agency to implement and manage most CAA provisions. The State of Colorado Air Quality Control Regulations can be found at: http://www.cdphe.state.co.us/ap/regoverview.html.

During the draft comment period for the 2007 PCMS Transformation EIS, the Air Pollution Control Division (APCD) requested analysis of far-field impacts to the AQRVs for the surrounding Class I/II areas. AQRVs are generally expressed in broad terms. The impacts of increased pollutant levels on some AQRVs are assessed by measuring parameters that reflect the AQRVs status. For instance, the projected impact on the presence and vitality of species of animals or plants may indicate the impact of pollutants on AQRVs associated with species diversity, or with the preservation of certain endangered species. Similarly, an AQRV associated with water quality may be measured by the pH of a water body or by the level of certain nutrients in the water. The AQRVs of Class I areas differ, depending on an area’s purpose and characteristics and on assessments by the area’s Federal Land Manager (FLM).

AQRVs have been established by FLMs for the USFS, the National Park Service, and the USFWS, who are responsible for protecting the nation’s parks and monuments. National parks and monuments are designated as Class I and Class II areas, depending on the significance of the area to the country. Class I areas are national parks and national wildlife areas that have been designated as special to the public. Well-managed growth is allowed in Class II areas, which leads to moderate deterioration of air quality in these areas. The concentration at which a pollutant adversely impacts an AQRV can vary between Class I areas and Class II areas because the sensitivity of the same AQRV often varies between similarly designated areas.

Table 4.3-1 National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
CO	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	8-hour(1) 1-hour(1)	None	
Pb	1.5 µg/m^3	Quarterly Average	Same as Primary	
NO_2	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary	
PM_{10}	150 µg/m^3	24-hour(2)	Same as Primary	

Table 4.3-1 National Ambient Air Quality Standards (continued)

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
$PM_{2.5}$	15.0 µg/m³	Annual(3) (Arithmetic Mean)	Same as Primary	
	35 µg/m³	24-hour(4)	Same as Primary	
O_3	0.075 ppm (2008 std)	8-hour(5)	Same as Primary	
	0.08 ppm (1997 std)	8-hour(6)	Same as Primary	
	0.12 ppm	1-hour(7) (Applies only in limited areas)	Same as Primary	
SO_2	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m³)	3-hour(1)
	0.14 ppm	24-hour(1)		

CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = particulate matter (≤ 10 µm)
$PM_{2.5}$ = particulate matter (≤ 2.5 µm)
ppm = parts per million
SO_2 = sulfur dioxide
µg/m³ = micrograms per cubic meter
Pb = lead

(1) Not to be exceeded more than once per year.
(2) Not to be exceeded more than once per year on average over 3 years.
(3) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³.
(4) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006).
(5) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
(6) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(7) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.

4.3.2. Affected Environment

This section describes the air quality in the region potentially affected by the Proposed Action and No Action Alternative. In addition, this section presents emission sources from PCMS in relation to the regional air quality setting.

PCMS is situated in Las Animas County, Colorado, which was established as the near-field (less than 31 miles) radius of impact. As requested by the APCD during the draft comment period for the 2007 PCMS Transformation EIS, far-field impacts to AQRVs were evaluated for Class I/II areas including the Great Sand Dunes National Park and Preserve, the Florissant Fossil Beds National Monument in Colorado, and the Wheeler Peak Wilderness in New Mexico, all of which are located within 125 miles of PCMS.

4.3.2.1. Regional Air Emissions

For a general description of sources and criteria pollutants, refer to Sections 3.3.2 and 3.3.3.1. Based on the most recent data available from the EPA regional 2001 Air Emission Inventory, Las Animas County and other counties in the region reported emissions of criteria air pollutants from both point and non-point sources, including emissions from industrial-source fuel combustion, petroleum-related industries, other industrial processes, use of solvents, storage and transport services, waste disposal, recycling, highway vehicles, off-highway vehicles, agricultural activities, and miscellaneous fugitive dust sources (Reference No. 25), (Table 4.3-2).

4.3.2.2. Regional Ambient Air Quality

Air quality monitoring stations are not located on PCMS. Section 3.3.2.2 lists all statewide monitors in operation for 2006. In the past, APCD has conducted only PM and meteorology monitoring in the Eastern Plains Counties (those east of the I-25 corridor). The majority of monitoring for particulates in this region (including the nearby city of Trinidad), as well in Walsenburg in the Southern Front Range, has been discontinued after a review of the data showed that levels were well below the standard and declining. Exceptional events associated with regional natural phenomenon (e.g., large wind/dust storm) are not included in NAAQS violation determinations as they are natural and uncontrollable events. Both Lamar and Alamosa monitors have recorded exceptional events (Reference No. 23).

Table 4.3-2 2001 Air Emissions in Tons Per Year Data from Point and Non-Point Sources in Counties Near to and Far[1] from Piñon Canyon Maneuver Site

	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$
La Plata	21,295	5,921	164	3,004	5,833	1,458
Las Animas	20,966	2,861	164	1,684	2,823	1,328
Saguache	8,417	639	67	827	2,924	906
Huerfano	11,635	1,777	109	889	1,045	399
Taos[2]	21,121	2,265	195	2,333	37,408	6,439
San Miguel[2]	30,470	3,103	385	2,832	22,176	4,198
Santa Fe[2]	64,234	8,101	688	7,445	55,516	9,258
Cimarron[3]	4,134	1,434	69	956	5,155	1,095

[1]Near is defined as less than 50 km and far as less than 125 miles. Class I and II areas identified in the modeling report are located in these counties.

[2]These counties are in New Mexico.

[3]This county is in Oklahoma.

CO = carbon monoxide; NO_x = nitrogen oxide; $PM_{2.5}$ = particulate matter (≤ 2.5 µm)
PM_{10} = particulate matter (≤ 10 µm); SO_2 = sulfur dioxide; VOC = volatile organic compound

Local Sources of Air Pollutants

Pollutants affecting air quality in any region can be characterized as being emitted from either stationary sources (e.g., fuel burning equipment and chemical processing operations), mobile sources (e.g., cars), or are fugitive (i.e., emissions that could not reasonably pass through a stack or tailpipe). Annually, Fort Carson prepares an emissions inventory for the stationary and fugitive emission sources at PCMS, which can be generalized as follows: boilers, furnaces/space heaters, fuel storage and use, military smoke/obscurants, prescribed burning, and fugitive dust from training activities (vehicle maneuvers and convoys).

Current Air Permits and Plans

Due to PCMS's location in an attainment area and its PTE of less than 250 tpy, the facility only has two construction permits: No. 96LA1082 (Reference No. 285), limits the generation of DoD-approved obscurants for training exercises, and No. 04LA0772 (Reference No. 286), for a 20,000-gallon gasoline underground storage tank and its associated dispensing operation. All other stationary sources are APEN-exempt per Colorado AQCC Regulation No. 3, and PCMS remains an area source of HAPs (Table 4.3-3).

Table 4.3-3 Piñon Canyon Maneuver Site Stationary Sources Potential to Emit Calendar Year 2007

Emission Unit	Pollutant in Tons Per Year				
	PM_{10}	**NO_x**	**CO**	**SO_2**	**VOC**
No. 2 Oil Boilers, Furnaces, & Heaters	0.24	4.47	1.12	1.59	0.08
Propane Furnaces & Heaters	0.03	1.04	0.14	1.04	0.04
Storage Tanks	--	--	--	--	0.00
20,000 Gal MOGAS UST	--	--	--	--	2.00
Other MOGAS Storage Tanks and Refueling	--	--	--	--	1.38
Smoke and Obscurants[1]	55.7	--	--	--	54.3
Prescribed Burning	44.8	9.0	334.4	0.00	0.00
Training Exercises (Includes Convoys and Maneuvers)[1]	138.0	--	--	--	--
Installation-Wide Total Stationary Source PTE	**55.96**	**5.51**	**1.26**	**2.63**	**57.8**
Installation-Wide Total Stationary Source PTE	**238.7**	**14.5**	**335.6**	**2.63**	**57.8**

Source: Reference No. 181

[1]Emissions were calculated assuming one IBCT training event per year.

CO = carbon monoxide NO_x = nitrogen oxide PM_{10} = particulate matter (≤ 10 µm)
SO_2 = sulfur dioxide VOC = volatile organic compound PTE = potential to emit
UST = underground storage tank

The major sources of PM emissions on PCMS are from burning and military training exercises (i.e., vehicle maneuvers and convoys on unpaved roads/areas). These emissions contribute to inhalable PM emissions that have the potential to limit visibility and impact health. The combustion of fossil fuels in equipment such as boilers and generators does not substantially contribute to the emissions generated at PCMS.

PCMS personnel must adhere to both AR and FC Regulation 200-1 to protect the environment. Though it is not required for PCMS to have a state-enforceable plan, the *Fort Carson Fugitive Dust Control Plan* (Reference No. 182) is followed as a BMP to minimize dust impacts to air quality. Subject to available funds and how much PCMS is anticipated to be used in a particular year, chemical dust suppression is applied to unpaved areas in the cantonment area and the most highly used tank trails. Recently, limited available funds have been used to apply dust palliative on Fort Carson instead of PCMS; however, approximately 32 miles of road near the boundaries of PCMS were treated in 2007.

Fort Carson has found dust palliatives (that is, magnesium chloride) to be of limited use at PCMS and will be researching alternatives in terms of effectiveness and cost. To obtain a worst case analysis, the *Air Quality Analysis Modeling Report for the PCMS* (Appendix C) does not include any emission reductions from the use of dust palliatives at PCMS. The only emission reductions accounted for in the PCMS calculations were for the application of gravel on the wheeled-vehicle convoy routes and designated speed limits in certain areas. The current chemical used as a dust palliative is expensive, so due to economical restrictions they are applied to the most heavily trafficked tank trails on Fort Carson (and at PCMS subject to available funds), such as those that parallel the installation boundary. Based on training activities and environmental conditions, if training activities rely on helicopters landing downrange during dusty conditions, then dust suppression would be requested (either water or chemical palliative depending on the training duration as it takes time/funds to obtain the chemicals); alternatively, based on a pre-site training report or AAR, the training activity location could be revised to another less dusty location. Additionally, state land disturbance permits are applicable and implemented for any disturbed areas larger than 25 acres, or areas that have been disturbed six months or longer.

New Source Review. PCMS is not subject to the non-attainment NSR permitting program and is a minor stationary source under the PSD program. The facility-wide PTE for the installation is less than 250 tpy (Table 4.3-3) and its boilers and hot water heaters are not PSD listed source categories, as they do not have a maximum heat input of more than 250 MMBtu/hour. Prior to installing stationary sources at PCMS, a PSD Applicability Analysis would be performed.

Prescribed Burn Permits. In addition to PCMS acreage being managed by Fort Carson, *the Fort Carson Fire and Emergency Services Prescribed Fire Plan* (Reference No. 89) addresses PCMS as well. Fort Carson is divided into three quadrants, and its fourth quadrant is PCMS. In addition to the required notifications to APCD prior to and after a burn, Fort Carson Fire Department personnel notify the appropriate personnel in Las Animas County. Controlled burns are used to minimize the risk of large fires by reducing fuel loads and breaking up the continuity of fuels. Prescribed burning targets areas with heavy fuel buildups that are the most likely to ignite from range operations. A Prescribed Burn Planning Document is submitted to meet the requirements of AQCC Regulation No. 9, Open Burning, Prescribed Fire and Permitting, and procedures within the INRMP (Reference No. 6) are followed for each prescribed burn event. This activity is responsible for the majority of PCMS's carbon monoxide emissions.

Air Compliance Status

ECHO records the compliance status for each permitted facility. APCD conducts a field and records inspection of PCMS every five years. PCMS was last inspected in 2005. Since then, PCMS has been in compliance and not subject to formal enforcement actions.

4.3.3. Environmental Consequences

This section describes the air quality analysis that was performed for criteria pollutants emitted during military training exercises and convoy traffic at PCMS associated with the Proposed Action.

Due to the anticipated additional military training maneuvers and convoy traffic, there would be impacts to the regional and local air quality. Air dispersion modeling (ADM) was not required under the PSD program as said permitting was not required. ADM, however, was performed to assess the cumulative impacts from the existing stationary sources on PCMS and the anticipated increase in military training exercises. Cumulative impacts were also analyzed from other activities on or near PCMS sponsored by either federal, state, or local agencies that have occurred, are occurring, or would occur in the foreseeable future (Chapter 5). The No Action Alternative is the baseline for comparison of air quality impacts to the Proposed Action.

Similar to ADM performed for Fort Carson, the models of choice were the EPA's preferred near-field (i.e., less than 50 kilometers) regulatory model AERMOD and the long-range transport CALPUFF in the full mode. Additionally, the Dust Transport Model (DUSTRAN) (developed by the Desert Research Institute for US Army applications) was used to assess fugitive dust impacts. Analysis by the models included criteria pollutant concentrations at critical receptor distances and visibility changes at federal Class I and sensitive Class II designated airsheds. Results of the three modeling analyses (AERMOD, DUSTRAN, and CALPUFF) are summarized below.

None of the AERMOD predicted ambient concentrations of criteria pollutants (i.e., modeled maximum concentration plus background concentration) exceeded the corresponding NAAQS or CAAQS.

DUSTRAN-modeled 24-hour PM concentrations did not exceed the applicable NAAQS or CAAQS.

CALPUFF results showed a PM_{10} 24-hour concentration above the SIL for one day out of the three years modeled at the Great Sand Dunes National Monument and Preserve. However, the predicted cumulative 24-hour PM_{10} concentration at this location was below the NAAQS. All other maximum modeled pollutants' (NO_x, SO_x, and PM_{10}) annual average concentrations and short-term concentrations were below their respective Class I increment SILs. The maximum predicted nitrogen and sulfur deposition rates were below the deposition analysis threshold of 0.004 pounds per acre per year for all Class I or sensitive Class II federal areas that were modeled.

The CALPUFF results also predicted there would be no noticeable visibility impacts for all but one Class I area, the Great Sand Dunes National Park and Preserve, which showed noticeable visibility impacts for one day out of the three years modeled. The visibility assessment is expressed as the number of days for each modeled year that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; therefore, greater deciview levels represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals. A visibility change of greater than one deciview was observed for one day out of the three years modeled at the Great Sand Dunes National Park and Preserve. No other visibility changes of greater than one deciview were observed for the modeled Class I areas. However, visibility changes of greater than one deciview were observed for some of the sensitive Class II areas. The greatest number of days with visibility changes occurred at the Southern Parcel, a scenic and/or important view located within PCMS. For additional details on the ADM results and analyses, see Appendix C.

4.3.3.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

New stationary sources would not be constructed under the Proposed Action at PCMS. Additional changes are not expected to be needed for the few permitted sources at PCMS as they are operated well under their permitted capacity. The slight increase over the next few years for prescribed burn activities are not related to the Proposed Action, as they are dependent on uncontrollable climate factors such as drought and meteorological conditions. However, due to the potential 6,700 authorized military personnel to be located or relocated to Fort Carson, it would be expected that training activities associated with an additional IBCT and potential CAB would cause an increase in the following sources at PCMS:

- Fugitive dust emissions from use of training ranges and maneuver areas (an increase in duration and frequency);
- Fugitive dust emissions from convoy travel along unpaved roads along boundary and in downrange areas; and
- Vehicle exhaust from convoy travel on paved roads between PCMS and Fort Carson.

Convoy travel between Fort Carson and PCMS was estimated in the 2007 PCMS Transformation EIS. The increase in convoy traffic between Fort Carson and PCMS would be on approximately 150 miles of paved public roads. The emissions resulting from the increase in convoys would be low, temporary, and dispersed over a great distance. The increases represent no more than 1 percent of total traffic and 10 percent of heavy vehicle traffic on the portions of road near the PM_{10} air monitors. PM_{10} is monitored in the Colorado Springs area and is representative of the ambient air conditions along the public road where convoy traffic is expected to occur. Currently, emissions from the ADT do not cause exceedances of the 24-hour standard. Therefore, any temporary incremental emission activity from the increased convoy transits is not expected to affect the current monitored compliance levels and would not result in adverse impacts to air quality.

Due to PCMS's topography, semi-arid climate conditions, soil types, and training requirements, long-term impacts may be expected from the increase in training activities downrange in terms of duration/frequency, additional vehicles, and type of training. Similar to the description for Fort Carson in Section 3.3.3.2, the type of military training (mostly maneuvers and convoy travel over large areas) that occurs at PCMS causes a military-unique problem of generating PM from non-traditional sources. Such sources include PM from training (e.g., extensive mounted and dismounted maneuver training and military convoy travel on unpaved roads, airborne training, and smoke and obscurant training) and prescribed burning (although the latter is an ecosystem management tool that assists training). Any impacts as a result of implementation of the Proposed Action would be mitigatable to a level that would be less than significant.

4.3.3.2. No Action Alternative

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson and therefore would not train at PCMS. Training activities, unit rotations, and land-based training restrictions would not change. Additionally, maneuver damage prevention would continue to be implemented; that is, the same training lands would need to be rested to recover between significant military training exercises, topography limitations would remain, and range safety fan (the area set aside as a personnel exclusion zone during training) positions would remain unchanged.

Prescribed burn activities are anticipated to increase slightly over the next few years, dependent on uncontrollable climate factors such as drought and meteorological conditions. As required by APCD regulations, Fort Carson would continue to adhere to the regulatory requirements, ensuring conditions are acceptable for prescribed fires, and air quality is not compromised (Reference No. 39).

The use of hand-held smoke grenades and mechanical generators for large area obscure training would continue to be limited by the construction permit emission rates and administrative operational controls would remain in place as per Colorado AQCC Regulation No. 1, Part II.D, to ensure no off-property transport of visible emissions from any smoke or obscurants.

Consequently, the No Action Alternative would not result in air quality impacts from these activities.

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4.4. Noise

This section describes the affected environment and the environmental consequences to noise, including potential impacts to noise-sensitive areas, such as those occupied by residences, schools, hospitals, or nursing homes, and traffic noise from increased convoy movements.

4.4.1. Affected Environment

Noise-sensitive locations adjacent to PCMS consist of a limited number of residences around the periphery of the installation. No other noise-sensitive areas are located adjacent to PCMS.

The primary sources of noise at PCMS originate from short-term military training exercises at the small-caliber weapons ranges and from military aircraft operations at the combat assault landing strip by C-130 aircraft. Large-caliber weapons are not used at PCMS. The vast majority of live-fire weapons qualification takes place at Fort Carson, not PCMS.

Airfield noise contours were developed in the noise analysis conducted for the 2007 PCMS Transformation EIS using the NOISEMAP computer model; and Small Arms Range Noise Assessment Model (SARNAM) was used to model noise from small-caliber weapons for the noise contours for the small arms ranges. Existing records on flight and range operations, along with reasonable assumptions of use, were used to create inputs for the noise models (Appendix D).

4.4.1.1. Small-Caliber Weapons Ranges

The ranges along the western boundary of PCMS were used to model existing noise contours resulting from small-caliber weapons. These ranges are the only ranges in proximity to noise receptors that would be affected at PCMS. As shown in Appendix D, Figure D-1, existing noise contours for the small-caliber weapons ranges indicate that the NZ II (PK15[met] 87-dB) contour extends beyond the western installation boundary by approximately 2,130 feet. The NZ III (PK15[met] 104-dB) contour does not extend beyond the installation boundary. PK15 describes the peak noise level expected to be exceeded by only 15 percent of the events and is an indication of the maximum noise that can be heard during a single event

4.4.1.2. Combat Assault Landing Strip

Compatible-use-zone noise contours generated for PCMS are shown in Appendix D, Figure D-2. The NZ II (65 ADNL) and NZ III (greater than 75 ADNL) contours for C-130 aircraft operations at the Combat Assault Landing Strip do not extend beyond the installation boundary. The LUPZ (60 to 65 ADNL) contour extends beyond the western installation boundary by approximately 525 feet. Though the NZ II and NZ III contours are contained within the installation boundary, there is the potential for aircraft to cause annoyance while entering or exiting the airspace.

In addition, a supplemental annoyance buffer was also generated for the NOE flight corridor. A 0.25-mile-wide buffer on either side of the NOE flight corridor was determined to be sufficient to account for possible annoyance outside the actual NOE flight corridor. As a result, the supplemental annoyance buffer extends past the installation boundary for a maximum of 0.25 mile. It should be noted that the 0.25-mile buffer does not surround the entire installation because the NOE flight corridor does not follow the full length of the installation boundary, but rather it is located at varying distances from the boundary.

The 2007 PCMS Transformation EIS concluded that increased convoy movements would result in increased traffic noise levels. Based on the expected traffic increases, hourly average traffic noise levels at locations along area roadways where convoy movements would occur are estimated to increase between 0 and 2 A-weighted decibel (dBA), which would not be a perceptible change to area residents.

4.4.2. Environmental Consequences

To evaluate noise impacts associated with additional IBCT and CAB training activities at PCMS, CHPPM conducted a revaluation of the noise study done for the 2007 PCMS Transformation EIS.

4.4.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

Though small arms range use would most likely increase, there would be no change to the small-caliber weapons noise contours under the Proposed Action because of the distance between the proposed range facilities and the installation boundary. As a result, an updated discussion of noise resulting from small-caliber weapons was not conducted. Appendix D provides anticipated noise contours.

The additional training of a potential CAB would increase the frequency in use of the combat assault landing strip and the training areas. There would be no change, however, to the noise contours under the Proposed Action. The frequency of noise would increase, but peak levels and intensity would remain the same. An updated discussion of noise resulting from Combat Assault Landing Strip activities was not conducted. In addition, the NOE flight corridor would not change under the Proposed Action; therefore, discussion of noise resulting from the NOE flight corridor is not included in the analysis.

4.4.2.2. No Action Alternative

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No increased impacts in noise would occur.

4.5. Geology and Soils

This section describes the geology and soil resources of the affected environment and identifies the environmental consequences to soils and geology predicted as a result of implementing the training component of the Proposed Action and alternatives at PCMS. New construction at PCMS is not part of the Proposed Action. At PCMS, the Army's Proposed Action and alternatives connected with this action involve changes primarily only to maneuver training. Therefore, the environmental consequences section focuses on the impacts of increased maneuver training at PCMS by the IBCT and CAB. Because of the maneuver training requirements of units stationed at Fort Carson and existing maneuver land shortfalls to meet doctrinal maneuver requirements, there are no viable alternatives for reduction of maneuver training evaluated in this section which meet the purpose and need for this stationing action. Army environmental and training staff will manage PCMS land resources to meet training, sustainability, and environmental goals to best meet the Army's training needs and sustainability of the land resource. This best use of the training resource to support unit maneuver requirements would occur under all Fort Carson's action alternatives.

Sources of information used in this analysis of geology and soils impacts included collaboration with the regional branch of the NRCS, soil surveys from the NRCS web mapper, studies from the CEMML, Army environmental and GIS professionals employed by Fort Carson, and peer reviewed studies. These sources of information were used to project likely impacts to PCMS soils and geology which may result from GTA stationing actions and the potential stationing of a CAB.

In conducting the analysis of soils and geology impacts, installation range managers provided an overview of the type and geographic extent of maneuver training activities that would take place at PCMS to support the stationing of an IBCT and the CAB. This information was used to generate approximately 9,000- to 10,000-acre area plots to analyze existing conditions and the projected impacts of military maneuvers. The NRCS web mapper tool was used to provide an assessment of compatibility and suitability of soil conditions in relation to military vehicle use associated with the Proposed Action, projected intensity of use, and location.

Assessment of soil-vehicle interaction considers several soil variables in capturing impacts of maneuver training in a given area. These variables include soil texture, wind and water erosion potential, soil strength, slipperiness in connection with surface shear, stickiness, stone content, aggregation, and slope. The NRCS web mapper tool was used to evaluate compatibility of PCMS maneuver areas with maneuver use by lightweight truck, heavy four-wheel truck, aviation, foot-traffic, and light digging impacts at plots selected on the basis of likely areas for military training. Analysis assumed repeated (50 passes of a vehicle) use and did not assume one-time use of land for vehicle movement. Geographic areas that this analysis focused on assumed use of canyon areas and more heavily contoured areas by units of the IBCT. IBCT training would also utilize PCMS urban operations areas. Analysis of impacts of CAB at PCMS assumed the use of all PCMS maneuver areas in support of CAB training. There is no anticipated differential use of PCMS training areas to support aviation training.

Significant impacts were assessed if Army training activities were projected to result in the loss of more soils than a training area could sustain. To derive these assessments, NRCS T value ratings (maximum tons per acre per year) of soil erosion an area can sustainably lose were used with NRCS hydrologic soils ratings, wind erodibility index values, and soils properties to ascertain whether Army activities are likely to exceed maximum sustainable rates of soil loss. A rating of significant but mitigable was used if mitigating actions would reduce soil loss to sustainable soil loss parameters. If Army activities are not predicted to cause significant erosion they were rated as either less than significant, minor, or no impact. Figure 4.5-1 shows that PCMS exhibits high geographic variability in sustainable soil loss thresholds across the affected environment.

PINON CANYON MANEUVER SITE

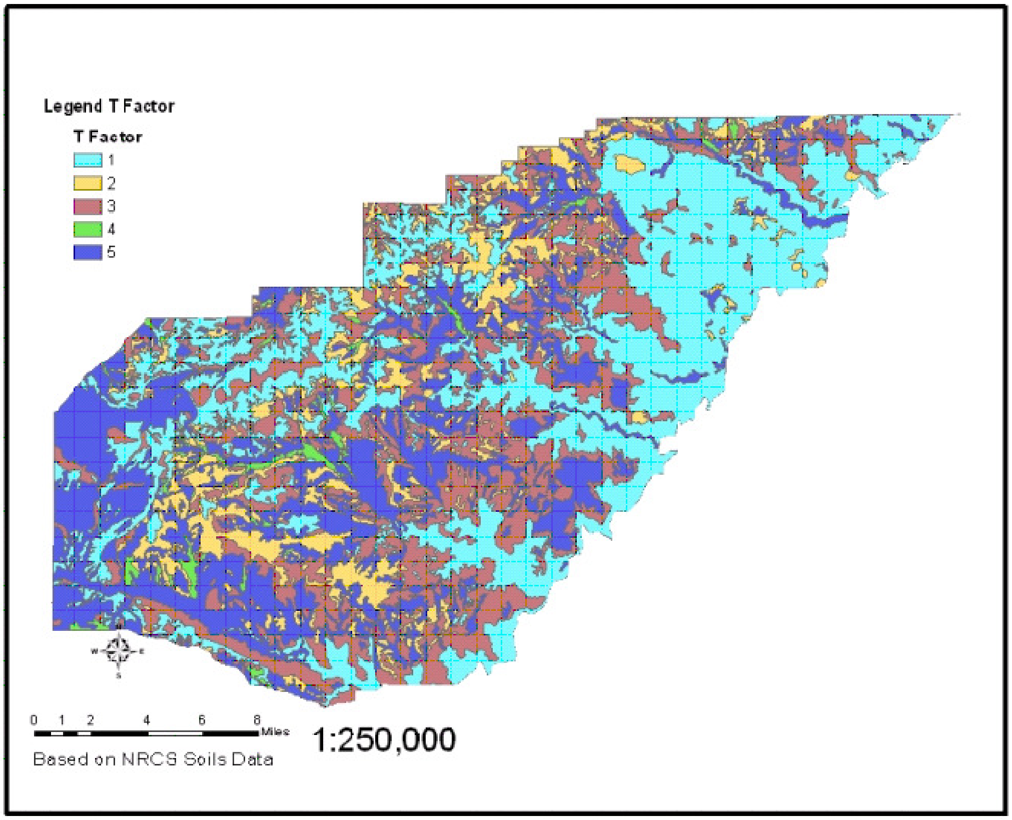

Figure 4.5-1 Sustainable Soil Loss Per Year (T Factor - Tons/Acre/Year)
Source NRCS

The T factor is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting vegetative productivity over a sustained period. The rate is in tons per acre per year. In general, the loamy plains exhibit higher T factor ratings (sustainable soil loss) than the limestone ridges to the Northwest and canyons feeding into the Arkansas River Basin to the East.

4.5.1. Affected Environment

4.5.1.1. Physiography

PCMS is located within the Raton Basin, along the western margin of the Great Plains Physiographic Province. Topographic features, such as mesas, cuestas, dissected plateaus, deep canyons, and volcanic formations, are the typical landscape within this section. The basin gradually slopes downward to the east, with elevations ranging from 5,500 feet above mean sea level (amsl) in the west to 2,500 feet amsl in the east (Reference No. 183). The topography of PCMS is divided into four general regions, as shown in the 2007 PCMS Transformation EIS (Reference No. 184). Woodlands made up of primarily pinyon pine and juniper cover limestone highlands in the north and northwest of PCMS. The Hogback, which consists of a basalt dike of volcanic origin, runs east-to-west along the southern boundary of PCMS. Grassy plains cover the area between the Purgatoire River and the woodlands. The fourth region along the eastern boundary of PCMS consists of canyons that drain to the Purgatoire River.

Elevations on PCMS range from 4,262 to more than 5,576 feet amsl (Reference No. 6). The Raton section of the Great Plains Province, which includes PCMS, falls into the shortgrass prairie zone, which is characterized by blue grama, galleta, and western wheatgrass (Shaw et al. 1989a – from INRMP). Variations in topography and soils affect vegetation patterns that are and will be found at PCMS. Climate, to include major droughts in the 1920s and 1930s also play a major role in determining vegetative associations (Reference No. 85). The NRCS has identified 15 distinct range types at PCMS. These sites are: Alkaline Plains, Basalt Breaks, Gypsum Breaks, Limestone Breaks, Loamy Plains, River Bottom, Sandstone Breaks, Salt Flats, Saline Overflows, Sandy Plains, Shaly Plains, Sandy Bottomlands, 80 percent Loamy Plains/20 percent Gravel, Shaly Plains/Loamy Plains, 75 percent Shaly Plains/25 percent Limestone Breaks, and unknown. Loamy plains (40 percent) is the most common range type at PCMS (Reference No. 6).

4.5.1.2. Geology

The Raton Basin is one of a series of intermontane basins that developed during the late Cretaceous and early Tertiary (approximately 66 million years ago) eras. It developed along the eastern margin of the Rocky Mountain foreland because of compression associated with the Laramide Orogeny. Numerous volcanoes intruded the Raton basin, forming lone mountain peaks. Volcanic vents, cinder cones, and lava fields typify the geology of the area. Geologic structures at PCMS are generally associated with the Apishapa Uplift, which is oriented southeast to northeast across the southern portion of PCMS. Sedimentary rocks associated with the uplift typically dip northeast ranging 1 up to 36 degrees (Reference No. 6). The Black Hills (5,365 feet amsl), Sheep Canyon, and Muddy Creek Monoclines (strata inclined in the same direction) are major smaller structures within PCMS. Several smaller synclines and anticlines are also associated with these monoclines, including the Model Anticline in the western portion of PCMS (Reference No. 185).

4.5.1.3. Soils

Soil types commonly occurring in the Raton section are aridisol and entisol soils. These soil types are characterized by moderate to severe soil erodibility, landslides, and unstable clay formation movement attributable to variations in moisture content and temperature (Reference No. 51). NRCS recognizes 29 soil series and associations and four major landscape types on PCMS (Figure 4.5-2).

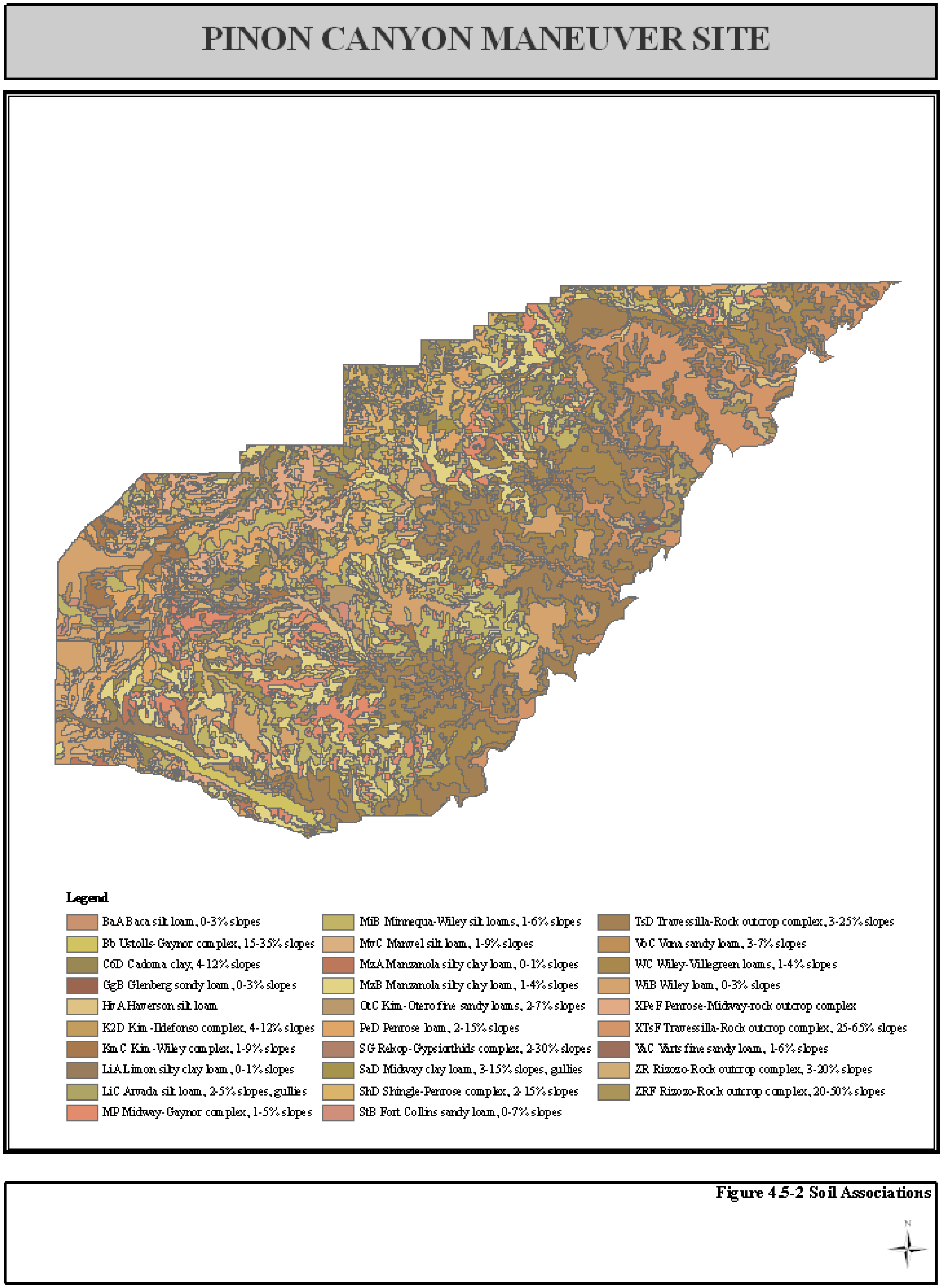

Figure 4.5-2 Soil Associations

Soils range from shallow to deep and are well drained. The soils are formed primarily from shale, sandstone, and limestone as parent material is a major determinant of soil type and texture at PCMS. In many areas of PCMS the undulating landscape is mantled by loess, or windblown sediments which have resulted from mineral weathering by wind, which has historically been a dominant force in shaping the geology and structure of soils at PCMS. Wide bands of steep slopes border the Arkansas River and its tributaries. In general, soil surface textures at PCMS are loamy, consisting of sandy loams of decreasing depth around canyon drainages. Silty loams are also prevalent at PCMS (Figure 4.5-3) which are more susceptible to forces of wind erosion than clay or sandy soils.

Each of the four landscape types on PCMS has a characteristic pattern and coverage of soils, which are described in Section 4.5.1.3.1. Additional information on PCMS soil types can be found in the INRMP, and specific information can be obtained from the NRCS soil surveys for Las Animas County.

4.5.1.3.1. Western Piñon Canyon Maneuver Site

Flat to sloping plains in the western portion of PCMS contain soils formed in wind-deposited lips with intermittent small ridges of limestone that outcrop in some areas (Reference No. 6). These soils are generally silty, weakly developed, and calcareous throughout. The dominant soils in this landscape are loamy plains on upland flats, saline overflow in the depressions and along intermittent drainages, and sandy plains in sand dunes. This landscape is characterized by medium stability, with moderate soil losses from water erosion and high soil losses from wind in areas where soil is disturbed (Reference No. 6). The native vegetation consists mainly of grassland with some vegetative cover in the form of Piñon and Juniper trees interspersed in areas with steeper slopes. Elevation is between 4,900 and 5,900 feet. Average annual precipitation is 10 to 12 inches per year with a mean annual ambient air temperature of 52 °F. This region experiences approximately 155 frost-free days. Soils in this group are shallow and well drained formed in eolian sands loess, alluvium residuum and colluvium derived dominantly from shale, sandstone, and limestone.

Dominant soil associations in the western plains portion of PCMS consist of Penrose-Manzanola-Midway and associated soils in approximate percentages of 20 percent Penrose, 20 percent Manzola, and 13 percent Midway soil associations in the western plains area (Reference No. 186).

Penrose soils. Typically found on ridges and steep hills, these soils are shallow and well drained. They formed in residuum derived dominantly from limestone. The soils are loamy and are typically underlain by limestone at a depth of 10 to 15 inches. Water capacity is low and potential for water erosion in these soils is high and permeability of these soils is moderate. Potential plant communities on these soils consist mainly of sideoats grama, needlefrass, and blue grama. Shingle Penrose can be found on footslopes and ridges. Shingle Penrose soil is shallow and well drained formed from shale.

Manzola soils. Found in western PCMS in swales and on stream terraces and plains, the soils are well drained and formed in loess, alluvium, and residuum derived dominantly from shale. The surface layer is silty with clay and the subsoil is fine textured. Soils, silty to fine, are moderately salt and alkali affected. Permeability of manzola is slow and available water capacity is high and runoff and water erosion potential is low. Potential vegetation on these soils includes blue grama and western wheatgrass. Only salt tolerant species should be planted, as the soil is calcareous with an effective rooting depth of 60 inches or more.

Midway soils. Found on side slopes, foot slopes, and plains, the soils are typically shallow and well drained. Formed in residuum derived dominantly from shale, the soils are underlain by shale at a depth of 5 to 15 inches, and are slightly salt and alkali affected. Typically, their surface layer is a few inches of clay loam. Permeability of Midway soil is slow, with an effective rooting depth of 5 to 20 inches. Soil is moderately alkaline and saline throughout, with high erosion potential from water erosion and typically rapid runoff.

PINON CANYON MANEUVER SITE

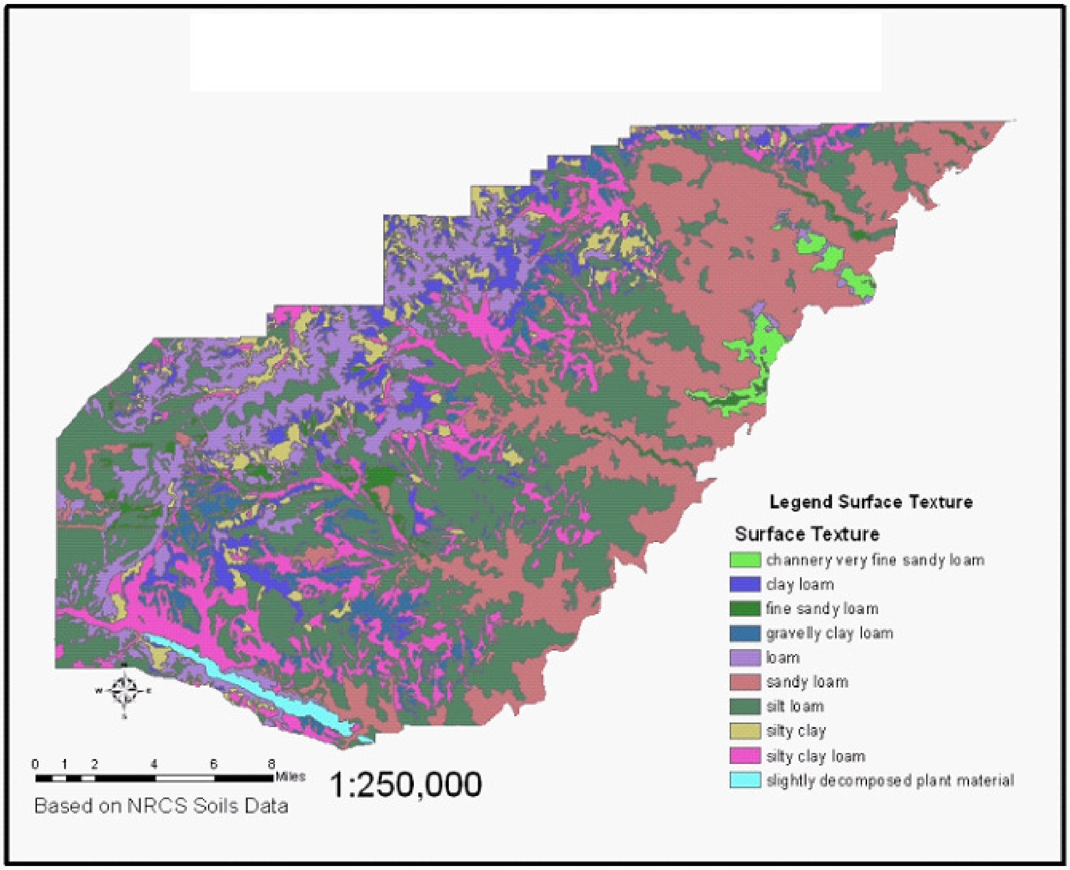

Figure 4.5-3 Soil Surface Textures
Source NRCS

4.5.1.3.2. Northern Piñon Canyon Maneuver Site and Limestone Ridges

Limestone ridges cross the northwestern highlands of PCMS. The landscape is composed of limestone breaks on steep side slopes and saline overflow along intermittent drainages. Soils are somewhat unstable, experiencing moderate to high water erosion and moderate wind erosion in disturbed areas (Reference No. 6).

The upland valley that crosses the installation from southwest to northeast, between limestone ridges and the Purgatoire River, contains soils that range from wind-deposited silty soils in flat areas to clayey soils formed from weathered shale in broad depressions. Major soils in this landscape consist of loamy plains, alkaline plains, and saline overflow. Soils in this landscape are characterized by medium to low stability, moderate water erosion, and high wind erosion rates in disturbed areas. The dominant soil associations in the Northwestern Limestone Ridges include Manzola silty clay loams (approximately 30 percent), Travessilla soils complexes (approximately 15 percent), and Midway-Razor soils complexes and rock outcrops (approximately 13 percent).

Travessilla soils. Found on steep canyons, ridges, and steep-sided drainage ways, the soils are shallow and well drained, formed in residuum derived dominantly from sandstone, are sandy and loamy, and are underlain by sandstone at a depth of 5 to 15 inches. Run-off of water is medium to rapid and water erosion potential is medium to high. Potential plant communities include mainly grama and blue grama. Seeding is typically difficult because of bedrock exposure and permeability is moderate and available water capacity is low.

A discussion of Manzola and Midway soil associations is provided in the description of western plains soil types.

4.5.1.3.3. Eastern Piñon Canyon Maneuver Site, Plains Bordering the Canyon

Soils occurring in the landscape where the Purgatoire River and the associated side canyons form a series of rock-strewn cliffs and rolling mesa tops are predominantly loamy plains and sandstone breaks, interspersed with rock outcrops with some areas of loamy plains, saline overflow, and salt meadow soil types. These soils are moderately stable and water erosive in gently sloping areas, but are unstable and severely erosive in steep areas. Soil loss from wind erosion is low on most soils in this landscape.

This portion of PCMS consists of sloping plains bordering steep canyons. Vegetation consists mainly of grassland with juniper trees on steeper slopes where bare rock is not exposed. The eastern portion of PCMS consists of an estimated 55 percent Travessilla soils, 15 percent Wiley soils, and 15 percent Villagreen soil associations and complexes.

Wiley soils. Found on gently sloping plains that border canyons and drainage ways. Soils are deep and well drained and formed in loess (silty wind-eroded material) and derived mainly from sediment deposits and wind erosion. Soils are silty throughout, native vegetative cover is mainly grass, and the surface layer or Wiley Loam is typically about 5 inches thick with a substratum to a depth of 60 inches or more. Soil is moderately alkaline and calcareous throughout. Runoff is slow and water erosion potential is moderate. Potential vegetative communities on these soils include blue grama and western wheatgrass. These soils are susceptible to wind erosion and their permeability of Wiley soils is moderate and water capacity is high.

Villagreen soils. Found on plains adjacent to drainage ways and canyons. Soils are moderately deep and well drained and formed in loess and residuum derived dominantly from sedimentary deposits. Soils are silty and underlain by sandstone at a depth of 32 inches. Formed in Aeolian silt and sand residuum derived dominantly from sandstone. The surface layer is typically 6 inches thick with a subsoil that is silty clay loam and 18 inches thick. It is noncalcareous and mildly alkaline in surface layer and moderately alkaline and calcareous below that depth.

A discussion of Travesilla soil associations are provided above in the description of Northern PCMS soil types.

4.5.1.3.4. Southern Plains

Southern plains of PCMS consists of sloping plains with vegetation consisting mainly of grassland. Dominant soils associations include Wiley and Kim soils and generally have a loamy surface texture. Wiley soil associations make up approximately more than 50 percent of the soils in the southern plains of PCMS with Kim soil associations representing approximately 10 percent of the soils surveyed (Reference No. 56). These soils are typically deep, and well-drained. Slopes in the area typically range from 0 to 9 percent. See discussion of Wiley soils in Section 4.5.1.3.3.

Kim soils. Found on steeper sloping plains, these soils are deep and well drained formed in eolian material (wind blown material usually bound with calcium carbonate [$CaCO_3$]). Kim soils are derived dominantly from sedimentary deposits and these soils typically consist of a loamy surface texture and are classified as soils that are moderately susceptible to water erosion.

4.5.1.4. Erosion Management

PCMS has several land management programs that implement management plans designed to sustain training resources and offset adverse effects associated with military training (Reference No. 6). The BMPs and engineering controls implemented to reduce effects on soils are included in these programs. Approximately 70 erosion-control reservoirs on PCMS are monitored by the USGS as funding is available (Reference No. 60). The major plans, permits, and regulations implemented to reduce the effects of erosion and sedimentation on PCMS include:

- *MDC Program, Deferment Program, Reclamation Planning* (Reference No. 187);
- INRMP (Reference No. 6);
- *Fugitive Dust Control Plan* (Reference No. 53); and
- Section 404 Regional Permit No. 2002-00707 (Reference No. 61).

In addition, the EIS for Training Land Acquisition (Reference No. 188) identified mitigation that would minimize erosion on the installation. Under the direction of these plans and regulations, PCMS implements various erosion-control BMPs and mitigation measures on the installation intended to reduce the adverse effects of erosion and associated sediment.

In addition to the programs previously listed, soils management at PCMS includes erosion control projects that are carried out by Fort Carson's Watershed Management Team when erosion control needs are identified. Prior to implementing erosion control projects, the work is subject to environmental review, which may include a categorical exclusion, Record of Environmental Consideration (REC), EA, or EIS, and permitting.

The types of erosion control projects implemented by DECAM (now called DPW Environmental Division) and ITAM include:

- Grading of existing roads to ensure proper drainage;
- Installation and maintenance of erosion control structures such as erosion control dams, rock check dams, waterbars, and hardened (bed of rock) crossings in existing drainages at intersections with established dirt roads;
- Bank-sloping to reduce gully erosion and to increase military training opportunities;
- Revegetation of disturbed lands; and
- Installation and maintenance of water diversions.

The main dirt roads in the training areas are maintained by PCMS staff.

4.5.1.4.1. Modeling Studies

Adding Modern Soil Erosion Prediction and Rangeland Health Assessment to the Land Condition Trend Analysis Program at Fort Carson and PCMS (Reference No. 189) evaluates soil erosion on training areas and the influences of land use and management practices on training areas at PCMS. The USDA assessment applied a hillslope erosion model to 19 study sites, one control site, and two bank slope sites on PCMS to assess soil erosion rates and sediment yield along hillslopes. In the assessment, the USDA recommended using the model in soil protection planning and the design evaluation on PCMS to evaluate revegetation design on sloped sites, training areas, and rest rotations (Reference No. 189). The model has not been used on PCMS since the initial studies were conducted by the USDA in 1999 because of the intensive field effort that would be required to collect data.

4.5.1.5. Chemical Constituents in Soil

As described in the INRMP, Fort Carson and PCMS have some of the highest naturally occurring documented levels of selenium in the United States. Naturally occurring selenium can acutely and chronically impact both aquatic and terrestrial wildlife when land disturbances, such as military mechanized maneuvers, and excessive erosion occur. Selenium that has leached into lower soil profiles over millions of years is exposed by land disturbance and taken up by selenium receiving plants that are uniquely adapted to these sites. The two most common plants found as indicators are two native species, desert princess plume (*Stanleya pinnata*), and two-grooved milkvetch (*Astragalus bisulcatus)*. When selenium-loaded soils are exposed to water, selenium can directly enter surface water systems and biologically accumulate in the systems of aquatic and terrestrial animals. Deep-rooted, selenium receptor plants can also redistribute selenium onto the ground surface and into the soil. Other heavy metals naturally occurring at high levels on Fort Carson, such as mercury, follow the same geological and biological pathways as selenium.

There are no government standards or regulations for terrestrial and non-point source selenium, because the understanding of selenium distribution in soil and plant communities is complex and studies are limited. The DECAM completed and implemented a selenium reception study in 1998 in conjunction with the University of Wyoming. The study defined the distribution of selenium in soils and vegetation, and subsequent academic work defined the relationship of selenium concentrations to geologic distribution (Reference No. 261). Additional academic study is ongoing, including a study conducted by the University of California, Riverside, in 1999, for which known selenium plant receptor tissues collected from all over the United States led to the observation that princess plume plant tissues from Fort Carson had the highest levels of selenium accumulation. The university then collected genetic material from Fort Carson princess plume populations in 2000 and 2001 to establish a strain of superior selenium receptors for use in biological soil amendments. Additional academic work has quantified selenium in aquatic systems at Fort Carson. Selenium study results provide land managers with site-specific selenium knowledge. Resulting management decisions ensure that land user activities do not create a selenium environmental reception hazard.

In 1998, the DECAM initiated its first major selenium remediation project that dramatically reduced aquatic selenium reception in Training Area 11. About 136,000 cubic yards of selenium-contaminated soil were buried and stabilized (Reference No. 6). Selenium management is a byproduct of watershed management. Thus, selenium exposure is controlled through the implementation of projects within watershed management plans.

With regard to high levels of naturally occurring selenium, U.S. Department of Health and Human Services studies have not revealed adverse health effects to US populations (Reference No. 259). Fort Carson has supported studies to map and assess locations where selenium concentrations are highest on the installation (Reference No. 260). To date, similar studies have not been conducted at PCMS to evaluate selenium concentrations or levels of naturally occurring uranium. The installation continues to look for opportunities to partner with local universities and government agencies to study naturally occurring levels of selenium at PCMS.

4.5.1.6. Geologic Hazards and Seismicity

The Great Plains Physiographic Province may be seismically active. According to the CGS, some of the 90 potentially active faults in Colorado may be near the Raton Basin (Reference No. 48). USGS and CGS databases indicate that faults in the area could have a low to moderate potential to cause damaging earthquakes (Reference No. 47 and 48). It is estimated that several thousand faults fall within the state that have not been extensively mapped or studied; therefore, predicting the timing or location of potentially dangerous earthquakes is not possible (Reference No. 48).

PCMS is located within the low-risk Seismic Zone 1 (Reference No. 6). Several seismic faults are located within the vicinity of PCMS, although none cross through the installation (Reference No. 57 and 49). Small faults potentially associated with the Apishapa Uplift are found in the northern edge of PCMS (Reference No. 6). As described for Fort Carson, small earthquakes are known to occur in the southeastern portion of Colorado, with generally undetectable effects (Reference No. 6). Since 1973, most earthquakes within 60 miles of PCMS registered a magnitude of less than 4.0 on the Richter scale. The largest earthquake in the area recorded a magnitude of 5.0 approximately 50 miles from the center of PCMS (Reference No. 50). There is low potential for significant seismic activity near PCMS.

A major landslide occurs every 20 to 40 years at PCMS, affecting soils with slopes that are greater than 30 percent. Landslides tend to occur at PCMS from approximately the middle of the western boundary, southwest to Dillingham Ridge (Reference No. 190).

4.5.1.7. Historical Use of Piñon Canyon Maneuver Site

PCMS has a history of grazing use prior to becoming an Army maneuver training site. No grazing has occurred on PCMS since its acquisition in 1983. Since this time the land at PCMS has been used to support the training activities and maneuvers of mechanized tracked vehicles, wheeled vehicles, dismounted Soldiers, and logistics transport trucks. Environmental management staff have implemented sound land management and stewardship policies to support training land use of Piñon Canyon, to include management of fuel loading to decrease potential and severity of wildfires. Land use, management programs, environmental fluctuations, and changes in climate patterns have all shaped soils and geologic conditions of the affected environment.

4.5.1.8. Climatic Factors Effecting Erosion Potential at Piñon Canyon Maneuver Site

PCMS drains into tributaries which for the most part drain to the Purgatoire River. Tributaries that drain PCMS are intermittent or ephemeral (Reference No. 191).

Contributing factors leading to soil erosion at PCMS are much different than those at Fort Carson. The semi-arid climate of the region has received an average of less than 12 inches of rain per year in the period from 1983 to 2007 (Reference No. 192). A vast majority of rainfall comes in the form of large rainfall events of greater than 0.5 inches. These storm events occur on an average of less than six days per year in any given year, though there is considerable variability in total amount of precipitation received and number of large rainfall events across years from 1983-2007 (Reference No. 193). These larger storms (more than 0.5 inches) generate much of the water erosion potential for PCMS. Approximately 80 percent of the precipitation received by PCMS is received between March and October. Non-hydrologic soils on PCMS have higher run-off potential and are susceptible to water erosion from these large storm events when disturbed. The limited number of days of precipitation, however, serve as a natural mitigation to water-based erosion of soils at PCMS. The fine and silty nature of some of the predominant soil types and the dry conditions mean that PCMS is more susceptible to wind based erosion rather than water erosion for most of the year, with the exception of a limited number of days of heavy rainstorms.

Figure 4.5-4 shows the hydrologic soils groupings of existing soils on PCMS and provides insight into the ability of soils to absorb surface water run-off from rainfall events and susceptibility to surface water erosion. Factors influencing surface water absorption capability include soil surface texture (high clay means less absorption), depth to bedrock, percent organic matter, and slope (Reference No. 55). A vast majority of PCMS soils are rated as C or D, and as Figure 4.5.4 shows do not readily absorb surface water in large rain events.

Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. These soils have high surface water absorption potential. Group B soils have moderately low runoff potential. Water transmission through the soil is unimpeded. Group B soils typically have between 10 and 20 percent clay and 50 to 90 percent sand and have loamy sand or sandy loam textures. Group C soils have moderately high runoff potential.

Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Group D soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is slow or very slow. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas they also have a high shrink-swell potential. Some soils are in this group because the depth to a restrictive layer is less than 20 inches. These soils are capable of absorbing less than 0.14 inches of water per hour.

Historically, PCMS has contributed highly variable levels of sediment/surface soil to the Purgatoire River Basin, ranging from 20,000 tons to several hundred thousand tons of sediment and soils (Reference No. 194). This level of contribution to the system is highly dependent on the variable rainfall and patterns (both total frequency of storms, their size, and amount of precipitation) the region receives; amount of maneuver training and maneuver damage; and the Army's internal land management, environmental, and training management programs.

Soil erosion potential from both water and wind erosion is partially dependent on types of vegetation in addition to slope of the landscape, amount of vegetative cover, and whether soils have been disturbed due to training activities at PCMS. Figure 4.7-1 shows the existing vegetative associations of PCMS.

4.5.2. Environmental Consequences

In order to understand the potential impacts to soils that would result from the Proposed Action it is necessary to understand PCMS' training areas, how they are managed now and in the future to support various alternatives.

In the past, PCMS has been broken down into different management areas to support training (i.e., mounted, dismounted, live-fire, surface excavation). Use of training areas has been scheduled and rotated to promote maximum sustainability of the training landscape while minimizing environmental impacts. This rest/recovery scheduling rotation has been implemented to achieve land sustainability while meeting the training requirements of Fort Carson's units. At the same time, the Army has implemented land rehabilitation, monitoring, and environmental stewardship programs to preserve the landscape and its natural and cultural resources. Since 2001, the maneuver area has seen limited large unit use (one to two Brigade sized deployment rotations per year) because of high deployment tempo to support the Global War on Terrorism.

PINON CANYON MANEUVER SITE

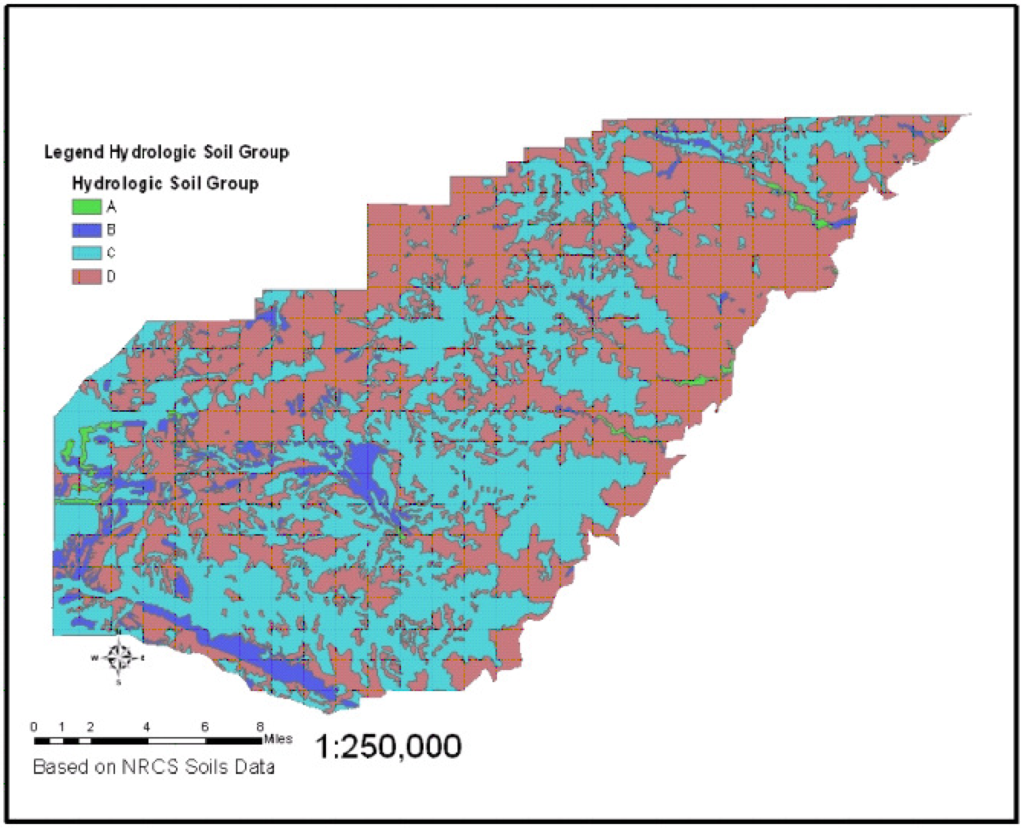

Figure 4.5-4 Hydrologic Soils Groupings
Source NRCS

With the implementation of BRAC 2005, GDPR, and AMF, and substantial increase in training requirements that accompanied these actions, installation managers are projected to have limited options in managing maneuver and live fire training activities at PCMS. The limited cantonment area activities that take place at PCMS would remain concentrated on the central-western portion of the installation. New cantonment area or range construction activities are not being proposed as part of this action at PCMS.

4.5.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

Maneuver activities are the main driver of environmental consequences to soils and geology at PCMS. Maneuvers would result in additional soil surface disturbance and additional exposure to soil loss from wind and water erosion.

The IBCT would be projected to conduct its maneuver training in the more ruggedly contoured areas of PCMS to the northern and western portions of the maneuver training site and in the suitable eastern canyon areas. The IBCT would conduct additional dismounted maneuvers in the dismounted maneuver areas. The flat plains areas are not ideally suited for executing mounted or dismounted infantry tasks and are more suitable for conventional force on force training exercises of heavy armored vehicles. The IBCT is capable of conducting mounted and dismounted operations in areas with more contour and steeper slopes and would utilize more rugged terrain not accessible or capable of supported mounted operations of armored vehicles. The central and southern plains areas would be more heavily utilized by HBCT units to support mechanized armored engagements.

4.5.2.1.1. Maneuver Impacts of Infantry Brigade Combat Team and Combat Support Units

The IBCT is projected to increase total maneuver training impacts at PCMS by approximately 8.6 percent, though the actual overall increase in maneuver training may be less after implementation of garrison training and land management controls. The IBCT does not engage in major surface disturbing activities, and conducts mounted maneuvers primarily with lightweight and medium tactical trucks. The IBCT's lightweight tactical trucks and HMMWVs have limited potential to shear vegetation and cause significant disturbance to the soil surface, particularly when operating at PCMS under dry conditions, which would be the vast majority of the time. Most of the land area of PCMS is considered compatible with HMMWV vehicles, the dominant type of vehicle used for off-road training by IBCTs. The NRCS rates PCMS as compatible with HMMWV use during both dry and wet conditions. Many of the IBCT's heavier trucks would be associated with logistics functions that would conduct most of their activities at PCMS on existing road and trail networks and would not cause significant increases in soil disturbance or loss of existing vegetation in off-road areas. Surface excavation activities of the IBCT would be restricted around canyon drainages to minimize water erosion potential, as is a management control that is currently in place at PCMS (Figure 4.5-5). Because of the low-impact nature of IBCT maneuver training and existing management controls that would remain in place, the predicted maneuver impacts of the IBCT to soils are less than significant.

Though soil impacts from the Proposed Action are not projected to be significant, the training of these units would result in a moderate increase to soil erosion. Soil erosion resulting from increased training at PCMS would result from both water and wind erosion, and a marginal reduction in vegetative cover from off-road maneuver activities.

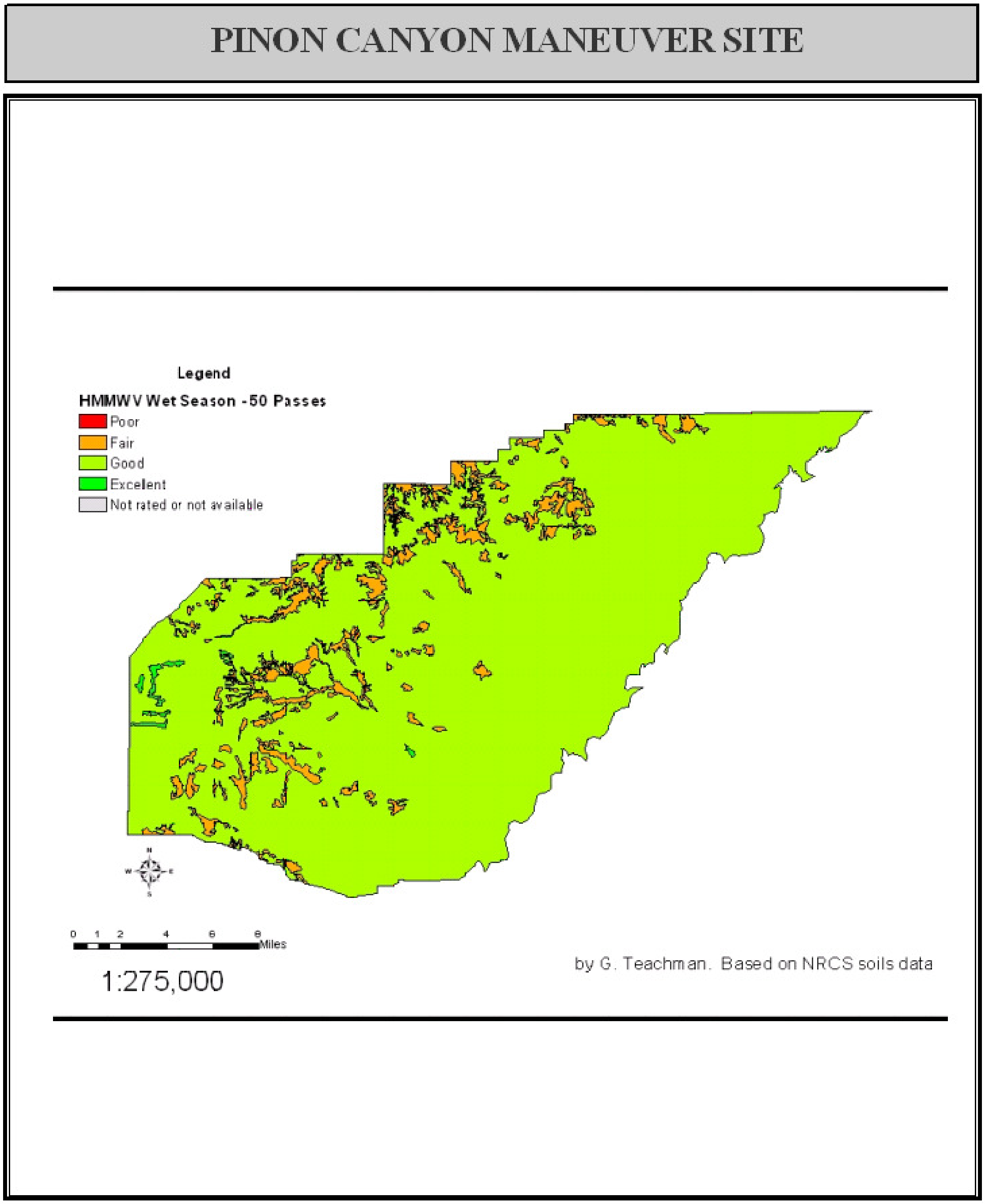

Figure 4.5-5 Military Training Compatibility of PCMS with HMMWV Training (Wet Conditions)
Source NRCS

Water Erosion

Water erosion is caused both by rain drops striking the earth's surface and sheet and rill (channeled) flow of surface water, particularly over disturbed soils and vegetation. The water erosion rate of soils depends primarily on the slope of the area in question, properties of the soil, climate/precipitation patterns, and vegetative cover (Reference No. 55). The greater the slope of the maneuver area, the more force surface water can generate to move soil particles and top soils from naturally occurring locations, and the greater potential for channeling which cuts into the soil.

Much of the central and southern portions of PCMS consist of gently rolling plains. The gentle slopes serve to naturally limit the potential for water erosion in these areas. Drainages and canyons leading to the Purgatoire River on the eastern boundary of PCMS and areas along the northwestern boundaries of the training area consist of steeper slopes that are more prone to water erosion. These areas would be used by IBCT units, particularly for dismounted training, and would generate some additional disturbance to vegetation and soils increasing the susceptibility of soils in these areas to water erosion. Figure 4.5-6 shows the susceptibility of PCMS to water erosion.

Wind Erosion

Wind movement of soils is often of greater concern than water erosion in the semi-arid southwest (Brashears et al 2003). Wind erosion of soils occurs when the force of the wind overcomes the stabilizing factors that hold soil in place. Factors influencing wind erosion of soils include natural properties of the soil (stickiness, aggregate content, and organic matter content), climate of an area, and amount of surface disturbance (Reference No. 55).

In drier environments, there tends to be less organic matter in the soils and less soils aggregation to prevent loss of soil. Finer soil particles, particularly silt, which lacks cohesion of clays, are prone to wind erosion. Soil associations with their high silt and low clay content are considerably more vulnerable to wind erosion than clay or sand soils (Reference No. 195). PCMS, which consists of approximately 25 percent fine silty surface texture soils (Figure 4.5-3 and Table 4.5-1), is susceptible to wind based erosion in many areas containing silt based soils.

The maneuver training of the IBCT and CS units is predicted to result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased frequency of use of PCMS by the IBCT for maneuvers would result in greater ground surface disturbance and in an increase in the loss of vegetative cover. MIMs calculations estimate an 8.6 percent increase in soil surface and vegetative disturbance impacts. A majority of IBCT off-road maneuvers would occur in topographic areas which permit maneuver of wheeled vehicles, but which have some contour and vegetation to offer cover and concealment to support military maneuvers of mounted and dismounted infantry units. Isolated surface disturbance would occur from the surface excavation of individual fighting positions and establishment of observation points on areas of observation with good fields of view. Loss of vegetative cover and surface disturbance would make soils more prone to water and wind erosion given the steeper sloped topography of areas where the IBCT is projected to operate (western, northern, and eastern PCMS canyon areas). Loss of soils from water erosion would be highly dependent on the number and intensity of large storm events, which are highly variable from year to year. The limited increase in mounted maneuver attributable to the lighter vehicles of the IBCT and minimal surface disturbing activities are predicted to result in less than significant impacts.

PINON CANYON MANEUVER SITE

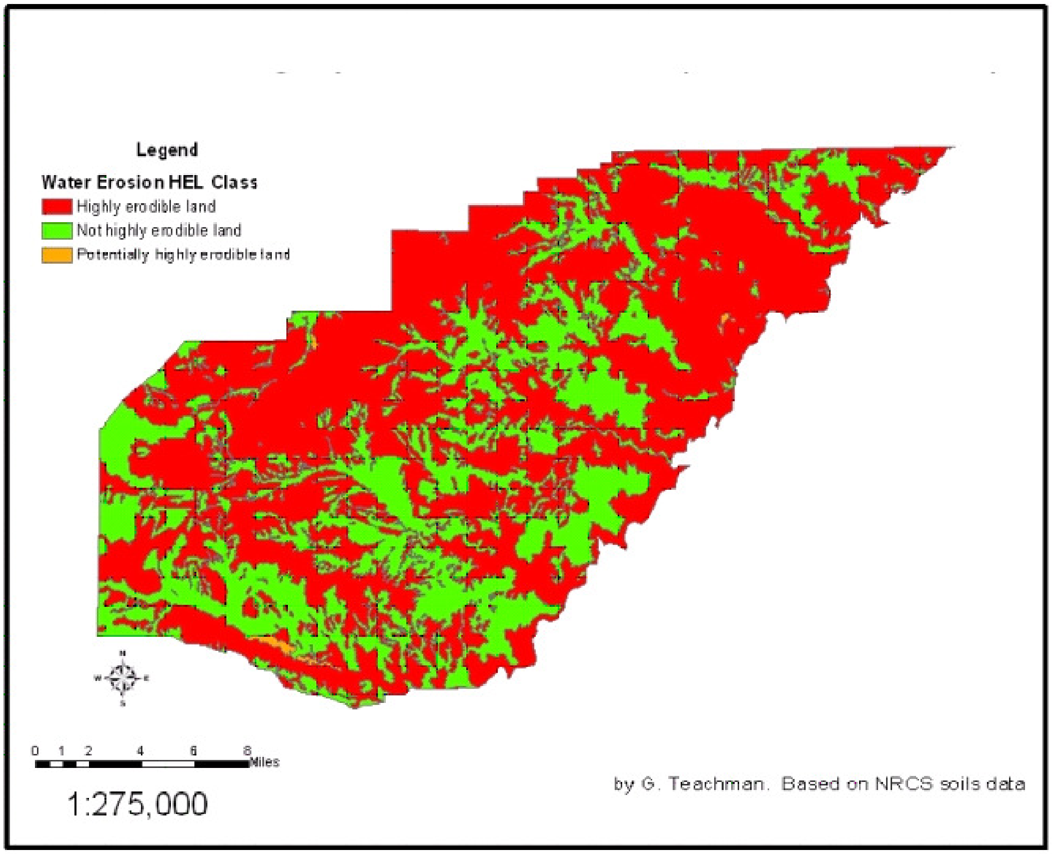

Figure 4.5-6 NRCS Classifications of Highly Erodible Soils (Water Erosion)
Source NRCS

Table 4.5-1 Piñon Canyon Maneuver Site Soil Association Category Symbols and Descriptions			
Symbol	**Description and Slope**	**Percent Slope**	**Percent Cover**
2-BaA	Baca silt loam	0-3	0.02
3-Bb	Ustolls-Gaynor complex	15-35	0.85
4-C6D	Cadoma clay	4-12	4.76
5-GgB	Glenberg sandy loam	0-3	0.13
6-HvA	Haverson silt loam	N/A	0.59
7-K2D	Kim-Ildefonso complex	4-12	0.32
8-KmC	Kim-Wiley complex	1-9	1.91
9-LiA	Limon silty clay loam	0-1	0.77
10-LiC	Arvada silt loam	2.5	0.03
11-MiB	Minnequa-Wiley silt loams	1-6	10.09
12-MP	Midway-Gaynor complex	1.5	5.22
13-MvC	Manvel silt loam	1-9	1.30
14-MzA	Manzanola silty clay loam	0-1	1.39
15-MzB	Manzanola silty clay loam	1-4	10.17
16-OtC	Kim-Otero fine sandy loams	2-7	1.67
18-PeD	Penrose loam	2-15	6.91
19-Rv	Riverwash	N/A	0.00
20-Sa	Shingle-Penrose complex	2-15	0.76
21-SaD	Midway clay loam, gullied	3-15	1.54
22-SG	Rekop-Gypsiorthids complex	2-30	0.27
23-ShD	Shingle-Penrose complex	2-15	3.84
24-StB	Fort Collins sandy loam	0-7	0.35
25-TsD	Travessilla-Rock outcrop complex	3-35	15.61
27-VoC	Vona sandy loam	3-7	0.45
28-WC	Wiley-villegreen loams	1-4	10.11
29-WiB	Wiley loam	0-3	8.15
30-XPeF	Penrose-Midway-rock outcrop complex	25-65	3.11
31-XTsF	Travessilla-Rock outcrop complex	25-65	8.23
32-YaC	Yarts find sandy loam	1-6	0.04
33-ZR	Rizozo-Rock outcrop complex	3-20	0.62
34-ZRF	Rizozo-Rock outcrop complex	20-50	0.78
Total			**100.00**

Source: Reference No. 52

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic fire. Use of artillery simulators, smoke obscurants, and catalytic converters from use of vehicles have some potential to start fires. The increased frequency of maneuver training elevates the risk of anthropogenic fire and the potential for loss of vegetative cover. This indirectly increases the potential for wind and water erosion of soils. Management would mitigate the indirect impacts from increased fire risk to less than significant.

Geology

The execution of maneuver training at PCMS to support the IBCT and other CS units as part of the Proposed Action is anticipated to have only minor impacts on PCMS geology or topography. These minor impacts are not predicted to result in perceptible changes to geologic resources.

Soil Compaction and Rutting. Soils in training areas would be subject to marginally increased levels of compaction. Dryer soils of semi-arid climates such as PCMS are less susceptible to soil compaction and displacement of water in soil pores and are less prone to losses of soil structure and function associated with compaction (Reference No. 196). In addition, vehicles used by the IBCT do not have the compaction potential of armored vehicles of the HBCTs training at PCMS. The logistics vehicles of the IBCT would, in most cases, follow existing trails and pathways and not result in additional soil compaction or rutting from off-road maneuvers. Maneuver training by an additional IBCT at PCMS would, however, reduce vegetative recovery, increasing rutting in some areas and reducing the ability of roots to break up existing compaction. Overall impacts to soils of PCMS are predicted to be less than significant.

Reduced Infiltration. The ability of water to infiltrate soils would be marginally reduced because of the additional training, compaction, and reduction in vegetative cover the training areas would experience. Reduced infiltration would lead to less absorption of precipitation and increased volume of surface water flow following storm events which would lead to slight increases in water erosion of soils (Reference No. 197). With less recovery time and increased loss of vegetation, less root matter and organic matter would be available to absorb water and reestablish soil pores. Reduced infiltration would lead to increased surface water erosion of soils, though impacts would be projected to be minor.

4.5.2.1.2. Maneuver Impacts of the Combat Aviation Brigade at Piñon Canyon Maneuver Site (All Alternatives)

Aviation maneuver training at PCMS would be conducted in support of heavy armored force on force maneuver rotations, and in support of infantry and special operations exercises. The CAB would engage in troop transport and insertion, equipment transport, and maneuver in support of ground units. Aviation units have operated at PCMS in the recent past, and aviation operations were conducted routinely through 2005 by the 3rd Armored Calvary Regiment (ACR). In addition to aviation maneuvers, the CAB ground vehicles would operate from designated areas, primarily traveling along roads and trails.

Aviation units would typically fly at altitudes of several hundred feet during support of armored maneuver rotations, but would conduct low-level flights during landing, and dismounted troop and equipment insertions. During maneuvers, attack and scout aviation elements would use terrain and flight altitude to conceal approaches. Low level flights would expose soils, particularly finer soils to high velocity winds generated by helicopter rotors. This rotor wash would differentially lift silts from the soils and expose areas of previously undisturbed soil surface to both water and wind erosion. Water erosion potential is highly dependent on the number and type of large storm events that PCMS would experience, and this varies considerably from year to year (Reference No. 194).

The maneuver training of the CAB would result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased frequency and intensity of use of PCMS by the CAB and its logistics elements would result in increased surface disturbance from rotor wash in areas used as helicopter landing areas and troop insertion points. Increased training of the CAB would result in an increase in the loss of vegetative cover. Potential for soil loss would be amplified in areas of PCMS with silt based soil associations (central and southern PCMS) that are more prone to impacts from wind erosion. Approximately 25 percent of PCMS soils are loamy with high silt concentrations. Aviation training would further exacerbate soil loss from wind erosion because of high velocity winds generated by helicopter rotor wash. Loss of vegetative cover and surface disturbance would make soils more prone to wind and water erosion. Areas designated for dismounted training, with more rugged contours and steeper slopes, would be differentially impacted by soil surface disturbance from aviation troop insertion activities. Water erosion from large storm events in these contoured areas would carry off disturbed soils and could lead to additional sheet and rill erosion and gullying. The stationing of the CAB and IBCT at PCMS is projected to result in a 15 percent increase in maneuver impacts at PCMS. Impacts are anticipated to be significant but mitigable to less than significant through training and environmental management procedures.

Increased Erosion and Wear from use of PCMS Trail Network. The additional use of PCMS trail network by the logistics element of the CAB would result in additional loosening of soils and sediment run-off from the trail network. Trails would be more susceptible to sheet, rill, and gully erosion during storm events. The limited increased use of PCMS trail network is predicted to result in minor additional direct adverse impacts.

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic fire. The use of training simulators, smoke obscurants, and catalytic converters from use of the CABs' ground vehicles have some potential to start fires. The increased frequency of maneuver training elevates the risk of anthropogenic fire and the potential for loss of vegetative cover. This indirectly increases the potential for wind and water erosion of soils. Indirect impacts to soils from fires are predicted to be less than significant.

Geology

The execution of maneuver training at PCMS to support the CAB as part of the Proposed Action is anticipated to have only minor impacts on PCMS geology or topography. The minor impacts to these resources are not predicted to result in significant changes.

4.5.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at PCMS would occur. Training activities needed to support these actions at PCMS would not occur either. Levels of maneuver training at PCMS would not increase in comparison to training levels following implementation of stationing actions in support of BRAC 2005, GDPR and AMF decisions. Therefore, under the No Action Alternative, there would be no impacts to geology or soils above those assessed in the 2007 PCMS Transformation EIS.

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4.6. Water Resources

This section describes the affected environment and environmental consequences to water resources at PCMS, including surface water, groundwater, and floodplains.

4.6.1. Affected Environment

As described in the INRMP, water resources at PCMS are managed in coordination with the USGS, NRCS, USFWS, DOJ, USACE, CDOW, and Colorado State Division of Water Resources. The water resources management program includes watershed and sedimentation monitoring, watershed and sedimentation management and enhancement, project reviews for erosion and sediment control, and compliance with federal and state laws and regulations (Reference No. 6). A cross-functional Watershed Management Team at Fort Carson provides an integrated approach to watershed compliance, management, and sustainability at PCMS. The Watershed Management Team is responsible for implementing strategic watershed goals that would maintain the critical land resources that provide a realistic military training environment. Performance goals for the Watershed Management Team include maintaining or improving rangeland conditions by developing and implementing erosion control and vegetation management initiatives in accordance with accepted scientific methods and engineering standards. This is validated through the Range Training Land Assessment component of the ITAM programs. Management plans and programs applicable to water resources under which PCMS operates are listed in Appendix A.

4.6.1.1. Surface Water

4.6.1.1.1. Regional Setting

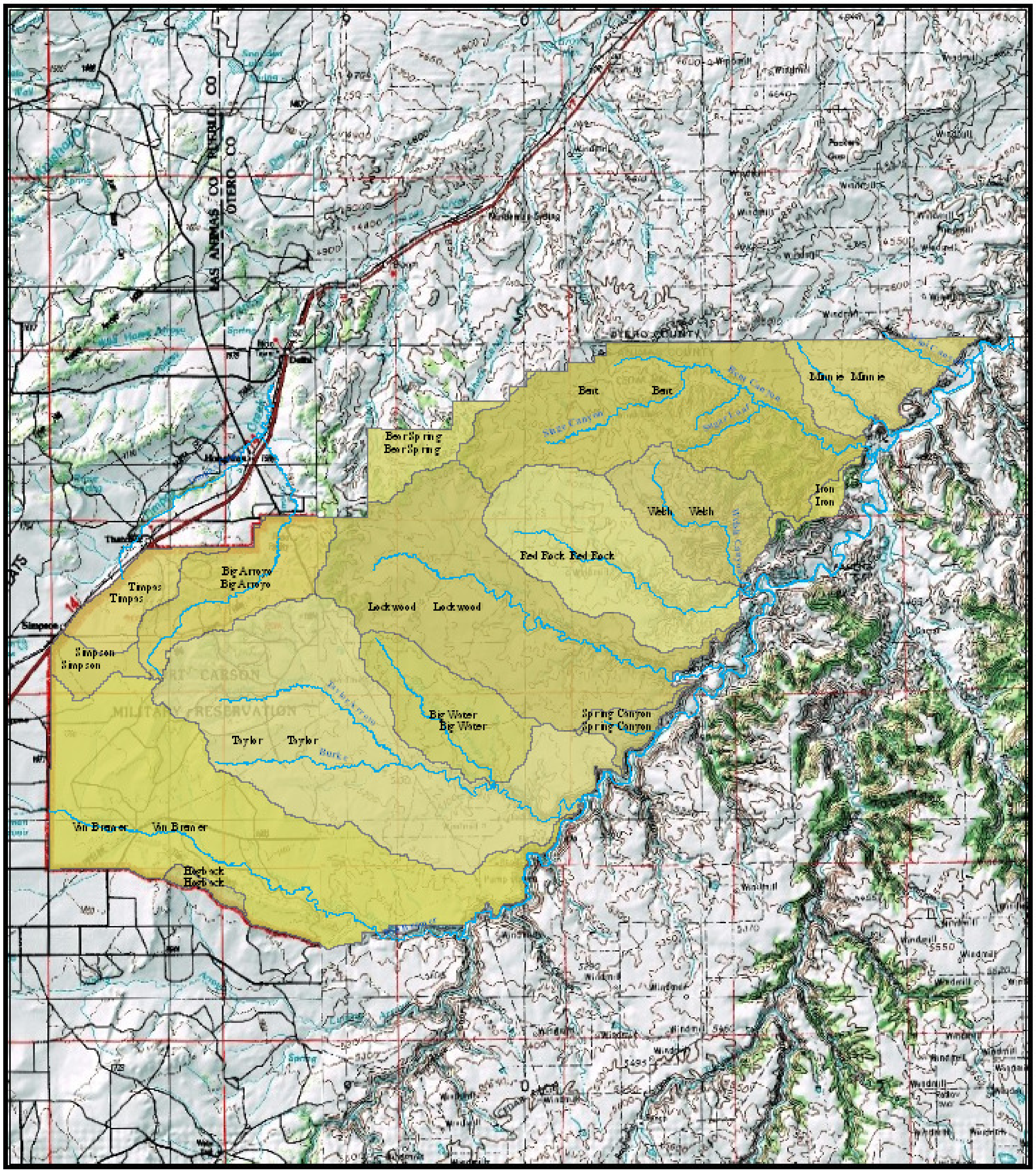
PCMS is located in the Arkansas River basin. The Purgatoire River is the primary drainage near PCMS. As shown on Figure 4.6-1, there are several smaller creeks and drainages on or adjacent to PCMS. Water from PCMS drains into the Arkansas River via the Purgatoire River or the Big Arroyo drainage. The Purgatoire River and its tributaries within PCMS have periodic high flows, including the potential for flash floods, while smaller creeks and drainages might be dry much of the year.

4.6.1.1.2. Local Setting

The majority of the drainages at PCMS flow from the northwest to the southeast and drain into the Purgatoire River, which flows to the northeast along the southern and eastern boundaries of PCMS. The Big Arroyo drainage is located in the northwest corner of PCMS and flows northeast (Reference No. 6). No creeks or major drainages are present in the cantonment area. The drainages at PCMS are intermittent; flow originates from precipitation events. Flow from PCMS contributes approximately 4 percent of the total flow in the Purgatoire River at the Rock Crossing USGS Station 07126485 (Reference No. 198).
The quality of surface water at PCMS has not changed considerably in the recent past. The surface water at PCMS is not a source of domestic water supply. The potential for sediment loading in surface water is a concern (Reference No. 188). Fort Carson and PCMS have been issued a Section 404 regional permit (Permit No. 2002-00707) by the USACE, Albuquerque District, which authorizes implementation of erosion control activities at PCMS (Reference No. 61).

There is a water resources management program for PCMS. Erosion control activities that are or could be implemented to control sediment loading in surface water are identified and described in detail in the Section 404 regional permit (Reference No. 61) and the Programmatic EA for the Erosion and Sediment Control Program (Reference No. 200). Most of the activities listed in the Clean Water Act, Sec 404, Regional Permit #2002-00707 have been implemented including erosion control impoundments (to include those defined as "stock water impoundments" which is a State Engineers Office definition based on size rather than use), bank-sloping, check dams, rock armor, hardened crossings, culverts, erosion control terraces, water diversions, and water turnouts. These activities are all designed to curtail erosion process and/or sediment transport. The only method that was not utilized that was listed on the permit is bridge construction because that method was determined to be unnecessary at this time.

Pinon Canyon Maneuver Site



Legend

Hydrologic Areas

Figure 4.6-1 Surface Water and Topography at Pinon Canyon Maneuver Site

These activities, together with plant material applications, are the principal techniques used by the Army to control sediment loading at the PCMS. The USGS (Stevens et al 2008) has determined that sediment production from PCMS tributaries into the Purgatoire River does not exceed normal background sediment contributions.

To control and monitor sediment transport and loading, the USGS operates approximately 70 erosion-control reservoirs, a stream flow gauge on the Purgatoire River, and five stream flow-sediment gauges on Purgatoire River tributaries that drain more than 60 percent of PCMS. The erosion-control reservoirs are used to assess sediment yields from small watersheds in the training areas, while the stream flow-sediment gauges quantify water and sediment quantities leaving PCMS. The USGS uses information from the erosion-control reservoirs and stream flow-sediment gauges to support an erosion-production and sediment-production assessment of PCMS (Reference No. 6).

The USGS has monitored water quality, including sediment yield, at PCMS since 1983 in cooperation with the Army and Fort Carson (Reference No. 198). Water quality data from 1984 (before military training activities started at PCMS) through 1987 (after training was initiated) were evaluated by statistical analysis. The finding of this report demonstrated that the military maneuvers conducted during this period did not have a statistically significant effect on water quality in the Purgatoire River (Reference No. 198).

In 2007, the USGS began an assessment of the spatial and temporal variations in precipitation, streamflow, suspended-sediment loads and yields, changes in land condition, effects of the tributaries on the Purgatoire River and the possible relation of effects from military training to hydrology and land conditions that have occurred at PCMS from 1983 through 2007. Data were collected for precipitation (19 stations) and streamflow and sediment load (5 tributary and 2 main-stem Purgatoire River stations) during 1983 through 2007 for various time periods (Reference No. 193). The report indicated spatial variation among watersheds which may be associated with precipitation differences, morphology, topography, geology, land condition differences, military training, and pre-maneuver grazing intensities, and post-grazing vegetation recovery rates (Reference No. 193).

In 2001, USDA did another study to evaluate erosion and sedimentation for potential Total Maximum Daily Load (TMDL) compliance (Reference No. 201). The TMDL study did not result in a TMDL for sedimentation, but it outlined further steps for study.

4.6.1.2. Surface Water Quality

4.6.1.2.1. Water Quality Standards

The CDPHE WQCC is responsible for establishing acceptable water quality levels on all streams in Colorado. As such, WQCC has divided all water bodies in the state into various segments, each of which has been assigned water quality levels, known as "water quality standards," that have been established to protect and preserve the beneficial uses of the water or to improve the water quality.

Classification and use designations have been established for the Purgatoire River, according to the water quality standards in Regulation No. 32, Classification and Numeric Standards for Arkansas River Basin, adopted by WQCC on August 11, 2008. The mainstem of the Purgatoire River and all tributaries within PCMS are contained in stream Segment 7 of the Lower Arkansas River Basin, and have been designated for the following uses: Aquatic Life Warm 1, Recreation E, and Agriculture. As detailed in Regulation 31, The Basic Standards and Methodologies for Surface Water, these uses are defined herein:

Warm Water Aquatic Life, Class 1

These are waters that 1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or 2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.

Recreation Class E

These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.

Agricultural

These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado, and are not hazardous as drinking water for livestock.

The established water quality standards for the mainstem of the Purgatoire River and all tributaries in PCMS are listed in Table 4.6-1.

Table 4.6-1 Stream Classifications and Water Quality Standards for Segment 7 (Mainstem of the Purgatoire River from Interstate 25 to the Confluence with the Arkansas River)

Designation	Classification	Physical and Biological Standards	Inorganic (mg/L)	Metals (µg/L)
UP	Aq Life Warm 1 Recreation E Agriculture	DO = 5.0 mg/l pH = 6.5-9.0 *E.Coli*=126/100ml	NH_3(ac/ch)=TVS Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005 S=0.002 B=0.75 NO2=0.5	As(ac)=340 As(ch)=7.6(Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=(TVS) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS Fe(ch)=WS(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(tot) Ni(ac/ch)=TVS Se(ac/ch)=TVS Ag(ac)=TVS Zn(ac/ch)=TVS

µg/L = micrograms per liter
ac = acute
Ag = silver
As = arsenic
B = boron
Cd = cadmium
ch = chronic
Cl = chlorine
Cl_2 = chlorine gas
CN = cyanide
CrIII = trivalent chromium
CrVI = hexavalent chromium
Cu = copper
DO = dissolved oxygen
Fe = iron
Hg = mercury
mg/L = milligrams per liter
ml = milliliters
Mn = manganese
NH_3 = ammonia
Ni = nickel
NO_2 = nitrogen dioxide
NO_3 = nitrate
Pb = lead
S = sulfur
Se = selenium
SO_4 = sulfate
Tot = total
Trec = total recoverable
TVS = table value standard
UP = use protected
Zn = zinc

4.6.1.2.2. 303(d) Listed Waters

Section 303(d) of the CWA requires CDPHE's Water Quality Control Division (Division) to develop a list of water bodies within the state that are not meeting the water quality standards. The Division is then required to further evaluate the stream and develop a TMDL, which will generally specify the amount of pollutants that each source, point and nonpoint, can discharge into the stream. Colorado's listing of impaired water bodies is incorporated into the Division's Regulation #93, Section 303(d) List Water-Quality-Limited Segments Requiring TMDLs. Segment 7 has been listed because the existing quality exceeds the underlying standard for dissolved selenium. In addition, and in accordance with Regulation #94, Colorado's Monitoring and Evaluation List, Segment 7 is included for sediment. It is included because there is reason to suspect water quality problems in the stream segment, but uncertainty exists in one or more factors to make a determination.

It should be noted that high selenium levels have been observed in numerous locations throughout the state. The selenium sources are typically tied to fossil fuels, such as coal or oil, or are the result of the natural weathering or irrigation of cretaceous marine shales and shale-derived soils. The latter is especially true of areas where the soils contain high alkalinity and receive low amounts of precipitation. The USGS has determined that PCMS drainage area contains slightly to moderately saline soils (Reference No. 198).

4.6.1.2.3. In-Stream Water Quality

Table 4.6-2 lists the surface water monitoring stations on streams that drain PCMS. The USGS has nine stream monitoring gauge stations along the Purgatoire River and its tributaries within PCMS, all of which have been evaluated to determine the extent of available water quality data. All but two USGS stream monitoring gauge stations stopped collecting data between 1987 and 1989. Two of the stations (07123600 and 07126485) continued to collect very limited data until 1990 and even less data after 1994. Several USGS stream monitoring gauge stations are present both upstream and downstream of the project area, but these stations are too remote from the project area to be representative of PCMS stream flow data. However, limited water quality data were found on the EPA STOrage and RETrieval (STORET) water quality database for two stream monitoring gauge stations (WCOP01-0812 and EPA01-0238) on the Purgatoire River adjacent to PCMS. Table 4.6-2 shows all of the water quality monitoring stations relevant to PCMS.

Available water quality data from 1999 to present are summarized in Table 4.6-3. Summary statistics of available stream flow data indicate large fluctuations in stream flow conditions. Near the southeast boundary of PCMS (07126300), stream flow in the Purgatoire River ranged from 0.10 to 1,560 cubic feet per second (cfs), while at the northwest boundary of the installation (07126485), stream flow in the river varied between 0.39 and 2,300 cfs. Stream flow fluctuations in the Purgatoire River can be attributed to precipitation, diversions, and irrigation–return flows. Suspended sediment concentrations at 07126485 ranged from 7 to 5,120 mg/L, with the fluctuations due in part to the additional flow from Chacuaco Creek, which is the main tributary to the Purgatoire River. Conductance has been shown to be correlated to dissolved-solids concentrations. Available specific conductance data also indicated large fluctuations in the available data at 07126300 and 07126485. The volume of available data from 1999 to the present was insufficient to establish baseline water quality for the Purgatoire River near PCMS.

Table 4.6-4 shows the available data from the 1993 USGS study at stations 07126300 and 07126485. Though the USGS evaluated 11 stations, including the USGS stations listed in Table 4.6-2, only stations 07126300 and 07126485 were evaluated for various water quality parameters in addition to stream flow, suspended solids, and sediment loads.

Table 4.6-2 Water Quality Monitoring Stations Within or Near the Piñon Canyon Maneuver Site

Organization Name	Station ID	Stream	Location
USGS	07126130	Van Bremer Arroyo, Purgatoire River	Van Bremer Arroyo near Thatcher, Colorado
USGS	07126140	Van Bremer Arroyo, Purgatoire River	Van Bremer Arroyo near Tyrone, Colorado
USGS	07126200	Van Bremer Arroyo, Purgatoire River	Van Bremer Arroyo near Model, Colorado
USGS	07126300	Purgatoire River	Purgatoire River near Thatcher, Colorado
USGS	07126320	Burke Arroyo, Purgatoire River	Burke Arroyo Tributary near Thatcher, Colorado
USGS	07126325	Taylor Arroyo, Purgatoire River	Taylor Arroyo below Rock Crossing near Thatcher, Colorado
EPA National Aquatic Resource Survey Data	WCOP01-0812	Purgatoire River	Purgatoire River midway between Taylor and Spring Canyon
USGS	07126390	Lockwood Arroyo, Purgatoire River	Lockwood Canyon Creek near Thatcher, Colorado
USGS	07126415	Red Rock Arroyo, Purgatoire River	Red Rock Canyon Creek at mouth near Thatcher, Colorado
EPA National Aquatic Resource Survey Data	EPA01-0238	Purgatoire River	Purgatoire River approximately 2 miles upstream of Bent Canyon
USGS	07126485	Purgatoire River	Purgatoire River at Rock Crossing near Timpas, Colorado

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Table 4.6-3 Water Quality Summary for Monitoring Stations Near the Piñon Canyon Maneuver Site

Station ID	Date Period	Statistics	pH (SU)	DO (mg/L)	Temp (°C)	Spec. Cond. (µs/cm)	Instantaneous Discharge (cfs)	Turbidity (NTU)	TSS (mg/L)	Sus. Sediment (mg/L)	Sulfur (mg/L)	Dissolved Ammonia as N (mg/L)	Dissolved Chloride (mg/L)	Dissolved Calcium (mg/L)	Dissolved Magnesium (mg/L)	*Hardness as $CaCO_3$ (mg/L)	Dissolved Selenium (µg/L)	Dissolved Zinc (µg/L)
07126300 (Purgatoire River near Thatcher, CO)	4/29/1999 to 10/6/2004	# samples	--	--	44	24	44	--	--	--	--	--	--	--	--	--	--	--
		Min	--	--	0.3	901	0.10	--	--	--	--	--	--	--	--	--	--	--
		Mean	--	--	15	2812	69	--	--	--	--	--	--	--	--	--	--	--
		Max	--	--	30	4730	1560	--	--	--	--	--	--	--	--	--	--	--
WCOP01-0812 (Purgatoire River midway between Taylor and Spring Canyon)	9/17/2002 to 8/13/2003	# samples	2	0	2	2	--	2	2	--	2	2	1	2	2	--	1	1
		Min	7.95	--	20.9	584	--	175	136	--	24	0.01	--	0.16	16.3	--	--	2.0
		Mean	7.98	--	24.6	618	--	212	156	--	25	0.02	7.24	0.18	17.5	72.3	7.9	17.9
		Max	8.01	--	28.3	651	--	248	177	--	27	0.03	--	0.20	18.6	--	--	33.7
EPA01-0238 (Purgatoire River approximately 2 miles upstream of Bent Canyon)	8/25/2004	# samples	1	1	1	1	--	1	1	--	1	1	1	1	1	1	1	1
		Min	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Mean	8.5	7.3	23.5	1357	--	84.1	173	--	63	0	58.8	0.03	63.6	263	1.1	0
		Max	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	3/2/1999 to 9/16/2005	# samples	--	--	67	32	72	--	--	35	--	--	--	--	--	--	--	--
		Min	--	--	0	1240	0.39	--	--	7	--	--	--	--	--	--	--	--
		Mean	--	--	17	2656	148	--	--	819	--	--	--	--	--	--	--	--
		Max	--		28	4190	2300	--	--	5120	--	--	--	--	--	--	--	--

*Calculated from calcium and magnesium concentrations.
°C = degrees Celsius
$CaCO_3$ = calcium carbonate
cfs = cubic feet per second
mg/L = milligrams per liter
NTU = nephelometric turbidity unit
SU = standard unit
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter

Table 4.6-4 1993 U.S. Geological Survey Water Quality Data at Stations 07126300 and 07126485

Station ID	Date	Statistics	Spec. Cond. (µS/cm)	Instantaneous Stream Flow (cfs)	Dissolved Oxygen (mg/L)	Dissolved Nitrite Plus Nitrate as Nitrogen (mg/L)	Total Recoverable Cadmium (µg/L)	Dissolved Chromium (mg/L)	Total Recoverable Copper (µg/L)	Total Recoverable Iron (µg/L)	Total Recoverable Lead (µg/L)	Total Recoverable Manganese (µg/L)	Total Recoverable Zinc (µg/L)	Total Cyanide (µg/L)
07126300 (Purgatoire River near Thatcher, CO)	Pre-maneuver (1982 – 1985)	# samples	15	22	16	20	15	15	15	15	15	15	15	12
		Min	1,320	14	7.0	<0.10	<0.1	<10	4.0	160	<1.0	20	10	<0.01
		Mean	2,440	52	8.5	0.18	<0.1	<10	12	1,200	4.0	60	40	<0.01
		Max	3,440	1,090	13.7	0.76	4.0	20	290	180,000	190	4,200	810	<0.01
07126300 (Purgatoire River near Thatcher, CO)	Post-maneuver (1985 – 1987)	# samples	25	22	11	22	10	10	10	9	10	10	9	10
		Min	1,030	17	7.2	<0.10	<0.1	<10	2.0	40	<1.0	30	30	<0.01
		Mean	2,900	275	10	0.38	<1.0	<10	20.5	1,700	9.0	275	110	<0.01
		Max	3,610	1,470	12.2	0.60	8.0	<10	930	290,000	600	11,000	1,500	<0.05
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	Pre-maneuver (1982 – 1985)	# samples	15	18	16	20	12	13	12	12	12	12	12	11
		Min	1,320	12	5.9	<0.01	<1.0	<10	2.0	160	<1.0	30	20	<0.01
		Mean	2,950	48	8.0	0.10	<1.0	<10	11	1,035	4.0	70	45	<0.01
		Max	3,430	861	13	0.70	3.0	20	430	240,000	270	6,400	1,100	<0.01
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	Post-maneuver (1985 – 1987)	# samples	25	25	9	26	15	15	15	15	15	15	15	15
		Min	1,020	9.3	5.6	<0.10	<1.0	<10	2.0	160	<1.0	40	20	<0.01
		Mean	2,780	211	8.6	0.33	<1.0	<10	130	100,000	6.0	2,800	580	<0.01
		Max	3,480	2,950	11.4	0.75	1.0	20	510	410,000	400	9,800	2,000	<0.05

cfs = cubic feet per second
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter

In 1993, the USGS completed a study entitled Assessment of Effects of Military Maneuvers on the Stream Flow, Water Quality, and Sediment Yields at PCMS, Las Animas County, Colorado (Reference No. 198). This report analyzed instream water quality data during the pre- and post- military maneuver periods at PCMS from 1982 to 1985 and 1985 to 1987, respectively. Effects of military maneuvers on stream flow quantity and quality were determined by statistical analysis. The USGS reported no statistically significant change in stream flow quantity or quality between the pre- and post-maneuver periods for the Purgatoire River and its tributaries within PCMS. According to the findings of the USGS, the largest correlation to sedimentation of the waters of the Purgatoire River is the number of large storm events received in the in the vicinity of PCMS, not the frequency of use of PCMS by the military.

The USGS report indicated that the reliability of statistical data, however, could have been improved with additional years of stream flow quantity and quality data. Because existing water quality data after 1999 are extremely limited, the 1993 report summarized the most recent extensive water quality data set for the Purgatoire River near PCMS.

Summary statistics of available stream flow data from the USGS (Reference No. 198) study indicate fluctuations in stream flow conditions at both USGS stations. However, the minimum stream flow recorded between 1982 and 1987 is 1,020 cfs, which is significantly higher than the limited data after 1999. The USGS (Reference No. 198) study also evaluated dissolved-solids and sediment loads in relation to specific conductance according to water years from 1984 to 1987. Table 4.6-5 summarizes the dissolved solids and suspended sediment loads for the water years evaluated by the USGS (Reference No. 198) study. In general, suspended sediment concentrations from 1982 to 1987 varied from 20 to 70,000 mg/L at stations 07126300 and 07126485.

Table 4.6-5 1993 U.S. Geological Survey Summary of Dissolved Solids and Suspended Sediment Loads

Station ID	Parameters	Water Years			
		1984	1985	1986	1987
07126300 (Purgatoire River near Thatcher, CO)	Dissolved Solids Load (tons)	119,000	110,000	118,000	155,000
	Suspended Sediment Load (tons)	134,000	280,000	701,000	753,000
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	Dissolved Solids Load (tons)	113,000	106,000	116,000	150,000
	Suspended Sediment Load (tons)	158,000	244,000	820,000	669,000

Source: Reference No. 9

The most recent physical, biological, inorganic, and metal parameters available were evaluated for each station near PCMS to determine existing ambient water quality. The water quality pollutants of concern are those that WQCC has established numeric water quality criteria. Table 4.6-6 lists numeric water quality criteria for which standards are in place and for which data were available from either the USGS or EPA after 1999. Those parameters where the ambient water quality data exceeded the water quality standards for each stream segment are noted in Table 4.6-6. Additionally, the 1993 USGS study compares the water quality data collected during the study to instream water quality standards using time-series plots. Table 4.6-7 indicates the amount of times the water quality standards for stations 07126300 and 07126485 was exceeded during 1982 and 1987.

Table 4.6-6 Comparison of Instream Monitoring Water Quality Data After 1999 to Water Quality Standards

Parameter	Units	Stations ID	Existing Water Quality (Percentile)	Existing Water Quality (Concentration)	Water Quality Standard***	Exceeds Water Quality Standard?
pH	SU	WCOP01-0812	Range of 15th to 85th	7.9 to 8.0	6.5 to 9.0	No
		EPA01-0238	Range of 15th to 85th	8.5**	6.5 to 9.0	No
Dissolved Oxygen	mg/L	EPA01-0238	Minimum 15th	7.3**	5.0	No
Dissolved Selenium	µg/L	WCOP01-0812	85th	7.9**	Se (acute) = 18.4 Se (chronic) = 7.0*	Yes, exceeds temporary modification
		EPA01-0238	85th	1.1**	Se (acute) = 18.4 Se (chronic) = 7.0*	No
Dissolved Zinc	µg/L	WCOP01-0812	85th	29	Zn (acute) = 88 Zn (chronic) = 89	No
		EPA01-0238	85th	0**	Zn (acute) = 261 Zn (chronic) = 263	No

Source: Reference No. 9.
*Temporary modification of Se chronic water quality standard by CDPHE based on uncertainty. The Se temporary modification of 7.0 µg/L expires 12/31/2007.
**Only one water quality data point was available.
***Water quality standards for dissolved selenium and dissolved zinc were calculated from instream hardness concentrations.
µg/L = micrograms per liter
mg/L = milligrams per liter
Se = selenium
SU = standard unit
Zn = zinc

Table 4.6-7 Comparison of Instream Monitoring Water Quality Data from 1993 U.S. Geological Survey Study to Water Quality Standards

	Station ID 07126300		Station ID 07126485	
	# Samples	# Samples Exceeded	# Samples	# Samples Exceeded
Dissolved Oxygen (mg/L)	27	0	24	0
Dissolved Nitrite Plus Nitrate as Nitrogen (mg/L)	42	10	46	11
Total Recoverable Cadmium (µg/L)	25	1	27	0
Dissolved Chromium (mg/L)	25	0	28	0
Total Recoverable Copper (µg/L)	25	14	27	19
Total Recoverable Iron (µg/L)	24	12	27	16
Total Recoverable Lead (µg/L)	25	8	27	6
Total Recoverable Manganese (µg/L)	25	8	27	10
Total Recoverable Zinc (µg/L)	24	7	26	11

Source: Reference No. 9
µg/L = micrograms per liter; mg/L = milligrams per liter

4.6.1.3. Hydrogeology and Groundwater

4.6.1.3.1. Regional Setting

The majority of regional groundwater at or near PCMS occurs in the Dakota Sandstone and the Purgatoire Formation (Reference No. 6), which are part of the Arkansas River basin. Much of the Arkansas River basin has a hydraulic head difference in the deep bedrock aquifers that is lower than that in the shallow formations. This indicates that the deep bedrock aquifers are not in communication with the shallow formations.

4.6.1.3.2. Local Setting

The Dakota Sandstone and Purgatoire Formation make up the Dakota-Purgatoire aquifer, which underlies PCMS and provides the principal groundwater source for this area. The Dakota-Purgatoire aquifer is predominately confined at PCMS, except for outcrop areas that are typically located along major tributaries to the Purgatoire River. The aquifer ranges from 185 to 320 feet in thickness and resides at approximate depths of 225 to 425 feet below the surface in upland areas. Recharge of this aquifer primarily occurs in areas approximately 60 miles west of PCMS. Recharge on PCMS occurs through precipitation and subsurface inflow from neighboring aquifers. However, PCMS resides in a very semi-arid climate and therefore only a small percentage of this precipitation may reach the aquifer. Groundwater movement in the northeastern corner of PCMS is toward the northeast, while groundwater movement throughout the remainder of the installation is toward the east and southeast. (Reference No. 200).

Previous groundwater quality testing determined that the groundwater beneath PCMS contains concentrations of dissolved solids, sulfate, iron, manganese, nitrate, chloride, fluoride, selenium, and radionuclide constituents that exceed domestic or public-use water quality standards. The water quality in the aquifer is adequate for wildlife and livestock, and for fire suppression (Reference No. 6 and 200). There are approximately 95 wells on PCMS, about 30 of which are functional. Some of the major wells are connected to distribution lines that fill stock tanks for wildlife management and fire suppression (Reference No. 6).

4.6.1.4. Floodplains

Floodplains have not been mapped on PCMS (Reference No. 202). However, flash floods occur intermittently during high rainfall events, typically from May through October (Reference No. 6). Flood-prone areas occur along the drainages in the training areas, but the cantonment area is not subject to flooding because the associated watershed drains to the Simpson Lake, which has adequate storage for flood events.

4.6.1.5. Stormwater

4.6.1.5.1. Modeling/Program Background

Hydrologic models were built for the Van Bremer Arroyo, Timpas Creek, Big Arroyo, Taylor and Big Water Arroyos and Simpson Lake watersheds and were presented during the public meetings held in October 2008. Modeling information relating to water quality should be available prior to the initiation of the Proposed Action. The modeling assessment is included in its entirety as Appendix E and provides a cumulative assessment of baseline and current conditions.

4.6.1.5.2. Regulations

Two permit types are utilized at PCMS under the EPA NPDES stormwater program: the *NPDES Construction General Permit* (Reference No. 301) and the *Multi-Section General Permit* (Reference No. 288).

Construction General Permit

Construction projects on PCMS are authorized to discharge stormwater runoff from construction sites under the *NPDES Construction General Permit* (Reference No. 301). To obtain coverage under the general permit, contractors performing work at PCMS must submit a NOI for each construction project that disturbs one acre or more of land. In addition, project proponents must develop and implement a Stormwater Pollution Prevention Plan for each project.

Multi-Sector General Permit

The *Multi-Sector General Permit* (Reference No. 288) provides facility-specific requirements for many types of industrial facilities within one overall permit. The permit outlines steps that facility operators must take prior to being eligible for permit coverage, including development and implementation of a Stormwater Pollution Prevention Plan. Some types of industrial facilities at PCMS covered under this permit are motor pool, the sewage lagoons, and the POL point.

4.6.2. Environmental Consequences

The threshold of significance for impacts to water resources would be if the Proposed Action or the Alternatives would cause a violation of state water quality criteria, a violation of NPDES discharge permits or potential degradation of an aquifer.

There would be no significant impacts associated with the ranges and training areas due to the Proposed Action.

4.6.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

There would be no significant impacts associated with the ranges and training areas due to the Proposed Action. Marginal increases in use of ranges designated for live fire are not projected to impact aquifers.

4.6.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson; and therefore, would not train at PCMS resulting in no additional impacts to water resources.

4.7. Biological Resources

This section introduces the resource areas and the impact analysis approach for PCMS. It also describes the affected environment and environmental consequences of implementing the training component of the Proposed Action, Alternatives and the No Action Alternative at PCMS. There are no impacts to the affected environment for PCMS due to construction of facilities, as all facilities to support the additional IBCT and potential CAB are planned at Fort Carson (Section 2.0). The affected environment and environmental consequences of the Proposed Action would be directly related to training an additional IBCT and potential CAB. Information on the occurrence and distribution of natural resources on PCMS was obtained from a variety of sources, chiefly the latest INRMP (Reference No. 6) and Fort Carson GIS data.

4.7.1. Affected Environment

4.7.1.1. Vegetation

PCMS is within the Central Shortgrass Prairie Ecoregion, which includes all Colorado plains east of the Rocky Mountains as well as parts of Wyoming, Nebraska, Kansas, Oklahoma, Texas, and New Mexico. The Central Shortgrass Prairie is characterized by rolling-to-undulating plains and tablelands of low relief that are traversed by streams and contain canyons, buttes, badlands, and isolated mountains. Shortgrass prairie, mixed-grass prairie, and sand-sage prairie community types dominate the Central Shortgrass Prairie Ecoregion (Reference No. 67). PCMS is within upper regions of the Prairie Grasslands Plant Zone, an area characterized by generally treeless terrain dominated by plants belonging to the grass family (Reference No. 6). Figure 4.7-1 shows vegetation types on PCMS.

A reference plant collection (herbarium) was developed for species found on PCMS. This herbarium includes a laminated sample of each plant species with pertinent information. The entire collection has been digitized (Reference No. 6). Current data on plant species and plant communities at PCMS are available in detail in the *Plant Communities, Ecological Checklist, and Species List for the U.S. Army Piñon Canyon Maneuver Site, Colorado* (Reference No. 85) and the INRMP (Reference No. 6). A plant species list for PCMS, including scientific names, is provided in Appendix F.

Vegetated areas comprise approximately one-fourth of the approximately 1,660-acre cantonment area. This vegetation is primarily native grasses and much of it is mowed. Landscaping plants (Pinyon pines and Blue spruce) are located around the headquarters building. A row of trees was planted as a windbreak around the inside boundary of the cantonment area shortly after PCMS was acquired in the early 1980s.

Grasslands. Comprising about 41 percent of PCMS, grasslands are usually classified as shortgrass prairie. Grasslands dominate much of PCMS. Major grasses include blue grama, western wheatgrass, galleta, sideoats grama, dropseeds, buffalo grass, little bluestem, and needle and thread grass. Various shrubs scattered throughout the grasslands are prickly pear cactus, cholla cactus, yucca, four-winged saltbush, rabbitbrush, and skunkbush sumac (Reference No. 6).

Shrublands. Shrublands typically with grass understory and sometimes intermixed with coniferous and/or deciduous trees, shrublands comprise about 33 percent of PCMS vegetation. Shaw et al. (Reference No. 85) identified 16 shrubland communities on PCMS with dominant species including black greasewood, fourwing saltbrush, bigelow sagebrush, sand sage, mountain mahogany, trumpet gooseberry, greasebush, rabbitbrush, cholla, yucca and many other shrubs are found throughout PCMS. Deciduous shrubland, whose species include gambel oak, locust, and willow, is found along major drainage ways (Reference No. 6).

PINON CANYON MANEUVER SITE

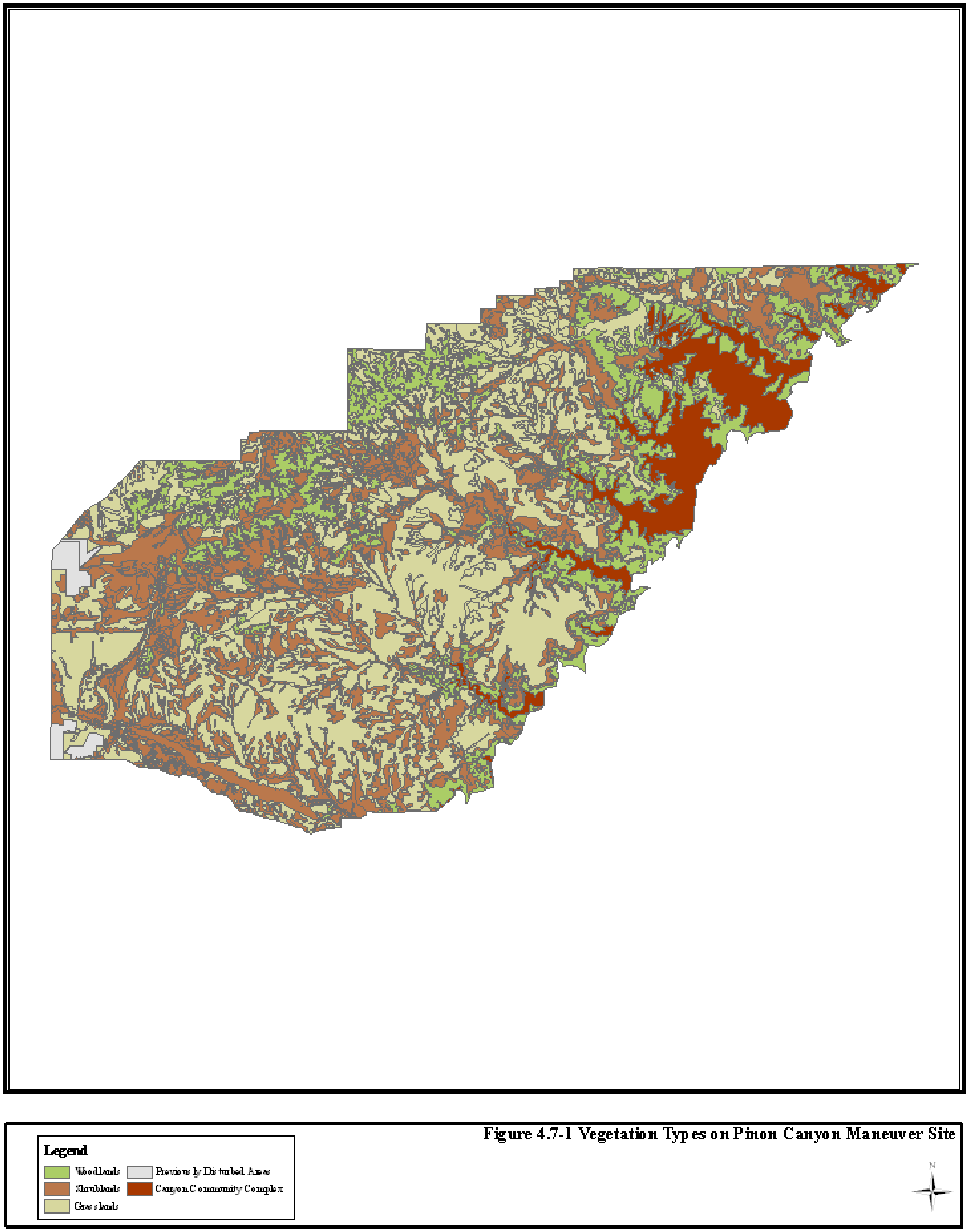

Figure 4.7-1 Vegetation Types on Pinon Canyon Maneuver Site

Forest/Woodlands. Constituting approximately 17 percent of PCMS.[9] Ponderosa pine, Pinyon pine, and one-seed juniper are the dominant species of higher elevation woodlands on rocky and steeper slopes, and cottonwood, willows, and cherries dominate woodlands of drainage ways (Reference No. 6).

Wildland fires. Fort Carson coordinates and consults with the National Wildfire Coordinating Group, federal and state agencies, universities, local land owners, or any other agency or organization that has concerns or input regarding wildland fire. Fort Carson has cooperative agreements with the Colorado Springs Fire Department, El Paso County, and the USFS to provide mutual aid for the suppression of wildland fires on the installation and surrounding area. The Directorate of Emergency Services operates the Fort Carson Fire Department, and includes the PCMS. FTC maintains mutual aid agreements with several cities in the area (e.g., Colorado Springs Fire Department and El Paso County) as well as a mutual firefighting assistance agreement with the North American Aerospace Defense Command. These mutual aid agreements include both FTC and PCMS. Applicable permits, such as an air quality burning permit or Section 404 permit is acquired prior to applicable fire management activities.

Management of wildland fires protects and enhances natural resources on the PCMS. Prescribed fires accomplish predefined resource management objectives that include: reducing the fuel load contributed by excessive understory vegetation, thereby preventing larger and less easily controlled wildfires; creating buffer zones in and around small arms live-fire ranges to reduce the risk of fire from training activities; manipulating the composition of existing plant communities; enhancing or creating specific wildlife habitats; and controlling noxious weeds. Prescribed burns are conducted on the PCMS in the spring, fall, and winter months. Fire is suppressed or controlled where necessary for safety and to protect high-value resources. Wildfires are typically suppressed on the PCMS because they generally occur when existing conditions are favorable for large, uncontrollable fires.

During the 2008 fire season, PCMS experienced severe fire conditions due to drought conditions that persisted throughout the summer, as did most of the Front Range and eastern plains of Colorado. Seven wildland fires occurred this summer burning approximately 50,000 acres on PCMS. Most notable was the Bridger wildland fire, which started from a lightning strike on June 8 and grew to approximately 46,000 acres. A fire of this magnitude has impacts to the mission, natural and cultural resources, and changes the existing conditions of portions of the maneuver site.

The impacts from the fires to natural resources are both positive and negative. Approximately 13,600 acres of woodland, 7,800 acres of shrublands, 7,700 acres of grasslands, and 13,700 acres of canyon complex (a mix of woodlands, shrublands, and grasslands) were within the PCMS fire footprint of the Bridger fire and were affected to varying degrees. The remaining acreage reflects burned areas outside of the PCMS boundary.

Some wildlife species will increase their population due to the increased edge created around islands of vegetation that did not burn, while other species will avoid many areas due to the change in habitat composition. The composition of plant species will also change in areas that were heavily impacted with pioneer species taking hold, while many plant species will regenerate in places that were not so intensely burned. Until some of the rehabilitation efforts start to take hold, there will be the potential for wind and rain to cause soil erosion.

Impacts will be evaluated with management decisions made and implemented through a BAER plan. Every effort possible will be made to return the land to a condition that allows the continuation of the military mission and restores the land and associated resources over time.

[9] The remaining 9 percent of PCMS vegetation can be explained as categories of anthropologically disturbed (1.3 percent) and canyon complex (8.4 percent), which are a mixture of grassland, shrublands, and woodland.

Noxious Weeds

See Section 3.7.1.1.1 for general noxious weed information that applies to Fort Carson and PCMS. PCMS specific noxious weed information is presented here.

Of the several noxious weeds known to occur on PCMS, only one, African rue (*Peganum harmala*), Family: Zygophyllaceae (Caltrop) is an A List species in Colorado (designated by the State for eradication). First recorded in the United States near Deming, New Mexico, in 1928, African rue is toxic to livestock and can replace valuable forage subsequently reducing the productivity of pasture and rangeland. This plant is extremely drought tolerant, and it has expanded into desert rangelands replacing desirable native plants like saltbrush and grasses. It has a competitive advantage over native plants as it germinates earlier in the spring. Most parts of this plant contain substances that retard or prevent the growth of other vegetation. African rue is present throughout New Mexico and is reported in Arizona, California, Idaho, Montana, Nevada, Texas, Oregon, and Washington.

One small population (8 to 10 plants) was found on PCMS during regular weed monitoring activities in 2006. That population was eradicated and monitoring for additional plants continues. An African rue eradication plan was coordinated with the State. Two additional populations of African rue were recently identified on private lands just south of PCMS. One large population was discovered during non-Army natural resources surveys and inventories for areas adjacent to PCMS. That population (over 100 acres) is located about 9 miles south of the small population found on PCMS. Another population of about 2 acres was discovered through incidental observation approximately 12 miles southwest of the population found on PCMS. This species is not yet well established in Colorado, and should be a priority for immediate eradication if found. There is little or no information available on the control of African rue. Control efforts should focus on detecting infestations as early as possible and eliminating them by removing plants before seed set and disposing of them properly.

Besides African rue, Russian knapweed and Canada thistle are the weed species of most concern at PCMS. No effective biological controls exist for Russian knapweed, and control efforts concentrate on mechanical and chemical.

While most of the species for which biological control is approved and available are found on Fort Carson, some species occur on PCMS. Tamarisk has recently been approved for biological control efforts (other than experimental populations) in Colorado by USDA Animal and Plant Health Inspection Service (APHIS), USFWS, and the Colorado DA. Fort Carson has initiated release of the biological control agent *Diorhabda elongata* against tamarisk at both Fort Carson and PCMS. Because of the availability of an effective biological control agent, the bindweed mite (*Aceria malherbae),* a List C species, Field bindweed, has been targeted for biological control. Releases of the mite have been made at both Fort Carson and PCMS to help suppress populations of this noxious weed. The 2008 Fort Carson and PCMS *Plants Management Plan* (Reference No. 84) has detailed information on weed distribution and control strategies.

4.7.1.2. Wildlife

Wildlife habitats on PCMS are diverse and cover large tracts of relatively undeveloped land. Though land use impacts are different than those typically found in the region (e.g., livestock grazing, mineral extraction, farming), maintaining wildlife habitats within the regime of military training is not completely compatible, but does require active management by Fort Carson.

Typical wildlife habitat types on PCMS include shortgrass prairie, pinyon-juniper woodland, and aquatic and riparian communities. Dominant terrestrial habitat types on PCMS are grasslands, shrublands, and woodlands. Aquatic habitats (springs, playa lakes, and man-made structures) on PCMS are very limited and consist of wetlands, riparian corridors, and open water (Reference No. 103).

Data on wildlife species and descriptions of wildlife habitats on PCMS are documented in the *Fish and Wildlife Management Recommendations: Piñon Canyon Maneuver Site Las Animas County, Colorado* (Reference No. 103) and the INRMP (Reference No. 6). A wildlife species list for PCMS, including scientific names, is provided in Appendix F. This list includes mammals, birds, fish, reptiles, amphibians, and invertebrates.

4.7.1.2.1. Mammals

Larger mammals on PCMS include mule and white-tailed deer, elk, pronghorn, mountain lion, bobcat, porcupine, badger, coyote, swift fox, desert cottontail, and black-tailed jackrabbit (Reference No. 6). The lower reaches of the Purgatoire River watershed, in which PCMS occurs, is one of few places on the Great Plains that still supports a relatively intact large mammal community (e.g., elk, mountain lion, pronghorn, bighorn sheep, black bear, mule, and white-tailed deer). Many of these species are more common in mountainous areas, but all were native to the Great Plains at one time and have been extirpated from large areas. While most are not considered species of concern, maintaining this representation of Great Plains biodiversity at times requires active management at PCMS.

Population estimates from Army and CDOW surveys over the past 10 years have fluctuated in the number of pronghorn on PCMS, but overall pronghorn populations have been steady to increasing. Habitat management and hunting have been effective in achieving a healthy pronghorn herd of about 1,000 animals (2007 data).

The mule deer population at PCMS is monitored by the Army and CDOW, and the Army coordinates with the CDOW on population numbers and trends. Overall, CDOW data show that the population associated with PCMS has been stable to slightly increasing. Fort Carson monitors both the habitat and health of the herd.

4.7.1.2.2. Birds

Numerous bird species are known to occur on PCMS. Representative species include the Bald Eagle, Bewick’s Wren, Burrowing Owl, Canyon Wren, Ferruginous Hawk, Golden Eagle, Horned Lark, Lewis’ Woodpecker, Mountain Bluebird, Mountain Plover, Prairie Falcon, Scaled Quail, Wild Turkey, Swainson’s Hawk, Western Meadowlark, and Yellow-billed Cuckoo (Reference No. 6).

4.7.1.2.3. Fish

Surveys during 1983-89 of the Piñon Canyon stretch of the Purgatoire River and its intermittent canyon tributaries on PCMS (Reference No. 204) found 11 native species; no nonnative fish were found. A 1993-94 survey (Reference No. 205) in the same areas found the exotic common carp for the first time.

4.7.1.2.4. Reptiles and Amphibians

The Texas horned lizard and western rattlesnake are typical grassland reptiles found on PCMS. The bullsnake is found in canyons with pinyon-juniper slopes and grasslands on the canyon floor. Wetlands support several reptile and amphibian species found at PCMS, including the plains leopard frog and snapping turtle.

Eight amphibian species have been identified on PCMS (Appendix F). Two of these species are spadefoot toads, which are well adapted to arid climates and spend eight to ten months a year subsurface (Reference No. 206). Other amphibian species found on PCMS are associated with wetlands.

4.7.1.2.5. Invertebrate Species

There are limited data on the types and distribution of invertebrate species on PCMS or in the surrounding area. No federal, state, or local agency has ever raised concerns that invertebrate species are being affected by military activities at PCMS. The few studies conducted at PCMS concentrating on invertebrates were focused on the aquatic habitats of the Purgatoire River and its tributaries (Reference No. 207, 208, and 209).

During summer 2007 systematic sampling for terrestrial invertebrates was initiated using various methods: malaise traps, net sweeps, pit fall traps, and mercury vapor lights within all major vegetation types. This work continued during summer 2008. Results from 2007 field surveys show about 250 species documented from about 50 Families (Appendix F). These data show that PCMS has intact and diverse terrestrial invertebrate species. None of the documented species have any associated regulatory status, but one species, the Colorado blue butterfly, is included on two conservation groups' lists of species of concern. Data will be used as a baseline from which to judge impacts to invertebrates as use of PCMS increases, and to establish baseline data for indicator species (Carabidae) to help monitor rangeland health. Preliminary data from the 2008 sampling show a decline in numbers and diversity. This has been attributed to the severe drought and associated decline in host plant species and flowers required by many of these species (Reference No. 210).

4.7.1.3. Sensitive Species

The first two paragraphs of Section 3.7.1.3, describe general regulatory requirements and agencies/organizations involved in identifying and managing sensitive species; these paragraphs are also pertinent to PCMS.

4.7.1.3.1. Federally-Listed Species

Table 4.7-1 presents federally-listed endangered, threatened, and candidate species that occur in Las Animas and Otero counties. No plant or wildlife species, with documented occurrences on PCMS, appear on USFWS lists of federally listed endangered, threatened, and candidate species, and no critical habitat for these species has been designated or proposed for designation in Las Animas County or any adjoining county (Reference No. 70 and 71).

The triploid checkered whiptail is designated as a Species of Risk by the Army. In 2006, CNHP surveyed for the species' distribution at PCMS. CNHP also developed a habitat model for triploid checkered whiptails based on habitat characteristics at 12 species observation locations (Reference No, 117)

Table 4.7-1 Federally-Listed Endangered, Threatened, and Candidate Species of Las Animas and Otero Counties[1]

Species	Scientific Name	Species Type	Status	Distribution on PCMS
Black-footed ferret	*Mustela nigripes*	Mammal	E	Not known to occur
New Mexico meadow jumping mouse	*Zapus husdonius luteus*	Mammal	C	Not known to occur; documented occurrences in Las Animas County
Mexican Spotted Owl	*Strix occidentalis*	Bird	T	Not known to occur; potential to occur

[1]Species for which no reasonably suitable habitat exists on PCMS are not included.
E = Endangered, T = Threatened, C = Candidate

The New Mexico meadow jumping mouse, recently listed as a candidate species (Reference No. 211), has no known occurrences on PCMS from extensive small mammal studies done by Kuenzi (Reference No. 212 and 213). There are known occurrences of the species in Las Animas County from studies done on the James M. John and Lake Dorothey State Wildlife Areas (Reference No. 214). Because there are known occurrences in the same county and within the same watershed as PCMS and even though there is a limited amount of suitable habitat for the species, live-trapping efforts were undertaken in the 2008 field season to confirm/document the presence or absence of the species. Current drought conditions, which affect the species life cycle, and wildland fires at PCMS have interrupted the originally planned trapping efforts, although some trapping has been conducted and no jumping mice have been captured. If the 2008 data is inconclusive, the effort will be continued during the 2009 season.

4.7.1.3.2. State-Listed Species and Species of Concern

Table 4.7-2 lists Colorado state-listed and other special status wildlife species that occur at PCMS. Figures 4.7-2 and 4.7-3 depict the distribution of sensitive wildlife and plant species at PCMS.

The Army has conducted surveys annually for black-tailed prairie dogs on PCMS. Approximately 700 to 1,200 acres on PCMS are populated by black-tailed prairie dog colonies. Population numbers fluctuate, primarily in relation to occurrence of sylvatic plague in the region.

Mountain Plovers are rare on PCMS, with two to ten Plover nests generally found annually. Only a small percentage of available habitat (black-tailed prairie dog colonies and other heavily disturbed areas such as from fire and training activities) is occupied. The population has been generally stable at these low numbers.

The Burrowing Owl is a summer/breeding resident on PCMS. Numbers of breeding pairs fluctuate annually due to many variables but appear to be most attributed to availability of nesting sites in black-tailed prairie dog colonies and other abandoned burrowing mammal dens. During the 2007 breeding season, 30 nesting pairs with young were observed. In addition, recent observations show that Burrowing Owls may be adapting to reside over the winter during years when favorable weather conditions prevail. Maintaining the health of the prairie dog colonies on PCMS is also essential since nearly all (>98 percent) of observations of the species nesting on PCMS have been in black-tailed prairie dog colonies.

Table 4.7-2 Special Status Wildlife Species Observed on Piñon Canyon Maneuver Site

Species	Scientific Name	Species Type	Status	Authority
Flathead chub	*Platyglobio gracilis*	Fish	SC	CDOW, CSP
Plains leopard frog	*Rana blairi*	Amphibian	SC	CDOW, CNHP, CSP
Canyon tree frog	*Hyla arenicolor*	Amphibian	SC	CNHP
Yellow mud turtle	*Kinosternon flavescens*	Reptile	SC	CDOW, CNHP, CSP
Corn snake	*Elaphe guttata emoryi*	Reptile	SC	CDOW, CSP
Texas blind snake	*Leptotyphlops dulcis*	Reptile	SC	CDOW, CSP
Western blackneck garter snake	*Thamnophis cyrtopsis cyrtopsis*	Reptile	SC	CNHP
Roundtail horned lizard	*Phrynosoma modestum*	Reptile	SC	CDOW, CNHP, CSP
Texas horned lizard	*Phrynosoma cornutum*	Reptile	SC	CDOW, CNHP, CSP
Short-horned lizard	*Phrynosoma douglassi*	Reptile	SC	CNHP
Triploid checkered whiptail	*Aspidoscelis neotessalatus*	Reptile	SC	CDOW, CNHP, CSP, SAR
Black-tailed prairie dog	*Cynomys ludovicianus*	Mammal	SC	CDOW, CNHP, CSP
Swift fox	*Vulpes velox*	Mammal	SC	CDOW, CNHP, CSP
Colorado chipmunk	*Tamias quadrivittatus*	Mammal	SC	CNHP
Southern Plains woodrat	*Neotoma micropus*	Mammal	SC	CNHP
Big free-tailed bat	*Nyctinomops macrotis*	Mammal	SC	CNHP
Brazilian free-tailed bat	*Tadarida brasiliensis*	Mammal	SC	CNHP

Table 4.7-2 Special Status Wildlife Species Observed on Piñon Canyon Maneuver Site (continued)				
Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Townsend's big-eared bat	*Plecotus townsendii pallescens*	Mammal	SC	CDOW, CNHP, CSP
Bald Eagle	*Haliaeetus leucocephalus*	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Northern Harrier	*Circus cyaneus*	Bird	SC	PIF, USFWS
Swainson's Hawk	*Buteo swainsoni*	Bird	SC	PIF, USFWS
Ferruginous Hawk	*Buteo regalis*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Golden Eagle	*Aquila chrysaetos*	Bird	SC	USFWS
Northern Goshawk	*Accipter gentilis*	Bird	SC	CNHP
Peregrine Falcon	*Falco peregrinus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Prairie Falcon	*Falco mexicanus*	Bird	SC	CNHP, PIF, USFWS
American White Pelican	*Pelecanus erythrorhynchos*	Bird	SC	CNHP
Mountain Plover	*Charadrius montanus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Western Snowy Plover	*Charadrius alexandrinus*	Bird	SC	CNHP, CSP, PIF, USFWS
Piping Plover	*Charadrius melodus*	Bird	SC	CNHP, CSP, PIF, USFWS
Solitary Sandpiper	*Tringa solitaria*	Bird	SC	USFWS
Upland Sandpiper	*Bartramia longicauda*	Bird	SC	PIF, USFWS
Marbled Godwit	*Limosa fedoa*	Bird	SC	USFWS
Black-necked Stilt	*Mimantopus mexicanus*	Bird	SC	CNHP
Long-billed Curlew	*Numenius americanus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Bird	SC	USFWS
Burrowing Owl	*Athene cunicularia*	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Short-eared Owl	*Asio flammeus*	Bird	SC	CNHP, PIF, USFWS
Flammulated Owl	*Otus flammeolus*	Bird	SC	PIF, USFWS
Lewis' Woodpecker	*Melanerpes lewis*	Bird	SC	CHNP, PIF, USFWS
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Bird	SC	USFWS
McCown's Longspur	*Calcarius mccownii*	Bird	SC	CNHP, CSP, PIF, USFWS
Willet	*Catoptrophorus semipalmatus*	Bird	SC	CNHP, PIF
Least Tern	*Sterna antillarum*	Bird	SC	CNHP, CSP, PIF
Ovenbird	*Seiurus aurocapillus*	Bird	SC	CNHP
Band-tailed Pigeon	*Columba fasciata*	Bird	SC	PIF

Table 4.7-2 Special Status Wildlife Species Observed on Piñon Canyon Maneuver Site (continued)				
Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Bird	SC	PIF, USFWS
White-faced Ibis	*Plegadis chihi*	Bird	SC	CNHP
Wilson's Phalarope	*Phalaropus tricolor*	Bird	SC	CNHP, USFWS
Bobolink	*Dolichonys oryzivorus*	Bird	SC	CNHP, USFWS
Loggerhead Shrike	*Lanius ludovicianus*	Bird	SC	USFWS
Pinyon Jay	*Gymnorhinus cyanocephalus*	Bird	SC	USFWS
Curve-billed Thrasher	*Toxostoma curvirostre*	Bird	SC	CNHP
Virginia's Warbler	*Vermivora virginiae*	Bird	SC	PIF, USFWS
Grace's Warbler	*Dendroica graciae*	Bird	SC	CNHP, PIF
MacGillivray's Warbler	*Oporornis tolmiei*	Bird	SC	PIF
Wilson's Warbler	*Wilsonia pusilla*	Bird	SC	PIF
Green-tailed Towhee	*Pipilo chlorurus*	Bird	SC	PIF
Chestnut-collared Longspur	*Calcarius ornatus*	Bird	SC	CSP, USFWS
Dickcissel	*Spiza americana*	Bird	SC	USFWS
Gray Vireo	*Vireo vicinior*	Bird	SC	CNHP, USFWS
Bell's Vireo	*Vireo bellii*	Bird	SC	PIF, USFWS
Barrow's Goldeneye	*Bucephala islandica*	Bird	SC	CNHP
Broad-tailed Hummingbird	*Selasphorus platycercus*	Bird	SC	PIF
Cassin's Sparrow	*Aimophila cassinii*	Bird	SC	CNHP, CSP, PIF, USFWS
Rufous-crowned Sparrow	*Aimophila ruficeps*	Bird	SC	CNHP
Brewer's Sparrow	*Spizella breweri*	Bird	SC	PIF, USFWS
Sage Sparrow	*Amphispiza belli*	Bird	SC	CNHP, PIF
Lark Bunting	*Calamospiza melanocorys*	Bird	SC	PIF, USFWS
Grasshopper Sparrow	*Ammodramus savannarum*	Bird	SC	PIF, USFWS
Bewick's Wren	*Thryomanes bewickii*	Bird	SC	USFWS
Lazuli Bunting	*Passerina amoena*	Bird	SC	PIF

CDOW = Colorado Division of Wildlife
CNHP = Colorado Natural Heritage Program
CSP = Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (Reference No. 73) (now called the Shortgrass Prairie Partnership)
PIF = Partners in Flight (PIF 2000)
SAR = Species at Risk; SC = Species of Special Concern
ST = Colorado State Threatened
USFWS = U.S. Fish and Wildlife Service (USFWS 2002)

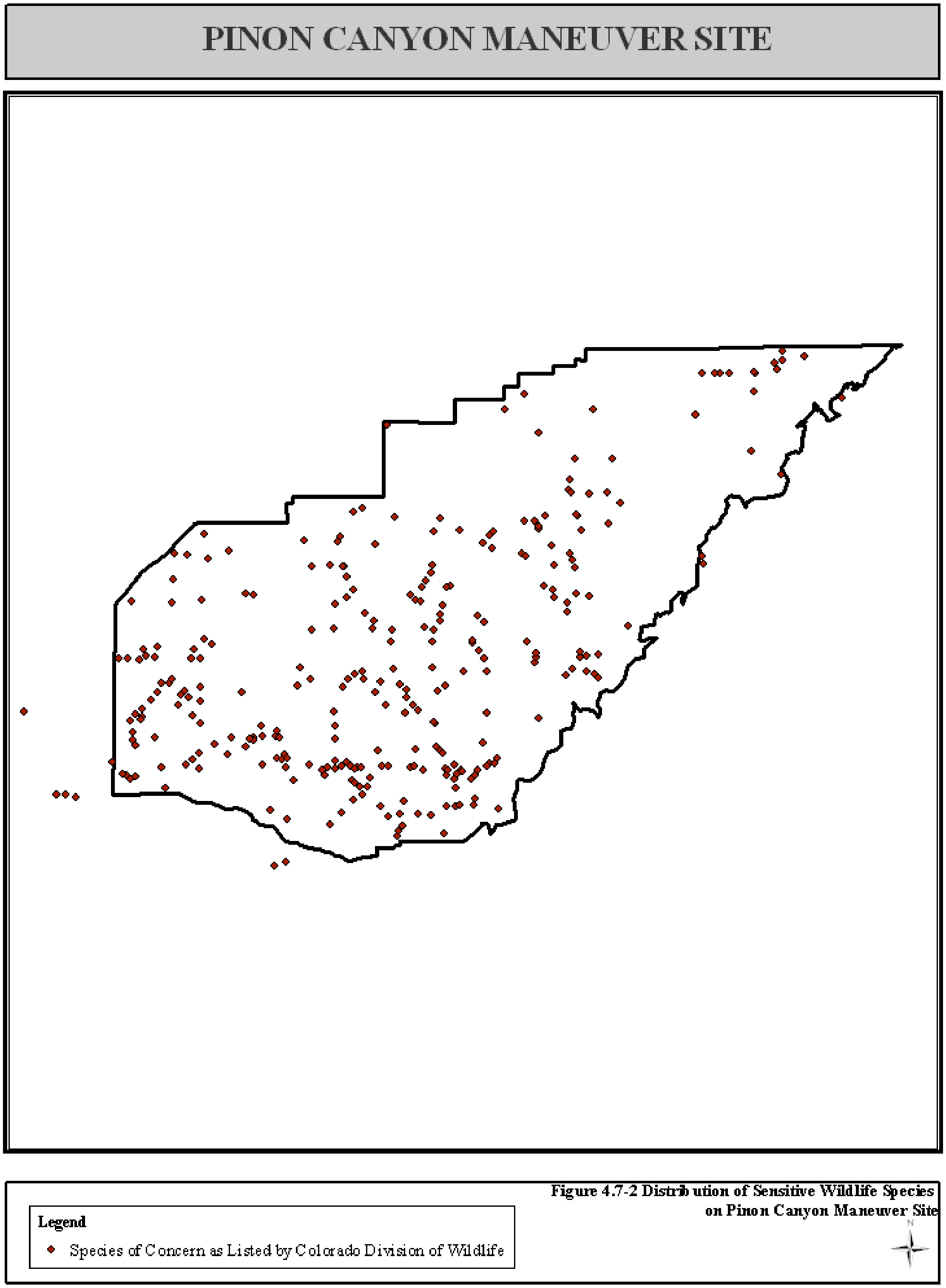

Figure 4.7-2 Distribution of Sensitive Wildlife Species on Pinon Canyon Maneuver Site

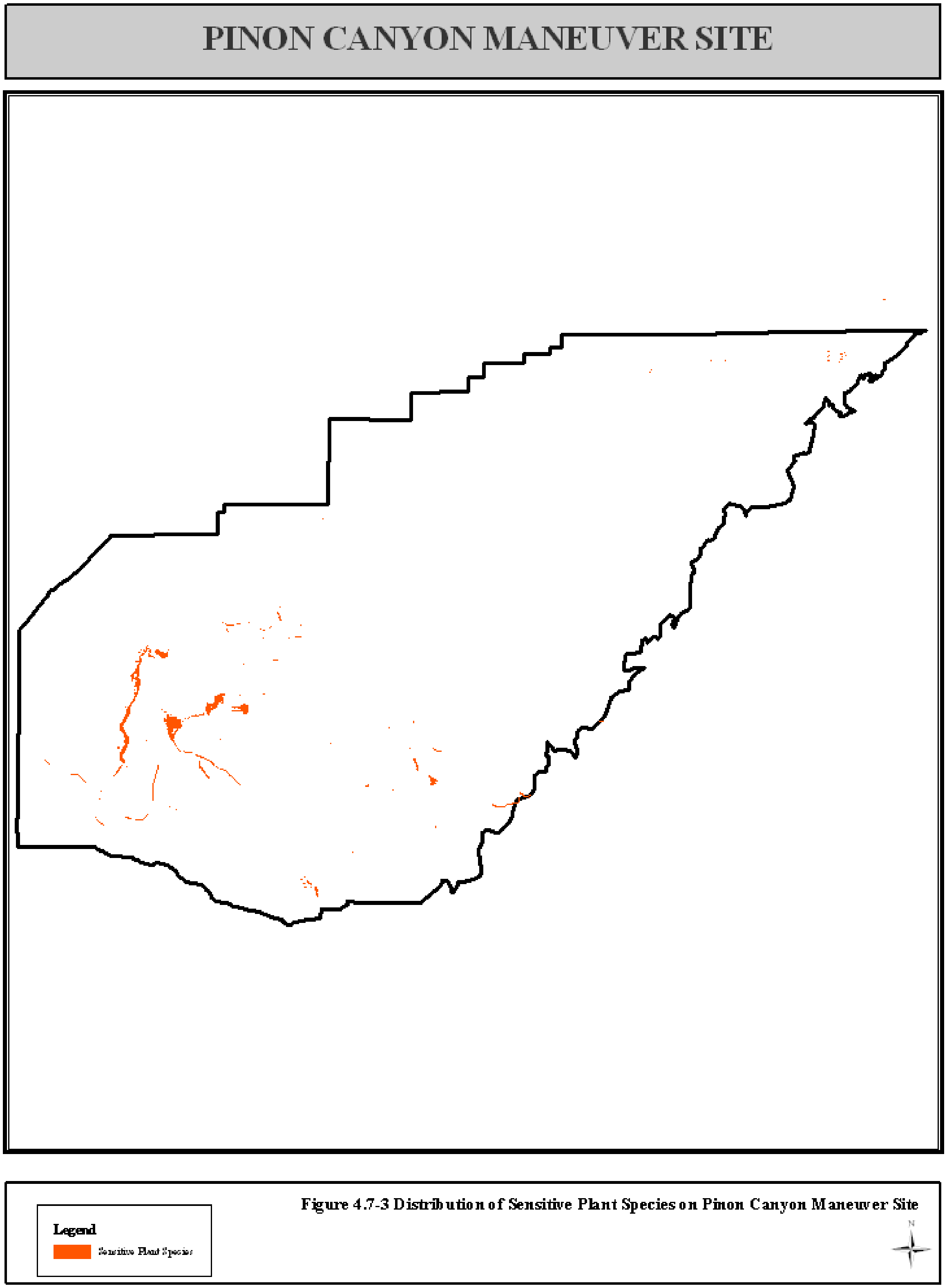

Figure 4.7-3 Distribution of Sensitive Plant Species on Pinon Canyon Maneuver Site

The state does not maintain a list of threatened or endangered plants. The following Colorado Species of Special Concern (as listed by the CNHP) plants are known to either occur or potentially occur on PCMS (Reference No. 215 and 78):

- Southern maidenhair fern (*Adiantum capillus-veneris*) - Potential to be on PCMS; has been found in adjacent Baca County; CNHP imperiled.
- Dwarf indigo amorpha (*Amorpha nana*) - Resident, CNHP imperiled; confirmed in Taylor and Spring canyons (Reference No. 78 and 216).
- Sidecluster milkweed (*Asclepias oenotheroides*) - Potential to be on PCMS; only Colorado collection was from near Troy, Mesa de Maya; CNHP critically imperiled.
- Dwarf milkweed (*Asclepias uncialis*) - Confirmed in 1990 collection near 'Sue site'; eight populations now known (Reference No. 78).
- Ebony spleenwort (*Asplenium platyneuron*) - Potential to be on PCMS; CNHP critically imperiled.
- Eaton's lip fern (*Cheilanthes eatonii*) - Potential to be on PCMS; found chiefly in Arkansas River drainage; CNHP imperiled.
- Giant helleborine (*Epipactis gigantea*) - Potential to be on PCMS; CNHP imperiled.
- Colorado green gentian (*Frasera coloradensis*) - Potential to be on PCMS. None found during 1996 surveys (Reference No. 78), but the species was documented in 2006 on the Comanche Grasslands.
- Rayless goldenweed (*Oönopsis foliosa* var. *monocephala*) - Resident in upper Burke, Taylor, and Van Bremer Arroyo watersheds (Reference No. 216); former federal Category C3; CNHP imperiled.
- Yellow stargrass (*Hypoxis hirsuta*) - Potential to be on PCMS; reported in western Las Animas County over 30 years ago; CNHP critically imperiled.
- Arkansas Valley evening primrose (*Oenothera harringtonii*) - Confirmed on PCMS in upper Burke, Taylor, and Van Bremer Arroyo watersheds (Reference No. 216); CNHP imperiled.
- Round-leaf four o'clock (*Oxybaphus rotundifolius*) - Confirmed in southcentral portions of PCMS during 1995 and 1997 surveys (Reference No. 78 and 79).
- Purple cliff brake (*Pellaea atropurpurea*) - Potential to be on PCMS; found elsewhere in Las Animas County; CNHP imperiled.
- Wright's cliff brake (*Pellaea wrightiana*) - Potential to be on PCMS; CNHP imperiled.
- Dwarf purslane (*Portulaca parvula*) - Resident, CNHP critically imperiled.
- Southern soapberry (*Sapindus saponaria drummondii*) - Resident, CNHP critically imperiled.
- Twinevine (*Sarcostemma crispum*) - Found in 2001.
- Long hood milkweed (*Asclepias macrotis*) - Found in 1985 and again in 1999 in Bravo Canyon (Reference No. 216).
- Texas beargrass (*Nolina texana*) - Found at the base of Mesa de Maya, with potential to exist on PCMS.

Of these Colorado Species of Special Concern, round-leaf four o'clock, dwarf milkweed, and Arkansas Valley evening primrose are well represented at PCMS in terms of known sites and numbers of individuals (Reference No. 81). Approximately 12 percent of the known range (acres) of the round-leaf four o'clock occurs on PCMS (Reference No. 79). Dwarf milkweed is known to inhabit approximately 400 acres in Colorado, 96 of which (approximately 24 percent) are found on PCMS. Arkansas valley evening primrose is known to inhabit approximately 2100 acres in Colorado, of which 361 acres (approximately 17 percent) are found on PCMS. Rayless goldenweed is known to inhabit approximately 460 acres in Colorado, of which 364 acres (approximately 80 percent) are found on PCMS (Reference No. 222) Geographic ranges for these species are much larger than the known inhabited acreages, and continuing surveys in Colorado may identify more populations in the future. Surveys are also ongoing at

PCMS. Natural resources management at PCMS is increasingly important for the overall rangewide survival of these species.

4.7.1.4. Wetlands

In 2007, the USACE re-issued a Regional Permit under Section 404 of the CWA (33 U.S.C. 1344) for Fort Carson and PCMS Erosion Control Activities (Reference No. 63). This regional permit authorizes Fort Carson to conduct erosion control activities that may result in minimal individual and cumulative impacts to wetlands from dredge and fill activities. Typical erosion control measures include erosion control and stock watering impoundments, banksloping of erosion courses, check dams, rock armor, hardened crossings, culverts and bridges, erosion control terraces and water diversions, water turnouts, and other erosion control activities approved by USACE.

Natural water bodies and wetlands are generally small and infrequent on PCMS but are important in contributing to wildlife habitat diversity. The total wetland area on PCMS is estimated to be 361 acres, of which approximately 290 acres are man-made (Reference No. 6). Most wetlands on PCMS are associated with side canyons of the Purgatoire River and water developments such as erosion control dams, rock check dams and other erosion control features. Playas (flat-bottomed depressions that are periodically covered by water) are also present, and additional small wetlands are associated with springs and other water bodies, such as erosion control impoundments, stock watering ponds, and the overflow from windmills.

4.7.2. Environmental Consequences

Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited training resources (maneuver area and firing range availability). This does not change with the IBCT and CAB facilities siting alternatives that occur at Fort Carson, and remains constant across all alternatives depending on the units training at Fort Carson and PCMS at any given time. The Proposed Action does not include any construction at PCMS; however, PCMS will support the training needs of the additional IBCT and potential CAB. Therefore, only the Proposed Action (to train an additional IBCT and potential Medium CAB at PCMS), and the No Action alternative (no additional IBCT and CAB training), are analyzed.

As a general guideline to projected impacts, the addition of one IBCT would increase overall quantifiable training impacts to land-based natural resources by approximately 9 percent, considering the type of unit and number of Soldiers involved; while the CAB would add approximately 6 percent.

4.7.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

A comprehensive description of training impacts from the Proposed Action and No Action alternative is in Section 3.7.2.2. Impacts discussed in Section 3.7.2 also apply to PCMS. To avoid redundancy, only PCMS specific impacts are discussed here.

4.7.2.1.1. Vegetation

Training at PCMS includes the establishment of temporary command operations bases. These are areas chosen by unit commanders for strategic and tactical value to their individual training scenarios. Depending on the size of the unit, 5 to 20 or more acres can be impacted where the unit sets up its operating base for the duration of the exercise. The concentration of Soldiers and equipment in these areas can cause temporary severe impacts to vegetation. Bivouacking causes similar impacts, in a generally smaller area. Because of the temporary nature of these impacts, they are not considered significant.

Training an additional IBCT and CAB at PCMS under the Proposed Action could increase potential impacts to vegetation. Impacts to dismounted training areas and maneuver training areas could increase under the Proposed Action, in extent (number of acres), magnitude (severity), or a combination of both, as previously described and depending on land sustainability considerations.

4.7.2.1.2. Noxious Weeds

Russian knapweed occurs at PCMS and is a difficult weed to control. Soldiers and their equipment can inadvertently spread this weed across the installation to suitable habitats (Section 3.7.2.2.2 Noxious Weeds).

4.7.2.1.3. Wildlife

The following impacts to wildlife from military training occur and would occur at a higher frequency due to training an additional IBCT and potential CAB as part of the Proposed Action.

Military training can reduce wildlife populations indirectly by damaging soils and vegetation, potentially leading to altered plant communities that are unsuitable as habitat for the wildlife species that once used them. Dismounted military training can flush or startle small mammals, ground nesting birds, and reptiles. This may lead to increased predation on young or the displacement and death of eggs or young. Impacts to reproductive success can cause decreased populations (Reference No. 90).

Mule deer, elk, pronghorn, and many species of raptors are more readily flushed or displaced by pedestrians than by moving vehicles. Wildlife species can be affected by mounted military training through direct disturbance and by indirect alteration of their habitat. Small animals that den, nest, or live exclusively on the ground can be killed directly from maneuver training. Eggs and young of ground-nesting birds can be destroyed. Human presence and noise from training exercises can disrupt wildlife species from foraging or reproducing. For example, some raptors abandon nests or territories as a result of human presence in the vicinity (Reference No. 90).

Limited research exists on the indirect, habitat-related impacts of mounted military training on reptiles, amphibians, or aquatic species (Trame 1997); however, military training results in the creation of two-track roads and wider corridors cleared of vegetation. Effects of these types of vegetation removal and surface disturbance on wildlife have been studied extensively (Reference No. 91, 93, 94, 95, 96, 97, 98, 99 and 100).

Training an additional IBCT and CAB as part of the Proposed Action would increase potential impacts to wildlife. In general, species adapted to reduced vegetation, bare ground, or disturbance would be increasingly favored. Depending on training frequency and intensity, species that prefer these conditions, such as the Mountain Plover, might be attracted into the area in greater numbers.

Training an additional IBCT and CAB might displace maneuvers on the grassland/pinyon-juniper interface farther into current pinyon-juniper habitat, which would exacerbate impacts to species using this habitat. Direct disturbance to wildlife species would increase in areas where vehicular activity, fire, and noise increase, which would occur during both maneuver and live-fire training exercises.

Increased dismounted training activity of the IBCT would increase disturbance of wildlife species sensitive to human presence. Species that are more tolerant of human presence, vehicular activity, and noise would be increasingly favored in areas where military training occurs, while species that are less tolerant of these factors would decline.

4.7.2.1.4. Rayless Goldenweed

Populations of rayless goldenweed, a species known to increase on disturbed ground at PCMS, are likely to expand in response to increased ground disturbance in maneuver training areas and other training areas where they occur (Reference No. 217).

4.7.2.1.5. Swift Fox

Direct impacts to swift fox caused by military training are minimal. Extensive studies have been conducted on swift fox on PCMS from 1987 to 1989 and 1997 to 2006 to understand their ecology better. Those studies indicate that the species is doing well on PCMS and needs little management to survive (Section 3.7.2.2.2).

Maintaining the range in good condition allows a diversity of small mammal populations needed to sustain viable swift fox populations. Overall degradation of shortgrass prairie habitat on a large scale would likely result in a localized decline in swift fox populations (Reference No. 103).

4.7.2.1.6. Wetlands

Few direct impacts to wetlands occur from ongoing training activities. Training an additional IBCT and CAB could result in indirect impacts to wetlands from erosion and sedimentation processes in drainages upstream of man-made erosion control dams. Sediments could silt in these small wetlands, changing their nature or converting them to upland habitats if erosion-control dams are not properly maintained.

Wetland and riparian area buffers are generally protected from vehicular and mechanized training due to the surrounding topography, which makes these areas unsuitable for this type of training. Because of avoidance and minimization efforts Fort Carson currently implements as part of its INRMP and ITAM procedures, direct effects to wetlands do not occur. Erosion control measures are protective of surface water, including wetlands and riparian areas.

From 1996 to 1997, a Legacy grant was used to study wetland community constituents and their distribution as well as various physical parameters at 10 sites on Fort Carson[10] and five sites on PCMS[11]. No decline was noted in representative wetlands, and no statistically significant increases in measured constituents were identified. These studies would be used to provide baselines for future wetland evaluations (Reference No. 6).

4.7.2.1.7. Summary of Known Piñon Canyon Maneuver Site Impacts from Training

Table 4.7-3 summarizes known effects of military training on biological resources at PCMS (see Section 3.7.2.2.2), and identifies effects that are specific to PCMS, but many also apply to Fort Carson.

4.7.2.2. No Action Alternative

Under the No Action Alternative, the IBCT and potential CAB would not be stationed at Fort Carson, therefore no additional training at PCMS would occur. Under the No Action Alternative, the addition of Soldiers at Fort Carson associated with Transformation will continue in accordance with BRAC 2005, GDPR and AMF as discussed in the 2007 Fort Carson and PCMS Transformation EISs. Training impacts already analyzed in the 2007 PCMS Transformation EIS are included as part of this No Action Alternative. For purposes of this EIS, impacts to vegetation, wildlife, and wetlands from training currently occurring at PCMS would continue to occur at similar levels under the No Action Alternative.

PCMS already trains an existing IBCT and has had aviation training ongoing in different formations over the years, based on stationing and National Guard/Reserve training. Impacts from training the additional IBCT and CAB would not occur, however, under the No Action Alternative.

[10] Wetland Program for Fort Carson, Colorado, 1996.
[11] Wetlands Monitoring Program for Piñon Canyon Maneuver Site (PCMS), Model, Colorado, 1998.

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources

Resource	Effects of Military Training	Reference
Aquatic habitat	Between 1985 and 1987, military maneuvers caused no measurable effect on streamflow, water quality, and estimated sediment load yields deceased. Since 1987, cumulative effects of maneuvers have developed to a point that there is potential for increased runoff and sediment yields and degradation of water quality.	USGS (undated) von Guerard *et al*. (1993) and USGS John Kuzmiak 2008 (Reference No. 198 and 194)
General vegetation	Training exercises result in less resource degradation than former grazing regimes, particularly for canyon and wetland habitats.	Canestorp *et al.* (1995) (Reference No. 231)
General vegetation and range condition	Disturbance by tracked vehicles resulted in lower grass and vegetative basal cover with the loss of prostrate growth forms. Litter cover declined. Vehicular maneuvering reduced woody life-forms in tall-height classes to a generally greater extent than short-height classes. Low-growing forms of cacti were relatively susceptible to crushing. Long-lived perennials declined in all communities in tracked locations; bare ground created was replaced by short-lived perennials in only shrub-grassland. Annuals and exotics did not show distinct temporal trends or relations with intensity of disturbance. Patterns in species diversity or richness were not related to intensity of disturbance. Plant communities on PCMS display a high resistance to aboveground disturbance, but a low resilience when an alternate state is reached. PCMS may be in a transient stage where release from grazing had as much or more impact on plant community dynamics as did imposition of training. Fine textured soils may be more susceptible to cumulative effects of soil compaction and erosion associated with heavy vehicular loads.	Milchunas *et al.* (1999) (Reference No. 233)
General vegetation and range condition	Through the exclusion of livestock, the vegetation biomass appears to have rebounded significantly, primarily evident through litter accumulation.	Milchunas *et al.* (2000) (Reference No. 234)
Range condition	Overall, range condition improved on PCMS from 1989 to 1991.	Gordon and Linn (undated) (Reference No. 237)

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Niobrara shale barrens vegetation	Most Niobrara shale barrens endemic species are not adversely affected by moderate disturbance, particularly *Oxybaphus rotundifolius*, which appears to increase abundance where disturbance reduces competition. Weed invasions are not generally significant problems on these barrens. The report has baseline data (six plots at Gilligan's Island) that could be used to compare effects of current military training.	Kelso *et al.* (1999) (Reference No. 236)
Fish	No observed effects.	Bramblett (1989), Bramblett and Fausch (1991a and 1991b) (Reference No. 204, 208 and 209)
General birds	During 1987-88 in cholla grasslands four species were detected more frequently and one species was detected less frequently in areas with training than control areas. In pinyon-juniper areas, four species were detected more frequently and one species was detected less frequently. Total numbers of birds detected in areas with training was significantly higher than the control for both habitat types, but species richness was significantly greater in control areas in cholla grasslands in 1987 and 1988 and significantly greater in areas with training in pinyon-juniper in 1988.	Youkey and Meslow (1989) (Reference No. 238)
General birds	Only one species (Grasshopper Sparrow) showed an abundance decline after initiation of military training. The pinyon-juniper bird community decreased in species richness with military disturbance.	Tazik (1991) (Reference No. 239)
Raptors	Increased size of areas used and made extra- home range movements more frequently.	Andersen *et al.* (1988, 1990) (Reference No.
Red-tailed Hawk	Habituated to low-level helicopter traffic. (Study includes both PCMS and Fort Carson.)	Andersen *et al.* (1989) (Reference No. 242)
General wildlife	No known long term negative impacts.	Canestorp *et al.* (1995) (Reference No. 231)

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Pronghorn	Shifted forage selection in response to forb increases on sites disturbed by tracked vehicles. Females and fawns increased home area sizes during maneuvers; males did not. Pronghorns (winter 1987) exposed to military training spent less time bedded.	Gerlach and Vaughan (1990) (Reference No. 101)
Mule deer	Female deer seasonal home ranges were larger in maneuver areas compared to nonmaneuver areas. Female nonsummer home ranges were larger in previous-maneuver areas than nonmaneuver areas. Fawn summer home ranges were larger in maneuver than previous maneuver areas. Bucks in maneuver areas had large home ranges than in nonmaneuver areas. Deer may exhibit a more negative response to unpredictable than predictable disturbances. Buck and doe survival rates and fawn:doe ratios did not differ prior to military maneuver and during 1986 and 1987. Population estimates increased from 1984 through early 1988; a decline was noted in late 1988. Cattle grazing during the baseline study and a coyote control program during 1987 and 1988 made it difficult to assess effects of military use on deer demographics.	Stephenson (1989) (Reference No. 243)
Coyote	Three of 16 radio-collared coyotes temporarily abandoned home ranges in response to military activities (one returned one week later). Most coyotes that changed home ranges during military activities resumed original home ranges after maneuvers ceased. Responses were related to amount of available cover, topography, and intensity of military activity. Day activity increased while sunrise, sunset, and night activity remained the same during military activities.	Gese *et al*. (1989) (Reference No. 104)
Coyote	Most changes in coyote movement from military activity are temporary, and coyotes resume their previous activity patterns and occupy similar home ranges after military activity ends.	Kitchen *et al*. (2000) (Reference No. 105)

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)

Resource	Effects of Military Training	Reference
Coyote	Coyotes shifted to higher levels of diurnal activity under Army training, due to less exploitation (trapping and gunning). No other changes detected.	Kitchen *et al*. (2000) (Reference No. 287)
Swift fox	No mortality was associated with training activities, either through direct mortality or the destruction of den sites. There was little difference in fox movements between times of military activity and no military activity.	Rongstad *et al*. (1989) (Reference No. 249)
Swift fox	No negative effects of military training on swift foxes were documented (2000 to 2004). Both grazed and military training sites had higher survival and density than unused sites, with populations on military sites showing more stable dynamics. Fox survival rate did not differ between different disturbance regimes.	Thompson (2006) (Reference No. 248)
Elk	Elk moved onto PCMS after acquisition and initiation of military training, indicating no significant negative effects of training and possible positive effects.	

[1]Impacts described in Table 4.7-3, Known Effects of Military Training on PCMS Biological Resources, are likely applicable to Fort Carson in many cases.

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4.8. Cultural Resources

This section describes the affected environment and environmental consequences to cultural resources.

4.8.1. Affected Environment

Archeological and historical studies have been conducted on the land encompassed by PCMS for the past 60 years. Prehistoric, historic, and multi-component sites eligible for inclusion in the National Register occur throughout the installation. Studies of the built environment, similar to those on Fort Carson, have not been conducted, as the only structures not designated as historic archaeological sites are contained within PCMS cantonment area and date from the mid-1980s.

Between June 8 and July 27, 2008, PCMS experienced seven wildland fire events affecting 46,971 acres. The Bridger and Dillingham fires were the most severe, encompassing 46,451 acres. Fort Carson's CRM and Senior Archaeologist were on site as RAs and conducted immediate cultural resources site assessments following the DOI BAER Standards. The initial assessment identified 315 archaeological sites eligible for inclusion in the National Register, including a portion of the Hogback Traditional Site. A report detailing these assessments will be forwarded to the COSHPO, the ACHP, and Tribes upon completion. Consultation efforts will be initiated as appropriate for the level of stabilization, site monitoring, and further Phase II evaluation as needed.

4.8.2. Prehistoric and Historic Background

Refer to Section 3.8.2 for a regional prehistoric and historic background, which includes a discussion of PCMS.

4.8.3. Section 106 Compliance and the Army Alternate Procedures

Refer to Section 3.8.1.2 for a discussion regarding Army Section 106 compliance and AAP.

4.8.4. Cultural Resources Investigations

4.8.4.1. Archaeological Resources

Though both vocational and professional archaeologists identified sites in PCMS area prior to 1980, large-scale archaeological investigations of the region did not occur until the early-1980s in preparation for the opening of PCMS. Archaeological research has intensified since that time in association with CRM Program development. As discussed in Section 3.8.1, the CRM Program at Fort Carson includes management of PCMS. The listing of Fort Carson's/PCMS's archaeological investigations, reports, and publications is summarized in Appendix G, however, is not an inclusive list of all Section 106 compliance actions as only large-scale archaeological investigations generate full reports. Large-scale investigations have not taken place on Fort Carson and PCMS since 2001.

Approximately 80 percent of PCMS has been inventoried for cultural resources, with 5,216 archeological sites having been recorded. Of these, 493 are currently determined to be eligible for inclusion in the National Register, with 4,723 sites determined to be not eligible. There are 2,589 prehistoric sites; 482 historic sites; 525 multi-component sites (i.e., having both prehistoric and historic components); and 240 sites that contain either historic or prehistoric rock art. All of the cantonment area of PCMS has been 100 percent surveyed for cultural resources and is devoid of known prehistoric sites. Additional information pertaining to cultural resources management for Fort Carson and PCMS is in Sections 3.8.2, 3.8.3, and 3.8.8, and may be found in Section 3.8 of the 2007 PCMS Transformation FEIS (Reference No. 184).

4.8.4.2. Paleontological Resources

Though not strictly classified as cultural resources, paleontological resources are managed by the Fort Carson Cultural Resources Program, as the management issues surrounding paleontological locales and collections are essentially consistent with those of archaeological resources. To date, 14 paleontological localities have been identified on PCMS. A Memorandum of Agreement is currently being drafted between PCMS and the USFS, Comanche National Grasslands, that will address paleontological resources, as well as wildland fire coordination and natural/cultural resources assessment partnerships.

4.8.4.3. Native American Consultation Status and Initiatives

Background information for this area is in Section 3.8.1.7. Information presented in the following discussion is specific to PCMS.

The TCP and sacred sites identified for PCMS are presented in *Our Footprints Are There: Report of Native American Consultation to Identify Traditional Cultural Properties and Sacred Sites on Land Administered by Fort Carson, Colorado* (Reference No. 121). On PCMS, five sacred site locations were identified, along with three TCPs and two Areas of Concern (AOCs).

Native American tribes are not the only groups that may have traditional and historical ties to PCMS. Other ethnic groups, such as those of Hispanic, Italian, or German descent, or family/social groups also have historic ties to southern Colorado. Fort Carson makes every attempt to include these groups/individuals in background research and decision-making processes when they can be identified. On PCMS, such groups have included many local families, as well as individuals who had a close association with the Piñon Booster Station (1920s – 1950s). Cultural resources personnel respond to all family and community inquiries for access to or information about historic properties located on PCMS.

4.8.5. Environmental Consequences

4.8.5.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The locations and actions analyzed in this EIS as the Proposed Action and alternatives are detailed in Section 2.0. No facilities construction at PCMS is part of the Proposed Action. A greater number of rotations is likely from the Proposed Action, and pose potential impacts to cultural resources.

The impacts from training an additional IBCT and potential CAB at PCMS could directly and indirectly affect nearly all available training areas within the boundaries of PCMS. Military training activities have the potential to result in adverse impacts to cultural resources. The extent of the impact is contingent upon two factors: the type of training and the landform where the training takes place. Archaeological investigations in unsurveyed areas are required prior to training use. Archaeological work on PCMS is ongoing, and the unsurveyed acreage will continue to decrease.

The Fort Carson CRM has made an initial determination that an Area of Potential Effect for this action cannot be adequately determined at this time, as the extent of potential ground or site disturbance is unknown. However, all training activities that could affect properties eligible for inclusion in the National Register must be considered undertakings in accordance with NHPA Section 106. Section 106 consultation in accordance with the NHPA will be initiated with the COSHPO, the ACHP, and Tribes as undertakings are identified.

4.8.5.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, therefore, no additional training at PCMS would occur. Range and training land use would remain the same as described in the 2007 PCMS Transformation FEIS. Levels of training above those analyzed in the 2007 PCMS Transformation FEIS would not occur. Maximum use of training lands was assumed in the 2007 PCMS Transformation FEIS. Impacts to cultural resources from an additional IBCT and CAB training would not occur.

4.9. Socioeconomics

This section describes the affected environment and environmental consequences to socioeconomics to include: demographics, housing, economic development, public finance, quality of life, Environmental Justice in minority and low-income populations, and the protection of children from environmental health risks and safety risks.

The ROI for the Proposed Action at PCMS comprises Huerfano, Las Animas, and Otero counties. The major communities in the vicinity of PCMS are Trinidad, in Las Animas County, and La Junta, in Otero County.

4.9.1. Affected Environment

4.9.1.1. Demographics

PCMS does not support a resident population. All troops that train at PCMS are permanently stationed either at or near Fort Carson or travel from other locations.

Demographic information is based on data from the US Census Bureau (Reference No. 138) and the Colorado State Demography Office (Reference No. 134).

The ROI population remained approximately the same over the 26-year period between 1980 and 2006 (from 43,904 to 43,937). Growth was highest in the 1990s, with an average annual growth rate of 0.82 percent. This rate slowed to 0.27 percent between 2000 and 2006. Between 1980 and 1990, all three counties decreased in population (Reference No. 134).

The share of the regional population contributed by Otero County decreased steadily from 51.4 percent in 1980 to an estimated 44.3 percent in 2006. The contribution of Las Animas County increased slightly from 33.9 percent in 1980 to an estimated 37.5 percent in 2006. Huerfano County's contribution, the smallest of the three counties, increased from 14.7 percent to an estimated 18.3 percent from 1980 to 2006 (Reference No. 134).

Each of the three counties in the ROI is characterized by a single population concentration. Walsenburg, in Huerfano County, makes up 46 percent of the county population; Trinidad, in Las Animas County, is comprised of 58 percent of the county population; and La Junta and Rocky Ford, in Otero County, together make up 59 percent of the county population.

4.9.1.2. Housing

Soldier housing is not required at PCMS because no Soldiers are permanently stationed there. Family housing and barracks for Soldiers training at PCMS are located at Fort Carson.

In 2000, approximately 21,000 housing units were documented in the three-county ROI. The vacancy rate varied from approximately 15 percent in Otero County to 19 percent in Las Animas County and 39 percent in Huerfano County (Reference No. 134). The high vacancy rate in Huerfano County is attributable to the high number of units having seasonal, recreational, and occasional use. The proportion of owner-occupied housing units was about 70 percent in all counties and, of these, between 75 and 80 percent was single-family units. Few structures contain ten or more units. Mobile homes comprise between 8 and 15 percent of the housing units. The housing stock is relatively old; the median age (year built) of the units is oldest in Las Animas County (1953) and most recent (1967) in Huerfano County. The proportion of units lacking complete plumbing and kitchen facilities (a surrogate measure for quality) is low in Otero County, but rises to 4 percent in Las Animas County and 5 percent in Huerfano County. Median rent values are $351 per month in Huerfano County, $316 per month in Las Animas County, and

$301 per month in Otero County. Median home values are approximately $80,000 in Huerfano County, $86,000 in Las Animas County, and $68,000 in Otero County (Reference No. 138).

Residential construction activity is cyclical and highly responsive to economic conditions. The number of housing units authorized varied for construction in the ROI from 1985 through 2005 (Reference No. 124). Building activity remained relatively constant from 1985 through 1993 and then rose rapidly to peak in 1999. This was followed by an equally steep decline in building activity through 2005.

4.9.1.3. Economic Development

Characteristics of economic development include employment and its distribution across industrial sectors; unemployment; earnings; sources of income; and contributions to the regional economy by military installations, their personnel, and retired service members.

4.9.1.3.1. Employment

The counties in the ROI are rural; ranching and agriculture support much of the local economy. Employment data for the ROI were obtained from the Colorado Department of Labor and Employment (Reference No. 130). Between 2006 and 2007, the number of jobs increased from approximately 19,400 to approximately 20,000 at a rate of 3.0 percent. Most of the growth took place in Las Animas County, which accounted for approximately 58 percent of the growth in employment.

Compared with the State of Colorado, where only 1.4 percent of the workforce is engaged in farming, the three counties in the ROI have high employment in farming—9 percent in Huerfano County and approximately 8 percent in Las Animas and Otero counties. Employment in government and government enterprises (federal, state, and local) is high in Las Animas County (23 percent) and Otero County (20 percent). Huerfano County (13.2 percent) is slightly above the state average (13.1 percent). Federal, civilian, and military employment is below the state average, whereas employment in state and local government is high in Las Animas and Otero counties (21.9 percent and 18.1 percent, respectively) compared to the state (10.1 percent) (Reference No. 128).

Major employers in Las Animas County include Burlington Northern/Santa Fe Railroad, Trinidad State Junior College, oil and gas drilling enterprises, and related support businesses. A new minimum-security correctional facility opened in 2003. The economy of Otero County is closely linked to agriculture, including livestock (primarily cattle) production and farming. Major crops include dry land wheat, irrigated corn, and alfalfa hay. The largest employers are local and county government entities. Huerfano County has a larger, medium-security correctional facility that provides employment in the area.

PCMS currently retains 12 full-time employees on site to maintain PCMS facilities and manage training lands.

4.9.1.3.2. Unemployment

The unemployment rate in all counties of the ROI has consistently been above that of the state. The rate gradually fell from highs between 7.5 and 10 percent in 1992 to lows between 4 and 5.5 percent in 2000. Between 2000 and 2003, the unemployment rate ranged between 6.5 and 9 percent, and it fell again slightly through 2006. Unemployment rate for the ROI averaged 6.0 for 2006 (Reference No. 129).

4.9.1.3.3. Earnings and Income

Total non-farm wage and salary earnings in the ROI in 2006 totaled more than $607 million. The majority was contributed by Otero County (42 percent) and Las Animas County (43 percent). The concentration of well-paying jobs in the government sector is evident when comparing the share of earnings contributed by the sector to the share of employment in the same sector. The share of earnings is noticeably higher than the share of employment.

Earnings from the private sector are lower for each of the three counties in the ROI than for the state. This is also true for earnings in the federal, civilian, and military sectors. Earnings in the state and local government sectors are noticeably higher than the state average, especially for Las Animas County where this category comprises almost 30 percent of total earnings.

4.9.1.3.4. Military Activities

Little permanent employment is directly associated with PCMS. The majority of supplies needed for training activities at PCMS are assembled at Fort Carson and transported to PCMS with the troops. No other military installations exist within the ROI, and only limited contracts are awarded to businesses in the ROI. Contracts totaling $3,123,102 were awarded to businesses in Las Animas and Otero counties by the Army during fiscal year 2006 (Reference No. 133).

4.9.1.4. Public Finance

For the three counties of the ROI, the main sources of revenue are transfers from the state government, property taxes, and transfers from the federal government (Reference No. 134). Intergovernmental transfers account for 48.8 percent to 52.1 percent of county revenues.

The major operating expenditure categories for the counties are social services, public works, and public safety. The provision of social services consumes about 36 percent of operating expenditures in Las Animas County, 34 percent in Otero County and 19.5 percent in Huerfano County. Expenditures on public safety comprise 14 to 17 percent of operating expenses for the three counties (Reference No. 134).

4.9.1.5. Quality of Life

No Soldiers are permanently stationed at PCMS. Units that train at PCMS travel from Fort Carson or other locations for field training that may last from several days to several weeks. Soldiers have limited access to off-post facilities and retail markets located over 25 miles away. Emergency medical and dental care is located on-post during training exercises.

4.9.1.6. Environmental Justice

On February 11, 1994, President William Clinton signed EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The order requires federal agencies to identify and address any disproportionately high and adverse environmental or economic effects that its programs and policies might have on minority or low-income populations.

Environmental Justice: Guidance Under the National Environmental Policy Act (CEQ, 1997) defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, and Hispanic. A minority population should be identified when the minority population of the affected area exceeds 50 percent or when it is meaningfully greater than the minority population percentage in the general population.

Low-income populations are identified using the US Census Bureau's statistical poverty threshold, which varies by household size and the number of children. For example, the 2007 poverty threshold for a family of four with two children was $21,027. The nationwide poverty rate was 12.4 percent at the 2000 Census (Reference No. 140). The US Census Bureau defines a poverty area as a census tract where 20 percent or more of the residents have incomes below the poverty threshold; an extreme poverty area has 40 percent or more of the residents below the poverty level (Reference No. 140).

The populations of the census tracts surrounding PCMS have a slightly lower percentage of minority population than Las Animas County and the ROI (Reference No. 138). For the counties in the ROI, the black population comprises 1.3 percent. The Hispanic or Latino population ranges from 35.1 percent in Huerfano County to 37.6 percent in Otero County and 41.5 percent in Las Animas County.

None of the census tracts surrounding PCMS meet the 20 percent definition of a poverty area (Reference No. 138). The poverty rate in these areas was about the same as that for Las Animas County and the ROI; however, the poverty rates in PCMS area, Las Animas County, and the ROI are about twice the state level.

4.9.1.7. Protection of Children

On April 21, 1997, President William Clinton issued EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, which seeks to protect children from disproportionately incurring environmental health or safety risks that might arise because of government policies, programs, activities, and standards.

No children live on PCMS, and PCMS is secured to prevent trespassing. There are few residences immediately adjacent to PCMS.

4.9.2. Environmental Consequences

4.9.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Aviation Brigade

Slight economic benefit to certain businesses from the training of an additional IBCT and potential CAB would occur in the ROI. Local purchases for vehicle maintenance, equipment rentals, and other services would potentially increase during training exercises.

4.9.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at PCMS would occur. A slight economic benefit to the local economy from activities associated with that training would not occur.

4.10. Transportation

This section describes the affected environment and the environmental consequences to transportation in the PCMS study area.

4.10.1. Affected Environment

4.10.1.1. Regional Transportation

4.10.1.1.1. Roadway Network

The sole public access point to PCMS is provided via US 350, approximately 30 miles northeast of Trinidad. Deployments from Fort Carson follow a fixed route along I-25 approximately 117 miles south to US 160, along US 160 approximately 7 miles northeast to US 350, and then along US 350 approximately 24 miles northeast to the main gate at PCMS cantonment area.

I-25 is the primary north-south interstate highway through Colorado. The City of Pueblo, located approximately 30 miles south of the Fort Carson cantonment area, is the only city transected by the I-25 portion of the deployment route. The remainder of the route runs through sparsely populated rural areas.

4.10.1.1.2. Traffic

I-25 is a four-lane, designated truck route that connects Fort Carson and Trinidad. The posted speed limit along the majority of I-25 is 75 mph and 55 mph through the urban areas of Pueblo and Trinidad. Traffic volumes on I-25 vary from a high of 72,200 ADT through downtown Pueblo to a low of 8,300 ADT near Walsenburg. Volumes on I-25 between Fort Carson and Pueblo range from 28,100 ADT to 44,300 ADT near SH 16. According to the CDOT, there is sufficient excess roadway capacity along the majority of this segment of I-25. However, near capacity conditions exist through Pueblo and in the immediate proximity of Fort Carson at SH 16, I-25 (Reference No. 218).

US 160 is a two-lane, designated truck route between I-25 and US 350. Speed limits on US 160 are 35 mph near Trinidad and 60 to 65 mph elsewhere. Traffic volumes on US 160 vary from 3,800 ADT near Trinidad to 1,900 ADT at US 350. Traffic volumes on US 160 drop substantially east of the junction of US 160 and US 350, which is a two-lane, designated truck route between US 160 and the main gate at the PCMS cantonment area. The posted speed limit for US 350 is 65 mph. Traffic volumes on US 350 vary from 1,300 ADT near US 160 to 740 ADT near the main gate at PCMS. According to CDOT, excess roadway capacity exists because of minimal traffic volumes on both US 160 and US 350 (References 219 and 220).

The full-time staff at PCMS is limited to 12 civilian maintenance and administrative staff. No troops are stationed at PCMS; therefore, traffic to the installation is primarily generated during training deployments from Fort Carson.

Military convoy traffic between Fort Carson and PCMS is generally limited to wheeled vehicles. Tracked vehicles are generally transported to and from PCMS by rail. Special circumstances could require the movement of a limited number of tracked or other vehicles that cannot travel on public roads or by commercial transport truck. The use of the Heavy Equipment Transporter System in support of deployments between Fort Carson and PCMS is prohibited by CDOT. To reduce traffic conflicts, current military convoy movements are scheduled to avoid peak traffic periods in the Pueblo metropolitan area. IBCTs use mostly wheeled equipment and convoy down to PCMS. The IBCT would travel to the PCMS primarily by using Gate 20 (located south of Colorado Springs most heavily used traffic areas) and immediately enter 1-25, traveling down to Trinidad.

4.10.1.2. Installation Transportation

4.10.1.2.1. Roadway Network

The roadway network at PCMS is divided into three categories; cantonment area roads, MSRs, and secondary roads in the training areas. Each roadway category serves a function in moving people and freight at PCMS cantonment area. Roads serve the movement of people and freight within the cantonment area and funnel them onto the MSRs; the cantonment area roads provide a direct connection between the off-post deployment route and the MSRs; MSRs serve the movement of Soldiers' equipment and supplies over extended distances throughout PCMS; and secondary roads provide access from the MSRs to adjacent training areas and move vehicle traffic through the training areas.

With the exception of 1 mile of paved road in the cantonment area, the roadway network at PCMS consists almost entirely of unpaved roads. There are approximately 107 miles of MSRs and 490 miles of secondary roads on PCMS.

4.10.1.2.2. Traffic

Traffic volumes on PCMS road network vary widely between training deployment and nondeployment periods. During nondeployment periods, traffic on PCMS is limited to a small number of maintenance and administrative vehicles, and traffic on the main entrance road is limited to light administrative and maintenance-related traffic totaling fewer than 25 vehicles per day. During deployments to PCMS, daily vehicle traffic entering the cantonment area increases by approximately 350 vehicles for a period of approximately three days. After this initial peak traffic period, administrative and service support traffic remain slightly increased during the training rotation. At the completion of training and the departure of the unit vehicles, traffic entering PCMS returns to an ADT of 25 vehicles per day.

During a full IBCT rotation, as many as 1,000 additional vehicles use the road network. The volume of traffic on a given section of road, with the exception of the main entrance road into PCMS, is variable and annual total of days that US 160 and 350 would experience increases cannot be stated because it is contingent on the nature of the maneuver training and variations of training mission requirements.

4.10.1.3. Other Transportation

The remote location of PCMS limits access to the installation by modes other than vehicular transportation. Descriptions of the rail, aviation, and transit systems that serve PCMS are presented as follows.

4.10.1.3.1. Rail

Freight rail service is provided to and from PCMS. The movement of tracked and other vehicles that cannot use public roads between Fort Carson and PCMS is almost exclusively by rail. PCMS railyard is designed to accommodate the large-scale movement of military vehicles and material. The railhead has six spurs and can accommodate up to 165 train cars at a one time.

A typical HBCT movement requires four trains (approximately 225 rail cars total) to meet its one-way rail transport requirement. The movement schedule for this type of unit generally consists of one train per day for four days. The average travel time for a rail shipment between Fort Carson and PCMS is 18 hours.

4.10.1.3.2. Aviation

The two small municipal airports located near PCMS are the Perry F. Stokes Airport in Trinidad and the La Junta Municipal Airport in La Junta. Both facilities support general aviation. Neither airport is serviced by a commercial passenger air carrier.

The military airstrip at PCMS is 5,000 feet long and can accommodate C-130 traffic. An apron and parallel taxiway allow four C-130 aircraft to be on the ground at one time.

4.10.1.3.3. Transit

No public bus or rail transit is servicing the area surrounding PCMS. Private charter buses are used by the Army to transport military personnel to and from PCMS for training. The number of personnel per bus is usually limited to 35 to allow adequate room for the Soldiers and their personal equipment. These buses travel individually or in limited numbers, independent of the military vehicle convoys.

4.10.2. Environmental Consequences

4.10.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

IBCT convoys to PCMS would not cause significant traffic increases because there is sufficient roadway capacity to accommodate the limited number of anticipated convoys.

A minimal amount of wheeled support vehicles would accompany CAB helicopters that would fly to PCMS to train. CABs typically do not train as an entire brigade. Elements of the CAB train with ground units in a support mode, therefore the numbers of wheeled support vehicles would vary with the size and type of training exercise.

4.10.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at PCMS would occur. Therefore, no impacts from the Proposed Action to transportation would occur.

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4.11. Utilities

This section describes the affected environment and environmental consequences to potable water, wastewater, energy sources, communications, and solid waste.

4.11.1. Affected Environment

The PCMS is a training installation with a small cantonment area and minimal utility services. Management plans and programs applicable to utilities under which the installation operates are listed in Appendix A.

As noted in the *Real Property Master Plan Digest, Piñon Canyon Maneuver Site* (Reference No. 221), PCMS information on utilities infrastructure is limited. The 2005 Piñon Canyon Maneuver Site Master Plan Digest is currently undergoing minor revisions and updates to reflect mission requirements. The information presented in this analysis is based on the best available published data.

4.11.1.1. Potable Water Supply

4.11.1.1.1. Regional Setting

Potable water for PCMS and the surrounding area is supplied by the City of Trinidad. The recently upgraded 12-inch diameter main water line, which originates as a 16-inch diameter line in Trinidad, provides service for PCMS, the Cougar Canyon development, and a state prison facility.

4.11.1.1.2. Project Setting

PCMS purchases treated potable water from the City of Trinidad for use in the cantonment area (Reference No. 6 and 221). The potable water enters the installation west of the cantonment area via a connection to a water supply pipeline adjacent to US 350. After the water is delivered to PCMS, it is chlorinated and stored in a 50,000-gallon tank. Both the chlorination and storage facilities were built in 1987 and are now undergoing repair.

From the storage tank, potable water is distributed to the cantonment area via approximately 14,000 LF of underground water line (Reference No. 221) and to the training areas by water truck. The location of the potable water supply and distribution lines in the cantonment area is generally known (Reference No. 221).

The potable water system is adequate to support approximately 5,000 people based on a water consumption rate of 35 gallons per person per day and other installation-related support activities (such as dust control and emergency fire suppression) (Reference No. 221). The water tank and potable water distribution system in the cantonment area is operating within capacity and would support water demands from additional training units.

The City of Trinidad has contracted to supply potable water to PCMS. The contract allows delivery of up to approximately 2,700,000 cubic feet (20,200,000 gallons) annually. In fiscal year 2006 (October 2005 through September 2006), the Army purchased approximately double the contract-allowed amount from the City of Trinidad. Historical annual consumption of water at PCMS has varied considerably, but the maximum has been roughly 10 million gallons and the average approximately 6 million gallons. The differences among the contract maximum amount, the purchased amount, and the amounts actually consumed are attributed to the deteriorated water supply line. The Army provided much of the funding for a project to repair the water line in 2007.

Since PCMS's historical use has been well less than half the contract maximum amount for purchase of water, the contract maximum is considered to be sufficient to satisfy the increases in training at PCMS anticipated under the Proposed Action. In negotiating this maximum amount, the City of Trinidad had the opportunity to consider the potential demand from PCMS in relation to its overall water supply and the demands of other customers. In times of shortages, the City has the authority to limit water usage and has exercised that authority in the past. The Army has no special exemption from any such limitations. The Army funded both the original water line to PCMS and much of the cost of repairs to that line in 2007 after it had failed prematurely. Those repairs will eliminate the substantial leakage waste that occurred before the repairs were made.

Existing wells are present on previously occupied ranches at PCMS (Reference No. 6). Potable water for consumption in the training areas is trucked from the cantonment area. Water from the wells is used for emergency fire suppression and made available to wildlife (Reference No. 6).

4.11.1.2. Wastewater System

The cantonment area primarily uses evaporative, nondischarging treatment/oxidation lagoons, originally constructed in 1985 for both sanitary wastewater and stormwater treatment (Reference No. 251). Only the Headquarters Building, which is located within the cantonment area, is constructed to discharge sewerage through a sanitary sewer system. Headquarters Building sewage drains into an underground collection pipe and discharges into treatment/oxidation lagoons. Sewage from other small buildings within the cantonment area are equipped with leach-fields. Stormwater is managed only at the bulk fuel facility where it is collected via catchment basin, directed to an oil-water separator and ultimately discharged into the same treatment/oxidation lagoons used for the Headquarters Building sewage. The treatment/oxidation lagoons are located in the southwestern corner of the cantonment area, and are currently operating at levels well below their capacity (Reference No. 221).

The combined treatment facility was originally designed for continuous use by a brigade-sized unit (Reference No. 221). The number of personnel at the cantonment area varies over time from fewer than ten to several thousand. The treatment/oxidation lagoons were upgraded in summer 2006 and subdivided into smaller ponds to more readily accommodate the fluctuation in flows (Reference No. 251). The lagoons’ impervious liners, which prevent seepage into groundwater, were recently replaced. The modified system was designed for an average daily flow capacity of 10,052 gpd. The wastewater lagoons do not have a discharge permit because the lagoons are designed to be nondischarging.

Sanitary wastewater and stormwater are conveyed to the treatment ponds through separate underground pipes. Wastewater and stormwater from the cantonment area are conveyed via approximately 7,000 feet of 8-inch-diameter and 12-inch-diameter mains (Reference No. 251). The location of this conveyance system is generally known.

Not all facilities in the cantonment area direct their sanitary wastewater to the treatment lagoons. The guard trailer, Headquarters building, the chlorination building, and wastewater at those facilities is treated using septic systems (Reference No. 251). A new 2,000-gallon septic system was constructed in 2006 for use by the Headquarters building (Reference No. 251).

Most facilities located outside of the cantonment area have septic systems and leach fields (Reference No. 221). Portable toilets are used in the training areas when septic systems are not available.

4.11.1.3. Energy Sources

4.11.1.3.1. Regional Setting

Electricity is supplied to the region by San Isabel Electric Association via high-voltage overhead power lines that parallel US 350. Colorado Interstate Gas (CIG), a subsidiary of El Paso Corporation, owns and operates a 10-inch diameter, high-pressure gas main that runs through the PCMS from northeast to southwest. This gas main separates into two 8-inch mains before it exits PCMS. CIG has an easement for its gas lines, and itmaintains the access road that extends the full length of the pipeline.

4.11.1.3.2. Project Setting

PCMS purchases electricity from San Isabel Electric Association (Reference No. 6). High-voltage overhead power lines enter the installation on the west side of the cantonment area, where the power lines connect to an electrical substation. The capacity of the existing transformer is 2,000-kilovolt ampere (kVA), and the existing demand is 300 kVA; therefore, electricity demand at the site is below the design capacity of the existing transformer.

The substation supplies electricity to buildings in PCMS cantonment area through underground distribution lines located adjacent to the roads. During the summer of 2008, the substation required routine repair to maintain the existing electrical capacity.

Electric service is not available outside the cantonment area (Reference No. 221). Batteries and portable generators are used to supply power to the training areas. Fort Carson anticipates that there will be power at ranges 1, 3, 5, and 7 by the end of 2009.

Trucked-in heating oil and propane currently provide adequate fuel for heating at PCMS. Most buildings in the cantonment area are heated by oil-fueled furnaces. Heating oil is trucked to the cantonment area and stored in building-specific USTs. Heating oil is not used outside the cantonment area. Propane is used to heat some buildings at the PCMS. Distribution lines are not required because storage of these fuels occurs at the point of use.

Natural gas is not currently used at PCMS but future development plans have analyzed the installation of a natural gas line for the heating of large buildings within the cantonment area. DPW is also evaluating the use of ground source heating and cooling with heat pumps as an alternative for heating small buildings. This option would only require electric energy resources for these buildings and would be more cost efficient. These are being considered for inclusion in the updated PCMS Master Plan Digest.

4.11.1.4. Communications

4.11.1.4.1. Project Setting

The communication infrastructure at PCMS consists of fiber cables that enter the cantonment area from US 350. In 2006, a project was completed to provide upgraded information/communication infrastructure downrange on Fort Carson and PCMS and to provide connectivity between Fort Carson and PCMS. This included installing approximately 125 miles of fiber optic lines, six guyed communication towers, and equipment shelters. A combination of towers and several equipment shelters at Pueblo Chemical Depot and Cedar Crest, Colorado, provide connectivity between Fort Carson and PCMS.

4.11.1.5. Solid Waste

4.11.1.5.1. Project Setting

Solid waste pickup at PCMS is managed via a contract with Waste Connections, and wastes are transported to appropriately permitted disposal facilities in Trinidad. Refuse and construction-related solid waste and are managed by DPW. Solid waste generated in the training areas is collected and returned to the cantonment area for disposal. From the cantonment area, solid wastes are transported to appropriately permitted facilities.

There is currently no recycling program at PCMS because there are an insufficient number of personnel at the cantonment area to manage a recycling program in addition to the other program areas. PCMS is evaluating how to facilitate a recycling program at this installation in the future.

4.11.2. Environmental Consequences

4.11.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The Proposed Action would not impact utilities at PCMS. There are no IBCT or CAB facilities planned for construction at PCMS as part of the Proposed Action. Upgrades and utilities construction to accommodate maximum training loads were analyzed in the 2007 PCMS Transformation EIS. This would accommodate the additional IBCT and potential CAB units as well.

4.11.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No increased impacts to utilities would occur at PCMS.

4.12. Hazardous and Toxic Substances

This section describes the affected environment and environmental consequences to the storage, use, and handling of hazardous materials and toxic substances (including petroleum-based products); the potential generation of hazardous waste (including disposal, site contamination, and cleanup); and special hazards (including the generation of medical waste) within the cantonment area and the training areas.

4.12.1. Affected Environment

Hazardous materials used at the PCMS include gasoline, diesel fuel, oil, and lubricants used during routine maintenance; pesticides; and explosive and pyrotechnic devices used in military training operations.

Any residual hazardous materials including oil, lubricants, solvents, and batteries generated during routine maintenance are recovered for reuse or recycling. Other hazardous materials such as pesticides, and fuel, are consumed in the process. Hazardous materials brought to the PCMS by maneuvering units are recovered as material and taken back to their home station for further use, or classification and turn-in for reissue or proper disposal. In the event that hazardous wastes are generated at the PCMS, they will be managed under the rules and regulations as they pertain to a Conditionally Exempt Small Quantity Generator (CESQG) under the RCRA.

Explosive and pyrotechnic devices are employed in military training operations at PCMS; however, high explosives are not used. Approximately 230,000 munition items were used at PCMS in calendar year 2007, consisting of 5.56mm, 7.62mm, 9mm, and .45 and .50 caliber bullets.

A small amount of biohazardous waste or infectious waste could be generated by injuries or casualties. All biohazard waste generated at Fort Carson and PCMS is disposed of through a MEDDAC contractor permitted to dispose of biohazardous or infectious waste. Any medical waste generated at PCMS is transported to Evans Army Community Hospital at Fort Carson to be disposed of in accordance with the MEDDAC plans; *Evans* Army Community Hospital Hazardous Materials/Hazardous Waste Program; MEDDAC Regulation Number 40-5-6 (Reference No. 222) and *Fort Carson Management of Regulated Medical Waste, MEDDAC Regulation Number 40-5-5* (Reference No. 223).

4.12.1.1. Uses, Storage, and Handling of Hazardous Materials

4.12.1.1.1. Cantonment Area

Activities involving the use of hazardous materials, including petroleum-based products, at the PCMS involve the operation and maintenance of vehicles. Gas and diesel are stored in 20,000 gallon USTs with bulk and retail dispensing mechanisms, and heating fuel is stored in smaller USTs located in the cantonment area. ASTs (1,000- to 2,000-gallon) are located at Big Canyon, Biernackis, Sharps, and Red Rocks Ranches for fuel storage. The 11 USTs and 10 ASTs have a combined capacity of approximately 130,000 gallons. The Army implements the requirements of AR 200-1 to minimize the risk of storage and potential spills into the environment. A SPCCP has been developed and is under review for the PCMS.

As required by Army policies, the PCMS emphasizes integrated pest management. Pesticides and herbicides could be required for insect and rodent control in structures and control of undesired vegetation, including noxious weeds (Reference No. 155). Potential areas of pesticide application include the grounds surrounding support facilities and ranges. A small inventory of DoD-approved pesticides are maintained and managed on site in accordance with the *Installation Pest Management Plan* (Reference No. 160).

Asbestos-containing materials and lead-based paint could be present in buildings constructed before 1978 (Reference No. 161). The cantonment area facilities were constructed after 1985 and are unlikely to contain asbestos or lead-based paint. Lead can potentially be found in chipped or cracking painted walls or in surrounding soils. Paint in liquid form can also contain hazardous lead concentrations (Reference No. 162).

4.12.1.1.2. Training Areas

Petroleum-based products are used in the training areas for the routine repair and maintenance of vehicles and replacement of obsolete or malfunctioning target systems, such as electrically powered lifters, that contain minute amounts of lubricating oil. Major repairs are done at Fort Carson. Electric lifters from mobile targets are stored at the small arms live-fire ranges.

Asbestos-containing materials and lead-based paint might be found in buildings constructed before 1978. The former ranch buildings in the training areas might contain asbestos and lead-based paint.

4.12.1.2. Hazardous Waste Disposal

4.12.1.2.1. Cantonment and Training Areas

In the event that hazardous wastes are generated at the PCMS, they will be managed under the rules and regulations as they pertain to a CESQG under the RCRA.

4.12.1.3. Site Contamination and Cleanup

No solid waste management units as defined and regulated under RCRA have been identified at PCMS.

4.12.1.4. Special Hazards

4.12.1.4.1. Cantonment Area

A small amount of biohazardous waste or infectious waste could be generated by training related injuries. All medical waste generated at Fort Carson and PCMS is disposed of through a MEDDAC contractor permitted to dispose of biohazardous or infectious waste. Any medical waste generated at PCMS is transported by medical personnel to Evans Army Community Hospital at Fort Carson to be disposed of in accordance with MEDDAC regulations.

4.12.1.4.2. Training Areas

Small arms ranges located at PCMS are used by Fort Carson units for training. Approximately 230,000 munition items were used at PCMS in calendar year 2007, consisting of 5.56mm, 7.62mm, 9mm, and .45 and .50 caliber bullets.

PCMS has not been required to submit a Toxic Release Inventory Report (TRI) as Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) exempts facilities with fewer than 10 full-time employees. However, with the anticipated growth in personnel at PCMS, it is expected a TRI report will need to be submitted for calendar year 2008, as preliminary data indicates lead used in munitions exceeds the reporting threshold for TRI.

High explosives are not used by the Army at PCMS, therefore UXO is not anticipated. Non-explosive practice grenades are used at an existing grenade launcher range.

A small amount of medical waste could be generated by injuries or casualties in the training areas. Any medical waste generated at PCMS is transported by medical personnel to Evans Army Community Hospital at Fort Carson to be disposed of in accordance with MEDDAC regulations.

4.12.2. Environmental Consequences

4.12.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

Increased live-fire activities associated with the Proposed Action or alternatives would result in the generation of small amounts of additional expended small arms ammunition UXO (.50 cal and below). With the exception of high explosives, which are not used at PCMS, impacts from these increased activities would be as described for Fort Carson in Section 3.12.2.2.2.

The Proposed Action would not adversely impact the generation, use and handling of other hazardous and toxic substances at PCMS. Treatment of these substances was analyzed under maximum training loads in the 2007 PCMS Transformation EIS. The anticipated requirement to submit a TRI report for calendar year 2008 is not dependent on the Proposed Action.

4.12.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No adverse impacts to the generation, use, and handling of hazardous and toxic substances would occur at PCMS.

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4.13. Sustainability

This section describes the affected environment and environmental consequences regarding sustainability. Sustainability initiatives at PCMS fall under the Fort Carson guidelines for training lands, energy, water, procurement, transportation, land use, buildings, solid and hazardous waste, HAPs, Community of One and Partnerships, and SEMS.

4.13.1. Affected Environment

PCMS lands and mission fall under Fort Carson's *Sustainability Range Program* (Reference No. 173). See Section 3.13.1.1 for a description of sustainability policies for training lands.

4.13.2. Environmental Consequences

4.13.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The stationing of the IBCT and CAB units at Fort Carson and training at the PCMS would not alter the status of the sustainability initiatives. Use of PCMS for training activities is expected to increase over the next several years, resulting in more focus on sustainability at PCMS. The Fort Carson sustainability team is currently developing program initiatives to address opportunities for sustainable training and development at PCMS.

4.13.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at the PCMS would occur. As with the Proposed Action, this would not alter the status of the sustainability initiatives. Even under No Action, the use of PCMS for training activities is expected to increase over the next several years due to Transformation activities, resulting in more focus on sustainability at PCMS. The Fort Carson sustainability team is developing program initiatives to address opportunities for sustainable training and development at PCMS.

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5. Cumulative Impacts

CEQ regulations implementing NEPA define a "cumulative impact" as follows:

> Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

EPA guidance to reviewers of cumulative impacts analyses further adds:

> …the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time. Thus the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal or private) is taking the action (Reference No. 224).

For the purposes of this EIS, significant cumulative impacts would occur if incremental impacts of the Proposed Action[12], added to the environmental impacts of past, present, and reasonably foreseeable actions, would result in significant adverse effects to resources for Fort Carson and/or PCMS and the surrounding regions. Since the baseline conditions (i.e., the implementation of Transformation) are not projected to fully occur until the end of fiscal year 2011, the impacts from Transformation and the Proposed Action are best understood if analyzed together as cumulative impacts in this chapter.

The Army considered a wide range of past, present, and reasonably foreseeable future actions in this chapter by researching existing literature and contacting local area planners and state and federal agencies to identify other projects in the region that could contribute to cumulative environmental impacts. The Army considered other past, present, or foreseeable future actions regardless of whether the actions are similar in nature to the Proposed Action or outside the jurisdiction of the Army.

5.1. Impacts Methodology

This cumulative impacts analysis considers direct and indirect impacts determined from the alternatives analysis presented in Chapters 3 and 4, mitigation measures presented in Chapter 6, and the past, present, and future projects considered relevant to the analysis. The geographic scope and time frame are discussed for each resource. In general, the geographic scope is limited to Fort Carson or PCMS and adjacent lands (including communities around these installations).

Though certain direct and indirect impacts are determined insignificant, they require further evaluation as elements of cumulative impacts to the resource. Only resource areas that are considered to be potentially significantly impacted by cumulative actions are discussed in detail. There may be some overlap of discussion in some resource areas as the cumulative actions may affect more than one resource area (e.g., loss of vegetation can affect soils, wildlife habitat, water, and air quality). Impacts may also be discussed in a more regional context or, when appropriate, limited to Fort Carson, PCMS, or both.

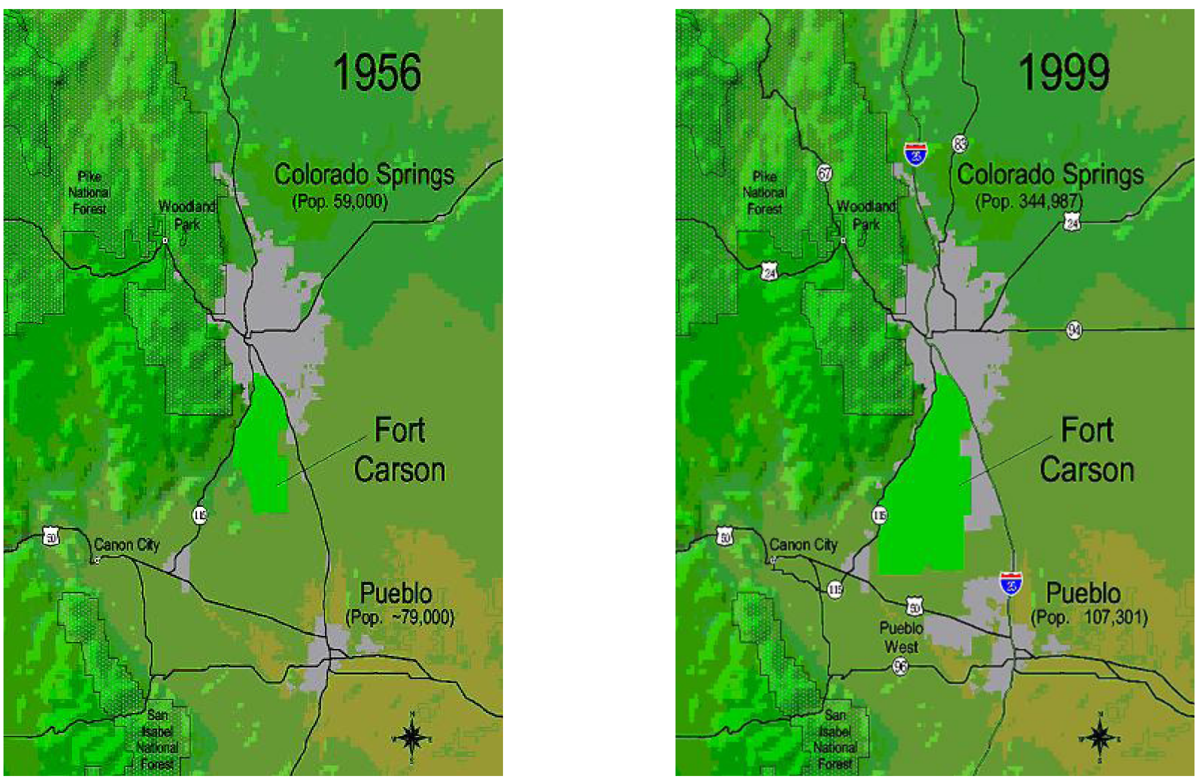
5.2. Overall Regional Development and Army Actions

No cumulative impacts analysis to Fort Carson's regional resources can be initiated without an overall view of the increase in human development that has taken place along the Front Range of Colorado. Following the 2000 Census, the population living within 10 miles of Fort Carson's installation boundaries was estimated to be approximately 370,000 individuals (Reference No. 225). By 2015, more than

[12] Unless otherwise stated, statements concerning "the Proposed Action" would have the same impact or effect if applied to Alternatives 1 or 2.

481,000 people are predicted to live within 10 miles of Fort Carson's boundaries. This represents an increase in population of more than 30 percent in 15 years, and the stationing of additional Soldiers as part of 2007 GTA stationing decisions will further increase this rate of growth surrounding the installation. Figure 5-1 shows the suburban encroachment trend around Fort Carson from 1956 to 1999 (Reference No. 40). As shown in the two images in Figure 5-1, growth around Fort Carson, especially along the eastern boundary along I-25 and from the City of Pueblo has been considerable.

Similar growth has occurred along much of the Colorado Front Range. This urbanization has resulted in conversion of native grasslands, shrublands, and woodlands to non-natural land cover on the Great Plains, which has significantly impacted many wildlife species throughout the region. Actions having the most widespread impacts on the Great Plains and Colorado Front Range have been cultivation for row crop agriculture and urbanization. Generally, species that commonly occur around Fort Carson have been most impacted by increasing urbanization through a loss of suitable habitat. Although some increase in urbanization is attributed to Army growth (i.e., additional family housing/infrastructure), a majority of this urbanization has been caused by overall economic development within the region. Overall human development has caused incremental adverse impacts primarily to land use, but also including the loss of open space and degradation of air quality, soils, and water resources. Undisturbed grassland, shrubland, and woodland habitats in the region are likely to continue to shrink as a result of the population growth and economic development along the Front Range anticipated by state and local governments (Reference No. 190).



Source: Reference No. 40

Figure 5-1 Encroachment Trend Around Fort Carson from 1956 to 1999

As part of the development and population growth in the region, several reasonably foreseeable future actions may take place in approximately the same time as the implementation of the Army's Proposed Action at Fort Carson. These actions have been considered in the Army's assessment of cumulative impacts. They are:

- Various maintenance and capital improvements projects near Fort Carson pertaining to housing, roadways, utilities, and other infrastructure.
- Constructing the arrival/departure air control group facility at the Colorado Springs Airport to support deployment of Fort Carson troops.
- Various capital improvements projects to municipal and county facilities now being planned or constructed.
- Improvements to roadway connections directly from I-25 to the Colorado Springs Airport, as currently being evaluated in the City's South Metro Accessibility Study, and the SH 16 EA.
- Improvements to Powers Boulevard/SH 16 and the I-25 interchange east of the installation.
- Improvements to Academy Boulevard north of the installation.
- Improvements to SH 115 west of the installation.
- Development of lands throughout the Pikes Peak region and greater Colorado Springs area.
- Bureau of Reclamation Southern Delivery System – proposal to construct new water storage reservoirs and an extensive network of delivery piping.
- Reconstruction of Powers Boulevard to a freeway with interchanges to enhance traffic movement around the eastern side of Colorado Springs.
- Future improvements to the roadway network to improve capacity on Drennan Road and Powers Boulevard to provide a more direct connection between I-25 and the airport.
- Future improvements to the roadway network to Banning-Lewis Ranch developments, and other features on the east and south sides of Colorado Springs.
- Future foreseeable improvements to SH 115 along the western boundary of the post.

Figure 5-1 also shows the growth of Fort Carson itself between 1956 and 1980. Camp Carson was created in WWII and consisted of 60,048 acres of land at the northern end of the current installation. In 1965 and 1966, the post was expanded to the south, bringing Fort Carson to its current size of approximately 137,000 acres. The acquisition and historical training use of a majority of this acreage has preserved open space in contrast to the rapid development and urbanization that has occurred along the I-25 corridor and north of Pueblo.

PCMS and the area immediately around it have experienced relatively little alteration of native habitats by urbanization or cultivation, but impacts from these activities throughout the rest of the Great Plains has contributed to declines in some wildlife species that also occur at PCMS. Little development in the vicinity of PCMS has taken place or is currently planned (Reference No. 190). According to Las Animas County (Reference No. 226), there are no permitted or anticipated projects in the vicinity of PCMS because water and sewer infrastructure is not available. The potential exists for future wind-power projects in Las Animas County, but no specific development plans are under consideration. According to the Otero County Engineering Department (Reference No. 227), no large-scale projects have been approved within Otero County. The only planned development consists of approved projects for 14 individual homes located throughout the county. More recently, the Trinidad Correctional Facility is evaluating expanding its capabilities, from 400 prisoners to 2,400. This would likely mean more water use, increased facilities, more energy consumed, a potential increase in traffic on US 350 and other related impacts. In Lamar, a former factory is being converted to build wind turbine parts, which creates the potential for more wind farm development in the region.

These regional cumulative changes, augmented by the present Proposed Action and past Army actions on Fort Carson and PCMS, have had varying degree of cumulative effects to regional resources. In addition to regional development projects discussed above, Table 5-1 lists past, present, and reasonably foreseeable Army actions, other than the Proposed Action that were reviewed to complete the cumulative impact analysis.

Table 5-1 Past, Present, and Reasonably Foreseeable Army Actions			
Project or Activity	**Time Frame**		
Troop Movements at Fort Carson and PCMS	Pre- 2005	2005-2008	2009-2013
2nd Brigade 4th ID at Fort Carson was inactivated.	X		
10th Special Forces Group (Airborne) arrived at Fort Carson.	X		
4IDHQ, one maneuver brigade (1st Brigade), and support units of the 4ID at Fort Carson were reassigned to Fort Hood. One brigade remained at Fort Carson. The 2nd Armored Division at Fort Hood was re-flagged as the 4ID, and the 3ACR was relocated to Fort Carson from Fort Bliss, Texas.	X		
Overseas deployment of military personnel.	X		
7ID was formed at Fort Carson.	X		
2BCT-2ID was transferred from Korea to Fort Carson and reflagged to 4BCT-4ID in 2008.		X	
52nd Engineer Battalion at Fort Carson was inactivated.		X	
7 ID Headquarters at Fort Carson was inactivated.		X	
1st Army Training Support Division- West (TSD-W), 2-Star HQs in charge of all Army National Guard and Army Reserve Units West of the MI River, was activated at Fort Carson.		X	
Implementation of Army Transformation by 2011.		X	
5th Armored Brigade (Reserve) restationed from Fort Carson to Fort Bliss.		X	
1-6 Cavalry Squadron (Aviation) restationed from Fort Carson to Fort Riley.			X
1-2 Aviation Regiment restationed from Korea to Fort Carson starting in 2009.			X
52nd Engineer Battalion reactivated at Fort Carson.			X
GTA (Proposed Action) additional IBCT and a CAB (approximately 6,700 Soldiers and their families) that would train at both installations.			X
Program and Policy Changes Fort Carson and PCMS	X	X	
Implemented PCMS rest/rotation program to build sustainable land use to recover training areas following mechanized maneuver rotations.	X		
PCMS rest/rotation program adjusted to provide more site-specific rehabilitation options and increase military training options. Fort Carson implemented the ACUB program.	X X	 X	 X
Construction Activities at Fort Carson			
WWII Wood Demolition program.	X		
Fort Carson Major Construction (Main Cantonment and Adjacent Areas).			
10th Special Forces Group (Airborne) Battalion Complex.	X	X	X
Army Reserve and National Guard Training.	X		
Barracks construction.	X	X	X
Utilities Upgrades.	X	X	X

Table 5-1 Past, Present, and Reasonably Foreseeable Army Actions (continued)			
Project or Activity	**Time Frame**		
	Pre- 2005	2005-2008	2009-2013
Privatization of family housing and renovation of substandard housing.	X	X	X
Gates upgraded and security fence installed.	X		
Centennial Training Site was constructed to support the Colorado Army National Guard, and is expanding.	X	X	X
Railhead upgraded and expanded.	X		
Construction to support Army restationing and conversions for CS/CSS Units.		X	X
Road Improvements.	X	X	X
Commissary/Post Office.			X
Lifestyle Village.			X
Army Space Command.			X
SIMS Center.			X
Rock Crusher training facility added to support training for the 96th Regional Readiness Command.	X		
Range 127 (Platoon Assault Course) upgrade.	X		
CACTF and an UAC and a Breach Facility constructed near Camp Red Devil.	X		
Hot Refuel Pads (BAAF).	X		
Bulk fuel facility constructed on Butts and Wilderness Rd and in cantonment area.	X		
TUAV support complex constructed near BAAF.		X	X
ORTC barracks constructed on Wilderness Road near BAAF.		X	X
DMPRC and MPTR upgrades.		X	X
Range 49 upgraded into a QTR to support training for the Colorado Army National Guard.		X	
Air Support Operation SQ Complex.			X
Range Upgrades.	X	X	X
Sniper Range.			X
Indoor Range.			X
71st EOD Complex.			X
Security Fence.			X
Ammunition Supply Point relocation.			X
PCMS Actions (Main Cantonment and Adjacent Areas)			
Construction of Piñon Village (Tuff Sheds in the cantonment).	X		
Maintenance facility (pole barn style).	X		
Butler building storage facility.	X		
Installation Information Infrastructure Modernization Program project (communications towers).		X	

Table 5-1 Past, Present, and Reasonably Foreseeable Army Actions (continued)

Project or Activity	Time Frame		
	Pre- 2005	2005-2008	2009-2013
Construction of PCMS cantonment facilities (administrative, clinic, etc.).			X
Establishment of PCMS as a sub-installation of Fort Carson.			X
Live-fire was introduced to PCMS with the construction of five small arms ranges.	X		
Special Use Airspace.			X
Training Areas B and C opened to mechanized military maneuver due to recovery from pre-acquisition erosion.		X	
Urban assault course and shoot house.			X
Live fire, convoy maneuver range.		X	
Two mock villages comprised of Tuff Sheds	X		
Road and trail improvements.	X		
Ammunition holding area, live grenade range.			X

The population of Fort Carson has fluctuated through time in accordance with the Army's need to train Soldiers and deploy them abroad to support the nation's mission requirements. Various Army initiatives and stationing decisions have increased or reduced the troop stationing levels of Fort Carson and training support requirements of both Fort Carson and PCMS. Figure 5-2 portrays the troop levels at Fort Carson over time.

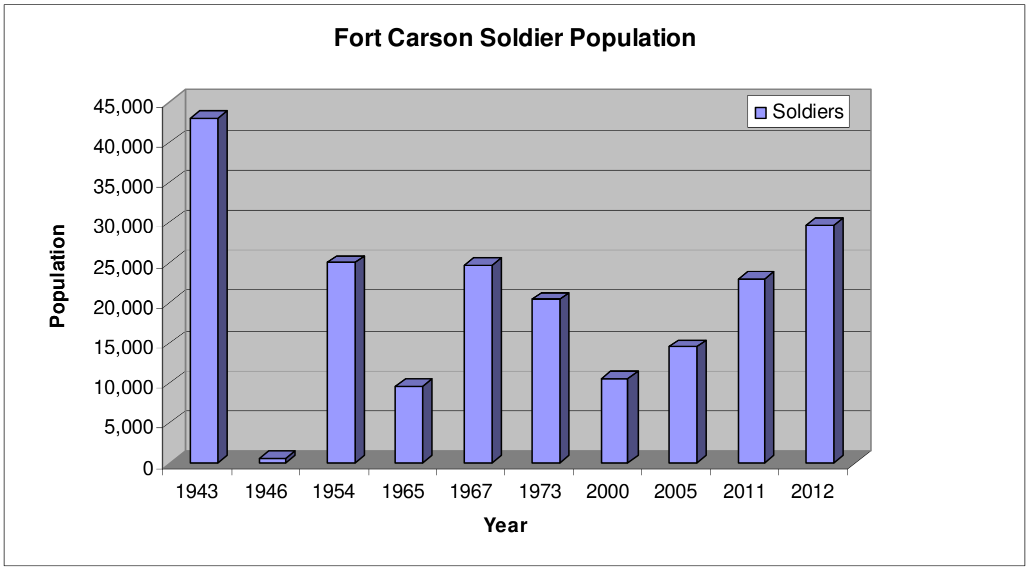


Figure 5-2 Fort Carson Soldier Population

5.2.1. Fort Carson Construction and Other Actions

5.2.1.1. Cantonment and Adjacent Areas

New construction has increasingly been sited outside of the area currently designated as the cantonment area. Encroachment on training lands and mission impacts are the major results of this trend.

5.2.1.2. Downrange Area

Most range construction within the downrange area at Fort Carson occurred within and prior to the 1980s. Since then, most of the range construction projects have been range upgrades (i.e., improvements to existing ranges, not siting of new ranges). Table 5-1 contains major range construction projects that have been completed, are ongoing, or are planned for Fort Carson downrange areas.

5.2.1.3. Training

Some of the development (existing and planned) within the cantonment area and most of the construction in the downrange area continues to encroach on Fort Carson's existing training lands and ranges. This, in turn, increases impacts to natural and cultural resources on remaining training lands due to increased frequency and intensity of maneuver on these lands.

The combination of Transformation actions and the addition of the GTA and CAB units would approximately double the troop strength at Fort Carson. Theoretically, training the higher numbers of units and Soldiers could increase the adverse effects to soils, vegetation, wildlife, and cultural resources in the downrange areas. Given the adaptive management of the training lands, as discussed in Section 2.2.4, however, the adverse effects on these resources are subject to sustainability limits. Also, empirical data concerning effects is exceedingly difficult to produce in light of the considerable influence of unpredictable and uncontrollable variables such as climate conditions and the frequency of unit deployments.

The ability to satisfy training needs of units and Soldiers has been somewhat hampered by their increased numbers, the increased areas in which they must train to meet doctrinal standards, and the reductions in available training lands. To date, this impact can be controlled by adapting training durations, frequencies, methods, and availability of training areas.

5.2.1.4. Cumulative Impacts

5.2.1.4.1. Land Use

The cumulative impact to land use consists of past, present, and reasonably foreseeable future changes to land use on and around Fort Carson. As discussed in Section 5.2 and shown in Table 5-1, increasing development has occurred both within Fort Carson and along the Front Range. Regionally, the Proposed Action would not result in a change of land use or present a conflict with existing land uses in areas adjacent to Fort Carson. The actions and construction activities, if implemented, would occur within Fort Carson. The percentage of developed areas within the approximate 6,000-acre cantonment area would increase under the Proposed Action, as additions to the Fort Carson cantonment area construction projects discussed in Table 5-1. This result is not adverse in that the cantonment area is designed to be developed. The amount of development may be reduced, however, through efficient land use planning and programs and renovation and replacement of existing facilities in ways that better use already developed areas.

The Proposed Action would change approximately 200 acres from training area to administrative and operational use, a change that has no impact on the community around Fort Carson. This change of land use would reduce the amount of maneuver area for training exercises and could cause reduction in flight corridors due to light encroachment. As the downrange area before this EIS consisted of approximately

96,000 acres of unimproved or open lands, and a majority of existing and proposed range construction projects deal with upgrades and re-use of existing ranges, any reductions caused by the Proposed Action would present minor direct, indirect and cumulative impacts to land use. The proposed improvements to Gate 19 with an improved access road to the ORTC or the Tent City area would encroach on the Land Navigation course south of BAAF.

As ranch and agricultural lands within the Colorado Springs area and other communities along the Colorado Front Range continue to be sold and developed, the approximate 96,000 acres in the downrange area of Fort Carson would constitute a growing percentage of remaining open space within the Front Range region. Also, Army programs such as ACUB both prevent land use incompatibility issues with neighboring areas and slow the reduction of undeveloped or open spaces in the region.

5.2.1.4.2. Air Quality

The cumulative impact to air quality consists of past, present, and future actions resulting in air emissions on and around Fort Carson within the Colorado Springs Urbanized Area in El Paso County. Cumulative impacts would result from the construction and operation phases of numerous activities at or near Fort Carson that are sponsored by federal, state, or local agencies. The following projects (also see Table 5-1) could contribute to regional emissions:

- Proposed Action;
- Various ongoing construction projects on Fort Carson (such as housing, barracks, motor pools, administration buildings, etc.);
- Existing sources on Fort Carson; and
- Transportation improvements off-post in the Colorado Springs Urbanized Area.

Construction activities would result in fugitive dust emissions from soil disturbance and wind erosion, and combustion product emissions (PM, NO_x, and CO) from worker vehicles and non-road equipment. Fugitive dust emissions are well mitigated due to regulatory requirements; therefore, impacts should be minimal and short-term, as discussed in Section 3.3.4.6.

Regional PM (both PM_{10} and $PM_{2.5}$) concentrations are approximately half of the NAAQS (Reference No. 20), and cumulative emissions from construction projects are unlikely to lead to a violation of the NAAQS because regional concentrations would have to double over the existing emissions to approach the regulatory threshold. The largest source category of CO emissions is mobile sources.

General Conformity

In accordance with the CAA, all regional highway improvement projects that receive federal funding must undergo a transportation conformity review for mobile source emissions to verify conformance to the maintenance plan and TIP. Project proponents must conduct an evaluation to determine whether the project would comply with the air conformity regulations under the CAA. Similarly, all other federal actions not addressed by the transportation conformity rule must undergo a review process to evaluate and document project-related air pollutant emissions, local air quality impacts, and the potential need for emission mitigation.

All of the demolition, construction, and renovation projects on Fort Carson fall well below the *de minimis* threshold for CO and result in a Record of Non-Applicability. The activities that were analyzed in the 2007 Fort Carson Transformation EIS resulted in a full Conformity Determination as the emissions of CO exceeded that threshold. These construction activities are still occurring on Fort Carson and troop relocation must be completed by 2012. Conformity with the SIP was demonstrated as the POV emissions could be accounted for in the TIP and the remaining emissions conformed as there was sufficient emissions budget in the SIP. A General Conformity determination also was completed for the Proposed Action (for all three siting scenarios).

Because of the regulatory limits that are enforced for CO, cumulative emissions associated with these projects are unlikely to lead to a violation of the NAAQS, and the TIP has already accounted for many of the highway projects. For those projects that were unknown at the time of the updated TIP, sufficient budget exists to accommodate those additional emissions. Further, CO monitoring by CDPHE, El Paso County, and Colorado State University would identify any violations. Corrective action would be taken by the region so the effects would be short-lived.

Modeling Analyses

Cumulative emissions during the operation phase of the Proposed Action at Fort Carson were calculated on a 24-hour and annual basis in the Air Quality Analysis Modeling Report and summarized in Tables 5-2 and 5-3 (Reference No. 227).

Table 5-2 Projected Actual Annual Emissions

Source Type	Total Emissions (tpy)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
External combustion	5.2	5.2	49.9	57.2	0.6	3.7
Internal combustion	1.2	1.2	21.3	5.3	2.4	1.4
Misc non-combustion	12.1	10.2	0.1	0.0	0.0	35.5
Fugitive dust from training	94.0	23.8	0.0	0.0	0.0	0.0

PM = particulate matter, PM_{10} = particulate matter (<10 microns), NO_X = nitrogen oxides, CO = carbon monoxide, SO_X = sulfur oxides, VOC = volatile organic compounds

Table 5-3 Projected Actual Hourly Emissions

Source Type	Total Emissions (lb/hr)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
External combustion	6.4	6.4	60.5	66.5	10.9	4.4
Internal combustion	1.1	1.1	27.1	7.2	4.9	1.6
Misc non-combustion	18.0	17.4	0.0	0.0	0.0	29.9
Fugitive dust from training	10695.0	2388.0	0.0	0.0	0.0	0.0

PM = particulate matter, PM_{10} = particulate matter (<10 microns), NO_X = nitrogen oxides, CO = carbon monoxide, SO_X = sulfur oxides, VOC = volatile organic compounds

Air dispersion modeling was performed to assess the cumulative impacts of existing, recently added and proposed emission sources at Fort Carson on ambient air quality. The modeling includes new and proposed emissions from the Transformation, GTA, ongoing MCA and DPW projects, and existing sources. Modeling procedures and results are provided in the Air Quality Analysis Modeling Report and are summarized as follows (Reference No. 227).

The near-field/off-base concentrations of criteria pollutants were determined using the American Meteorological Society (AMS)/EPA Regulatory Model AERMOD (Version 07026).

Near-field 24-hour PM concentrations were determined using the dust transport atmospheric modeling system, DUSTRAN, which was developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) to assist the DoD in addressing particulate air quality issues at military training sites.

The far-field (greater than 31 miles) AQRV impacts were analyzed using the CALPUFF dispersion model. AQRV impacts include comparison of modeled pollutant concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation for the appropriate Class I and sensitive Class II federal areas. The CALPUFF models were created using meteorological years 2001, 2002, and 2003 CALMET output derived from over 40 surface, 50 precipitation, and two upper-air raw data sets that are located throughout the modeling domain.

Maximum AERMOD predicted ambient concentrations of criteria pollutants (modeled maximum concentration plus background concentration) were predicted to exceed the corresponding NAAQS or CAAQS.

Likewise, DUSTRAN-modeled 24-hour particulate concentrations do not exceed the applicable NAAQS and CAAQS, although the model predicts a definite measurable impact.

CALPUFF results showed that maximum modeled 24-hour PM_{10} concentrations were slightly above the Class I SIL at the La Garita Wilderness Area, Great Sand Dunes National Park, and the Weminuche Wilderness Area during one of the three years modeled. However, the predicted cumulative 24-hour PM_{10} concentrations at these locations were below the NAAQS. All other maximum modeled pollutants' (NO_x, SO_x and PM_{10}) annual average concentrations and short-term concentrations were below their respective Class I increment SILs. The maximum predicted nitrogen and sulfur deposition rates were below the deposition analysis threshold of 0.005 kilograms per hectare per year for all Class I or sensitive Class II federal areas that were modeled.

The CALPUFF results also predicted there would be no noticeable visibility impacts to the Class I and sensitive Class II areas modeled. The visibility assessment is expressed as the number of days for each modeled year that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; therefore, greater deciview levels represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals. No visibility changes of greater than one deciview were observed for the modeled Class I and sensitive Class II areas. For additional details on the ADM results and analyses, see Appendix C.

Prevention of Significant Deterioration

Fort Carson is considered a major stationary source under PSD review requirements (40 CFR 52.21) as its installation-wide stationary source PTE for NO_x is greater than 250 tpy. Furthermore, the boilers and hot water generators are also considered a major listed source category because they are in one of the 28 individually regulated PSD categories (i.e., fossil fuel boilers [or combination thereof] totaling more than 250 MMBtu per hour (hr) heat input), which has a PTE of 100 tpy. As such, Fort Carson's boilers are a major stationary source because they have a PTE of more than 100 tpy for NO_x and CO (40 CFR 52.21[b][1][i][a]).

In 1998, CDPHE determined that at some point prior to Fort Carson's initial Title V permit, the combined capacity of boilers had made the installation subject to the 250 MMBtu/hr PSD category threshold. In support of issuing the Title V permit to Fort Carson, CDPHE prepared a Technical Review Document (Reference No. 291) and discussed the PSD issue as cited below:

> A thorough review of the available information was conducted and numerous meetings were held within the Division and with Fort Carson personnel to discuss the findings. The

effort resulted in total frustration in trying to re-create the historic record of when sources were added, and trying to decide if a PSD review should have been done. An effort to try to determine when the Category 24 100 tpy threshold may have been established resulted in the same frustration. The source of the problems was the lack of available documentation to re-create the history of events. After much discussion and deliberation, the Division reached the following decisions:

1) Fort Carson achieved the major source PSD category for sulfur dioxide emissions with the construction of the two boilers in 1979.
2) Fort Carson at some uncertain point in time achieved major source status for VOC emissions.
3) At an undefined point in time regulated criteria pollutants achieved major source status at 100 tpy because of PSD Category 24.
4) If the PSD major source status thresholds had been properly recognized, subsequent construction permits and permit modifications could have been developed to avoid the major source status.
5) Even if a historic point in time could be established when a particular source should have been subject to a PSD/NSR review, the performance of this review now would require spending a large amount of resources with little or no air quality benefit.
6) The resolution of the issue was to document that Fort Carson is now to be a major source for PSD considerations. The documentation of the regulated criteria pollutants with major source status would be done by issuing construction permits for all existing sources, including grandfathered sources, with emissions above the construction permit thresholds. The construction permits limits established federally enforceable limits that would establish the Fort Carson PTE levels. Fugitive emissions must be included in the PTE values.
7) The sum of the existing boiler heating input design was evaluated. If the value exceeded the PSD/NSR Category 24 250 MMBtu/hr threshold, the PSD/NSR threshold will be 100 tpy for each regulated criteria pollutant. Colorado Springs is a non-attainment area for carbon monoxide. A carbon monoxide PTE above 100 tpy would require future source additions, changes or modifications to address carbon monoxide under the NSR provisions.

In 2002, Fort Carson reviewed every significant project that had occurred in the most recent five-year period (January 1999 to December 2003) for PSD applicability. Sources evaluated included the installation of 13 small boilers (under 10 MMBtu/hr) at various motorpools, a 1,620-horse-power (hp) emergency generator at the WWTP and a 1,550-hp emergency generator at the hospital. Since that time, during the preparation of permit applications and/or APENs, Fort Carson continues to evaluate significant projects, such as the Contractor Owned, Contractor Operated Bulk/Retail Fuel Facilities, main heat plant (Building 1860) high temperature hot water generator upgrades, blended fuel at Building 1860, Building 8000 paint booth, emergency generator upgrades at the hospital, and the Transformation projects.

Air Quality Sustainability

Since 2002, the Fort Carson air program has been implementing various initiatives to minimize criteria and HAP emissions from stationary sources on the installation. All boilers/hot water generators installed are required to have low NO_x burners, and some have flue gas recirculation, which minimizes NO_x emissions. Emissions from traffic paint striping activities have been dramatically reduced by replacing the paint type and installing permanent markings on cross-walks. In 2002, HAP emissions were approximately six tons from this painting operation, and in 2006 they were 0.4 tons.

Fort Carson staff and community stakeholders originally developed 12 sustainability goals for the installation. One of these goals was to reduce the weight of HAP emissions to zero. This goal is not attainable within a foreseeable timeframe. Discussion is currently underway to revise it to either reflect what is feasible or define what types or HAP sources can be reduced to zero (http://sems.carson.army.mil/).

Greenhouse Gas Emissions

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of trace greenhouse gases (GHGs), such as CO_2, in our atmosphere. An increase in GHG emissions is said to result in an increase in the Earth's average surface temperature, which together are commonly referred to as global warming. Global warming is expected, in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, etc., which is commonly referred to as climate change. The Intergovernmental Panel on Climate Change (IPCC) best estimates are that the average global temperature rise between 2000 and 2100 could range from 0.6 degrees Celsius (°C) (with no increase in GHG emissions above year 2000 levels) to 4.0°C (with substantial increase in GHG emissions). Large increases in global temperatures could have considerable detrimental impacts on natural and human environments.

GHGs include water vapor, CO_2, CH_4, N_2O, O_3, and several hydrocarbons (HCs) and chlorofluorocarbons (CFCs). Each GHG has an estimated Global Warming Potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. A gas GWP provides a relative basis for calculating its Carbon Dioxide Equivalent (CO_2e) or the amount of CO_2 a gases emission would be equal to. CO_2 has a GWP of 1, and is therefore the standard to which all other GHGs are measured.

Water vapor is a naturally occurring GHG and accounts for the largest percentage of the greenhouse effect. Next to water vapor, CO_2 is the second-most abundant GHG. Uncontrolled CO_2 emissions from power plants, heating sources, and mobile sources are a function of the power rating of each source, the feedstock (fuel) consumed, and the source's net efficiency at converting the energy in the feedstock into other useful forms of energy (e.g., electricity, heat, and kinetic). Because CO_2 and the other GHGs are relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of these emissions does not depend upon the source location on the earth (i.e., regional climatic impacts/changes will be a function of global emissions).

Regulatory Climate

There have been no significant environmental regulations enacted in the US at the national level to specifically address increasing concentrations of GHGs or climate change. In April 2007, the US Supreme Court determined that the EPA has the regulatory authority to list GHGs as pollutants under the federal CAA. The EPA has sought comments from the public and other federal agencies, but has not yet proposed or adopted any regulations pertaining GHGs. Numerous proposals and bills have been circulated and have been considered in the US Congress to regulate GHGs, but no legislation has been adopted.

Although GHG emissions are not currently regulated at the federal level, certain state and local governments are passing legislation and adopting action plans to reduce GHG emissions under cap-and-trade or other market-based initiatives. The State of Colorado does not participate in a regional initiative at present. The State of Colorado has produced a Climate Action Plan that sets the framework for future requirements, and the Governor has issued an EO directing the state government to reduce overall energy consumption and petroleum use by the state vehicle fleet. The plan also states the Governor's commitment to join the Western Climate Initiative if the federal government fails to enact GHG legislation, provided the Initiative is compatible with Colorado's resources.

Need for Analysis

While NEPA does not mandate specific limits for pollution or any other specific environmental impact, provided whatever outcome produced is one which provides for some degree of stewardship consistent with NEPA's goals, it does require project proponents to analyze reasonably foreseeable direct and indirect consequences of the action that could be farther removed in distance or later in time. The analysis must include cumulative, and/or trans-boundary impacts as a result of the Proposed Action.

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. GHG emissions are precisely the type of cumulative and trans-boundary impacts which NEPA analysis should consider.

Of the states that have adopted their own NEPA-like programs, a few have implemented guidance, or are formulating guidance, to use for analysis and mitigation requirements by the project proponent. Currently, no federal or Colorado guidance exists for establishing threshold criteria for GHG emissions or mitigation methodologies for climate change analysis.

Fort Carson's GHG Emissions Assessment

In May 2008, Fort Carson became the first Army installation nationwide to perform a comprehensive carbon equivalent emissions analysis for its operations. This analysis was based on guidance provided in the *Green House Gas Protocol, A Corporate Accounting and Reporting Standard*, *2007* (Reference No. 228). The protocol was established by the World Business Council on Sustainable Development (WBCSD) in partnership with the World Resources Institute (WRI), with the goal to help businesses, governments, and environmental groups engage climate change through the establishment of effective, credible programs. The Fort Carson carbon emissions analysis was developed for scope 1 and 2 sources on-post for which it has total operational control. The scope sources include direct emissions (scope 1) units such as boilers, furnaces, emergency generators and government-owned vehicles and indirect (scope 2) units such as emissions from local utilities which are estimated for the production of electricity that Fort Carson consumes. The model does not consider PCMS base operations, privatized family housing, POVs operated on Fort Carson, or tenant operations other than Evans Army Community Hospital.

Baseline GHG Emissions

The Fort Carson GHG model uses numerous widely available emissions factors and accepted methodologies for estimating emissions from a variety of sources. The level of detail considered by the model is beyond the scope of this document and several simplifying assumptions about emissions units and operational parameters have been made to facilitate the emissions projection analysis.

For example, for fuel burning sources nearly all of the fuel carbon (98.5 – 99.9 percent) is converted to CO_2 during the combustion process (both internal and external), regardless of fuel type. Fuel carbon not converted to CO_2, due to incomplete combustion, results in CH_4, CO, and/or HC emissions. Even in units operating with poor combustion efficiency, the amount of CH_4, CO, and HC produced is insignificant compared to CO_2 levels. Additionally, there is sufficient data to suggest that CO, which is not considered a GHG, would become completely oxidized to CO_2 in the atmosphere within one to two months from being emitted, thus adding to the total GHG global burden. The data provides enough rationale to make the simplified assumption that all carbon contained in the source's fuel stocks should be considered emitted as CO_2. To account for the various quantities and GWPs of non CO_2 GHG emissions produced, the ratio of CO_2e to CO_2 was analyzed from the Fort Carson model to produce a source category specific emissions factor multiplier. The emissions factor multiplier is applied to the fuel carbon estimates to produce total CO_2e for the baseline and projection analysis. Table 5-5 summarizes the input parameters and results, in CO_2e units, from the simplified baseline analysis. For the purposes of this section, "Baseline" is defined as emissions resulting from operations in the year 2007 (i.e., pre-transformation emissions data analysis and/or estimations).

Table 5-5 Baseline Greenhouse Gas Emissions Summary

Source Type	Input Parameter	Input data (2007)	Emissions (tons)
External Combustion Units	Natural Gas, Fuel Oil, & Propane	Annual Fuel Use	51,390
Internal Combustion Units	JP-8, E85, ULSD, Gasoline, VMT (vehicle miles traveled)	Annual Fuel Use	17,125
Munitions	DODIC Type	Annual Use Rates	78
Refrigerants	Refrigerant Types	Annual Refrigerants Purchased	0.965
Electricity Production	Electricity Consumption	Annual MWh Consumed	88,663
CO_2e / CO_2 Ratio	Ratio Multiplier for Direct and Indirect Fuel Combustion Sources	1.009 (Utilities Ave.) 1.003 (Combustion Ave.)	N/A
		BASELINE TOTAL TONS of CO_2e	**157,257**

E85 = ethanol; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; JP = jet propellant; ULSD = ultra-low sulfur diesel; VMT = vehicle miles traveled

Direct Emissions - Fuel Combustion Units

Emissions units in this category are broken out into two subcategories for both internal and external combustion sources and include fuel-consuming sources such as heating and hot water boilers, furnaces and space heaters, emergency generators, tactical vehicles, GOVs, grounds maintenance equipment and other non-road engines. Inputs for this source category include natural gas, No. 2 fuel oil, propane, jet propellant (JP)-8, ethanol (E)85, ultra-low sulfur diesel (ULSD), gasoline, and vehicle miles traveled (VMT). VMT data, along with the corresponding average fuel efficiency and emissions factors for each vehicle class, was used to estimate emissions from sources where fuel use records were otherwise not available.

Direct Emissions - Munitions

Emissions units in this category are made up of the individually expended ammunition rounds of various sizes for weapons systems used in training and qualifying soldiers for combat. Emissions consist primarily of CO_2 resulting from the ignition of gun powder and/or propellant. The number in the Table 5-5 also includes approximately 19.64 tons of CO (considered by this analysis to be an indirectly emitted GHG) along with the CO_2 estimates. Oxides of nitrogen are also emitted. The composition of species, however, is unknown making it impossible to determine potential N_2O emissions.

Direct Emissions - Refrigerants

Emissions units in this category are made up of the individual gases used for replenishing refrigeration and air conditioning units on post. New units installed are shipped fully charged, and therefore Fort Carson's model assumes that all refrigerants purchased are for replenishing existing systems and that any corresponding releases would be equal to the amount of refrigerant purchased per calendar year. Emissions are reported in CO_2e.

Indirect Emissions - Electricity Consumption

Emissions units in this category are based on supply records and operational data from the local publicly owned utilities.

Proposed Action Emissions Projections

Projections of emissions were made from existing data used for the GHG baseline summary, and several assumptions were made for each source category to estimate future potential emissions. Table 5-6 presents GHG emissions estimates for the 2009 and 2012 project years, which represent the 2007 Fort Carson Transformation EIS and this EIS, respectively.

Table 5-6 Projected Greenhouse Gas Emissions

Source Type	2009 Greenhouse Gas Estimates (tons)	2012 Greenhouse Gas Estimates (tons)	Total Emissions (including baseline, tons)
External Combustion Units	16,900	14,940	83,230
Internal Combustion Units	8,746	6,885	32,756
Munitions	40	32	150
Refrigerants	0.025	0.025	1.015
Electricity Production	29,598	26,166	144,427
Annual Projected Total Tons of CO_2e	**55,284**	**48,023**	**260,564**

CO_2e = carbon dioxide equivalent

Projection Methodology

External combustion unit emissions estimates were derived from the projected increase in facility space. The analyses done for the 2007 Fort Carson Transformation EIS and subsequent project tracking indicate facility space expanding by 2.9 million square feet. Current Army construction planning documents for this EIS show new facilities totaling 2.6 million square feet. Although all these new facilities would be constructed to higher energy conservation and efficiency standards, the analysis assumed a worst case or conservative scenario for the projections by using 2007 standards for energy requirements and associated emissions per square foot.

Internal combustion unit emissions were estimated for the various sources by using population data and a multiplier to obtain reasonable fuel use projection. Each source type and corresponding input has a different multiplier since functions of source types vary considerably. For example, ground fuel use total increases were modestly estimated to be 30 percent by 2012. This estimate is based in part on the fact that the Proposed Action has virtually no increases in the civilian or contract workforce, facilities would be designed with low impact/maintenance landscaping, and trip generation is likely to decrease as a whole as facility density increases. Therefore, straight population increases could not be used to account for projected emissions, unlike tactical vehicle use which was estimated on a per capita basis. Other estimation factors include accounting for mandatory increased renewable fuel use (3 percent per year per EO 13423), determining what percentage of the renewable fuel could be considered carbon neutral, and estimating what impact newer fleet vehicles with higher fuel efficiency standards will have on fuel use.

Munitions emissions estimates were made from population and existing emissions data.

Refrigerant emission estimates were based on virtually no new leaking equipment being used on the site. All of the proposed facility equipment would be new or almost new by 2012. Future emissions projections equivalent to the useful economic life of the facilities could easily double the current annual emissions level.

Emissions from electricity consumption were estimated the same way as external combustion units, and are therefore considered reasonably conservative.

Long-Term Projections

Long-term foreseeable emissions are dependent upon unforeseeable circumstances such as energy supply and demand, technological developments, energy policy, politics, regulations, and future federal actions. Given the stability, increasing concentration, and atmospheric lifetime of GHG emissions, it makes sense to develop long-term emissions projections to assess the addition of potential worst-case, "business as usual" emissions as a result of the Proposed Action.

For the Proposed Action, emissions are estimated on the basis of a 25-year economic life expectancy for the facilities. For this analysis emissions are assumed to stay consistent. GHG emissions would total approximately 1,200,575 short tons and would be considered cumulative in the atmosphere. The Proposed Action would raise atmospheric concentrations of CO_2e by 0.000142 ppm by 2037. Cumulatively, operations at Fort Carson under this same scenario and time could raise atmospheric concentrations of CO_2e by 0.000835 ppm. As mitigation, increases in the use of renewable fuels and alternate forms of energy are expected to reduce emissions.

5.2.1.4.3. Noise

The cumulative impact to noise consists of past, present, and reasonably foreseeable future actions resulting in increased noise frequency (extension of noise contours) and increase of noise duration to sensitive receptors on and around Fort Carson. Noise contours would remain unchanged as a result of the Proposed Action. Although noise contours would remain unchanged, an adverse cumulative impact could result from the increased duration and frequency of training. The occurrence (duration) of noise produced and noise generating activities associated with live-fire training are expected to increase by approximately 27 percent. Other range projects (i.e., range upgrades and construction) presented in Table 5-1 would also allow for additional training, potentially increasing the occurrence of noise within the training areas. The projects within Table 5-1 would occur within or adjacent to existing training ranges, and would therefore not likely extend beyond existing noise contours. This is supported by CHPPM's 2006 and 2008 noise studies, which evaluated existing noise conditions and assessed potential future actions and concluded that there would be no significant change. Because a majority of noise energy generated by training activities remains within the installation boundaries, there is little cumulative interaction with other off-post sources of noise.

Alternative 1 may increase the intensity and duration of traffic-related noise due to the increases in Soldiers, vehicles (both tactical and non-tactical), and population density in the cantonment area. This noise is not anticipated to travel beyond the cantonment area and would only potentially impact areas currently used as motor pools or other industrial operations. In the Proposed Action and Alternative 2, the increases in noise generating activities would occur downrange, with virtually no possibility of traffic noise traveling to off-post receptors. A significant cumulative increase in noise generating activities could occur from the Proposed Action and the alternatives in combination with range construction, cantonment area construction, and training activities listed in Table 5-1 and those actions that will be taken to implement the actions studied in the 2007 Fort Carson Transformation EIS.

5.2.1.4.4. Geology and Soils

The cumulative impact to geology and soils consists of past, present, and reasonably foreseeable future actions resulting from soil erosion and loss of surface soils on and around Fort Carson.

The implementation of cantonment area construction and range construction/upgrades on Fort Carson have and will continue to have temporary impacts of soil erosion and loss of surface soils through erosion of disturbed construction sites. Past, present, and future construction projects within the cantonment area presented in Table 5-1 would not result in an adverse cumulative impact of soil erosion. Reasonably foreseeable past present and future projects would use similar BMPs as the Proposed Action to control wind and water erosion and stabilize sites following construction activities. There would be a potentially significant cumulative loss of soil resources across the region, however, as development of military projects in concert with community transportation projects and other regional initiatives continue.

The cumulative erosion of soils from range firing activities will occur on designated range areas and impact areas and generally will not affect non-military activities. As discussed in Sections 3.5 and 4.5, range firing activities and the increased volume of live-fire under the Proposed Action are projected to cause less than significant soil erosion. Surface disturbance caused by training activities and munitions impact would result in larger areas of bare ground than experienced under current conditions, both for the Proposed Action and for those projects presented in Table 5-1 and other projects discussed in Section 5.2. Cumulative impacts would be reduced through Fort Carson/PCMS's ITAM program, INRMP implementation, and adaptive management of training lands.

As discussed in Chapter 2, Army would adaptively manage maneuver training activities, but implementation of the Proposed Action could result in an approximate 15 percent increase in projected MIMs at Fort Carson. Increased maneuver activities of the Proposed Action are predicted to have significant but mitigable cumulative increases in soil erosion at Fort Carson. It is predicted that there would be increased surface disturbance of soil, removal of vegetation, soil compacting and rutting, reduced infiltration, and indirect effects of increased potential for fire and lost vegetative cover. Those activities listed in Table 5-1, which increase the frequency of training and training activity/footprint, would be anticipated to have similar effects on soils, causing the potential for adverse cumulative soil erosion in Fort Carson/PCMS's downrange area training lands. There would be limited cumulative increases in soil erosion in maneuver training areas from activities other than training, though deposition of soils from wind erosion could occur outside of maneuver training areas.

When the Proposed Action is considered in connection with the increased maneuver activities of units stationed at Fort Carson as a result of implementation of the Transformation activities studied in the 2007 Fort Carson Transformation EIS, the projected surface disturbance, compaction of soils, and loss of vegetative cover could approximately double. Maneuver training to support Transformation activities, and GTA could result in significant cumulative impacts. This potential adverse cumulative impact would be reduced through Fort Carson/PCMS's adaptive training management, erosion control, and land rehabilitation programs including the ITAM program and limited use programs. The stationing of a CAB at Fort Carson would further add to significant cumulative impacts to soils through wind based erosion caused by low-level flying activities which could destabilize soils and vegetation, but this impact would also be reduced through the ITAM and installation land management programs.

5.2.1.4.5. Water Resources

The cumulative impacts to water resources consist of past, present, and reasonably future actions resulting in changes to water quality or availability on and around Fort Carson. Construction of Camp Carson began in 1942, and there has been considerable development since (Table 5-1). In predevelopment conditions, stormwater runoff occurred but was far less due to the natural infiltration and evapotranspiration processes that dominated the landscape. More than 55 percent of the cantonment area is now impervious surface, and many of the drainages have been rerouted (such as the northwestern portion of B-Ditch) or straightened (such as Clover Ditch) to allow for various phases of construction and growth. The dynamics of the watershed characteristics within the cantonment area have changed considerably as a result of the development, reflecting an unbalanced system. Stormwater runoff has increased due to the increase of impervious surface area. Erosion in the southeastern-most stretches of the drainages, and both point and non-point source discharges are prevalent throughout the drainages. During the development of the Fort Carson hydrologic baseline models, it was determined that, over the last 50 years, nine major storm events have occurred, resulting in significant flooding and damage to the area and the installation.

In 2005, the Army completed a preliminary evaluation of Fort Carson's storm sewer capacity. The study concluded that the existing Fort Carson storm sewer system was at or near capacity. Increased development of Fort Carson's cantonment area would result in cumulative increased stormwater runoff. The increased runoff could contribute to flooding, high peak flows that cause erosion, and degradation of water quality. The study recommended that Fort Carson implement additional BMPs for new and existing development to control and properly treat stormwater flows and reduce cumulative adverse impacts (Reference No. 199).

In 2006, the Fountain Creek Vision Task Force was initiated by El Paso County to develop a comprehensive strategic plan for the Fountain Creek Watershed. Fountain Creek is the receiving water body for the four watersheds located in the northern portion of the installation (B-Ditch, Clover Ditch, Unnamed Ditch, and Rock Creek). This watershed has become unstable due to increased development in the Colorado Springs region. Some of the effects of this urbanization are a decrease in water quality, increased bank erosion in Fountain Creek, and localized flooding.

In 2007, Fort Carson increased its emphasis on the Stormwater Program to better address Municipal MS4 permit requirements and start proactively managing stormwater runoff on the installation. Hydrologic modeling, water quality sampling, and increased public outreach are some of the main efforts that have been targeted. In December 2007, Fort Carson also began implementing the intent of Section 438, Storm Water Runoff Requirements for Federal Development Projects, of the Energy Independence and Security Act of 2007 (Title IV, Subtitle C), which has significant impacts on project development with regard to stormwater runoff management. The Act states that the sponsor of any development or redevelopment project involving a federal facility with a footprint that exceeds 5,000 SF shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow. This proactive management of stormwater would address stormwater runoff impacts associated with the Proposed Action and other Army actions discussed in Table 5-1, reducing adverse cumulative stormwater impacts. If BMPs and stormwater plans and permits are adhered to for the Proposed Action and future projects, cumulative impacts would be minor.

As stated in Section 3.6, increased training activities under the Proposed Action may increase groundwater use which would be accommodated through existing subsurface water rights. Other on-going or proposed Army actions as presented in Table 5-1 are not anticipated to cause a cumulative adverse impact on local or regional water supplies. In addition, the Proposed Action would not release any water or pollutants that could infiltrate aquifers at Fort Carson, as Fort Carson would continue to implement all applicable hazardous waste management plans to address leaks or spills of hazardous materials as described above.

5.2.1.4.6. Biological Resources

The cumulative impact to biological resources consists of past, present, and reasonably foreseeable future actions that change the ecosystem on and around Fort Carson. The Proposed Action results in a variety of potential impacts, including mortality, disturbance or displacement, and loss of habitat or nesting or foraging territory (Reference No. 190). The Proposed Action includes continuation of a number of management measures to avoid and minimize impacts, as described in Section 3.7.2.2 Analysis of Fort Carson's biological resources is generally of the downrange areas since the cantonment area is largely developed.

Ongoing natural resources programs, such as described in the INRMP (Reference No. 6), and ITAM programs at Fort Carson are providing mitigation for past (and ongoing) cumulative impacts associated with early training at Fort Carson. Of particular importance is Fort Carson's involvement in regional efforts to address natural resources issues. Fort Carson continues to be a leader in sustainability and ecosystem management by proactively seeking partners to facilitate natural resources conservation, while concomitantly maintaining the installation training mission. Examples of such regional efforts include (Reference No. 6):

- Fort Carson ACUB program;
- Greenprint Initiative (assessing potential buffer zones);
- Shortgrass Prairie Partnership;
- Upper Arkansas Cooperative Weed Management Area;
- Lower Fountain Creek Water Quality Management Association;
- Wildlife Habitat Council;
- Front Range Eco-Regional Management Team initiative;
- Arkansas River Habitat Partnership Program (mitigates elk damage);
- Colorado Mountain Plover Working Group;
- Colorado Black-tailed Prairie Dog Working Group;
- Multi-State Prairie Dog Working Group; and
- Mexican Spotted Owl Working Group.

Fort Carson actively manages the natural resources entrusted to it as a valuable member of a larger, regional land management team, either by initiating regional natural resource protection and enhancement efforts or joining and cooperating in existing efforts. Coordination occurs between Fort Carson and natural resource management agencies, Fort Carson and state and local transportation agencies and also among both those types of agencies and Fort Carson. In the interest of space, only some are discussed here, but the range and breadth of the coordination and cooperative efforts with natural resource management agencies is hopefully captured.

The following provides an example of coordination among natural resource management agencies, CDOT and Fort Carson. USFWS staff is augmented through CDOT to provide a liaison between CDOT and USFWS. Coordination on rare plant issues at and around Fort Carson has taken place between Fort Carson staff, USFWS and CDOT discussing issues and management regarding roadside plant occurrences.

Fort Carson coordinates with and in some cases provides funding to non-governmental agencies such as The Nature Conservancy, Colorado Natural Heritage Program, Shortgrass Prairie Partnership, and National Wildlife Federation to help protect natural resources both on and off Fort Carson. Coordination with many governmental agencies occurs from the city level up to the federal level, and at times international. Noxious weeds are managed in cooperation with county weed boards, Colorado Department of Agriculture and the State Noxious Weed Coordinator. Fort Carson initiated a biological control program for noxious weeds in 1997 that has grown into a model regional effort across the Colorado Front Range into Wyoming. This effort coordinates noxious weed control on several military installations and two national wildlife refuges. Fort Carson cooperates with the Colorado Division of Wildlife and the US Fish & Wildlife Service on the management, protection and conservation of, for example, declining species such as bats, grassland birds and raptors. Fort Carson has developed management tools based on this shared information that protects those species in the long term. US Department of Agriculture/Agricultural Research Service, Oxford University and Massachusetts Institute of Technology have coordinated and cooperated on sediment transport studies, the outcome of which has provided information that is used by Fort Carson's Watershed Management Team.

Informal coordination between Fort Carson staff and natural resource management agencies occurs on a routine basis. The Colorado Division of Wildlife is consulted routinely through staff communication on issues such as hunting and sensitive species management. USFWS personnel are on staff at Fort Carson and help coordinate NEPA, endangered species and migratory bird issues. The outcome of these coordination and cooperative efforts has resulted in an outstanding, award winning natural resources management program at Fort Carson and PCMS. Results include programs that have helped provide populations of endangered species such as greenback cutthroat trout and red-bellied dace for releases aiding recovery efforts. Swift fox data provided by Fort Carson has added greatly to the body of knowledge regarding this species distribution and abundance in SE Colorado. Fort Carson's coordination efforts with agencies regarding rare plants provides data on populations that in some cases are known to occur almost entirely on Fort Carson or PCMS due to Fort Carson's survey efforts. Some examples of formal coordination with governmental natural resource management agencies include:

- *Upper Arkansas Regional Weed Management Area – Cooperative Agreement through USFWS.* Provides for joint collaboration, education, outreach, and shared weed projects if necessary between cooperating counties (Reference No. 292).
- *Front Range Ecological Partnership – Memorandum of Understanding.* Provides joint collaboration for 8 Front Range Installations for invasive species using biological control and burning (Reference No. 293).
- *Interagency Agreement between the Department of Interior, Specifically the National Park Service, Midwest Regional Office and the Department of the Army, Specifically Headquarters Fort Carson, Fort Carson CO* 80903, dated 2000 (Reference No. 294).
- Statement of Work between the US Fish and Wildlife Service and the US Army, Fort Carson, in *Support of the Cooperative Plan for Conservation of Natural Resources on Fort Carson and the Piñon Canyon Maneuver Site*, dated 1997 (Reference No. 295).
- *Cooperative Agreement between Fort Carson, the US Fish and Wildlife Service, Region 6 and Texas A&M Research Foundation* regarding work done for biological control of noxious weeds at
- *Cooperative Agreement between Fort Carson; the US Fish and Wildlife Service, Region 6; and Texas A&M Research Foundation*, dated August 1999 (Reference No. 296).
- *Integrated Natural Resources Management Plan, 2007 Cooperative Agreement among Colorado Division of Wildlife, US Fish & Wildlife Service, and Fort Carson* (Reference No. 6).
- *Memorandum of Understanding Among the U.S. Department of Defense and the U.S. Fish and Wildlife Service and the International Association of Fish and Wildlife Agencies for a Cooperative*
- *Integrated Natural Resource Management Program on Military Installations*, 2006 (Reference No. 297).
- *Memorandum of Understanding Between the U.S. Department of Defense and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds*, 2006 (Reference No. 298).
- *Memorandum of Understanding Between the Department of Defense and Bat Conservation International*, October 2006 (Reference No. 299).

Cumulative impacts from the Proposed Action in combination with other present and planned future actions are occurring and would continue to occur at Fort Carson and in the region. It will continue to be necessary to adaptively assess the cumulative impacts on vegetation and wildlife. The rapid rate of development of the military installation, range areas, and the surrounding community will continue to collectively contribute to significant cumulative impacts on vegetation and wildlife and lead to a reduction of quality available habitat. Fort Carson will continue to play a key role in sustaining native wildlife and vegetation in the region through its land management and natural resources programs to minimize these impacts.

As these determinations of specific effects of cumulative impacts are better understood, Fort Carson would use adaptive management to adjust management programs to mitigate adverse impacts to vegetation or specific species to the best extent possible. The INRMP would continue to document the overall installation management plan, while the ITAM program would continue to be directed to repair and restoration efforts in response to maneuver damages downrange.

5.2.1.4.7. Cultural Resources

The cumulative impact to cultural resources consists of past, present, and reasonably foreseeable future actions which affect archeological resources or historic resources or their viewsheds on and near Fort Carson. As is true of cultural and historic resources world-wide, impacts to such places are tied to land use; i.e., a particular culture's view of the landscape it occupies and the societal functions that the land fulfills for that group. Each subsequent population or activity that occupies a landscape produces an impact to past land use practices and cultural remains. The foundation of archaeological and anthropological investigation was formed within these tenets of human progress in order to understand the past, present, and future. Landscapes with repeated use tend to contain high site densities, as human populations are drawn to natural resources, such as water, arable land, minerals, and climates hospitable for game and crops. Repeated land use also means re-use of both natural and man-made materials, such as is seen in the remnants of numerous stone structures scattered throughout Colorado.

The implementation of the Proposed Action may result in direct or indirect loss of cultural resources in the State of Colorado through training maneuvers or increased frequency of wildfires that military training could generate. It is anticipated that the Proposed Action would not result in significant adverse cumulative impacts with the continued cultural resource management program and policies in place to preserve Fort Carson's historic and archaeological resources. Procedures and processes that Fort Carson implements to protect cultural resources are discussed in further detail below.

As mandated by federal law, Fort Carson conducts archaeological and historic building inventories and evaluations on all resource areas prior to use by impact-generating activities, whether those activities be military training, construction, or other land management actions, such as erosion control and re-seeding efforts. For archaeological sites, once identified, each site is recorded, evaluated for eligibility on the National Register, and the cultural landscape is analyzed. If applicable, significant sites are set apart using a variety of site protection methods. In this way, the information gained ensures that the cultural characteristics and lifeways of those who have come before us is not lost to history, but rather contributes to it. The information acquired is used for future land management, and is also made available to qualified researchers for professional purposes and used in the Program's considerable educational outreach efforts.

In accordance with NHPA Sections 110 and 106 and the stipulations of all agreement and management documents in force prior to training use (see Section 3.8), resources within Fort Carson/PCMS would be surveyed and evaluated for National Register eligibility, providing a greater protection and overall preservation to these resources and greater understanding of their cultural significance than is true for those located on private lands which are not bound to these regulations and standards. New construction and training activity under the Proposed Action include the possibility of inadvertent damages to cultural resources that occur on rare occasion despite education and awareness programs to prevent them. It is anticipated that, with continued active management which is currently in place to preserve Fort Carson's historic and archaeological resources, the Proposed Action would not result in significant adverse cumulative impacts.

5.2.1.4.8. Socioeconomics

The cumulative impact to socioeconomics consists of past, present, and reasonably foreseeable future actions that affect economy, employment, demographics, housing, quality of life, schools, community services, or Environmental Justice on and around Fort Carson. As discussed in Section 3.9, implementation of the Proposed Action would result in an increase in active duty military employment of approximately 3,800 Soldiers by 2012 and approximately 16 civilian jobs. EIFS modeling results indicate an increase in the on-post residential population of approximately 3,100 persons and an increase in the on-post workforce population of 3,816 persons. This increase is occurring against a background of rapid regional population growth that was discussed in Section 5.1. Although the potential CAB is included in the Proposed Action, it was not included in the EIFS analysis, as too many assumptions would have to be made. If the decision is made to bring the CAB to Fort Carson, a new EIFS will be conducted at that time and disclosed in follow-on NEPA documentation.

This increase in both the personnel and residential population on Fort Carson, as well as increases in nearby communities (see Section 3.9) would translate into increased Army and individual expenditures for purchases of goods, contracting of services, utilities, and rent and lease payments and would, therefore, have a net positive cumulative impact to the local and regional economy. This increase is occurring against a rapid increase in regional population density around Fort Carson that was discussed in Section 5.1 and will increase the rate of projected growth in the area.

The increased population associated with the Proposed Action, along with the general trend of development and population growth with the Front Range, could cause a cumulative strain on housing and public services. Adverse cumulative effects would be reduced by provision of barracks and housing for single Soldiers and supporting the housing needs of the married Soldiers and their Families through the Residential Communities Initiative on the installation to decrease the number of Soldiers and Families requiring housing off-post. The Fort Carson Regional Growth Plan (Reference No. 125) estimates that the housing market should be able to absorb the additional proposed Fort Carson growth. Housing and apartment space is available in the vicinity of Fort Carson. The many military Families who would reside off-post would generate upward pressure on the housing and apartment rental markets and to the extent they choose to live in new homes, increase property tax revenues for local jurisdictions.

School enrollment would increase as a result of the cumulative increase in regional population. Adverse cumulative effects would be partially offset through the provision of federal impact aid to offset costs of providing public education to families of military personnel. In addition, as discussed in Section 3.9, four of the seven school districts that would likely absorb additional growth have new or expanded facilities planned. The other three have sufficient capacity to absorb foreseeable future growth.

Other impacts associated with the Proposed Action such as construction would involve temporary boosts to the local Colorado Springs economy. These impacts would last for a period of 1-3 years depending on the project.

5.2.1.4.9. Transportation

The cumulative impact to transportation consists of past, present, and reasonably foreseeable future actions which increase the frequency or intensity (load) of the transportation network on and around Fort Carson. Troops travel via the region's roads, rails, and airports for daily commuting, training, and deployments, adding incrementally to traffic volumes generated by civilian residents and nonmilitary commercial activities. The cumulative effects of the Proposed Action are considered significant but could be mitigated to less than significant through the implementation of transportation projects on the installation and across the region.

The city, county, and state transportation departments maintain road networks in the region. Approximately $148 million in transportation projects are currently underway to accommodate current and future needs, including SH 16/I-25 improvements near Gate 20, construction of Defense Access Road and connection of the Rapid Deployment Route to Arrival/Departure Control Group and South Academy Boulevard/ Gate 4 access improvements. Implementation of additional recommendations to accommodate future transportation needs of the post will require additional funding. These recommendations include: continued planning and construction of capacity improvements to SH 115 between Gates 1 and 6, continued planning for access road improvements to support activation of Gate 19, and completion of a non-motorized transportation plan to enhance bike and pedestrian access on- and off-post (Reference No. 30). CDOT is currently reconstructing Powers Boulevard to a freeway with interchanges to enhance traffic movement around the eastern side of Colorado Spring. Future improvements to the roadway network also may include improving capacity on Drennan Road and Powers Boulevard to provide a more direct connection between I-25 and the airport, Banning-Lewis Ranch developments, and other features on Colorado Springs' south and east sides. Although specific planning is not yet underway, improvements would likely be made to SH 115 along the western boundary of the post south of Gate 6.

The addition of personnel and Families to Fort Carson as described under the Proposed Action would result in several types of transportation impacts: increasing on-post and regional traffic and altering traffic patterns, temporary construction disturbances, increased rail use related to training at PCMS, increased transit ridership, and potential increase in rail and aviation for deployment. Additional personnel would result in short-term cumulative adverse impacts on transportation based on incremental interaction with other growth in the region. In the long term, the impact to transportation would be negligible because current and future transportation improvement projects would provide sufficient infrastructure to accommodate the expected 60 percent increase in regional population. The growth at Fort Carson would constitute approximately 5 percent of the projected regional population increase (Reference No. 10).

The *PPAGC 2035 Regional Transportation Plan* established a vision, mission, and principles in order to meet the transportation needs for the Pikes Peak Region (Reference No. 148). Fort Carson would continue to work with the City of Colorado Springs, PPACG, and CDOT to assure that the design and construction of on-post roadways are consistent with the *2035 Regional Transportation Plan* and to ensure adequate traffic operations are sustained and adverse impacts are minimized to the extent possible.

Coordination among Fort Carson and State and Local Transportation Agencies. Close coordination with State and County traffic agencies is necessary to address and mitigate cumulative traffic impacts to the region. The preferred location of the proposed IBCT facilities would necessitate the activation of two installation gates, 6 & 19, for regular commuter use. Gate 6 is located near the intersection of Wilderness Road and SH 115. Gate 19 is located near the intersection of Wilderness Road and Charter Oak Ranch Road. Fort Carson is currently coordinating with CDOT on the off-post road concerns with regards to Gate 6. CDOT had already planned to make improvements to SH 115 in the area of Gates 5 and 6. Coordination on anticipated needs regarding the activation of these gates is ongoing. Construction dates for these improvements is subject to the availability of funding.

Due to the potential activation of Gate 19, the replacement/reconstruction of an off-post roadway, Charter Oak Ranch Road, would also be recommended due to the poor condition of the existing roadway. Charter Oak Ranch Road is a little used and poorly maintained roadway which provides direct access to Gate 19 from both Interstate 25 and the nearby City of Fountain. The road is owned by El Paso County. Recent severe budget shortfalls in the County reduce the likelihood of the County being able to fund the project in the foreseeable future. Fort Carson is in the process of drafting an Access Road Needs Report to request Defense Access Road (DAR) Program funding for the work required on Charter Oak Ranch Road.

Fort Carson also coordinates with the PPACG Transportation Partnership Group. Phase 1 of the Fort Carson Regional Growth Plan, which concluded in July 2008, covered twelve resource areas, including transportation. Phase 1 identified key transportation issues related to Fort Carson growth and actions for implementation, including safety and capacity improvements to State Highway 115, travel demand management, and other efforts to address transportation needs. The purpose of Phase 2 is to provide more detailed information regarding Soldiers and Family members and to continue planning and implementation efforts to address transportation and other needs related to Fort Carson growth.

The Phase 2 effort will also include assistance from subject matter experts and service providers through the partnership groups. Each group will also have representation on the Growth Plan's steering committee, the Colorado Defense Mission Coalition (CDMC), in order to ensure that information across all issue areas is shared throughout the process.

The outcome of coordination efforts among Fort Carson Traffic and Sustainability experts and other agency experts has resulted in the formation of a partnership group to help communities work together to address regional transportation needs. Some of the issues and challenges raised at the meetings include the following:

- Local jurisdictions should look at changing land use and zoning proactively, rather than reactively, including looking at increases in density and transit-oriented development.
- Corridor Planning – more planning is needed for dead corridors to redevelop high quality, high density growth and focus more on transit-oriented development.
- Incentives for Soldiers <u>not</u> to drive should be pursued more, such as providing free bus passes, encouraging carpooling, etc.
- A whole-systems approach might have a better chance of success than piecemeal efforts. For example, simply adding a park and ride outside Fort Carson's gates would not be sufficient to solve traffic issues on- or off-post.
- In order to make transit options work, land use (i.e., density) must be addressed; transit-oriented development is key.

Fort Carson is looking at transit and other options and is currently working with a consultant on some of these issues. Colorado Springs is pursuing a feasibility study of a street car along Nevada Avenue between UCCS and the I-25/Tejon Street exit. The possibility exists of having the route go farther south to serve Fort Carson and Pikes Peak Community College.

The Transportation and Planning and the land use partnership groups are considering meeting jointly occasionally to ensure the linkage between land use and transportation is addressed.

5.2.1.4.10. Utilities

The cumulative impact to utilities consists of past, present, and reasonably foreseeable future actions which affect the capacity or use of utilities on and around Fort Carson. As stated in Section 3.11, the Proposed Action would result in an increase in Fort Carson Soldiers and Families. This increase in population would cause an increased demand for water, wastewater treatment, and electricity.

The result of the Proposed Action in combination with other Army actions and regional growth and development discussed in Section 5.2.1 would put usage of water by CSU closer to the firm yield for raw water by 2012. Adverse cumulative effects could be offset if Fort Carson continues to aggressively pursue water conservation and work with CSU to implement the *CSU Water Conservation Plan* (Reference No. 151) as discussed in Section 3.11.1.1. In addition, actions such as replacing existing deteriorating water lines on-post and the proposed Southern Delivery System would offset cumulative impacts to firm yield for raw water.

As discussed in Section 3.11, implementation of the Proposed Action could be accommodated by existing wastewater handling and energy systems. Upgrades to Fort Carson's existing utility infrastructure would be built to handle increased demand, such as the construction of electrical substations or on-site wastewater disposal systems. Thus, less than significant cumulative effects are anticipated for utilities.

5.2.1.4.11. Hazardous and Toxic Substances

The cumulative impact to hazardous and toxic substances consists of past, present, and reasonably foreseeable future actions that increase the handing of these substances or the generation of hazardous wastes on Fort Carson. Under the Proposed Action, the addition of personnel and training would result in an increase in the use of hazardous materials and petroleum and subsequent generation, handling, storage, and disposal of wastes derived from these materials. The installation has the capacity to handle these wastes and would continue to implement installation SOPs and plans for their reduction, disposal, and handling. Only minor cumulative impacts are predicted.

5.2.1.4.12. Sustainability

The cumulative impact to sustainability consists of past, present, and reasonably foreseeable future actions that place a strain on sustainability principles within Fort Carson. The Proposed Action would increase the population at Fort Carson and could increase the frequency of training at Fort Carson. The Proposed Action in concert with the projects in Table 5-1 could pose a significant cumulative impact to sustainability in the region through increased demand for energy, water use, facility construction, and land use, unless prescribed mitigation measures are taken. Also, in the regional context, the actions on Fort Carson are only a small fraction of anticipated regional growth; however, that regional growth, with the resulting strain on the environment, make it imperative that Fort Carson both continue and increase its own sustainability measures and encourage similar actions throughout the region.

To ensure the continued availability of quality training lands, the Proposed Action would continue to implement Fort Carson's land and environmental management programs on Fort Carson. These programs are designed to maintain a sustainable balance of land use and sustainability.

In addition to existing programs and policies, Fort Carson has adopted 12 aggressive, long-term *25-Year Sustainability Goals in 2002* (Reference No. 274) (http://sems.carson.army.mil). Those that pertain directly to sustaining the military mission are as follows:

- Further integrate sustainability principles into the Fort Carson land use planning, real property master planning, and Military Construction, Army programming processes.
- Key stakeholder groups are trained, compliant and motivated toward sustainability principles.
- Training Ranges capable of supporting current and future military training to standard.
- Advance a sustainable mission at Fort Carson by adopting a SEMS and by imparting (passing on) a personal commitment and enthusiasm for sustainability.

The Army would continue to implement these programs and develop new sustainability programs to promote effective and efficient use of regional resources. Because of the rapid pace of growth and development in Fort Carson's ROI, reduction of significant cumulative impact to sustainability will remain both a challenge and a priority for the installation.

5.2.2. Piñon Canyon Maneuver Site

PCMS was purchased by the Army in the early 1980s, followed by development of the current approximately 1,600 acre austere cantonment area. Primarily, development has occurred within the cantonment area, with the exception of limited training infrastructure in downrange area locations. The land previously supported large grazing operations and several residences. Military training operations began at the site in 1985. Until 2005, when several small arms ranges were built, only maneuver and dismounted operations took place at PCMS. Despite the construction of some limited range infrastructure, the primary function of PCMS remains supporting the maneuver requirements of Soldiers stationed at Fort Carson.

Limited development of the area, settlements, Army training, and past agricultural practices have disturbed natural areas and affected biological resources, soils, and water resources to some extent. Cultural and paleontological resources are present throughout the area and at PCMS. These past and present activities have disturbed some of these resources. Some are present on federal lands, such as the Comanche National Grassland, and are protected from development and related disturbance. Historical grazing has affected wildlife, vegetation, soils, and water resources (Reference No. 119). Similar to Fort Carson, the majority of land at PCMS consists of undeveloped maneuver training area.

The combination of Transformation actions and the addition of the GTA and CAB units will approximately double the troop strength at Fort Carson. Theoretically, the resulting training of these higher numbers of units and Soldiers could increase the adverse effects to soils, vegetation, wildlife, and cultural resources in the downrange areas. Given the adaptive management of the training lands as discussed in Section 2.2.4, however, the adverse effects on these resources are subject to sustainability limits. Also, empirical data concerning effects is exceedingly difficult to produce in light of the considerable influence of unpredictable and uncontrollable variables such as weather and deployments of units.

The ability to satisfy the doctrinal training needs of units and Soldiers is predicted to be somewhat limited as a result of the increases in Soldier numbers and the increased areas in which they must train to meet doctrinal standards. To date, this impact can be controlled by adapting training durations, frequencies, methods, and areas.

5.2.2.1. Potential Expansion of Piñon Canyon Maneuver Site

As discussed in Section 2.1.6, this EIS, including this chapter, does not include expansion of PCMS. Whether any such expansion may occur, where it might occur and to what extent, and whether it would receive Congressional approval and funding are all unknown. The impact of PCMS expansion is therefore, not included in this cumulative analysis because it is not reasonably foreseeable. It is important to note, however, that before any expansion could occur, NEPA review would be required, including analysis of the cumulative impact of such expansion combined with past actions, including the Proposed Action in this EIS.

5.2.2.2. Cumulative Impacts

This section discusses the past, present, and reasonably foreseeable future cumulative impacts that are predicted to result at PCMS and in the surrounding region as a result of implementing the Proposed Action and alternatives. A list of actions considered in this Section is presented in Table 5-1. No stationing, cantonment area construction, or range projects are part of the Proposed Action and the cumulative impacts of the Proposed Action are primarily related to possible increases in maneuver training. Some actions, such as changes in weapons systems or prepositioning of equipment at PCMS, could occur in the future but are not considered reasonably foreseeable at this time. Because maneuver training is the primary action affecting PCMS as part of the Proposed Action, cumulative impacts analysis is limited to those resources that are anticipated to be incrementally affected by maneuver training. These resources include land use, air quality, noise, soils, surface water quality, biological resources, and cultural resources, which are the focus of this section's discussion.

Use of PCMS has varied with the level of troop stationing at Fort Carson and other mission-related factors since it was first established and used for training in 1985. Since 2001, levels of training at the site have been lower than anticipated because of the high operations tempo and frequency of Fort Carson troop deployments to support mission in Iraq, Afghanistan, and other locations. Future use of PCMS is projected to increase with the stationing of additional Soldiers as part of Transformation and GTA.

5.2.2.2.1. Land Use

The cumulative impact to land use consists of past, present, and reasonably foreseeable future changes to land use on and around PCMS or changes in land use that would adversely impact adjacent land use compatibility. Prior to 1985, the land comprising PCMS was used to support large grazing operations and several residences. In 1985, military maneuver training operations began at the site. In 2005, several small arms ranges were constructed allowing for up to .50 caliber rounds to be fired. PCMS has been used for military training exercises, on average, approximately four to six months per year, though it has been used much less frequently since 2001 because of the increase in operational deployments of Fort Carson's units. In the 1980s and 1990s, units trained mostly in larger, battalion and brigade-sized elements. Since the start of the wars in Iraq and Afghanistan, utilization of PCMS by smaller units (company and below) has increased.

The Proposed Action would not change existing land use classifications, and it would not pose a conflict with adjacent land uses. Increased maneuver training would not result in significant cumulative impacts to land use.

5.2.2.2.2. Air Quality

The cumulative impact to air quality would consist of past, present, and reasonably foreseeable future actions resulting in increased air pollution on and around PCMS. The primary sources of air pollution would be combusted fuels and particulate matter generated by maneuver training activities. Cumulatively, the projected increase in training maneuvers at PCMS resultant from the need to train more Soldiers is expected to result in less than significant impacts. As stated in Chapter 2, PCMS will be adaptively managed to ensure the sustainability of training areas. The installation will revegetate and rehabilitate "high use" areas to reduce the amounts of fugitive dust and particulate matter released into the atmosphere. Increased vehicle maneuvers will add additional CO_2, NO_x, and other byproducts of combustion to the regional airshed in greater quantities. As existing and foreseeable development is anticipated to be limited and the region surrounding PCMS is in attainment, however, cumulative impacts to air quality are predicted to be less than significant.

Air dispersion modeling was performed to assess the cumulative impacts of existing emission sources, and increased vehicle maneuvers at PCMS on ambient air quality. Modeling procedures and results are provided in the Air Quality Analysis Modeling Report (Appendix C) and are summarized as follows (Reference No. 227).

The near-field/off-base concentrations of criteria pollutants were determined using the American Meteorological Society (AMS)/EPA Regulatory Model AERMOD (Version 07026).

Particulate matter near-field 24-hour concentrations were determined using the dust transport atmospheric modeling system, DUSTRAN, which was developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) to assist the DoD in addressing particulate air quality issues at military training sites.

The far-field (greater than 31 miles) air quality related value (AQRV) impacts were analyzed using the CALPUFF dispersion model. AQRV impacts include comparison of modeled pollutant concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation for the appropriate Class I and sensitive Class II federal areas. The CALPUFF models were created using meteorological years 2001, 2002, and 2003 CALMET output derived from over 40 surface, 50 precipitation, and two upper-air raw data sets that are located throughout the modeling domain.

None of the AERMOD predicted ambient concentrations of criteria pollutants (i.e., modeled maximum concentration plus background concentration) exceeded the corresponding national ambient air quality standards (NAAQS) or Colorado ambient air quality standards (CAAQS).

DUSTRAN-modeled 24-hour particulate concentrations did not exceed the applicable NAAQS or CAAQS.

CALPUFF results showed a PM10 24-hour concentration above the SIL for one day out of the three years modeled at the Great Sand Dunes National Monument and Preserve. However, the predicted cumulative 24-hr PM10 concentration at this location was below the NAAQS. All other maximum modeled pollutants' (NOx, SOx, and PM10) annual average concentrations and short-term concentrations were below their respective Class I increment SILs. The maximum predicted nitrogen and sulfur deposition rates were below the deposition analysis threshold of 0.005 kilograms/hectare/year for all Class I or sensitive Class II federal areas that were modeled.

The CALPUFF results also predicted there would be no noticeable visibility impacts for all but one Class I area, the Great Sand Dunes National Park and Preserve, which showed noticeable visibility impacts for one day out of the three years modeled. The visibility assessment is expressed as the number of days for each modeled year that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; therefore, greater deciview levels represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals. A visibility change of greater than one deciview was observed for one day out of the three years modeled at the Great Sand Dunes National Park and Preserve. No other visibility changes of greater than one deciview were observed for the modeled Class I areas. However, visibility changes of greater than one deciview were observed for some of the sensitive Class II areas. The greatest number of days with visibility changes occurred at the Southern Parcel, a scenic and/or important view located within PCMS. For additional details on the ADM results and analyses, see Appendix C.

5.2.2.2.3. Noise

The cumulative impact to noise consists of past, present, and reasonably foreseeable future actions resulting in increased noise frequency (extension of noise contours) and increase of noise duration to sensitive receptors on and around PCMS. As stated in Section 4.4, increased convoy movements would result in increased traffic noise levels. Based on the expected traffic increases, however, hourly average traffic noise levels at locations along area roadways where convoy movements would occur are estimated to increase between 0 and 2 decibels (acoustic) (dBA), which would not be a perceptible change to area residents. Additionally, there are no known noise-sensitive receptors located in the areas outside the installation boundaries where noise increases are anticipated. As no existing or foreseeable planned development (noise receptor) is known for the PCMS area, no adverse cumulative noise impacts would be expected as a result of the Proposed Action.

5.2.2.2.4. Geology and Soils

The cumulative impact of geology and soils consists of past, present, and reasonably foreseeable future actions resulting from soil erosion and loss of surface soils on around PCMS. Potential increased maneuver activities of the Proposed Action are predicted to have significant cumulative impacts to soil erosion at PCMS. When assessing this action in connection with maneuver and construction activities of the 2007 PCMS Transformation EIS, it is predicted that there would be increased surface disturbance of soil, removal of vegetation, soil compacting and rutting, reduced infiltration, and indirect effects of increased potential for fire and lost vegetative cover. Those activities listed in Table 5-1 which increase the frequency of training would be anticipated to have similar effects on soils, causing the potential for increased cumulative soil erosion on PCMS training lands. There would be limited, if any, impacts of soil erosion in maneuver training areas from activities other than training, though training could cause the deposition of soils from wind erosion to occur outside of maneuver training areas.

When the Proposed Action is considered in connection with the increased training proposed in past, present, and reasonably foreseeable actions, the projected surface disturbance, compaction of soils, and loss of vegetative cover could approximately double in connection with proposed increases in maneuver activities. These adverse cumulative impacts would be reduced through PCMS's adaptive training management, erosion control, and land rehabilitation programs including INRMP implementation, the ITAM and limited use programs, but these programs would not reduce impacts to below less than significant levels. The maneuver training of a CAB at Fort Carson would increase susceptibility of soils to wind based erosion through low level flying activities which could destabilize soils and vegetation, but this impact would also be reduced through the ITAM and installation land management programs.

5.2.2.2.5. Water Resources

The cumulative impacts to water resources consist of past, present, and reasonably future actions resulting in changes to water quality or availability on and around PCMS. Impacts to water resources are predicted to be less than significant. The Proposed Action does not include expanding the existing cantonment area or the amount of impervious surface which would lead to the channeling of surface waters. The major impact to water resources would stem from sedimentation into the Purgatoire River and Arkansas River basin during large storm events (Reference No. 229). A particular concern is to avoid degradation of the section of approximately 16 miles of the Purgatoire River flowing through Picket Wire Canyonlands on the Comanche National Grassland (downstream of the PCMS), which has the potential to be considered for designation as a Wild and Scenic River. Increased maneuver training would result in a loss of vegetation and increase in surface disturbance exposing soils to water erosion during large storms. This impact along with agricultural inputs into surface waters could potentially lead to degradation of water quality in the Purgatoire and Arkansas River basin. Inputs of sediments into the surface waters, however, are highly correlated with unpredictable factors such as the number and intensity of large storm events in a given year (Reference No. 229). Also, erosion and sedimentation control activities at PCMS by the Army and USGS, as outlined Section 4.6.1.1.2, would be continued and expanded commensurate with the increase in maneuver training, thereby avoiding any significant impact to the Purgatoire and Arkansas basin.

5.2.2.2.6. Biological Resources

The cumulative impacts to biological resources consist of past, present, and reasonably foreseeable future actions resulting in changes to vegetation, wildlife, and habitat on and around PCMS. Table 5-7 summarizes known effects of early (1985 through early 1990s) and present (mid-1990s until now) military training on biological resources. Undisturbed grassland, shrubland, and woodland habitats in the region are likely to continue to shrink as a result of the population growth and economic development.

As part of the original PCMS acquisition process, specific studies were conducted on PCMS prior to and after the initiation of training, specifically to assess impacts of early (1985 through early 1990s) training on vegetation and wildlife. There have been a few similar studies on these effects since that period. Table 5-7 summarizes the results of these studies.

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources

Resource	Effects of Military Training	Reference
General	This baseline provides a means to measure success of the Fort Carson sustainability program, including PCMS. The report has information on the status of water, air quality, energy, transportation, lands, materials, wildlife, noise, and cultural programs and their challenges with regard to sustainability.	DECAM (2002): Reference No. 6
Aquatic habitat	Conducted field investigations and computer simulations on Taylor Arroyo, which could be used as baseline data to compare effects of current military training on infiltration, overland flow, and channel flow.	Doe (1992): Reference No. 230
Aquatic habitat	These reports have 1985-87 data on streamflow, water quality, and sediment load yields that could be used to compare effects of current military training.	USGS (undated) von Guerard et al. (1993): Reference No. 191
Wetlands	Six wetland sites being monitored were described, including monitoring results for 1998. The report has baseline data that could be used to compare effects of current military training.	DECAM (1998): Reference No. 200
General vegetation	Reports have baseline data that could be used to compare effects of current military training.	Shaw and Diersing (1989, 1990): Reference No. 85 and 86
General vegetation	Reports have 1985-1988 baseline vegetation data that could be used to compare effects of current military training.	Shaw et al. (1989): Reference No. 85 and 232
General vegetation	Training exercises result in less resource degradation than former grazing regimes, particularly for canyon and wetland habitats.	Canestorp et al. (1995): Reference No. 231
General vegetation	Live and litter basal cover decreased and bare ground increased in tracked areas following training. Species composition shifted from perennial warm-season grasses to annual cool-season grasses and annual warm-season forbs in tracked areas. Shrubby and woody plant densities were significantly reduced by training.	Shaw and Diersing (1989 and 1990): Reference No. 85 and 86
General vegetation and range condition	Disturbance by tracked vehicles resulted in lower grass and vegetative basal cover with the loss of prostrate growth forms. Litter cover declined. Vehicular maneuvering reduced woody life-forms in tall-height classes to a generally greater extent than short-height classes. Low-growing forms of cacti were relatively susceptible to crushing. Long-lived perennials declined in all communities in tracked locations; bare ground created was replaced by short-lived perennials in only shrub-grassland. Annuals and exotics did not show distinct temporal trends or relations with intensity of disturbance. Patterns in species diversity or richness were not related to intensity of disturbance. Plant communities on PCMS display a high resistance to aboveground disturbance but a low resilience once an alternate state is reached. PCMS may be in a transient stage where release from grazing had as much or more impact on plant community dynamics as did imposition of training. Fine textured soils may be more susceptible to cumulative effects of soil compaction and erosion associated with heavy vehicular loads.	Milchunas et al. (1999): Reference 233

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
General vegetation and range condition	Reports have baseline data that could be used to compare effects of current military training. Through the exclusion of livestock, the vegetation biomass appears to have rebounded significantly, primarily evident through litter accumulation.	Milchunas et al. (1999, 2000): Reference 233 and 234
Trees	PCMS (and Fort Carson) forest inventory that could be used to compare effects of current military training.	Betters and Reich (2002): Reference No. 235
Niobrara shale barrens vegetation	Most Niobrara shale barrens endemic species are not adversely affected by moderate disturbance, particularly Oxybaphus rotundifolius, which appears to increase abundance where disturbance reduces competition. Weed invasions are not generally significant problems on these barrens. The report has baseline data (six plots at Gilligan's Island) that could be used to compare effects of current military training.	Kelso et al. (1999): Reference No. 236
Range condition	The report has 1991 data that could be used to compare effects of current military training. Overall, range condition improved on PCMS from 1989 through 1991.	Gordon and Linn (undated): Reference No. 237
Aquatic habitat	1985-87 military maneuvers caused no measurable effect on streamflow, water quality, and estimated sediment load yields deceased. Since 1987 cumulative effects of maneuvers have developed to a point that there is potential for increased runoff and sediment yields and degradation of water quality.	USGS (undated) von Guerard et al. (1993): Reference No. 191
Fish	A 1993-94 survey in the Piñon Canyon stretch of the Purgatoire River and its intermittent canyon tributaries on PCMS, which has data that could be used to compare effects of current military training.	Lohr and Fausch (1994): Reference No. 205
Fish	No observed effects.	Bramblett (1989), Bramblett and Fausch (1991) Reference No. 204, 208 and 209
General birds	These reports have 1987-88 data that could be used to compare effects of current military training. During 1987-88 in cholla grasslands four species were detected more frequently and one species was detected less frequently in areas with training than control areas. In pinyon-juniper areas four species were detected more frequently and one species was detected less frequently. Total numbers of birds detected in areas with training was significantly higher than the control for both habitat types, but species richness was significantly greater in control areas in cholla grasslands in 1987 and 1988 and significantly greater in areas with training in pinyon-juniper in 1988.	Youkey and Meslow (1989): Reference No. 238
General birds	Only one species (Grasshopper Sparrow) showed an abundance decline after initiation of military training. The pinyon-juniper bird community decreased in species richness with military disturbance.	Tazik (1991): Reference No. 239
Mountain Plover	Mountain Plover surveys were conducted on PCMS during 1995-96 summers. These data could be used to compare effects of current military training.	Maynard (1996) : Reference No. 240

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Raptors	Increased size of areas used and made extra- home range movements more frequently.	Andersen et al. (1988, 1990): Reference No. 112 and 241
Red-tailed hawk	Habituated to low-level helicopter traffic. (Study includes both PCMS and Fort Carson.)	Andersen et al. (1989): Reference No. 242
General wildlife	No known long term negative impacts.	Canestorp et al. (1995) 231
Pronghorn	The report has 1985-89 data that could be used to compare effects of current military training. Shifted forage selection in response to forb increases on sites disturbed by tracked vehicles. Females and fawns increased home area sizes during maneuvers; males did not. Pronghorns (winter 1987) exposed to military training spent less time bedded.	Gerlach and Vaughan (1990): Reference No. 101
Mule deer	The report has 1986-87 data that could be used to compare effects of current military training. Female deer seasonal home ranges were larger in maneuver areas compared to non-maneuver areas. Female non-summer home ranges were larger in previous-maneuver areas than non-maneuver areas. Fawn summer home ranges were larger in maneuver than previous-maneuver areas. Bucks in maneuver areas had larger home ranges than in non-maneuver areas. Deer may exhibit a more negative response to unpredictable than predictable disturbances. Buck and doe survival rates and fawn:doe ratios did not differ prior to military maneuver and during 1986-87. Population estimates increased from 1984 through early 1988; a decline was noted in late 1988. Cattle grazing during the baseline study and a coyote control program during 1987-88 made it difficult to assess effects of military use on deer demographics.	Stephenson (1989): Reference No. 243
Deer	CDOW, in cooperation with PCMS Biologist, has data from annual aerial surveys that could be used to compare effects of current military training.	CDOW data (unpublished)
Elk	Elk moved onto PCMS after acquisition and initiation of military training, indicating no significant negative effects of training and possible positive effects.	
Coyote	These reports have 1996-97 data that could be used to compare effects of current military training. Most changes in coyote movement from military activity are temporary, and coyotes resume their previous activity patterns and occupy similar home ranges after military activity ends. Coyotes shifted to higher levels of diurnal activity under Army training, due to less exploitation (trapping and gunning. No other changes detected.	Kitchen et al. (2000): Reference No. 105
Coyote	Three of 16 radio-collared coyotes abandoned home ranges in response to military activities (one returned one week later). Most coyotes that changed home ranges during military activities resumed original home ranges after maneuvers ceased. Responses were related to amount of available cover, topography, and intensity of military activity. Day activity increased while sunrise, sunset, and night activity remained the same during military activities.	Gese et al. (1989): Reference No. 104

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Swift fox	The study concluded that the swift fox population at PCMS was saturated in 1998-2000. No negative effects of military training on swift foxes were documented. These data could be used to compare effects of current military training.	Karki (2003) Karki et al. (2007): Reference No. 244 and 245
Swift fox	No negative effects of military training on swift foxes were documented. These 1997-98 population data could be used to compare effects of current military training.	Schauster (2001) Schauster et al. (2002): Reference No. 246 and 247
Swift fox	No negative effects of military training on swift foxes were documented (2000-04). Both grazed and military training sites had higher survival and density than unused sites, with populations on military sites showing more stable dynamics. Fox survival rate did not differ between different disturbance regimes.	Thompson (2006): Reference No. 248
Swift fox	No mortality was associated with training activities, either through direct mortality or the destruction of den sites. There was little difference in fox movements between times of military activity and no military activity.	Rongstad et al. (1989): Reference No. 249
Small mammals	Survey data collected in 1989 could be used to compare effects of current military training.	Kuenzi (1991): Reference No. 212

Populations of rayless goldenweed, a species known to increase on disturbed ground at PCMS, are likely to expand in response to increased ground disturbance in maneuver training areas and other training areas where they occur (Reference No. 217).

Direct impacts to swift fox caused by military training are minimal. Extensive studies were conducted on swift fox on PCMS in 1987-1989 and 1997-2006 to better understand its ecology. Those studies indicate that the species is doing well on PCMS and needs little management to survive as long as sufficient prey sources and suitable habitat are available.

Maintaining the range in good condition allows a diversity of small mammal populations needed to sustain viable swift fox populations. Although overall degradation of shortgrass prairie habitat on a large scale has not occurred at PCMS, should it occur it would likely result in a localized decline in swift fox populations (Reference No. 103).

Besides the swift fox's natural requirements, one potential threat that needs to be monitored is range expansion of the red fox, a known predator of swift fox. Should expansion in the range of the red fox reasonably threaten to extend to PCMS, coordination with other agencies such as USFWS and DOW might be in order.

Cumulative impacts from the Proposed Action in combination with past actions are anticipated to be significant but assessments of impact would change as monitoring data and better information are acquired. Impacts would likely be similar to those past actions documented in Table 5-1.

As determinations of specific effects of cumulative impacts of the ongoing military mission are completed, the Army would use the adaptive management process to adjust management programs to mitigate adverse impacts to vegetation or specific species to the best extent possible. The INRMP would continue to document the overall installation management plan, while the ITAM program would continue to be directed to repair and restoration efforts in response to maneuver damages downrange.

5.2.2.2.7. Cultural Resources

The cumulative impact to cultural resources consists of past, present, and reasonably foreseeable future actions which affect archeological resources or historic resources or their viewsheds on and around PCMS. The implementation of the Proposed Action may result in direct or indirect loss of cultural resources during PCMS maneuver training rotations through direct physical disturbance or through indirect loss from wildfires that military training could generate. It is anticipated that the Proposed Action would not result in significant adverse cumulative impacts with the continued cultural resource management program and policies in place to preserve historic and archaeological resources of PCMS. Procedures and processes implemented to protect cultural resources of PCMS are discussed in further detail below.

As mandated by federal law, archaeological and historic building inventories and evaluations on all resource areas are conducted prior to use by impact-generating activities, whether those activities are military training, construction, or other land management actions, such as erosion control and re-seeding efforts. For archaeological sites, once identified, each site is recorded, evaluated for eligibility on the National Register, and the cultural landscape is analyzed. If applicable, significant sites are set apart using a variety of site protection methods. In this way, the information gained ensures that the cultural characteristics and lifeways of those who have come before us is not lost to history, but rather contributes to it. The information acquired is used for future land management, and is also made available to qualified researchers for professional purposes and used in the Program's considerable educational outreach efforts.

In accordance with NHPA Sections 110 and 106 and the stipulations of all agreement and management documents, resources within PCMS would be surveyed and evaluated for National Register eligibility, providing a greater protection and overall preservation to these resources and understanding of cultural significance than those located on private lands which are not bound to these regulations and standards. Training activity under the Proposed Action includes the possibility of inadvertent damages to cultural resources that occur on rare occasion despite education and awareness programs to prevent them. It is anticipated that, with continued active management which is currently in place to preserve Fort Carson's historic and archaeological resources, the Proposed Action, along with the activities listed in Table 5-1, would not result in significant adverse cumulative impacts.

5.2.2.2.8. Socioeconomics

The cumulative impacts to socioeconomics consist of past, present, and reasonably foreseeable future actions which affect socioeconomics on and around PCMS. The Proposed Action involves no construction activities at PCMS, and current training practices involve only minor expenditures in the PCMS area. Thus, there are no anticipated cumulative socioeconomic effects. The Army has committed to taking actions to increase local purchases to support training at PCMS, but measure of the extent or impact of these actions is not yet possible. In 2008, Fort Carson also began a conceptual planning process to establish PCMS as a sub-installation, which may involve permanent assignment of support personnel to PCMS. That action has not yet reached the stage of characterization as reasonably foreseeable, however. Before it is implemented, it will receive NEPA analysis.

5.2.2.2.9. Transportation

The cumulative impact to transportation consists of past, present, and reasonably foreseeable future actions on and around PCMS. There is anticipated to be a less than significant cumulative impact to traffic and transportation. This takes into account the present and future personnel, equipment, and convoys to PCMS. The major impact to transportation would be from military convoys between PCMS and Fort Carson in addition to existing regional traffic. Some additional traffic would occur as a result of new construction projects proposed in the 2007 PCMS Transformation EIS. This traffic would be temporary and would result in less than significant impacts.

5.2.2.2.10. Utilities

The cumulative impact to utilities consists of past, present, and reasonably foreseeable future actions on and around PCMS. As stated in Section 4.10, the Proposed Action would not impact utilities or the need for additional utilities at PCMS. Upgrades and utilities construction to accommodate maximum training loads have been previously identified and analyzed in the 2007 PCMS Transformation EIS. This past analysis concluded that PCMS would be able to accommodate the additional IBCT and potential CAB units. The region remains relatively undeveloped, with no known large-scale projects that would significantly increase demands on utilities; no adverse cumulative impacts are anticipated.

5.2.2.2.11. Hazardous and Toxic Substances

The cumulative impact to hazardous and toxic substances consists of past, present, and reasonably foreseeable future actions that increase the handing or the generation of hazardous wastes on and around PCMS. Cumulatively, the Proposed Action would result in an increase in the use of hazardous materials and generation of petroleum based waste products. This would lead to an increase in requirements to handle, store, and dispose of hazardous waste. Any adverse cumulative impacts resulting from this increase or from additional increases caused by those projects listed in Table 5-1, however, would be offset through the Army's continued implementation of SOPs and plans (P2 Plan, HWMP, SPCCP, and the Installation Pest Management Plan). Thus, no significant cumulative impacts are anticipated.

5.2.2.2.12. Sustainability

The cumulative impact to sustainability consists of past, present, and reasonably foreseeable future actions that place a strain on sustainability principles on and around PCMS. The Proposed Action and other actions listed in Table 5-1 would increase the frequency of training at PCMS and would impact sustainable land use of PCMS. The region surrounding PCMS is projected to have limited population growth and additional need for energy and new facilities. Because of this, the primary sustainability challenges are predicted to be with the Army's internal management of PCMS to promote sustainable land use.

To ensure the continued availability of quality training lands, the Proposed Action would continue to implement land and environmental management programs on PCMS. These programs are designed to maintain a sustainable balance of land use and sustainability. The ITAM program, INRMP implementation, and limited use programs are predicted to reduce adverse cumulative effects to significant but mitigable levels at PCMS.

5.2.3. Cumulative Impacts Summary

The preceding discussion of cumulative impacts is summarized in Table 5-8.

Table 5-8 Summary of Cumulative Effects

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation[13,14]	Cumulative Effect
Fort Carson				
Land Use	• Changes to Land Use within Fort Carson	• Increasing development both within Fort Carson and along the Front Range. • Loss of open space within the Front Range and potential encroachment/adjacency of incompatible land uses.	• ACUB program would continue to both prevent land use incompatibility issues with neighboring areas and slow the reduction of undeveloped or open spaces in the region.	• The Proposed Action would result in negligible adverse cumulative effects.
Air Quality	• Emissions increase anticipated during construction, operations, and military training.	• Operations, training, and construction-introduced emissions beginning over 60 years ago that have affected air quality. • Local Metropolitan Planning Organization monitors regional trends for criteria pollutants and all below the NAAQS. • Conformity applicability and PSD analysis performed for projects. • Emissions increase from other regional construction and operations, added primarily by vehicle travel.	• Maintenance plan will continue to monitor CO emissions.	• The Proposed Action is not anticipated to result in violations of NAAQS. • None of the AERMOD predicted ambient concentrations exceed the corresponding NAAQS or CAAQS. Further analysis is needed, however, to determine whether negative air quality related value impacts will occur.

[13] As appropriate, Fort Carson will update the environmental management plans cited.
[14] Mitigation measures are subject to approval in the ROD and funding.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Noise	• Noise contours would remain unchanged as a result of the Proposed Action. The occurrence (duration) of noise produced, and noise generating activities associated with live-fire training are expected to increase by approximately 27 percent.	• Other past, present, and future projects occur within or adjacent to existing training ranges, potentially causing an adverse cumulative increase of noise within and areas adjacent to Fort Carson.	• Fort Carson would continue to implement the installation "Fly Neighborly" program, of which works to lessen the noise aircraft produce when flying in developed areas. • Noise complaint management procedures would continue to be implemented by logging, investigating, and applying corrective actions where applicable. • Other possible mitigation measures are siting adjustments for noise sensitive facilities, management of training activities, use of noise reduction technologies for receptors located within NZ II and NZ III.	• The Proposed Action would not result in a significant adverse change to noise outside of Fort Carson. • A significant cumulative increase in noise generating activities within Fort Carson could occur from the Proposed Action in combination with other range construction, cantonment area construction, and training activities.

Table 5-8 Summary of Cumulative Effects (continued)				
Resource	**Proposed Action**	**Past, Present, and Future Actions**	**Mitigation**	**Cumulative Effect**
Geology and Soils	• Minor adverse impacts would occur to soil resources within the cantonment area through the loss of soils resources and temporary increased potential for soil erosion during construction. Potentially adverse impact to soil resources could occur within downrange areas. It is predicted that there will be increased surface disturbance of soil, removal of vegetation, soil compacting and rutting, reduced infiltration, from range activities and increased training.	• The implementation of past, present, and future cantonment area construction and range construction/upgrades on Fort Carson have and will continue to have temporary impacts on soil erosion and loss of surface soils through erosion of disturbed construction sites. • Increase training frequencies and training activity/footprint would cause the potential for adverse soil erosion effects on Fort Carson/downrange area training lands.	• BMPs would be utilized to control wind and water erosion and stabilize sites following construction activities. • Fort Carson's ITAM program and training land deferment programs would continue to restore training lands and to reduce future erosion potential. • The INRMP and adaptive management of training lands would be implemented.	• The Proposed Action would result in significant, but mitigable cumulative impacts to soil erosion. There would be a potentially significant cumulative loss of soil resources, however, across the region as development of military projects in concert with community transportation projects and other regional initiatives continue.

Table 5-8 Summary of Cumulative Effects (continued)				
Resource	**Proposed Action**	**Past, Present, and Future Actions**	**Mitigation**	**Cumulative Effect**
Water Resources	• Increased training activities under the Proposed Action may increase groundwater use which would be accommodated through existing subsurface water rights. The Proposed Action would not release any water or pollutants that could infiltrate aquifers at Fort.	• Past development of the cantonment area has led to over 55 percent of the cantonment area containing impervious surface and alteration of natural drainage patterns. • Stormwater runoff has increased due to the increase of impervious surface area, erosion processes have become dominant in the southeastern-most stretches of the drainages, and both point and non-point source discharges are prevalent throughout the drainages. • Fort Carson has begun proactive management of stormwater to address stormwater runoff impacts associated with construction activities.	• Fort Carson would continue use of BMPs in construction and training activities and would adhere to BMPs and stormwater plans and permits to address impervious surface and stormwater runoff.	• The Proposed Action would result in adverse cumulative, but mitigable, effects to water resources. Increased impervious surface and stormwater runoff but would be mitigable. Other on-going or proposed Army actions as well as the Proposed Action are not anticipated to cause a cumulative adverse impact on local or regional water supplies.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Biological Resources	• The Proposed Action would result in a variety of potential impacts, including mortality, disturbance or displacement, and loss of habitat or nesting or foraging territory.	• Increasing development both within Fort Carson and along the Front Range. • Loss of vegetation and habitat within the Front Range from private and federal land development.	• Ongoing natural resources programs, such as described in the INRMP and ITAM programs at Fort Carson would continue to be implemented and provide mitigation for past (and ongoing) cumulative impacts. • Fort Carson will continue to adaptively assess the cumulative impacts on vegetation and wildlife and play a key role in sustaining native wildlife and vegetation in the region through its land management and natural resources programs to minimize these impacts.	• The Proposed Action would result in adverse cumulative, but mitigable, effects to biological resources. • Cumulative effects from the Proposed Action in combination with other present and planned future actions are and would continue to occur at Fort Carson and in the region.
Cultural Resources	• The Proposed Action may result in direct or indirect loss of cultural resources in the state of Colorado through training maneuvers or increased frequency of wildfires that military training could generate.	• Development in Fort Carson and downrange training prior to Section 106 requirements and ICRMP procedures have impacted cultural resources • Increasing private development along the Front Range has resulted in a loss of cultural resources.	• Fort Carson would continue cultural resource management program and policies to preserve Fort Carson's historic and archaeological resources.	• The Proposed Action would result in minimal adverse cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Socioeconomics	• The Proposed Action would result in an increase in active duty military employment of approximately 6,700 Soldiers by 2012 and approximately 27 civilian jobs. EIFS modeling results indicate an increase in the on-post residential of approximately 3,100 persons and an increase in the on-post workforce population of 9,700 persons.	• Increasing development both within Fort Carson and along the Front Range resulting in an increase of population, jobs, and an overall growing economic trend. • Increasing populations has caused the overall need for additional housing and public services.	• Strains on local housing markets would be reduced through the provision of barracks and housing for single Soldiers and supporting the housing needs of the married Soldiers and their families through the Residential Communities Initiative on the installation to decrease the number of Soldiers and Families requiring housing off-post. Adverse cumulative effects would be partially offset through the provision of federal impact aid to offset costs of providing public education to families of military personnel.	• The Proposed Action would result in beneficial and adverse, but mitigable, cumulative effects. The increase in both the personnel and residential population on Fort Carson and within the surrounding communities would have a net positive cumulative impact to the local and regional economy. • The increased population associated with the Proposed Action, along with the general trend of development and population growth with the Front Range, could cause a cumulative strain on housing and public services, including schools.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Transportation	• The addition of personnel and families to Fort Carson as described under the Proposed Action would result in five types of transportation impacts: increasing on-post and regional traffic and altering traffic patterns, temporary construction disturbances, increased rail use related to training at PCMS, increased transit ridership, and potential increase in rail and aviation for deployment.	• Increasing population and economic development has decreased the LOS within Fort Carson and along adjacent roadways. • Approximately $148 million in transportation projects are currently underway to accommodate current and future needs.	• Continue to provide federal funds for transportation improvement projects within Fort Carson and surrounding roadways to accommodate increase of base populations.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.
Utilities	• The Proposed Action would result in is increase in an increased demand for water, wastewater treatment, and electricity.	• Increasing population and development has increased utility usage within Fort Carson and the region.	• Adverse cumulative effects could be offset if Fort Carson continues to aggressively pursue water conservation and work with CSU to implement the CSU *Water Conservation Plan*. Replacing existing deteriorating water lines on-post and the proposed Southern Delivery System would offset cumulative impacts to firm yield for raw water.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Hazardous and Toxic Substances	• The Proposed Action would result in an increase in the use of hazardous materials and petroleum and subsequent generation, handling, storage, and disposal of wastes from these materials.	• Past and present operations at Fort Carson have resulted in the use and generation of hazardous and toxic substances. • Future operations at Fort Carson will likely result in the use and generation of hazardous and toxic substances.	• Fort Carson would continue to implement installation SOPs for disposal and handling of hazardous and toxic substances.	• The Proposed Action would result in negligible adverse cumulative effects.
Sustainability	• The Proposed Action would result in an increased use of energy, water resources and increased use of training lands.	• Past and present training at Fort Carson has resulted in the degradation of some of its lands and increased energy and water demand. • Future training will likely continue to cause the potential for land degradation and result in increased use of energy and water demand. • Increased population levels have resulted in increased energy and water demand. • Fort Carson has adopted aggressive policies to promote a sustainable environment.	• Fort Carson would continue to implement land and environmental management programs designed to maintain a sustainable balance of land use and sustainability.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.
PCMS				
Land Use	• The Proposed Action would not change existing land use classifications, and it would not pose a conflict with adjacent land uses.	• Prior to 1985, the land comprising PCMS was used to support large grazing operations and several residences. • PCMS has been used for military training exercises, on average, approximately four to six months per year though it has been used much less frequently since 2001 because of the increase in operational deployments of Fort Carson's units.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Air Quality	• Under the Proposed Action, the primary sources of air pollution would be combusted fuels and particulate matter generated by maneuver training activities.	• Existing and foreseeable development within and surrounding PCMS is anticipated to be limited; causing a low chance of additional sensitive receptors or sources of air pollutants.	• PCMS will be adaptively managed to ensure the sustainability of training areas. The installation will revegetate and rehabilitate "high use" areas to reduce the amounts of fugitive dust and particulate matter released into the atmosphere. Increased vehicle maneuvers will add additional CO_2, NO_x and other byproducts of combustion to the regional airshed in greater quantities.	• The Proposed Action would result in negligible adverse cumulative effects.
Noise	• Increased convoy movements would result in increased traffic noise levels, however, would not be a perceptible change to area residents.	• No existing or foreseeable planned development (noise receptor) is known for the PCMS area.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.
Geology and Soils	• The Proposed Action would result in potentially significant impacts to soil erosion within PCMS.	• Past and present training activities have has caused increase potential for erosion. • Future training activities and military use of PCMS will likely continue to increase the potential for erosion.	• PCMS would continue to implement adaptive training management, erosion control, and land rehabilitation programs including the ITAM program, INRMP implementation and limited use programs.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)				
Resource	**Proposed Action**	**Past, Present, and Future Actions**	**Mitigation**	**Cumulative Effect**
Water Resources	• The Proposed Action could impact water resources as increased maneuver training would result in a loss of vegetation and increase in surface disturbance exposing soils to water erosion during large storms.	• Past and present training activities have caused increased potential for sedimentation of local waterways. • Future training activities will likely increase the potential for sedimentation of local waterways. • Past, present, and future agricultural practices outside PCMS have and will continue to result in degradation of local water quality.	• PCMS would continue use of BMPs in construction and training activities to address soil erosion and stormwater runoff.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.
Biological Resources	• The Proposed Action would result in a variety of potential impacts, including disturbance and loss of habitat, nesting or foraging territory.	• Undisturbed grassland, shrubland, and woodland habitats in the region are likely to continue to shrink as a result of the population growth and economic development.	• Ongoing natural resources programs, such as described in the INRMP and ITAM programs at Fort Carson would continue to be implemented and provide mitigation for past (and ongoing) cumulative impacts. Continued regional partnering and education programs create awareness and protection of resources.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Cultural Resources	• The implementation of the Proposed Action may result in direct or indirect loss of cultural resources during PCMS maneuver training rotations through direct physical disturbance or through indirect loss from wildfires that military training could generate.	• Historical use of PCMS has impacted cultural resources. • Private development within the region, although limited, has the potential to result in a loss of cultural resources.	• PCMS would continue cultural resource management program and policies to preserve historic and archaeological resources.	• The Proposed Action would result in negligible adverse cumulative effects.
Socioeconomics	• The implementation of the Proposed Action would not result in adverse socioeconomic impacts.	• Limited development has occurred or is anticipated to occur within the region surrounding PCMS.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.
Transportation	• The Proposed Action would cause an adverse impact to transportation from military convoys deploying to and from PCMS from Fort Carson.	• Increased regional population growth has decreased the LOS along roadways servicing between Fort Carson and PCMS. • Past and present, personnel and equipment have been transported to and from PCMS and Fort Carson and will likely continue into the future.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.
Utilities	• The Proposed Action would not impact utilities.	• Limited development has occurred within the region surrounding PCMS. • No future large-scale federal or private projects that would significantly increase demands on utilities are known.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)				
Resource	**Proposed Action**	**Past, Present, and Future Actions**	**Mitigation**	**Cumulative Effect**
Hazardous and Toxic Substances	• The Proposed Action would result in an increase in the use of hazardous materials and petroleum and subsequent generation, handling, storage, and disposal of wastes from these materials.	• Past and present operations at Fort Carson have resulted in the use and generation of hazardous and toxic substances. • Future operations at Fort Carson will likely result in the use and generation of hazardous and toxic substances.	• PCMS would continue to implement installation SOPs for disposal and handling of hazardous and toxic substances.	• The Proposed Action would result in negligible adverse cumulative effects.
Sustainability	• The Proposed Action would result in an increase use of energy, water resources and increased use of training lands.	• The region surrounding PCMS is projected to have limited population growth and additional need for energy and new facilities.	• PCMS would continue to implement land and environmental management programs designed to maintain a sustainable balance of land use and sustainability.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

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6. Mitigation Summary

This chapter summarizes existing and potential mitigation measures that have the potential to reduce environmental impacts of the Proposed Action or alternatives.

6.1. General Mitigation Measures

Fort Carson employs the following primary mitigation processes throughout the installation to minimize current and future environmental impacts caused by Army actions: (1) implementation of *25-Year Sustainability Goals in 2002* (Reference 274), and SEMS; and (2) environmental impact analysis.

6.1.1. Sustainability

6.1.1.1. 25–Year Sustainability Goals

Fort Carson adopted 12 *25-Year Sustainability Goals in 2002* (Reference No. 274*)* which are described in more detail in Section 3.13. These goals address training lands, energy and water use, procurement, transportation, land use, site and building design, solid and hazardous waste, and air emissions. These goals, by nature, are intended to mitigate current and future impacts of Army actions through strategic planning principles. The Garrison Commander supports these goals through incorporation into the Fort Carson Strategic Plan, which directs subordinate commands and directorates to support sustainability initiatives. In support of the Strategic Plan, Fort Carson Sustainability Planners prepare and monitor 5-Year Sustainability Goal Plans associated with each Sustainability Goal and update the Plans on a biannual basis, or more frequently as necessary. In summary, Goal Plans have the Garrison Commander's support and serve to steer all Fort Carson sustainability initiatives towards achievement of 25-Year Goals (Reference No. 274).

6.1.1.2. Sustainability and Environmental Management System

Fort Carson adopted the International Organization for Standardization Environmental Management Standard 14001 (ISO 14001) in 2002 and declared conformance in November 2007. In accordance with ISO 14001, the Installation maintains an Environmental Management System (EMS) that includes a multitude of plans, policies, and procedures that support continual improvement. Fort Carson's EMS goes beyond conformance with ISO 14001 by incorporating sustainability principles, and is therefore appropriately titled SEMS. As part of the SEMS, Fort Carson sustainability and environmental professionals routinely analyze the Installation's environmental aspects for significant impacts and ensure operational controls are in place to appropriately mitigate these impacts. Fort Carson's key operational controls are implemented through regulations, management plans, and permits of which are discussed more extensively in Appendix A.

6.2. Environmental Impact Analysis

Fort Carson Environmental Staff use the internal *NEPA SOPs for Fort Carson and the Piñon Canyon Maneuver Site,* 2008 (Reference No. 300), to assess environmental impacts of Army Actions. In general, proposed projects are routed through the Fort Carson NEPA Coordinators to determine the level of NEPA analysis required. There are basically three levels of NEPA. Based on specific criteria, a project may be categorically excluded and documented with a REC. If the action does not meet the criteria, an EA, or an EIS would be performed (based on the magnitude and/or potential significant impacts of the project). The Installation NEPA Coordinators prepare the appropriate level of analysis and documentation for recordkeeping, Army review, and public review.

6.3. Specific Mitigation Measures

Table 6-1 presents a summary of existing and potential mitigation opportunities identified through the FEIS process and that are under consideration by the Army to minimize potential impacts of the Proposed Action or alternatives. The table describes potential impacts, existing mitigation practices, and potential mitigation measures that apply to each alternative. The measures listed in the table address various types of potential impacts, not just adverse impacts. The Army would specify which mitigation measures it would implement in the ROD.

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS

Impact by Resource	*Existing Mitigation Measure*	*Proposed Additional Mitigation Measure*	*Alternative*
Land Use – Fort Carson			
• Siting major construction projects within training lands would reduce overall training area acreage somewhat, thereby requiring movement of some training facilities elsewhere on the installation and adjusting training to the remaining land available. • Adding more units and troops would create more demand for already limited training areas. • Increased training may result in reduced hunting opportunities.	• Continue to support Goal 11 – Training Lands objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002. • Units, G-3, and Range Control facilitate training area workarounds to meet training and mission requirements.	• Consult with the public and CDOW to maximize public hunting opportunities.	• Proposed Action, 1, 2
Air Quality – Fort Carson			
• Increased vehicular emissions on-post and off-post associated with additional personnel traveling around the Installation and in the surrounding region.	• Continue pursuing alternative transportation methods through collaboration with the City of Colorado Springs Mountain Metropolitan Transit, PPACG, and other organizations to encourage transit ridership and carpooling to reduce vehicle travel miles. • Continue to support Goal 5 – Zero HAPs objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• None identified.	• Proposed Action, 1, 2
• Emissions associated with the Annual Prescribed Burn Program. (Prescribed Burn Program is influenced by environmental conditions and the level of training conducted).	• Comply with the Fort Carson Prescribed Fire Management Plan to limit adverse effects of prescribed burns. • Continue to support Goal 5 – Zero HAPs objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• In concert with prescribed burning, use alternate fuel reduction methods such as mowing, and use of reseeding mixtures that produce reduced biomass in comparison to current practices.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
• Additional training could result in impacts to air quality from increased fugitive dust from more frequent off-road vehicle travel.	• All training activities are subject to Fort Carson's Fugitive Dust Control Plan. Military convoys must comply with a lower speed limit than regular traffic. Fort Carson applies chemical stabilizer (dust palliative) to tank trails parallel to I-25 and Highway 115, as well as to unpaved areas within the cantonment and downrange Areas.	• Collect additional data to determine impacts of fugitive dust generation and investigate need for additional dust control measures to control fugitive dust generation. Additional mitigation measures would be implemented if impacts were shown to be severe, safety considerations are compromised or otherwise in violation of applicable standards. • Investigate and, if appropriate and affordable, use dust palliatives with longer effective life spans than currently used chemical stabilizers.	• Proposed Action, 1, 2
• Construction of facilities would result in impacts to air quality from exhaust emissions from construction equipment, fugitive dust from construction activities, and additional vehicle trips by construction workers. Construction impacts would be short-term and limited to the duration and area of construction activities.	• All construction activities are subject to Fort Carson's Fugitive Dust Control Plan. Site-specific dust control plans are required for all projects greater than 25 acres or disturbed for 6 months or longer (state permit) and an El Paso County permit is required for disturbed land greater than one acre. Implementation of BMPs, including dust suppression and establishment of speed limits in construction areas. Use of low sulfur diesel fuel to reduce SO_x emissions. • Continue to support Goal 5 – Zero HAPs objectives and targets of Fort Carson's *25*-Year Sustainability Goals in 2002.	• As available, practical, and affordable, use ultra low sulfur diesel fuel to further reduce SO_x emissions in equipment engines. • Update Title V Permit within 12 months of finalizing construction permits.	• Proposed Action, 1, 2
• Increased fugitive emissions from facility construction could impact Fort Carson's status as an area source for Hazardous Air Pollutants and trigger major source status.	• Track all construction products including paints, thinners, sealers, coatings, adhesives, and similar to determine insignificant source contributions. • Continue to support Goal 5 – Zero HAPs objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• If feasible, have contracts include language for contractors to submit MSDS for all construction products used, with amounts and units to Fort Carson's Air Program to determine emissions estimates. Encourage use of LEED system to limit HAP and VOC emissions by specifying Green Seal certification or similar product rating. • Investigate and, if appropriate and affordable, use dust palliatives with longer effective life spans than chemical stabilizers currently in use.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
• Operation of additional external combustion sources has the potential to result in impacts to air quality. Emissions from proposed stationary sources.	• Installation of low NO_x burner systems for all boilers and hot water heaters to reduce emissions.	• Limit the use of indirect fired MAU for stationary source HVAC. Prior design and construction consideration and coordination with the Fort Carson Air Program would be required before specifying these units to ensure PSD limits are not exceeded. Include similar coordination language in construction contracts as feasible.	• Proposed Action, 1, 2
Noise – Fort Carson			
• Aircraft noise generated from helicopters.	• Continue to implement Installation "Fly Neighborly" program, which works to lessen the noise aircraft produce when flying in developed areas. • Continue to implement ACUB Program to maximum extent possible to reduce, or limit increases in, development around Fort Carson that would be incompatible with aircraft noise. • Adhere to Installation Environmental Noise Management Plan guidelines and procedures.	• Installation G3 and Range Control schedule and coordinate aviation training to reduce noise impacts to installation facilities.	• Proposed Action, 1, 2
• Large and small-caliber weapons use during increased numbers of live-fire and qualification exercises.	• Continue to implement ACUB Program to maximum extent possible to reduce, or limit increases in, development around Fort Carson that would be incompatible with weapons noise. • Adhere to Installation Environmental Noise Management Plan guidelines and procedures.	• None identified.	• Proposed Action, 1, 2
• Increased exposure to Noise Zone II in barracks, child development center, chapels, and other noise-sensitive receptors.	• Adhere to Installation Environmental Noise Management Plan guidelines and procedures.	• Integrate, to the extent practical and affordable, noise mitigation techniques into construction of noise sensitive facilities (examples: brick/masonry construction, increased thermal insulation, sealing cracks, and spaces between wall layers). Noise mitigation techniques for construction are described in the Installation Environmental Noise Management Plan. • Installation G3 and Range Control schedule and coordinate aviation training to reduce noise impacts to installation facilities.	• Proposed Action, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Geology/Soils – Fort Carson			
• Potential construction site instability. Constructing facilities outside of known geologically stable areas increases risk exponentially.	• Site-specific geotechnical analyses,in conjunction with area research and additional borings conducted.	• None identified.	• Proposed Action, 2
• Temporary increase in potential for sedimentation and erosion due to ground disturbance associated with construction and demolition projects.	• Adhere to SWPPP and MS4 requirements, which include BMPs to maintain drainages and restore vegetative cover on the construction site as quickly as would be practicable. • Continue methods described in the INRMP and Section 404 regional permit for erosion control methods.	• None identified.	• Proposed Action, 1, 2
• Accelerated soil erosion in training areas.	• Fund and implement land management practices and procedures described in the ITAM annual work plan to reduce erosion and geologic impacts. • Adhere to MS4 requirements.	• Increase funding of the ITAM program to address additional erosion.	• Proposed Action, 1, 2
• Erosion of range access roads.	• Maintain range roads and tank trails to minimize erosion in accordance with ITAM and facilities management program requirements. • Adhere to MS4 requirements.	• Increase levels of SRM funding to address increased levels of wear and tear on roads and trails.	• Proposed Action, 1, 2
Water Resources – Fort Carson			
• Construction of facilities could result in stormwater runoff from land disturbance, hazardous substances storage, and discharges of non-stormwater from the site. Construction impacts would be short-term and limited to the duration of construction activities; however, the extent of impacts may go beyond the project site boundary.	• Pursuant to provisions in the CWA, work being performed at Fort Carson that disturbs one acre or more is subject to coverage under the EPA's Construction General Permit number COR10000F. In accordance with permit conditions, project proponents must submit a Notice of Intent to EPA and develop and implement a SWPPP for each project that includes mitigation strategies to reduce impacts associated with stormwater runoff during construction. • Continue use of BMPs • Continue to manage hazardous materials in accordance with applicable Fort Carson regulations and management plans. These include: FC Regulation 200-1, P2 Plan, SPCCP, HWMP.	• Use of Low-Impact Development practices.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
• Design and construction of facilities could result in impacts to Fort Carson's stormwater drainage system from sediment and other non-stormwater discharges and inadequate design of permanent stormwater controls.	• Fort Carson is an MS4 permitted facility. Therefore, any land disturbance on Fort Carson is subject to the terms of Fort Carson's Final Stormwater Management Plan in order to help mitigate negative impacts to water quality. • Continue to support Goal 1 – Energy and Water objectives and targets of Fort Carson's • 25-Year Sustainability Goals in 2002.	• None identified.	• Proposed Action, 1, 2
Biological Resources – Fort Carson			
• Loss of habitat due to construction.	• Minimize construction site footprint. • Adhere to SWPPP and MS4 requirements, which include BMPs to maintain drainages and restore vegetative cover on the construction site as quickly as would be practicable. • Continue recommendations outlined in management plans and the INRMP.	• None identified.	• Proposed Action, 1, 2
• Increase in nuisance species in vicinity of IBCT and CAB facility sets.	• Limit construction of administrative and operational facilities in natural wildlife corridors. • Continue to educate Soldiers and civilians through venues such as Mayor and Town Hall meetings, EPO course, National Night Out, and Safety Days. • Use solid waste disposal practices that limit access by wildlife.	• Use design mitigation techniques in facilities in order to minimize nuisance species habitat; use xeriscaping, or other habitat denial techniques. • Use wildlife-proof dumpsters where necessary.	• Proposed Action, 2
• Increase in BASH at BAAF.	• Limit nuisance species habitats in vicinity of airfields. • Exclude and/or relocate nuisance species from BAAF vicinity.	• Conduct wildlife hazard assessment and prepare BASH Plan. Implement appropriate mitigation measures as indicated in the plan. • Reduce nuisance wildlife habitat through design mitigation and wildlife-proofing dumpsters.	• Proposed Action, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
• Increased disturbance of breeding raptors.	• Continue to implement INRMP and Bald Eagle Management Plan. • Continue to prevent breeding season fires from encroaching on breeding habitat by burning adjacent areas in late winter or early spring. • Continue to retrofit utility systems with avian protection devices and follow practices outlined in the Avian Protection Plan Guidelines.	• Study the impacts of aircraft training on breeding raptor populations and develop and implement mitigation strategies based on results, as appropriate. • Establish buffer zones around nests in which human activity is curtailed or reduced.	• Proposed Action, 1, 2
• Increased vehicular collisions with deer and other wildlife.	• Limit construction of administrative and operational facilities within vicinities of natural wildlife corridors. • Use lower speed limits in downrange areas to reduce safety and environmental hazards.	• Adjust speed limit on Wilderness Road as appropriate to minimize collisions. • Increase speed limit enforcement efforts on Wilderness Road. • Erect deer hazard signage.	• Proposed Action, 2
• Increase in hazardous wildlife such as black bear, mountain lions, coyotes, and venomous snakes, as well as the potential spread of plague and hanta virus.	• Limit construction of administrative and operational facilities within vicinities of natural wildlife corridors. • Limit Soldier exposure to areas known to be frequented by hazardous wildlife or identified to potentially contain the plague and/or hanta virus. • Continue BMPs (land restrictions and habitat restoration based upon identifying and prioritizing critical areas and resources, maintain ecologically healthy grasslands, and development of water resources). • Continue to educate Soldiers and civilians on wildlife and their inherent risks.	• Use bear resistant trash containers to eliminate food sources for hazardous wildlife. • Use native vegetation that is not attractive to wildlife in landscaping.	• Proposed Action, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)

Impact by Resource	*Existing Mitigation Measure*	*Proposed Additional Mitigation Measure*	*Alternative*
• Damage to vegetation and subsequent increase in noxious weed infestations due to more frequent tactical vehicle use.	• Continue to manage training lands in accordance with ITAM, INRMP, Fort Carson Invasive Species Management Plan, and program requirements. • Continue to employ integrated weed management strategies (biological, chemical, cultural, and physical/mechanical control techniques). • Continue to eradicate all Colorado A-list species when found. • Conduct mission activities in a manner that precludes the introduction or spread of invasive species. • Continue procedures for cleaning vehicles and equipment prior to shipment from one location to another, deployment, and/or redeployment.	• Authorize and hire additional staff necessary to accomplish increased field survey work, mapping, preventive education and awareness activities, record-keeping and reporting requirements resulting from the addition of Soldiers, and their equipment and training requirements. • Increased herbicide and biocontrol agents would be used when and where appropriate, as determined by the Installation Noxious Weed Management Team.	• Proposed Action, 1, 2
• Impacts on sensitive species from construction, maintenance, and training activities.	• Survey and monitor sensitive species habitat and conduct construction, maintenance, and training activities in accordance with the INRMP, which describes appropriate species management and impact mitigation techniques.	• None identified.	• Proposed Action, 1, 2
• Accidental wildfires caused by live-fire and maneuver training.	• Continue prescribed burning to create buffer areas and reduce fuel loads. • Continue to update the annual Fort Carson Fire and Emergency Services Prescribed Fire Plan. • Fort Carson fire response teams would continue to be available to respond to wildland fires. • The Army would continue to comply with cooperative agreements with the Colorado Springs fire department and USFS. • Continue with BAER efforts.	• Investigate the feasibility of constructing an additional fire station downrange.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)

Impact by Resource	*Existing Mitigation Measure*	*Proposed Additional Mitigation Measure*	*Alternative*
Cultural Resources – Fort Carson			
• Potential adverse impacts to cultural properties from renovation or new construction.	• Implementation of Fort Carson's ICRMP, and development of the AAP, would continue to maintain cultural resources sustainability. This includes evaluation of all historic properties for NRHP eligibility and continued consultations with Native American tribes to identify and evaluate TCPs and Sacred Sites. • BMPs, as identified in the ICRMP are used during project design and planning to avoid or minimize effects to all cultural sites. If a potential impact cannot be avoided, consultation with the COSHPO, Native American tribes, and other interested parties would be initiated.	• None identified.	• Proposed Action, 1, 2
• Potential loss of unrecorded archeological resources during construction and training activities.	• Unsurveyed areas required for military use would be surveyed, and resources identified during survey would be evaluated for NRHP eligibility according to the Secretary of the Interior's Standards for Archaeology and Historic Preservation, as well as applicable Colorado standards. • Fort Carson would continue development and implementation of the cultural resources education and awareness programs for Army personnel, families, civilians, and the public to enhance the conservation of historic properties on Fort Carson lands. If cultural resources are discovered or disturbed during any undertaking, Fort Carson's Inadvertent Discovery of Archaeological Resources or Burials SOPs would be implemented. • Continued implementation of the ICRMP.	• If subsurface cultural resources are discovered or disturbed during construction, Fort Carson's Inadvertent Discovery of Archaeological Resources or Burials SOPs or NAGRPA SOPs and appropriate Section 106 consultation will be implemented.	• Proposed Action, 1, 2
• Accidental wildlifes caused by live-fire and maneuver training.	• The Army would continue to comply with cooperative agreements with the Colorado Springs fire department and USFS. • Continue with BAER efforts.	• Investigate the feasibility of constructing an additional fire station downrange.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)

Impact by Resource	*Existing Mitigation Measure*	*Proposed Additional Mitigation Measure*	*Alternative*
Socioeconomics – Fort Carson			
• Minor temporary economic benefits to ROI associated with construction expenditures and employment. • Minor long-term economic benefits associated with population increases such as increased sales volume, employment and income in the ROI.	• Mitigation is not required as these impacts are favorable but not significant.	• None identified.	• Proposed Action, 1, 2
• Increased housing demand for Fort Carson personnel.	• Construct additional on-post housing. • Private construction is taking place in the off-post housing market to satisfy the increased demand.	• None identified.	• Proposed Action, 1, 2
• Increased student population in area school districts.	• Federal impact aid is provided on a per-student basis as an offset for the costs incurred by civilian school districts.	• None identified.	• Proposed Action, 1, 2
• Increased demand for hospital space and medical professionals.	• Increase capacity of Evans Hospital to accommodate additional staff and patients.	• None identified.	• Proposed Action, 1, 2
• Additional Soldiers and their Families would require more on-post services.	• The Army is continuing to plan for additional facilities to support Soldier services.	• Installation would receive increased funding for SRM to maintain facilities.	• Proposed Action, 1, 2
• Additional Soldiers and their Families would generate additional demand for off-post recreation and services.	• The services provided through the private sector can be expected to respond to the increased demand by increasing supply.	• The demand for facilities may be moderated by use of new on-post facilities.	• Proposed Action, 1, 2
• Potential increase in safety risk to children at construction sites.	• Continue safety measures outlined in 29 CFR Part 1926, "Safety and Health Regulation for Construction" and follow other applicable regulations and guidance.	• Barriers and no trespassing signs would be placed around construction sites to deter children from playing in these areas and construction vehicles, equipment, and materials stored in fenced areas and secured when not in use.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Transportation – Fort Carson			
• Increased demand at access control points and additional traffic congestion throughout major roadway networks on the installation.	• Alterative transportation modes are being explored in traffic demand management and low impact vehicle studies. • Continue to support Goal 2 – Sustainable Transportation objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• Use the Fort Carson Comprehensive Transportation Study 2008 Update Action Plan, as amended and updated, to review and implement necessary roadway improvements. • Activate and expand Gates 6 and 19 to absorb additional traffic entering and leaving the installation. (These projects are part of the Proposed Action and Alterative 2. See Appendix B.) • Coordinate with CDOT to try to include SH 115 intersection improvements at Fort Carson gates. • Implement alternative transportation modes as appropriate • Provide additional bus routes and more frequent bus service.	• Proposed Action, 2
• Additional use of the rail line connecting Fort Carson and PCMS due to the additional training of the IBCT, CAB, and CSS units at PCMS.		• Advanced scheduling of rail shipments through the Installation Transportation Officer to minimize the effects of increased use of the rail system.	• Proposed Action, 1, 2
• On-post roadway closure due to construction activities.		• Use of traffic control procedures, including flaggers and posted detours to minimize impacts to traffic flow. • Minimize construction vehicle movement during peak rush hours on the installation and placing construction staging areas in optimal locations to minimize traffic within administrative, housing, and school areas.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)

Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Hazardous and Toxic Substances – Fort Carson			
• Demolition of existing facilities would require proper removal and disposal of asbestos containing materials (ACMs), lead-based paints (LBPs), and PCBs.	• Continue to comply with asbestos and lead National Emission Standard for Hazardous Air Pollutants as well as Toxic Substances and Control Act requirements by adhering to applicable permits and the following Fort Carson management plans; Lead Management Plan, Asbestos Management Plan, Fugitive Dust Control Plan, Polychlorinated Biphenyl Management Plan.	• None identified.	• Proposed Action, 1, 2
• Exposure to contaminated soil, groundwater, and waste materials in Training Area Bravo may occur if construction is sited within the footprint of Landfill 2/3 and Landfill 8.	• Presently, Landfills 2/3 and 8 have interim soil covers; however, final covers would be installed by 2011 to achieve closure and maintain compliance with the terms of Fort Carson's hazardous waste permit.	• Avoid construction within the footprint of the landfill to the extent possible.	• Alternative 1
• Exposure to petroleum contaminated soil at BAAF (1986 release of unleaded fuel, est. at 10,500 gal.) may occur as a result of construction adjacent to the footprint of the former hot refueling pad and former Building 9648.	• Site closure has been requested through the Colorado Division of Oil and Public Safety.	• Quarterly groundwater monitoring and reporting of contaminant concentrations in groundwater until closure is completed.	• Proposed Action, 1, 2
• Potential exposure to chlorinated organic compounds may occur as a result of construction over a plume of contaminated groundwater in the vicinity of the CSS proposed construction sites at Wetzel and Specker.	• Groundwater monitoring and reporting of contaminant concentrations. Cleanup of the site has entered the corrective measures phase.	• If deemed necessary, install injection and barrier wells, followed by in situ groundwater treatment, confirmation monitoring, and preparation of the remedy completion report. • Implement the remedies selected by CDPHE.	• Proposed Action, 1, 2
• Hazardous materials use and potential releases would increase commensurately with personnel and equipment.	• Continue to manage hazardous materials in accordance with HMCC and applicable Fort Carson regulations and management plans. These include: FC Regulation 200-1, P2 Plan, SPCCP, HWMP. • Continue to implement the ASP SOP for storage and transportation of additional munitions. • Designated Installation Explosives Ordnance Detachment would continue to respond to discoveries of UXO for safe open detonation either in place or at Range 121.	• None identified.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
• Increased UXO generation as a result of additional live-fire training of IBCT, CAB, and CSS units.	• Continue to implement management plans and SOPs for munitions handling, UXO removal, and maintenance and management of vegetation in impact areas to preclude surface water or wind transport.	• None identified.	• Proposed Action, 1, 2
• Potential exposure to elevated radon levels in buildings.	• Install radon mitigation systems in buildings with radon levels 4pCi/L or higher. Retest to confirm radon values are at an acceptable level.	• Construct new facilities to incorporate design mitigation techniques in areas with elevated radon levels in accordance with the Fort Carson Radon Management Plan.	• Proposed Action, 1, 2
Utilities – Fort Carson			
• Increased peak electrical and natural gas demands.	• Follow Installation Design Guide for construction. Require the achievement of LEED Silver on all new construction. • Continue to provide energy management training to Soldiers through the Building Energy Manager course. • Continue to inspect units, directorates and tenants in regard to energy use and conformance with FC Regulation 200-1. • Continue to support Goal 1 – Energy and Water, and Goal 7 – Platinum Buildings objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• Construction of utilities infrastructure to satisfy the increased demand is part of the Proposed Action and alternatives. • Require all facilities be connected to the Energy Management Control System (EMCS) to allow for remotely controlling HVAC systems to the extent practical and affordable. • Investigate and implement the use of renewable resources in new construction to reduce the demand for natural gas and electricity.	• Proposed Action, 1, 2
• Increased personnel and Family Members at Fort Carson and in Colorado Springs would increase pressure on current water supplies from CSU.	• Implement planned upgrades to existing water lines. • Continue cooperative efforts with the surrounding communities. • Continue to implement water use reduction measures such as low-flow toilets and waterless urinals, xeriscaping, and use of gray water for irrigation. • Continue to support Goal 1 – Energy and Water, objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• None identified.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)

Impact by Resource	*Existing Mitigation Measure*	*Proposed Additional Mitigation Measure*	*Alternative*
• Additional wastewater generation from administrative and operational activities.		• Upgraded capacity and extend existing sanitary sewer lines are part of the Proposed Action and alternatives. • Implement recommendations of the 2006 Wastewater Treatment Plant Capacity Evaluation, which includes aeration system and equalization basin channel improvements.	• Proposed Action, 2
• Construction of electrical, gas and fiber optic line upgrades would disturb soil and vegetation within construction footprint in vicinity of ORTC and Tent City.	• All new electric and gas lines are buried underground, and disturbed areas are graded and reseeded after construction to stabilize the soil.	• None identified.	• Proposed Action, 2
• Solid waste generation would increase with additional personnel.	• Solid wastes and recyclable materials would continue to be managed in accordance with the existing ISWMP and P2 Plan.	• None identified.	• Proposed Action, 1, 2
• Increased production of industrial wastewater.		• New industrial wastewater lines would be installed along Butts Road and along the southern portion of the ORTC, as part of the Proposed Action and alternatives.	• Proposed Action, 1, 2
Land Use – Piñon Canyon Maneuver Site			
• Increased training may result in reduced hunting opportunities.		• Consult with the public and CDOW to maximize public hunting opportunities.	• Proposed Action, 1, 2
Air Quality – Piñon Canyon Maneuver Site			
• Increased fugitive dust emissions from increased training.	• All training activities are subject to Fort Carson and PCMS Fugitive Dust Control Plan. Military convoys must comply with a lower speed limit than regular traffic. • Fort Carson applies chemical stabilizer to tank trails.	• Collect additional data on impacts of fugitive dust generation and implement additional control measures as required. • Investigate and, if appropriate and affordable, use dust palliatives with longer effective life spans than currently used chemical stabilizers.	• Proposed Action, 1, 2
Noise – Piñon Canyon Maneuver Site			
• Noise from increased use of small arms ranges and live-fire ranges and increased aviation training of potential CAB.	• Continue to implement Installation "Fly Neighborly" program, of which works to lessen the noise aircraft produce when flying in developed areas. • Adhere to Installation Environmental Noise Management Plan guidelines and procedures.	• None identified.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Geology and Soils – Piñon Canyon Maneuver Site			
• Increased soil erosion from maneuver activity of IBCT and increased helicopter training of potential CAB.	• Continue to fund and implement land management practices and procedures as described in the ITAM annual work plan and INRMP to reduce soil erosion and maintain sustainable use of its training areas. ITAM would continue to implement erosion management measures, site restoration, and continue to monitor training areas to mitigate damage from unit training. • Continue to limit soil erosion by designating no-dig areas around drainages feeding the Purgatoire River and restricting mounted maneuver in areas susceptible to water erosion in the canyon drainage and northern training areas. • Continue to take measures to reduce the potential for wild fires. Prescribed burning and other measures would continue to be used to prevent fires and limit their severity when they do occur. In addition, Soldiers are educated on fire prevention procedures prior to conducting maneuver training at PCMS and are required to have a minimum amount of firefighting equipment on hand to extinguish small fires during maneuver training. • Maintain range roads and tank trails and continued use of dust palliatives to minimize erosion.	• Fund additional land rehabilitation projects necessary to control erosion impacts of additional training. • Create hardened designated landing areas, as necessary and appropriate, to limit soil erosion and sedimentation impacts.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Water Resources – Piñon Canyon Maneuver Site			
• Increased impacts to stormwater runoff from land disturbance.	• Continued use of erosion control dams, reseeding, and other BMPs as required in the ITAM Annual Work Plan and INRMP.	• Conduct a Watershed Assessment of River Stability and Sediment Supply (WARSSS) assessment to aid in determining the health and stability of the major waterways within the western-most watersheds at PCMS (that were previously modeled). WARSSS is a geomorphology-based procedure for quantifying the effects of land uses on sediment relations and channel stability. The results of the WARSSS assessment would reveal any significant adverse influences of land use on stream channel stability, sediment sources, and sediment yield that may affect the material and beneficial uses of rivers and streams. WARSSS data can be used for watershed planning, TMDL assessments for non-point source pollution, and stability analysis for river restoration. • Develop a Stormwater Management Plan for PCMS.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Biological Resources – Piñon Canyon Maneuver Site			
• Impacts to Biological Resources, including destruction of sensitive species habitat, wetlands, and noxious weed infestation, from military training. • Impacts on sensitive species from training activities. • Damage to vegetation and subsequent increase in noxious weed infestations due to more frequent tactical vehicle use.	• Continue to comply with all laws, regulations and Army policies governing natural resource protection. • Continue to comply with Fort Carson/PCMS regional permit (or other permit as necessary), identified by the Section 404 process. • Continue to manage training lands in accordance with ITAM, INRMP, and Fort Carson Invasive Species Management Plan and program requirements. • Survey and monitor sensitive species habitat and conduct maintenance and training activities in accordance with the INRMP. • Continue the practice of installing all new and replacement electric lines underground. • Buffer areas around raptor nesting sites. Disturbance activities (e.g., mowing, prescribed burns) are restricted during nesting seasons.	• Install a central vehicle wash facility to reduce the potential spread of weed seed. • Authorize and hire additional personnel necessary to accomplish increased field survey work, mapping, preventive education and awareness activities, record-keeping and reporting requirements. • Increased herbicide and biocontrol agents would be used when and where appropriate, as determined by the Installation Noxious Weed Management Team. • Authorize and hire additional personnel necessary to monitor wildlife and vegetation. • Augmentation of, as appropriate, permanent environmental and/or ITAM staff at PCMS. Additional onsite staff would facilitate coordination of increased training activities as well as the protection of natural and cultural resources. • Study the impacts of aircraft training on breeding raptor populations and develop mitigation strategies based on results.	• Proposed Action, 1, 2
• Accidental wildfires caused by live-fire and maneuver training.	• The Army would continue to comply with cooperative agreements with the USFS and other agencies. • Continue with BAER efforts.	• None identified.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
Cultural Resources – Piñon Canyon Maneuver Site			
• Potential loss of unrecorded archaeological resources during training activities. • Potential impacts to archeological resources during increased training activities.	• Implementation of Fort Carson's ICRMP, and development of the AAP, would continue to maintain cultural resources sustainability. This includes evaluation of all historic properties for NRHP eligibility and continued consultations with Native American tribes to identify and evaluate TCPs and Sacred Sites. • BMPs, as stated in the ICRMP, are used during project design and planning to avoid or minimize effects to all cultural sites. If a potential impact cannot be avoided, consultation with the COSHPO, Native American tribes, and other interested parties would be initiated.	• Increase awareness and education of Soldiers and the public by developing a plan for a Heritage Resource Center that would entail curation, scientific education, and construction of a heritage awareness facility located at PCMS. Explore making a select number of historic ranch sites more accessible to the public as examples of ranching heritage in Southeast Colorado. • The Fort Carson, Public Affairs Office and MWR would work to establish a tourism program for Fort Carson Soldiers and Families, focusing on selected historic points in and around PCMS. • Augmentation of, as appropriate, permanent cultural resources staff at PCMS to help ensure the coordination of activities and protection of cultural resources.	• Proposed Action, 1, 2
Socioeconomics – Piñon Canyon Maneuver Site			
• Potential economic benefit to ROI.	• Mitigation is not required as these impacts are favorable but not significant.	• Investigate ways to further enhance favorable economic benefit such as increase spending locally, and educate local businesses in government contracting processes. Additionally, explore contractual methods to buy locally whenever possible and feasible.	• Proposed Action, 1, 2
Transportation – Piñon Canyon Maneuver Site			
• Increased convoy traffic.	• Continue to schedule convoys to PCMS during off-peak road usage times. Continue to break larger convoys into smaller numbers of vehicles travelling together to facilitate traffic flow.	• None identified.	• Proposed Action 1, 2
Hazardous and Toxic Substances – Piñon Canyon Maneuver Site			
• Increased use of hazardous materials.	• Continue to follow Federal, State and Army Regulations for the use, removal, and disposal of regulated materials.	• None identified.	• Proposed Action, 1, 2

Table 6-1. Summary of Environmental Impacts and Mitigation Measures for Fort Carson and PCMS (continued)			
Impact by Resource	***Existing Mitigation Measure***	***Proposed Additional Mitigation Measure***	***Alternative***
• Increased accumulation of lead in soils on firing ranges.	• Continue to implement ITAM and re-vegetation programs following maneuver and live fire training activities at PCMS to reduce the ability of lead to migrate from firing ranges. Re-vegetation would occur with grasses and vegetation that would stand up to small arms range use and also minimize the impact of range fires.	• None identified.	• Proposed Action, 1, 2
Utilities – Piñon Canyon Maneuver Site			
• Increased use of heating fuel and propane due to increased facilities use.	• Continue to support Goal 1 – Energy and Water objectives and targets of Fort Carson's *25-Year* Sustainability Goals in 2002.	• Investigate and implement the use of ground source heat pumps to reduce the need for heating oil and propane in new facilities.	• Proposed Action, 1, 2
• Increased water usage.	• Continue to monitor main water line from the City of Trinidad for necessary repairs.	• None identified.	• Proposed Action, 1, 2
• Increased solid waste generation with additional training activities.	• Continued waste pickup would be managed via private contractor and disposed of in permanent disposal facilities. • Continue to support Goal 10 – Zero Waste objectives and targets of Fort Carson's 25-Year Sustainability Goals in 2002.	• None identified.	• Proposed Action, 1, 2

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7. References

Numbers are not sequential because, in some cases, previous references used in the Draft EIS are not used in the Final EIS.

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9. Acronyms

2BCT-2ID	2nd Brigade Combat Team, 2nd Infantry Division
2BCT-4ID	2nd Brigade Combat Team, 4th Infantry Division
3BCT	3rd Brigade Combat Team
3BCT-4ID	3rd Brigade Combat Team, 4th Infantry Division
4BCT-4ID	4th Brigade Combat Team, 4th Infantry Division
4ID	4th Infantry Division
5-4ID	5th Brigade, 4th Infantry Division
AAFES	Army Air Force Exchange Service
AAP	Army Alternate Procedures
ACAM	Air Conformity Applicability Model
ACHP	Advisory Council on Historic Preservation
ACR	Armored Calvary Regiment
ACUB	Army Compatible Use Buffers
ADA	Average Daily Attendance
ADM	Air Dispersion Modeling
ADNL	A-weighted DNL (ADNL)
ADT	Average Daily Traffic
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFV	Alternative Fuel Vehical
AH	Attack Helicoper
AIRFA	American Indian Religious Freedom Act
AMF	Army Modular Force
AMS	American Meteorological Society
amsl	above mean sea level
AOAPL	Army Oil Analysis Program Laboratory
AOC	Area of Concern
AOI	Area of Interest
APCD	Air Pollution Control Division
APE	Area of Potential Effect
APEN	Air Pollutant Emission Notice
APHIS	Animal and Plant Health Inspection Service
AQCC	Air Quality Control Commission
AQRV	Air Quality Related Value
AR	Army Regulation
ASP	Ammunition Supply Point
AST	aboveground storage tank
AWSS	Aerial Weapons Scoring System

B.P.	Before Present
BAAF	Butts Army Airfield
BAER	Burned Area Emergency Response/Rehabilitation
BART	Best Available Retrofit Technology
BASH	Bird Air Strike Hazards
BCT	Brigade Combat Team
BH	Bridage Headquarters
BLM	Bureau of Land Management
BMP	Best Management Practice
BRAC	Base Realignment and Closure
°C	degrees celsius
C	Candidate
CA	Comprehensive Agreement
CAA	Clean Air Act
CAAQS	Colorado Ambient Air Quality Standards
CAB	Combat Aviation Brigade
$CaCO_3$	calcium carbonate
CALPUFF	California Puff Model
CCPA	Colorado Council of Professional Archaeologists
CCR	Colorado Code of Regulations
CDA	Colorado Department of Agriculture
CDNL	C-weighted DNL
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEMML	Center for Environmental Management of Military Lands
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESQG	Conditionally Exempt Small Quantity Generator
CFC	Cholorfluorocarbon
CFR	Code of Federal Regulation
CGS	Colorado Geological Survey
CH	Cargo Helicopter
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIG	Colorado Interstate Gas
CNHP	Colorado Natural Heritage Program
CO	Carbon Monoxide
CO_2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
COF	Company Operations Facility
COSHPO	Colorado State Historic Preservation Office

CPI	Colorado Preservation, Inc.
CRM	Cultural Resource Management
CS	Combat Support
CSP	Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative
CSS	Combat Service Support
CSU	Colorado Springs Utilities
CTP	Combat Trail Maintenance Program
CWA	Clean Water Act
DAR	Defense Access Road
DAT	Deposition analysis threshold
dB	decibels
dBA	A-weighted decibel
DECAM	Directorate of Environmental Compliance and Management
DEIS	Draft Environmental Impact Statement
Divison	CDPHE's Water Quality Control Division
DMPRC	Digital Range Multi-Purpose Range Complex
DNL	Day-night average sound level
DoD	United States Department of Defense
DoDI	Department of Defense Instructions
DOI	Department of Interior
DOJ	Department of Justice
DPW	Directorate of Public Works
DUSTRAN	Dust Transport Model
E	Endangered
E	Ethanol
EA	Environmental Assessment
ECHO	EPA Enforcement and Compliance Online
EIFS	Economic Impact Forecast System
EIS	Environmental Impact Statement
ENMP	Environmental Noise Management Program
EO	Executive Order
EOD	Explosives Ordnance Detachment
EPA	United States Environmental Protection Agency
EPACT	Energy Policy Act
EPC Health	El Paso County Department of Health & Environment
EPCRA	Emergency Planning and Community Right-To-Know Act
ESPC	Energy Savings Performance Contract
FARRP	Forward Area Rearming and Refueling Points
FC	Fort Carson
FEIS	Final Environmental Impact Statement
FM	Field Manual

FMTV	Family of Medium Tactical Vehicle
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FWPCA	Federal Water Pollution Control Act
GAO	Government Accountability Office
GDPR	Global Defense Posture Realignment
GHG	Greenhouse gas
GIS	Geographic Information System
GOV	Government Owned Vehicle
gpd	gallons per day
gpm	gallons per minute
GTA	Grow the Army
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
HBCT	Heavy Brigade Combat Team
HC	Hydrocarbon
HEMTT	Heavy Expanded Mobility Tactical Truck
HMCC	Hazardous Material Control Center
HMMWV	High Mobility Multipurpose Wheeled Vehicle
hp	horse-power
HPC	Historic Properties Component
HQ	Headquarters
hr	hour
HVAC	heating, ventilating, and air conditioning
HWMP	Hazardous Waste Management Plan
HWSF	Hazardous Waste Storage Facility
I	Interstate
IBCT	Infantry Brigade Combat Team
ICRMP	Integrated Cultural Resource Management Plan
ID	Infantry Division
IED-D	Improvised Explosives Device-Defeat
IFS	Integrated Facilities System
INRMP	Integrated Natural Resource Management Plan
IPCC	Intergovernmental Panel on Climate Change
ISWMP	Integrated Solid Waste Management Plan
ITAM	Integrated Training Area Management
IWFMP	Integrated Wildland Fire Management Plan
IWTP	Industrial Wastewater Treatment Plant
JP	Jet propellant
kg/ha/yr	kilogram per hectare per year
kVA	kilovolt Ampere

LEED	Leadership in Energy and Environmental Design
LF	linear feet
LOS	Levels of Service
LRAM	Land Rehabilitation and Maintenance
LUPZ	Land Use Planning Zone
Ma	Million years ago
MAU	Make-Up Air Unit
MCA	Military Construction Army
mcf	million cubic feet
MEDDAC	Medical Department Activity
METL	Mission Essential Task List
mg/L	milligrams per liter
mgd	million gallons per day
MILCON	Military Construction
MILES	Multiple Integrated Laser Engagement System
MIMS	Maneuver Impact Miles
mm	millimeter
MMBtu	Million British Thermal Units
MOA	Memorandum of Agreement
mph	miles per hour
MPMG	Multipurpose Machine Gun
MPTR	Multi-Purpose Training Range
MRF	Modified Record Fire
MS4	Municipal Separate Storm Sewer System
MSR	Military Supply Route
MVA	Megavolts-Ampere
MWR	Office and Directorate of Morale, Welfare, and Recreation
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NCRS	Natural Resources Conservation Service
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants Program
NFA	No Further Action
NH3	Ammonia gas
NH4	ammonium
NHPA	National Historic Preservation Act
No.	Number
NO_2	Nitrogen Dioxide
NOA	Notice of Availability

NOE	Nap-of-the earth
NOI	Notice of Intent
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NSR	New Source Review
NZ	Noise Zones
O_3	Ozone
OD	Open Detonation
OH	Observation Helicopter
OH	hydroxyl radical
ORTC	Operational Readiness Training Center
OSD	Office of the Secretary of Defense
P2	Pollution Prevention
Pb	Lead
PCB	Polychlorinated Biphenyl
PCMS	Piñon Canyon Maneuver Site
PEIS	Programmatic Environmental Impact Statement
PIF	Partners in Flight
PM	Particulate Matter
PM_{10}	Particulate Matter, 10 micrometers or less in aerodynamic diameter
$PM_{2.5}$	Particulate Matter, 2.5 micrometers or less in aerodynamic diameter
PNNL	Pacific Northwest National Laboratory
POV	Privately Owned Vehicle
PPACG	Pikes Peak Area Council of Governments
PPSIP	Pikes Peak Sustainability Indicators Project
PRT	Personal Rapid Transit
PSD	Prevention of Significant Deterioration
PT	Physical training
PTE	Potential to emit
QTR	Qualification Training Range
RA	Resources Advisor
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
REC	Record of Environmental Consideration
RECCE	Reconnaissance
ROD	Record of Decision
ROI	Region of Influence
RTVs	Rational Threshold Values

SAPs	Satellite Accumulation Points
SARNAM	Small Arms Range Noise Assessment Model
SBCT	Stryker Brigade Combat Team
SC	Species of Special Concern
SDZ	Surface Danger Zone
SE	Colorado State Endangered
SEMS	Sustainability and Environmental Management System
SF	Square feet
SH	State Highway
SHPO	State Historic Preservation Office
SIEA	San Isabel Electric Association
SIL	Significant impact level
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SPCCP	Spill Prevention Control and Countermeasures Plan
Special Forces	10th Special Forces Group (Airborne)
SRM	Sustainability, Restoration and Modernization
ST	Colorado State Threatened
STORET	STOrage and RETrieval
SWMU	Solid Waste Management Units
SWPPP	Stormwater Pollution Prevention Plan
T	Threatened
TC	Training Circular
TCP	Traditional Cultual Property
TIP	Transportation Improvement Program
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
TNT	trinitrotoluene
tpy	tons per year
TRI	Toxic Release Inventory Report
TUAVs	Tactical Unmanned Arial Vehicle Systems
U.S.C.	United States Code
UAC	Urban Assault Course
UAS	Unmanned Aircraft System
UH	Utility Helicopters
ULSD	Ultra-low sulfur dioxide
UPH	Unaccompanied Personnel Housing
US	US Highway
USACE	United States Army Corps of Engineers
USAEC	U.S. Army Environmental Command

USDA	United States Department of Agriculture
USD (AT&L)	Under Secretary of Defense (Acquisition, Technology, and Logistics)
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
UXO	Unexploded Ordinance
v/c	volume to capacity
VMT	Vehicle miles traveled
VOC	Volatile Organic Compound
WQCC	Colorado Water Quality Control Commission
WRI	World Resources Institute
WWII	World War II
WWTP	Waste Water Treatment Plant

10. Index

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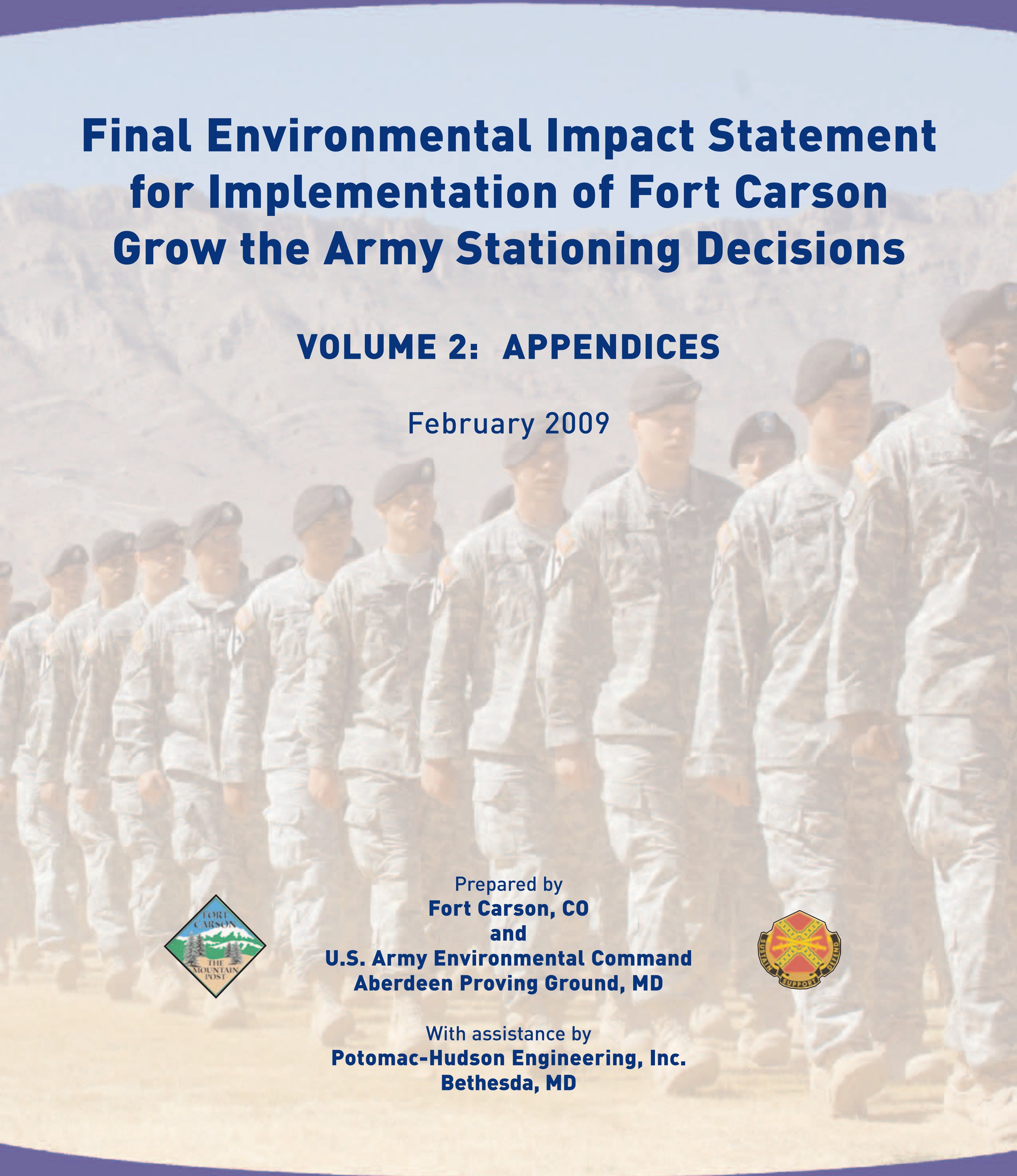

Final Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions

VOLUME 2: APPENDICES

February 2009

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APPENDIX A
REGULATION MANAGEMENT PLANS

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A. Regulation Management Plans

Fort Carson and the PCMS operate under management plans specific to the installations that provide guidance on operations, construction and demolition activities, waste management, the environment, and installation resources. Many of the management plans pertinent to the Proposed Action are required by Fort Carson Regulation 200-1, Environmental Quality: Environmental Protection and Enhancement. Regulations and management plans pertinent to the proposed action are discussed in this appendix.

A.1. Regulations and Policies

A.1.1. Fort Carson Regulation 200-1, Environmental Quality: Environmental Protection and Enhancement (1999)

This regulation prescribes policies and procedures, and assigns responsibilities for the conservation, protection, and enhancement of the environment at Fort Carson, the PCMS, and supported facilities. The regulation provides an overview of the Fort Carson Environmental Program and discusses specific management policies relating to water resources, air quality, solid waste management, hazardous and toxic materials, noise pollution, historic preservation, natural resources, energy conservation, and other environmental resources.

A.1.2. Fort Carson Regulation 350-4, Training: Piñon Canyon Maneuver Site (2004)

This regulation prescribes procedures and responsibilities used to support training activities at PCMS, including scheduling, logistics, and environmental management of training rotations at the PCMS.

A.1.3. Fort Carson Regulation 350-9, Training: Integrated Training Area Management (2001)

This regulation prescribes responsibilities, management requirements, and general guidance to implement Fort Carson's ITAM program. The ITAM program focuses on aligning training activities with sustainable land management methods.

A.1.4. Fort Carson Regulation 350-10, Training: Maneuver Damage Control Program (2004)

This regulation assists commanders in evaluating training against the cost and possible environmental effects of maneuver damage by providing information on maneuver damage control. The regulation provides guidance on education and prevention of maneuver damage; reporting, correction, and repair of damage; consideration of inclement weather training issues; and areas of training restrictions.

A.1.5. Fort Carson Regulation 385-63, Firing Ammunition for Training, Target Practice, Administration and Control of Ranges and Training Areas (2006)

This regulation prescribes Fort Carson range operating procedures and safety policies/responsibilities for firing ammunition, lasers, guided missiles and rockets, as well as use of the military training areas of Fort Carson and PCMS.

A.1.6. Fort Carson Regulation 200-6, Wildlife Management (1999)

This regulation governs hunting and fishing on PCMS. CDOW state regulations (and associated permits and fees) also apply to hunting and fishing privileges at PCMS.

A.1.7. Army Regulation 420-90, Fire and Emergency Services (2005)

This AR prescribes policies and responsibilities covering all fire fighting (structural, aircraft, and wildland), emergency dispatching services by civilians or military, fire prevention (technical services), HAZMAT/CBRNE response, WMD, Global War on Terrorism, EMS, rescue services, disaster preparedness, and ancillary services.

A.1.8. Army Regulation 200-3, Land, Forest, and Wildlife Management (2000)

This regulation sets forth policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources consistent with the military mission and in consonance with national policies. The scope includes the conservation, management, and utilization of the soils, vegetation, water resources, croplands, rangelands, forests, and fish and wildlife species.

A.1.9. Army Regulation 200-4, Cultural Resources Management (1998)

This regulation prescribes policies, procedures, and responsibilities for meeting cultural resources compliance and management requirements. The scope of this regulation includes the NHPA, AIRFA and EO 13007, NAGPRA, ARPA, 36 CFR 79, and other requirements and policies affecting cultural resources management. These policies are designed to ensure that installations make informed decisions regarding the cultural resources under their control in compliance with public laws, in support of the military mission, and consistent with sound principles of cultural resource management.

A.1.10. Army Regulation 200-1, Environmental Quality: Environmental Protection and Enhancement (2007)

This regulation covers environmental protection and enhancement. The regulation provides an overview of the Army Environmental Program and discusses specific management policies relating to water resources, air quality, solid waste management, hazardous and toxic materials, noise pollution, historic preservation, natural resources, energy conservation, and other environmental resources.

A.1.11. Army Regulation 350-19, The Army Sustainable Range Program (2005)

This regulation assigns responsibilities and provides policy and guidance for managing and operating US Army ranges and training lands to support their long-term viability and utility to meet the National defense mission; planning, programming, funding, and executing the core programs comprising the Army's Sustainable Range Program, the Range and Training Land Program, and the ITAM Program; integrating program functions to support sustainable ranges; assessing range sustainability; and managing the automated and manual systems that support sustainable ranges.

A.2. Management Plans

A.2.1. Plans Pertaining to Construction and Demolition

A.2.1.1. Fort Carson Lead Management Plan (2004)

The Lead Management Plan is a guidance document to direct all aspects of the lead management program for Fort Carson and PCMS. The plan is designed to direct health, safety, and disposal activities associated with demolition, renovation, construction, and sandblasting activities that are associated with lead-based paint, indoor firing ranges, and other lead contamination. The plan discusses procedures to follow in response to lead contamination as well as procedures for worker protection and identification of lead hazards on the installation.

A.2.1.2. Fort Carson Asbestos Management Plan (2004)

The Asbestos Management Plan sets forth activities and procedures designed to minimize exposure to airborne asbestos fibers, particularly in regards to renovation, demolition, and maintenance activities. The plan focuses on workers and outside contractors who perform building renovation and maintenance, with the objective of protecting these workers as well as the premises and other occupants of the premises. This plan provides procedures to be followed when asbestos fibers are released. Specific work plans for asbestos abatement must be approved by the appropriate Fort Carson personnel and, in some cases, by regulatory agencies.

A.2.1.3. Fort Carson Fugitive Dust Control Plan (2004)

The Fugitive Dust Control Plan lists recommended measures to control fugitive dust resulting from construction and land development activities and from demolition, dismantling, and renovation activities.

A.3. Plans Pertaining to Operations

A.3.1. Fort Carson Integrated Natural Resources Management Plan (2007)

The INRMP is a guide for the management of natural resources at Fort Carson and PCMS. Objectives of this plan are to manage natural resources on the installation and ensure environmental stewardship of public lands entrusted to the care of the Army, ensure compliance with relevant laws and regulations, and integrate resource management. This plan includes general policies regarding the conservation and protection of existing resources and the management of land resources in support of the military mission.

The plan provides for an inventory and description of the natural resource base at Fort Carson, including land management units, hunting areas, bivouac and training areas, and physiographic and land management zones. Natural Resource Management Program objectives and implementing management and monitoring programs are discussed for flora, fauna, threatened and endangered species, sensitive habitats, and related resources. An important element within this plan is a program for the monitoring, conservation, and protection of land resources to support the military training mission at Fort Carson and PCMS on a sustained basis. Included within the Land Management Program are training area conservation programs, such as the ITAM Program, soil and watershed management, rangeland management, prescribed burning/wildfire control programs, and a Landscape Management Program.

A.3.2. Fort Carson Integrated Cultural Resources Management Plan (2002)

The ICRMP provides guidance and procedures for the identification, evaluation, and protection of cultural resources while causing the least disturbance to the military mission. The plan details preservation and mitigation plans for specific archaeological and historic architectural resources at Fort Carson and PCMS. The plan also defines processes for identifying and evaluating cultural resources on the installations and describes specific projects for cultural resources management.

A.3.3. Master Planning Strategy, Smart Growth Principles (2005)

The Master Planning Strategy Smart Growth Principles outlines the 10 principles Fort Carson uses to evaluate facility siting layouts and infrastructure development decisions at Fort Carson and acts to assist decision makers in understanding the various positive and negative impact on future facility opportunities. The 10 Smart Growth principles are: 1) promote military cohesiveness and efficiency in training; 2) minimize development of open spaces; 3) improve walk-ability of installation neighborhoods; 4) site facilities to promote mass transit opportunities; 5) site facilities based on analysis of interrelationships among users of facilities to adjacent facilities; 6) create high density mixed-use areas; 7) site facilities to leverage existing utility infrastructure and future renewable energy opportunities; 8) low-impact development; 9) encourage stakeholder collaboration in development decisions; and 10) use full life-cycle cost analysis instead of first cost criteria in making development decisions. Guidance on implementation of each principle and associated criteria to guide facility siting each project is described in the plan.

A.3.4. Fort Carson Pollution Prevention Plan (2004)

The P2 Plan provides a comprehensive approach to waste and resource management that seeks to reduce the impact that an operation or activity has on the environment by reducing or eliminating the production of wastes, by using energy and raw materials more efficiently, and by promoting sustainable practices. The plan provides recommendations for green procurement, sustainable construction practices, a centralized hazardous materials control center, BMPs for vehicle maintenance, energy conservation, and materials substitutions, among others.

A.3.5. Prescribed Burn Plan (2003)

Fort Carson has prepared this plan to comply with the requirements of the Colorado Air Quality Control Commission Regulation No. 9, "Open Burning, Prescribed Fire and Permitting." Pursuant to that regulation, this document summarizes Fort Carson's use of prescribed fire as a land management tool and its integrated planning process related to fuel management. The plan incorporates requirements of other Army regulations and guidance, including Army Wildland Fire Policy Guidance (2002), AR 420-90 (Fire and Emergency Services), and AR 200-3 (Natural Resources - Land, Forest and Wildlife Management).

A.3.6. Fort Carson Polychlorinated Biphenyl Management Plan (2004)

The primary purpose of the PCB Management Plan is to provide handling and control procedures for PCBs and a contingency plan for PCB spills. The plan includes the following requirements:

- During inspections, all transformers and light ballast fixtures are assumed to contain PCB waste unless otherwise marked.
- All personnel handling PCB waste will wear the proper personal protective equipment and comply with the Fort Carson Health and Safety Plan.
- PCB waste is properly packaged, labeled, weighed, catalogued, and stored within the HWSF under the supervision of DECAM.
- MSDSs are prepared and laboratory samples are analyzed (if the contents are unknown or mixed) to ensure that safe handling procedures and accurate waste classification are met.
- All containers holding PCB must be in good condition and checked for leaks every 30 days.

A.3.7. Fort Carson Radon Management Plan (2004)

The Radon Management Plan documents results of surveys at Fort Carson and PCMS to determine the extent of radon exposure in buildings on the installations. The plan identifies survey locations with high potential for mitigation, and recommended time frames for retesting and/or mitigation at these sites.

A.3.8. Installation Pest Management Plan (2001)

The Installation Pest Management Plan describes Fort Carson pest management requirements and describes the administrative, safety, and environmental requirements for surveillance and control of pests. The Pest Management Program utilizes DoD-certified pest control personnel to control pests. Principles of Integrated Pest Management practices are stressed in the plan, which consists of judicious use of both chemical and non-chemical control techniques to achieve effective pest control with minimal environmental contamination.

A.3.9. Fort Carson Facility-Wide Spill Prevention, Control, and Countermeasures Plan (2004)

The SPCCP provides procedures to follow for employing spill prevention and response measures should a spill occur. The plan is applicable to all areas of the installation that handle oil, hazardous waste, or hazardous substances. The plan includes a discussion of general types of spill prevention procedures, methods, and equipment used at Fort Carson facilities. The plan provides a summary of each location having the potential for a reportable spill including type and size of facility, quantity and material stored, probable spill route, and type of secondary containment provided in accordance with Title 40 of the CFR, Part 112.7(b). The primary goal of the plan is to prevent spills.

A.3.10. Fort Carson Facility Response Plan (2004)

The Facility Response Plan is designed to minimize hazards created by spills involving petroleum, oils, lubricant, or hazardous materials. The plan complements the Fort Carson SPCCP. Its purpose is to minimize the potential for spills, to prevent spills from reaching navigable waterways, and to correct causes of spills. The plan designates responsibilities and procedures for a proper response to spill events.

A.3.11. Army Regulation 200-1, Chapter 11, Underground Storage Tanks and Aboveground Storage Tanks (2007)

The UST and AST chapter includes information on the storage of hazardous waste, petroleum products and used oil, and practices implemented to minimize the risk of storage and potential spills into the environment. The report outlines the responsibilities of personnel involved with USTs and ASTs, the procedures involved in materials storage, UST and AST operations, maintenance, and record keeping requirements, and troubleshooting of facility repairs.

A.3.12. Ammunition Supply Point Standard Operating Procedure (2006)

This manual prescribes basic ammunition management procedures pertinent to ammunition and explosive support.

A.4. Plans Pertaining to Waste Management

A.4.1. Fort Carson Installation Recycling Plan (2004)

The Installation Recycling Plan sets forth the components of the Qualified Recycling Program that the installation is required to follow to meet federal, state, and ARs pertaining to recycling and environmental management. The plan provides direction on collecting and segregating waste materials intended for recycling and reuse of resources. Recycling efforts are required for construction and demolition activities.

A.4.2. Fort Carson Hazardous Waste Management Plan (2004)

The HWMP establishes procedures, policies, and standards; assigns responsibilities; and provides guidance for personnel who generate, handle, manage, transport, and dispose of hazardous waste on Fort Carson. The plan discusses hazardous waste accumulation points, the centralized hazardous waste control center, and procedures for the management of existing facilities. The objective of the plan is to effectively manage hazardous waste generated from military operations in an environmentally safe manner from the point of generation to reuse or ultimate disposal without impairment to the mission at Fort Carson.

A.4.3. Integrated Solid Waste Management Plan (2004)

The ISWMP describes the waste management program, procedures, and requirements for solid waste generated at Fort Carson. The plan identifies various types of wastes being generated and their current disposition. It also identifies source reduction and pollution prevention programs and projects implemented at Fort Carson. The plan provides guidelines for construction and demolition waste management and requires construction and demolition waste management plans for different types of waste.

A.5. Plans Pertaining to Erosion Management Reclamation Planning (2002)

Reclamation planning sustains training resources and offsets adverse effects associated with military training on soils by identifying improvements needed to reclaim rested areas and includes planning for the duration of rested and deferred areas. Reclamation planning includes identifying locations and justification for erosion control structures, check dams, and road and trail reclamation; reseeding disturbed areas; cost-benefit analysis; and project evaluations and monitoring data.

A.6. Permits

Fort Carson obtains project-specific permits for various operations and construction. Some operational permits are applicable to general operations at the installation and are described.

A.6.1. Clean Water Act Section 404 Regional Permit No. 2002-00707 (2002)

This regional permit authorizes Fort Carson to conduct erosion control activities on post and at PCMS that may result in minimal individual and cumulative impacts to wetlands from dredge and fill activities. Typical erosion control measures include erosion control and stock watering impoundments, banksloping of erosion courses, check dams, rock armor, hardened crossings, culverts and bridges, erosion control terraces and water diversions, water turnouts, and other erosion control activities approved by USACE.

A.6.2. Small Municipal Separate Storm Sewer System Permit No. COR042000 (2003)

In compliance with the provisions of the CWA, Fort Carson operates under a NPDES MS4 General Permit in Colorado. This permit authorizes Fort Carson to discharge pollutants (in the form of stormwater runoff) into the waters of the US in accordance with the conditions and requirements of the permit. The permit, which became effective June 23, 2003, and expires on June 22, 2008, requires Fort Carson to develop a stormwater management system that addresses six key areas. The six areas include public outreach, public involvement, illicit discharges, construction site storm water control, post-construction (i.e., new development or redevelopment) storm water control, and pollution prevention.

A.6.3. Resource Conservation and Recovery Act (RCRA) Part B Permit No. CO-95-09-29-03 (1995)

The installation maintains a Resource Conservation and Recovery Act Part B permit issued by the CDPHE, Hazardous Materials and Waste Management Division, for the storage of hazardous waste at Fort Carson. The Permit became effective on October 29, 1995, in accordance with the Colorado Hazardous Waste Act, Sections 25-15-301 through 316, C.R.S. and the regulations thereunder. The Permit will remain effective until October 28, 2006, at which time the renewed Part B permit No. CO-06-09-29-01 will become effective until October 29, 2016, unless revoked and reissued, or terminated under 6 CCR 1007-3, Sections 100.61 or 100.25. The permit requirements are consistent with the Hazardous Waste Management Plan referenced in this section.

A.6.4. Title V of the Clean Air Act

In accordance with the provisions of Colorado Air Pollution Prevention and Control Act, Fort Carson operates under a Title V permit issued by the CDPHE, Air Pollution Control Division. The permit number 95OPEP110 was issued for Fort Carson on September 1, 1998, and last revised on October 24, 2001. Until the permit expires or is modified or revoked, Fort Carson is allowed to discharge air pollutants in accordance with the requirements, limitations, and conditions of the permit.

APPENDIX B

Fort Carson Construction Projects

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B. Fort Carson Construction Projects

Project Name	Project Number	Brief Scope Description	Building Area (SF)	Paved Area (SF)	Construction Area (SF)	Demolition (SF)	Construction Start	Construction End
Cantonment								
Quartermaster	**69795**	Standard Company Operations, Vehicle and equipment maintenance and unit storage facilities.	38,530	263,759	302,289	-	July 2009	January 2011
Engineer Company	**67137**	Standard Group HQs Building, Brigade HQs Building, Battalion HQs Building, Company Operations facilities	152,499	195,203	347,702	41,007	June 2011	April 2013
ORTC								
Barracks and Dining Facility	**69121**	Standard BCT barracks and dining facility	553,540	33,804	587,344	10,500	March 2009	March 2011
Phys Fitness CTR	**71165**	Physical Fitness Facility: includes fitness, exercise, gym, and activity modules. Includes natatorium	64,799	129,598	194,397	-	March 2009	September 2010
Child Development CTR	**71171**	Standard Design CDC for 0-5 years of age and one for 6-10 years of age, one standard play and activity area for each age group	79,650	156,000	235,650	-	March 2009	September 2010
Headquarters	**71176**	BCT Brigade and Battalion headquarters	145,176	15,993	161,169	-	March 2009	March 2011
Company Ops	**71178**	Standard design BCT Company Operations Facilities	368,964	64,596	433,560	-	March 2009	March 2011
Tactical Equip Maintenance	**71198**	Standard BCT vehicle and equipment maintenance and storage facilities with parking	225,255	1,399,599	1,624,854	-	March 2009	March 2011
Infrastructure	**71208**	Includes road improvements, tank trail relocation, earthwork, parking and utilities		1,047,558			March 2009	March 2010
Fire station	**71221**	Construct a two-company main fire station	24,143	10,800	34,943	-	March 2010	March 2011
Central Vehicle Wash	**71222**	Centralized Wash Facility to include tank trail	-	51,390		-	March 2010	March 2011

Project Name	Project Number	Brief Scope Description	Building Area (SF)	Paved Area (SF)	Construction Area (SF)	Demolition (SF)	Construction Start	Construction End
Gate 6 ACP	**71223**	Access Control Point (ACP) at Gate 6 for Commercial, military, and registered passenger vehicles to include roads, parking, vehicle barriers, and buildings	3,504	260,640	264,144	-	March 2010	March 2011
Gate 19 ACP	**71249**	ACP at Gate 19 for Commercial, military, and registered passenger vehicles to include roads,parking, vehicle barriers, and buildings	3,504	107,479	110,983	-	March 2010	March 2011
Crows foot ACP	**71273**	ACP at Crow's Foot Gate for military and registered passenger vehicles. The ACP includes roadways, parking, passive and active vehicle barriers, with comprehensive control systems, and buildings	1,320	72,454	73,774	-	March 2010	March 2011
Ranges								
Modified Record Fire (MRF)	72170	Upgrade to Range 65 to a standard design Modified Record Fire (MRF) Range	5,418	32,103	18	-	March 2010	March 2011
Automated Multi-Purpose Machine Gun (MPMG)	72171	Upgrade to Range 121C to an Automated Multi-purpose Machine Gun	3,424	6,480	266	-	March 2010	March 2011
Scout Reconnaissance (RECCE) Gunnery	72172	Upgrade to Range 127 to a Scout Reconnaissance Gunnery Range	1,336	18,526	19,862	-	March 2010	March 2011
Convoy Live-Fire Training facility	72177	Upgrade to Range 127a to a Convoy Live Fire training facility	10,040	3,600	0.4	800	March 2010	March 2011
Urban Assault Course (UAC)	72173	Training Area 51 construction to an Urban Assault Course	1,120	17,100	7.5	-	March 2010	March 2011
Qualification Training Range (QTR)	71693	Upgrade to Range 115 to a Qualification Training Range	3,512	6,480	60	-	March 2010	March 2011

Source: Tom Wiersma, Fort Carson Master Planner, Directorate of Public Works

APPENDIX C

AIR QUALITY SUPPORTING DOCUMENTATION

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FINAL

Clean Air Act General Conformity Analysis and Determination

for

US Army Garrison (USAG)

Fort Carson, Colorado

Prepared for:

Department of the Army

Directorate of Public Works, Environmental Division

USAG Fort Carson, Colorado

URS

13825 Sunrise Valley Drive, Suite 250
Herndon, VA 20171

January 2009

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FINAL - CLEAN AIR ACT CONFORMITY ANALYSIS AND DETERMINATION

for

US Army Garrison (USAG) Fort Carson
Fort Carson, Colorado

Prepared for

USAG Fort Carson, Colorado
Directorate of Public Works, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078, Delivery Order 0005 (URS Project No. 39455606)

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List of Acronyms

ACAM	Air Conformity Applicability Model
AFCEE	Air Force Center for Environmental Excellence
bhp	brake horsepower
BTU/hr	British thermal units/hour
CAA	Clean Air Act
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
CS/CSS	Combat Support/Combat Service Support
CY	Calendar Year
DFAC	Dining Facility
DOPAA	Description of Proposed Action and Alternatives
EIS	Environmental Impact Statement
EN	Engineer Company
EPA	US Environmental Protection Agency
FY	Fiscal Year
GOV	Government-owned vehicle
GTA	Grow the Army
hr	Hour
IBCT	Infantry Brigade Combat Team
lb	pound
NAAQS	National Ambient Air Quality Standards
POV	Privately-owned vehicle
PPACG	Pikes Peak Area Council of Governments
QM	Quartermaster
RONA	Record of Non-applicability
sf	square feet
SIP	State Implementation Plan
TA	Training Area
TEMF	Tactical Equipment Maintenance Facility
TIP	Transportation Improvement Program
tpy	tons per year
USACHPPM	US Army Center for Health Promotion and Preventive Medicine

USACE	US Army Corps of Engineers
USAG	US Army Garrison
VMT	vehicle miles traveled
VOC	volatile organic compound

Executive Summary

The Department of the Army will expand activities at United States Army Garrison (USAG) Fort Carson, an Army installation located southwest of Colorado Springs, Colorado. The stationing of troops associated with this proposed federal action are planned for fiscal years (FYs) 2009 through 2013. Fort Carson could receive up to approximately 6,700 additional Soldiers consisting of the following units:

- One Infantry Brigade Combat Team (IBCT) of approximately 3,500 Soldiers;
- Two Combat Support/Combat Service Support (CS/CSS) units of approximately 400 Soldiers (total); and,
- Potentially, a medium Combat Aviation Brigade (CAB) of approximately 2,800 Soldiers (Fort Carson 2008).

To carry out the associated requirements with this stationing, and potential re-stationing action, there will be the construction of new facilities to support additional Soldiers, aircraft and support equipment, and an increase in privately-owned vehicle (POV)/government-owned vehicle (GOV) traffic. As a result of this, it is expected that an increase of air pollutants will occur that has the potential to impact existing air quality conditions.

Although the Colorado Springs Urbanized Area is currently in attainment for all criteria pollutants, it is classified as a maintenance area for carbon monoxide (CO) due to a previous violation of air quality standards. Since the installation's main cantonment area falls within the boundaries of the Colorado Springs maintenance area, CO is the only pollutant of concern that Fort Carson must consider for this analysis. Therefore, in accordance with the Clean Air Act Section 176(c), as amended in 1990, this report is an analysis and determination of the General Conformity Rule, and it examines the anticipated actual emissions associated with the proposed action from both mobile and stationary sources located and operated in Fort Carson's main cantonment area. Any initiatives related to the proposed action that occur outside of the maintenance area delineation within Fort Carson are not included in this analysis.

This document demonstrates that the growth activities at Fort Carson not only comply with the General Conformity Rule requirements, but also that the action conforms with the Colorado State Implementation Plan (SIP) to achieve attainment or to maintain status with national air standards. The results are based on the latest planning assumptions derived from the construction plans, population, employment, and travel data acquired from multiple sources to determine compliance with the General Conformity Rule, as well as all relevant requirements and milestones in the SIP.

Reasonable assumptions to reflect realistic activities, and the latest and most accurate emissions estimation techniques, were applied to address this action and the associated emission-generating activities. Three possible locations are being considered for the aforementioned unit stationing/re-stationing actions. For both scenarios, the CS/CSS facilities would be constructed in the main cantonment area (inside the maintenance area), and the CAB facilities would be constructed outside these areas on Wilderness Road. The IBCT is the only unit to change location that would affect the conformity model; its facilities could be set either within the main cantonment area or at one of two locations outside of the maintenance area on Wilderness Road. As the Wilderness Road locations fall outside the maintenance area, for the purposes of this analysis, there were only two scenarios to consider.

For both scenarios, the maximum CO emissions increase from all applicable sources is estimated to occur in calendar year (CY) 2012. If either the Proposed Action or Alternative 2 (2008 GTA EIS) are implemented as the siting scenario for the IBCT facilities (i.e., either Wilderness Road location, referred to as Scenario 1 in this document) then the CY 2012 CO emissions would total 64.66 tons per year (tpy) (i.e., 54 tpy from POVs, 3.5 tpy from GOVs, and 7.16 tpy from all other sources). These emissions do not exceed the 100 tpy *de minimis* General Conformity threshold limit, and also are not considered to be regionally significant; therefore, demonstration of conformity is not required and is documented on a Record of Non-Applicability.

However, the Alternative 1 siting of IBCT facilities in the cantonment area (referred to as Scenario 2 in this document), results in CY 2012 maximum CO emissions of 156.05 tpy (i.e., 96.43 tpy from POVs, 34.09 tpy from GOVs, and 25.53 tpy from all other sources), which exceeds the regulatory *de minimis* limit for General Conformity. Fort Carson can demonstrate that Scenario 2 complies with the General Conformity Rule requirements and conforms with the Colorado SIP in the following way:

- The *FY 2008 Through FY 2013 Transportation Improvement Program for the Colorado Springs Urbanizing Area* allows a "sufficient margin of safety to the mobile source emissions budget[1] buffer to maximize the flexibility for determining conformity in future years due to mobile source growth beyond projected levels for future years or for model changes that revise projected emissions" (Pikes Peak Area Council of Governments [PPACG] 2008(b)). The PPACG updated the Transportation Improvement Program (TIP) by significantly revising its travel demand model for forecasting traffic and specifically, Fort Carson has been attributed enough growth in the TIP to allow for a total population of 30,000 active duty troops by CY 2015 (Prather 2008). As the Soldier numbers used in this Conformity Analysis are rounded up to be conservative, the worst case total active duty troop population for Fort Carson after this proposed action (FY 2013) is estimated to be 32,000 Soldiers. However, "…[d]eployments overseas mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS" (Fort Carson 2008). Therefore, there is a low probability that Fort Carson will ever realize that population potential for any sustained period of time. Based on discussions with PPACG, it is asserted that their TIP will be able to accommodate Fort Carson's growth based on the remaining available budgeted emissions for the region. Therefore, the 96.43 tpy of POV emissions meet the requirements and criteria for demonstrating conformity (per 40 Code of Federal Regulations [CFR] 93.158(a)(5)(ii)), as those emissions will be certified as accounted for in the TIP by PPACG.
- The remaining emissions (i.e., 59.62 tpy) related to GOVs, facility construction, stationary sources (i.e., boilers and generators), and miscellaneous area source emissions, are less than

[1] Emissions budgets are "those portions of the applicable SIP's projected emissions inventories that describe the levels of emissions (mobile, stationary, area, etc.) that provide for meeting reasonable further progress milestones, attainment, and/or maintenance for any criteria pollutant or its precursors" (EPA 1993).

the regulatory thresholds outlined for General Conformity at 40 CFR 93.158(c)(1) and are considered to be *de minimis*. These emissions are also not considered regionally significant; therefore, demonstration of conformity has been shown and official public and agency notification of the availability of this report and public comment period will be given.

1.0 Description of Federal Action[2]

US Army Garrison (USAG) Fort Carson will be undergoing additional growth in the near future due to decisions made by the Deputy Chief of Staff of the Army (G 3/5/7), as part of the 2007 Record of Decision for the Programmatic Environmental Impact Statement (EIS) for Army Growth and Force Structure Realignment. The plan to station and realign units to optimize training, leader development, and combat readiness will meet the strategic requirements of the contemporary global security environment (Fort Carson 2008). Stationing actions will occur at Fort Carson between fiscal years (FYs) 2009 and 2013, which will result in new construction, operation of additional emissions sources (e.g., HVAC equipment, additional vehicular traffic), and some demolition of facilities that are no longer needed. As a result of this decision to grow, it is expected that an increase in air pollutants will occur with the potential to impact existing air quality conditions.

To account for the worst case emissions, the potential re-stationing of a medium Combat Aviation Brigade (CAB) (approximately 2,800 Soldiers), which is reasonably foreseeable and has known activities, was included in this analysis.

Along with the CAB, the following stationing actions of new units are considered in this analysis:

- One Infantry Brigade Combat Team (IBCT) – approximately 3,500 Soldiers; and,
- Two Combat Support/Combat Service Support (CS/CSS) units – a Quartermaster (QM) Company and an Engineer (EN) Company (approximately 400 total Soldiers) (Fort Carson 2008(b)).

The stationing of these new units are referred to as Grow the Army (GTA), and together with the CAB, are considered one federal action for the purposes of this General Conformity Analysis. Although the Fort Carson GTA EIS includes the support units with the IBCT, referring to them together as the IBCT, this report retains their separate names due to the consideration of three possible locations for siting the new construction for these units. The addition of the GTA Units and CAB will increase Fort Carson's total active duty troop population by an estimated 6,700 active duty Soldiers, resulting in a total estimated force population of 32,000 Soldiers by FY 2013.

This report addresses the increased numbers of military units and associated emission-generating activities (both mobile and stationary) and assesses whether the resulting direct and indirect emissions in the Fort Carson's cantonment area conform with the State Implementation Plan (SIP) to attain and maintain clean air.

[2] Federal action is "any activity engaged in by a department, agency, or instrumentality of the Federal government, or any activity that a department, agency or instrumentality of the Federal government supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans" (EPA 1993).

2.0 Location

Fort Carson is situated southwest of the City of Colorado Springs, Colorado, between Interstate 25 and Highway 115, east of the Rocky Mountain Front Range. The installation is approximately 137,000 acres and portions occupy El Paso, Pueblo, and Fremont counties. To the north, the City of Denver is approximately 65 miles away, and approximately 10 miles to the south is the City of Pueblo.

Fort Carson's northern portion is referred to as the main cantonment area (i.e., the condensed inhabited area where housing, administrative, and maintenance activities occur) and is located in El Paso County. The majority of this cantonment (north of Titus Boulevard and Specker Avenue) falls within the Colorado Springs maintenance area for carbon monoxide (CO) (see Figure 2-1 and Section 3.0). There are currently six active installation access gates. In anticipation of this growth, two new access gates (Nos. 6 and 19 on the west and east sides of Wilderness Road, respectively) will open in the near future to alleviate traffic congestion and provide more direct routes to areas outside the main cantonment area; thereby, minimizing any unnecessary travel through the main cantonment area to areas south of Titus Boulevard or downrange.

Three possible siting locations were considered for the federal action. However, the IBCT is the only unit that had possible variable locations; its facilities could be set either:

1) Within the main cantonment area (i.e., at Training Area [TA] Bravo on the eastern side), referred to in the Description of Proposed Action and Alternatives (DOPAA) as Alternative 1, or
2) South of Titus Boulevard (referred to in this report as "downrange") at one of two locations on Wilderness Road near Butts Army Airfield (i.e., at the Operational Readiness Training Complex [ORTC]or at the Tent City), referred to in the DOPAA as the Proposed Action and Alternative 2.

Regardless of where the IBCT could be located, the CS/CSS facilities would be constructed in the main cantonment area (i.e., inside the maintenance area), and the CAB facilities would be constructed outside these areas at the ORTC. The EN Company's facilities would be constructed between Magrath and Minick Avenues, south of O'Connell Boulevard. Facilities for the QM Company would be constructed nearby at Barkeley Avenue and O'Connell Boulevard. As the Wilderness Road locations fall outside the maintenance area, for the purposes of this analysis, there were only two scenarios to consider:

<u>Location Scenario 1 – Proposed Action or Alternative 2 (Fort Carson 2008):</u>

- IBCT outside cantonment/maintenance area (at either Wilderness Road location);
- CS/CSS inside cantonment/maintenance area; and
- CAB outside cantonment/maintenance area (at ORTC).

Location Scenario 2 – Alternative 1 (Fort Carson 2008):

- IBCT inside cantonment/maintenance area (at TA Bravo);
- CS/CSS inside cantonment/maintenance area; and
- CAB outside cantonment/maintenance area (at ORTC).

This analysis considers those activities occurring in the main cantonment area (i.e., associated construction activities, operation of emission sources, miscellaneous area sources, and vehicular travel), and only vehicular travel to/from the area south of Titus Boulevard. (See Appendix B for detailed descriptions of the reasonable assumptions made in the analysis for each scenario.)

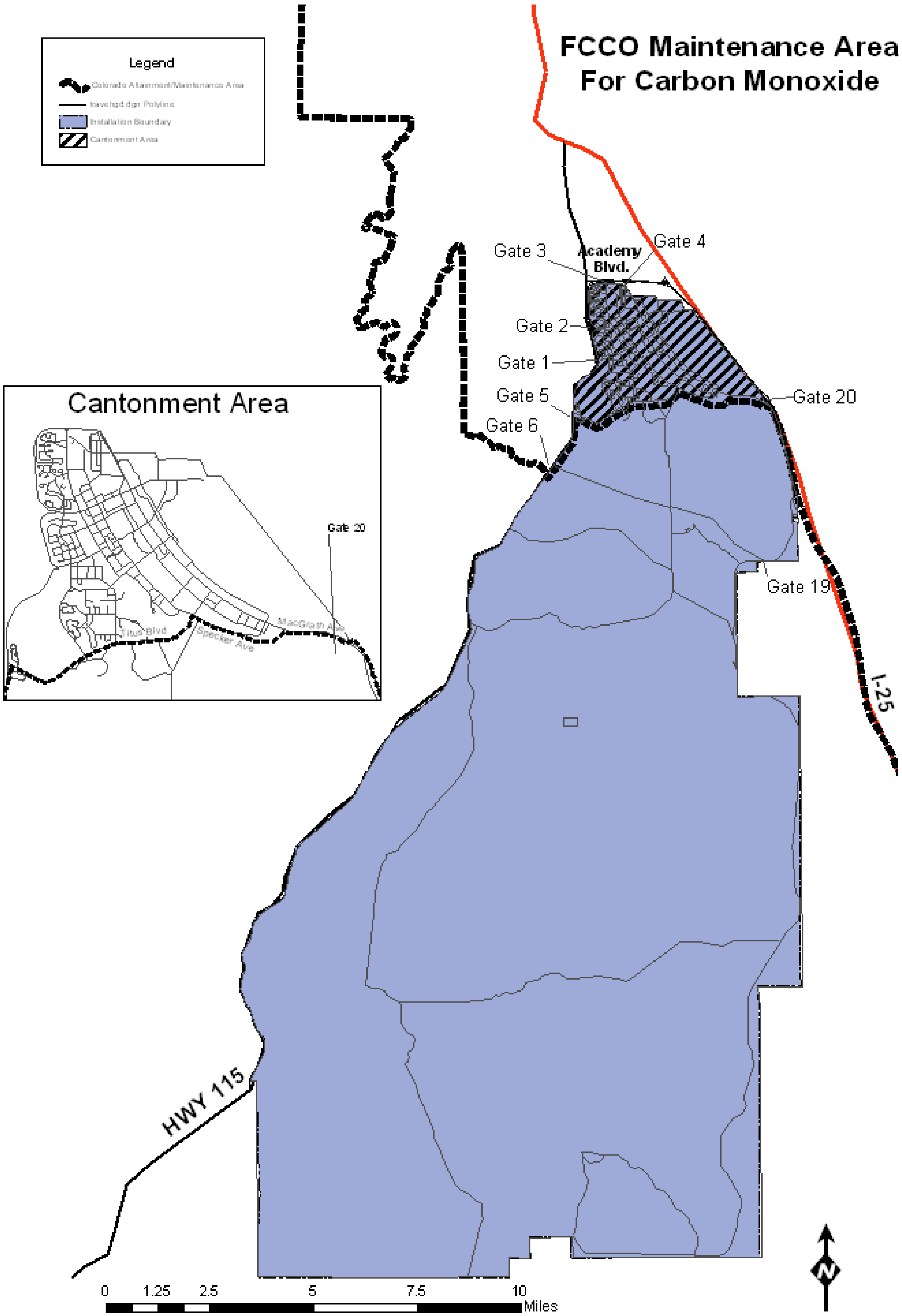
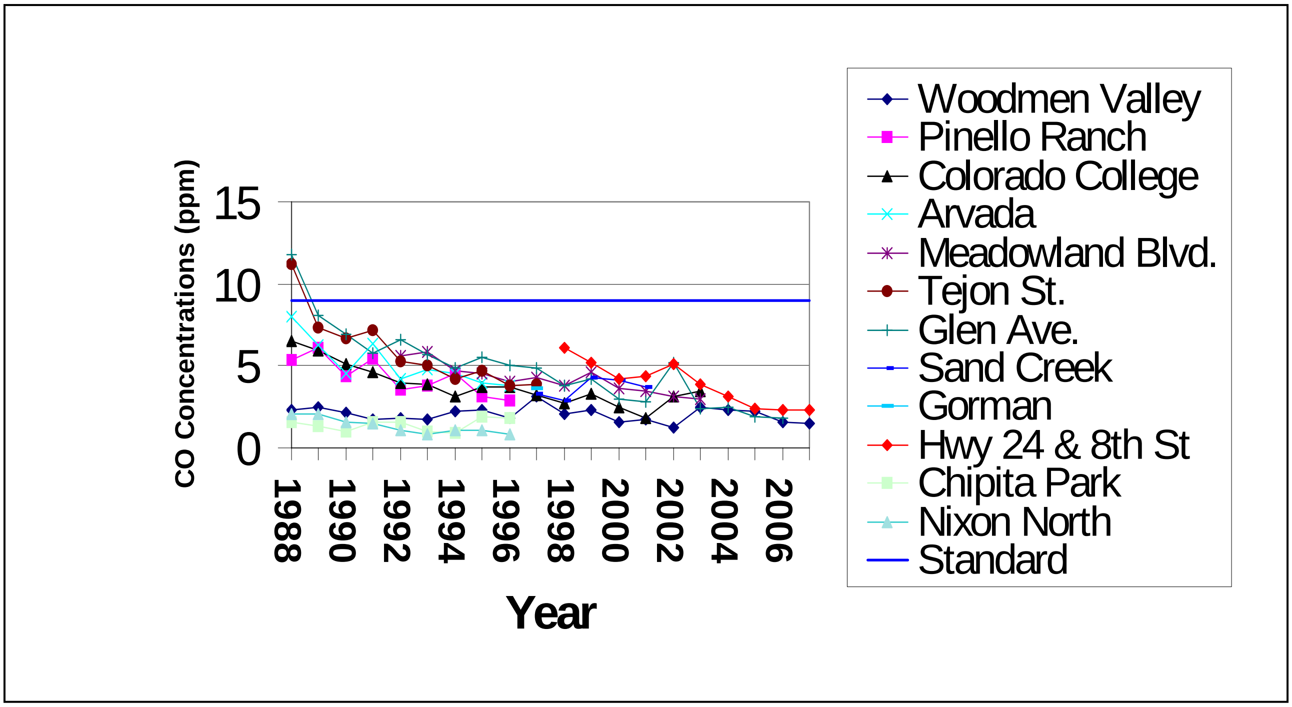


Figure 2-1. Fort Carson Maintenance Area for Carbon Monoxide

3.0 Local Air Quality

Criteria pollutants in the ambient air are measured at various locations in the Colorado Springs area. For the past few years, CO concentrations have been collected at two locations: the Woodmen Valley and Highway 24/8th Street monitoring stations. Figure 3-1 depicts the CO 8-hour concentrations compared with the 8-hour national air quality standard (NAAQS) and the trend shows that CO concentrations have been below the NAAQS since 1989. In fact, the concentrations have stabilized at less than 50% of the standard for approximately the last five years (Pikes Peak Area Council of Governments [PPACG] 2008[a]). Weather/seasons affect overall ambient pollutant concentrations, with winter conditions contributing to higher concentrations due to inversion layers (except ozone, which has higher concentrations in the summer months).

Figure 3-1. Carbon Monoxide Trends (2nd Max 8-hour Values)



The primary source of total CO emissions in Colorado Springs is vehicular traffic; the trend shows that although the number of vehicles has increased, the emissions per vehicle have decreased (PPACG 2008(a)). Other minor CO contributions in this area are from combustion sources, such as aircraft, power plants, boilers, generators, and open and wood burning. The emissions inventory estimates for CO emissions in the Colorado Springs maintenance area are 433.82 tons per day in 2010, which is expected to decline to 409.35 tons per day by 2015 (Colorado Department of Public Health and Environment [CDPHE] 2003). Since transportation sources are usually the main source of air pollutants, CDPHE works closely with PPACG to develop transportation plans that are consistent with the goals of the Clean Air Act (CAA) of 1970.

4.0 Regulatory Background and Applicability

The CAA, 42 United States Code 7401 *et seq*. (40 CFR Parts 50-99), amended in 1977 and 1990, is the primary federal statute governing outdoor air pollution. In 1990, the NAAQS (40 CFR Part 50) were established to protect human health and welfare, allowing for an adequate margin of safety. Primary and secondary standards exist for the most prevalent (criteria) air pollutants: O_3, CO, nitrogen dioxide (NO_2), sulfur dioxide, lead, and two types of particulate matter (i.e., particulate matter with a diameter of less than 10 micrometers and particulate matter with a diameter of less than 2.5 micrometers).

Federal regulations designate Air Quality Control Regions, or airsheds, that cannot attain compliance with the NAAQS as non-attainment areas and those areas with levels below the NAAQS as attainment areas. Maintenance areas were once designated non-attainment and now designated attainment for a certain time period. States with regions in violation of the NAAQS are mandated to submit a SIP to EPA; this plan details the steps that the state is taking to bring their air quality into compliance with the applicable standard(s). Currently, the Colorado Springs Urbanized Area is in attainment for all criteria pollutants, although it was reclassified as a maintenance area for CO in October 1999. This status currently extends through 2015, although the maintenance plan will be revised in 2009, which will continue the status until 2019. At that time, the Colorado Springs Urbanized Area will be re-designated as an attainment area, unless any NAAQS violations have occurred. The last such violation in the Colorado Springs region was for the 8-hour CO standard in 1988 (PPACG 2008). For now, there are no mandatory regulations to reduce CO emissions in El Paso County, as monitoring results show there have been decreases in CO concentrations since the late 80s; most recently El Paso County's vehicle inspection and maintenance program ended (January 2007). As Colorado Springs is in a maintenance area, its applicable SIP is the *Carbon Monoxide Maintenance Plan for the Colorado Springs Attainment/Maintenance Area*, approved by US Environmental Protection Agency (EPA) on 8 November 2004 (CDPHE 2003).

4.1 General Conformity Rule Requirements

In 1993, EPA established two conformity regulations (40 CFR Parts 6, 51, and 93) for federal transportation and non-transportation projects. Section 176(c) of the CAA requires that federal actions in non-attainment or maintenance areas must conform to a SIP to ensure, prior to the action occurring, that all activities associated with the planned action (i.e., all stationary, mobile, and area sources) do not adversely impact or interfere with achieving attainment of the NAAQS However, certain activities are exempt from the analysis: 1) actions covered by the Transportation Conformity Rule; 2) actions where the total net emissions are below regulatory *de minimis*[3] levels and are not considered to be regionally significant[4]; and 3) certain other actions (listed in 40 CFR 93.153(c)) that are exempt or presumed to conform per 40 CFR 93 Subpart B.

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[3] *de minimis* levels are 100 tons per year for CO in a maintenance area (EPA 1993).

[4] Regionally significant action means "a Federal action for which the direct and indirect emissions of any pollutant represent 10 percent or more of a nonattainment or maintenance area's emissions inventory for that pollutant" (EPA 1993). Therefore, the General Conformity Rule applies to the proposed federal action.

The Conformity Analysis must utilize the latest and most accurate emission estimation techniques (e.g., motor vehicle emission models used to prepare or revise the SIP, factors for non-motor vehicle sources, databases, and models specified and approved by EPA), unless written approval to employ modifications or substitutions is obtained from the EPA regional administrator.

If a proposed federal action is not exempt, exceeds the regulatory *de minimis* threshold, or is considered regionally significant, then a Conformity Determination must be prepared. This determination is made to assess whether the total direct and indirect emissions that would result from the federal action would be in conformity with the SIP. That is, the emissions are in compliance or consistent with all relevant requirements and milestones in the applicable SIP, including reasonable further progress schedules; assumptions specified in the attainment or maintenance demonstration; and SIP prohibitions, numerical emission limits, and work practice requirements.

Conforming actions should not result in any of the following:

Cause or contribute to new NAAQS violations in any area;

- Increase the frequency or severity of an existing NAAQS violation; or,
- Delay timely attainment of any NAAQS or interim emission reductions.

4.2 Applicability of Requirements to Proposed Federal Action

Since this proposed federal action is a non-transportation project, the transportation conformity regulations do not apply. Instead the general conformity regulations apply, described in the final rule for *Determining Conformity of Federal Actions to State or Federal Implementation Plans*, which is incorporated by reference in the CDPHE Air Quality Control Commission Regulation No. 10, *Criteria for Analysis of Conformity*. Per Army policy, if the action is shown to be exempt, the Conformity Applicability Analysis must be documented in a Record of Non-applicability (RONA) and then the action can proceed as planned (US Army Center for Health Promotion and Preventive Medicine [USACHPPM] 2002).

Therefore, in accordance with the CAA, this report examines the anticipated actual emissions associated with the Proposed Action (and its Alternatives) from both mobile and stationary sources located and operated in Fort Carson's main Cantonment area. The Conformity Applicability Analysis was conducted for both scenarios and was based on the latest planning assumptions derived from the population, employment, and travel data acquired from the local PPACG. The comparison to the regulatory *de minimis* threshold is focused on the year with the maximum emissions for CO.

Any construction, demolition, or renovation to occur south of the CO maintenance area on Fort Carson are not included in this analysis. Furthermore, in accordance with the regulation, if the following criteria were met, these emissions were included:

1. The emissions must be caused by the federal action but may occur later in time and/or may be farther removed and discreet from the action itself, yet are still reasonably foreseeable (i.e., emissions from projected future federal actions that can be quantified at the time of the conformity determination); and,
2. The federal agency must be able to practicably control and maintain control over the emissions.

The Army's *Technical Guide for Compliance with the General Conformity Rule* indicates that "the Federal proponent of the action must have continuing control over the source of indirect emissions" (USACHPPM 2004). Therefore, emission sources that are not under the Army's control are exempt from this analysis (i.e., motor vehicle use for shopping trips and other errands, travel by dependents on post, commuter traffic not on post, and emissions associated with off-post housing) (US Army Corps of Engineers [USACE] 2007).

4.3 Criteria For Demonstrating Conformity

A federal action is determined to conform if the total direct and indirect emissions are in compliance or consistent with all relevant SIP requirements and milestones and meet any one or a combination of the requirements listed at 40 CFR 93.158:

- Direct and indirect emissions from the activity are specifically identified and accounted for in the attainment or maintenance demonstration of a SIP approved after 1990 (40 CFR 93.158(a)(1) or;
- The emissions are determined and documented by the State Agency responsible for SIP preparation to result in a level of direct and indirect emissions associated with the federal action are together with all other emissions in the non-attainment or maintenance area, would not exceed the emissions inventories specified by the approved applicable SIP (40 CFR 93.158(a)(5)(i)(A) or;
- If SIP conformity cannot be demonstrated by any of the above options then a conformity determination is possible only if the air quality management agency notifies EPA that appropriate changes will be made in the applicable SIP documents and the air quality management agency commits to a schedule for preparing an acceptable SIP amendment that accommodates the net increase in direct and indirect emissions from the federal action without causing any delay in the schedule for attaining the relevant federal ambient air quality standard (40 CFR 93.158(a)(5)(i)(B);
- The federal action (or portion thereof), as determined by PPACG, is specifically included in a current transportation plan and transportation improvement program (TIP), which have been found to conform to the applicable SIP under 40 CFR part 51, subpart T, or 40 CFR part 93, subpart A (40 CFR 93.158(a)(5)(ii) or;
- The federal action (or portion) fully offsets its emissions within the same nonattainment or maintenance area through a revision to the applicable SIP or an equally enforceable measure that effects emission reductions equal to or greater than the total of direct and indirect emissions from the federal action so that there is no net increase in emission of that pollutant; 40 CFR 93.158(a)(5)(iii).

5.0 Conformity Applicability Analysis – Scenario 1 (Proposed Action and Alternative 2)

5.1 Approach

The CO emissions are calculated using various tools and data. Emissions from mobile, stationary, and area sources are quantified using AP-42 emission factors (EPA 1995) and by employing two versions of the Air Conformity Applicability Model (ACAM), version 4.3.3 (Air Force Center for Environmental Excellence [AFCEE] 2006) and version 4.3.31 (Fort Carson 2007). The latest vehicular emission model, MOBILE6.2 (EPA 2002), is used as an input file to ACAM.

To understand the net effect of the change in emissions due to the proposed federal action, direct and indirect emissions occurring from 2009 through 2013 must be calculated. In this case, personnel data, demolition activities, new construction activities, and heating requirements for the new buildings were used in the analysis.

Sources of emissions affecting the maintenance area were assumed to include the following:

- Construction of CS/CSS facility structures, defined by projects numbered 69795 and 67137;
- Demolition associated with the CS/CSS EN Company, project number 67137;
- All CS/CSS Soldiers commuting within the cantonment area in privately-owned vehicles (POVs);
- IBCT and CAB Soldiers commuting in POVs from off-post housing, assuming a portion of them enters the installation through an access gate in the cantonment area and drive through this area before driving downrange to IBCT or CAB facilities;
- Driving of government-owned vehicles (GOVs) for a portion of CS/CSS employees;
- A small additional population regularly driving POVs from IBCT or CAB facilities to meetings in the cantonment area;
- Aircraft operations (in flight only) over the cantonment area;
- Facility heating for the CS/CSS buildings; and
- Miscellaneous mobile and stationary sources, which ACAM assumes to be part of any addition of personnel.

Details regarding the assumptions and calculations are discussed throughout this section and in Appendix B.

5.2 Personnel and Mobile Vehicle Emissions

The stationing/re-stationing of additional units will result in a total personnel increase of 6,700 military personnel at Fort Carson by FY 2013. For Scenario 1, only the 400 personnel of CS/CSS are to be located within the main cantonment area, with the 3,500 IBCT and 2,800 CAB personnel located downrange, outside the Cantonment/CO maintenance area (Table 5-1).

Mobile vehicle emissions include emissions from POVs commuting within the installation, GOVs (e.g., sedans, station wagons, buses, and passenger, utility, and heavy-duty trucks), and off-road support vehicles typically used at military installations. Only emissions generated on Fort Carson and within the cantonment area are included in this analysis.

Scenario 1 would result in an overall increase in full-time military personnel within the Cantonment/CO Maintenance area. Consequently, the number of vehicle miles traveled (VMT) and associated emissions are expected to increase.

Table 5-1. Scenario 1 – Estimated Increase in Active Duty Troops at Fort Carson by CY 2013

Unit	Military Personnel	Location in Scenario 1	In Cantonment/ CO Maintenance Area
IBCT	3,500	Wilderness Road or Tent City	No
CS/CSS	400	Cantonment area	Yes
CAB	2,800	Wilderness Road or Tent City	No
TOTAL	**6,700**		
TOTAL within cantonment area	**400**		

5.2.1 Methodology/Results

ACAM uses MOBILE6.2 (EPA 2002) to calculate emissions from POV and GOV on-road vehicle emissions. The following assumptions were used to develop these emissions:

- New employee POV commuting distance: EPA has stated that only commuting travel inside the installation's boundary needs to be considered in the Conformity Determination (USACE 2007). Based on precedence in other EISs in Colorado, the same assumption was used for this. Emissions associated with other household travel are not under Army control; therefore, these indirect emissions are excluded from the Applicability Analysis calculations.
- A portion of personnel associated with IBCT or CAB commute to work from off-post housing and enter the installation through access gates within the Cantonment/CO maintenance area. It is assumed 25% enter through Gate 5 and 25% through Gate 20. The remaining 50% enter through gates outside the Cantonment/CO maintenance area.
- Gates 19 and 6, located outside the CO maintenance area, are planned for reopening in conjunction with this proposed federal action.
- IBCT and CAB personnel housed in downrange barracks do not create POV emissions within the Cantonment/CO maintenance area while commuting to work.
- Based on the maximum number of available spaces in the proposed barracks: an estimated 1,440 of 3,500 IBCT personnel will be housed in downrange barracks.

- Similarly, an estimated 1,008 of 2,800 CAB personnel will be housed in downrange barracks.
- Estimated distance from Gate 5 to Brown Road and Titus Boulevard, is 2.02 miles. Estimated distance from Gate 20 to Brown Road and Titus Boulevard is 2.64 miles (Moeder 2008).
- The 400 CS/CSS personnel located within the cantonment area had an average 2 mile one-way commute, whether or not personnel live on or off post (USACE 2007).
- It is assumed that all new Soldiers will arrive in the first quarter of CY 2012.
- A few additional senior and their support personnel were assumed to commute from the proposed downrange facilities to daily meetings within the cantonment area. Commute length was assumed to be 2 miles, the measured distance from Brown Road and Titus Boulevard to the cantonment area center point of Prussman Street and Specker Avenue (Google Earth 2008). Number of personnel was estimated to be 120 for IBCT and 20 for CAB.
- GOV annual VMT per new Soldier: the ACAM default value of 229 miles per year per employee was used (AFCEE 2005).

Additional descriptions of how these assumptions were used in the ACAM model are documented in Appendix B. Additional mobile source emissions are calculated for Off-Road Installation Support Vehicles based on the total number of personnel. For this calculation, only the 400 CS/CSS personnel were included in the emissions estimate.

By using these assumptions, the model shows that the maximum increase in CO emissions begin in CY 2012 from POVs and on- and off-road GOVs (Table 5-2). Further calculation details are provided in Appendix B.

Table 5-2. Summary of Mobile Vehicle Emissions for CO for Scenario 1 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
POV Employee Commute	0	0	0	53.99	53.99
GOV On-Road Vehicles	0	0	0	1.91	1.91
GOV Off-Road Installation Support Vehicles	0	0	0	1.58	1.58
TOTAL	**0**	**0**	**0**	**57.53**	**57.53**

5.3 Aircraft Flight Operations

Additional aircraft will be re-stationed at Fort Carson associated with the CAB. Since the CAB and Butts Army Airfield are located outside the cantonment area, most emissions related to operation (take off/landing) and maintenance of the re-stationed aircraft would occur outside the CO maintenance area and would be excluded from this conformity analysis. However, a portion of the training flights is assumed to fly over the cantonment area. Emissions for these training flyovers were calculated using ACAM and by making some very conservative assumptions about the training practices. The results are shown in Table 5-3.

Table 5-3. Summary of Aircraft Flyover Emission of CO for Scenario 1 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
Aircraft Flight Operations	0	0	0	0.05	0.05

5.4 Facility Construction

The CO emissions from new construction in the Fort Carson cantonment area would result primarily from vehicles and fuel-driven tools used to implement construction activities. All construction in Scenario 1 would occur within previously undeveloped areas. In Scenario 1, two projects are planned in the Fort Carson cantonment area, subject to available funds, including more than 131,000 square feet (sf) of new building space (Table 5-4). These projects consist of:

- New CS/CSS QM and EN Company facilities, which include company operations, vehicle maintenance, and various storage areas.

The planned CS/CSS facilities will fit into the existing infrastructure footprint, therefore there are no emissions included related to upgrade or expansion of roads and utilities.

Table 5-4. Proposed Construction Projects at Fort Carson Cantonment Area

Begin Construction	Project Number/ Project Name	Building Size (sf)	Graded Area (acres)	Paved Area (acres)	Phase I/ Phase II Days
1st Qrtr/2009	69795 CS/CSS QM Facilities	38,530	6.94	6.06	78/313
1st Qrtr/2011	67137 CS/CSS EN Company Complex	152,499	7.98	4.48	104/417
TOTAL		**191,029**	**14.92**	**10.54**	**182/730**

5.4.1 Methodology/Results

ACAM calculates emissions for a number of different construction activities that would occur during Phase 1 (site preparation and grading) and Phase II (building construction), including:

- Phase I – Grading Equipment: diesel truck emissions;
- Phase I – Grading Operations: dust generation;
- Phase II – Acres Paved: volatile organic emissions from asphalt;
- Phase II – Mobile Equipment: diesel truck emissions;
- Phase II – Non-residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Stationary Equipment: non-mobile diesel and gasoline-powered equipment; and
- Phase II – Worker Trips: construction worker POV commuting emissions.

The emissions for the above categories are estimated based on the square footage of the buildings to be constructed, the area graded, the area to be paved, and the estimated length of time of each phase of construction. See Appendix B for details.

Table 5-5 illustrates the CO emissions resulting from construction projects for both Phase I site grading and Phase II building construction.

Table 5-5. Summary of Construction Activity Emissions for CO from Scenario 1 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Construction Activity	2009	2010	2011	2012	2013
Phase I – Grading Equipment	0.15	0.00	0.23	0.00	0.00
Phase I – Grading Operations	0.00	0.00	0.00	0.00	0.00
Phase II – Acres Paved	0.00	0.00	0.00	0.00	0.00
Phase II – Mobile Equipment [c]	7.18	1.82	5.09	3.04	0.00
Phase II – Non-Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Stationary Equipment [a]	3.33	0.30	3.92	2.35	0.00
Phase II – Worker Trips [b,c]	19.93	10.94	2.27	1.35	0.00
TOTAL	**30.59**	**13.06**	**11.51**	**6.74**	**0.00**

[a] Adjustment for a combination of diesel engines and gasoline engines (90%/10%) for stationary equipment.

[b] Adjusted for altitude (USACE 2007).

[c] Includes mobile source emissions occurring within the Cantonment/CO maintenance area related to construction projects occurring downrange.

5.5 Facility Demolition

Demolition activities are planned to occur at the CS/CSS project site associated with the EN Company. This analysis includes 41,007 sf of demolition to occur in the first quarter of 2011.

5.5.1 Methodology/Results

The emissions from demolition activities are estimated based on the square footage and height of the buildings to be demolished, and the estimated duration of demolition.

Table 5-6 illustrates the CO emissions resulting from the demolition activities for CS/CSS EN Company.

Table 5-6. Summary of Demolition Activity Emissions for CO from Scenario 1 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Demolition Activity	2009	2010	2011	2012	2013
Phase I – Demolition Operations [a]	0.00	0.00	0.16	0.00	0.00

5.6 Stationary Sources

Facility Heating. The federal action would result in an increase of emissions due to the proposed operation of heating equipment in additional facilities. The buildings that contain heating power units in the cantonment area would also increase CO emissions (Table 5-7). Table 5-4 shows the building area inputs (in square feet) that are used to calculate emissions for facility boilers in the Fort Carson cantonment area.

5.6.1 Methodology/Results

Building Heating and Hot Water Heaters (Boilers). Building heating and hot water heater heat input were estimated to be 50 British thermal units per hour (BTU/hr) per square foot of new building construction, operating at 2,190 hours per year, based on past fuel usage (USACE 2007). The emissions factor for CO (AP-42, Table 1.4-1 1998) was used to determine yearly emissions (see Appendix B). CO emissions from boilers are shown for each year of the proposed federal action in Table 5-7.

Table 5-7. Summary of Proposed Boiler Emissions for CO from Scenario 1 -Federal Action at Fort Carson Cantonment Area (Tons/Year)

Point Source	2009	2010	2011	2012	2013
Facility Heating	0.00	0.13	0.13	0.39	0.64

5.7 Miscellaneous Sources

Additional emissions will be generated by miscellaneous source activities (e.g., degreasing, surface coating, pesticides, and residential sources such as lawn mowers.) anticipated to occur as a result of increased personnel and construction of new facilities. These activities are too small and/or too disaggregated to be calculated separately, so they have been considered as one category in ACAM.

5.7.1 Methodology/Results

For personnel actions, the ACAM model calculates emissions from miscellaneous area sources based on an aggregate emission factor and the number of personnel living in on-post housing proposed to be added as a result of the federal action. Aggregate per employee or per capita factors were developed for ACAM.

For Scenario 1, no additional personnel are expected to live in housing on-post within the Cantonment/CO maintenance area; therefore, no emissions are calculated for this category.

5.8 Scenario 1 – Conformity Applicability Analysis Findings

Table 5-8 shows the total direct and indirect CO emissions for each source applicable to this analysis as a result of the federal action Scenario 1 at Fort Carson from CYs 2009 to 2013. The maximum CO emissions from all emissions sources are expected to occur in 2012 with 64.66 tpy. The year with the greatest emissions is used to determine whether the emissions that result from the federal action exceed the specified regulatory *de minimis* levels. Since the threshold for CO emissions is 100 tpy, the maximum emissions do not exceed this regulatory threshold. Furthermore, these maximum emissions (equivalent to 0.18 tons per day) are not considered regionally significant, as the established emissions inventory for 2015 in the SIP is 409.35 tons per day, based on 149,412.75 TPY (CDPHE 2003), and therefore, a Conformity Determination is not required for the Fort Carson proposed federal action Scenario 1. A RONA documents that the General Conformity Rule requirements are not applicable (see Appendix A).

Table 5-8. Summary of Total CO Emissions from Federal Action Scenario 1 at Fort Carson Cantonment Area (Tons/Year)

Emissions Source	2009	2010	2011	2012	2013
Construction	30.59	13.06	11.51	6.74	0
Demolition	0	0	0.16	0	0
Mobile (POV)	0	0	0	53.99	53.99
Mobile (GOV)	0	0	0	3.49	3.49
Mobile (Aircraft)	0	0	0	0.05	0.05
Boilers	0	0.13	0.13	0.39	0.64
Emergency Generators	N/A	N/A	N/A	N/A	N/A
Miscellaneous	N/A	N/A	N/A	N/A	N/A
Total Estimated CO Emissions	**30.59**	**13.19**	**11.80**	**64.66**	**58.18**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

N/A = not applicable

6.0 Conformity Applicability Analysis – Scenario 2 – (Alternative 1)

6.1 Approach

The CO emissions are calculated using various tools and data. Emissions from mobile, stationary, and area sources are quantified using AP-42 emission factors (EPA 1995) and by employing two versions of the ACAM, version 4.3.3 (AFCEE 2006) and version 4.3.31 (Fort Carson 2007). The latest vehicular emission model, MOBILE6.2 (EPA 2002), is used as an input file to ACAM.

To understand the net effect of the change in emissions due to the proposed federal action, direct and indirect emissions occurring from 2009 through 2013 must be calculated. In this case, personnel data, new construction activities, and heating requirements for the new buildings were used in the analysis.

For this scenario, the CS/CSS and IBCT are both proposed to be located within the Cantonment/ CO maintenance area. Although Fort Carson has not determined yet where the CS/CSS would integrate into the cantonment area footprint, for the purposes of estimating mileage, it was assumed CS/CSS and IBCT would be located in TA Bravo. Sources of emissions occurring outside the cantonment area are not included in this analysis. Sources of emissions affecting the maintenance area were assumed to include the following:

- All CS/CSS and IBCT Soldiers commuting in POVs;
- CAB Soldiers commuting in POVs from off-post housing, assuming a portion of them enter the installation through an access gate in the cantonment area and drive through this area before driving downrange to CAB facilities;
- Driving of GOVs for a portion of IBCT and CS/CSS employees;
- A small additional population regularly driving POVs from CAB facilities to meetings in the cantonment area;
- Aircraft operations (in flight only) over the cantonment area;
- Construction of CS/CSS structures, defined by projects numbered 69795 and 67137;
- Demolition associated with the CS/CSS EN Company, project number 67137;
- Construction of IBCT structures defined by projects numbered 69121, 71171, 71176, 71178, and 71198;
- Facility heating for the CS/CSS and IBCT buildings;
- Installation and use of three 749 brake horsepower (bhp) emergency backup generators for IBCT headquarters buildings;
- Miscellaneous mobile and stationary sources, which ACAM assumes to be part of any addition of personnel.

Details regarding the assumptions and calculations are discussed throughout this section and in Appendix B.

6.2 Personnel and Mobile Vehicle Emissions

The stationing/re-stationing of additional units will result in a total personnel increase of 6,700 military personnel at Fort Carson by FY 2013. For Scenario 2, the 400 personnel of CS/CSS and the 3,500 personnel of IBCT are to be located within the cantonment area, with the 2,800 CAB personnel located downrange, outside the Cantonment/CO maintenance area (Table 6-1).

Mobile vehicle emissions include emissions from POVs commuting within the installation, GOVs (e.g., sedans, station wagons, buses, and passenger, utility, and heavy-duty trucks), and off-road support vehicles typically used at military installations. Only emissions generated on Fort Carson and within the cantonment area are included in this analysis.

Scenario 2 would result in an overall increase in full-time military personnel within the Cantonment/CO Maintenance area. Consequently, the number of VMT and associated emissions are expected to increase.

Table 6-1. Scenario 2 – Estimated Increase in Active Duty Troops at Fort Carson By 2013

Unit	Personnel	Location in Scenario 2	In Cantonment/ CO Maintenance Area
IBCT	3,500	TA Bravo	Yes
CS/CSS	400	Cantonment Area	Yes
CAB	2,800	Wilderness Road or Tent City	No
TOTAL	**6,700**		
TOTAL Within Cantonment	**3,900**		

6.2.1 Methodology/Results

ACAM uses MOBILE6.2 (EPA 2002) to calculate emissions from POV and GOV on-road vehicle emissions. The following assumptions were used to develop these emissions:

- New employee POV commuting distance: EPA stated that only commuting travel inside the installation's boundary needs to be considered in the Conformity Determination (USACE 2007). Emissions associated with other household travel are not under Army control; therefore, these indirect emissions are excluded from the Applicability Analysis calculations.
- A portion of personnel associated with CAB commute to work from off-post housing and enter the installation through access gates within the Cantonment/CO maintenance area. It is assumed 25% enter through Gate 5, and 25% through Gate 20. The remaining 50% enter through Gates outside the Cantonment/CO maintenance area.
- Gates 19 and 6, located outside the CO maintenance area, are planned for reopening in conjunction with this proposed federal action.

- CAB personnel housed in downrange barracks do not create POV emissions within the Cantonment/CO maintenance area while commuting to work.
- Based on the maximum number of available spaces in the proposed barracks, an estimated 1,440 of 3,500 IBCT personnel will be housed in cantonment area barracks.
- No CS/CSS personnel will be in on-post housing.
- An estimated 1,008 of 2,800 CAB personnel will be housed in downrange barracks.
- Estimated distance from Gate 5 to Brown and Titus Boulevard is 2.02 miles. Estimated distance from Gate 20 to Brown and Titus Boulevard is 2.64 miles (Moeder 2008).
- The 400 CS/CSS and 3,500 IBCT personnel located within the cantonment area had an average 2 mile one-way commute, whether or not personnel live on- or off-post (USACE 2007).
- It is assumed that all new Soldiers arrive in the first quarter of 2012.
- A few additional senior personnel and their support personnel were assumed to commute from downrange facilities to daily meetings within the cantonment area. Commute length was assumed to be 2 miles, the measured distance from Brown Road and Titus Boulevard to the cantonment area center point of Prussman Street and Specker Avenue (Google Earth 2008). Number of personnel was estimated to be 20 for CAB.
- GOV annual VMT per new Soldier: the ACAM default value of 229 miles per year per employee was used (AFCEE 2005).

Additional descriptions of how these assumptions were used in the ACAM model are described in Appendix B. Additional mobile source emissions are calculated for off-Road Installation Support Vehicles based on the total number of personnel. For this calculation, the 400 CS/CSS and 3,500 IBCT personnel were included in the emissions estimate.

By using these assumptions, the model shows that the maximum increase in CO emissions begin in CY 2012 from POVs and on- and off-road GOVs (Table 6-2). Further calculation details are in Appendix B.

Table 6-2. Summary of Mobile Vehicle Emissions for CO for Scenario 2 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
POV Employee Commute	0	0	0	96.43	96.43
GOV On-Road Vehicles	0	0	0	18.67	18.67
GOV Off-Road Installation Support Vehicles	0	0	0	15.42	15.42
TOTAL	**0**	**0**	**0**	**130.52**	**130.52**

6.3 Aircraft Flight Operations

Additional aircraft will be re-stationed at Fort Carson associated with the CAB. Since the CAB and Butts Army Airfield are located outside the cantonment area, most emissions related to operation (take off/landing) and maintenance of the re-stationed aircraft would occur outside the CO maintenance area and would be excluded from this conformity analysis. However, a portion of the training flights is assumed to fly over the cantonment area. Emissions for these training flyovers were calculated using ACAM and by making some very conservative assumptions about the training practices. The results are shown in Table 6-3.

Table 6-3. Summary of Aircraft Flyover Emission of CO for Scenario 2 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
Aircraft Flying Operations	0	0	0	0.05	0.05

6.4 Facility Construction

The CO emissions from new construction in the Fort Carson cantonment area would result primarily from vehicles and fuel-driven tools used to implement construction activities. All construction in Scenario 2 would occur within previously undeveloped areas. In Scenario 2, two projects are planned in the Fort Carson cantonment area, subject to available funds, including more than1,563,000 sf of new building space (Table 6-4). These projects consist of:

- New CS/CSS QM and EN Company facilities, which include company operations, vehicle maintenance, and various storage areas;
- IBCT Headquarters;
- IBCT Barracks and Dining Facility (DFAC);
- IBCT Company Operations Facilities;
- IBCT Tactical Equipment Maintenance Facility (TEMF), including vehicle maintenance and various storage areas;
- Child Development Center; and
- Construction of additional roads.

Table 6-4. Proposed Scenario 2 Construction Projects at Fort Carson Cantonment Area

Begin Construction	Project Number/ Project Name	Building Size (sf)	Graded Area (acres)	Paved Area (acres)	Phase I/ Phase II Days
1st Qrtr/2009	69795 CS/CSS QM Facilities	38,530	6.94	6.06	78/313
1st Qrtr/2011	67137 CS/CSS EN BN Complex	152,499	7.98	4.48	104/417
1st Qrtr/2009	69121 IBCT Barracks and DFAC	553,540	13.48	0.78	104/417
1st Qrtr/2009	71171 Child Development Center	79,650	5.41	3.58	78/313
1st Qrtr/2009	71176 IBCT HQ	145,176	3.70	0.37	104/417
1st Qrtr/2009	71178 IBCT Company Operations	368,964	9.95	1.48	104/417
1st Qrtr/2009	71198 IBCT TEMF	225,255	37.30	32.13	104/417
1st Qrtr/2009	71208 IBCT New Road Construction	NA	24.05	24.05	104/417
TOTAL		**1,563,614**	**108.81**	**72.93**	**676/2711**

6.4.1 Methodology/Results

ACAM calculates emissions for a number of different construction activities that would occur during Phase 1 (site preparation and grading) and Phase II (building construction), including:

- Phase I – Grading Equipment: diesel truck emissions;
- Phase I – Grading Operations: dust generation;
- Phase II – Acres Paved: volatile organic emissions from asphalt;
- Phase II – Mobile Equipment: diesel truck emissions;
- Phase II – Non-residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Stationary Equipment: non-mobile diesel and gasoline-powered equipment; and
- Phase II – Worker Trips: construction worker POV commuting emissions.

The emissions for the above categories are estimated based on the square footage of the buildings to be constructed, the area graded, the area to be paved, and the estimated length of time of each phase of construction. See Appendix B for details.

Table 6-5 illustrates the CO emissions resulting from construction projects for both Phase I site grading and Phase II building construction.

Table 6-5. Summary of Construction Activity Emissions for CO from Scenario 2 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Construction Activity	2009	2010	2011	2012	2013
Phase I – Grading Equipment	2.80	0.00	0.23	0.00	0.00
Phase I – Grading Operations	0.00	0.00	0.00	0.00	0.00
Phase II – Acres Paved	0.00	0.00	0.00	0.00	0.00
Phase II – Mobile Equipment [c]	34.40	15.39	5.09	3.04	0.00
Phase II – Non-Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Stationary Equipment [a]	25.42	11.32	3.92	2.35	0.00
Phase II – Worker Trips [b,c]	29.59	16.37	2.27	1.35	0.00
TOTAL	**92.20**	**43.09**	**11.51**	**6.74**	**0.00**

[a] Adjustment for a combination of diesel engines and gasoline engines (90%/10%) for stationary equipment.

[b] Adjusted for altitude (USACE 2007).

[c] Includes mobile source emissions occurring within the Cantonment/CO maintenance area related to construction projects occurring downrange.

6.5 Facility Demolition

Demolition activities are planned to occur at the CS/CSS project site associated with the EN Company. This analysis includes 41,007 sf of demolition to occur in the first quarter of 2011.

6.5.1 Methodology/Results

The emissions from demolition activities are estimated based on the square footage and height of the buildings to be demolished, and the estimated duration of demolition.

Table 6-6 illustrates the CO emissions resulting from the demolition activities for CS/CSS EN Company.

Table 6-6. Summary of Demolition Activity Emissions for CO from Scenario 2 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Demolition Activity	2009	2010	2011	2012	2013
Phase I – Demolition Operations [a]	0.00	0.00	0.16	0.00	0.00

6.6 Stationary Sources

Facility Heating. The federal action would result in an increase of emissions due to the proposed operation of heating equipment in additional facilities. The buildings that contain heating power units in the cantonment area would also increase CO emissions (see Table 6-7).

Table 6-4 shows the building area inputs in square feet that are used to calculate emissions for facility boilers at the Fort Carson cantonment area.

Emergency Generators. There are an estimated three new diesel-fired emergency generators, rated 749 bhp, proposed to be installed within the Cantonment/maintenance area. It was assumed they would operate 44 hours per year per generator, based on Fort Carson average actual operation. The three generators will begin operating in CY 2011 and will operate throughout the years of the proposed action.

6.6.1 Methodology/Results

Building Heating and Hot Water Heaters (Boilers). Building heating and hot water heater heat input were estimated to be 50 BTU/hr per square foot of new building construction, operating at 2,190 hours per year, based on past fuel usage (USACE 2007). The emissions factor for CO (AP-42, Table 1.4-1, 1998) was used to determine yearly emissions (see Appendix B). CO emissions from boilers are shown for each year of the proposed federal action in Table 6-6.

Emergency Generators. CO emissions from the three emergency generators are based on usage of 44 hours per generator per year. Emissions were estimated using AP-42 emission factors (AP-42-Table 3.3-1, 1998). The total CO emissions for these proposed units are shown in Table 6-7.

Table 6-7. Summary of Proposed Boiler and Generator Emissions for CO from Scenario 2 - Federal Action at Fort Carson Cantonment Area (Tons/Year)

Point Source	2009	2010	2011	2012	2013
Facility Heating	0.00	1.68	2.97	3.23	3.49
Emergency Generators	0.00	0.00	0.21	0.27	0.27
TOTAL	0.00	1.68	3.17	3.50	3.76

6.7 Miscellaneous Sources

Additional emissions will be generated by miscellaneous source activities (e.g., degreasing, surface coating, pesticides, and residential sources such as lawn mowers) anticipated to occur as a result of increased personnel and construction of new facilities. These activities are too small and/or too disaggregate to be calculated separately, so they have been considered as one category in ACAM.

6.7.1 Methodology/Results

For personnel actions, the ACAM model calculates emissions from miscellaneous area sources based on an aggregate emission factor and the number of personnel living in on-post housing proposed to be added as a result of the federal action. Aggregate per employee or per capita factors were developed for ACAM. As mentioned earlier in the section, it was assumed that 1,440 of the 3,900 added personnel were in on-post/in-cantonment housing. Total emissions are shown below in Table 6-8.

Table 6-8. Summary of Miscellaneous Source Emissions of CO for Scenario 2 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
Miscellaneous Point Sources	0	0	0	15.23	15.23

6.8 Scenario 2 – Conformity Applicability Analysis Findings

Table 6-9 shows the total direct and indirect CO emissions for each source applicable to this analysis as a result of the federal action Scenario 2 at Fort Carson from FYs 2009 to 2013. The maximum CO emissions from all emissions sources are expected to occur in 2012 with 156.05 tpy. The year with the greatest emissions is used to determine whether the emissions that result from the federal action exceed the specified regulatory *de minimis* levels. Since the threshold for CO emissions is 100 tpy, the maximum emissions do exceed this threshold, and therefore a Conformity Determination is required for the Fort Carson federal action Scenario 2.

Table 6-9. Summary of Total CO Emissions from Federal Action Scenario 2 at Fort Carson Cantonment Area (Tons/Year)

Emissions Source	2009	2010	2011	2012	2013
Construction	92.20	43.09	11.51	6.74	0
Demolition	0	0	0.16	0	0
Mobile (POV)	0	0	0	96.43	96.43
Mobile (GOV)	0	0	0	34.09	34.09
Mobile Aircraft	0	0	0	0.05	0.05
Boilers	0	1.68	2.97	3.23	3.49
Emergency Generators	0	0	0.21	0.27	0.27
Miscellaneous	0	0	0	15.23	15.23

Emissions Source	2009	2010	2011	2012	2013
Total Estimated CO Emissions	92.20	44.77	14.85	156.05	149.57
CO *de minimis* Threshold	100	100	100	100	100

N/A = not applicable

6.9 Statement of Conformity

Based on the criteria outlined in Section 4.2, the CY 2012 CO emissions for the alternative siting of unit facilities (Scenario 2) exceeds the *de minimis* limit by totaling 156.05 tpy (i.e., 96.43 tpy from POVs, 34.09 tpy from GOVs, and 25.53 tpy from all other sources). Fort Carson can demonstrate that the Scenario 2 planned federal action complies with the General Conformity Rule requirements and conforms with the Colorado SIP in the following ways:

- The *FY 2008 Through FY 2013 Transportation Improvement Program for the Colorado Springs Urbanizing Area* allows a "sufficient margin of safety to the mobile source emissions budget[5] buffer to maximize the flexibility for determining conformity in future years due to mobile source growth beyond projected levels for future years or for model changes that revise projected emissions" (Pikes Peak Area Council of Governments [PPACG] 2008(b)). The PPACG updated the Transportation Improvement Program (TIP) by significantly revising its travel demand model for forecasting traffic and specifically, Fort Carson has been attributed enough growth in the TIP to allow for a total population of 30,000 active duty troops by CY 2015 (Prather 2008). As the Soldier numbers used in this Conformity Analysis are rounded up to be conservative, the worst case total active duty troop population for Fort Carson after this proposed action (FY 2013) is estimated to be 32,000 Soldiers. However, "…[d]eployments overseas mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS" (Fort Carson 2008). Therefore, there is a low probability that Fort Carson will ever realize that population potential for any sustained period of time. Based on discussions with PPACG, it is asserted that their TIP will be able to accommodate Fort Carson's growth based on the remaining available budgeted emissions for the region. Therefore, the 96.43 tpy of POV emissions meet the requirements and criteria for demonstrating conformity (per 40 Code of Federal Regulations [CFR] 93.158(a)(5)(ii)), as those emissions will be certified as accounted for in the TIP by PPACG.
- The remaining emissions (i.e., 59.62 tpy) related to GOVs, facility construction, stationary sources (i.e., boilers and generators), and miscellaneous area source emissions, are less than the regulatory thresholds outlined for General Conformity at 40 CFR 93.158(c)(1) and are considered to be *de minimis*. These emissions are also not considered regionally significant;

[5] Emissions budgets are "those portions of the applicable SIP's projected emissions inventories that describe the levels of emissions (mobile, stationary, area, etc.) that provide for meeting reasonable further progress milestones, attainment, and/or maintenance for any criteria pollutant or its precursors" (EPA 1993).

therefore, demonstration of conformity has been shown and official public and agency notification of the availability of this report and public comment period will be given.

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Appendix A – Records of Non-Applicability

GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Action Name:	**US Army Garrison (USAG) Fort Carson – Grow the Army and Combat Aviation Brigade**
Action Identification Number:	**Scenario 1- Proposed Action and Alternative 2**
Action Point of Contact:	**Tom Warren, Deputy Garrison Commander PCMS 719-526-2022**
Begin Date: Calendar Year (CY) 2009	**End Date: CY 2013**

General Conformity under the Clean Air Act, Section 176(c) has been evaluated for the federal action described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because total annual direct and indirect emissions from it have been estimated:

Carbon Monoxide (CO) Emissions (CY 2012)

Construction and Demolition Phase	6.74 tpy
Operations Phase – Mobile Sources	57.53 tpy
Operations Phase – Point Sources	0.39 tpy
TOTAL Annual Emissions	**64.66 tpy**

These emission rates are below the conformity threshold values established at 40 CFR 93.153(b):

Conformity Threshold Rate

CO	100 tpy

Also, under 40 CFR 93.153(i), the federal action is not considered regionally significant, as the calculated emissions are less than 10% of the maintenance area emissions for CO. The maximum annual emissions from the proposed project are estimated to be 0.18 tons/day of CO, which is about 0.04 percent of the area-wide emissions.

Supporting documentation and emissions estimates are discussed in the Clean Air Act General Conformity Analysis and Determination report, which supports the USAG Fort Carson's *Grow the Force Environmental Impact Statement.*

SIGNED ______________________________

Thomas L. Warren,
Deputy Garrison Commander PCMS

GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Action Name:	**US Army Garrison (USAG) Fort Carson – Grow the Army and Combat Aviation Brigade**
Action Identification Number:	**Scenario 2- Alternative 1**
Action Point of Contact:	**Tom Warren, Deputy Garrison Commander PCMS 719-526-2022**
Begin Date: Calendar Year (CY) 2009	**End Date: CY 2013**

General Conformity under the Clean Air Act, Section 176(c) has been evaluated for the federal action described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because total annual direct and indirect emissions from it have been estimated:

Carbon Monoxide (CO) Emissions (CY 2012)

Construction and Demolition Phase	6.74 tpy
Operations Phase – Mobile Sources	49.37 tpy
Operations Phase – Point Sources	3.5 tpy
TOTAL Annual Emissions	**59.61 tpy**

These emission rates are below the conformity threshold values established at 40 CFR 93.153(b):

Conformity Threshold Rate

CO	100 tpy

Also, under 40 CFR 93.153(i), the federal action is not considered regionally significant, as the calculated emissions are less than 10% of the maintenance area emissions for CO. The maximum annual emissions from the proposed project are estimated to be 0.18 tons/day of CO, which is about 0.04 percent of the area-wide emissions.

Supporting documentation and emissions estimates are discussed in the Clean Air Act General Conformity Analysis and Determination report, which supports the USAG Fort Carson's *Grow the Force Environmental Impact Statement*.

SIGNED ______________________________

Thomas L. Warren,
Deputy Garrison Commander PCMS

Appendix B – Carbon Monoxide Emissions Calculations/Assumptions

This section provides greater detail of the use of ACAM and other emission calculation methods to develop the carbon monoxide (CO) emission calculations for this general conformity analysis. Only that information pertinent to Fort Carson, CO conformity is included.

B1.0 USE OF ACAM SOFTWARE

The CO emissions are calculated using two versions of the Air Conformity Applicability Model (ACAM): the standard Air Force version 4.3.3 (AFCEE 2006) and a modified version 4.3.31 developed especially for Fort Carson (Fort Carson 2007). ACAM 4.3.31 was used for most emission categories. ACAM 4.3.3 was used to calculate on-road POV and GOV emissions using the MOBILE6.2 software supplied with and run through ACAM. This method was chosen due to technical difficulty in getting the MOBILE6 software to operate properly from the ACAM 4.3.31 model. In addition, the unique assumptions used for the POV calculations made it necessary to use different personnel assumptions for MOBILE6.2 and other population-based ACAM calculations.

In addition, ACAM 4.3.3 was used for generating the Aircraft Flying Operations emissions, because the module had been disabled in ACAM 4.3.31.

Emissions generated from each model were assembled and tabulated using a Microsoft Access database linking to the underlying data tables used by each of the ACAM versions.

B2.0 METHODS, ASSUMPTIONS, AND INPUT PARAMETERS

For all of the emission sources involved in this analysis, ACAM was used for the initial emissions development. For certain source categories, the emissions produced by ACAM were modified to account for unique conditions related to the Fort Carson facility. The document U.S. Air Force Air Conformity Applicability Model Version 4.3 Technical Documentation, December 2005, should be referred to for any questions about particular emissions methods, emission factors, or input definitions. The intent of this appendix is to describe and document any special assumptions or modifications made to the ACAM results used in this report.

B2.1 Personnel and Mobile Vehicle Emissions

ACAM uses MOBILE6.2 (EPA 2002) to calculate emissions from POV and GOV on-road vehicle emissions. The following assumptions were used to develop the emissions for each scenario:

- New employee POV commuting distance: EPA has stated that only commuting travel inside the installation's boundary needs to be considered in the Conformity Determination (USACE 2007). Emissions associated with other household travel are not under Army control; therefore, these indirect emissions are excluded from the Applicability Analysis calculations.

- A portion of personnel associated with downrange units commute to work from off-post housing and enter the installation through access gates within the Cantonment/CO maintenance area. It is assumed 25% enter through Gate 5 and 25% through Gate 20. The remaining 50% enter through gates outside the Cantonment/CO maintenance area.
- Gates 19 and 6, located outside the CO maintenance area are planned for reopening in conjunction with this federal action.
- Downrange unit personnel housed in downrange barracks do not create POV emissions within the Cantonment/CO maintenance area while commuting to work.
- Based on the maximum number of available spaces in the proposed barracks: an estimated 1,440 of 3,500 IBCT personnel will be housed in barracks (downrange in Scenario 1, cantonment area in Scenario 2.)
- Similarly, an estimated 1,008 of 2,800 CAB personnel will be housed in downrange barracks in both scenarios.
- Estimated distance from Gate 5 to Brown Road and Titus Boulevard is 2.02 miles. Estimated distance from Gate 20 to Brown Road and Titus Boulevard is 2.64 miles (Moeder 2008)
- The 400 CS/CSS personnel located within the cantonment area had an average 2 mile one-way commute, whether or not personnel live on or off post. (USACE 2007)
- It is assumed that all new personnel arrive in the first quarter of 2012.
- A few additional senior personnel and their support staff were assumed to commute from the proposed downrange facilities to daily meetings within the cantonment area. Commute length was assumed to be 2 miles, the measured distance from Brown Road and Titus Boulevard to the cantonment area center point of Prussman Street and Specker Avenue (Google Earth 2008). The number of personnel was estimated to be 120 for IBCT and 20 for CAB.
- For GOV annual vehicle miles traveled per new Soldier: the ACAM default value of 229 miles per year per employee was used (AFCEE 2005).

B2.1.1 MOBILE6.2 POV and GOV On-Road Emission Calculations

The assumptions listed above were incorporated into a spreadsheet that determined total POV vehicle miles traveled (VMT) occurring within the CO maintenance area for each scenario. From this, the one-way commute was calculated to use as the ACAM input, based on the total number of in-cantonment area personnel added. This was necessary because the number of in-cantonment area personnel is also used by ACAM for the GOV On-Road emission calculations, and needs to represent only personnel at units in the cantonment area; while the POV calculation is attempting to include emissions from personnel in units outside the maintenance area that may produce some emissions within the maintenance area. Table B-1 shows the ACAM 4.3.3 inputs and MOBILE6.2 non-default assumptions used for each Scenario calculation. Note that the one-way commute mileage is much higher for Scenario 1 since mileage is included for a large number of downrange personnel passing through the cantonment area during their commute.

Table B-1. ACAM 4.3.3 Inputs for MOBILE6.2 Calculations

Input	Scenario 1	Scenario 2
One-Way Commute (miles)[6]	13.92[7]	2.55[8]
Added Active Duty Personnel (1Q2012)	400	3900
New Employees Living On Base (%)	0	0
Government VMT (miles/person/year)	229	229
MOBILE6.2 POV/GOV Oxygenated Fuels	25 % Alcohol at 0.027% by weight RVP to exceed limit	
MOBILE6.2 POV/GOV Fuel Program	Conventional Gasoline West	

B2.1.2 Off-Road Base Support Vehicle Emission Calculations

Additional mobile source emissions are calculated for Off-Road Base Support Vehicles based on the total number of personnel. For this calculation, only the personnel stationed within the cantonment area were included in the emissions estimate. The ACAM 4.3.31 input values are shown in Table B-2. The standard ACAM calculation method was used.

Table B-2. ACAM 4.3.31 Inputs for Personnel and Off-Road Base Support Vehicle Calculations

Input	Scenario 1	Scenario 2
Added Active Duty Personnel (1Q2012)	400	3900
New Employees Living On Base (%)[9]	0%	37%[10]

B2.2 Aircraft Flight Operations

Additional aircraft will be re-stationed at Fort Carson associated with the CAB unit. Since the CAB and Butts Army Airfield are located outside the cantonment area, most emissions related to operation (take off/landing) and maintenance of the re-stationed aircraft would occur outside the CO maintenance area and would be excluded from this conformity analysis. However, a portion of the training flights are assumed to fly over the cantonment area. Emissions for these training

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[6] One-way Commute (miles) = (Total VMT within cantonment area by all personnel) / (# cantonment personnel)
[7] 13.92 = 5567.58 total VMT / 400 cantonment area personnel
[8] 2.55 = 9927.68 total VMT / 3900 cantonment area personnel
[9] Since ACAM is an Air Force-developed software, “Base” is used instead of “Post”.
[10] Percent of new Soldiers living on post and in cantonment area = 1440/3900 = 37%

flyovers were calculated using ACAM 4.3.3 and by making the following conservative assumptions about the training practices:

- All operations performed by Blackhawk UH-60M helicopters with two T700-GE-701C engines.
- Used readily available emission factors for T700-GE-700, an older version of the same engine. It is assumed that CO emissions are similar or higher for the older engine type.
- All operations within the cantonment area airspace are in “Climb” mode.
- Each flyover consists of one minute of “Climb” mode operation within the cantonment area airspace.
- Conduct 50 operations per day with 10% flying north through the cantonment area airspace.
- Assume all operations fly below the mixing zone. The mixing zone varies, with 12,000 ft as the maximum average mixing zone elevation for this region (Cook 2008).
- Operations conducted five days per week, 52 weeks per year.

The ACAM 4.3.3 input values are shown in Table B-3. The standard ACAM calculation method was used.

Table B-3. ACAM 4.3.3 Inputs for Aircraft Operation Emission Calculations

Input	Scenarios 1 & 2
Aircraft Type	UH-60A
Engine Type	T700-GE-700
Quantity	5[11]
Time in Climb Mode	1 minute[12]
Sorties per year	260[13]

B2.3 Facility Construction

The CO emissions from new construction in the Fort Carson cantonment area would primarily result from vehicles and fuel-driven tools used to implement construction activities. ACAM calculates emissions for a number of different construction activities that would occur during Phase 1 (site preparation and grading) and Phase II (building construction), including,

[11] Number of aircraft = 50 operations per day x 10% that fly through the cantonment area airspace
[12] All other mode times set to zero.
[13] Sorties = 1/aircraft x 5/week x 52 weeks/year. All other types of operations and support equipment set to zero.

- Phase I – Grading Equipment: diesel truck emissions;
- Phase I – Grading Operations: dust generation;
- Phase II – Acres Paved: volatile organic emissions from asphalt;
- Phase II – Mobile Equipment: diesel truck emissions;
- Phase II – Non-residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Stationary Equipment: non-mobile diesel and gasoline-powered equipment; and
- Phase II – Worker Trips: construction worker POV commuting emissions.

The emissions for the above categories are estimated based on the square footage of the buildings to be constructed, the area graded, the area to be paved, and the estimated length of time of each phase of construction. This data is shown in Table B-4, with the first two columns indicating whether the project was part of Scenario 1 or Scenario 2.

Some of the construction-related emissions generated by ACAM were modified for certain source types in order to take into account the added complexity of considering the impact of construction occurring downrange, outside the cantonment area. These and other special assumptions are explained in each subsection below.

Table B-4. ACAM 4.3.31 Inputs for Construction Projects at Fort Carson

Scenario 1	Scenario 2	Begin Construction	Project Number/ Project Name	Building Size (sf)	Graded Area (acres)	Paved Area (acres)	Phase I/ Phase II[14] Days
Yes	Yes	1Q/2009	69795 CS/CSS QM Facilities	38,530	6.94	6.06	78/313
Yes	Yes	1Q/2011	67137 CS/CSS EN BN Complex	152,499	7.98	4.48	104/417
No	Yes	1Q/2009	69121 IBCT Barracks and DFAC	553,540	13.48	0.78	104/417
No	Yes	1Q/2009	71171 Child Development Center	79,650	5.41	3.58	78/313
No	Yes	1Q/2009	71176 IBCT HQ	145,176	3.70	0.37	104/417
No	Yes	1Q/2009	71178 IBCT Company Operations	368,964	9.95	1.48	104/417
No	Yes	1Q/2009	71198 IBCT TEMF	224,810	37.30	32.13	104/417
No	Yes	1Q/2009	71208 IBCT New Road Construction	NA	24.05	24.05	104/417

B2.3.1 Phase I – Grading Equipment

This is a calculation of diesel truck emissions, based on the graded acres for each project, as shown in Table B-4. Because these emissions occur primarily at the project site, it is assumed

[14] Phase II days for ACAM input equal the project data Phase II + Phase III duration.

that only projects within the Cantonment should be included. The standard ACAM calculation method was used.

B2.3.2 Phase I – Grading Operations

This is a calculation of particulate dust emissions, based on the graded acres for each project, as shown in Table B-4. Because these emissions occur primarily at the project site, it is assumed that only projects within the Cantonment should be included. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.3 Phase II – Acres Paved

This is a calculation of volatile organic emissions from asphalt paving. The calculation is based on paving footprint (acres), as shown in Table B-4. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.4 Phase II – Mobile Equipment

This is a calculation of diesel truck emissions from mobile equipment used during Phase II of the construction, such as dump trucks and fork lifts. The calculation is based on building square footage and duration of each project, as shown in Table B-4. Because these emissions could occur away from the project site (e.g. diesel truck transporting building materials to the site), it is assumed that a portion of emissions for downrange projects should be included. This is intended to account for mobile equipment entering post through a cantonment area gate and passing through the cantonment area on the way to a downrange construction site. The standard ACAM calculation method was used for each in-cantonment area project. The resulting emissions were adjusted using the following methods and assumptions:

- Scenario 1– Added 5% of IBCT construction mobile source emissions calculated for Scenario 2[15] to account for a portion of downrange IBCT traffic passing through Cantonment. Added an additional 5% of IBCT construction mobile source emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic passing through the cantonment area.
- Scenario 2 – Added 5% of IBCT construction mobile source emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic passing through the cantonment area.
- It was assumed most downrange project construction vehicles would enter post through downrange gates (Nos. 6 and 19). Therefore the small value of 5% was chosen to estimate the maximum portion of downrange construction mobile sources to pass through the cantonment area.
- It was assumed that CAB construction levels were similar to IBCT construction levels.

[15] IBCT construction mobile source emissions = (Total calculated for Scenario 2 – IBCT and CS/CSS) – (Total calculated for Scenario 1 – CS/CSS only)

B2.3.5 Phase II – Non-residential Architectural Coatings

This is a calculation of volatile organic emissions from non-residential architectural coatings. The calculation is based on building square footage, as shown in Table B-4. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.6 Phase II – Residential Architectural Coatings

This is a calculation of volatile organic emissions from residential architectural coatings. The calculation is based on building square footage, as shown in Table B-4. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.7 Phase II – Stationary Equipment

ACAM estimates emissions for stationary gasoline-powered equipment commonly used at a construction site (e.g. generators, saws, etc.). The calculation is based on building square footage and duration of each project, as shown in Table B-4. Since it is reasonable to assume that a combination of diesel-powered (90%) and gasoline-powered (10%) equipment will be used on post, a correction outside the model is made using AP-42 emission factors for gasoline and diesel engines (EPA 1995) according to the following equation:

CO $\text{emissions}_{\text{stationary equipment}}$ = CO $\text{emissions}_{\text{gasoline}}$ x (0.9 x 0.00668 + 0.1 x 0.439)/0.439
where:
CO $\text{emissions}_{\text{gasoline}}$ is the ACAM result using the standard calculation method,
0.00668 lb/bhp-hr is the emission factor for CO from diesel engines (EPA 1995, Table 3.3-1), and
0.439 lb/bhp-hr is the emission factor for CO from gasoline engines (EPA 1995, Table 3.3-1).

Because these emissions occur primarily at the project site, it is assumed that only projects within the cantonment area should be included. The standard ACAM calculation method was used.

B2.3.8 Phase II – Worker Trips: construction worker POV commuting emissions.

ACAM estimates emissions for construction worker commuting in POV to the project site. The calculation is based on the project duration and building square footage, as shown in Table B-4. Because these emissions could occur away from the project site, it is assumed that a portion of emissions for downrange projects should be included. A factor of 50% was chosen as a conservative estimate based on similar assumptions made for POV gate usage, as described in section B2.1. This is intended to account for workers of downrange projects entering post through a cantonment area gate and passing through the cantonment area on the way to a downrange construction site. The standard ACAM calculation method was used for each in-cantonment area project. The resulting emissions were adjusted using the following methods and assumptions:

- Scenario 1– Added 50% of IBCT worker trip emissions calculated for Scenario 2[16] to account for a portion of downrange IBCT traffic entering post through a cantonment area gate. Added an additional 50% of IBCT worker trip emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic entering post through a cantonment area gate.
- Scenario 2 – Added 50% of IBCT worker trip emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic entering post through a cantonment area gate.
- It was assumed that 50% of downrange project worker POVs would enter post through cantonment area gates.
- It was assumed that CAB construction levels were similar to IBCT construction levels.

In addition, these emissions were adjusted for altitude and oxygenated fuels without the inspection and maintenance program (USACE 2007) to account for the elevation at Fort Carson of greater than 500 feet above sea level. Adjustment was made with the following calculation:

$\text{CO emissions}_{\text{adjusted}} = \text{CO emissions}_{\text{ACAM}} \times 1.035$

B2.4 Facility Demolition

In order to construct the facilities associated with the CS/CSS EN Company, several demolition activities must occur during Phase I, in the first quarter of 2011 specifically. ACAM calculates emissions from demolition activities using the length, width, and height of the buildings to be demolished, and the duration. Therefore, the following parameters were estimated:

- A total square footage of 41,007;
- A height of 18 feet for all of the buildings; and
- A duration of one week, or five days.

B2.5 Stationary Sources

B2.5.1 Facility Heaters

ACAM has several methods available for calculating emissions from facility heating. In this case, facility heating emissions were calculated based on the building square footage, as listed in Table B-4. In addition to building area, ACAM requires definition of an average facility heating rate. Facility heating rate was estimated by the US Army Corps of Engineers (USACE 2007) to be 50 BTU/hr per square foot of new building construction. The heaters were assumed to operate only 2,190 hours based on past fuel usage.

ACAM 4.3.31 Input Facility Heating Rate = (50 BTU/hr-sf) x (2190 hr/yr) = 109,500 BTU/sf

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[16] IBCT construction mobile source emissions = (Total calculated for Scenario 2 – IBCT and CS/CSS) – (Total calculated for Scenario 1 – CS/CSS only)

ACAM uses standard AP-42 emissions factor for CO (AP-42, Table 1.4-1 1998) was used to determine yearly emissions. The standard ACAM calculation method was used for each in-cantonment area project.

B2.5.2 Emergency Generators

ACAM calculates emissions for emergency generators based on fuel type, capacity rating, and annual fuel use. CO emission rates from the three emergency generators are based on usage of 44 hours per generator per year (average actual hours for 2006 and 2007). Emissions were estimated using AP-42 emission factors for diesel generators of less than 600 bhp capacity (EPA 1995, Table 3.3-1). The fuel consumption for use as ACAM input was calculated using the following equation:

749 bhp x 3 engines x 44 hr/yr/engine x 7,000 BTU/bhp-hr / (140,000 btu/gal) = 4,943.4 gal/yr where:

- 749 bhp is the estimated capacity of each engine
- 3 engines are assumed to be installed within the cantonment area in Scenario 2
- 44 hr/yr is average actual use per engine based on Fort Carson's historic actual use (Meister 2008).
- 7,000 BTU/bhp-hr is average brake-specific fuel consumption, (EPA 1995, Table 3.3-1).
- 140,000 BTU/gal is heating value of distillate oil, (EPA 1995, Appendix A, p.A-5).

B2.5.3 Miscellaneous Sources

Additional emissions will be generated by miscellaneous source activities (e.g. degreasing, surface coating, pesticides, and residential sources such as lawn mowers) anticipated to occur as a result of increased personnel and construction of new facilities. These activities are too small and/or too disaggregated to be calculated separately, so they have been considered as one category in ACAM. The ACAM model calculates emissions from miscellaneous area sources based on an aggregate emission factor and the number of personnel living in on-post housing proposed to be added as a result of the federal action (see Table B-2). The standard ACAM calculation method was used.

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FINAL

AIR QUALITY ANALYSIS MODELING REPORT

for

US Army Garrison (USAG) Fort Carson
Fort Carson, Colorado

Prepared for
USAG Fort Carson
DPW, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078, Delivery Order 0005 (URS Project No. 39455606)

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December 2008

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Appendices

Acronyms

%	percent
A_0	total area
AAQS	ambient air quality standards
AERMET	a meteorological preprocessor for AERMOD
AERMOD	AMS/EPA regulatory model
AERSURFACE	AMS/EPA regulatory model surface characteristics development tool
AMS	American Meteorological Society
AQRV	air quality related value
ArcGIS	an integrated collection of geographic information system software products
ArcMap	a geographic information system application
bhp	brake horsepower
BRIP	building input profile program
CAAQS	Colorado ambient air quality standards
CALGRID	California photochemical grid model
CALMET	California meteorological model—a preprocessor component of the CALPUFF modeling system
CALPOST	a post-processing component of the CALPUFF modeling system
CALPUFF	California puff air quality dispersion modeling system
CDPHE	Colorado Department of Public Health and Environment
CO	carbon monoxide
CY	calendar year
DAT	deposition analysis threshold
DEM	digital elevation model
DPW	Directorate of Public Works
DUSTRAN	dust transport atmospheric modeling system
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
ft	feet
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLM	Federal land manager
Fort Carson	US Army Garrison (USAG) Fort Carson, Colorado
GIS	Geographic information system
GTA	Grow the Army
IWAQM	Interagency Workgroup on Air Quality Modeling
kg/ha/yr	kilogram per hectare per year
km	kilometer
km^2	square kilometers
lb/hp-hr	pounds per horsepower-hour
MM5	Fifth-Generation NCAR/Penn State Mesoscale Model
MMBtu/hr	million British thermal units per hour
mph	mile per hour
m/s	meters per second
N	nitrogen

Acronyms (continued)

NAAQS	national ambient air quality standards
NAD	North American datum
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPS	National Park Service
PCMS	Piñon Canyon Maneuver Area
PCRAMMET	EPA personal computer version of the meteorological preprocessor for the RAM program
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
PNNL	Pacific Northwest National Laboratory
POSTUTIL	an inorganic chemistry parameterization component of the CALPUFF modeling system
ppb	parts per billion
PSD	Prevention of Significant Deterioration
PTE	potential to emit
RMNP	Rocky Mountain National Park
S	sulfur
SIL	significant impact levels
SO_2	sulfur dioxide
SO_x	sulfur oxides
USAG	United States Army Garrison
VOC	volatile organic compound

EXECUTIVE SUMMARY

Air dispersion modeling was performed to assess the cumulative impacts of existing, recently added and proposed emission sources at US Army Garrison, Fort Carson, Colorado on ambient air quality. The modeling was initiated in support of the Grow the Army Environmental Impact Statement. Emission estimates were calculated for the following pollutants:

- Carbon monoxide (CO),
- Nitrogen oxides (NOx),
- Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}),
- Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers ($PM_{2.5}$),
- Sulfur dioxide (SO_2), and
- Volatile organic compounds (VOC).

The near-field/off-post concentrations of criteria pollutants were determined using the American Meteorological Society (AMS)/United States Environmental Protection Agency's (EPA) Regulatory Model (AERMOD) (Version 07026). The model was run using surface meteorological data from the Colorado Springs airport and upper-air data from Denver Stapleton international airport (WebMET 2002).

Particulate matter near-field 24-hour concentrations were determined using the dust transport atmospheric modeling system, DUSTRAN. This model was developed by the US Department of Energy's Pacific Northwest National Laboratory to assist the US Department of Defense in addressing particulate air quality issues at military training installations. DUSTRAN is based on Environmental System Research Institute's ArcMap geographical information system (Version 9.x), the EPA-approved California puff air quality dispersion modeling system (CALPUFF) and the widely used California grid dispersion model (CALGRID). The California meteorological (CALMET) model provides meteorological parameter values for the CALPUFF and CALGRID models. For this analysis, average Colorado Springs airport meteorological monitored values were input to CALMET, and a 4-kilometer (km) (2.5 mile) resolution meteorological grid was created.

The far-field (greater than 50 km [31 miles]) air quality related value (AQRV) impacts were analyzed using the CALPUFF dispersion model. AQRV impacts include comparison of modeled pollutant concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation for the appropriate Class I and sensitive Class II federal areas. The CALPUFF models were created using meteorological years 2001, 2002, and 2003 CALMET output derived from over 40 surface, 50 precipitation, and two upper-air raw data sets that are located throughout the modeling domain.

Results of the three modeling analyses (AERMOD, DUSTRAN, and CALPUFF) are summarized below.

None of the AERMOD predicted ambient concentrations of criteria pollutants (i.e., modeled maximum concentration plus background concentration) exceeded the corresponding national ambient air quality standards (NAAQS) or Colorado ambient air quality standards (CAAQS).

DUSTRAN-modeled 24-hour particulate concentrations did not exceed the applicable NAAQS and CAAQS.

CALPUFF results showed a maximum modeled 24-hr PM_{10} concentrations were slightly above the Class I SIL at the La Garita Wilderness Area, Great Sand Dunes National Park, and the Weminuche Wilderness Area during one of the three years modeled. However, the predicted cumulative 24-hr PM_{10} concentrations at these locations were below the NAAQS. All other maximum modeled pollutants' (NO_x, SO_x and PM_{10}) annual average concentrations and short-term concentrations were below their respective Class I increment SILs. The maximum predicted nitrogen and sulfur deposition rates were below the deposition analysis threshold of 0.005 kilograms/hectare/year for all Class I or sensitive Class II federal areas that were modeled.

The CALPUFF results also predicted there would be no noticeable visibility impacts to the Class I and sensitive Class II areas modeled. The visibility assessment is expressed as the number of days for each modeled year that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; therefore, greater deciview levels represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals. No visibility changes of greater than one deciview were observed for the modeled Class I and sensitive Class II areas.

1.0 BACKGROUND

Emissions of air pollutants at US Army Garrison (USAG) Fort Carson (Fort Carson) will increase due to the addition of personnel associated with Grow the Army (GTA) project. The addition of personnel will require additional support facilities and will increase the amount of training conducted in existing training areas. Consequently, emissions will increase from the following sources:

- Installation of new emission sources;
    - Boilers equipped with low nitrogen oxides (NO_x) burners
    - Miscellaneous external combustion equipment
    - Emergency generators with power output ratings of less than 600 brake horsepower (bhp)
- Increased use of military ranges and maneuver areas; and
- Increased travel on paved and unpaved roads in the down-range areas.

Three air quality analyses were conducted to assess the cumulative impacts associated with existing Fort Carson activities and the proposed growth projects:

- The near-field (within 50 kilometers [km] [31 miles])/)/off-post concentrations of criteria pollutants were determined using the American Meteorological Society (AMS)/United States Environmental Protection Agency's (EPA) Regulatory Model (AERMOD) Version 07026.

- Particulate matter near-field concentrations were determined using DUSTRAN, which was developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) to assist the US Department of Defense in addressing particulate air quality issues at military training installations.

- The far-field (greater than 50 km [31 miles]) impacts were determined using the EPA-approved California puff air quality dispersion modeling system (CALPUFF). A 3-km (1.8-mile) receptor grid covered the approximate 3.55×10^{11} square meter (1.37×10^{5} square mile) modeling domain, which includes most of Colorado, much of northern New Mexico, and parts of the Oklahoma and Texas pan handles. The far-field analysis focused on air quality related values (AQRVs).

Air quality impacts to several nearby Class I and sensitive Class II federal areas were evaluated in this assessment. Additionally, based on Colorado Department of Public Health and Environment (CDPHE) guidance, impacts were evaluated at several nearby Colorado locations that have scenic and/or important views (CDPHE 2005a, CDPHE 2005b, Campbell 2006).

2.0 LOCATION DESCRIPTION

Fort Carson consists of military support facilities, training areas, and the Butts Army Air Field. It is located in the east-central portion of Colorado at the foot of the Rocky Mountain Front Range. The installation occupies land between the cities of Colorado Springs and Pueblo, a distance of approximately 25 miles (see Figure 1).

Fort Carson's boundaries are adjacent to Colorado Springs to the north, State Highway 115 to the west, private land to the south, and Interstate 25 to the east. Land use adjacent to Fort Carson includes municipal, residential, agricultural, industrial, and other privately held interests. Fort Carson measures from 2 to 15 miles in width east to west and 24 miles in length north to south.

The northern tip of Fort Carson is in El Paso County and lies within the Colorado Springs metropolitan area, approximately eight miles south of downtown Colorado Springs (population 360,890). This northern area comprises approximately 22.3 square kilometers (km^2) (5,510 acres) and is known as the cantonment area, where military housing, administrative facilities, and motor pools are located. The balance of Fort Carson, referred to as the down-range area, lies south of the cantonment area. It consists of training rangeland and occupies approximately 535 km^2 (132,200 acres) in southern El Paso, Fremont, and Pueblo counties.

Fort Carson is located in an attainment area for all criteria pollutants. There is one federal Class I designated area[1] within 100 km (62 miles) of the Fort Carson site, Great Sand Dunes National Park and preserve, located approximately 80 km (50 miles) southwest. Florissant Fossil Beds National Monument is a Class II federal land area within 100 km of the facility that has been designated by the State of Colorado to have the same sulfur dioxide (SO_2) increment[2] as a Class I area (Colorado Department of Public Health and Environment [CDPHE] Regulation 3, Part D, VIII.B). Additionally, several nearby Colorado locations that have scenic and/or important views have been designated by Federal Land Managers (FLM) as sensitive Class II areas (CDPHE 2005b).

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[1] Class I federal lands include areas such as national parks; national wilderness areas and national monuments that exceed 5,000 acres in size. These areas are granted special air quality protections under Section 162(a) of the federal Clean Air Act. Generally all other areas are Class II; some Class II areas are also designated for specific protections.

[2] "Increment" is a concept within the Clean Air Act's Prevention of Significant Deterioration (PSD) program that means the amount (or increment) of additional air pollution allowed in areas that are cleaner than required by the National Ambient Air Quality Standards (NAAQS) for particulates, SO_2 or NO_2. Class I increments permit only minor air quality deterioration; Class II increments permit moderate deterioration.

3.0 SOURCE CHARACTERIZATION

3.1 Emission Inventory

The Fort Carson air emission inventory consists of over six hundred individual emission sources. The majority of the air emission sources in the cantonment area are internal and external combustion sources. In the down-range area, the majority of air emissions are fugitive dust from vehicle travel on unpaved roads and trails during convoys and maneuvers. Military training involving smoke and obscurants is also a significant emission source in the down-range area when these materials are used. For inventory purposes, emission sources were grouped based on the following similar emission characteristics:

- Stationary external combustion sources (i.e., boilers, hot water generators, furnaces, space heaters, and domestic hot water heaters);
- Stationary internal combustion sources (i.e., generators, engine test cells);
- Stationary non-combustion sources (i.e., abrasive blasting, paint booths, and cooling towers);
- Sources contributing to fugitive particulate emissions (i.e., construction yards, road dust, smoke and obscurants, open burning, open detonation, and road paint striping); and
- Fugitive emissions from maneuvers, deployments, and vehicle travel to down-range areas.

Existing stationary sources were identified based on the calendar year (CY) 2006 Fort Carson air emission inventory (Fort Carson 2007). New sources (post 2006) and proposed sources, including those that have been added or are projected to be added as part of Transformation, GTA, Warrior in Transition, or other projects, were identified by Fort Carson Directorate of Public Works (DPW) personnel (Meister 2008a, Meister 2008b, Meister 2008c, Meister 2008e, and Meister 2008f.).

Appendix A provides the emission inventory for the stationary external combustion sources, stationary internal combustion sources, stationary non-combustion sources, and fugitive particulate sources. Appendix B provides the emission inventory for the down-range fugitive particulate emission sources.

Annual and 24-hour emissions were calculated on a projected actual and potential to emit[3] (PTE) basis. Assumptions used to calculate emissions are described in the following sections.

[3] Potential to emit means the maximum possible emissions, assuming each piece of equipment operates at its maximum design rate for 8,760 hours per year (or 24 hours per day), without any air pollution controls.

3.1.1 Stationary External Combustion Sources

Projected actual annual emissions: Emissions from existing external combustion sources were determined based on actual fuel use in CY 2006. Projected actual emissions from new and proposed sources were determined based on the projected heat input rates provided by Fort Carson DPW personnel and the historical average utilization rate of 18.7% for existing sources (Fort Carson 2007, Meister 2008a).

Annual PTE: PTE was determined based on permit limits and emission factors for those sources that have construction permits. PTE for permit-exempt, new, and proposed sources was based on 8,760 hours of operation per year.

Projected actual 24-hour emissions: Projected actual 24-hour emissions were estimated by dividing the annual PTE by 8,760 to obtain a conservative hourly emission rate. This emission rate was assumed to occur for a full 24-hour period in the models.

24-hour PTE: PTE was calculated for a 24-hour period based on every source operating at its maximum heat input rate. For sources with dual-fuel capability, emissions were based on the dirtier fuel.

3.1.2 Stationary Internal Combustion Sources

Projected actual annual emissions: Emissions from existing internal combustion sources were determined based on the horsepower rating and actual hours of operation in CY 2006. Projected actual emissions from new and proposed sources were based on the average hours of operation for existing sources and the maximum horsepower rating (Meister 2008a).

Annual PTE: Annual PTE was determined based on permit limits and emission factors for those sources that had permits. PTE for permit-exempt, new, and proposed sources was based on the horsepower rating and operation of each source at the maximum hours of operation per year at the applicable air pollutant emission notice (APEN) exemption level in the Colorado regulations (Regulation 3, Part A, II.D.1.ttt).

Projected actual 24-hour emissions: Projected actual 24-hour emissions were conservatively estimated by dividing the annual PTE by 8,760 to obtain a conservative hourly emission rate. This emission rate was assumed to occur for a full 24-hour period in the models.

24-hour PTE: PTE was calculated for a 24-hour period based on every source operating at its maximum horsepower rating for 24 hours.

3.1.3 Stationary Non-Combustion Sources and Fugitive Particulate Sources

Projected actual annual emissions: No new stationary non-combustion sources or fugitive particulate sources are proposed for this action, so projected actual emissions from stationary non-combustion sources were assumed to be equal to actual emissions for CY 2006.

Annual PTE: Since no new stationary non-combustion sources or fugitive particulate sources are proposed with this action, annual PTE was assumed to be equal to the annual PTE reported in the CY 2006 Fort Carson air emission inventory.

Projected actual 24-hour emissions: Projected actual 24-hour emissions were estimated by dividing the annual PTE by 8,760 to obtain a conservative hourly emission rate. This emission rate was assumed to occur for a full 24-hour period in the models.

24-hour PTE: PTE was calculated for these sources based on source-specific assumptions as documented in Appendix A, Table A-21.

3.1.4 Down-range Fugitive Particulate Sources

Fugitive particulate emissions occur when military vehicles conduct training maneuvers, convoy from the Cantonement Area to and from the maneuver area, and convoy to the railhead to deploy. Routine vehicle travel to the down-range areas is an additional source of fugitive particulate emissions. A battalion is the largest size group that can conduct maneuvers at Fort Carson. Emissions were calculated based on two types of battalions: heavy and light. A light battalion supports infantry and contains only wheeled vehicles. A heavy battalion includes both wheeled vehicles and tracked, tactical vehicles.

Projected actual annual emissions: Projected actual fugitive emissions from maneuvers, deployments, and vehicle travel to down-range areas were calculated based on the following assumptions (Meister 2008b, Meister 2008c):

- Four heavy battalions maneuver per year and convoy to and from the maneuver areas;
- Two light battalions maneuver per year and convoy to and from the maneuver areas;
- Two brigades deploy per year (one heavy and one light brigade) and two like units return; and
- 100 vehicles travel down-range per day on paved segment A-B and graveled segment B-F (See Figure 4).
- Tracked vehicles travel on dirt roads;
- Wheeled vehicles travel on graveled routes, where available;
- In areas where roads are graveled and dust suppressant is applied, $PM_{2.5}$ emissions are reduced by 59% and PM_{10} emissions are reduced by 90%.

Annual PTE: The actual annual emission calculation assumptions are conservative and represent annual PTE. Annual PTE is equal to the projected actual annual emissions.

Projected actual 24-hour emissions: Projected actual 24-hour emission rates were estimated for a light battalion and heavy battalion during vehicle convoys and maneuvers. The highest projected actual emissions occur when a one heavy battalion conducts maneuvers while another convoys during the same 24-hour period.

24-hour PTE: The projected actual 24-hour emissions assumptions are conservative and represent the 24-hour PTE.

3.1.5 Wind Erosion Emissions

The wind erosion emission factor was calculated based on a maximum wind speed of 19.5 meters per second (m/s), which was determined using five years of Colorado Springs surface meteorological data at the 99.99 percentile (WebMET 2002). Particulate matter emissions per area of disturbance were calculated from the threshold friction velocity derived from the maximum wind speed. Lastly, the AP-42 calculation method, equations, and factors were applied to determine an applicable and conservative wind erosion emissions factor (EPA 2006).

Annual PTE: The total land disturbance area (in square meters) from maneuver and convoy exercises for the year was multiplied by the emission factor to determine the maneuver and convoy "induced" wind erosion emissions. Constant hourly emission rates were determined by dividing the annual PTE by 8,760 hours per year.

24-hour PTE: All routes within all maneuver areas were assumed to be previously disturbed and subject to wind erosion. Wind erosion emissions were assumed to occur from previously disturbed areas and from routes that were disturbed during the 24-hour period. This represents a situation where a front blows through the area causing emissions from previously disturbed areas. Additionally, all convoy and maneuver vehicle travel during the 24-hour period was assumed to result in additional disturbance. Winds continue to blow throughout the day, causing emissions from all surfaces disturbed throughout the day. The total disturbed area (i.e., previously disturbed area plus area disturbed during 24-hour period) was multiplied by the wind erosion emission rate (calculated as described above) and divided by 24 hours to determine an hourly emission rate.

3.1.6 Smoke and Obscurant Emissions

Annual PTE: Based on the current training mission, Fort Carson does not anticipate smoke and obscurant use in excess of the current permit limits. Therefore, annual PTE from smoke and obscurants was conservatively estimated to equal the permitted emission limits[4] (CDPHE 2007).

24-hour PTE: The 24-hour PTE was conservatively estimated to equal the annual emission limits from the Title V operating permit. In other words, the entire annual permitted amount was emitted in one day.

[4] Per Condition 16 of Operating Permit 95OPEP110 emissions of air pollutants from mechanical smoke generators shall not exceed the following limitations: PM: 31.82 tons per year (tpy); PM_{10}: 31.82 tpy; and VOCs: 31.82 tpy (CDPHE 2007). Per Condition 17 of Operating Permit 95OPEP110, emissions of air pollutants from grenades, munitions, artillery, mortar, screens and smoke pots shall not exceed PM: 32.11 tpy and PM_{10}: 32.11 tpy (CDPHE 2007).

3.2 Emission Source Locations

To facilitate modeling the analyses and ensure a conservative assessment, Fort Carson was divided into nine areas: eight in the cantonment area and one in the down-range area. All emissions in a given area were assigned to a single location (i.e., a pseudo source). The emissions were assigned to one of three stacks at the pseudo source: an internal combustion point source, an external combustion point source, and a stationary, non-combustion, volume source. Each pseudo source is located at a large building within its associated area, and building dimensions and stack parameters (e.g., height, location with respect to the building, exhaust temperature, exhaust velocity, etc.) are assigned based on actual conditions at the location, where available. Stack parameters are based on similar sources where information is not available (e.g. the pseudo source is located at a building that does not yet exist). The pseudo source locations are represented as Groups A-I in Figure 3.

Two areas sources, J and K, account for widespread emissions. Area source K (see Figures 2 and 3) accounts for widespread emissions (i.e., road painting, etc.) within the cantonment area, and area source J (see Figure 2) accounts for smoke emissions associated with artillery/weapons training. Cantonment area source locations are shown in Figure 3 and training exercise source locations are shown in Figure 4.

Particulate matter emissions from vehicle travel (including vehicle convoys to maneuver areas) were represented by 188 equally spaced (500-meter [1640-foot] spacing) volume sources that represent 75 miles of travel routes (see Figure 4). Particulate matter emissions associated with the maneuver training exercises were modeled as four area sources that represent the four designated maneuver exercise training areas (see Figure 2 – Areas 1,2,3,4).

4.0 NEAR-FIELD (AERMOD) DISPERSION MODEL ANALYSIS

Near-field air quality impacts in the Class II areas located less than 50 km (31 miles) from the facility were determined with the latest version of the AMS/EPA/AERMOD (Version 07026). Due to the source types/distribution of emissions and nature of the surrounding topography, the following model "options" were selected:

- Calculation of wet and dry deposition of particulate matter;
- AERMOD toxics option;
- Elevated terrain effects;
- Beta option to account for capped and horizontal stacks dispersion;
- Stack-tip downwash for point sources; and
- Rural dispersion parameter values.

The AERMOD model includes rural and urban algorithm options. These options affect the wind speed profile, dispersion rates, and mixing-height formula used in calculating ground-level pollutant concentrations. An EPA-protocol document provides a classification guideline for selecting either the rural or urban algorithm based on average heat flux, land use, or population density within a 3-km (1.8 mile) radius from the modeled facility (Auer 1978). Of the three criteria, land use is the most definitive. The urban/rural classification scheme based on land use is as follows:

> *"The land use within the total area, total area (A_0), circumscribed by a 3-km circle about the source, is classified using the meteorological land use-typing scheme proposed by Auer (1978). The classification scheme requires that more than 50% of the area, total area (A_0), be from the following land use types in order to be considered urban for dispersion modeling purposes: heavy industrial; light-moderate industrial; commercial; single-family compact residential; and multi-family compact residential. Otherwise, the use of rural dispersion coefficients is appropriate."*

Fort Carson has little, if any heavy industrial, light-moderate industrial, and commercial land, and has some single-family compact residential or multi-family compact residential land within 3 km (1.8 mile) of the fenceline. Based on EPA's definition, Fort Carson is considered a rural area; therefore the rural option was used.

4.1 AERMOD Set-Up for Short-Term PM_{10}/$PM_{2.5}$ Impacts

To be conservative, two possible worst case scenarios were considered to assess 24-hour particulate matter (PM_{10} and $PM_{2.5}$) impacts. Both scenarios are based on the possibility of two heavy battalions conducting maneuvers and/or convoys simultaneously.

Scenario 1 - Two heavy battalions conduct maneuver training exercises simultaneously in two areas over a 24-hour period (see Figure 2 – Areas 2 and 4).

Scenario 2 - One heavy battalion conducts maneuver training exercises in Area 2, while another heavy battalion convoys along route A-B-C-D over a 24-hour period (Figure 2).

Modeling assumptions for the worst case 24-hour emission scenarios were:

- Emissions for activity/exercises within the maneuver areas (i.e., from wind erosion and vehicle travel) were spread evenly across the area source;
- Emissions from vehicle travel were distributed equally among the convoy route volume sources;
- Pseudo point (i.e., external and internal combustion) and volume sources emissions were used to represent cantonment area sources in both scenarios (see Figure 3). Constant hourly emission rates were determined by dividing the annual PTE by one year (8,760 hours);
- Building/structure down wash emissions effects were included in the model. The Building Input Profile Program (BPIP) was used to create the model ready parameter values to represent the building effects;
- The AERMOD Beta option was chosen to account for dispersion influences associated with horizontal and capped stack emissions exit points;
- Miscellaneous particulate matter emissions within the cantonment area were accounted for by an area source, Area K (see Figure 3), and the emissions were spread evenly across it;
- Miscellaneous particulate matter emissions associated with down-range munitions use (smoke) were accounted for by an area source, Area J (see Figure 2). The emissions were spread evenly across the area source; and
- Wind erosion emissions occur at the 24-hour PTE hourly emission rate (see Section 3.1.5) only during hours when the AERMOD default wind speed threshold of 10.8 meters per second is met or exceeded. Emissions were divided spatially across all four maneuver areas and along the convoy route (see Figure 2).

The pseudo point source stack exhaust parameters (i.e., flow rates, exit diameter and temperature) are shown in Appendix A, Tables A-1 and A-2. Modeled 24-hour average PM_{10} and $PM_{2.5}$ emission rates and three dimensional values for all sources are shown in Table 1.

4.2 AERMOD Set-Up for Annual PM_{10}/$PM_{2.5}$ Impacts

One emission scenario was analyzed for the annual particulate matter (PM_{10} and $PM_{2.5}$), NO_x, and SO_2 concentration modeling. In this scenario it was assumed all six battalions (four heavy and two light) would complete training exercises in a one-year period and the cantonment area emission sources and down-range sources would emit particulate matter at constant hourly emission rates.

Modeling assumptions for the annual emission scenario were:

- Four heavy battalions perform maneuver exercises with the associated total emissions evenly distributed across Areas 3 and 4 (see Figure 2) over a one-year period (8,760 hours);
- Two light battalions perform maneuver exercises with the associated total emissions evenly distributed across Areas 1 and 2 (see Figure 2) over a one-year period (8,760 hours);
- Each of the six battalions complete convoy exercises to and from the maneuver areas with emissions divided equally among each pathway volume source (see Figure 3) over a one-year period;
- 100 wheeled vehicles travel to the down-range areas via the paved and graveled road segments (A-B and B-F) per day. The emissions associated with the vehicle travel to down-range areas were divided equally among the volume sources that correspond with particular segment of roads/paths and were divided across a one-year period (8,760 hours);
- Two brigades (one heavy and one light) deploy and two similar brigades return over the course of one year. Deployment related emissions are accounted for by dividing the total emissions among 11 equally spaced (500 meter; 1,640 feet) volume sources (see Figure 3). The total emissions for the deployment were divided over a temporal one year period (8,760 hours);
- Pseudo point (i.e., external and internal combustion) and volume sources emissions are used to represent cantonment area sources in both scenarios (see Figure 3). Constant hourly emission rates for these sources are determined by dividing the annual PTE for a group of sources by 1 year (8,760 hours);
- Building / structure down wash emissions effects are included for the model. The Building Input Profile Program (BPIP) was used to create the model ready parameter values to represent the building effects;
- The AERMOD Beta option was chosen to account for dispersion influences associated with horizontal and capped stack emissions exit points;
- Miscellaneous particulate matter emissions within the cantonment area are accounted for by Area K (see Figure 3). The constant hourly emissions rates are determined by dividing the PTE by 1 year (8,760 hours). The emissions are spread evenly across the area source, Area K;
- Miscellaneous particulate matter emissions associated with the down-range munitions (smoke) are accounted for by Area J (see Figure 4). The constant hourly emissions rates are determined by dividing the PTE by 1 year (8,760 hours). The emissions are spread evenly across the area source, Area J; and
- Wind erosion emissions occur at the annual PTE hourly emission rate (See Section 3.1.5) only during hours when the AERMOD default wind speed threshold of 10.8 m/s (22.4 mph) is met or exceeded. Emissions were divided spatially across all four maneuver areas and along the convoy route (see Figure 4).

The pseudo point source stack exhaust parameters (flow rates, exit diameter and temperature) are shown in Appendix A, Tables A-1 and A-2. Modeled annual average PM_{10} and $PM_{2.5}$ emission rates and three dimensional values for all sources are shown in Table 2.

4.3 AERMOD Set-Up for Estimating NO_x, SO_2, and Carbon Monoxide Concentrations as a Result of Combustion Source Emissions

For the NO_x, SO_2 and carbon monoxide (CO) concentration modeling, one emission scenario was analyzed, which assumed that all of the cantonment area and down-range emission sources emit NO_x, SO_2, and CO at constant hourly emission rates.

The following describes the assumptions for the NO_x, SO_2 and CO models:

- Pseudo point (external and internal combustion) and volume sources emissions were used to represent cantonment area sources (see Figure 3). Constant hourly emissions rates for these sources are determined by dividing the PTE for a group of sources by one year (8,760 hours);
- Buildings / structures down wash emissions effects were included for the model. The BPIP was used to create the model ready parameter values to represent the building effects;
- The AERMOD Beta option was chosen to account for dispersion influences associated with horizontal and capped stack emissions exit points; and
- Miscellaneous emissions within the cantonment area were accounted for by an area source, Area K (see Figure 3) and emissions are spread evenly across it.

The pseudo point source stack exhaust parameters (i.e., flow rates, exit diameter and temperature) are shown in Appendix A, Tables A-1 and A-2. Modeled NO_x, SO_2 and CO emission rates and three dimensional values for all sources are shown in Table 2.

4.4 AERMOD Receptor Grid

A receptor grid, or network, defines the locations of predicted air concentrations that are used to assess compliance with the relevant standards or guidelines (see Figure 2). The following near-field receptor network was used for this analysis:

- A universal transverse mercator Cartesian (x, y) grid was designed based on the projected coordinate system: North American datum (NAD) 1927, Zone 13 North
- 100-meter (328-foot) spacing along the Fort Carson fence line represents the ambient boundary
- 500-meter (1,640-foot) spacing from Fort Carson Area boundary out to five km (3.1 miles)
- No “flag pole” (i.e. elevated) heights were assigned to receptors
- The above sea-level elevation for each receptor was determined by geographical software (AERMAP) interpolation for associated 7.5 minute (at least 30 meter resolution) Digital Elevation Model (DEM) output

4.5 Meteorological Data Processing for AERMOD

The AERSURFACE land surface characteristics determination program was used to create representative surface characteristic parameters values for input to the meteorology processor AERMET (Version 06341). A representative Colorado Land Usage file was input to AERSURFACE, with a central location of the Fort Carson area. For each year of meteorology, Colorado Springs annual rainfall was compared to a Colorado Springs 30-year mean to determine the AERSURFACE input parameter value used to calculate the Bowen Ratio. It was also assumed that snowfall occurs frequently during the winter months (December to February). Monthly values were calculated for twelve 30-degree sectors.

Five years (1986-1990) of Solar and Meteorological Surface Observational Network format Colorado Springs surface meteorology (WebMET 2002) were merged with five years (1986-1990) of Denver Stapleton vertical meteorology profile data using the meteorology processor, AERMET version 06341. AERMET then used the merged data and representative surface characteristics created by AERSURFACE to create an AERMOD-ready meteorology data set.

4.6 AERMOD Results

Predicted (modeled) maximum criteria pollutant concentrations are presented in Table 3. For each criteria pollutant, the maximum predicted concentration is defined as follows:

- For the NO_x, SO_2, PM_{10}, and $PM_{2.5}$ annual averages, the maximum predicted concentration is the highest modeled annual average value;
- For CO and SO2 short-term averages (1-hour, 8-hour, 3-hour, and 24-hour), the maximum predicted concentration is the highest of the first-high values for each receptor;
- For the PM10 short-term average (24-hour), the maximum predicted concentration is the highest of the second-high values for each receptor; and
- For the PM2.5 short-term average (24-hour), the maximum predicted concentration is the highest of the eighth-high (98th percentile) values for each receptor.

Predicted maximum criteria pollutant concentrations were added to applicable background concentrations and the total maximum predicted concentrations were compared to the applicable NAAQS and CAAQS (see Table 3). Background concentrations indicate existing pollutant concentrations and are based on ambient air quality monitoring data. Background/existing particulate matter concentrations for Pueblo, El Paso, and Fremont counties, and background/existing nitrogen dioxide (NO_2), SO_2 and CO concentrations for Denver, Colorado were obtained from the EPA's AirData website (http://www.epa.gov/oar/data/). None of the predicted ambient concentrations (modeled maximum concentration plus background concentration) exceeded the corresponding NAAQS or CAAQS.

5.0 DUSTRAN PARTICULATE MATTER MODELING ANALYSIS

DUSTRAN atmospheric modeling system was also used to quantify the potential near-field particulate matter 24-hour average concentrations.

5.1 Model System Description/Information

DUSTRAN is based on Environmental System Research Institute's ArcMap Geographical Information System (Version 9.x), the EPA-approved CALPUFF dispersion model, and the widely used CALGRID dispersion model. The CALMET model provides meteorological parameter values for the CALPUFF and CALGRID models (PNNL 2006).

Several key features of the modeling system are:

- Multiple point, area, and line releases can be accommodated and specified graphically;
- Simulation periods are typically a few hours to a few days;
- The atmospheric models treat wet and dry deposition and complex terrain effects; and
- Multiple particle sizes can be simulated at one time.

5.2 Model System Source Set-up Scenarios

Due to the distribution of emissions sources, locations of nearby communities, and the projected timeline of military activities, three simulations (models) for three different emission scenarios (i.e., nine total) were created to predict 24-hour average PM_{10} and $PM_{2.5}$ concentrations. The simulation period for each scenario was 48 hours. Each of the three emission scenarios are described below, and are considered worst case with respect to the operations performed for the 24-hour period (refer to Figure 5 for source locations). Each emission scenario was modeled assuming three different wind directions (see section 5.4 below).

Scenario 1 - Emissions originate from two heavy battalions maneuvering in Areas 1 and 2 for 48 hours. No convoy exercises occur during these two days. Wind erosion occurs for all paths and areas within the Fort Carson boundary for both days. One pseudo-point source, emitting at a constant hourly rate, represents all cantonment area emissions, including combustion and miscellaneous particulate matter emissions.

Scenario 2 - During the first 24 hours, one heavy battalion conducts maneuver exercises in the south-east maneuver area (Area 4) while a second heavy battalion convoys along the east, southeast, and south paths (A-B, B-C, C-D) to Area 3 (southwest). During the next 24 hours, emissions originate from the two heavy battalions maneuvering in Areas 3 and 4. Wind erosion occurs for all paths and areas within the Fort Carson boundary for both days. One pseudo-point source, emitting at a constant hourly rate, represents all cantonment area emissions, including combustion and miscellaneous particulate matter emissions.

Scenario 3 - Much like Scenario 2, during the first 24 hours, one heavy battalion conducts daily maneuver exercises in the west area (Area 2) while a second heavy battalion convoys along the east, south-east, and south paths (A-B, B-C, C-D) to Area 3 (southwest). During the next 24 hours, emissions originate from the two heavy battalions maneuvering in Areas 2 and 3. Wind erosion occurs for all paths and areas within the Fort Carson boundary for both days. One pseudo-point source, emitting at a constant hourly rate, represents all cantonment area emissions, including combustion and miscellaneous particulate matter emissions.

5.3 Model System Source Emissions Calculations

Table 4 (DUSTRAN emissions sources inputs) lists emissions sources, parameter values, and DUSTRAN inputs for each emissions scenario. To calculate the emission rates, specific DUSTRAN vehicle-generated dust emissions factors (Desert Research Institute 2006) were used, as well as project-specific vehicle information (Meister 2008b, Meister 2008c). These rates were manually applied to the emissions sources via the DUSTRAN modeling system graphical user interfaces. Wind erosion emissions, derived using the AP-42 industrial wind erosion factors (EPA 2006), were also included in the emissions rates. It was conservatively assumed that each convoy route and each minor road in the maneuver sections was disturbed daily, and the fugitive emissions were emitted by a wind of maximum magnitude. For derivation of wind erosion emissions, it was conservatively assumed that the maximum magnitude wind blows continuously all day for maneuver exercise activities (i.e., all dust for daily maneuver vehicle travel surface disturbances is emitted and AP-42 emissions factors and methods were applied). The maximum wind magnitude was derived from a five-year Colorado Springs airport meteorology data set (WebMET 2002). Each maneuver area's ArcMap derived interior roads/paths are shown in Figure 5.

5.4 Meteorological Conditions Applied to DUSTRAN

Each emissions scenario for the DUSTRAN atmospheric modeling system was modeled three times for three wind directions: winds coming from 80 degrees (10 degrees north of east), 315 degrees (45 degrees north of west), and 180 degrees (south wind). These wind directions were selected due to Fort Carson's proximity to the nearby communities of Pueblo, Colorado Springs, and Canyon City/Florence (see Figure 6) and would correspond to maximum potential particulate matter impacts at these communities. Wind directions are shown in the concentration contour plots in Figures 6–23.

The "single observation" meteorological conditions input to CALMET were based on the following parameters:

- Mixing height was set equal to 2,000 meters (6,562 feet) (2-year Colorado Springs average);
- Ambient atmospheric pressure was set equal to 807 millibars (Colorado Springs meteorology data set average);
- Wind speed was set equal to 2.0 m/s (4.5 mph). To conservatively estimate PM_{10} and $PM_{2.5}$ concentrations, a high wind speed (19.5 m/s [43.6 mph]) was used initially to calculate wind erosion emissions. However, modeling indicated that light winds led

to high particulate concentrations due to reduced dispersion. Consequently, a 2-m/s (4.5 mph) wind speed was input to CALMET;

- Atmospheric stability was set to “F” (i.e., stable atmosphere), which does not allow vertical mixing. (Modeling iterations indicated that stable conditions result in higher concentrations of particulate matter.); and
- The wind directions were adjusted due to variations in terrain elevations. Land surface characteristics were incorporated from ArcMap layers to create a 4-km (2.5 mile) resolution gridded three-dimensional field of meteorological parameter values.

5.5 Existing Pollutant Concentrations

Background/existing particulate matter concentrations for Pueblo, El Paso, and Fremont counties were obtained from EPA’s AirData website (EPA AirData) (see Table 5). These background concentration values were added to the predicted concentration contours in Figures 6–23 to estimate predicted ambient concentrations for the nearby communities.

5.6 DUSTRAN Modeled Concentrations

Eighteen 24-hour average concentration contour plots for this DUSTRAN modeling analysis are presented (see Figures 6–23) as each contour plot shows the modeled result for either $PM_{2.5}$ or PM_{10} for one of the emission scenarios and wind directions (nine figures for $PM_{2.5}$ and nine figures for PM_{10}).

For each figure, the following information is depicted:

- Concentration contours are red and labeled with the modeled concentrations;
- A legend shows sources as different colors, with a different symbol for each source type (point, area, and line);
- Nearby community locations are shown;
- Terrain map is used as a base map, which shows the underlying complex terrain;
- Wind vectors are shown in blue; and
- The second-day particulate matter average concentrations were shown, since it was found that the second-day (24-hour) average values were of greater magnitude and extended greater distances from Fort Carson in all scenarios.

As discussed in Section 5.4, three wind directions were chosen due to the nearby terrain complexity and community locations, and as a result, advections into the nearby communities are as follows: easterly winds transport particulate matter into the Florence/Canyon City area and are shown in Figures 6, 7, 12, 13, 18 and 19; northwesterly winds transport particulate matter into the Pueblo Area and are shown in Figures 8, 9, 14, 15, 20, and 21; and southern winds transport particulate matter into the Colorado Springs Area and are shown in Figures 10, 11, 16, 17, 22, and 23. The DUSTRAN modeled concentrations shown in these figures can be added to the nearby community ambient monitored particulate matter concentrations shown in Table 5 to determine the possible predicted total concentration within a reasonable distance of the ambient monitor.

Concentration contours values that intersect/coincide with a nearby community plus the reported monitored particulate matter values in Table 5 do not amount to a total concentration that exceeds the applicable NAAQS and CAAQS. While there is a definite measurable impact, it is also reasonable to assume that the monitored values in the nearby communities of Fort Carson are reporting concentrations that are partially due to emissions from Fort Carson. Therefore, the previous stated method for determining total concentrations could be "double counting" some of the installation's area of influence and considered a conservative approach.

6.0 Far-field (CALPUFF) Analysis for Class I Air Quality Related Values Impacts

Far-field impacts up to 200 km (124 miles) of Fort Carson's boundary were assessed by modeling projected emission rates with the EPA-recommended CALPUFF model. This model is an advanced, integrated Gaussian puff-type modeling system that can incorporate four-dimensional varying wind fields, wet and dry deposition, and atmospheric gas and particle phase chemistry. The three main components are CALMET (a diagnostic three-dimensional meteorological model), the CALPUFF air dispersion model, and CALPOST (a post processing package). Additionally, it includes numerous other processors that may be used to prepare geophysical data, meteorological data, and interfaces with other models. It is designed to simulate the dispersion of buoyant, puff, or continuous point and area pollution sources, as well as the dispersion of buoyant, continuous line sources. CALPUFF is the only EPA-approved non-Eulerian model that can be used for source-receptor distances greater than 50 km (31 miles).

The far-field analysis focused on AQRVs, including comparison of modeled concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation, for the following Class I areas or sensitive Class II federal areas (see Figure 24):

- Rocky Mountain National Park
- La Garita Wilderness
- Maroon Bells – Snowmass Wilderness
- Great Sand Dunes National Park
- Eagles Nest Wilderness Area
- West Elk Wilderness Area
- Weminuche Wilderness Area
- Florissant Fossil Beds National Monument
- Dinosaur Tracks
- Rourke Ranch
- Southern Parcel
- Spanish Peaks
- Comanche National Grassland, Picture Canyon

6.1 Meteorological Data

An extensive 3-km (1.8-mile) spaced 3.55×1011 square meter (1.37×105 square mile) grid covering most of Colorado, most of northern New Mexico and parts of the Texas and Oklahoma pan handles was spatially designed to allow complex terrain puff "meandering" and included a buffer greater than 25 km (15.5 miles) from the farthest Class I receptor for puff "recirculation" (see Figure 24). The modeling domain grid size was designed to accommodate the long range pollutant transport modeling analyses for both the Fort Carson and Piñon Canyon Maneuver Area (PCMS). A unique Lambert Conic Conformal coordinate system was used, for which the center of the coordinate system was located half-way between the Fort Carson and Piñon Canyon areas. Ten vertical layers were allocated at heights of 20; 40; 80; 160; 300; 600; 1,000; 1,500; 2,200; and 3500 meters (66; 131; 263; 525; 984; 1,968; 3,281; 4,921; 7,218; and 11,483 feet) above ground level (see Figure 24 for the extent of the horizontal grid). A combination of several meteorological data sets was input to CALMET to derive meteorological parameter values needed by the CALPUFF modeling program. Mesoscale Meteorological Model (MM5) 36-km (22-mile) spaced grid data sets were input as "first guess" meteorological conditions to the CALMET model (Pennsylvania State University / National Center for Atmospheric Research numerical model home page 2008). The MM5 data were extracted from the 2001, 2002, and 2003 MM5 datasets provided by CDPHE. The CALMET meteorological program was then loaded with over 40 NCDC surface station meteorological data sets for geographical locations between and including Amarillo, Texas and Fort Collins, Colorado (NCDC 2005). The Grand Junction and Denver Stapleton upper-air data set (National Oceanic and Atmospheric Administration), along with 50 widely dispersed precipitation station data sets, were also input to the CALMET program. The surface, upper-air, and precipitation data sets along with geographic land use/characteristics domain representative data were used to adjust the "first guess" MM5 meteorological fields to produce final CALPUFF input data. The adjustment produced a modeling grid that represented finer resolution meteorology monitored phenomena.

6.2 Receptor Grids

Coordinates of Class I receptors (National Park Service 2008) were converted to the modeling analysis' specific coordinate system and input to the CALPUFF model. Receptors were obtained and processed for the following Class I federal areas:

- Rocky Mountain National Park
- La Garita Wilderness
- Maroon Bells – Snowmass Wilderness
- Great Sand Dunes National Park
- Eagles Nest Wilderness Area
- West Elk Wilderness Area
- Wheeler Wilderness Area

In addition to those receptors, one discrete receptor was placed to assess far-field AQRVs at the following Class II locations identified by CDPHE as scenic views (see Figure 24) (CDPHE 2005b, Campbell 2006):

- Dinosaur Tracks
- Rourke Ranch

- Southern Parcel
- Spanish Peaks
- Comanche National Grassland, Picture Canyon

6.3 CALPUFF / CALPOST / POSTUTIL Model Options and Inputs

Table 6 shows several CALPUFF and CALPOST modeling options and inputs utilized in this analysis. Some of the most important model inputs are summarized below:

- The full chemistry option was enabled (MCHEM =1, MESOPUFF II scheme);
- The deposition option was enabled (MWET = 1 and MDRY = 1);
- Method two was selected for estimating light extinction (MVISBK); therefore, hourly humidity adjustment factors were needed by CALPOST for each analysis area (Class I or sensitive Class II). The hourly humidity factors were provided as output from the CALPUFF modeling. The recommended Federal Land Managers' Air Quality Related Values Workgroup (FLAG) natural background aerosol concentrations for the western portion of the United States were input to CALPOST (FLM 2005);
- The options and scaling parameters selected for POSTUTIL conformed to the FLM modeling guidance (FLM 2005);
- Hourly ground-level ozone data for 2001, 2002 and 2003 were obtained from the Clean Air Status and Trends Monitoring Network for the Gothic (GTH161), Rocky Mountain National Park (ROM206) and Mesa Verde (MEV405) monitors (EPA 2008);
- Monthly ammonia concentrations input to CALPUFF were based on the surrounding land use for each area (Class I or sensitive Class II area) analyzed. The Interagency Workgroup on Air Quality Modeling (IWAQM) recommendations suggest that typical values are 10 parts per billion (ppb) for grasslands, 0.5 ppb for forested lands, and 1 ppb for arid lands at 20 degrees Celsius. A value of 5 ppb was input to CALPUFF based on the surrounding areas use as arid grassland; and
- Default light extinction coefficients for all applicable species concentrations were applied in the CALPOST post-processing.

6.4 Emission Sources and Modeled Emission Rates Determination (Far-field Analysis)

Emissions and locations for sources modeled in CALPUFF were established similarly to those modeled in AERMOD for the annual averaging periods, as described in Sections 3.2, 4.2 and 4.3 of this report. All emission sources and activities are the same, although per guidance by Fort Carson Department of Public Works (DPW) personnel, a 90-day time period is enough time to complete all maneuver, convoy training exercises and deployment. Therefore, total fugitive particulate matter emissions from maneuvers, convoys, and deployments were divided by 2,160 hours (90 times 24) to determine representative hourly emissions rates for these activities.

Wind erosion related emissions for all surface disturbances associated with the total maneuver and convoy exercises were also divided by a 90-day time period (2,160 hours). As a conservative measure, wind erosion emissions calculated using a maximum wind speed (five year meteorology data set) of 19.5 m/s (43.6 mph) were assumed to be emitted at all wind speeds in the CALPUFF model. The cantonment area pseudo point sources, volume sources, area sources and the down-range area source emitted at the constant hourly emissions rates derived by dividing the annual PTE emissions by a one year period (8,760 hours).

Since the fugitive particulate matter emissions occur over a 90-day time period, two analyses were completed for each Class I area or sensitive Class II area. The first analysis assumed all training was conducted over the 90-day period from February to April. In the second analysis, all training was assumed to occur over a 90-day period from August to October.

6.5 CALPUFF Results and AQRV Analysis

CALPUFF modeling results for Fort Carson emissions are presented in Tables 8 and 9. Maximum predicted values are reported for all modeled criteria pollutants along with maximum nitrogen (N) and sulfur (S) deposition values, and a visibility assessment, for each Class I area/group of receptors within the modeling domain. Maximum modeled criteria pollutant concentrations were compared to the Class I increment SILs, and deposition rates were compared to a deposition analysis threshold (DAT) value of 0.005 kilogram per hectare per year (kg/ha/yr). The visibility assessment is expressed as the number of days for each modeled year that the change in visibility exceeded 1.0 deciview. A change of one deciview is approximately equal to a 10% change in atmospheric light extinction. Greater visibility changes are indicated by greater deciview changes and represent poorer visibility. A one deciview change translates to a “just noticeable” change in visibility for most individuals.

CALPUFF results showed a maximum modeled 24-hr PM10 concentrations above the Class I SIL at the La Garita Wilderness Area, Great Sand Dunes National Monument and Preserve, and Weminuche Wilderness Area during one of the three years modeled. All other maximum modeled NOx, SO2, and PM10 annual average concentrations and short-term concentrations were below their respective Class I increment SILs. Modeling did not show any exceedances of the DAT threshold of 0.005 kg/ha/yr in any Class I or sensitive Class II areas for either N or S deposition.

SILs are not thresholds for asserting negative environmental impacts; rather, they are used in PSD permitting to provide a basic screening of potential impacts and justify the need for further analysis5. Concentrations above the SILs do not necessarily indicate that negative impacts will occur. Instead, the results indicate that further analysis is necessary to predict whether any negative impacts will occur. For each of the three Class I areas that have predicted 24-hr PM10 concentrations exceeding the associated SIL, a cumulative concentration analysis was completed. Specifically, a representative background 24-hr PM10 concentration for each regarded Class I area was obtained from the EPA’s Air Data

[5] PSD SILs are for comparison only, as a PSD analysis is not required for this action.

Monitor Website (EPA AirData) and added to the maximum predicted concentration for that area. The following text is information regarding the background concentrations:

- EPA Monitor Site ID = 080670004 to represent current existing conditions near Weminuche Wilderness Area. Background concentration = 40 ug/m^3;
- EPA Monitor Site ID = 081130004 to represent current existing conditions near La Garita Wilderness Area. Background concentration = 77 ug/m^3; and
- EPA Monitor Site ID = 080030001 to represent current existing conditions near Great Sand Dunes National Park. Background concentration = 79 ug/m^3.

All background (current existing conditions) concentrations shown above are well below the NAAQS of 150 ug/m3, and all of the maximum predicted impacts that exceeded the 24-hr PM10 SIL were below 1 ug/m3. Therefore, the predicted cumulative impacts were below the NAAQS.

No visibility changes of greater than one deciview were observed for the modeled Class I or sensitive Class II areas.

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TABLES

Table 1. AERMOD Emissions - Particulate Matter 24-hour Average
AERMOD Emissions Sources Inputs

Description			Emissions		Stack / Source Dimensions		
	Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
Scenario 1 (Area 2 and Area 4 All Day Maneuvers, No Convoy Exercises)	G_gen	Point - vertical with cap	0.00267	0.00267	10.4	N/A	N/A
	G_boil	Point - vertical with cap	0.08644	0.08644	10.4	N/A	N/A
	H_boil	Point - vertical with cap	0.04904	0.04904	10.4	N/A	N/A
	H_gen	Point – vertical no cap	0.01046	0.01046	10.4	N/A	N/A
	A_Gen	Point - vertical with cap	0.00401	0.00401	12.2	N/A	N/A
	A_Boil	Point – vertical no cap	0.0677	0.0677	12.2	N/A	N/A
	B_boil	Point - vertical with cap	0.03469	0.03469	12.8	N/A	N/A
	B_gen	Point – vertical no cap	0.03932	0.03932	16.8	N/A	N/A
	C_boil	Point - vertical with cap	0.18769	0.18769	11.6	N/A	N/A
	C_gen	Point - horizontal	0.021	0.021	10.4	N/A	N/A
	D_boil	Point – vertical no cap	0.13406	0.13406	10.4	N/A	N/A
	D_gen	Point - vertical with cap	0.00102	0.00102	10.4	N/A	N/A
	E_gen	Point - horizontal	0.00079	0.00079	10.4	N/A	N/A
	E_boil	Point - vertical with cap	0.09834	0.09834	10.4	N/A	N/A
	F_gen	Point - vertical with cap	0.01991	0.01991	7.3	N/A	N/A
	F_boil	Point - vertical with cap	0.11289	0.11289	10.4	N/A	N/A
	I_gen	Point - vertical with cap	0.03592	0.03592	10.4	N/A	N/A
	I_boil	Point - vertical with cap	0.03018	0.03018	10.4	N/A	N/A
	H_volume	Volume	0.00077	0.00077	10.15	1.63	4.25
	F_volume	Volume	0.02069	0.02069	9.54	1.63	3.97
	E_volume	Volume	0	0	10.15	1.63	4.25
	A_volume	Volume	0.00004	0.00004	12.43	1.63	5.32
	B_volume	Volume	0.02618	0.02618	13.2	1.63	5.67
	C_volume	Volume	0	0	10.15	1.63	4.25
	D_volume	Volume	0.01475	0.01475	9.54	1.63	3.97
	G_volume	Volume	0	0	10.15	1.63	4.25
	I_volume	Volume	0.00815	0.00815	16.24	1.63	7.09
	Area_S_3	Area	54.57	8.19	2	N/A	2.33

Table 1 AERMOD Emissions - Particulate Matter 24-hour Average
AERMOD Emissions Sources Inputs (continued)

Description			Emissions		Stack / Source Dimensions		
	Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
Scenario 1 (continued)	Area_S_4	Area	168.39	25.26	2	N/A	2.33
	Area_S_2	Area	145.35	21.8	2	N/A	2.33
	Area_S_1	Area	24.68	3.7	2	N/A	2.33
	Area_S_J	Area	1.84	1.84	2	N/A	2.33
	Area_S_K	Area	0.29	0.29	2	N/A	2.33
	Convoy_A_B	Volumes	0.388	0.058	2	232.56	6.98
	Convoy_B_C	Volumes	0.071	0.011	2	232.56	6.98
	Convoy_C_D	Volumes	0.265	0.04	2	232.56	6.98
	Support_Route	Volumes	0.498	0.075	2	232.56	6.98
Scenario 2 (Area 2 All Day Maneuvers, Convoy Travel All Day to Area 3)	G_gen	Point - vertical with cap	0.00267	0.00267	10.4	N/A	N/A
	G_boil	Point - vertical with cap	0.08644	0.08644	10.4	N/A	N/A
	H_boil	Point - vertical with cap	0.04904	0.04904	10.4	N/A	N/A
	H_gen	Point – vertical no cap	0.01046	0.01046	10.4	N/A	N/A
	A_Gen	Point - vertical with cap	0.00401	0.00401	12.2	N/A	N/A
	A_Boil	Point – vertical no cap	0.0677	0.0677	12.2	N/A	N/A
	B_boil	Point - vertical with cap	0.03469	0.03469	12.8	N/A	N/A
	B_gen	Point – vertical no cap	0.03932	0.03932	16.8	N/A	N/A
	C_boil	Point - vertical with cap	0.18769	0.18769	11.6	N/A	N/A
	C_gen	Point - horizontal	0.021	0.021	10.4	N/A	N/A
	D_boil	Point – vertical no cap	0.13406	0.13406	10.4	N/A	N/A
	D_gen	Point - vertical with cap	0.00102	0.00102	10.4	N/A	N/A
	E_gen	Point - horizontal	0.00079	0.00079	10.4	N/A	N/A
	E_boil	Point - vertical with cap	0.09834	0.09834	10.4	N/A	N/A
	F_gen	Point - vertical with cap	0.01991	0.01991	7.3	N/A	N/A
	F_boil	Point - vertical with cap	0.11289	0.11289	10.4	N/A	N/A
	I_gen	Point - vertical with cap	0.03592	0.03592	10.4	N/A	N/A
	I_boil	Point - vertical with cap	0.03018	0.03018	10.4	N/A	N/A
	H_volume	Volume	0.00077	0.00077	10.15	1.63	4.25
	F_volume	Volume	0.02069	0.02069	9.54	1.63	3.97
	E_volume	Volume	0	0	10.15	1.63	4.25

Table 1 AERMOD Emissions - Particulate Matter 24-hour Average AERMOD Emissions Sources Inputs (continued)

Description			Emissions		Stack / Source Dimensions		
	Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
Scenario 2 (continued)	A_volume	Volume	0.00004	0.00004	12.43	1.63	5.32
	B_volume	Volume	0.02618	0.02618	13.2	1.63	5.67
	C_volume	Volume	0	0	10.15	1.63	4.25
	D_volume	Volume	0.01475	0.01475	9.54	1.63	3.97
	G_volume	Volume	0	0	10.15	1.63	4.25
	I_volume	Volume	0.00815	0.00815	16.24	1.63	7.09
	Area_S_3	Area	27.69	4.15	2.00	N/A	2.33
	Area_S_4	Area	47.16	7.07	2.00	N/A	2.33
	Area_S_2	Area	110.92	16.64	2.00	N/A	2.33
	Area_S_1	Area	12.52	1.88	2.00	N/A	2.33
	Area_S_J	Area	1.84	1.84	2.00	N/A	2.33
	Area_S_K	Area	0.29	0.29	2.00	N/A	2.33
	Convoy_A_B	Volumes	80.2	16.54	2.00	232.56	6.98
	Convoy_B_C	Volumes	1.857	0.937	2.00	232.56	6.98
	Convoy_C_D	Volumes	27.869	4.18	2.00	232.56	6.98
	Support_Route	Volumes	0.69	0.104	2.00	232.56	6.98

g/sec = grams per second
m = meters

Table 2 AERMOD Emissions Sources Inputs for the Particulate Matter Annual Average, NO_x, SO_2 and CO Models

Description		Emissions					Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	NO_x (g/sec)	SO_2 (g/sec)	CO (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
G_gen	Point - vertical with cap	0.00267	0.00267	0.08565	0.00327	0.0463	10.4	N/A	N/A
G_boil	Point - vertical with cap	0.08644	0.08644	0.40945	0.00682	0.95539	10.4	N/A	N/A
H_boil	Point - vertical with cap	0.04904	0.04904	0.5778	0.00387	0.54199	10.4	N/A	N/A
H_gen	Point - vertical no cap	0.01046	0.01046	0.43045	0.06152	0.10565	10.4	N/A	N/A
A_Gen	Point - vertical with cap	0.00401	0.00401	0.08278	0.00386	0.02596	12.2	N/A	N/A
A_Boil	Point - vertical no cap	0.0677	0.0677	0.86802	0.00534	0.74824	12.2	N/A	N/A
B_boil	Point - vertical with cap	0.03469	0.03469	0.301	0.00274	0.38344	12.8	N/A	N/A
B_gen	Point - vertical no cap	0.03932	0.03932	0.56471	0.0652	0.12049	16.8	N/A	N/A
C_boil	Point - vertical with cap	0.18769	0.18769	1.89588	0.01482	2.07451	11.6	N/A	N/A
C_gen	Point - horizontal	0.021	0.021	0.64974	0.12088	0.19512	10.4	N/A	N/A
D_boil	Point - vertical no cap	0.13406	0.13406	1.34031	1.1041	1.03322	10.4	N/A	N/A
D_gen	Point - vertical with cap	0.00102	0.00102	0.06093	0.01027	0.01396	10.4	N/A	N/A
E_gen	Point - horizontal	0.00079	0.00079	0.01566	0.00095	0.01356	10.4	N/A	N/A
E_boil	Point - vertical with cap	0.09834	0.09834	0.69619	0.00776	1.08691	10.4	N/A	N/A
F_gen	Point - vertical with cap	0.01991	0.01991	1.06391	0.28267	0.18749	7.3	N/A	N/A
F_boil	Point - vertical with cap	0.11289	0.11289	1.18293	0.21291	1.22782	10.4	N/A	N/A
I_gen	Point - vertical with cap	0.03592	0.03592	0.46139	0.07358	0.2045	10.4	N/A	N/A

Table 2 AERMOD Emissions Sources Inputs for the Particulate Matter Annual Average, NO_x, SO_2 and CO Models (continued)

Description		Emissions					Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	NO_x (g/sec)	SO_2 (g/sec)	CO (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
I_boil	Point - vertical with cap	0.03018	0.03018	0.35689	0.01767	0.32989	10.4	N/A	N/A
H_volume	Volume	0.00077	0.00077	0.00321	0	0.00105	10.15	1.63	4.25
F_volume	Volume	0.02069	0.02069	0	0	0	9.54	1.63	3.97
E_volume	Volume	0	0	0	0	0	10.15	1.63	4.25
A_volume	Volume	0.00004	0.00004	0	0	0	12.43	1.63	5.32
B_volume	Volume	0.02618	0.02618	0	0	0	13.2	1.63	5.67
C_volume	Volume	0	0	0	0	0	10.15	1.63	4.25
D_volume	Volume	0.01475	0.01475	0	0	0	9.54	1.63	3.97
G_volume	Volume	0	0	0	0	0	10.15	1.63	4.25
I_volume	Volume	0.00815	0.00815	0	0	0	16.24	1.63	7.09
Area_S_3	Area	17.96	2.69	N/A	N/A	N/A	2.00	N/A	2.33
Area_S_4	Area	24.49	3.67	N/A	N/A	N/A	2.00	N/A	2.33
Area_S_2	Area	13.37	2.01	N/A	N/A	N/A	2.00	N/A	2.33
Area_S_1	Area	5.68	0.85	N/A	N/A	N/A	2.00	N/A	2.33
Area_S_J	Area	1.84	1.84	N/A	N/A	N/A	2.00	N/A	2.33
Area_S_K	Area	0.29	0.29	N/A	N/A	N/A	2.00	N/A	2.33
Deployment	Volumes	0.71	0.11	N/A	N/A	N/A	2.00	232.56	2.33
Down_Range_Travel	Volumes	5.37	3.3	N/A	N/A	N/A	2.00	232.56	2.33
Convoy_A_B	Volumes	22.75	0.35	N/A	N/A	N/A	2.00	232.56	6.98
Convoy_B_C	Volumes	4.17	0.05	N/A	N/A	N/A	2.00	232.56	6.98
Convoy_C_D	Volumes	15.55	0.2	N/A	N/A	N/A	2.00	232.56	6.98
Support_Route	Volumes	0.26	0.04	N/A	N/A	N/A	2.00	232.56	6.98

g/sec = grams per second
m = meters

Table 3 AERMOD Predicted Impacts

Pollutants	Averaging Period	Maximum Predicted Concentration (μg/m^3)	Background Concentration (μg/m^3)	Maximum Predicted + Background Concentration (μg/m^3)	Primary NAAQS (μg/m^3)	CAAQS (μg/m^3)
NO_2	Annual	2.4	55	57.4	100	100
CO	1-Hour	230.2	5355	5585.2	10,000	10,000
	8-Hour	51.3	3609	3660.3	40,000	40,000
SO_2	Annual	0.2	8	8.2	80	80
	3-Hour	47.7	24	71.7	365	365
	24-Hour	6.6	59	65.6	1,300	700
PM_{10} (Scenario 1)[1]	24-Hour	76.6	56	132.6	150	150
PM_{10} (Scenario 2)[1]	24-Hour	79	56	135	150	150
$PM_{2.5}$ (Scenario 1)[1]	24-Hour	9.5	19	28.5	35	35
$PM_{2.5}$ (Scenario 2)[1]	24-Hour	14.4	19	33.4	35	35
PM_{10}	Annual	13.6	24	37.6	N/A	50
$PM_{2.5}$	Annual	4.4	8	12.4	15	15

[1]Emission inputs vary only for 24-hour average fugitive particulate matter models (see Section 4.1 for description of scenarios).

μg/m^3 = microgram per cubic meter

Table 4 DUSTRAN Emissions Sources Inputs

			Day 1 Emissions		Day 2 Emissions		Stack / Source Dimensions (both days)	
	Sources (ID)	Type	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	Release Height (m)[1]	Sigma-z (m)
Scenario 1 (Area 1 and Area 2 Maneuver Both Days, No Convoy Exercises)	Cantonment Pseudo Source	Point	1.01	1.01	1.01	1.01	12.2	N/A
	Area_S_3	Area	27.69	4.15	27.69	4.15	2.0	5
	Area_S_4	Area	47.16	7.07	47.16	7.07	2.0	5
	Area_S_2	Area	145.35	21.80	145.35	21.80	2.0	5
	Area_S_1	Area	87.97	13.20	87.97	13.20	2.0	5
	Convoy_A_B	Volumes	0.39	0.06	0.39	0.06	2.0	5
	Convoy_B_C	Volumes	0.07	0.01	0.07	0.01	2.0	5
	Convoy_C_D	Volumes	0.07	0.01	0.07	0.01	2.0	5
	Support_Route	Volumes	0.49	0.07	0.49	0.07	2.0	5
Scenario 2 (Area 4 Maneuver Both Days, Convoy to Area 3 Day 1, then Area 3 Maneuver Day 2)	Cantonment Pseudo Source	Point	1.01	1.01	1.01	1.01	10.4	N/A
	Area_S_3	Area	27.69	4.15	103.14	15.47	2.0	5
	Area_S_4	Area	122.61	18.39	122.61	18.39	2.0	5
	Area_S_2	Area	35.47	5.32	35.47	5.32	2.0	5
	Area_S_1	Area	12.52	1.88	12.52	1.88	2.0	5
	Convoy_A_B	Volumes	80.20	16.54	0.39	0.06	2.0	5
	Convoy_B_C	Volumes	1.86	0.94	0.07	0.01	2.0	5
	Convoy_C_D	Volumes	27.60	4.14	0.07	0.01	2.0	5
	Support_Route	Volumes	0.49	0.07	0.49	0.07	2.0	5
Scenario 3 (Area 2 Maneuver Both Days, Convoy to Area 3 Day 1, then Area 3 Maneuver Day 2)	Cantonment Pseudo Source	Point	1.01	1.01	1.01	1.01	7.3	N/A
	Area_S_3	Area	27.69	4.15	103.14	15.47	2.0	5
	Area_S_4	Area	47.16	7.07	47.16	7.07	2.0	5
	Area_S_2	Area	110.92	16.64	110.92	16.64	2.0	5
	Area_S_1	Area	12.52	1.88	12.52	1.88	2.0	5
	Convoy_A_B	Volumes	80.20	16.54	0.39	0.06	2.0	5
	Convoy_B_C	Volumes	1.86	0.94	0.07	0.01	2.0	5
	Convoy_C_D	Volumes	27.60	4.14	0.07	0.01	2.0	5
	Support_Route	Volumes	0.49	0.07	0.49	0.07	2.0	5

g/sec = grams per second
m = meters

Table 5 DUSTRAN Existing Pollutant Background Concentrations

County Name (City / Community)	PM_{10} (µg/m3)[1]	$PM_{2.5}$ (µg/m3)[1]
El Paso (Colorado Springs)	55.7	14.5
Pueblo (Pueblo)	53	19
Fremont (Canyon City, Florence)	35	Not available

µg/m3 = microgram per cubic meter

[1] Average values for the reporting monitors (example: three monitors for El Paso [Colorado Springs])

Table 6 CALPUFF / CALPOST Modeling Options

CALPUFF / CALPOST Variable	Specified Value	Comment
IBTZ	7	Base Time Zone
CALMETDAT	cmet01-12.dat	Using CALMET Derived Meteorological Data
MGAUSS	1	Vertical Distribution Used In The Near Field
MCTADJ	3	Terrain Adjustment Method
MCTSG	0	Subgrid-Scale Complex Terrain Flag
MSLUG	0	Near-Field Puffs Modeled As Elongated 0
MTRANS	1	Transitional Plume Rise Modeled
MTIP	1	Stack Tip Downwash
MSHEAR	0	Vertical Wind Shear Modeled Above Stack Top
MSPLIT	0	Puff Splitting Allowed
MCHEM	1	Chemical Mechanism Flag
MWET	1	Wet Removal Modeled
MDRY	1	Dry Deposition Modeled
MDISP	3	Method Used To Compute Dispersion Coefficients
MTURBVW	3	Sigma-V/Sigma-Theta, Sigma-W Measurements Used
MROUGH	0	PG Sigma-Y,Z Adjusted For Roughness
MPARTL	1	Partial Plume Penetration Of Elevated Inversion (per IWAQM)
MTINV	0	Strength Of Temperature Inversion Provided In PROFILE.DAT Extended Records
MPDF	0	PDF Used For Dispersion Under Convective Conditions
MBCON	0	Boundary Conditions (Concentration) Modeled
MVISBK	6	Method used for background light extinction
MFRH	2	Particle growth curve f(RH) for hygroscopic species
PMAP	LCC	Map Projection
IUTMZN	13	UTM Zone (not used for LCC except to check O3 file)
UTMHEM	N	Hemisphere For UTM Projection
DATUM	NAS-C	Datum-Region For Output Coordinates
NX	192	No. X Grid Cells
NY	205	No. Y Grid Cells
NZ	10	No. Vertical Layers
DGRIDKM	3	Grid Spacing (km)
XORIGKM	-347.186	Reference Coordinate of Southwest Corner of (1,1)- X Coordinate
YORIGKM	-310.19	Reference Coordinate of Southwest Corner of (1,1)- Y Coordinate
RCUTR	30	Reference Cuticle Resistance
RGR	10	Reference Ground Resistance
REACTR	8	Reference Pollutant Reactivity
NINT	9	Number Of Particle-Size Intervals Used To Evaluate Effective Particle Deposition Velocity
IVEG	1	Vegetation State In Unirrigated Areas
MOZ	1	Ozone Data Input Option
MHFTSZ	0	Switch For Using Heffter Equation For Sigma Z As Above
WSCALM	.5	Minimum Wind Speed (m/s) Allowed For Non-Calm Conditions
XMAXZI	5000m	Maximum Mixing Height (m)
XMINZI	50	Minimum Mixing Height (m)
BCKO3	Varies per hour per monitor	Hourly Background Ozone Concentration (ppb)
BCKNH3	5	Monthly Background Ammonia Concentration (ppb)

Table 7 CALPUFF Model Emissions Source Inputs

Description		Emissions					Stack / Source Dimensions		
Sources (ID)	**Type (Point, Volume or Area)**	**PM coarse[1] (g/sec)**	**$PM_{2.5}$ (g/sec)**	**NO_x (g/sec)**	**SO_2 (g/sec)**	**CO (g/sec)**	**Release Height (m)**	**Sigma-y (m)**	**Sigma-z (m)**
G_gen	Point - vertical with cap	0	0.00267	0.08565	0.00327	0.0463	10.4	N/A	N/A
G_boil	Point - vertical with cap	0	0.08644	0.40945	0.00682	0.95539	10.4	N/A	N/A
H_boil	Point - vertical with cap	0	0.04904	0.5778	0.00387	0.54199	10.4	N/A	N/A
H_gen	Point - vertical no cap	0	0.01046	0.43045	0.06152	0.10565	10.4	N/A	N/A
A_Gen	Point - vertical with cap	0	0.00401	0.08278	0.00386	0.02596	12.2	N/A	N/A
A_Boil	Point - vertical no cap	0	0.0677	0.86802	0.00534	0.74824	12.2	N/A	N/A
B_boil	Point - vertical with cap	0	0.03469	0.301	0.00274	0.38344	12.8	N/A	N/A
B_gen	Point - vertical no cap	0	0.03932	0.56471	0.0652	0.12049	16.8	N/A	N/A
C_boil	Point - vertical with cap	0	0.18769	1.89588	0.01482	2.07451	11.6	N/A	N/A
C_gen	Point - horizontal	0	0.021	0.64974	0.12088	0.19512	10.4	N/A	N/A
D_boil	Point - vertical no cap	0	0.13406	1.34031	1.1041	1.03322	10.4	N/A	N/A
D_gen	Point - vertical with cap	0	0.00102	0.06093	0.01027	0.01396	10.4	N/A	N/A
E_gen	Point - horizontal	0	0.00079	0.01566	0.00095	0.01356	10.4	N/A	N/A
E_boil	Point - vertical with cap	0	0.09834	0.69619	0.00776	1.08691	10.4	N/A	N/A

Table 7 CALPUFF Model Emissions Sources Inputs (continued)

Description		Emissions					Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM coarse (g/sec)	$PM_{2.5}$ (g/sec)	NO_x (g/sec)	SO_2 (g/sec)	CO (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
F_gen	Point - vertical with cap	0	0.01991	1.06391	0.28267	0.18749	7.3	N/A	N/A
F_boil	Point - vertical with cap	0	0.11289	1.18293	0.21291	1.22782	10.4	N/A	N/A
I_gen	Point - vertical with cap	0	0.03592	0.46139	0.07358	0.2045	10.4	N/A	N/A
I_boil	Point - vertical with cap	0	0.03018	0.35689	0.01767	0.32989	10.4	N/A	N/A
H_volume	Volume	0	0.00077	0.00321	0	0.00105	10.15	1.63	4.25
F_volume	Volume	0	0.02069	0	0	0	9.54	1.63	3.97
E_volume	Volume	0	0	0	0	0	10.15	1.63	4.25
A_volume	Volume	0	0.00004	0	0	0	12.43	1.63	5.32
B_volume	Volume	0	0.02618	0	0	0	13.2	1.63	5.67
C_volume	Volume	0	0	0	0	0	10.15	1.63	4.25
D_volume	Volume	0	0.01475	0	0	0	9.54	1.63	3.97
G_volume	Volume	0	0	0	0	0	10.15	1.63	4.25
I_volume	Volume	0	0.00815	0	0	0	16.24	1.63	7.09
Area_S_3	Area	37.82	6.67	N/A	N/A	N/A	2.0	N/A	2.33
Area_S_4	Area	43.36	7.65	N/A	N/A	N/A	2.0	N/A	2.33
Area_S_2	Area	15.23	2.69	N/A	N/A	N/A	2.0	N/A	2.33
Area_S_1	Area	8.7	1.53	N/A	N/A	N/A	2.0	N/A	2.33
Area_S_J	Area	0	1.84	N/A	N/A	N/A	2.0	N/A	2.33
Area_S_K	Area	0	0.35	N/A	N/A	N/A	2.0	N/A	2.33
Deployment	Volumes	2.43	0.43	N/A	N/A	N/A	2.0	232.56	2.33
Down_Range_Travel	Volumes	2.07	3.3	N/A	N/A	N/A	2.0	232.56	2.33
Convoy_A_B	Volumes	88.45	15.92	N/A	N/A	N/A	2.0	232.56	6.98
Convoy_B_C	Volumes	16.22	2.92	N/A	N/A	N/A	2.0	232.56	6.98
Convoy_C_D	Volumes	60.44	10.88	N/A	N/A	N/A	2.0	232.56	6.98
Support_Route	Volumes	0.99	0.17	N/A	N/A	N/A	2.0	232.56	6.98

[1] PM coarse = $PM_{10} - PM_{2.5}$
g/sec = grams per second
m = meters

Table 8 Maximum Early Season – February, March, April CALPUFF Predicted Impacts

Class I & Class II Areas↓	Pollutant→	NO_x	SO_x			PM_{10}		Visibility[1]	Deposition N[2]	Deposition S[3]
	Modeling Period→	Annual μg/m^3	3-hr μg/m^3	24-hr μg/m^3	Annual μg/m^3	24-hr μg/m^3	Annual μg/m^3	Deciview Change	kg/ha/yr	kg/ha/yr
	↓Year/SIL→	0.1 ($1x10^{-1}$)	1	0.2 ($2x10^{-1}$)	0.08 ($8x10^{-2}$)	0.32 ($3.2x10^{-1}$)	0.16 ($1.6x10^{-1}$)	Days >=1.0	0.005 ($5.0x10^{-3}$)	0.005 ($5.0x10^{-3}$)
Rocky Mountain National Park	2001	1.0123E-04	1.0627E-02	2.9872E-03	1.4481E-04	1.9100E-01	3.2108E-03	0	1.77E-04	1.14E-04
	2002	1.3183E-04	1.2106E-02	5.2987E-03	2.2856E-04	1.2685E-01	2.7612E-03	0	2.54E-04	1.39E-04
	2003	6.6903E-05	9.2098E-03	3.6242E-03	1.6925E-04	1.8097E-01	4.5614E-03	0	3.13E-04	1.35E-04
La Garita Wilderness Area	2001	1.8555E-05	4.7978E-03	1.8413E-03	3.4720E-05	2.7057E-02	4.8315E-04	0	7.40E-05	3.83E-05
	2002	2.1099E-05	1.0916E-02	2.0815E-03	5.2331E-05	9.8860E-03	2.5578E-04	0	1.41E-04	9.06E-05
	2003	4.5823E-05	2.0056E-02	8.9102E-03	8.1115E-05	**6.6080E-01**	3.0956E-03	0	1.95E-04	7.77E-05
Maroon – Bells Snowmass Wilderness	2001	1.5289E-05	5.0720E-03	1.1933E-03	3.1321E-05	1.3868E-01	1.1336E-03	0	6.09E-05	2.95E-05
	2002	1.1870E-05	2.9536E-03	8.9112E-04	3.0014E-05	4.4726E-03	1.4500E-04	0	5.12E-05	2.94E-05
	2003	2.9367E-06	3.5459E-03	1.3352E-03	4.4448E-05	3.6711E-02	7.8155E-04	0	1.03E-04	5.64E-05
Great Sand Dunes National Park	2001	2.3559E-04	2.5131E-02	8.4644E-03	2.0157E-04	2.4819E-01	2.9910E-03	0	4.42E-04	2.25E-04
	2002	3.9638E-04	2.9144E-02	5.0681E-03	3.5636E-04	2.1149E-01	4.0579E-03	0	4.85E-04	2.59E-04
	2003	2.9869E-04	2.0297E-02	6.9234E-03	3.3593E-04	**6.2478E-01**	1.1853E-02	0	7.79E-04	4.26E-04
Eagles Nest Wilderness Area	2001	7.2739E-05	1.0887E-02	3.0933E-03	8.7218E-05	1.0978E-01	1.9164E-03	0	1.91E-04	8.85E-05
	2002	3.1921E-05	7.7438E-03	2.1288E-03	1.0372E-04	1.3456E-01	1.0474E-03	0	1.94E-04	1.00E-04
	2003	1.0540E-05	3.5300E-03	2.0958E-03	8.7349E-05	1.2306E-01	2.4657E-03	0	1.91E-04	9.02E-05
West Elk Wilderness Area	2001	1.5364E-05	6.6200E-03	1.2502E-03	2.6168E-05	5.3807E-02	6.3068E-04	0	3.42E-05	2.16E-05
	2002	1.0740E-05	2.9451E-03	8.3250E-04	2.6233E-05	2.7801E-03	1.1543E-04	0	3.51E-05	2.60E-05
	2003	6.6272E-06	4.1509E-03	1.2836E-03	4.4634E-05	5.9628E-02	6.5800E-04	0	9.44E-05	5.25E-05
Weminuche Wilderness Area	2001	1.0477E-05	6.3924E-03	2.2544E-03	2.3852E-05	1.3626E-02	2.6110E-04	0	5.60E-05	2.75E-05
	2002	1.5702E-05	2.9144E-02	5.0681E-03	3.5636E-04	1.3193E-02	2.1145E-04	0	1.36E-04	7.59E-05
	2003	2.1021E-05	1.3376E-02	5.7834E-03	5.0311E-05	**4.9421E-01**	2.3249E-03	0	1.32E-04	5.58E-05
Florrisant Fossil Beds National Monument[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Dinosaur Tracks[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Rourke Ranch[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Southern Parcel[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Spanish Peaks[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Comanche National Grassland, Picture Canyon[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA

[1] Number of days with deciview change >1.0.
[2] Nitrogen deposition (N)
[3] Sulfur deposition (S)
[4] Colorado Scenic View (Class II) – Visibility Calculations Only

SIL = significant impact level
μg/m3 = microgram per cubic meter
kg/ha/yr = kilograms per hectare per year

Table 9 Maximum Late Season – August, September, October CALPUFF Predicted Impacts

Class I & Class II Areas↓	Pollutant→	NO_x	SO_x			PM_{10}		Visibility[1]	Deposition N[2]	Deposition S[3]
	Modeling Period→	**Annual µg/m^3**	**3-hr µg/m^3**	**24-hr µg/m^3**	**Annual µg/m^3**	**24-hr µg/m^3**	**Annual µg/m^3**	**Deciview Change**	**kg/ha/yr**	**kg/ha/yr**
	↓Year/SIL→	**0.1 ($1X10^{-1}$)**	**1**	**0.2 ($2X10^{-1}$)**	**0.08 ($8 X10^{-2}$)**	**0.32 ($3.2X10^{-1}$)**	**0.16 ($1.6X10^{-1}$)**	**Days >=1.0**	**0.005 ($5.0 X10^{-3}$)**	**0.005 ($5.0 X10^{-3}$)**
Rocky Mountain National Park	2001	1.0123E-04	1.0627E-02	2.9872E-03	1.4481E-04	9.6337E-02	2.32E-03	0	1.77E-04	1.14E-04
	2002	1.2705E-04	1.3011E-02	5.2987E-03	2.1130E-04	1.4804E-01	4.0688E-03	0	2.25E-04	1.31E-04
	2003	9.7603E-05	9.2098E-03	4.3959E-03	1.7373E-04	1.2460E-01	2.9469E-03	0	3.05E-04	1.29E-04
La Garita Wilderness Area	2001	1.8555E-05	4.7978E-03	1.8413E-03	3.4720E-05	7.2412E-02	2.47E-03	0	7.40E-05	3.83E-05
	2002	2.1529E-05	1.0916E-02	2.0815E-03	5.1811E-05	3.7569E-02	7.7078E-04	0	1.46E-04	9.34E-05
	2003	3.5662E-05	2.0056E-02	8.9102E-03	6.3586E-05	6.4301E-02	1.0423E-03	0	1.48E-04	5.97E-05
Maroon – Bells Snowmass Wilderness	2001	1.5289E-05	5.0720E-03	1.1933E-03	3.1321E-05	5.7566E-02	1.42E-03	0	6.09E-05	2.95E-05
	2002	1.2049E-05	2.8836E-03	1.0671E-03	2.8035E-05	4.7327E-02	5.2863E-04	0	4.72E-05	2.86E-05
	2003	2.6674E-06	3.5459E-03	1.3352E-03	3.4824E-05	8.9135E-02	8.0647E-04	0	7.81E-05	4.30E-05
Great Sand Dunes National Park	2001	2.3559E-04	2.5131E-02	8.4644E-03	2.0157E-04	**5.9198E-01**	5.1638E-03	0	4.42E-04	2.25E-04
	2002	2.73E-04	5.72E-02	9.57E-03	3.01E-04	3.07E-01	1.61E-03	0	8.72E-04	5.49E-04
	2003	2.06E-04	3.98E-02	1.31E-02	2.84E-04	**9.07E-01**	4.70E-03	0	1.40E-03	9.03E-04
Eagles Nest Wilderness Area	2001	7.2739E-05	1.0887E-02	3.0933E-03	8.7218E-05	6.1755E-02	1.65E-03	0	1.91E-04	8.85E-05
	2002	3.0029E-05	6.5573E-03	1.8839E-03	9.4039E-05	4.6501E-02	1.5484E-03	0	1.80E-04	9.73E-05
	2003	9.7894E-06	3.5300E-03	2.0958E-03	7.8454E-05	8.9235E-02	1.7947E-03	0	1.54E-04	7.39E-05
West Elk Wilderness Area	2001	1.5364E-05	6.6200E-03	1.2502E-03	2.6168E-05	5.2531E-02	1.63E-03	0	3.42E-05	2.16E-05
	2002	1.0946E-05	2.6271E-03	9.4285E-04	2.5364E-05	6.3275E-02	4.7291E-04	0	3.44E-05	2.64E-05
	2003	5.4153E-06	4.1509E-03	1.2836E-03	3.4343E-05	9.2488E-02	7.4261E-04	0	7.17E-05	3.98E-05
Weminuche Wilderness Area	2001	1.09E-05	6.39E-03	2.25E-03	2.38E-05	2.93E-02	5.33E-04	0	5.75E-05	2.78E-05
	2002	1.5992E-05	1.3915E-02	4.4219E-03	4.7762E-05	3.3280E-02	6.2786E-04	0	1.43E-04	7.89E-05
	2003	1.6804E-05	1.3376E-02	5.7834E-03	4.0730E-05	8.2596E-02	7.5864E-04	0	1.00E-04	4.33E-05
Florrisant Fossil Beds National Monument[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Dinosaur Tracks[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Rourke Ranch[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Southern Parcel[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Spanish Peaks[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA
Comanche National Grassland, Picture Canyon[4]	2001	NA	NA	NA	NA	NA	NA	0	NA	NA
	2002	NA	NA	NA	NA	NA	NA	0	NA	NA
	2003	NA	NA	NA	NA	NA	NA	0	NA	NA

[1] Number of days with deciview change >1.0.
[2] Nitrogen deposition (N)
[3] Sulfur deposition (S)
[4] Colorado Scenic View (Class II) – Visibility Calculations Only

SIL = significant impact level
µg/m3 = microgram per cubic meter
kg/ha/yr = kilograms per hectare per year

FIGURES

Figure 1 – Fort Carson Location and Surrounding Area

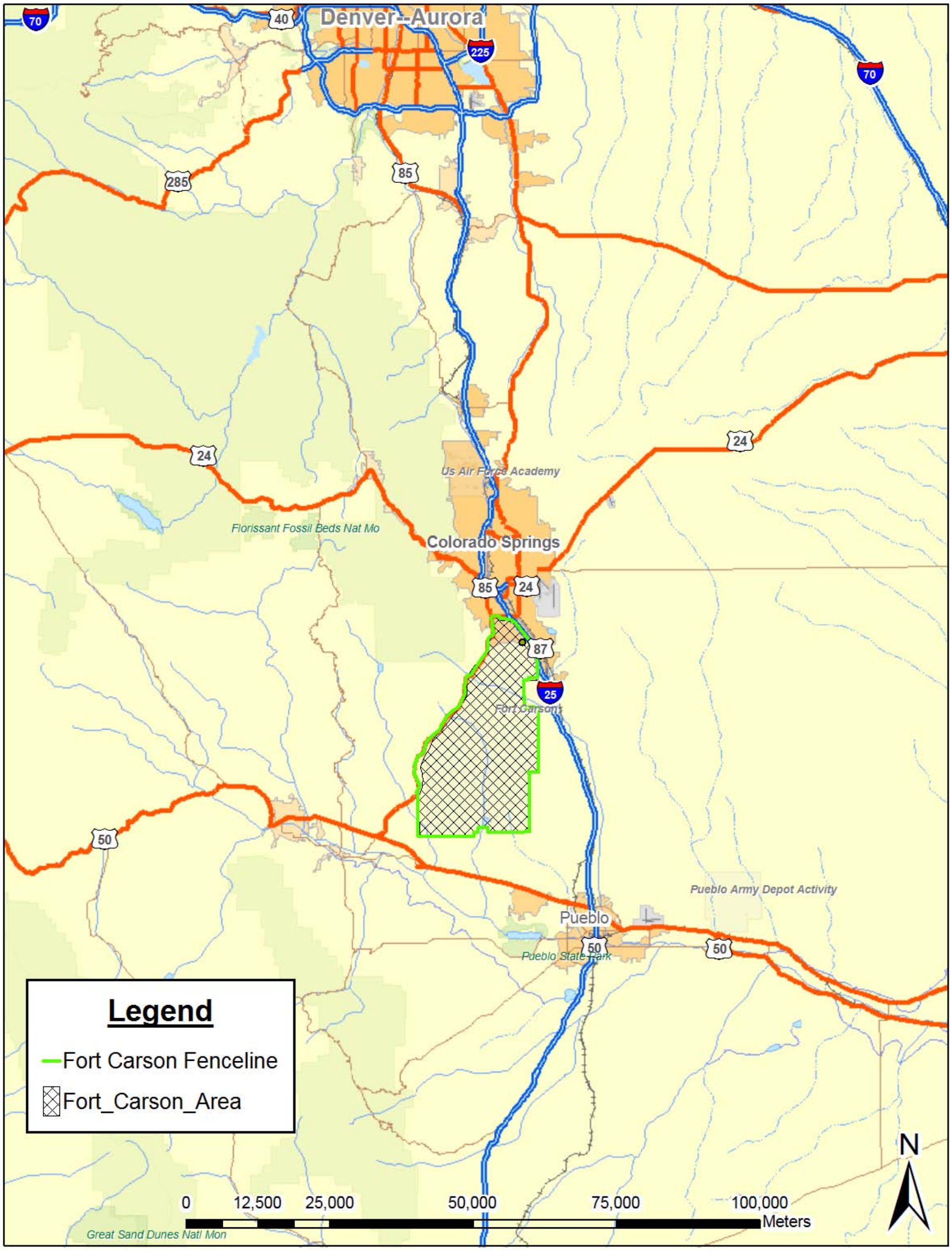


Figure 2 – Fort Carson AERMOD Source Locations and Receptors

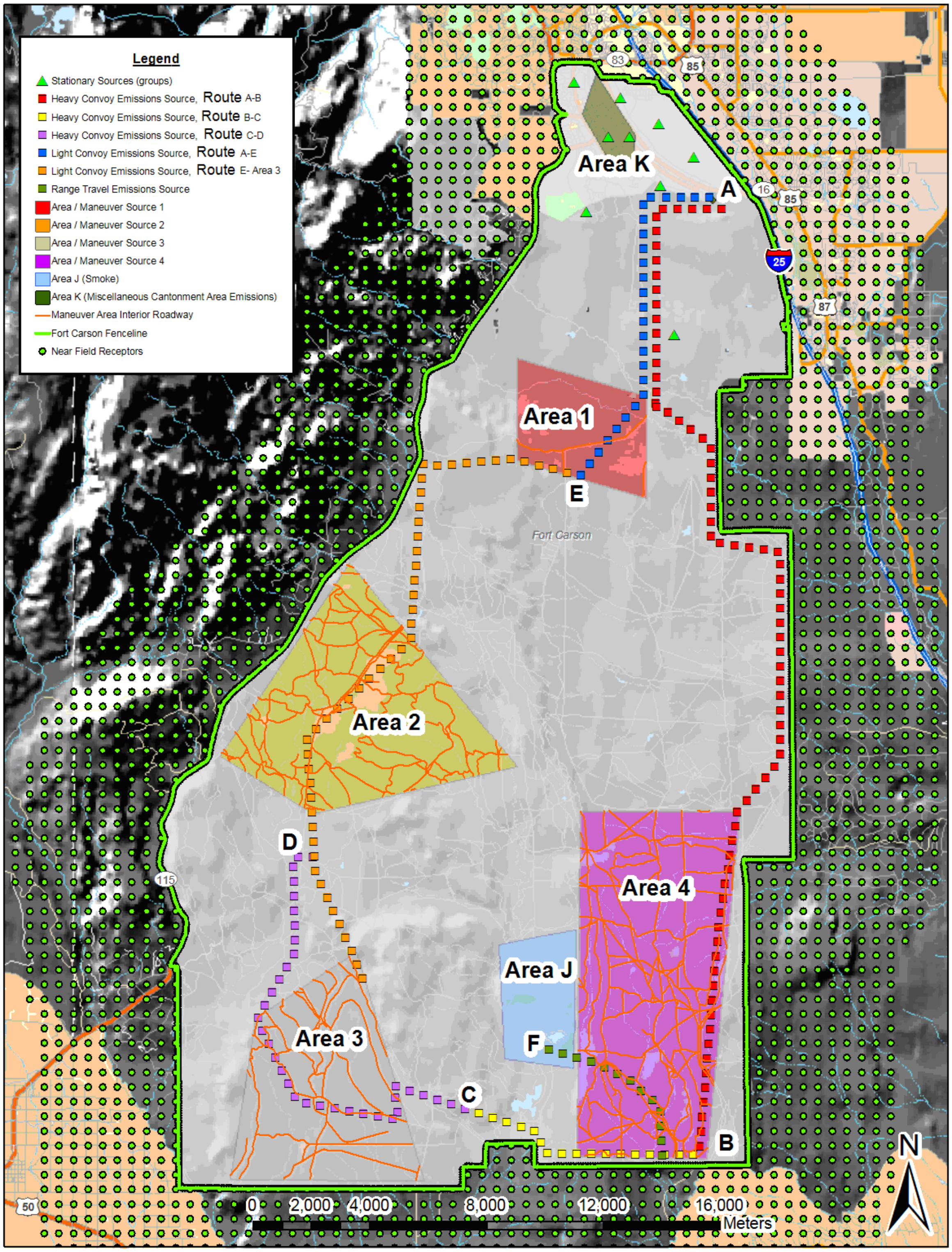


Figure 3 – Fort Carson AERMOD Cantonment Area Source Locations

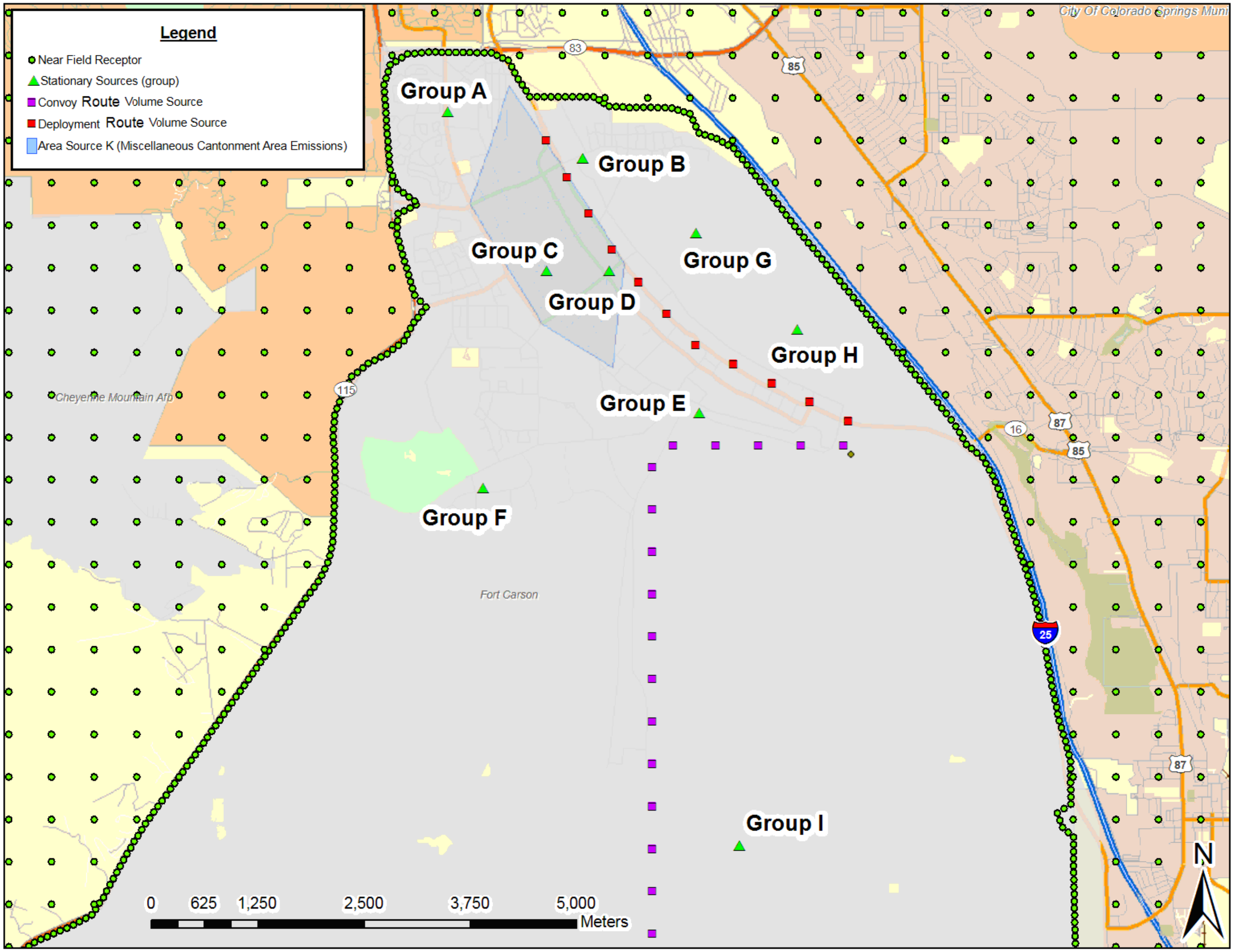


Figure 4 – AERMOD Convoy and Down-range Travel Paths

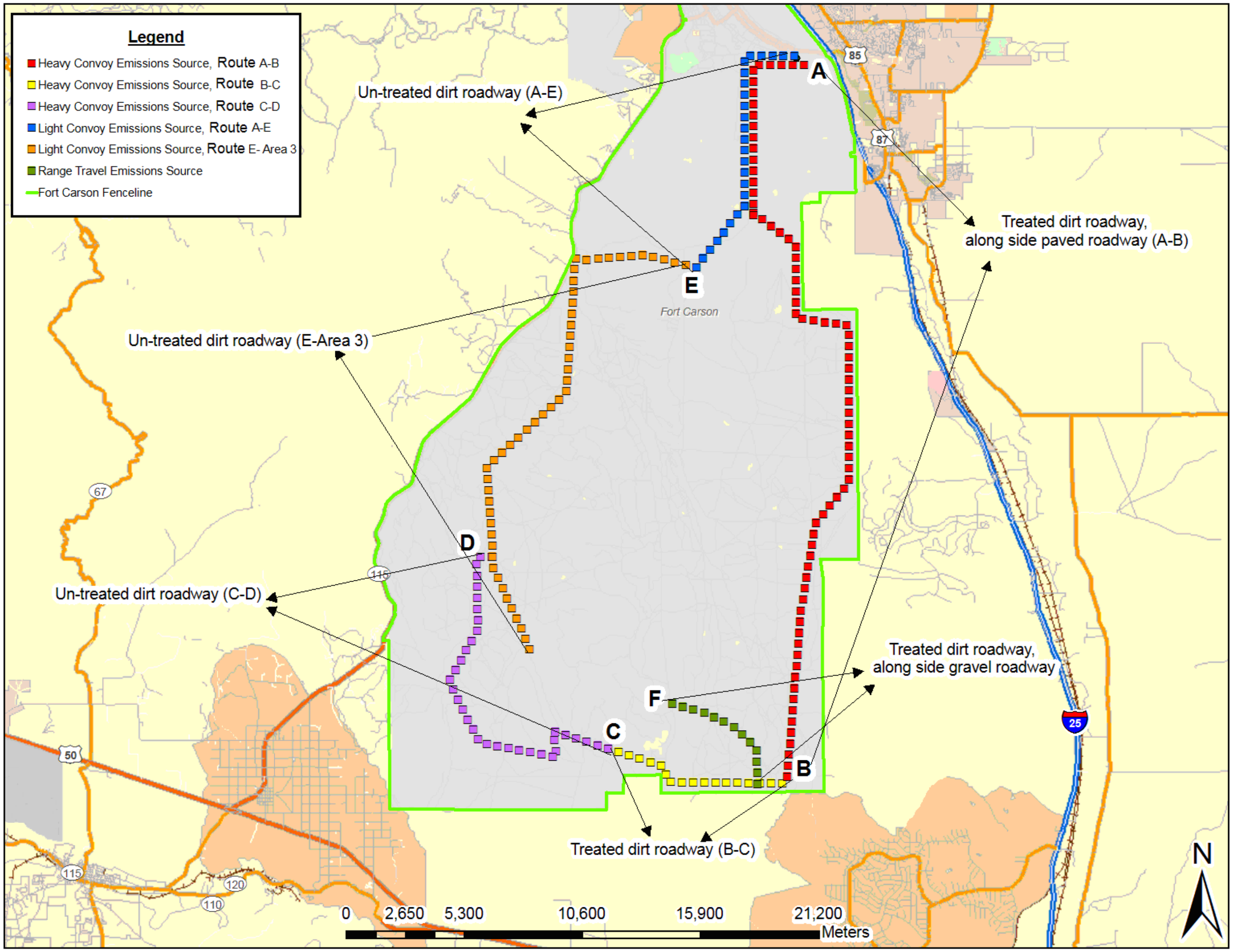


Figure 5 – Emissions Sources for DUSTRAN

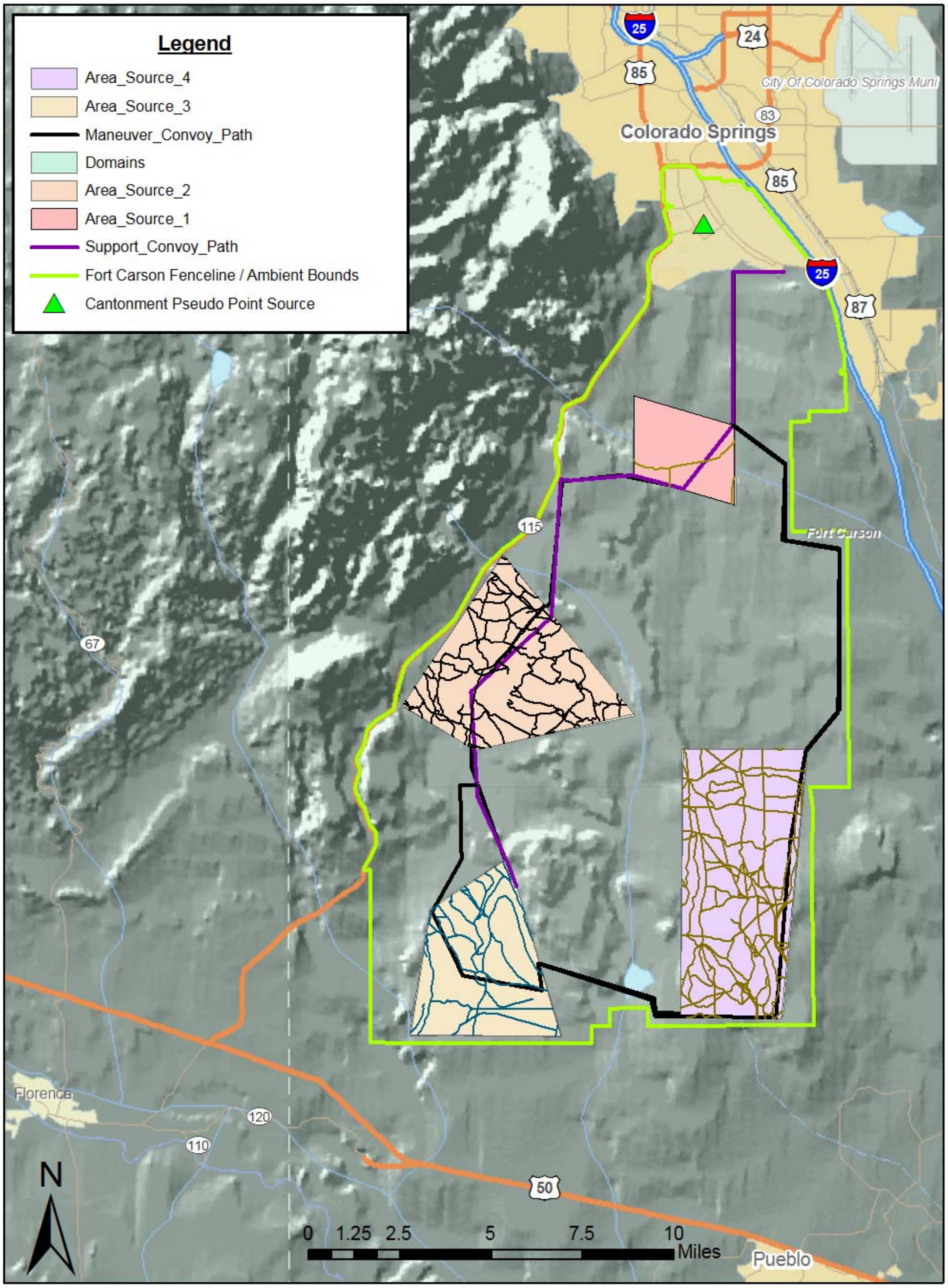
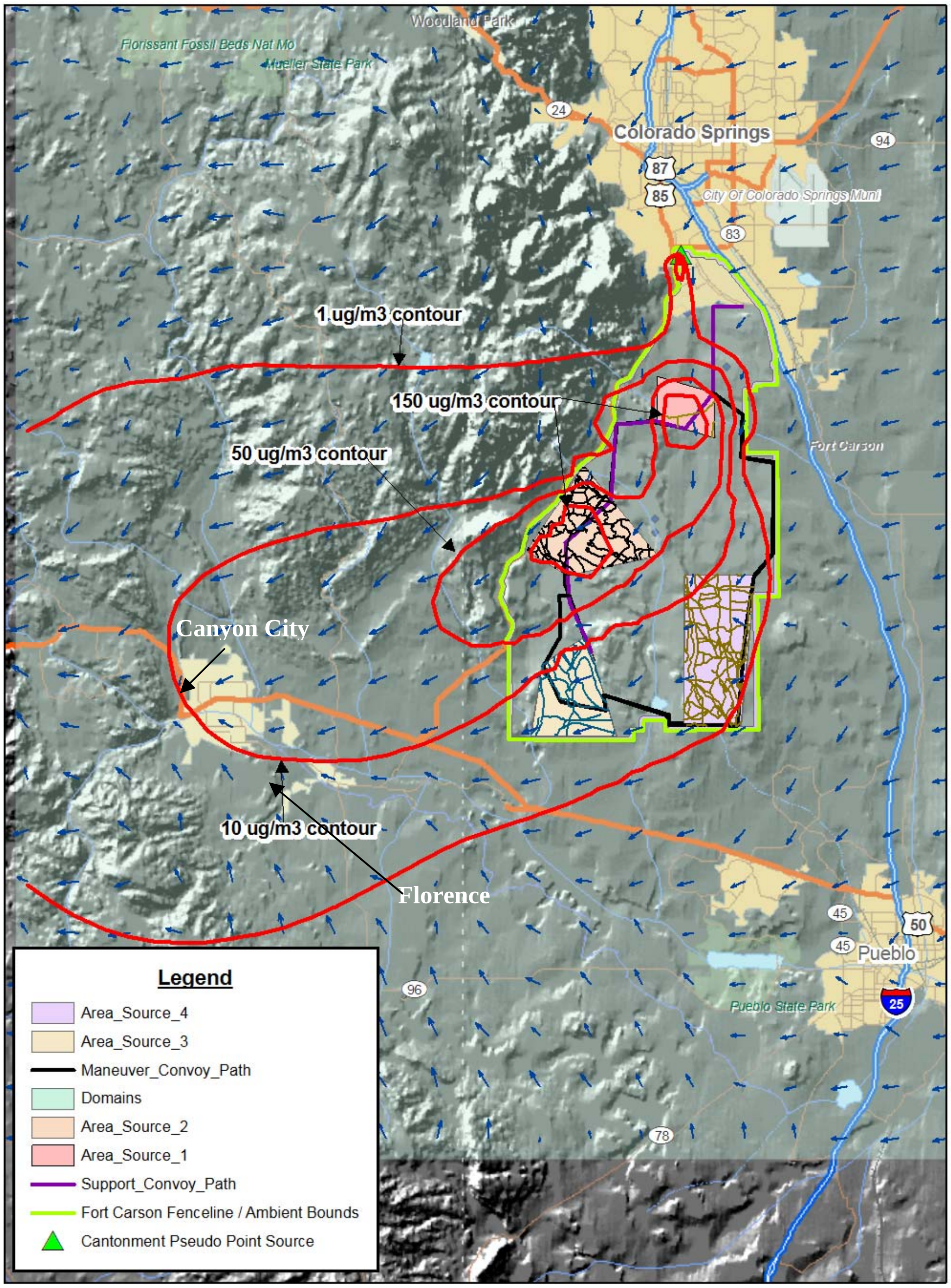
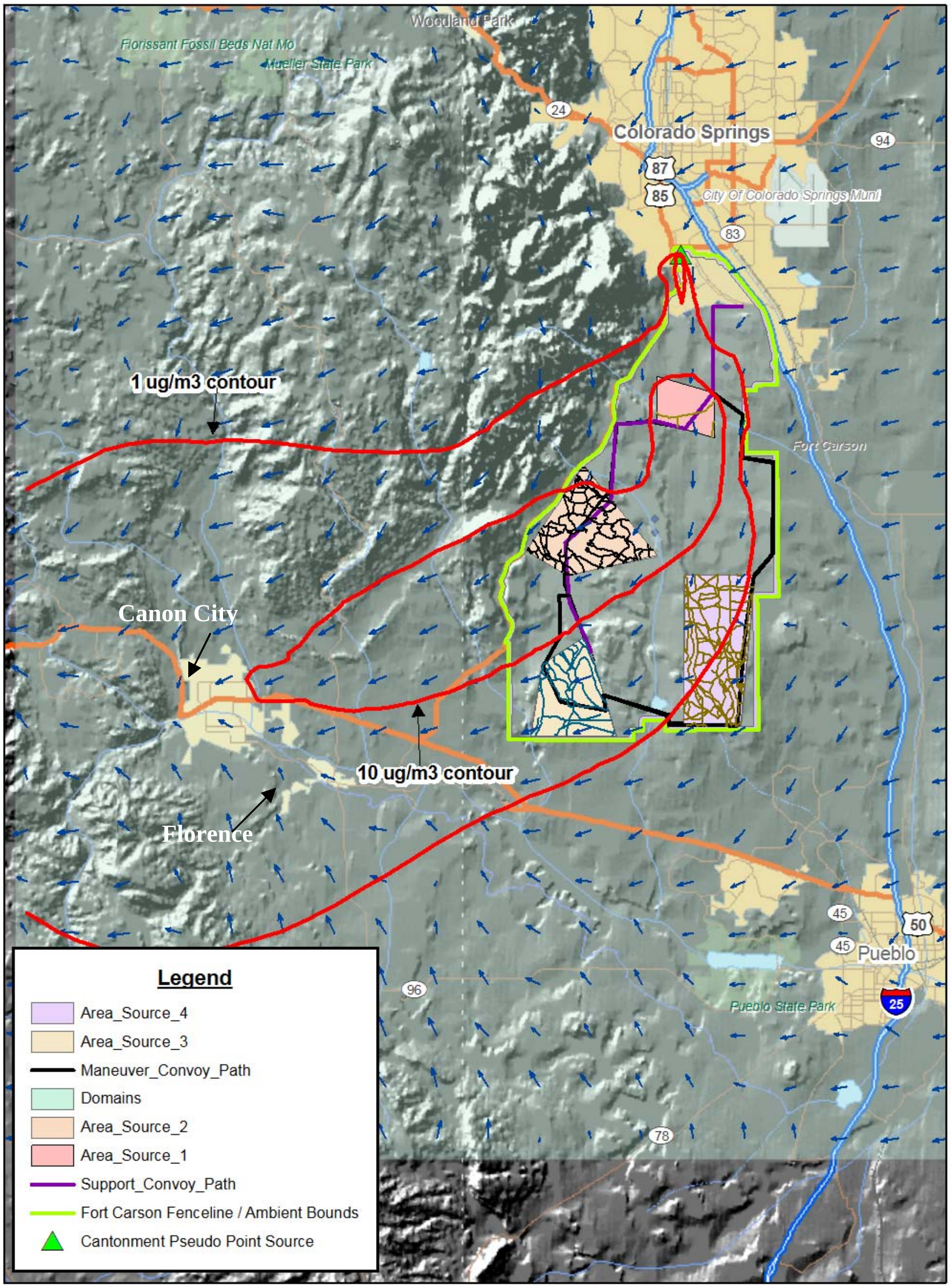


Figure 6 – DUSTRAN Emission Scenario 1 (PM_{10}), East Wind[1]



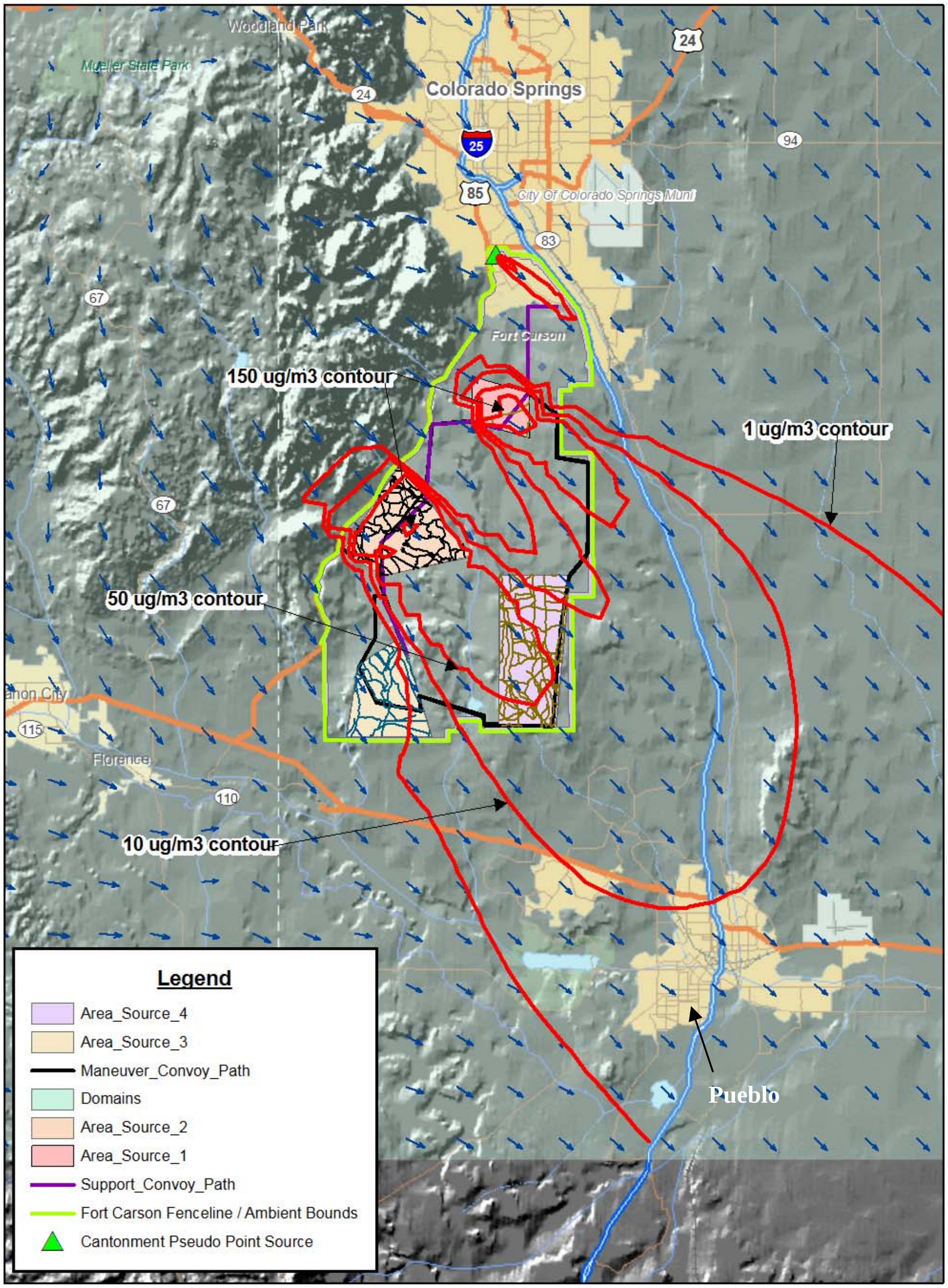
[1] Emission contours do not include background concentrations.

Figure 7 – DUSTRAN Emission Scenario 1 ($PM_{2.5}$), East Wind[1]



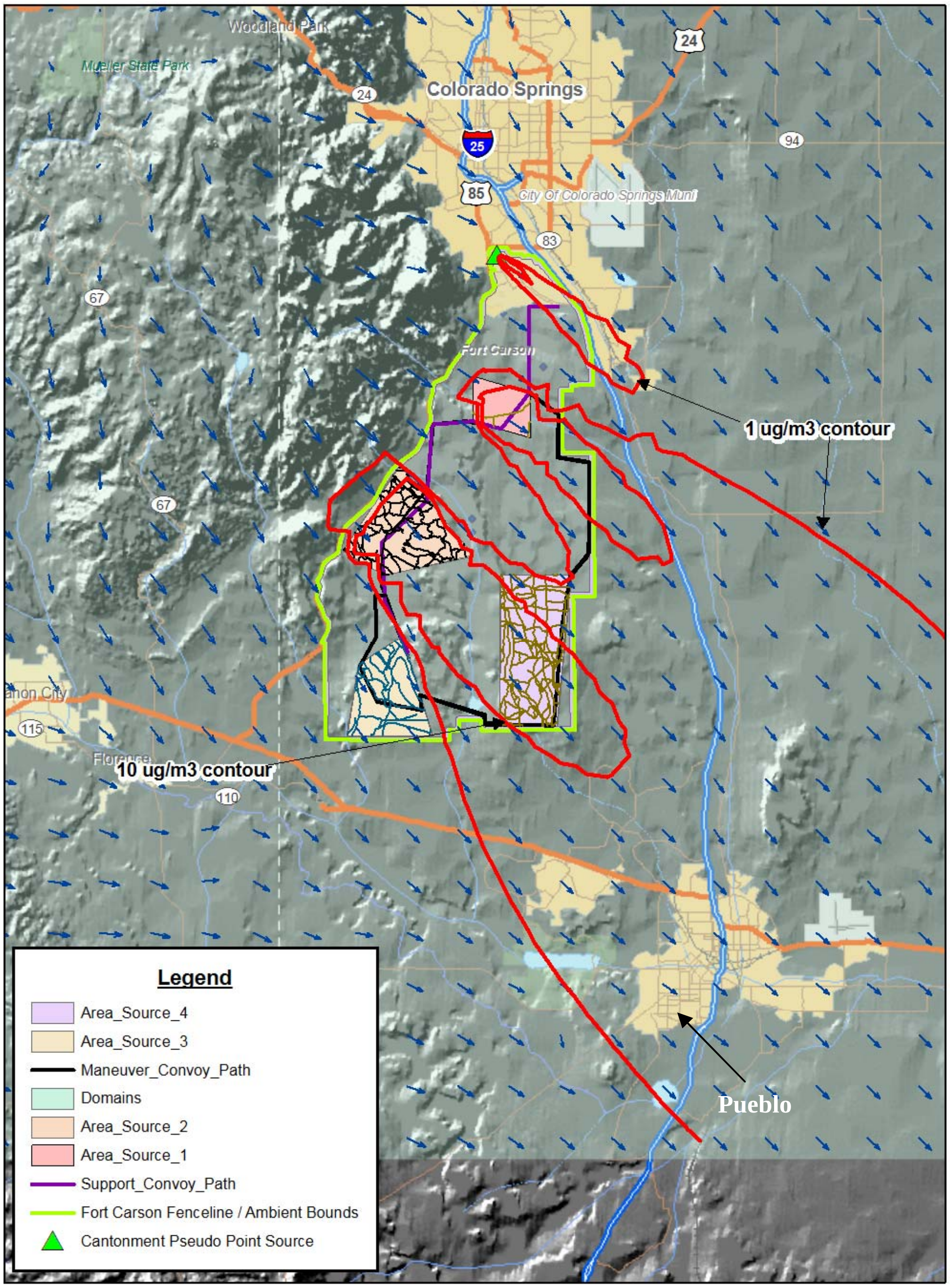
[1] Emission contours do not include background concentrations.

Figure 8 – DUSTRAN Emission Scenario 1 (PM_{10}), Northwest Wind[1]



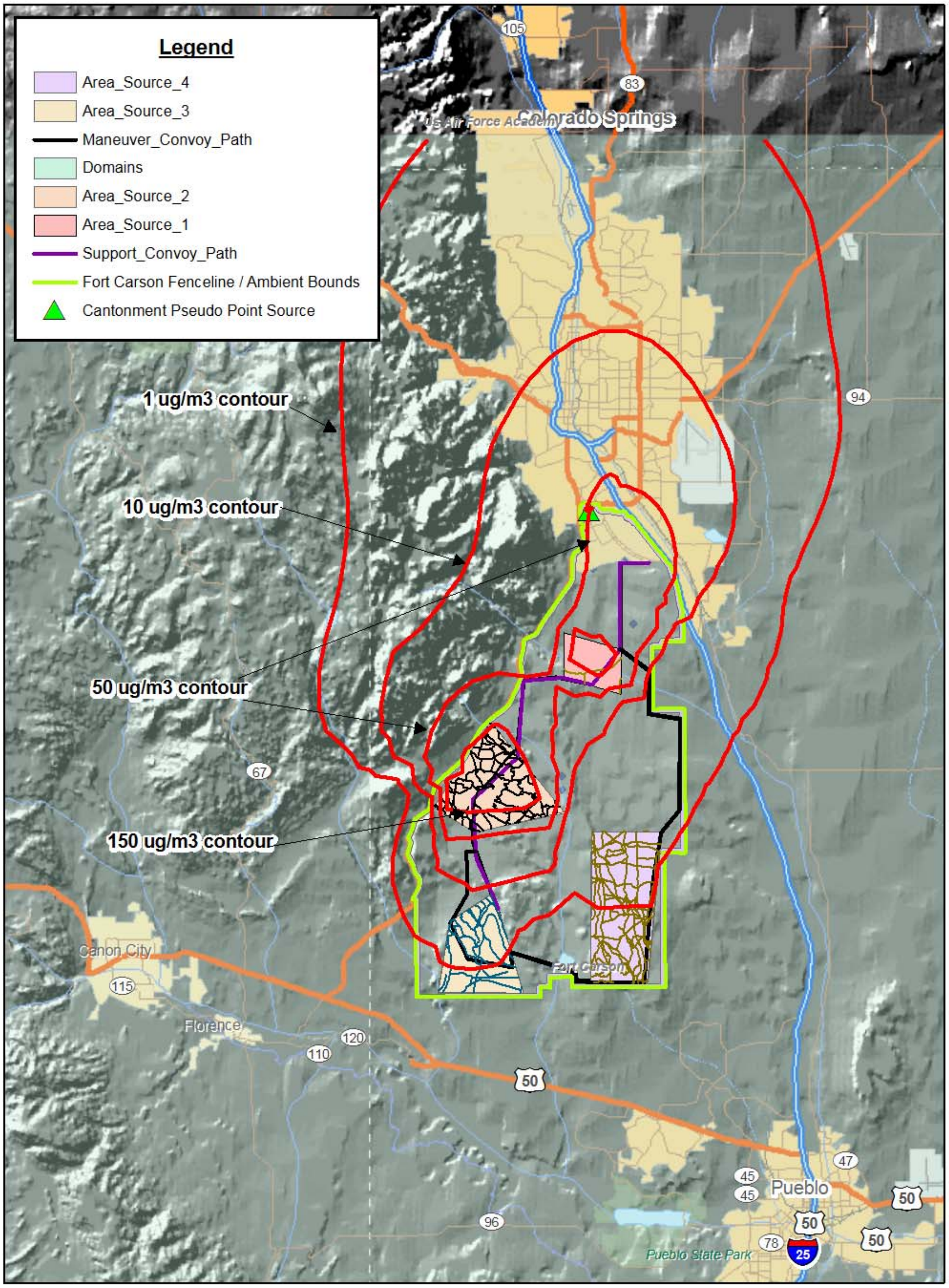
[1] Emission contours do not include background concentrations.

Figure 9 – DUSTRAN Emission Scenario 1 ($PM_{2.5}$), Northwest Wind[1]



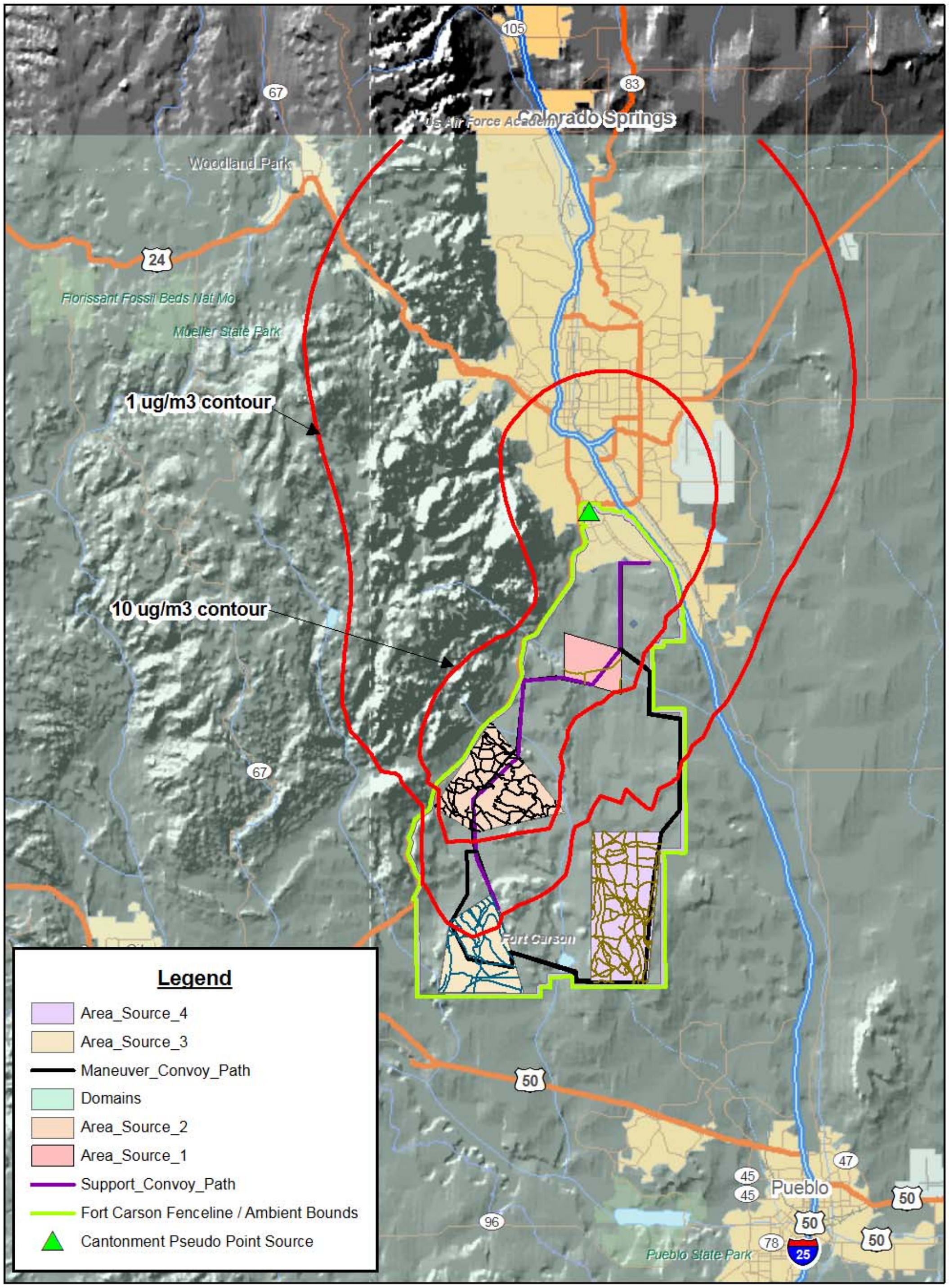
[1] Emission contours do not include background concentrations.

Figure 10 – DUSTRAN Emission Scenario 1 (PM_{10}), South Wind[1]



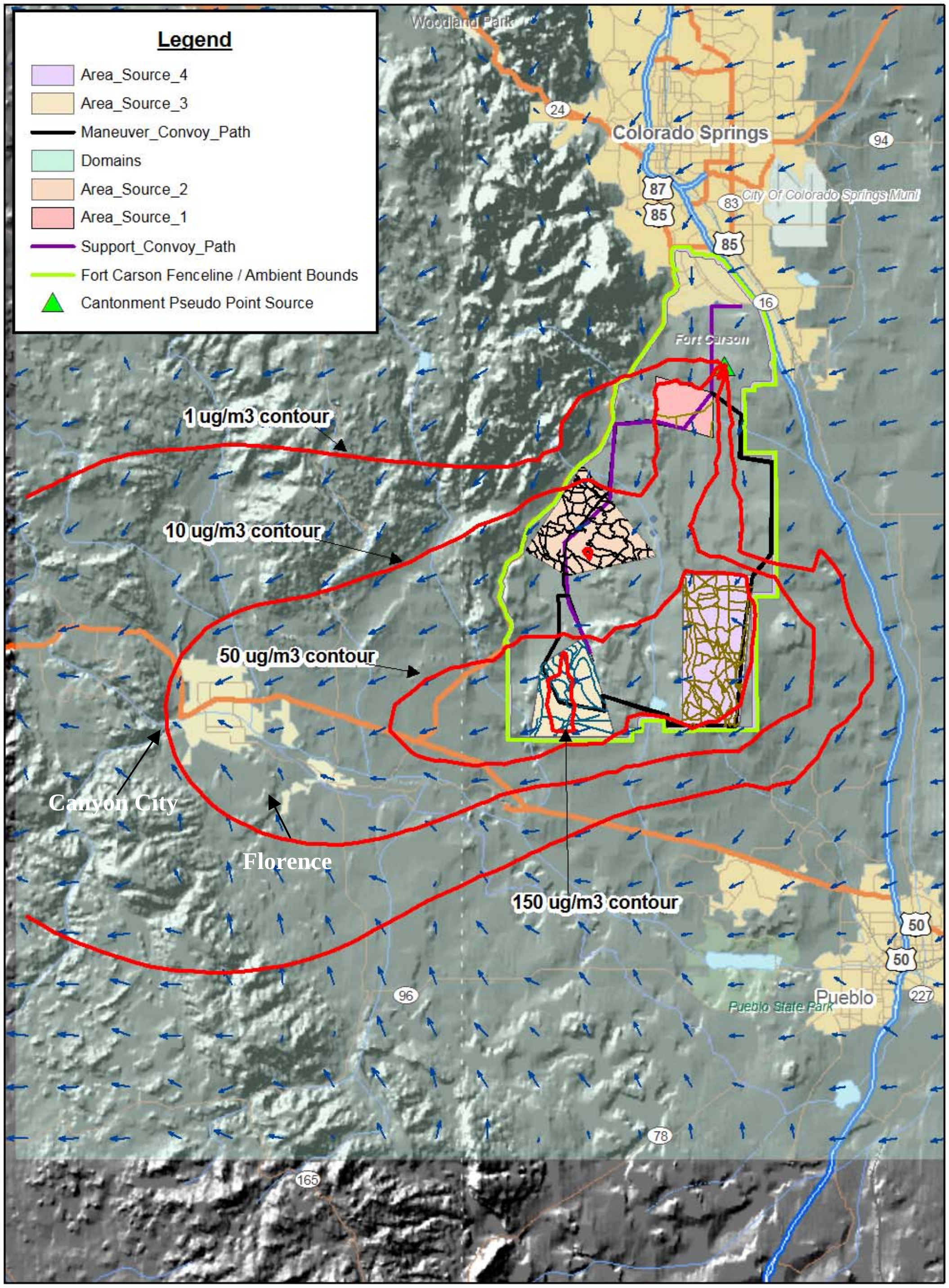
[1] Emission contours do not include background concentrations.

Figure 11 – DUSTRAN Emission Scenario 1 ($PM_{2.5}$), South Wind[1]



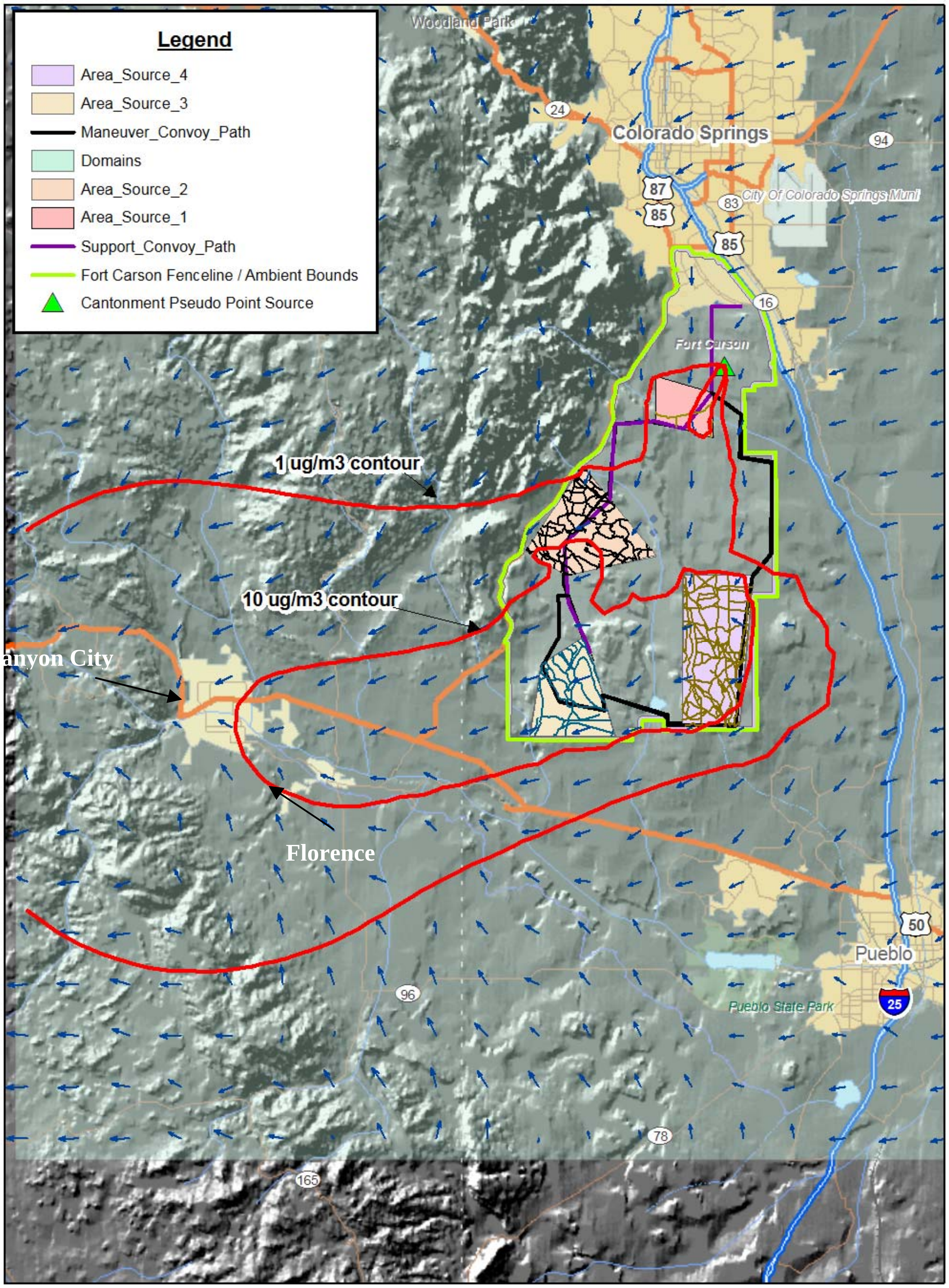
[1] Emission contours do not include background concentrations.

Figure 12 – DUSTRAN Emission Scenario 2 (PM_{10}), East Wind[1]



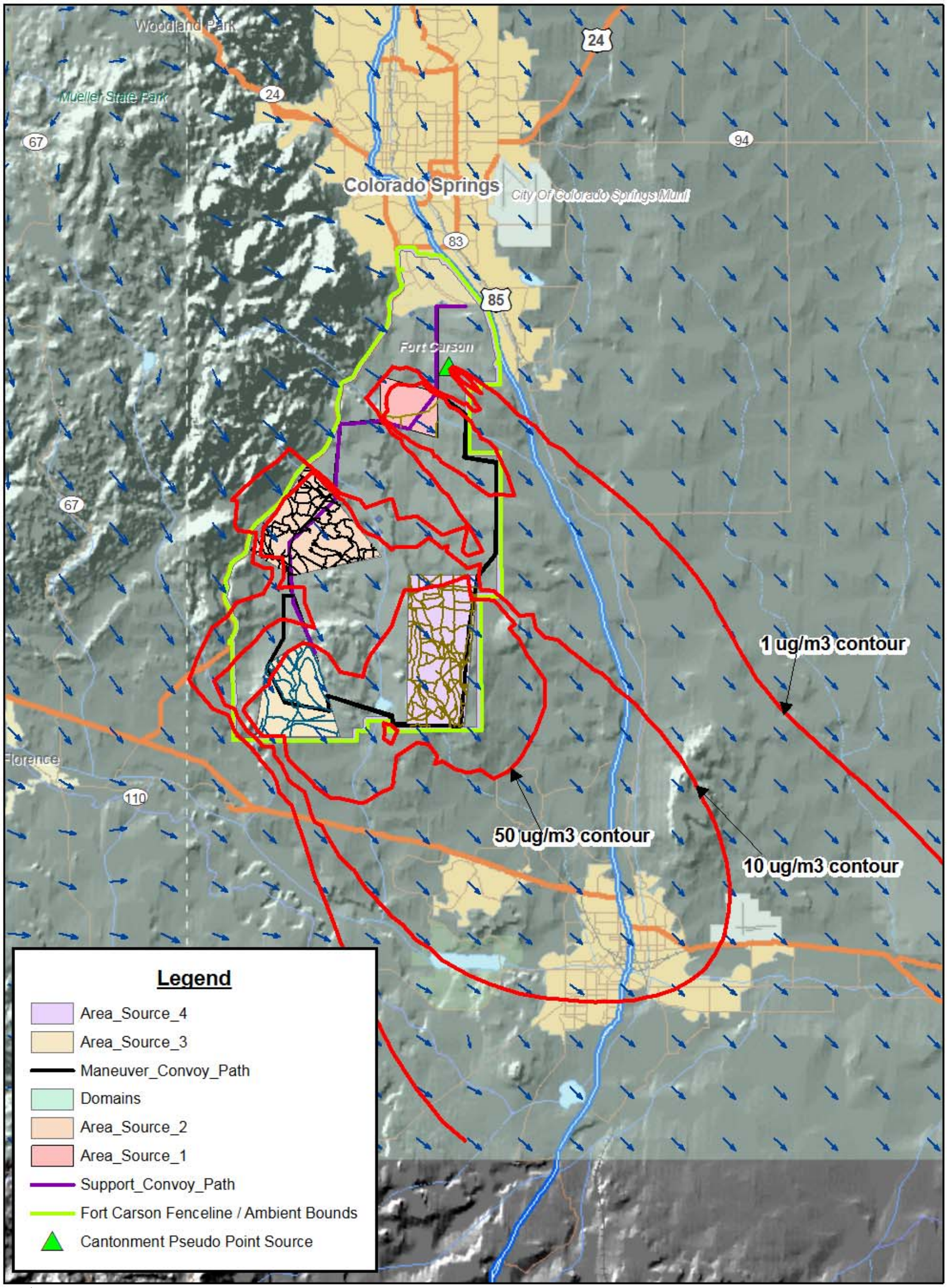
[1] Emission contours do not include background concentrations.

Figure 13 – DUSTRAN Emission Scenario 2 ($PM_{2.5}$), East Wind[1]



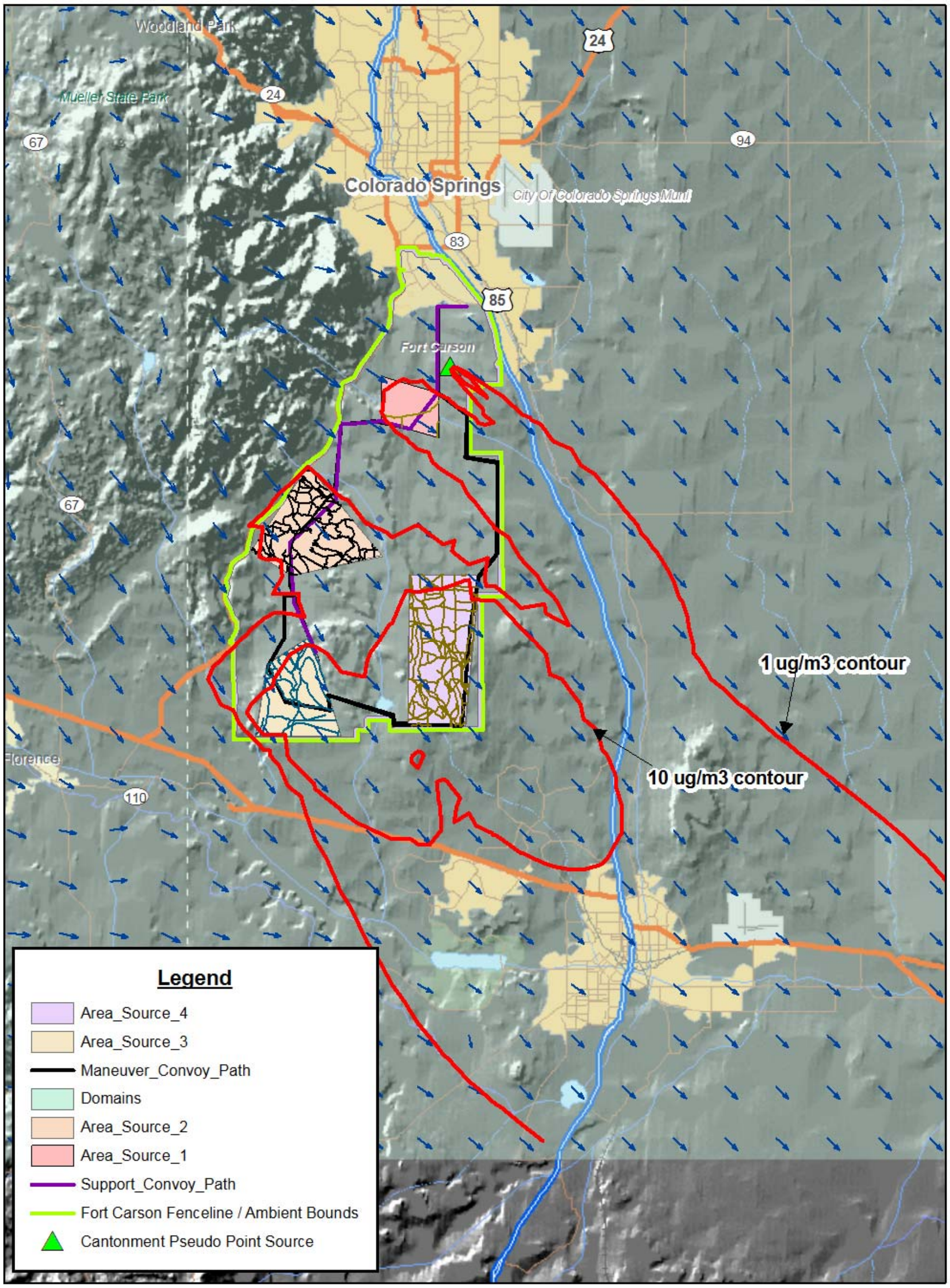
[1] Emission contours do not include background concentrations.

Figure 14 – DUSTRAN Emission Scenario 2 (PM_{10}), Northwest Wind[1]



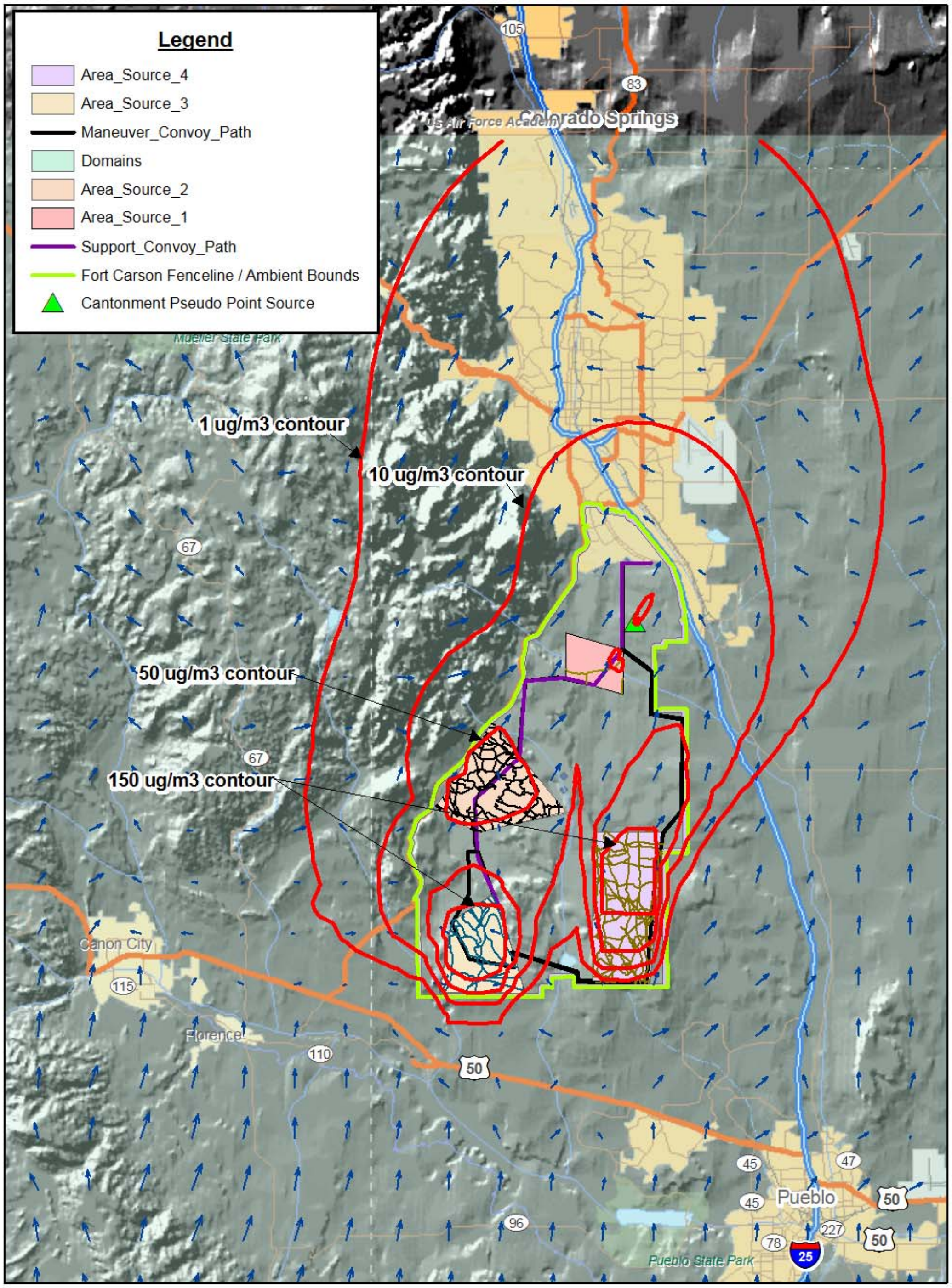
[1] Emission contours do not include background concentrations.

Figure 15 – DUSTRAN Emission Scenario 2 ($PM_{2.5}$), Northwest Wind[1]



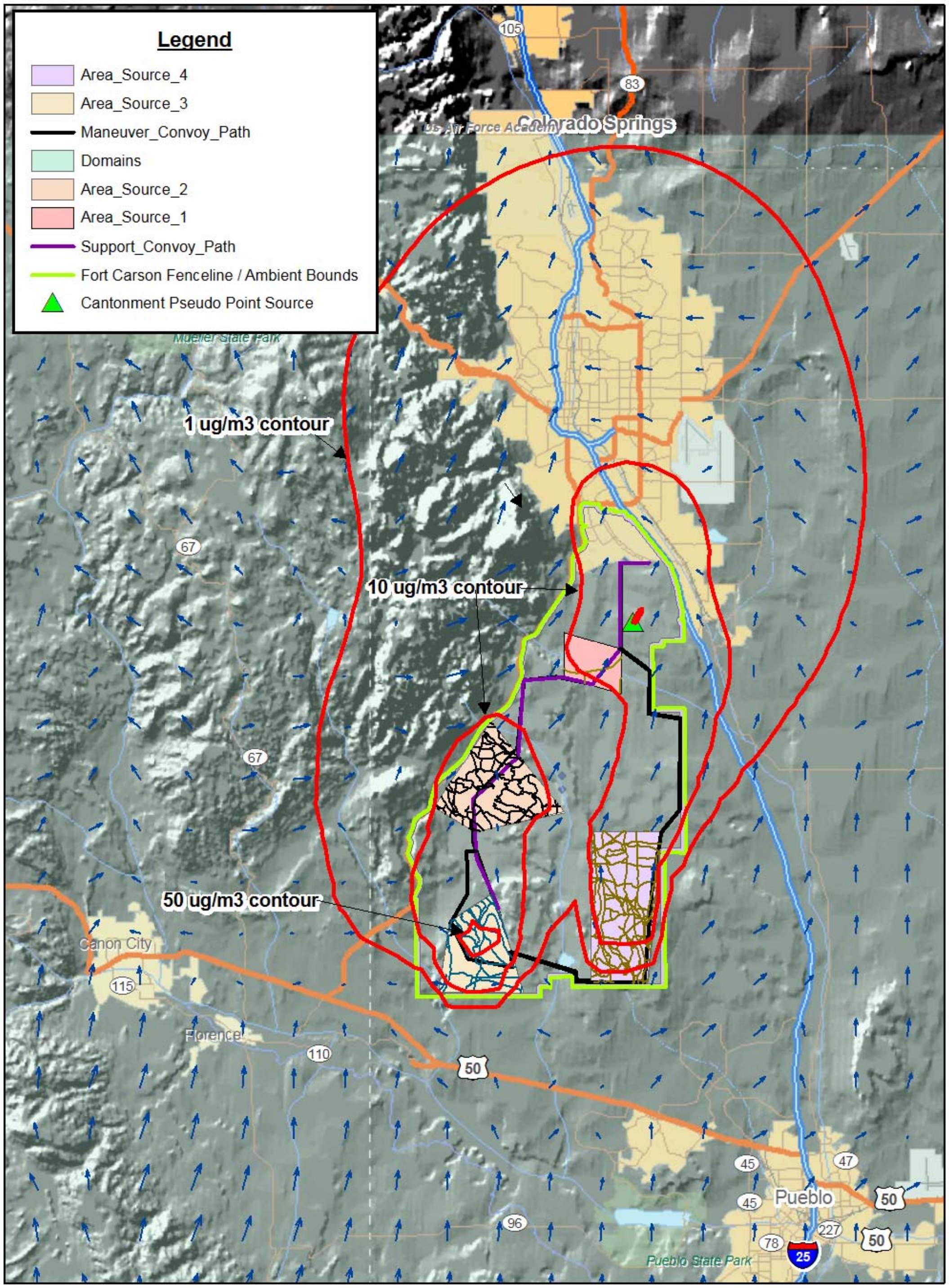
[1] Emission contours do not include background concentrations.

Figure 16 – DUSTRAN Emission Scenario 2 (PM_{10}), South Wind[1]



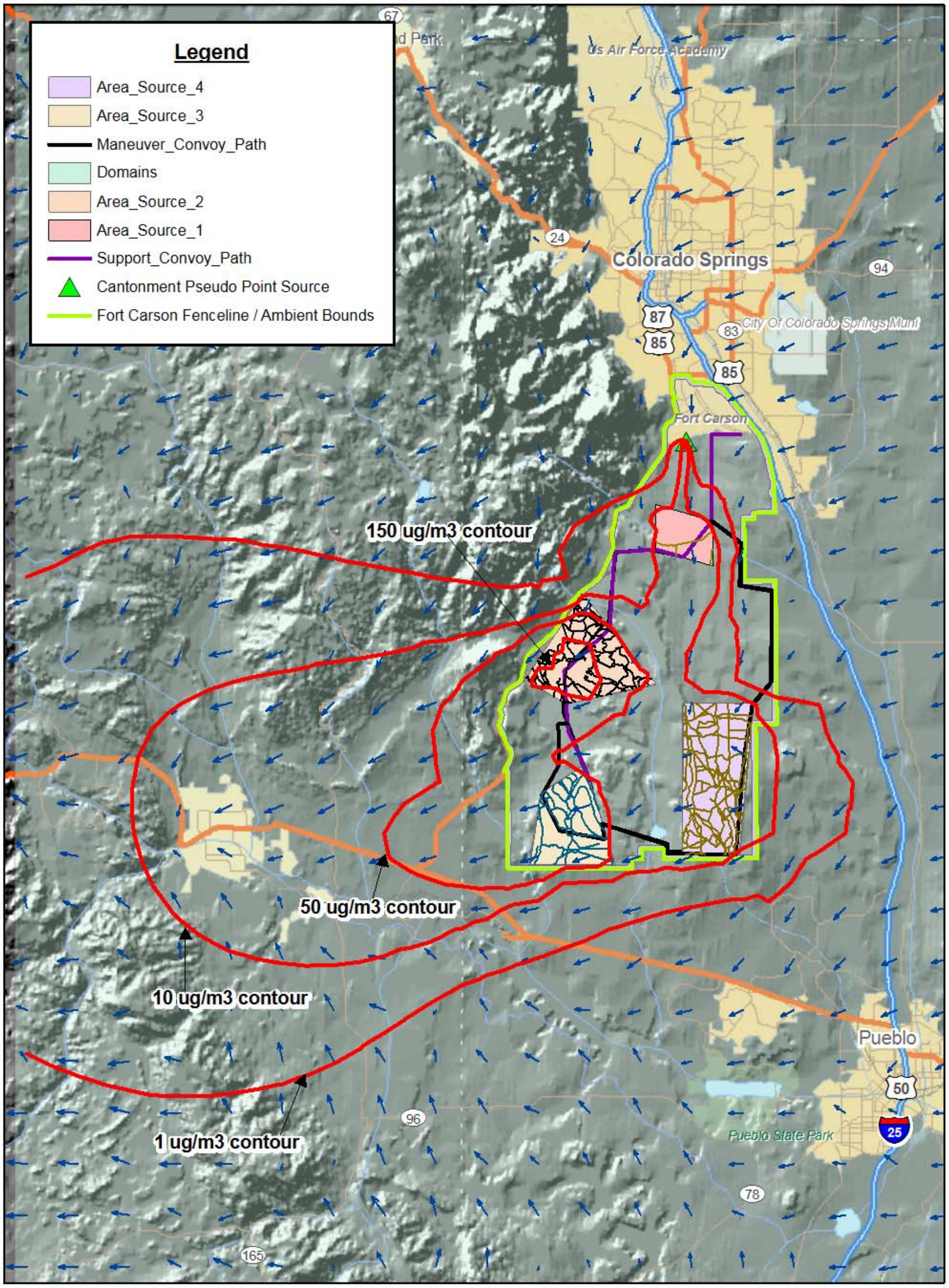
[1] Emission contours do not include background concentrations.

Figure 17 – DUSTRAN Emission Scenario 2 ($PM_{2.5}$), South Wind[1]



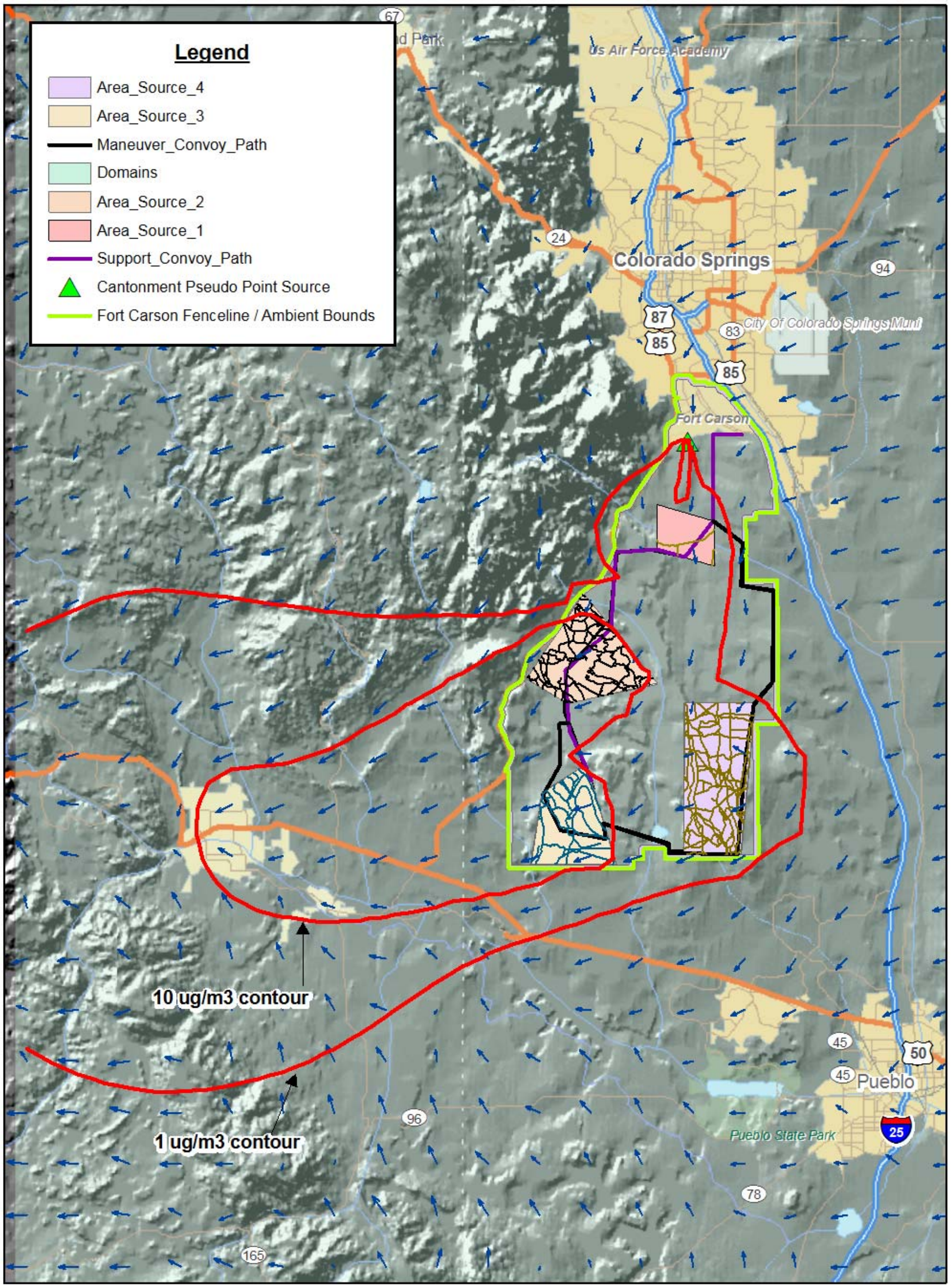
[1] Emission contours do not include background concentrations.

Figure 18 – DUSTRAN Emission Scenario 3 (PM_{10}), East Wind[1]



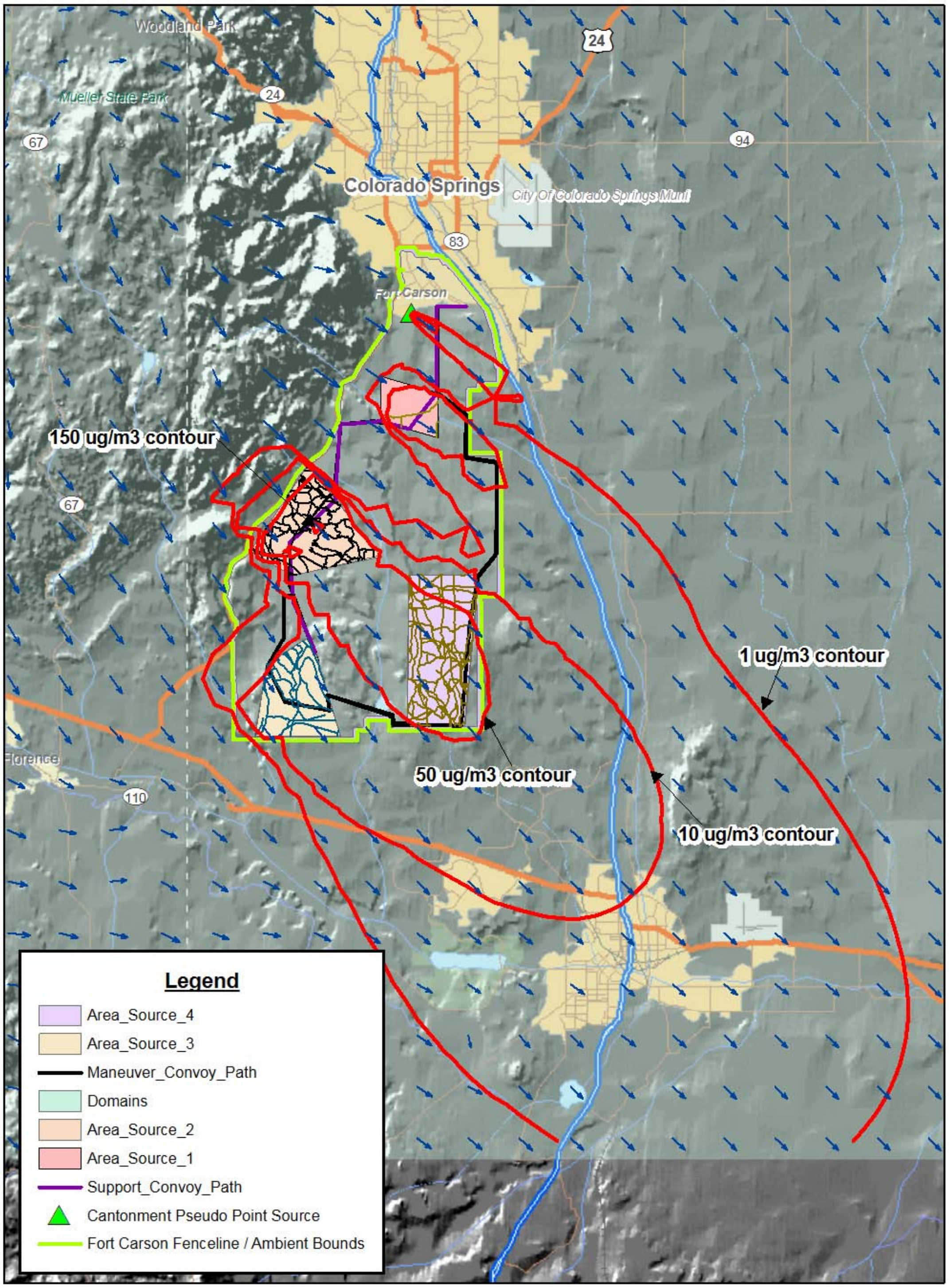
[1] Emission contours do not include background concentrations.

Figure 19 – DUSTRAN Emission Scenario 3 ($PM_{2.5}$), East Wind[1]



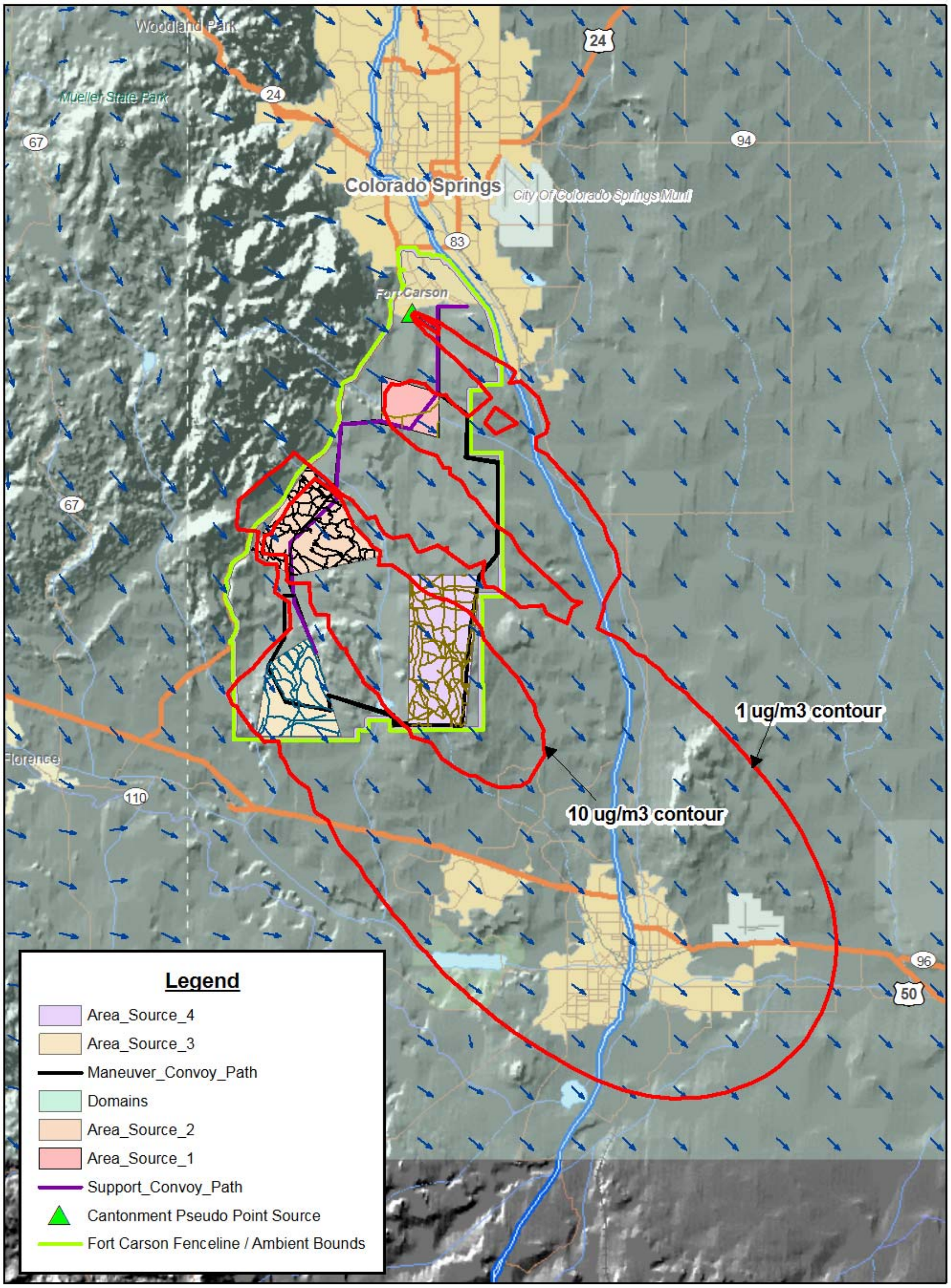
[1] Emission contours do not include background concentrations.

Figure 20 – DUSTRAN Emission Scenario 3 (PM_{10}), Northwest Wind[1]



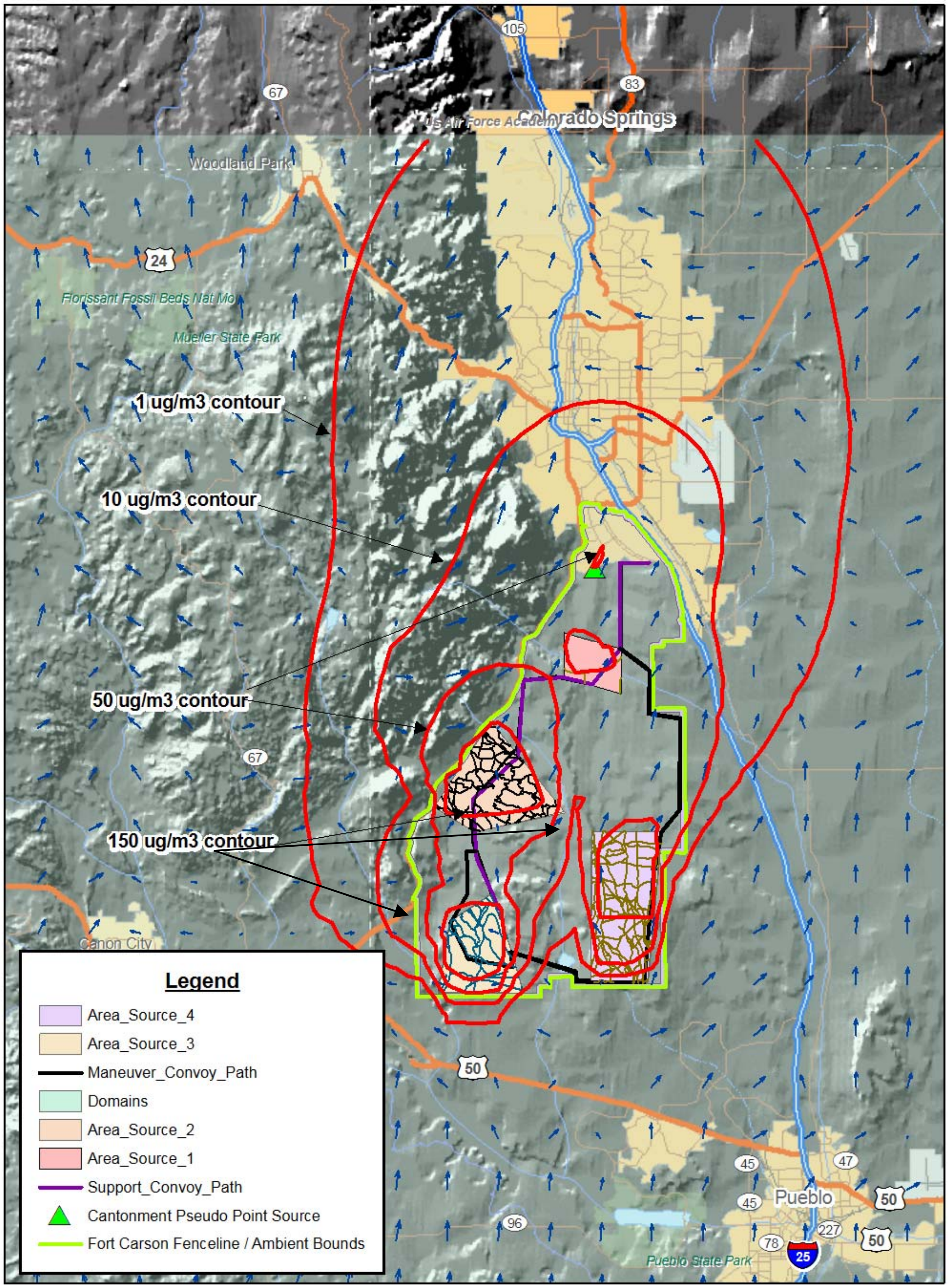
[1] Emission contours do not include background concentrations.

Figure 21 – DUSTRAN Emission Scenario 3 ($PM_{2.5}$), Northwest Wind[1]



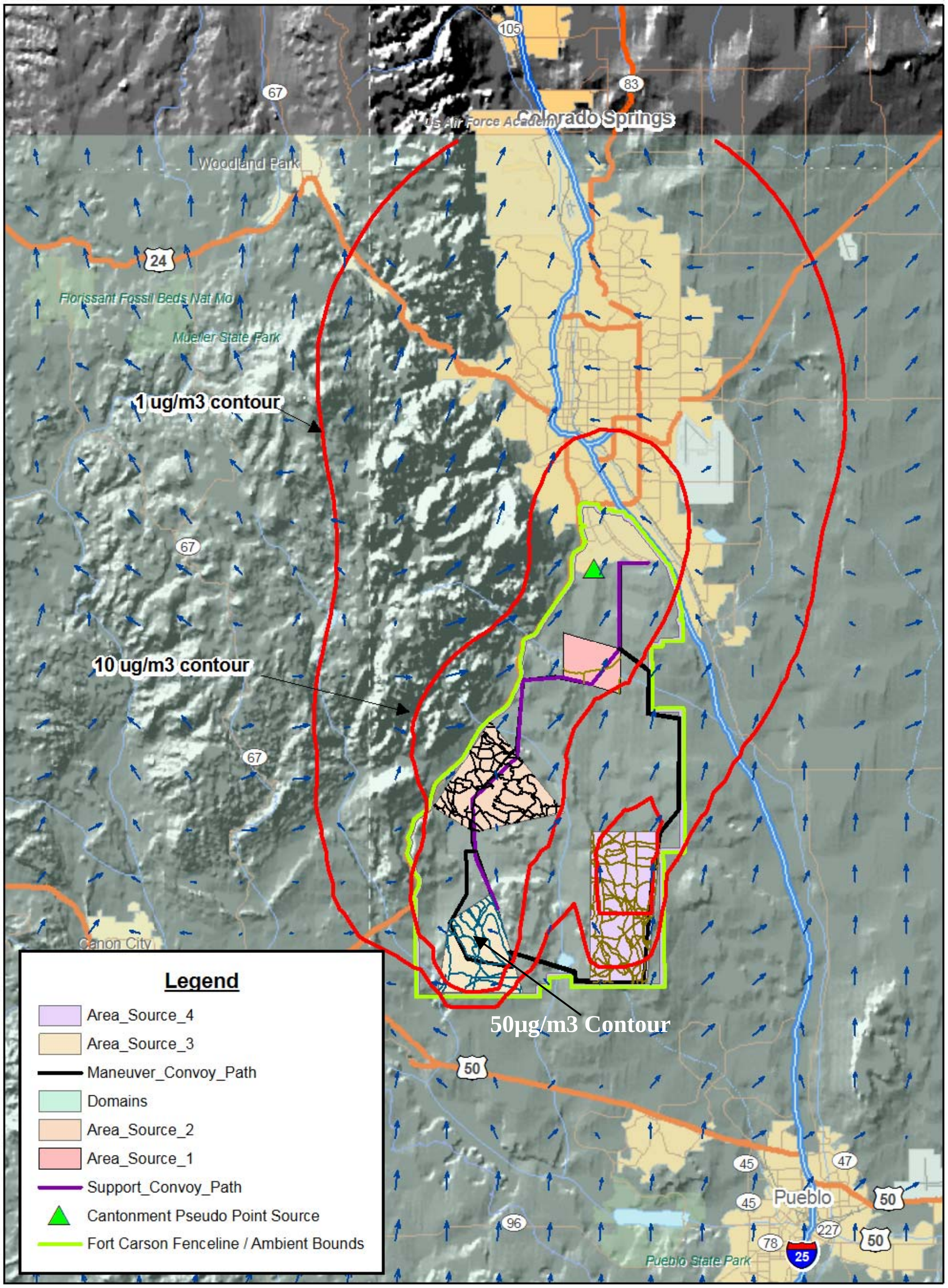
[1] Emission contours do not include background concentrations.

Figure 22 – DUSTRAN Emission Scenario 3 (PM_{10}), South Wind[1]



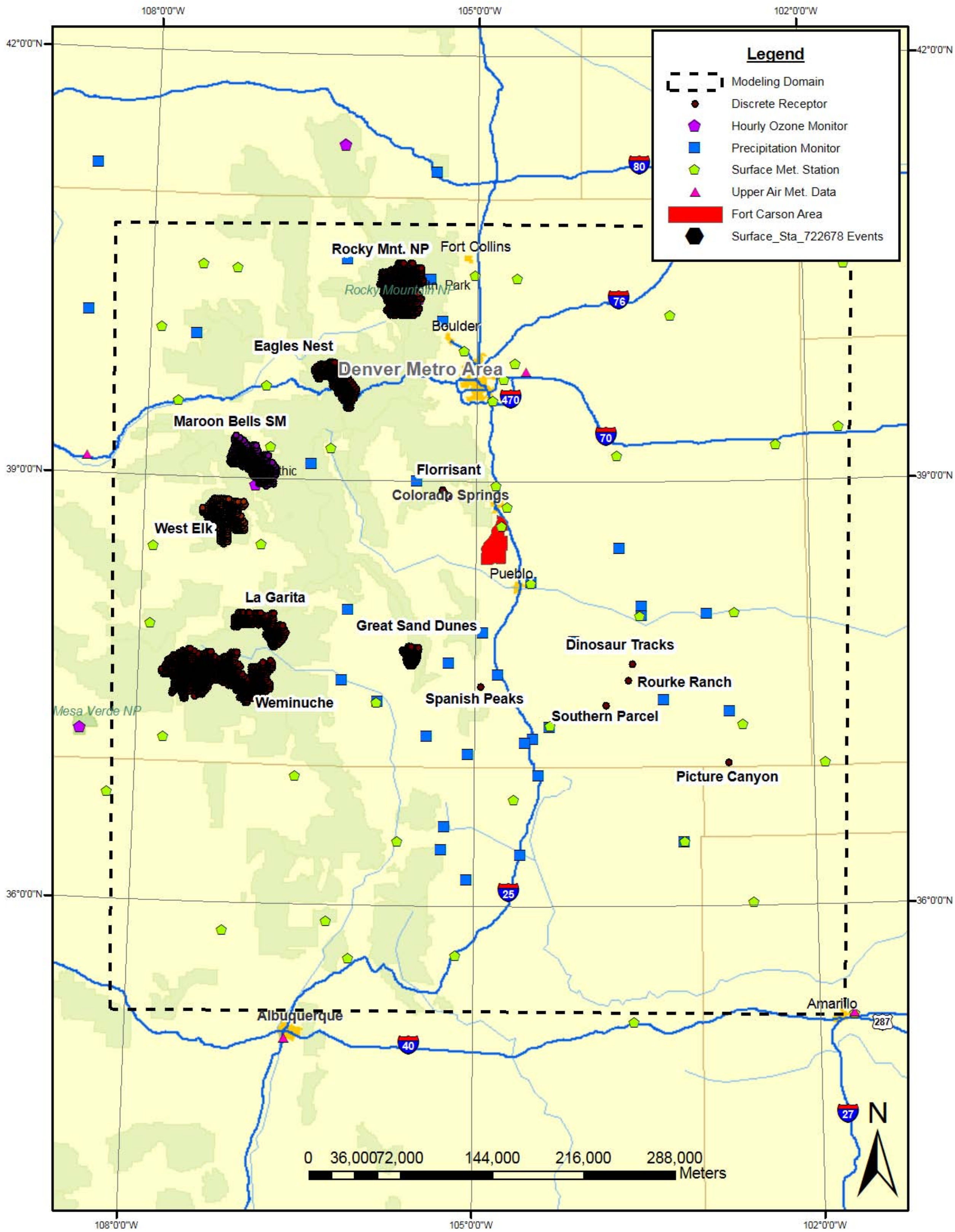
[1] Emission contours do not include background concentrations.

Figure 23 – DUSTRAN Emission Scenario 3 ($PM_{2.5}$), South Wind[1]



[1] Emission contours do not include background concentrations.

Figure 24 – CALPUFF Modeling Domain



APPENDIX A

Table A-1. Modeling Summary
Cumulative Impacts Modeling
Fort Carson Army Post

PROJECTED ACTUAL ANNUAL EMISSIONS

Pseudo Source Location	EXTERNAL COMBUSTION Total Emissions (tpy)						INTERNAL COMBUSTION Total Emissions (tpy)						MISC NON-COMBUSTION Total Emissions (tpy)				
	PM	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**
A	0.44	0.44	5.65	4.87	0.03	0.3	0.01	0.01	0.32	0.12	0.01	0.0	0.00	0.00	0.00	0.00	0.00
B	0.20	0.20	1.66	2.24	0.02	0.1	0.20	0.20	2.80	0.60	0.18	0.2	0.45	0.45	0.00	0.00	0.00
C	1.21	1.21	12.31	13.41	0.10	0.9	0.10	0.09	2.23	0.56	0.50	0.1	0.00	0.00	0.00	0.00	0.00
D	0.87	0.87	10.33	9.53	0.23	0.6	0.02	0.01	0.60	0.14	0.10	0.0	0.51	0.51	0.00	0.00	0.00
E	0.63	0.63	4.44	6.94	0.05	0.5	0.00	0.00	0.10	0.08	0.01	0.0	0.00	0.00	0.00	0.00	0.00
F	0.82	0.82	7.58	9.04	0.06	0.6	0.20	0.18	4.23	0.99	0.49	0.2	0.72	0.72	0.00	0.00	0.00
G	0.55	0.55	2.61	6.10	0.04	0.4	0.02	0.02	0.52	0.28	0.02	0.0	0.00	0.00	0.00	0.00	0.00
H	0.32	0.32	3.76	3.52	0.03	0.2	0.09	0.05	2.76	0.69	0.43	0.1	0.02	0.02	0.06	0.02	0.00
I	0.14	0.14	1.55	1.51	0.01	0.1	0.62	0.61	7.71	1.86	0.64	0.7	0.06	0.06	0.00	0.00	0.00
J	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.44	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	9.87	8.02	0.00	0.00	0.00
Source Category Total	**5.18**	**5.18**	**49.88**	**57.16**	**0.57**	**3.74**	**1.25**	**1.17**	**21.27**	**5.32**	**2.38**	**1.39**	**12.07**	**10.21**	**0.06**	**0.02**	**0.00**

PROJECTED ACTUAL MAXIMUM HOURLY EMISSIONS[a]

Pseudo Source Location	EXTERNAL COMBUSTION Total Emissions (lb/hr)						INTERNAL COMBUSTION Total Emissions (lb/hr)						MISC NON-COMBUSTION Total Emissions (lb/hr)				
	PM	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**
A	0.54	0.54	6.89	5.94	0.04	0.4	0.03	0.03	0.66	0.21	0.03	0.0	0.00	0.00	0.00	0.00	0.00
B	0.28	0.28	2.39	3.04	0.02	0.2	0.31	0.31	4.48	0.96	0.52	0.4	0.21	0.21	0.00	0.00	0.00
C	1.49	1.49	15.05	16.46	0.12	1.1	0.19	0.17	5.16	1.55	0.96	0.3	0.00	0.00	0.00	0.00	0.00
D	1.12	1.06	10.64	8.20	8.76	0.5	0.01	0.01	0.48	0.11	0.08	0.0	0.12	0.12	0.00	0.00	0.00
E	0.78	0.78	5.53	8.63	0.06	0.6	0.01	0.01	0.12	0.11	0.01	0.0	0.00	0.00	0.00	0.00	0.00
F	0.92	0.90	9.39	9.74	1.69	0.6	0.16	0.16	8.44	1.49	2.24	0.2	0.16	0.16	0.00	0.00	0.00
G	0.69	0.69	3.25	7.58	0.05	0.5	0.02	0.02	0.68	0.37	0.03	0.0	0.00	0.00	0.00	0.00	0.00
H	0.39	0.39	4.59	4.30	0.03	0.3	0.12	0.08	3.42	0.84	0.49	0.1	0.01	0.01	0.03	0.01	0.00
I	0.24	0.24	2.83	2.62	0.14	0.2	0.29	0.29	3.66	1.62	0.58	0.6	0.06	0.06	0.00	0.00	0.00
J	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	14.60	14.60	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	2.82	2.29	0.00	0.00	0.00
Source Category Total	**6.44**	**6.36**	**60.54**	**66.52**	**10.92**	**4.36**	**1.14**	**1.07**	**27.10**	**7.25**	**4.94**	**1.63**	**17.98**	**17.45**	**0.03**	**0.01**	**0.00**

[a] Projected actual maximum hourly emissions are estimated as Annual PTE/8760.

Table A-1, Continued

POTENTIAL ANNUAL EMISSIONS

Pseudo Source Location	EXTERNAL COMBUSTION Total Emissions (tpy)						INTERNAL COMBUSTION Total Emissions (tpy)						MISC NON-COMBUSTION Total Emissions (tpy)				
	PM	PM_{10}	NO_X	CO	SO_X	VOC	PM	PM_{10}	NO_X	CO	SO_X	VOC	PM	PM_{10}	NO_X	CO	SO_X
A	2.35	2.35	30.17	26.01	0.19	1.7	0.14	0.14	2.88	0.90	0.13	0.2	0.00	0.00	0.00	0.00	0.00
B	1.21	1.21	10.46	13.33	0.10	0.9	1.37	1.37	19.63	4.19	2.27	1.6	0.91	0.91	0.00	0.00	0.00
C	6.52	6.52	65.90	72.11	0.52	4.7	0.85	0.73	22.59	6.78	4.20	1.1	0.00	0.00	0.00	0.00	0.00
D	4.91	4.66	46.59	35.92	38.38	2.4	0.06	0.04	2.12	0.49	0.36	0.1	0.51	0.51	0.00	0.00	0.00
E	3.42	3.42	24.20	37.78	0.27	2.5	0.03	0.03	0.54	0.47	0.03	0.1	0.00	0.00	0.00	0.00	0.00
F	4.02	3.92	41.12	42.68	7.40	2.8	0.69	0.69	36.98	6.52	9.83	0.8	0.72	0.72	0.00	0.00	0.00
G	3.00	3.00	14.23	33.21	0.24	2.2	0.09	0.09	2.98	1.61	0.11	0.2	0.00	0.00	0.00	0.00	0.00
H	1.70	1.70	20.09	18.84	0.13	1.2	0.51	0.36	14.96	3.67	2.14	0.5	0.03	0.03	0.11	0.04	0.00
I	1.05	1.05	12.41	11.47	0.61	0.8	1.25	1.25	16.04	7.11	2.56	2.7	0.28	0.28	0.00	0.00	0.00
J	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	63.95	63.95	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	12.34	10.02	0.00	0.00	0.00
Source Category Total	**28.19**	**27.85**	**265.18**	**291.35**	**47.83**	**19.10**	**4.99**	**4.70**	**118.72**	**31.74**	**21.63**	**7.16**	**78.74**	**76.42**	**0.11**	**0.04**	**0.00**

POTENTIAL HOURLY EMISSIONS

Pseudo Source Location	EXTERNAL COMBUSTION Total Emissions (lb/hr)						INTERNAL COMBUSTION Total Emissions (lb/hr)						MISC NON-COMBUSTION Total Emissions (lb/hr)				
	PM	PM_{10}	NO_X	CO	SO_X	VOC	PM	PM_{10}	NO_X	CO	SO_X	VOC	PM	PM_{10}	NO_X	CO	SO_X
A	0.54	0.54	6.89	5.94	0.04	0.4	0.68	0.68	15.48	5.75	0.69	1.0	0.00	0.00	0.00	0.00	0.00
B	0.45	0.45	4.68	4.97	0.04	0.3	2.09	2.09	39.45	8.53	3.97	2.3	0.88	0.88	0.00	0.00	0.00
C	1.49	1.49	15.05	16.46	0.12	1.1	4.14	3.68	121.71	41.04	25.91	6.0	0.00	0.00	0.00	0.00	0.00
D	2.03	1.71	20.21	12.49	32.47	0.8	0.49	0.28	16.94	3.88	2.86	0.5	0.49	0.49	0.00	0.00	0.00
E	0.78	0.78	5.53	8.63	0.06	0.6	0.22	0.22	4.36	3.77	0.26	0.4	0.00	0.00	0.00	0.00	0.00
F	2.00	1.65	20.52	17.95	27.05	1.2	5.83	5.04	230.28	45.97	51.08	6.4	0.69	0.69	0.00	0.00	0.00
G	0.69	0.69	3.25	7.58	0.05	0.5	0.74	0.74	23.82	12.88	0.91	1.4	0.00	0.00	0.00	0.00	0.00
H	0.39	0.39	4.59	4.30	0.03	0.3	2.40	1.71	71.86	18.68	10.06	2.6	5.66	5.66	27.90	9.09	0.00
I	0.34	0.34	3.60	2.78	6.52	0.2	4.56	4.56	55.28	32.24	12.00	12.1	0.27	0.27	0.00	0.00	0.00
J	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	131.63	131.63	0.02	0.55	0.00
K	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.0	11.87	9.63	0.00	0.00	0.00
Source Category Total	**8.70**	**8.03**	**84.31**	**81.11**	**66.38**	**5.31**	**21.16**	**19.01**	**579.18**	**172.74**	**107.73**	**32.85**	**151.49**	**149.26**	**27.92**	**9.63**	**0.00**

Table A-1, Continued

INTERNAL COMBUSTION STACK PARAMETERS

Pseudo Source	Exhaust Temp (deg. F)	Exhaust Flow Rate (acfm)	Building Height (ft)	Stack Height (ft)	Stack Dia. (inches)	Exhaust Velocity (ft/s)	Exhaust Direction	Rain Cap?
A	893	3899	37.5	40	10	119	Vertical	Yes
B	970	1047	30-40	55	8	50	Vertical	No
C	970	5901	30	34	12	125	Horizontal	No
D	970	2688	28	34	10	82	Vertical	Yes
E	970	1904	30	34	8	91	Horizontal	No
F	970	4988	20	24	10	152	Vertical	Yes
G	893	3899	30	34	10	119	Vertical	Yes
H	1050	11345	30	34	15	154	Vertical	No
I	970	1352	30	34	8	65	Vertical	Yes
J	0	0	0	0	0	0	0	0
K	0	0	0	0	0	0	0	0

EXTERNAL COMBUSTION STACK PARAMETERS

Pseudo Source	Exhaust Temp (deg. F)	Exhaust Flow Rate (acfm)	Building Height (ft)	Stack Height (ft)	Stack Dia. (inches)	Exhaust Velocity (ft/s)	Exhaust Direction	Rain Cap?
A	315	991	37.5	40	24	5	Vertical	No
B	315	1674	30-40	42	30	6	Vertical	Yes
C	315	869	30	38	12	18	Vertical	Yes
D	315	14244	28	34	42	25	Vertical	No
E	315	2424	30	34	24	13	Vertical	Yes
F	315	7879	28	34	36	19	Vertical	Yes
G	315	2424	30	34	24	13	Vertical	Yes
H	315	636	30	34	24	3	Vertical	Yes
I	315	2222	30	34	24	12	Vertical	Yes
J	0	0	0	0	0	0	0	0
K	0	0	0	0	0	0	0	0

Table A-2. Exhaust Parameters

PSEUDO SOURCE DESCRIPTION

Pseudo Source	Pseudo Source Location (Bldg)	Emission Points Assigned
A	330	Buildings 0-1000; Buildings 4000-5999
B	8000	Buildings 8000-8999
C	1550	Buildings 1000 - 1699
D	1860	Buildings 1700 - 2299
E	Proposed, Unnumbered Bldg	Heavy Brigade Area
F	Near 7501	Buildings 6000-7999
G	Proposed, Unnumbered Bldg	New Brigade Area
H	Motorpool, Unknown Bldg. No.	Buildings 2300-3999
I	9609	Buildings 9000-10000
J	N/A	Range Area Volume Sources
K	N/A	Cantonment Area Volume Sources

CONSTANTS

Heat content of No. 2 Oil/Diesel	137000	Btu/gal
Brake Specific Fuel Consumption	7000	Btu/hp-hr
Standard Temperature	68	deg. F
Standard Temperature	528	deg.Rk
Wet Exhaust Flow Rate (Fw)	10320	scf/MMBtu diesel fuel (from 40 CFR Part 60, Appendix A, Method 19, Table 19-2)
Wet Exhaust Flow Rate (Fw)	10610	scf/MMBtu natural gas fuel (from 40 CFR Part 60, Appendix A, Method 19, Table 19-2)

EQUATIONS

F = Fw*20.9/(20.9-%O2)	(from 40 CFR Part 60, Appendix A, Method 19, Equation 19-1)
%O2 = 20.9-Fw/F*20.9	(derived from 40 CFR Part 60, Appendix A, Method 19, Equation 19-1)

INTERNAL COMBUSTION STACK PARAMETERS

Pseudo Source	Representative Source Description	Size (hp)	Fuel Type	Fuel Use Rate (gal/hr)	Heat Input Rate (MMBtu/min)	Wet Exhaust Flow Rate Fw (scfm)	%O2	O2 Adjusted Exhaust Flow Rate, F (scfm)	Exhaust Temp (deg. F)	Exhaust Temp (deg. Rk)	Exhaust Flow Rate (acfm)	Building Height (ft)	Stack Height (ft)	Stack Dia. (inches)	Stack Cross Sectional Area (sq. ft.)	Exhaust Velocity (ft/s)	Exhaust Direction	Rain Cap?
A	747.7 hp, Kohler 500REOZVB[a]	747.7	Diesel	54	0.12	1272	3.4	1522	893	1353	3899	37.5	40	10	0.55	119	Vertical	Yes
B	275 hp engine at Bldg. 8000 dyno	275	Diesel	14	0.03	331	3.0	387	970	1430	1047	30-40	55	8	0.35	50	Vertical	No
C	1550 hp generator at Bldg. 1550	1550	Diesel	79	0.18	1866	3.0	2179	970	1430	5901	30	34	12	0.79	125	Horizontal	No
D	706 hp generator at Bldg. 1860	706	Diesel	36	0.08	850	3.0	992	970	1430	2688	28	34	10	0.55	82	Vertical	Yes
E	500 hp generator	500	Diesel	26	0.06	602	3.0	703	970	1430	1904	30	34	8	0.35	91	Horizontal	No
F	1310 hp generator at Hospital	1310	Diesel	67	0.15	1577	3.0	1842	970	1430	4988	20	24	10	0.55	152	Vertical	Yes
G	747.7 hp, Kohler 500REOZVB[a]	747.7	Diesel	54	0.12	1272	3.4	1522	893	1353	3899	30	34	10	0.55	119	Vertical	Yes
H	1620 hp, Cummins KTA50-G2[b]	1620	Diesel	152	0.35	3582	2.0	3967	1050	1510	11345	30	34	15	1.23	154	Vertical	No
I	355 hp generator	355	Diesel	18	0.04	427	3.0	499	970	1430	1352	30	34	8	0.35	65	Vertical	Yes
J	N/A, No IC Sources																	
K	N/A, No IC Sources																	

[a] Kohler 2007.

b Cummins 1998.

EXTERNAL COMBUSTION STACK PARAMETERS

Pseudo Source	Representative Source Description	Fuel Type	Heat Input Rate (MMBtu/hr)	Heat Input Rate (MMBtu/min)	Wet Exhaust Flow Rate Fw (scfm)	%O2	O2 Adjusted Exhaust Flow Rate, F (scfm)	Exhaust Temp (deg. F)	Exhaust Temp (deg. Rk)	Exhaust Flow Rate (acfm)	Building Height (ft)	Stack Height (ft)	Stack Dia. (inches)	Stack Cross Sectional Area (sq. ft.)	Exhaust Velocity (ft/s)	Exhaust Direction	Rain Cap?
A	3.27 MMBtu/hr boiler at Bldg. 330	Natural Gas	3.27	0.05	578	3.0	675	315	775	991	37.5	40	24	3.14	5	Vertical	No
B	5.525 MMBtu/hr boiler at Bldg. 8000	Natural Gas	5.525	0.09	977	3.0	1141	315	775	1674	30-40	42	30	4.91	6	Vertical	Yes
C	2.869 MMBtu/hr boiler at Bldg. 1550	Natural Gas	2.869	0.05	507	3.0	592	315	775	869	30	38	12	0.79	18	Vertical	Yes
D	47 MMBtu/hr boiler at Bldg. 1860	Natural Gas	47	0.78	8311	3.0	9704	315	775	14244	28	34	42	9.62	25	Vertical	No
E	8.0 MMBtu/hr boiler at proposed Bldg.	Natural Gas	8	0.13	1415	3.0	1652	315	775	2424	30	34	24	3.14	13	Vertical	Yes
F	26 MMBtu/hr boiler near 7501	Natural Gas	26	0.43	4598	3.0	5368	315	775	7879	28	34	36	7.07	19	Vertical	Yes
G	8.0 MMBtu/hr boiler at proposed Bldg.	Natural Gas	8	0.13	1415	3.0	1652	315	775	2424	30	34	24	3.14	13	Vertical	Yes
H	2.1 MMBtu/hr boiler at Motorpool	Natural Gas	2.1	0.04	371	3.0	434	315	775	636	30	34	24	3.14	3	Vertical	Yes
I	7.333 MMBtu/hr boiler	Natural Gas	7.333	0.12	1297	3.0	1514	315	775	2222	30	34	24	3.14	12	Vertical	Yes
J	N/A, No EC Sources																
K	N/A, No EC Sources																

Table A-3. External Combution Summary

EXTERNAL COMBUSTION SOURCES - ACTUAL ANNUAL EMISSIONS

Pseudo Source Location	Total Emissions (tpy)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
A	0.44	0.44	5.65	4.87	0.03	0.3
B	0.20	0.20	1.66	2.24	0.02	0.1
C	1.21	1.21	12.31	13.41	0.10	0.9
D	0.87	0.87	10.33	9.53	0.23	0.6
E	0.63	0.63	4.44	6.94	0.05	0.5
F	0.82	0.82	7.58	9.04	0.06	0.6
G	0.55	0.55	2.61	6.10	0.04	0.4
H	0.32	0.32	3.76	3.52	0.03	0.2
I	0.14	0.14	1.55	1.51	0.01	0.1
Source Category Total	**5.18**	**5.18**	**49.88**	**57.16**	**0.57**	**3.74**

EXTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

Pseudo Source Location	Total Emissions (tpy)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
A	2.35	2.35	30.17	26.01	0.19	1.7
B	1.21	1.21	10.46	13.33	0.10	0.9
C	6.52	6.52	65.90	72.11	0.52	4.7
D	4.91	4.66	46.59	35.92	38.38	2.4
E	3.42	3.42	24.20	37.78	0.27	2.5
F	4.02	3.92	41.12	42.68	7.40	2.8
G	3.00	3.00	14.23	33.21	0.24	2.2
H	1.70	1.70	20.09	18.84	0.13	1.2
I	1.05	1.05	12.41	11.47	0.61	0.8
Source Category Total	**28.19**	**27.85**	**265.18**	**291.35**	**47.83**	**19.10**

EXTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

Pseudo Source Location	Total Emissions (lb/hr)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
A	0.54	0.54	6.89	5.94	0.04	0.4
B	0.45	0.45	4.68	4.97	0.04	0.3
C	1.49	1.49	15.05	16.46	0.12	1.1
D	2.03	1.71	20.21	12.49	32.47	0.8
E	0.78	0.78	5.53	8.63	0.06	0.6
F	2.00	1.65	20.52	17.95	27.05	1.2
G	0.69	0.69	3.25	7.58	0.05	0.5
H	0.39	0.39	4.59	4.30	0.03	0.3
I	0.34	0.34	3.60	2.78	6.52	0.2
Source Category Total	**8.70**	**8.03**	**84.31**	**81.11**	**66.38**	**5.31**

Table A-4. Existing External Combustion

Heat content of Natural gas	**1,020**	**Btu/scf**
Heat content of No. 2 Oil/Diesel	**137,000**	**Btu/gal**

EXISTING EXTERNAL COMBUSTION SOURCES[a]

Emission Unit	Rating (MMBtu/hr)	NG Limit (MMscf/yr)	No. 2 Oil Limit	Actual NG Use in CY 2006 (MMscf)	Actual No. 2 Oil Use in 2006 (gal)	Max NG Rate (MMscf/hr)	Max No. 2 Oil Rate (Mgal/hr)	Max No. 2 Oil Sulfur Content (%)
External Combustion Sources								
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	47	240	1,100,000	167	9,294	0.046	0.34	**0.25**
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	47	140	550,000	0	0	0.046	0.34	**0.25**
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	31.25	120	500,000	16.95	0	0.031	0.23	**0.25**
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	84	150	0	18.04	0	0.082	0.00	N/A
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	52	150	200,000	65.85	0	0.051	0.38	**0.50**
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	13.213	20	0	6.91	0	0.013	0.00	N/A
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	5.25	36	0	0.00	0	0.005	0.00	N/A
Bldg 8300 Boiler (12.553 MMBtu/hr)	12.553	15	0	0.32	0	0.013	0.00	N/A
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	22	90	15,000	1.95	0	0.012	0.09	**0.50**
Categorically Exempt Boilers Standard Burner Configuration	250	2,144	0	401	0	0.245	0.00	N/A
Area A	42	364	0	68	0	0.042	0.00	N/A
Area B	4.8	40.9	0	7.7	0	0.005	0.00	N/A
Area C	113	974	0	182	0	0.111	0.00	N/A
Area D	14	121	0	23	0	0.014	0.00	N/A
Area F	31	264	0	49	0	0.030	0.00	N/A
Area H	32	274	0	51	0	0.031	0.00	N/A
Area I	12	107	0	20	0	0.012	0.00	N/A
Categorically Exempt Low NOx Boilers - 20 ppm	31	263	0	49	0	0.030	0.00	N/A
Area B	17	142	0	27	0	0.016	0.00	N/A
Area C	0.9	7.7	0	1.4	0	0.001	0.00	N/A
Area D	9.0	77	0	14	0	0.009	0.00	N/A
Area I	4.1	36	0	6.7	0	0.004	0.00	N/A
Categorically Exempt Low NOx Boilers - 30 ppm	4.14	35.6	0	6.7	0	0.004	0.00	N/A
Categorically Exempt Miscellaneous External Combustion Units	102	877	0	164	0	0.100	0.00	N/A
Area A	27	230	0	43	0	0.026	0.00	N/A
Area B	7.4	63	0	12	0	0.007	0.00	N/A
Area C	17	150	0	28	0	0.017	0.00	N/A
Area D	3.4	29	0	5.4	0	0.003	0.00	N/A
Area F	31	262	0	49	0	0.030	0.00	N/A
Area H	12	102	0	19	0	0.012	0.00	N/A
Area I	4.6	40	0	7.4	0	0.005	0.00	N/A

[a] Emission factors in BOLD are based on the source permit.
All others are from AP-42.

[b] Emission source information is from the *Fort Carson Emission Inventory* for calendar year 2006 (Fort Carson 2007), site visit notes (Fort Carson 2008), and personnal communication with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).

Percent Utilization of Existing External Combustion Sources	**18.7**	**Percent (%)**

Table A-4. Existing External Combustion

Table A-4, Continued

EXISTING EXTERNAL COMBUSTION SOURCES[a]

Emission Unit	NG Emission Factor (lb/MMscf)[b]					
	PM	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
External Combustion Sources						
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	**7.60**	**7.60**	**100**	**84**	**0.60**	5.50
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	**7.60**	**7.60**	**35.00**	**84.00**	**0.60**	**5.50**
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	**7.60**	**7.60**	**37**	**84**	**0.60**	5.500
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	7.60	7.60	**100**	**84**	0.60	5.5
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	7.60	7.60	**35.3**	**84**	**0.60**	5.5
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	7.60	7.60	**100**	**84**	0.60	5.5
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	**7.60**	**7.60**	**100**	**84**	**0.60**	**5.50**
Bldg 8300 Boiler (12.553 MMBtu/hr)	7.60	7.60	**100**	**84**	0.60	5.5
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	7.60	7.60	**100**	**84**	0.60	5.5
Categorically Exempt Boilers Standard Burner Configuration						
Area A	7.60	7.60	100	84	0.60	5.5
Area B	7.60	7.60	100	84	0.60	5.5
Area C	7.60	7.60	100	84	0.60	5.5
Area D	7.60	7.60	100	84	0.60	5.5
Area F	7.60	7.60	100	84	0.60	5.5
Area H	7.60	7.60	100	84	0.60	5.5
Area I	7.60	7.60	100	84	0.60	5.5
Categorically Exempt Low NOx Boilers - 20 ppm						
Area B	7.60	7.60	24	84	0.60	5.5
Area C	7.60	7.60	24	84	0.60	5.5
Area D	7.60	7.60	24	84	0.60	5.5
Area I	7.60	7.60	24	84	0.60	5.5
Categorically Exempt Low NOx Boilers - 30 ppm	7.60	7.60	35	84	0.60	5.5
Categorically Exempt Miscellaneous External Combustion Units						
Area A	7.60	7.60	100	84	0.60	5.5
Area B	7.60	7.60	100	84	0.60	5.5
Area C	7.60	7.60	100	84	0.60	5.5
Area D	7.60	7.60	100	84	0.60	5.5
Area F	7.60	7.60	100	84	0.60	5.5
Area H	7.60	7.60	100	84	0.60	5.5
Area I	7.60	7.60	100	84	0.60	5.5

[a] Emission factors in BOLD are based on the source permit.
All others are from AP-42.

[b] Emission source information is from the *Fort Carson Emission Inventory* for calendar year 2006 (Fort Carson 2007), site visit notes (Fort Carson 2008), and personnal communication with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).

Table A-4, Continued

EXISTING EXTERNAL COMBUSTION SOURCES[a]

Emission Unit	No.2 Oil Emission Factor (lb/Mgal)[b]						Pseudo Source Location	PTE Basis
	PM	PM_{10}	NO_X	CO	SO_X	VOC		
External Combustion Sources								
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	**2.00**	**2.00**	**20.00**	**5.00**	**36**	0.35	D	95OPEP110
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	**2.00**	**1.08**	**20.00**	**5.00**	**36**	**0.34**	D	07EP0205
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	**2.00**	**2.00**	**20.00**	**5.00**	**36**	0.35	D	95OPEP110
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	---	---	---	---	---	---	F	95OPEP110
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	2.00	1.08	**14.6**	**5**	**71**	0.35	F	95OPEP110
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	---	---	---	---	---	---	B	95OPEP110
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	---	---	---	---	---	---	B	95OPEP110
Bldg 8300 Boiler (12.553 MMBtu/hr)	---	---	---	---	---	---	B	95OPEP110
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	2.00	2.00	**20.00**	**5.00**	71	0.35	I	95OPEP110
Categorically Exempt Boilers Standard Burner Configuration								
Area A	---	---	---	---	---	---	A	8760 hrs
Area B	---	---	---	---	---	---	B	8760 hrs
Area C	---	---	---	---	---	---	C	8760 hrs
Area D	---	---	---	---	---	---	D	8760 hrs
Area F	---	---	---	---	---	---	F	8760 hrs
Area H	---	---	---	---	---	---	H	8760 hrs
Area I	---	---	---	---	---	---	I	8760 hrs
Categorically Exempt Low NOx Boilers - 20 ppm								
Area B	---	---	---	---	---	---	B	8760 hrs
Area C	---	---	---	---	---	---	C	8760 hrs
Area D	---	---	---	---	---	---	D	8760 hrs
Area I	---	---	---	---	---	---	I	8760 hrs
Categorically Exempt Low NOx Boilers - 30 ppm	---	---	---	---	---	---	H	8760 hrs
Categorically Exempt Miscellaneous External Combustion Units								
Area A	---	---	---	---	---	---	A	8760 hrs
Area B	---	---	---	---	---	---	B	8760 hrs
Area C	---	---	---	---	---	---	C	8760 hrs
Area D	---	---	---	---	---	---	D	8760 hrs
Area F	---	---	---	---	---	---	F	8760 hrs
Area H	---	---	---	---	---	---	H	8760 hrs
Area I	---	---	---	---	---	---	I	8760 hrs

[a] Emission factors in BOLD are based on the source permit. All others are from AP-42.

[b] Emission source information is from the *Fort Carson Emission Inventory* for calendar year 2006 (Fort Carson 2007), site visit notes (Fort Carson 2008), and personnal communication with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).

Table A-5. Existing External Combustion Emissions

EXISTING EXTERNAL COMBUSTION SOURCES
ACTUAL ANNUAL EMISSIONS

Emission Unit	NG Emissions (tpy) PM	NG PM_{10}	NG NO_X	NG CO	NG SO_X	NG VOC	No.2 Oil Emissions (tpy) PM	No.2 Oil PM_{10}	No.2 Oil NO_X	No.2 Oil CO	No.2 Oil SO_X	No.2 Oil VOC
External Combustion Sources												
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	0.63	0.63	8.34	7.01	0.05	0.46	0.01	0.01	0.09	0.02	0.16	0.00
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	0.00	0.00	0.00	0.00	0.00	0.00	---	---	---	---	---	---
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.06	0.06	0.31	0.71	0.01	0.047	---	---	---	---	---	---
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.07	0.07	0.90	0.76	0.01	0.0	---	---	---	---	---	---
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.25	0.25	1.16	2.77	0.02	0.2	---	---	---	---	---	---
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.03	0.03	0.35	0.29	0.00	0.0	---	---	---	---	---	---
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.00	0.00	0.00	0.00	0.00	0.0	---	---	---	---	---	---
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.00	0.00	0.02	0.01	0.00	0.0	---	---	---	---	---	---
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.01	0.01	0.10	0.08	0.00	0.0	---	---	---	---	---	---
Categorically Exempt Boilers Standard Burner Configuration												
Area A	0.26	0.26	3.41	2.86	0.02	0.2	---	---	---	---	---	---
Area B	0.03	0.03	0.38	0.32	0.00	0.0	---	---	---	---	---	---
Area C	0.69	0.69	9.11	7.66	0.05	0.5	---	---	---	---	---	---
Area D	0.09	0.09	1.13	0.95	0.01	0.1	---	---	---	---	---	---
Area F	0.19	0.19	2.47	2.08	0.01	0.1	---	---	---	---	---	---
Area H	0.19	0.19	2.56	2.15	0.02	0.1	---	---	---	---	---	---
Area I	0.08	0.08	1.00	0.84	0.01	0.1	---	---	---	---	---	---
Categorically Exempt Low NOx Boilers - 20 ppm												
Area B	0.10	0.10	0.32	1.12	0.01	0.1	---	---	---	---	---	---
Area C	0.01	0.01	0.02	0.06	0.00	0.0	---	---	---	---	---	---
Area D	0.06	0.06	0.17	0.61	0.00	0.0	---	---	---	---	---	---
Area I	0.03	0.03	0.08	0.28	0.00	0.0	---	---	---	---	---	---
Categorically Exempt Low NOx Boilers - 30 ppm	0.03	0.03	0.12	0.28	0.00	0.0	---	---	---	---	---	---
Categorically Exempt Miscellaneous External Combustion Units												
Area A	0.16	0.16	2.16	1.81	0.01	0.1	---	---	---	---	---	---
Area B	0.05	0.05	0.59	0.50	0.00	0.0	---	---	---	---	---	---
Area C	0.11	0.11	1.40	1.18	0.01	0.1	---	---	---	---	---	---
Area D	0.02	0.02	0.27	0.23	0.00	0.0	---	---	---	---	---	---
Area F	0.19	0.19	2.45	2.06	0.01	0.1	---	---	---	---	---	---
Area H	0.07	0.07	0.96	0.81	0.01	0.1	---	---	---	---	---	---
Area I	0.03	0.03	0.37	0.31	0.00	0.0	---	---	---	---	---	---
Source Category Total	**3.41**	**3.41**	**40.17**	**37.73**	**0.27**	**2.47**	**0.01**	**0.01**	**0.09**	**0.02**	**0.16**	**0.00**

Table A-5. Existing External Combustion Emissions

EXISTING EXTERNAL COMBUSTION SOURCES **Table A-5, Continued**
ACTUAL ANNUAL EMISSIONS

Emission Unit	PM	PM_{10}	NO_X	CO	SO_X	VOC	Pseudo Source Location
	Total Emissions (tpy)						
External Combustion Sources							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	0.64	0.64	8.44	7.03	0.22	0.46	D
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	0.00	0.00	0.00	0.00	0.00	0.00	D
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.06	0.06	0.31	0.71	0.01	0.05	D
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.07	0.07	0.90	0.76	0.01	0.05	F
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.25	0.25	1.16	2.77	0.02	0.18	F
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.03	0.03	0.35	0.29	0.00	0.02	B
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.00	0.00	0.00	0.00	0.00	0.00	B
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.00	0.00	0.02	0.01	0.00	0.00	B
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.01	0.01	0.10	0.08	0.00	0.01	I
Categorically Exempt Boilers Standard Burner Configuration							
Area A	0.26	0.26	3.41	2.86	0.02	0.19	A
Area B	0.03	0.03	0.38	0.32	0.00	0.02	B
Area C	0.69	0.69	9.11	7.66	0.05	0.50	C
Area D	0.09	0.09	1.13	0.95	0.01	0.06	D
Area F	0.19	0.19	2.47	2.08	0.01	0.14	F
Area H	0.19	0.19	2.56	2.15	0.02	0.14	H
Area I	0.08	0.08	1.00	0.84	0.01	0.06	I
Categorically Exempt Low NOx Boilers - 20 ppm							
Area B	0.10	0.10	0.32	1.12	0.01	0.07	B
Area C	0.01	0.01	0.02	0.06	0.00	0.00	C
Area D	0.06	0.06	0.17	0.61	0.00	0.04	D
Area I	0.03	0.03	0.08	0.28	0.00	0.02	I
Categorically Exempt Low NOx Boilers - 30 ppm	0.03	0.03	0.12	0.28	0.00	0.02	H
Categorically Exempt Miscellaneous External Combustion Units							
Area A	0.16	0.16	2.16	1.81	0.01	0.12	A
Area B	0.05	0.05	0.59	0.50	0.00	0.03	B
Area C	0.11	0.11	1.40	1.18	0.01	0.08	C
Area D	0.02	0.02	0.27	0.23	0.00	0.01	D
Area F	0.19	0.19	2.45	2.06	0.01	0.13	F
Area H	0.07	0.07	0.96	0.81	0.01	0.05	H
Area I	0.03	0.03	0.37	0.31	0.00	0.02	I
Source Category Total	**3.42**	**3.42**	**40.26**	**37.76**	**0.43**	**2.47**	

Table A-5, Continued

EXISTING EXTERNAL COMBUSTION SOURCES
POTENTIAL ANNUAL EMISSIONS

	NG Emissions (tpy)						No.2 Oil Emissions (tpy)					
Emission Unit	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
External Combustion Sources												
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	0.91	0.91	12.00	10.08	0.07	0.66	1.10	1.10	11.00	2.75	19.53	0.19
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	0.53	0.53	2.45	5.88	0.04	0.39	0.55	0.30	5.50	1.38	9.76	0.09
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.46	0.46	2.22	5.04	0.04	0.330	0.50	0.50	5.00	1.25	8.88	0.09
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.57	0.57	7.50	6.30	0.05	0.4	---	---	---	---	0.00	---
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.57	0.57	2.65	6.30	0.05	0.4	0.20	0.11	1.5	0.50	7.10	0.04
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.08	0.08	1.00	0.84	0.01	0.1	---	---	---	---	0.00	---
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.14	0.14	1.80	1.51	0.01	0.1	---	---	---	---	0.00	---
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.06	0.06	0.75	0.63	0.00	0.0	---	---	---	---	0.00	---
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.34	0.34	4.50	3.78	0.03	0.2	0.02	0.02	0.15	0.04	0.53	0.00
Categorically Exempt Boilers Standard Burner Configuration												
Area A	1.38	1.38	18.21	15.30	0.11	1.0	---	---	---	---	---	---
Area B	0.16	0.16	2.05	1.72	0.01	0.1	---	---	---	---	---	---
Area C	3.70	3.70	48.68	40.89	0.29	2.7	---	---	---	---	---	---
Area D	0.46	0.46	6.05	5.08	0.04	0.3	---	---	---	---	---	---
Area F	1.00	1.00	13.21	11.09	0.08	0.7	---	---	---	---	---	---
Area H	1.04	1.04	13.68	11.49	0.08	0.8	---	---	---	---	---	---
Area I	0.41	0.41	5.34	4.49	0.03	0.3	---	---	---	---	---	---
Categorically Exempt Low NOx Boilers - 20 ppm												
Area B	0.54	0.54	1.71	5.97	0.04	0.4	---	---	---	---	---	---
Area C	0.03	0.03	0.09	0.32	0.00	0.0	---	---	---	---	---	---
Area D	0.29	0.29	0.93	3.25	0.02	0.2	---	---	---	---	---	---
Area I	0.14	0.14	0.43	1.49	0.01	0.1	---	---	---	---	---	---
Categorically Exempt Low NOx Boilers - 30 ppm	0.14	0.14	0.62	1.49	0.01	0.1	---	---	---	---	---	---
Categorically Exempt Miscellaneous External Combustion Units												
Area A	0.88	0.88	11.52	9.67	0.07	0.6	---	---	---	---	---	---
Area B	0.24	0.24	3.16	2.66	0.02	0.2	---	---	---	---	---	---
Area C	0.57	0.57	7.49	6.29	0.04	0.4	---	---	---	---	---	---
Area D	0.11	0.11	1.45	1.22	0.01	0.1	---	---	---	---	---	---
Area F	1.00	1.00	13.10	11.00	0.08	0.7	---	---	---	---	---	---
Area H	0.39	0.39	5.12	4.30	0.03	0.3	---	---	---	---	---	---
Area I	0.15	0.15	1.99	1.67	0.01	0.1	---	---	---	---	---	---
Source Category Total	**16.26**	**16.26**	**189.67**	**179.76**	**1.28**	**11.77**	**2.37**	**2.02**	**23.11**	**5.91**	**45.80**	**0.41**

Table A-5. Existing External Combustion Emissions

Table A-5, Continued

EXISTING EXTERNAL COMBUSTION SOURCES
POTENTIAL ANNUAL EMISSIONS

Emission Unit	PM	PM_{10}	NO_X	CO	SO_X	VOC	Pseudo Source Location
	Total Emissions (tpy)						
External Combustion Sources							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	2.01	2.01	23.00	12.83	19.60	0.85	D
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	1.08	0.83	7.95	7.26	9.80	0.48	D
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.96	0.96	7.22	6.29	8.91	0.42	D
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.57	0.57	7.50	6.30	0.05	0.41	F
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.77	0.68	4.11	6.80	7.15	0.45	F
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.08	0.08	1.00	0.84	0.01	0.06	B
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.14	0.14	1.80	1.51	0.01	0.10	B
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.06	0.06	0.75	0.63	0.00	0.04	B
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.36	0.36	4.65	3.82	0.56	0.25	I
Categorically Exempt Boilers Standard Burner Configuration							
Area A	1.38	1.38	18.21	15.30	0.11	1.00	A
Area B	0.16	0.16	2.05	1.72	0.01	0.11	B
Area C	3.70	3.70	48.68	40.89	0.29	2.68	C
Area D	0.46	0.46	6.05	5.08	0.04	0.33	D
Area F	1.00	1.00	13.21	11.09	0.08	0.73	F
Area H	1.04	1.04	13.68	11.49	0.08	0.75	H
Area I	0.41	0.41	5.34	4.49	0.03	0.29	I
Categorically Exempt Low NOx Boilers - 20 ppm							
Area B	0.54	0.54	1.71	5.97	0.04	0.39	B
Area C	0.03	0.03	0.09	0.32	0.00	0.02	C
Area D	0.29	0.29	0.93	3.25	0.02	0.21	D
Area I	0.14	0.14	0.43	1.49	0.01	0.10	I
Categorically Exempt Low NOx Boilers - 30 ppm	0.14	0.14	0.62	1.49	0.01	0.10	H
Categorically Exempt Miscellaneous External Combustion Units	3.33	3.33	43.83	36.81	0.26	2.41	
Area A	0.88	0.88	11.52	9.67	0.07	0.63	A
Area B	0.24	0.24	3.16	2.66	0.02	0.17	B
Area C	0.57	0.57	7.49	6.29	0.04	0.41	C
Area D	0.11	0.11	1.45	1.22	0.01	0.08	D
Area F	1.00	1.00	13.10	11.00	0.08	0.72	F
Area H	0.39	0.39	5.12	4.30	0.03	0.28	H
Area I	0.15	0.15	1.99	1.67	0.01	0.11	I
Source Category Total	**21.96**	**21.61**	**256.61**	**222.48**	**47.34**	**14.59**	

Table A-5. Existing External Combustion Emissions

Table A-5, Continued

EXISTING EXTERNAL COMBUSTION SOURCES
MAXIMUM HOURLY EMISSIONS

	NG Emissions (lb/hr)						No.2 Oil Emissions (lb/hr)					
Emission Unit	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
External Combustion Sources												
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	0.35	0.35	4.61	3.87	0.03	0.25	0.69	0.69	6.86	1.72	12.18	0.12
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	0.35	0.35	1.61	3.87	0.03	0.25	0.69	0.37	6.86	1.72	12.18	0.12
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.23	0.23	1.13	2.57	0.02	0.169	0.46	0.46	4.56	1.14	8.10	0.08
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.63	0.63	8.24	6.92	0.05	0.5	---	---	---	---	0.00	---
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.39	0.39	1.80	4.28	0.03	0.3	0.76	0.41	5.54	1.90	26.95	0.13
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.10	0.10	1.30	1.09	0.01	0.1	---	---	---	---	0.00	---
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.04	0.04	0.51	0.43	0.00	0.0	---	---	---	---	0.00	---
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.10	0.10	1.30	1.09	0.01	0.1	---	---	---	---	0.00	---
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.09	0.09	1.23	1.03	0.01	0.1	0.18	0.18	1.83	0.46	6.51	0.03
Categorically Exempt Boilers Standard Burner Configuration												
Area A	0.32	0.32	4.16	3.49	0.02	0.2	---	---	---	---	---	---
Area B	0.04	0.04	0.47	0.39	0.00	0.0	---	---	---	---	---	---
Area C	0.84	0.84	11.11	9.34	0.07	0.6	---	---	---	---	---	---
Area D	0.10	0.10	1.38	1.16	0.01	0.1	---	---	---	---	---	---
Area F	0.23	0.23	3.02	2.53	0.02	0.2	---	---	---	---	---	---
Area H	0.24	0.24	3.12	2.62	0.02	0.2	---	---	---	---	---	---
Area I	0.09	0.09	1.22	1.02	0.01	0.1	---	---	---	---	---	---
Categorically Exempt Low NOx Boilers - 20 ppm												
Area B	0.12	0.12	0.39	1.36	0.01	0.1	---	---	---	---	---	---
Area C	0.01	0.01	0.02	0.07	0.00	0.0	---	---	---	---	---	---
Area D	0.07	0.07	0.21	0.74	0.01	0.0	---	---	---	---	---	---
Area I	0.03	0.03	0.10	0.34	0.00	0.0	---	---	---	---	---	---
Categorically Exempt Low NOx Boilers - 30 ppm	0.03	0.03	0.14	0.34	0.00	0.0	---	---	---	---	---	---
Categorically Exempt Miscellaneous External Combustion Units												
Area A	0.20	0.20	2.63	2.21	0.02	0.1	---	---	---	---	---	---
Area B	0.05	0.05	0.72	0.61	0.00	0.0	---	---	---	---	---	---
Area C	0.13	0.13	1.71	1.44	0.01	0.1	---	---	---	---	---	---
Area D	0.03	0.03	0.33	0.28	0.00	0.0	---	---	---	---	---	---
Area F	0.23	0.23	2.99	2.51	0.02	0.2	---	---	---	---	---	---
Area H	0.09	0.09	1.17	0.98	0.01	0.1	---	---	---	---	---	---
Area I	0.03	0.03	0.45	0.38	0.00	0.0	---	---	---	---	---	---
Source Category Total	**5.16**	**5.16**	**57.07**	**56.98**	**0.41**	**3.73**	**2.77**	**2.11**	**25.66**	**6.93**	**65.91**	**0.48**

Table A-5. Existing External Combustion Emissions

Table A-5, Continued

EXISTING EXTERNAL COMBUSTION SOURCES
MAXIMUM HOURLY EMISSIONS

Emission Unit	PM	PM_{10}	NO_X	CO	SO_X	VOC	Pseudo Source Location
	Maximum Emissions (lb/hr)						
External Combustion Sources							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	0.69	0.69	6.86	3.87	12.18	0.25	D
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	0.69	0.37	6.86	3.87	12.18	0.25	D
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.46	0.46	4.56	2.57	8.10	0.17	D
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.63	0.63	8.24	6.92	0.05	0.45	F
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.76	0.41	5.54	4.28	26.95	0.28	F
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.10	0.10	1.30	1.09	0.01	0.07	B
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.04	0.04	0.51	0.43	0.00	0.03	B
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.10	0.10	1.30	1.09	0.01	0.07	B
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.18	0.18	1.83	1.03	6.51	0.07	I
Categorically Exempt Boilers Standard Burner Configuration							
Area A	0.32	0.32	4.16	3.49	0.02	0.23	A
Area B	0.04	0.04	0.47	0.39	0.00	0.03	B
Area C	0.84	0.84	11.11	9.34	0.07	0.61	C
Area D	0.10	0.10	1.38	1.16	0.01	0.08	D
Area F	0.23	0.23	3.02	2.53	0.02	0.17	F
Area H	0.24	0.24	3.12	2.62	0.02	0.17	H
Area I	0.09	0.09	1.22	1.02	0.01	0.07	I
Categorically Exempt Low NOx Boilers - 20 ppm							
Area B	0.12	0.12	0.39	1.36	0.01	0.09	B
Area C	0.01	0.01	0.02	0.07	0.00	0.00	C
Area D	0.07	0.07	0.21	0.74	0.01	0.05	D
Area I	0.03	0.03	0.10	0.34	0.00	0.02	I
Categorically Exempt Low NOx Boilers - 30 ppm	0.03	0.03	0.14	0.34	0.00	0.02	H
Categorically Exempt Miscellaneous External Combustion Units							
Area A	0.20	0.20	2.63	2.21	0.02	0.14	A
Area B	0.05	0.05	0.72	0.61	0.00	0.04	B
Area C	0.13	0.13	1.71	1.44	0.01	0.09	C
Area D	0.03	0.03	0.33	0.28	0.00	0.02	D
Area F	0.23	0.23	2.99	2.51	0.02	0.16	F
Area H	0.09	0.09	1.17	0.98	0.01	0.06	H
Area I	0.03	0.03	0.45	0.38	0.00	0.02	I
Source Category Total	**6.51**	**5.85**	**72.34**	**56.98**	**66.21**	**3.73**	

Table A-5, Continued

EXISTING EXTERNAL COMBUSTION SOURCES
ACTUAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.42	0.42	5.57	4.68	0.03	0.31
B	0.20	0.20	1.66	2.24	0.02	0.15
C	0.80	0.80	10.54	8.90	0.06	0.58
D	0.87	0.87	10.33	9.53	0.23	0.62
E	0.00	0.00	0.00	0.00	0.00	0.00
F	0.69	0.69	6.99	7.66	0.05	0.50
G	0.00	0.00	0.00	0.00	0.00	0.00
H	0.29	0.29	3.64	3.24	0.02	0.21
I	0.14	0.14	1.55	1.51	0.01	0.10
Source Category Total	**3.42**	**3.42**	**40.26**	**37.76**	**0.43**	**2.47**

EXISTING EXTERNAL COMBUSTION SOURCES
POTENTIAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	2.26	2.26	29.73	24.97	0.18	1.64
B	1.21	1.21	10.46	13.33	0.10	0.87
C	4.30	4.30	56.26	47.51	0.34	3.11
D	4.91	4.66	46.59	35.92	38.38	2.37
E	0.00	0.00	0.00	0.00	0.00	0.00
F	3.34	3.25	37.91	35.20	7.35	2.31
G	0.00	0.00	0.00	0.00	0.00	0.00
H	1.56	1.56	19.42	17.28	0.12	1.13
I	1.05	1.05	12.41	11.47	0.61	0.75
Source Category Total	**18.63**	**18.28**	**212.78**	**185.67**	**47.08**	**12.18**

EXISTING EXTERNAL COMBUSTION SOURCES
MAXIMUM HOURLY EMISSIONS

	Total Emissions (lb/hr)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.52	0.52	6.79	5.70	0.04	0.37
B	0.45	0.45	4.68	4.97	0.04	0.33
C	0.98	0.98	12.84	10.85	0.08	0.71
D	2.03	1.71	20.21	12.49	32.47	0.82
E	0.00	0.00	0.00	0.00	0.00	0.00
F	1.84	1.49	19.78	16.24	27.03	1.06
G	0.00	0.00	0.00	0.00	0.00	0.00
H	0.36	0.36	4.43	3.95	0.03	0.26
I	0.34	0.34	3.60	2.78	6.52	0.18
Source Category Total	**6.51**	**5.85**	**72.34**	**56.98**	**66.21**	**3.73**

Table A-6. Exempt Boiler List

STANDARD BURNER CONFIGURATION

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
238	2.500	**A**
301	2.250	**A**
330	3.270	**A**
330	3.270	**A**
330	3.270	**A**
330	3.270	**A**
501	1.308	**A**
633	1.310	**A**
634	1.733	**A**
635	1.308	**A**
636	2.836	**A**
749	2.340	**A**
750	0.600	**A**
754	0.420	**A**
754	0.420	**A**
756	3.150	**A**
758	3.150	**A**
813	1.337	**A**
813	1.337	**A**
814	0.264	**A**
1007	0.450	**C**
1008	0.450	**C**
1011	1.337	**C**
1011	1.337	**C**
1012	1.337	**C**
1012	1.337	**C**
1012	0.512	**C**
1013	1.337	**C**
1013	1.337	**C**
1030	0.840	**C**
1070	1.125	**C**
1070	1.125	**C**
1070	1.123	**C**
1070	1.337	**C**
1117	1.630	**C**
1117	1.630	**C**
1118	1.630	**C**
1118	1.630	**C**
1129	0.399	**C**
1130	0.399	**C**
1130	0.399	**C**
1200	0.550	**C**
1201	0.594	**C**
1202	0.630	**C**
1203	0.594	**C**
1217	4.500	**C**
1217	2.871	**C**
1218	1.630	**C**
1218	1.630	**C**

Table A-6, Continued

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
1219	1.630	**C**
1219	1.630	**C**
1220	1.630	**C**
1220	1.630	**C**
1225	1.440	**C**
1227	0.850	**C**
1230	2.163	**C**
1231	3.050	**C**
1354	0.350	**C**
1382	2.100	**C**
1382	2.100	**C**
1392	4.186	**C**
1430	1.800	**C**
1430	1.771	**C**
1444	2.500	**C**
1444	2.500	**C**
1446	3.475	**C**
1446	1.308	**C**
1450	0.136	**C**
1454	0.300	**C**
1456	0.300	**C**
1456	0.300	**C**
1500	2.630	**C**
1511	1.750	**C**
1517	0.825	**C**
1517	0.825	**C**
1524	0.330	**C**
1526	2.250	**C**
1528	0.627	**C**
1528	0.627	**C**
1532	2.630	**C**
1550	2.869	**C**
1552	0.750	**C**
1552	0.750	**C**
1552	0.750	**C**
1552	0.750	**C**
1552	0.750	**C**
1552	0.750	**C**
1552	1.500	**C**
1552	1.500	**C**
1554	0.750	**C**
1554	0.750	**C**
1554	0.750	**C**

Table A-6. Exempt Boiler List

Table A-6, Continued

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
1554	0.750	**C**
1554	0.750	**C**
1554	1.500	**C**
1554	1.500	**C**
1650	1.200	**C**
1682	2.100	**C**
1682	2.100	**C**
1682	0.399	**C**
1682	0.399	**C**
1692	2.100	**C**
1692	2.100	**C**
1698	0.495	**C**
1816	0.770	**D**
1829	4.185	**D**
1843	2.100	**D**
2135	1.000	**D**
2135	1.000	**D**
2140	0.825	**D**
2392	2.100	**D**
2392	2.100	**D**
2426	0.330	**H**
2427	0.702	**H**
2429	0.520	**H**
2429	0.520	**H**
2492	2.100	**H**
2492	2.100	**H**
2692	2.100	**H**
2692	2.100	**H**
2792	2.100	**H**
2792	2.100	**H**
2992	2.100	**H**
2992	2.100	**H**
3092	2.100	**H**
3092	2.100	**H**
3192	2.100	**H**
3192	2.100	**H**
3292	2.100	**H**
3292	2.100	**H**
3887	0.375	**H**
5110	0.495	**A**
5510	0.495	**A**
5510	0.495	**A**
5950	0.396	**A**

Table A-6, Continued

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
5950	0.396	**A**
5950	0.396	**A**
5950	0.396	**A**
6058	0.800	**F**
6060	1.125	**F**
6225	1.308	**F**
6271	0.594	**F**
6271	0.594	**F**
7301	2.230	**F**
7301	0.715	**F**
7302	2.500	**F**
7302	0.726	**F**
7303 [a]	1.500	**F**
7303	0.333	**F**
7304	0.726	**F**
7304	0.512	**F**
7304	0.512	**F**
7304	0.512	**F**
7400	0.990	**F**
7402	1.160	**F**
7404	1.160	**F**
7416	1.575	**F**
7418	1.575	**F**
7438	1.800	**F**
7450	1.223	**F**
7462	1.688	**F**
7480	1.150	**F**
7481	0.950	**F**
7482	1.150	**F**
7490	1.650	**F**
8200	3.208	**B**
8930	0.648	**B**
8932	0.910	**B**

Table A-6, Continued

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
9550	2.163	**I**
9613	0.350	**I**
9620	4.700	**I**
9628	0.850	**I**
9633	1.738	**I**
9638	0.469	**I**
9638	0.469	**I**
10000	0.550	**I**
20000	1.150	**I**
TOTAL	**249.657**	

LOW NO_X BOILERS, MANUFACTURER GUARANTEE OF 20 PPM NO_X OR LESS

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
1048	0.900	**C**
1882	1.800	**D**
1882	1.800	**D**
1982	2.340	**D**
2082	1.530	**D**
2082	1.530	**D**
8100	2.070	**B**
8100	2.070	**B**
8142	2.340	**B**
8142	2.340	**B**
8142	2.340	**B**
8152	1.800	**B**
8152	1.800	**B**
8152	1.800	**B**
9072	2.070	**I**
9072	2.070	**I**
TOTAL	**30.600**	

LOW NO_X BOILERS, MANUFACTURER GUARANTEE OF 30 PPM NO_X OR LESS

BLDG	RATING (MMBTU/HR)	Pseudo Source Location
3450	2.070	**H**
3450	2.070	**H**
TOTAL	**4.140**	

Table A-6, Continued

Standard Burner Heat Input Summary

Location	Total Heat Input	% of Total
A	42.412	16.99
B	4.766	1.91
C	113.355	45.40
D	14.080	5.64
F	30.758	12.32
H	31.847	12.76
I	12.439	4.98
Total	249.657	100.00

Low NOx 20 ppm Burner Heat Input Summary

Location	Total Heat Input	% of Total
A	0.000	0.00
B	16.560	54.12
C	0.900	2.94
D	9.000	29.41
F	0.000	0.00
H	0.000	0.00
I	4.140	13.53
Total	30.600	100.00

Low NOx 30 ppm Burner Heat Input Summary

Location	Total Heat Input	% of Total
A	0.000	0.00
B	0.000	0.00
C	0.000	0.00
D	0.000	0.00
F	0.000	0.00
H	4.140	100.00
I	0.000	0.00
Total	4.140	100.00

Table A-7. Miscellaneous External Combustion List

EXISTING EXTERNALLY FIRED EQUIPMENT

FURNACES

BLDG	EQUIPMENT DESCRIPTION	QUANTITY	RATING (MMBTU/HR)[a]	PRIMARY FUEL	TOTAL HEAT INPUT (MMBTU/HR)[a]	Pseudo Source Location
223	Furnace	1	1.063	Natural Gas	1.0625	A
227	Furnace	1	0.606	Natural Gas	0.606	A
302	Furnace	1	0.330	Natural Gas	0.33	A
307	Furnace	1	0.600	Natural Gas	0.6	A
350	Furnace	1	0.133	Natural Gas	0.133	A
406	Furnace	3	0.230	Natural Gas	0.69	A
1217	Furnace	4	0.120	Natural Gas	0.48	C
1520	Furnace	2	0.203	Natural Gas	0.406	C
1520	Furnace	1	0.125	Natural Gas	0.125	C
1520	Furnace	2	0.120	Natural Gas	0.24	C
5510	Furnace	3	0.200	Natural Gas	0.6	H
6110	Furnace	10	0.525	Natural Gas	5.25	F
6110	Furnace	1	0.360	Natural Gas	0.36	F
6110	Furnace	1	0.250	Natural Gas	0.25	F
6110	Furnace	1	0.224	Natural Gas	0.224	F
6110	Furnace	3	0.150	Natural Gas	0.45	F
6110	Furnace	1	0.115	Natural Gas	0.115	F
7300	Furnace	3	0.400	Natural Gas	1.2	F
7300	Furnace	4	0.330	Natural Gas	1.32	F
7300	Furnace	1	0.250	Natural Gas	0.25	F
7300	Furnace	1	0.100	Natural Gas	0.1	F
8932	Furnace	1	0.225	Natural Gas	0.225	B
8932	Furnace	1	0.175	Natural Gas	0.175	B
109	Furnace	7	**0.316**	Propane	**2.215**	A
207	Furnace	4	**0.316**	Natural Gas	**1.266**	A
210	Furnace	1	**0.316**	Natural Gas	**0.316**	A
214	Furnace	1	**0.316**	Natural Gas	**0.316**	A
218	Furnace	1	**0.316**	Natural Gas	**0.316**	A
302	Furnace	2	**0.316**	Natural Gas	**0.633**	A
304	Furnace	6	**0.316**	Natural Gas	**1.899**	A
305	Furnace	1	**0.316**	Natural Gas	**0.316**	A
318	Furnace	1	**0.316**	Natural Gas	**0.316**	A
324	Furnace	1	**0.316**	Natural Gas	**0.316**	A
407	Furnace	1	**0.316**	Natural Gas	**0.316**	A
1395	Furnace	1	**0.316**	Propane	**0.316**	C
1512	Furnace	2	**0.316**	Natural Gas	**0.633**	C
1513	Furnace	3	**0.316**	Natural Gas	**0.949**	C
1518	Furnace	1	**0.316**	Natural Gas	**0.316**	C
1533	Furnace	3	**0.316**	Natural Gas	**0.949**	C
1662	Furnace	2	**0.316**	Natural Gas	**0.633**	C
1919	Furnace	1	**0.316**	Natural Gas	**0.316**	D
2031	Furnace	1	**0.316**	Natural Gas	**0.316**	D
2059	Furnace	1	**0.316**	Natural Gas	**0.316**	D
2410	Furnace	1	**0.316**	Natural Gas	**0.316**	H
2420	Furnace	1	**0.316**	Natural Gas	**0.316**	H
3708	Furnace	1	**0.316**	Natural Gas	**0.316**	H
3709	Furnace	1	**0.316**	Natural Gas	**0.316**	H
3710	Furnace	1	**0.316**	Natural Gas	**0.316**	H
3711	Furnace	1	**0.316**	Natural Gas	**0.316**	H
3900	Furnace	1	**0.316**	Natural Gas	**0.316**	H
6001	Furnace	2	**0.316**	Natural Gas	**0.633**	F
6215	Furnace	3	**0.316**	Natural Gas	**0.949**	F
8998	Furnace	1	**0.316**	Natural Gas	**0.316**	B
9732	Furnace	1	**0.316**	Propane	**0.316**	I
10012	Furnace	1	**0.316**	Natural Gas	**0.316**	I

[a] Heat input values in **BOLD** are assumed based on the average heat input value of similar sources.

Number of furnaces with known heat input:	48
Total heat input (known):	15.19 MMBtu/hr
Average heat input:	0.32 MMBtu/hr
Total number of furnaces:	104 MMBtu/hr
TOTAL HEAT INPUT FROM ALL FURNACES (MMBtu/hr):	**33 MMBtu/hr**

Table A-7, Continued

HOT WATER HEATERS

BLDG	EQUIPMENT DESCRIPTION	QUANTITY	RATING (MMBTU/HR)	PRIMARY FUEL	TOTAL HEAT INPUT (MMBTU/HR)	Pseudo Source Location
109	Hot Water Heater	1	0.034	Natural Gas	0.034	A
109	Hot Water Heater	1	0.075	Natural Gas	0.075	A
109	Hot Water Heater	1	0.200	Natural Gas	0.200	A
155	Hot Water Heater	1	0.043	Natural Gas	0.043	A
223	Hot Water Heater	1	0.034	Natural Gas	0.034	A
227	Hot Water Heater	1	0.034	Natural Gas	0.034	A
238	Hot Water Heater	1	0.075	Natural Gas	0.075	A
301	Hot Water Heater	1	0.040	Natural Gas	0.040	A
304	Hot Water Heater	1	0.034	Natural Gas	0.034	A
330	Hot Water Heater	1	0.075	Natural Gas	0.075	A
350	Hot Water Heater	1	0.040	Natural Gas	0.040	A
407	Hot Water Heater	1	0.075	Natural Gas	0.075	A
750	Hot Water Heater	1	0.300	Natural Gas	0.300	A
754	Hot Water Heater	2	0.300	Natural Gas	0.600	A
756	Hot Water Heater	1	0.160	Natural Gas	0.160	A
756	Hot Water Heater	1	0.500	Natural Gas	0.500	A
758	Hot Water Heater	1	0.160	Natural Gas	0.160	A
758	Hot Water Heater	1	0.500	Natural Gas	0.500	A
814	Hot Water Heater	1	0.034	Natural Gas	0.034	A
815	Hot Water Heater	1	0.040	Natural Gas	0.040	A
1007	Hot Water Heater	1	0.156	Natural Gas	0.156	C
1008	Hot Water Heater	1	0.360	Natural Gas	0.360	C
1011	Hot Water Heater	1	0.500	Natural Gas	0.500	C
1129	Hot Water Heater	1	0.156	Natural Gas	0.156	C
1140	Hot Water Heater	1	0.075	Natural Gas	0.075	C
1150	Hot Water Heater	1	0.036	Natural Gas	0.036	C
1200	Hot Water Heater	1	0.075	Natural Gas	0.075	C
1201	Hot Water Heater	1	0.075	Natural Gas	0.075	C
1203	Hot Water Heater	1	0.075	Natural Gas	0.075	C
1217	Hot Water Heater	1	0.500	Natural Gas	0.500	C
1219	Hot Water Heater	1	0.500	Natural Gas	0.500	C
1220	Hot Water Heater	1	0.720	Natural Gas	0.720	C
1225	Hot Water Heater	1	0.155	Natural Gas	0.155	C
1227	Hot Water Heater	2	0.076	Natural Gas	0.151	C
1354	Hot Water Heater	1	0.040	Natural Gas	0.040	C
1362	Hot Water Heater	1	0.003	Natural Gas	0.003	C
1450	Hot Water Heater	1	0.136	Natural Gas	0.136	C
1510	Hot Water Heater	1	0.034	Natural Gas	0.034	C
1510	Hot Water Heater	1	0.060	Natural Gas	0.060	C
1510	Hot Water Heater	2	0.360	Natural Gas	0.720	C
1511	Hot Water Heater	1	0.360	Natural Gas	0.360	C
1520	Hot Water Heater	1	0.300	Natural Gas	0.300	C
1525	Hot Water Heater	1	0.200	Natural Gas	0.200	C
1526	Hot Water Heater	1	0.075	Natural Gas	0.075	C
1532	Hot Water Heater	2	0.156	Natural Gas	0.312	C
1533	Hot Water Heater	1	0.200	Natural Gas	0.200	C
1550	Hot Water Heater	1	0.190	Natural Gas	0.190	C
1659	Hot Water Heater	1	0.280	Natural Gas	0.280	C
1661	Hot Water Heater	1	0.700	Natural Gas	0.700	C
1662	Hot Water Heater	1	0.038	Natural Gas	0.038	C
1662	Hot Water Heater	1	0.040	Natural Gas	0.040	C
1670	Hot Water Heater	1	0.075	Natural Gas	0.075	C
1692	Hot Water Heater	1	0.150	Natural Gas	0.150	C
1829	Hot Water Heater	1	0.195	Natural Gas	0.195	D
1843	Hot Water Heater	1	0.400	Natural Gas	0.400	D
2059	Hot Water Heater	1	0.280	Natural Gas	0.280	D
2082	Pressure Washer	1	0.282	Unknown - Assumed Diesel	0.282	D
2135	Hot Water Heater	1	0.199	Natural Gas	0.199	D
2259	Hot Water Heater	1	0.280	Natural Gas	0.280	D
2427	Hot Water Heater	1	0.200	Natural Gas	0.200	H
3701	Hot Water Heater	1	0.033	Natural Gas	0.033	H
3887	Hot Water Heater	1	0.038	Natural Gas	0.038	H
3887	Hot Water Heater	1	0.040	Natural Gas	0.040	H

Table A-7, Continued

HOT WATER HEATERS (continued)

BLDG	EQUIPMENT DESCRIPTION	QUANTITY	RATING (MMBTU/HR)	PRIMARY FUEL	TOTAL HEAT INPUT (MMBTU/HR)	Pseudo Source Location
3897	Hot Water Heater	1	0.040	Natural Gas	0.040	H
3912	Hot Water Heater	1	0.199	Natural Gas	0.199	H
5510	Hot Water Heater	1	0.075	Natural Gas	0.075	H
5510	Hot Water Heater	1	0.200	Natural Gas	0.200	H
5950	Hot Water Heater	1	0.197	Natural Gas	0.197	H
6058	Hot Water Heater	1	0.032	Natural Gas	0.032	F
6058	Hot Water Heater	1	0.113	Natural Gas	0.113	F
6058	Hot Water Heater	1	0.156	Natural Gas	0.156	F
6060	Hot Water Heater	2	0.255	Natural Gas	0.510	F
6110	Hot Water Heater	1	0.240	Natural Gas	0.240	F
7300	Hot Water Heater	2	0.360	Natural Gas	0.720	F
7305	Hot Water Heater	2	0.250	Natural Gas	0.500	F
7400	Hot Water Heater	1	0.500	Natural Gas	0.500	F
7416	Hot Water Heater	2	1.800	Natural Gas	3.600	F
7418	Hot Water Heater	2	1.800	Natural Gas	3.600	F
7440	Hot Water Heater	1	1.800	Natural Gas	1.800	F
7450	Hot Water Heater	1	0.500	Natural Gas	0.500	F
7462	Hot Water Heater	2	1.800	Natural Gas	3.600	F
7480	Hot Water Heater	1	1.000	Natural Gas	1.000	F
7481	Hot Water Heater	1	1.000	Natural Gas	1.000	F
7490	Hot Water Heater	1	0.250	Natural Gas	0.250	F
8300	Hot Water Heater	1	0.120	Natural Gas	0.120	B
8932	Hot Water Heater	1	0.480	Natural Gas	0.480	B
8999	Hot Water Heater	1	0.075	Propane	0.075	B
9628	Hot Water Heater	1	0.040	Natural Gas	0.040	I
9633	Hot Water Heater	1	0.260	Natural Gas	0.260	I
9638	Hot Water Heater	1	0.038	Natural Gas	0.038	I
9732	Hot Water Heater	1	0.030	Propane	0.030	I
207	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
302	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
305	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
501	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
749	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
813	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
1012	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1013	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1117	Hot Water Heater	2	**0.320**	Natural Gas	0.640	C
1218	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1230	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1360	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1392	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1395	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1500	Hot Water Heater	2	**0.320**	Natural Gas	0.640	C
1528	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1660	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1698	Hot Water Heater	1	**0.320**	Natural Gas	0.320	C
1816	Hot Water Heater	1	**0.320**	Natural Gas	0.320	D
2140	Hot Water Heater	1	**0.320**	Natural Gas	0.320	D
2429	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
2492	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
2692	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
2757	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
2792	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
3192	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
3852	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
3900	Hot Water Heater	1	**0.320**	Natural Gas	0.320	H
5490	Hot Water Heater	1	**0.320**	Natural Gas	0.320	A
6001	Hot Water Heater	1	**0.320**	Natural Gas	0.320	F
6215	Hot Water Heater	1	**0.320**	Natural Gas	0.320	F
7426	Hot Water Heater	1	**0.320**	Natural Gas	0.320	F
7438	Hot Water Heater	1	**0.320**	Natural Gas	0.320	F
8000	Hot Water Heater	12	**0.320**	Natural Gas	3.840	B
8200	Hot Water Heater	1	**0.320**	Natural Gas	0.320	B
8930	Hot Water Heater	1	**0.320**	Natural Gas	0.320	B
8998	Hot Water Heater	1	**0.320**	Propane	0.320	B
10000	Hot Water Heater	2	**0.320**	Natural Gas	0.640	I
12001	Hot Water Heater	1	**0.320**	Propane	0.320	I

[a] Heat input values in **BOLD** are assumed based on the average heat input value of similar sources.

Number of hot water heaters with known heat input:	101	
Total heat input (known) mmbtu/hr:	32.32	MMBtu/hr
Average heat input:	0.32	MMBtu/hr
Total number of hot water heaters:	154	MMBtu/hr
TOTAL HEAT INPUT FROM ALL HOT WATER HEATERS:	**49**	**MMBtu/hr**

Table A-7, Continued

SPACE HEATERS

BLDG	EQUIPMENT DESCRIPTION	QUANTITY	RATING (MMBTU/HR)	PRIMARY FUEL	TOTAL HEAT INPUT (MMBTU/HR)	Pseudo Source Location
108	Space Heater	4	0.175	Natural Gas	0.700	A
108	Space Heater	2	0.045	Natural Gas	0.090	A
217	Space Heater	4	0.250	Natural Gas	1.000	A
310	Space Heater	9	0.150	Natural Gas	1.350	A
311	Space Heater	5	0.150	Natural Gas	0.750	A
400	Space Heater	3	0.230	Natural Gas	0.690	A
1007	Space Heater	1	0.030	Natural Gas	0.030	C
3880	Space Heater	1	0.045	Natural Gas	0.045	H
3897	Space Heater	2	0.125	Natural Gas	0.250	H
3901	Space Heater	3	0.050	Natural Gas	0.150	H
3904	Space Heater	2	0.325	Natural Gas	0.650	H
3910	Space Heater	1	0.750	Natural Gas	0.750	H
9249	Space Heater	1	0.160	Used oil	0.160	I
10015	Space Heater	1	0.050	Propane	0.050	I
12016	Space Heater	2	0.075	Propane	0.150	I
12017	Space Heater	2	0.075	Propane	0.150	I
12018	Space Heater	2	0.075	Propane	0.150	I
12019	Space Heater	2	0.060	Propane	0.120	I
12020	Space Heater	2	0.075	Propane	0.150	I
12022	Space Heater	2	0.060	Propane	0.120	I
154	Space Heater	1	**0.147**	Propane	0.147	A
155	Space Heater	3	**0.147**	Propane	0.441	A
209	Space Heater	1	**0.147**	Natural Gas	0.147	A
213	Space Heater	5	**0.147**	Natural Gas	0.736	A
220	Space Heater	1	**0.147**	Natural Gas	0.147	A
221	Space Heater	12	**0.147**	Natural Gas	1.766	A
318	Space Heater	1	**0.147**	Natural Gas	0.147	A
320	Space Heater	1	**0.147**	Natural Gas	0.147	A
324	Space Heater	2	**0.147**	Natural Gas	0.294	A
340	Space Heater	1	**0.147**	Natural Gas	0.147	A
341	Space Heater	1	**0.147**	Natural Gas	0.147	A
342	Space Heater	1	**0.147**	Natural Gas	0.147	A
343	Space Heater	1	**0.147**	Natural Gas	0.147	A
344	Space Heater	1	**0.147**	Natural Gas	0.147	A
350	Space Heater	1	**0.147**	Natural Gas	0.147	A
520	Space Heater	3	**0.147**	Natural Gas	0.441	A
1387	Space Heater	1	**0.147**	Natural Gas	0.147	C
1395	Space Heater	1	**0.147**	Natural Gas	0.147	C
1697	Space heater	1	**0.147**	Natural Gas	0.147	C
1843	Space Heater	1	**0.147**	Natural Gas	0.147	D
2427	Space Heater	12	**0.147**	Natural Gas	1.766	H
2428	Space Heater	1	**0.147**	Natural Gas	0.147	H
3705	Space Heater	1	**0.147**	Natural Gas	0.147	H
3887	Space Heater	2	**0.147**	Natural Gas	0.294	H
3912	Space Heater	3	**0.147**	Natural Gas	0.441	H
3916	Space Heater	1	**0.147**	Natural Gas	0.147	H
6001	Space Heater	1	**0.147**	Natural Gas	0.147	H
6286	Space Heater	1	**0.147**	Natural Gas	0.147	H
7300	Space Heater	1	**0.147**	Natural Gas	0.147	H
7426	Space Heater	1	**0.147**	Natural Gas	0.147	H
7440	Space Heater	1	**0.147**	Natural Gas	0.147	H
8005	Space Heater	4	**0.147**	Natural Gas	0.589	B
8007	Space Heater	1	**0.147**	Natural Gas	0.147	B
8472	Space Heater	2	**0.147**	Natural Gas	0.294	B
8930	Space Heater	1	**0.147**	Natural Gas	0.147	B
9277	Space Heater	3	**0.147**	Natural Gas	0.441	I
9634	Space Heater	4	**0.147**	Natural Gas	0.589	I
9635	Space Heater	4	**0.147**	Propane	0.589	I

[a] Heat input values in **BOLD** are assumed based on the average heat input value of similar sources.

Number of space heaters with known heat input:	51
Total heat input (known) mmbtu/hr:	7.51 MMBtu/hr
Average heat input:	0.15 MMBtu/hr
Total number of space heaters:	135 MMBtu/hr
TOTAL HEAT INPUT FROM ALL SPACE HEATERS:	**20 MMBtu/hr**

TOTAL NUMBER OF SOURCES: **393**
TOTAL HEAT INPUT FROM ALL EXTERNALLY-FIRED EQUIPMENT: **102 MMBtu/hr**

Table A-7, Continued

Misc. External Combustion Summary

Location	Total Heat Input (MMBtu/hr)	% of Total
A	27	26.28
B	7	7.22
C	17	17.10
D	3	3.30
F	31	29.89
H	12	11.68
I	5	4.54
Total	**102**	**100.00**

Table A-8. CY 2006 Facility-Wide Gas Use

Total Facility-wide Gas Use:	**1,119**	MMCF[1]
	898	MMSCF[2]
Atmospheric pressure at Fort Carson	11.8	psia
Standard atmospheric pressure	14.7	psia

[1] Fuel use information is from the Fort Carson Emission Inventory for calendar year 2006 (Fort Carson 2007),
[2] MMSCF = MMCF x [atmospheric pressure at Fort Carson] / [standard atmospheric pressure]

Metered Sources	Gas Use (MMCF)[3]	Gas Use (MMSCF)
Bldg 1860 Hot Water Generators (2 @ 47 MMBtu/hr each)	207.85	166.84
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	21.12	16.95
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	22.47	18.04
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	82.04	65.85
Bldg 8000 Boilers (3 @ 13.213 MMBtu/hr total)	8.61	6.91
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.40	0.32
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	2.43	1.95
Total Metered Sources	**344.92**	**276.88**

Facility-wide gas use	**898.38**
- Gas Used in Metered Sources	**-276.88**
Gas used in Unmetered Sources	**621.51**

[3] Fuel use information is from the Fort Carson Emission Inventory for calendar year 2006 (Fort Carson 2007),

Unmetered Sources	Total Heat Input Rate (MMBtu/hr)	Prorated Natural Gas Use (MMSCF)
Categorically Exempt Boilers Standard Burner Configuration	249.66	401.50
Low NOx Boilers, Manufacturer guarantee of 20 ppm NOx or less	30.60	49.21
Low NOx Boilers, Manufacturer guarantee of 30 ppm NOx or less	4.14	6.66
Categorically Exempt Miscellaneous External Combustion Units[4]	102.06	164.14
TOTAL	**386.46**	**621.51**

[4] Space heaters, furnaces and hot water heaters.

Table A-9. New External Combustion

PROPOSED EXTERNAL COMBUSTION SOURCES

Emission Unit	Size	Units	NG Limit (MMscf/yr)	Projected Annual Actual NG Use	Max NG Rate (MMscf/hr)
External Combustion Sources					
GTF EIS	90.3	MMBtu/hr	791	145	0.090
GTF EA	15.1	MMBtu/hr	133	24	0.015
Area A	2.8	MMBtu/hr	25	5	0.003
Area C	8.1	MMBtu/hr	71	13	0.008
Area H	4.2	MMBtu/hr	37	7	0.004
Warrior in Transition	15.7	MMBtu/hr	137	25	0.016
BRAC	166	MMBtu/hr	1,456	267	0.166
Area C - 0.5 ppm NOx	6.4	MMBtu/hr	56	10	0.006
Area C - 30 ppm NOx	51.7	MMBtu/hr	453	83	0.052
Area C - 55 ppm NOx	0.7	MMBtu/hr	6	1	0.001
Area E - 9.9 ppm NOx	6.0	MMBtu/hr	53	10	0.006
Area E - 30 ppm NOx	61.0	MMBtu/hr	534	98	0.061
Area E - 66 ppm NOx	2.3	MMBtu/hr	20	4	0.002
Area E - 100 ppm NOx	23.6	MMBtu/hr	207	38	0.024
Area E - Standard Combustion	9.8	MMBtu/hr	86	16	0.010
Area F - 30 ppm NOx	4.7	MMBtu/hr	41	8	0.005

Table A-9, Continued

Heat content of Natural gas	**1,000**	**Btu/scf**
Heat content of No. 2 Oil/Diesel	**137,000**	**Btu/gal**
Projected Percent Utilization	**18.4**	**MMscf/yr per MMBtu/hr**

PROPOSED EXTERNAL COMBUSTION SOURCES	**NG Emission Factor (lb/MMscf)**							
Emission Unit	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**Pseudo Source Location**	**Emission Limit Source**
External Combustion Sources								
GTF EIS	7.60	7.60	36	84	0.60	5.50	G	N/A
GTF EA								
Area A	7.60	7.60	36	84	0.60	5.50	A	N/A
Area C	7.60	7.60	36	84	0.60	5.50	C	N/A
Area H	7.60	7.60	36	84	0.60	5.50	H	N/A
Warrior in Transition	7.60	7.60	36	84	0.60	5.50	F	N/A
BRAC								
Area C - 0.5 ppm NOx	7.60	7.60	0.6	84	0.60	5.5	C	N/A
Area C - 30 ppm NOx	7.60	7.60	36	84	0.60	5.5	C	N/A
Area C - 55 ppm NOx	7.60	7.60	66	84	0.60	5.5	C	N/A
Area E - 9.9 ppm NOx	7.60	7.60	12	84	0.60	5.5	E	N/A
Area E - 30 ppm NOx	7.60	7.60	36	84	0.60	5.5	E	N/A
Area E - 66 ppm NOx	7.60	7.60	66	84	0.60	5.5	E	N/A
Area E - 100 ppm NOx	7.60	7.60	90	84	0.60	5.5	E	N/A
Area E - Standard Combustion	7.60	7.60	100	84	0.60	5.5	E	N/A
Area F - 30 ppm NOx	7.60	7.60	36	84	0.60	5.5	F	N/A

Table A-10. New External Combustion Emissions

PROPOSED EXTERNAL COMBUSTION SOURCES - PROJECTED ACTUAL ANNUAL EMISSIONS

Emission Unit	Total Emissions (tpy)						Pseudo Source Location
	PM	PM_{10}	NO_X	CO	SO_X	VOC	
GTA EIS	0.55	0.55	2.61	6.10	0.04	0.40	G
GTA EA							
Area A	0.02	0.02	0.08	0.19	0.00	0.01	A
Area C	0.05	0.05	0.23	0.55	0.00	0.04	C
Area H	0.03	0.03	0.12	0.29	0.00	0.02	H
Warrior in Transition	0.10	0.10	0.45	1.06	0.01	0.07	F
BRAC							
Area C - 0.5 ppm NOx	0.04	0.04	0.00	0.43	0.00	0.03	C
Area C - 30 ppm NOx	0.32	0.32	1.50	3.49	0.02	0.23	C
Area C - 55 ppm NOx	0.00	0.00	0.04	0.05	0.00	0.00	C
Area E - 9.9 ppm NOx	0.04	0.04	0.06	0.41	0.00	0.03	E
Area E - 30 ppm NOx	0.37	0.37	1.77	4.12	0.03	0.27	E
Area E - 66 ppm NOx	0.01	0.01	0.12	0.15	0.00	0.01	E
Area E - 100 ppm NOx	0.14	0.14	1.71	1.60	0.01	0.10	E
Area E - Standard Combustion	0.06	0.06	0.79	0.66	0.00	0.04	E
Area F - 30 ppm NOx	0.03	0.03	0.14	0.32	0.00	0.02	F
Source Category Total	**1.76**	**1.76**	**9.62**	**19.40**	**0.14**	**1.27**	

PROPOSED EXTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

Emission Unit	Total Emissions (tpy)						Pseudo Source Location
	PM	PM_{10}	NO_X	CO	SO_X	VOC	
GTA EIS	3.00	3.00	14.23	33.21	0.24	2.17	G
GTA EA							
Area A	0.09	0.09	0.44	1.04	0.01	0.07	A
Area C	0.27	0.27	1.27	2.97	0.02	0.19	C
Area H	0.14	0.14	0.67	1.56	0.01	0.10	H
Warrior in Transition	0.52	0.52	2.47	5.76	0.04	0.38	F
BRAC							
Area C - 0.5 ppm NOx	0.21	0.21	0.02	2.35	0.02	0.15	C
Area C - 30 ppm NOx	1.72	1.72	8.16	19.03	0.14	1.25	C
Area C - 55 ppm NOx	0.02	0.02	0.20	0.25	0.00	0.02	C
Area E - 9.9 ppm NOx	0.20	0.20	0.32	2.21	0.02	0.14	E
Area E - 30 ppm NOx	2.03	2.03	9.62	22.44	0.16	1.47	E
Area E - 66 ppm NOx	0.08	0.08	0.65	0.83	0.01	0.05	E
Area E - 100 ppm NOx	0.79	0.79	9.31	8.69	0.06	0.57	E
Area E - Standard Combustion	0.33	0.33	4.30	3.62	0.03	0.24	E
Area F - 30 ppm NOx	0.16	0.16	0.74	1.72	0.01	0.11	F
Source Category Total	**9.56**	**9.56**	**52.40**	**105.68**	**0.75**	**6.92**	

PROPOSED EXTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

Emission Unit	Total Emissions (lb/hr)						Pseudo Source Location
	PM	PM_{10}	NO_X	CO	SO_X	VOC	
GTA EIS	0.69	0.69	3.25	7.58	0.05	0.50	G
GTA EA							
Area A	0.02	0.02	0.10	0.24	0.00	0.02	A
Area C	0.06	0.06	0.29	0.68	0.00	0.04	C
Area H	0.03	0.03	0.15	0.36	0.00	0.02	H
Warrior in Transition	0.12	0.12	0.56	1.32	0.01	0.09	F
BRAC							
Area C - 0.5 ppm NOx	0.05	0.05	0.00	0.54	0.00	0.04	C
Area C - 30 ppm NOx	0.39	0.39	1.86	4.34	0.03	0.28	C
Area C - 55 ppm NOx	0.01	0.01	0.04	0.06	0.00	0.00	C
Area E - 9.9 ppm NOx	0.05	0.05	0.07	0.50	0.00	0.03	E
Area E - 30 ppm NOx	0.46	0.46	2.20	5.12	0.04	0.34	E
Area E - 66 ppm NOx	0.02	0.02	0.15	0.19	0.00	0.01	E
Area E - 100 ppm NOx	0.18	0.18	2.13	1.98	0.01	0.13	E
Area E - Standard Combustion	0.07	0.07	0.98	0.83	0.01	0.05	E
Area F - 30 ppm NOx	0.04	0.04	0.17	0.39	0.00	0.03	F
Source Category Total	**2.18**	**2.18**	**11.96**	**24.13**	**0.17**	**1.58**	

Table A-10. New External Combustion Emissions

Table A-10, Continued

PROPOSED EXTERNAL COMBUSTION SOURCES - ACTUAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.02	0.02	0.08	0.19	0.00	0.0
B	0.00	0.00	0.00	0.00	0.00	0.0
C	0.41	0.41	1.77	4.52	0.03	0.3
D	0.00	0.00	0.00	0.00	0.00	0.0
E	0.63	0.63	4.44	6.94	0.05	0.5
F	0.12	0.12	0.59	1.37	0.01	0.1
G	0.55	0.55	2.61	6.10	0.04	0.4
H	0.03	0.03	0.12	0.29	0.00	0.0
I	0.00	0.00	0.00	0.00	0.00	0.0
Source Category Total	**1.76**	**1.76**	**9.62**	**19.40**	**0.14**	**1.27**

PROPOSED EXTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.09	0.09	0.44	1.04	0.01	0.1
B	0.00	0.00	0.00	0.00	0.00	0.0
C	2.23	2.23	9.64	24.61	0.18	1.6
D	0.00	0.00	0.00	0.00	0.00	0.0
E	3.42	3.42	24.20	37.78	0.27	2.5
F	0.68	0.68	3.21	7.48	0.05	0.5
G	3.00	3.00	14.23	33.21	0.24	2.2
H	0.14	0.14	0.67	1.56	0.01	0.1
I	0.00	0.00	0.00	0.00	0.00	0.0
Source Category Total	**9.56**	**9.56**	**52.40**	**105.68**	**0.75**	**6.92**

PROPOSED EXTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

	Total Emissions (lb/hr)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.02	0.02	0.10	0.24	0.00	0.0
B	0.00	0.00	0.00	0.00	0.00	0.0
C	0.51	0.51	2.20	5.62	0.04	0.4
D	0.00	0.00	0.00	0.00	0.00	0.0
E	0.78	0.78	5.53	8.63	0.06	0.6
F	0.15	0.15	0.73	1.71	0.01	0.1
G	0.69	0.69	3.25	7.58	0.05	0.5
H	0.03	0.03	0.15	0.36	0.00	0.0
I	0.00	0.00	0.00	0.00	0.00	0.0
Source Category Total	**2.18**	**2.18**	**11.96**	**24.13**	**0.17**	**1.58**

Table A-11. Grow the Army EIS Projects External Combustion

Grow the Army Projects (2008 Construction EIS)[1]					
PROJECT NUMBER	**PROJECT NAME**	**SQUARE FOOTAGE[2]**	**Number of Bldg./ Stories**	**TOTAL HEAT INPUT (BTU/HR/Sq.Ft.)[3,4]**	**TOTAL HEAT INPUT (MMBtu/hr)**
71176 Reviewed 4/10/2008	**Brigade Combat Team (L) H.Q.**	**145,176**			
	Total Heated Sq. Ft.	**145,176**			
	Total Parking Sq. Ft.	**0**			
	Brigade H.Q.	40,300	2	60	2.4
	Battalion H.Q.	104,876	2	60	6.3
69121 Reviewed 4/10/2008	**BCT (L) Barracks and DFAC**	**587,344**			
	Total Heated Sq. Ft.	**553,540**			
	Total Parking Sq. Ft.	**33,804**			
	Unac. Enl. Housing (barracks)	527,040	4/4	55	29.0
	POV Parking	33,804			
	Dinning Facility	26,500	1	150	4.0
71178 Reviewed 4/10/2008	**BCT (L) Company Ops.**	**472,134**			
	Total Heated Sq. Ft.	**368,964**			
	Total Parking Sq. Ft.	**103,170**			
	Company Operations Facilities	368,964	2	60	22.1
	Access and Service Surfaces	38,574			
	Company Operations Covered Hardstands	64,596			
71198 Reviewed 4/10/2008	**BCT (L) TEMF Tact. Equip. Maintenance**	**1,638,215**			
	Total Heated Sq. Ft.	**224,810**			
	Total Parking Sq. Ft.	**1,413,405**			
	Vehicle Maintenance Shop	159,870	1	75	12.0
	Organizational Vehicle Parking	1,399,599			
	Organizational Storage Facility	42,300	1	55	2.3
	Oil Storage Building	2,820	1	35	0.1
	HAZMAT Storage Building	2,820	1	35	0.1
	Tact. Unmanned Aerial Veh. Hanger	9,000	1	45	0.4
	Dist. Company Storage	8,000	1	45	0.4
	Open Dist. Company Storage	4,005	1		
69795 Reviewed 4/10/2008	**Quarter Master Facilities**	**289,189**			
	Total Heated Sq. Ft.	**38,530**			
	Total Parking Sq. Ft.	**250,659**			
	Vehicle Maintenance Shop	18,000	1	75	1.4
	Organizational Vehicle Parking	202,059			
	Company Operations Facilities	17,730	2	60	1.1
	Covered Hardstand	3,000			
	Organizational Storage Facility	2,800	1	55	0.2
67137 Reviewed 4/10/2008	**EN BN Complex**	**326,415**			
	Total Heated Sq. Ft.	**92,829**			
	Total Parking Sq. Ft.	**233,586**			
	Vehicle Maintenance Shop	25,152	1	75	1.9
	Organizational Vehicle Parking	62,136			
	POV Parking	171,450			
	Company Operations Facilities	64,802	2	60	3.9
	Oil Storage Building	660	1	35	0.0
	Deployed Equipment Storage	2,215	1	55	0.1
71171 Reviewed 4/10/2008	**Child Development Center (2)(Totals)**	**71,650**			
	Total Heated Sq. Ft.	**31,650**			
	Total Parking Sq. Ft.	**40,000**			
	Building	31,650	1	85	2.7
	Parking	40,000			
XXXX Reviewed 4/10/2008	**BCT Infrastructure (Cantonment)**	**0**			
	Total Heated Sq. Ft.	**0**			
	Total Parking Sq. Ft.	**0**			
XXXX Reviewed 4/10/2008	**Land Fill Removal (partial or whole)**	**0**			
	Total Heated Sq. Ft.	**0**			
	Total Parking Sq. Ft.	**0**			
Total Heated Sq. Ft. for Boilers/Other External Combustion Units		1,455,499		1,175	90.3

1.) Emission source information is from personnal communications with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).
2.) Heated sq. ft. estimate from Department of Army Form 1391 project numbers.
3.) BTU input taken from BRAC projects that were similar in scope and size for which DPW has estimates from the USACE, or actual data from project plan reviews.
4.) NOx emissions based on combustion equipment burning natural gas with 30 ppm emissions rate.

Table A-12. Grow the Army EA Projects External Combustion

Grow the Force Projects (2008 Construction EA)[1]

PROJECT NUMBER	PROJECT NAME	SQUARE FOOTAGE[2]	TOTAL HEAT INPUT (BTU/HR/Sq.Ft.)[3,4]	TOTAL HEAT INPUT (MMBtu/hr)	PSEUDO SOURCE LOCATION
68763	**Engineer Batt. (Combat Heavy) Complex**	**2,056,212**			
Reviewed	Total Heated Sq. Ft.	**214,299**			
1/10/2008	Total Parking Sq. Ft.	**1,841,913**			
	Battalion H.Q.	13,600	60	0.8	H
	Org. Classroom	4,115	60	0.2	H
	Company Operations Fac.	146,626	42	6.2	C
	Covered Hardstands	26,622			
	Vehicle Maint. Shop	35,290	65	2.3	H
	Deployment Equipment Storage	11,200	64	0.7	H
	Organizational Vehicle Parking	1,815,291			
	Oil Storage Bldg.	1,200	25	0.030	H
	Administrative Bldg.	2,268	60	0.1	H
68830	**M.P. Company Operations**	**74,404**			
Reviewed	Total Heated Sq. Ft.	**55,744**			
1/10/2008	Total Parking Sq. Ft.	**18,660**			
	Company Operations Fac.	34,160	42	1.4	A
	Covered Hardstands	5,970			
	Vehicle Maint. Shop	18,224	65	1.2	A
	Deployment Equipment Storage	3,000	64	0.2	A
	Organizational Vehicle Parking	12,690			
	Oil Storage Bldg.	360	25	0.009	A
69276	**Construct Arterial Roadway**	**1,370,880**			
Reviewed	Total Road Sq. Ft.	**1,370,880**			
1/10/2008	Total Road Acers				
69820	**Medical Clinic Add/Alt**	**32,210**			
Reviewed	Total Heated Sq. Ft.	**32,210**			
1/10/2008	Total Parking Sq. Ft.	**0**			
	DiRaimondo Medical/Health Clinic Add	17,622	106	1.868	C
	DiRaimondo Medical/Health Clinic Add	500	106	0.053	C
Total Heated Sq. Ft. for Boilers/Other External Combustion Units		302,253	784	15.1	

1.) Emission source information is from personnal communications with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).
2.) Heated sq. ft. estimate from Department of Army Form 1391 project numbers.
3.) BTU input taken from BRAC projects that were similar in scope and size for which DPW has estimates from the USACE, or actual data from project plan reviews.
4.) NOx emissions based on combustion equipment burning natural gas with 30 ppm emissions rate.

Total Heat Input by Location

LOCATION	HEAT INPUT (MMBtu/hr
A	2.8
C	8.1
H	4.2

Table A-13. Warrior in Transition External Combustion

Warrior In Transition (2008 Construction EA)[1]				
PROJECT NUMBER	**PROJECT NAME**	**SQUARE FOOTAGE[2]**	**TOTAL HEAT INPUT (BTU/HR/Sq.Ft.)[3,4]**	**TOTAL HEAT INPUT (MMBtu/hr)**
70100	**(SFAC) Soldier Family Assistance Center**	**15,000**		
	Total Heated Sq. Ft.	**15,000**	65	1.0
*	Total Parking Sq. Ft.	**0**		
70196	**Warrior In Transition Complex**	**154,322**		
	Total Heated Sq. Ft.	**154,322**		
	Total Parking Sq. Ft.	**0**		
	WT Barracks	113,400	106	12.0
	Admin. and Ops. Facility	40,922	65	2.7
	Total Heated Sq. Ft. for Boilers/Other External Combustion Units	169,322	236	15.7

1.) Emission source information is from personnal communications with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).
2.) Heated sq. ft. estimate from Department of Army Form 1391 project numbers.
3.) BTU input taken from BRAC projects that were similar in scope and size for which DPW has estimates from the USACE, or actual data from project plan reviews.
4.) NOx emissions based on combustion equipment burning natural gas with 30 ppm emissions rate.

Table A-14. Base Realignment and Closure External Combustion

BRAC External Combustion[1]					
PROJECT NUMBER	BUILDING	HEATED SQUARE FOOTAGE	HEAT INPUT (BTU/HR)	NOx EMISSION FACTOR	PSEUDO SOURCE LOCATION
31469	O'CONNELL BARRACKS	62,966			
	Boilers		600,000	36	C
	Domestic Hot Water		2,000,000	36	C
31469	O'CONNELL COMPANY OPS.	45,000			
	Boilers		2,000,000	36	C
	Domestic Hot Water		480,000	66	C
64123	HOSPITAL EXPANSION				C
59626	DIGITAL MULTI-PURPOSE TRAINING RANGE	10,402	0	36	C
62812	INDOOR BAFFLE RANGE FY08	23,000			
	Boilers		1,150,000	36	C
	Domestic Hot Water		230,000	36	C
65362	EAB BARRACKS	217,000			
	Boilers		10,850,000	36	C
	Domestic Hot Water		15,190,000	36	C
65473, 65474, 85475	BCT-H COMPLEX-BRIGADE-BATTALION HQ'S	141,000			
	Boilers		6,000,000	12	E
	Domestic Hot Water		750,000	36	E
65473, 65474, 85475	BCT-H COMPLEX- COMPANY OPERATIONS FACILITIES	355,064			
	Boilers		4,500,000	36	E
	Domestic Hot Water		1,358,000	66	E
	MAUs		9,828,000	100	E
65473, 65474, 85475	BCT-H COMPLEX-TACTICAL EQUIPMENT MAINTENANC	237,932			
	Boilers		16,800,000	36	E
	Domestic Hot Water		900,000	66	E
	MAUs		23,622,000	90	E
65473, 65474, 85475	BCT-H COMPLEX- BARRACKS	525,942			
	Boilers		8,000,000	36	E
	Domestic Hot Water		24,000,000	36	E
65473, 65474, 85475	BCT-H COMPLEX-ORG STORAGE	64,900			
	Boilers		3,245,000	36	E
	Domestic Hot Water		908,600	36	E
65473, 65474, 85475	BCT-H COMPLEX-DINING FACILITY	26,500			
	Boilers		2,252,500	36	E
	Domestic Hot Water		530,000	36	E
65478, 65479	DIV HQ COMPLEX-COMMAND & CONTROL (C2) FACILIT	135,380			
	Boilers		4,200,000	36	C
	Domestic Hot Water		199,000	66	C
65478, 65479	DIV HQ-BATTALION HQ'S	12,852			
	Boilers		578,340	36	C
	Domestic Hot Water		192,780	36	C
65478, 65479	DIV HQ-COMPANY OPERATIONS FACILITIES	67,200			
	Boilers		1,000,000	36	C
	Domestic Hot Water		3,000,000	36	C
	MAUs		6,400,000	0.6	C

Table A-14, Continued

BRAC External Combustion[1]					
PROJECT NUMBER	BUILDING	HEATED SQUARE FOOTAGE	HEAT INPUT (BTU/HR)	NOx EMISSION FACTOR	PSEUDO SOURCE LOCATION
65478, 65479	DIV HQ-TACTICAL EQUIPMENT MAINTENANCE FACILITI	37,200			
	Boilers		2,232,000	36	C
	Domestic Hot Water		186,000	36	C
65478, 65479	DIV HQ-BARRACKS	89,304			
	Boilers		3,000,000	36	C
	Domestic Hot Water		4,000,000	36	C
65478, 65479	DIV HQ-ORG STORAGE	18,230			
	Boilers		911,500	36	C
	Domestic Hot Water		255,220	36	C
65616	RAILYARD EXPANSION	2,500			
	Boilers		112,500	36	C
	Domestic Hot Water		37,500	36	C
63728	10 SFG BATTALION HEADQUARTERS	14,470			
	Boilers		651,150	36	F
	Domestic Hot Water		217,050	36	F
63728	10 SFG WAREHOUSE	17,630			
	Boilers		352,600	36	F
	Domestic Hot Water		88,150	36	F
63728	10 SFG HAZMAT	6,750			
	Boilers		337,500	36	F
	Domestic Hot Water		101,250	36	F
63728	10 SFG VEHICLE MAINTENANCE	31,990			
	Boilers		1,919,400	36	F
	Domestic Hot Water		159,950	36	F
63728	10 SFG COMPANY OPERATIONS	20,200			
			303,000	36	F
			545,400	36	F
63728	10 SFG OIL STORAGE	480			
			9,600	36	F
			2,400	36	F
Total for Boilers/Other External Combustion Units		2,163,892	166,186,390		

1.) Emission source information is from personnal communications with Mr. Chad Meister (Meister 2008a, 2008b, 2008c, 2008d, 2008e, and 2008f).

Heat Input Summary by Location and NOx Emission Factor			
LOCATION	NOx EMISSION FACTOR (LB/MMscf)	HEAT INPUT (BTU/HR)	HEAT INPUT (MMBTU/HR)
C	0.6	6,400,000	6.40
C	36	51,725,840	51.73
C	66	679,000	0.68
E	12	6,000,000	6.00
E	36	60,986,100	60.99
E	66	2,258,000	2.26
E	90	23,622,000	23.62
E	100	9,828,000	9.83
F	36	4,687,450	4.69

Table A-15. Internal Combustion Summary

INTERNAL COMBUSTION SOURCES - PROJECTED ACTUAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.01	0.01	0.32	0.12	0.01	0.0
B	0.20	0.20	2.80	0.60	0.18	0.2
C	0.10	0.09	2.23	0.56	0.50	0.1
D	0.02	0.01	0.60	0.14	0.10	0.0
E	0.00	0.00	0.10	0.08	0.01	0.0
F	0.20	0.18	4.23	0.99	0.49	0.2
G	0.02	0.02	0.52	0.28	0.02	0.0
H	0.09	0.05	2.76	0.69	0.43	0.1
I	0.62	0.61	7.71	1.86	0.64	0.7
Source Category Total	**1.25**	**1.17**	**21.27**	**5.32**	**2.38**	**1.39**

INTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.14	0.14	2.88	0.90	0.13	0.2
B	1.37	1.37	19.63	4.19	2.27	1.6
C	0.85	0.73	22.59	6.78	4.20	1.1
D	0.06	0.04	2.12	0.49	0.36	0.1
E	0.03	0.03	0.54	0.47	0.03	0.1
F	0.69	0.69	36.98	6.52	9.83	0.8
G	0.09	0.09	2.98	1.61	0.11	0.2
H	0.51	0.36	14.96	3.67	2.14	0.5
I	1.25	1.25	16.04	7.11	2.56	2.7
Source Category Total	**4.99**	**4.70**	**118.72**	**31.74**	**21.63**	**7.16**

INTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

	Total Emissions (lb/hr)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.68	0.68	15.48	5.75	0.69	1.0
B	2.09	2.09	39.45	8.53	3.97	2.3
C	4.14	3.68	121.71	41.04	25.91	6.0
D	0.49	0.28	16.94	3.88	2.86	0.5
E	0.22	0.22	4.36	3.77	0.26	0.4
F	5.83	5.04	230.28	45.97	51.08	6.4
G	0.74	0.74	23.82	12.88	0.91	1.4
H	2.40	1.71	71.86	18.68	10.06	2.6
I	4.56	4.56	55.28	32.24	12.00	12.1
Source Category Total	**21.16**	**19.01**	**579.18**	**172.74**	**107.73**	**32.85**

Table A-16. Existing Internal Combustion

Heat content of No. 2 Oil/Diesel	**137,000**	**Btu/gal**
Brake Specific Fuel Consumption	**7,000**	**Btu/hp-hr**

Emission Unit	Size (hp)	Maximum hp	Hours of Operation Limit	Maximum Annual hp-hr	Actual Hours of Operation in 2006	Actual hp-hr in 2006	Actual Diesel Use in 2006 (gal)	Max Diesel Rate (Mgal/hr)	Max No. 2 Oil Sulfur Content (%)
Internal Combustion Units									
Bldg 1118 Generator (747.7 hp)	747.7	747.7	250	186,925	0	0	---	---	---
Bldg 1550 Generator (1550 hp)	1550	1550	500	775,000	12	18,600	---	---	**0.5**
Bldg 3909 Generator (1620 hp)	1620	1620	500	810,000	122	197,640	---	---	**0.5**
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	1310	2620	0	0	134	176,064	2,682	0.067	**0.5**
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	1555.2	4665.6	1500	2,332,800	0	0	0	0.079	---
Bldg 8000 Title V Dynamometers <600 hp	<600	275		1,000,000	---	165,768	---	---	---
Bldg 8000 Title V Dynamometers >600 hp	>600	600		1,000,000	---	0	---	---	0.5
Butts Air Field Engine Test Stand					---	---	---	---	---
Categorically Exempt Diesel Emergency Generators <600hp	<600	3696.3	(2)	1,509,400		230,463			
Area A	<600	187.6	(2)	93,800	---	4,665	---	---	---
Area B	<600	475.7	(2)	237,850	---	14,380	---	---	---
Area C	<600	702.4	(2)	351,200	---	65,618	---	---	---
Area D	<600	0	(2)	0	---	0	---	---	---
Area E	<600	0	(2)	0	---	0	---	---	---
Area F	<600	1201	(2)	350,500	---	122,385	---	---	---
Area G	<600	0	(2)	0	---	0	---	---	---
Area H	<600	241.2	(2)	120,600	---	6,725	---	---	---
Area I	<600	888.4	(2)	355,450	---	16,690	---	---	---
Categorically Exempt Diesel Emergency Generators >600hp	>600	1376	(2)	344,000		58,483			
Area A	>600	0	(2)	0	---	0	---	---	0.5
Area B	>600	0	(2)	0	---	0	---	---	0.5
Area C	>600	0	(2)	0	---	0	---	---	0.5
Area D	>600	706	(2)	176,500	---	49,773	---	---	0.5
Area E	>600	0	(2)	0	---	0	---	---	0.5
Area F	>600	0	(2)	0	---	0	---	---	0.5
Area G	>600	0	(2)	0	---	0	---	---	0.5
Area H	>600	670	(2)	167,500	---	8,710	---	---	0.5
Area I	>600	0	(2)	0	---	0	---	---	0.5
Auxiliary Ground Power Units (8 @ 40.5 hp each)	40.5	324	11600	469,800		469,800	---	---	---
Categorically Exempt Natural Gas/Propane Emergency Generators	<350	857	(2)	349,210		13,524			
Area A	<350	78	(2)	38,860	---	6,399	---	---	---
Area B	<350	80	(2)	40,000	---	736	---	---	---
Area C	<350	317	(2)	79,250	---	1,490	---	---	---
Area D	<350	0	(2)	0	---	0	---	---	---
Area E	<350	0	(2)	0	---	0	---	---	---
Area F	<350	275	(2)	137,600	---	3,723	---	---	---
Area G	<350	0	(2)	0	---	0	---	---	---
Area H	<350	67	(2)	33,500	---	730	---	---	---
Area I	<350	40	(2)	20,000	---	447	---	---	---

[1] Emission factors in **BOLD** are based on the source permit.

[2] Maximum annual operating hours for each generator are based on the amount of hours allowed by the APEN exemption (either 250 hours per year or 500 hours per year). Refer to Table A-18 for source-specific hours of operation.

Table A-16. Existing Internal Combustion

Table A-16, Continued

Emission Unit	Emission Factor (lb/hp-hr)[1]						Pseudo Source Location	Emission Limit Source
	PM	PM_{10}	NO_X	CO	SO_X	VOC		
Internal Combustion Units								
Bldg 1118 Generator (747.7 hp)	8.81E-04	8.81E-04	1.52E-02	1.87E-02	4.03E-04	2.20E-03	C	07EP0293
Bldg 1550 Generator (1550 hp)	7.00E-04	4.00E-04	**2.40E-02**	**5.50E-03**	**4.05E-03**	6.42E-04	C	95OPEP110
Bldg 3909 Generator (1620 hp)	7.00E-04	4.00E-04	**2.40E-02**	**5.50E-03**	**4.05E-03**	6.42E-04	H	95OPEP110
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	7.00E-04	4.00E-04	**2.40E-02**	**5.50E-03**	**4.05E-03**	6.42E-04	F	95OPEP110
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	2.20E-04	2.20E-04	**2.49E-02**	**3.96E-03**	8.08E-03	2.20E-04	F	05EP0230 & APEN
Bldg 8000 Title V Dynamometers <600 hp	**2.20E-03**	**2.20E-03**	**3.10E-02**	**6.68E-03**	**2.05E-03**	**2.51E-03**	B	95OPEP110
Bldg 8000 Title V Dynamometers >600 hp	**7.00E-04**	**7.00E-04**	**2.40E-02**	**5.50E-03**	**4.05E-03**	**6.42E-04**	B	95OPEP110
Butts Air Field Engine Test Stand	N/A	N/A	N/A	N/A	N/A	N/A	I	95OPEP110
Categorically Exempt Diesel Emergency Generators <600hp								
Area A	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	A	APEN Threshold
Area B	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	B	APEN Threshold
Area C	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	C	APEN Threshold
Area D	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	D	APEN Threshold
Area E	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	E	APEN Threshold
Area F	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	F	APEN Threshold
Area G	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	G	APEN Threshold
Area H	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	H	APEN Threshold
Area I	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	I	APEN Threshold
Categorically Exempt Diesel Emergency Generators >600hp								
Area A	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	A	APEN Threshold
Area B	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	B	APEN Threshold
Area C	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	C	APEN Threshold
Area D	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	D	APEN Threshold
Area E	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	E	APEN Threshold
Area F	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	F	APEN Threshold
Area G	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	G	APEN Threshold
Area H	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	H	APEN Threshold
Area I	7.00E-04	4.00E-04	2.40E-02	5.50E-03	4.05E-03	7.05E-04	I	APEN Threshold
Auxiliary Ground Power Units (8 @ 40.5 hp each)	2.20E-03	2.20E-03	3.10E-02	6.68E-03	2.05E-03	2.47E-03	I	APEN Threshold
Categorically Exempt Natural Gas/Propane Emergency Generators	**Emission Factor (lb/MMBtu)**							
Area A	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	A	APEN Threshold
Area B	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	B	APEN Threshold
Area C	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	C	APEN Threshold
Area D	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	D	APEN Threshold
Area E	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	E	APEN Threshold
Area F	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	F	APEN Threshold
Area G	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	G	APEN Threshold
Area H	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	H	APEN Threshold
Area I	3.84E-02	3.84E-02	3.17E+00	3.86E-01	5.88E-04	1.20E-01	I	APEN Threshold

[1] Emission factors in **BOLD** are based on the source permit.

[2] Maximum annual operating hours for each generator are based on the amount of hours allowed by the APEN exemption (either 250 hours per year or 500 hours per year). Refer to Table A-18 for source-specific hours of operation.

Table A-17. Existing Internal Combustion Emissions

EXISTING INTERNAL COMBUSTION SOURCES - ACTUAL ANNUAL EMISSIONS

Emission Unit	PM	PM_{10}	NO_X	CO	SO_X	VOC	Pseudo Source Location
	Total Emissions (tpy)						
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.00	0.00	0.00	0.00	0.00	0.00	C
Bldg 1550 Generator (1550 hp)	0.01	0.00	0.22	0.05	0.04	0.01	C
Bldg 3909 Generator (1620 hp)	0.07	0.04	2.37	0.54	0.40	0.06	H
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	0.06	0.04	2.11	0.48	0.36	0.06	F
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	0.00	0.00	0.00	0.00	0.00	0.00	F
Bldg 8000 Title V Dynamometers <600 hp	0.18	0.18	2.57	0.55	0.17	0.21	B
Bldg 8000 Title V Dynamometers >600 hp	0.00	0.00	0.00	0.00	0.00	0.00	B
Butts Air Field Engine Test Stand	0.08	0.08	0.16	0.24	0.14	0.06	I
Categorically Exempt Diesel Emergency Generators <600hp							
Area A	0.01	0.01	0.07	0.02	0.00	0.01	A
Area B	0.02	0.02	0.22	0.05	0.01	0.02	B
Area C	0.07	0.07	1.02	0.22	0.07	0.08	C
Area D	0.00	0.00	0.00	0.00	0.00	0.00	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.13	0.13	1.90	0.41	0.13	0.15	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.01	0.01	0.10	0.02	0.01	0.01	H
Area I	0.02	0.02	0.26	0.06	0.02	0.02	I
Categorically Exempt Diesel Emergency Generators >600hp							
Area A	0.00	0.00	0.00	0.00	0.00	0.00	A
Area B	0.00	0.00	0.00	0.00	0.00	0.00	B
Area C	0.00	0.00	0.00	0.00	0.00	0.00	C
Area D	0.02	0.01	0.60	0.14	0.10	0.02	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.00	0.00	0.00	0.00	0.00	0.00	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.00	0.00	0.10	0.02	0.02	0.00	H
Area I	0.00	0.00	0.00	0.00	0.00	0.00	I
Categorically Exempt Natural Gas/Propane Emergency Generators							
Area A	0.00	0.00	0.07	0.01	0.00	0.00	A
Area B	0.00	0.00	0.01	0.00	0.00	0.00	B
Area C	0.00	0.00	0.02	0.00	0.00	0.00	C
Area D	0.00	0.00	0.00	0.00	0.00	0.00	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.00	0.00	0.04	0.01	0.00	0.00	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.00	0.00	0.01	0.00	0.00	0.00	H
Area I	0.00	0.00	0.00	0.00	0.00	0.00	I
Auxiliary Ground Power Units (8 @ 40.5 hp each)	0.52	0.52	7.28	1.57	0.48	0.58	I
Source Category Total	**1.19**	**1.12**	**19.15**	**4.39**	**1.94**	**1.28**	

Table A-17. Existing Internal Combustion Emissions

Table A-17, Continued

EXISTING INTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

	Total Emissions (tpy)						
Emission Unit	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**Pseudo Source Location**
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.08	0.08	1.42	1.75	0.04	0.21	C
Bldg 1550 Generator (1550 hp)	0.27	0.16	9.30	2.13	1.57	0.25	C
Bldg 3909 Generator (1620 hp)	0.28	0.16	9.72	2.23	1.64	0.26	H
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	0.00	0.00	0.00	0.00	0.00	0.00	F
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	0.26	0.26	29.03	4.62	9.43	0.26	F
Bldg 8000 Title V Dynamometers <600 hp	1.10	1.10	15.50	3.34		1.26	B
Bldg 8000 Title V Dynamometers >600 hp					2.02		B
Butts Air Field Engine Test Stand	0.34	0.34	3.03	4.33	1.71	1.63	I
Categorically Exempt Diesel Emergency Generators <600hp							
Area A	0.10	0.10	1.45	0.31	0.10	0.12	A
Area B	0.26	0.26	3.69	0.79	0.24	0.29	B
Area C	0.39	0.39	5.44	1.17	0.36	0.43	C
Area D	0.00	0.00	0.00	0.00	0.00	0.00	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.39	0.39	5.43	1.17	0.36	0.43	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.13	0.13	1.87	0.40	0.12	0.15	H
Area I	0.39	0.39	5.51	1.19	0.36	0.44	I
Categorically Exempt Diesel Emergency Generators >600hp							
Area A	0.00	0.00	0.00	0.00	0.00	0.00	A
Area B	0.00	0.00	0.00	0.00	0.00	0.00	B
Area C	0.00	0.00	0.00	0.00	0.00	0.00	C
Area D	0.06	0.04	2.12	0.49	0.36	0.06	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.00	0.00	0.00	0.00	0.00	0.00	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.06	0.03	2.01	0.46	0.34	0.06	H
Area I	0.00	0.00	0.00	0.00	0.00	0.00	I
Categorically Exempt Natural Gas/Propane Emergency Generators							
Area A	0.01	0.01	0.43	0.05	0.00	0.02	A
Area B	0.01	0.01	0.44	0.05	0.00	0.02	B
Area C	0.01	0.01	0.88	0.11	0.00	0.03	C
Area D	0.00	0.00	0.00	0.00	0.00	0.00	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.02	0.02	1.53	0.19	0.00	0.06	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.00	0.00	0.37	0.05	0.00	0.01	H
Area I	0.00	0.00	0.22	0.03	0.00	0.01	I
Auxiliary Ground Power Units (8 @ 40.5 hp each)	0.52	0.52	7.28	1.57	0.48	0.58	I
Source Category Total	**4.68**	**4.39**	**106.68**	**26.43**	**19.13**	**6.57**	

Table A-17, Continued

EXISTING INTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

Emission Unit	PM	PM_{10}	NO_X	CO	SO_X	VOC	Pseudo Source Location
	Total Emissions (lb/hr)						
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.66	0.66	11.36	14.00	0.30	1.65	C
Bldg 1550 Generator (1550 hp)	1.09	0.62	37.20	8.53	6.27	0.99	C
Bldg 3909 Generator (1620 hp)	1.13	0.65	38.88	8.91	6.55	1.04	H
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	1.83	1.05	62.88	14.41	10.60	1.68	F
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	1.03	1.03	116.13	18.50	37.72	1.03	F
Bldg 8000 Title V Dynamometers <600 hp	0.61	0.61	8.53	1.84	0.56	0.69	B
Bldg 8000 Title V Dynamometers >600 hp	0.42	0.42	14.40	3.30	2.43	0.38	B
Butts Air Field Engine Test Stand (120 tests @ 3 hours each)	1.88	1.88	16.81	24.03	9.51	9.06	I
Categorically Exempt Diesel Emergency Generators <600hp							
Area A	0.41	0.41	5.82	1.25	0.38	0.46	A
Area B	1.05	1.05	14.75	3.18	0.98	1.17	B
Area C	1.55	1.55	21.77	4.69	1.44	1.73	C
Area D	0.00	0.00	0.00	0.00	0.00	0.00	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	2.64	2.64	37.23	8.02	2.46	2.97	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.53	0.53	7.48	1.61	0.49	0.60	H
Area I	1.95	1.95	27.54	5.93	1.82	2.19	I
Categorically Exempt Diesel Emergency Generators >600hp							
Area A	0.00	0.00	0.00	0.00	0.00	0.00	A
Area B	0.00	0.00	0.00	0.00	0.00	0.00	B
Area C	0.00	0.00	0.00	0.00	0.00	0.00	C
Area D	0.49	0.28	16.94	3.88	2.86	0.50	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.00	0.00	0.00	0.00	0.00	0.00	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.47	0.27	16.08	3.69	2.71	0.47	H
Area I	0.00	0.00	0.00	0.00	0.00	0.00	I
Categorically Exempt Natural Gas/Propane Emergency Generators							
Area A	0.02	0.02	1.72	0.21	0.00	0.07	A
Area B	0.02	0.02	1.78	0.22	0.00	0.07	B
Area C	0.09	0.09	7.03	0.86	0.00	0.27	C
Area D	0.00	0.00	0.00	0.00	0.00	0.00	D
Area E	0.00	0.00	0.00	0.00	0.00	0.00	E
Area F	0.07	0.07	6.11	0.74	0.00	0.23	F
Area G	0.00	0.00	0.00	0.00	0.00	0.00	G
Area H	0.02	0.02	1.49	0.18	0.00	0.06	H
Area I	0.01	0.01	0.89	0.11	0.00	0.03	I
Auxiliary Ground Power Units (8 @ 40.5 hp each)	0.71	0.71	10.04	2.16	0.66	0.80	I
Source Category Total	**18.68**	**16.53**	**482.85**	**130.25**	**87.75**	**28.14**	

Table A-17, Continued

EXISTING INTERNAL COMBUSTION SOURCES - ACTUAL ANNUAL EMISSIONS

Pseudo Source Location	Total Emissions (tpy)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
A	0.01	0.01	0.14	0.02	0.00	0.0
B	0.20	0.20	2.80	0.60	0.18	0.2
C	0.08	0.08	1.26	0.27	0.10	0.1
D	0.02	0.01	0.60	0.14	0.10	0.0
E	0.00	0.00	0.00	0.00	0.00	0.0
F	0.20	0.17	4.05	0.90	0.48	0.2
G	0.00	0.00	0.00	0.00	0.00	0.0
H	0.08	0.05	2.59	0.59	0.42	0.1
I	0.62	0.61	7.71	1.86	0.64	0.7
Source Category Total	**1.19**	**1.12**	**19.15**	**4.39**	**1.94**	**1.28**

EXISTING INTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

Pseudo Source Location	Total Emissions (tpy)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
A	0.11	0.11	1.89	0.37	0.10	0.1
B	1.37	1.37	19.63	4.19	2.27	1.6
C	0.75	0.63	17.04	5.16	1.97	0.9
D	0.06	0.04	2.12	0.49	0.36	0.1
E	0.00	0.00	0.00	0.00	0.00	0.0
F	0.66	0.66	35.99	5.98	9.79	0.7
G	0.00	0.00	0.00	0.00	0.00	0.0
H	0.48	0.33	13.97	3.14	2.10	0.5
I	1.25	1.25	16.04	7.11	2.56	2.7
Source Category Total	**4.68**	**4.39**	**106.68**	**26.43**	**19.13**	**6.57**

EXISTING INTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

Pseudo Source Location	Total Emissions (lb/hr)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
A	0.43	0.43	7.54	1.46	0.38	0.5
B	2.09	2.09	39.45	8.53	3.97	2.3
C	3.37	2.91	77.37	28.07	8.01	4.6
D	0.49	0.28	16.94	3.88	2.86	0.5
E	0.00	0.00	0.00	0.00	0.00	0.0
F	5.58	4.79	222.34	41.67	50.78	5.9
G	0.00	0.00	0.00	0.00	0.00	0.0
H	2.15	1.46	63.92	14.39	9.76	2.2
I	4.56	4.56	55.28	32.24	12.00	12.1
Source Category Total	**18.68**	**16.53**	**482.85**	**130.25**	**87.75**	**28.14**

Table A-18. Exempt Internal Combustion Source List

DIESEL EMERGENCY GENERATORS <600 hp

LOCATION	OUTPUT (KW)[a]	RATING (HP)[b]	ANNUAL PTE OPERATING HOURS[c]	PTE HP-HR	FUEL	Hours (end of Dec 2005)	Hours (end of Dec 2006)	Hours Run 2006	ACTUAL HP-HR	Pseudo Source Location
Crow Foot Gate	40	53.6	500	26,800	DIESEL	34.3	58.7	24.4	**1308**	**I**
Gate 1	100	134	500	67,000	DIESEL	44.4	168	123.6	**16562**	**C**
Gate 2	40	53.6	500	26,800	DIESEL	123.8	149.2	25.4	**1361**	**C**
Gate 3	50	67	500	33,500	DIESEL	46.9	68.3	21.4	**1434**	**A**
Gate 4 (Bldg 102)	50	67	500	33,500	DIESEL	59.4	87.3	27.9	**1869**	**A**
Gate 5	40	53.6	500	26,800	DIESEL	36.1	61.5	25.4	**1361**	**A**
Gate 20	50	67	500	33,500	DIESEL	46.4	88.7	42.3	**2834**	**H**
BAAF Gate	40	53.6	500	26,800	DIESEL	40.1	69.7	29.6	**1587**	**I**
Bldg 1014	160	*214.4*	500	107,200	DIESEL	919	970	51	**10934**	**C**
Bldg 1399	60	*80.4*	500	40,200	DIESEL	1416.9	1426	9.1	**732**	**C**
Bldg 1431	50	67	500	33,500	DIESEL	12.4	39.1	26.7	**1789**	**C**
Bldg 1516	50	86	500	43,000	DIESEL	168.7	177.3	8.6	**740**	**C**
Bldg 1525	50	*67*	500	33,500	DIESEL	NIC	NIC	500	**33500**	**C**
Bldg 2404	40	*53.6*	500	26,800	DIESEL	20.4	53.8	33.4	**1790**	**H**
Bldg 2700	50	*67*	500	33,500	DIESEL	82.4	94	11.6	**777**	**H**
Bldg 2757	40	*53.6*	500	26,800	DIESEL	0	24.7	24.7	**1324**	**H**
Bldg 6290	300	465	250	116,250	DIESEL	N/A	N/A	250	**116250**	**F**
Bldg 7400	350	535	250	133,750	DIESEL	98.8	108.2	9.4	**5029**	**F**
Bldg 7499 (150 KW?)	150	*201*	500	100,500	DIESEL	234.5	240	5.5	**1106**	**F**
Bldg 8010	175	*234.5*	500	117,250	DIESEL	818.9	829	10.1	**2368**	**B**
Bldg 8099	180	*241.2*	500	120,600	DIESEL	804.7	854.5	49.8	**12012**	**B**
Bldg 9299 Lift Station	100	***134***	500	67,000	DIESEL	124.1	142.1	18	**2412**	**I**
Bldg 9601	175	355	250	88,750	DIESEL	622.6	635.4	12.8	**4544**	**I**
Bldg 9610	30	45	500	22,500	DIESEL	1132.1	1164	31.9	**1436**	**I**
@ Butts	30	***40.2***	500	20,100	DIESEL	475	484.3	9.3	**374**	**I**
Bldg 9699	125	207	500	103,500	DIESEL	262.3	286.6	24.3	**5030**	**I**
TOTAL		**3,696**		**1,509,400**					**230,463**	

[a] kw entries in *italic* are calculated based on hp rating / 1.34 hp/KW.

[b] hp entries in *italic* are calculated based on KW output * 1.34 hp/KW.

[c] Annual operating hours are based on the amount of hours allowed by the APEN exemption.

Table A-18. Exempt Internal Combustion Source List

Table 18, Continued

DIESEL EMERGENCY GENERATORS >600 HP

LOCATION	OUTPUT (KW)	RATING (HP)	ANNUAL PTE OPERATING HOURS[a]	PTE HP-HR	FUEL	Hours (end of Dec 2005)	Hours (end of Dec 2006)	Hours Run 2006	ACTUAL HP-HR	Pseudo Source Location
Bldg 1860	Not Available	706	250	176,500	DIESEL	145.8	216.3	70.5	**49773**	**D**
Bldg 3895	500	670	250	167,500	DIESEL	718	731	13	**8710**	**H**
TOTAL		**1,376**		**344,000**					**58,483**	

[a] Annual operating hours are based on the amount of hours allowed by the APEN exemption.

NATURAL GAS, PROPANE AND GASOLINE-FIRED EMERGENCY GENERATORS

LOCATION	OUTPUT (KW)[a]	RATING (HP)[b]	ANNUAL PTE OPERATING HOURS[c]	PTE HP-HR	FUEL	Hours (end of Dec 2005)	Hours (end of Dec 2006)	Hours Run 2006	ACTUAL HP-HR	Pseudo Source Location
Bldg 319	50	*67*	500	33,500	NAT. GAS	397.8	413.3	15.5	**1038.5**	**A**
Bldg 500	8	10.72	500	5,360	NAT. GAS	N/A	N/A	500	**5360**	**A**
Bldg 1395	200	*317*	250	79,250	PROPANE	153	157.7	4.7	**1489.9**	**C**
Bldg 2360	50	*67*	500	33,500	NAT. GAS	132.6	143.5	10.9	**730.3**	**H**
Bldg 6257	80	*107.2*	500	53,600	NAT. GAS	193.8	211.6	17.8	**1908.16**	**F**
Bldg 7906	125	168	500	84,000	PROPANE	35.7	46.5	10.8	**1814.4**	**F**
Bldg 8008	60	80	500	40,000	NAT. GAS	24.9	34.1	9.2	**736**	**B**
Bldg 9550	19	25	500	12,500	NAT. GAS	67.5	78.9	11.4	**285**	**I**
Bldg 10012	12	15	500	7,500	PROPANE	79.3	90.1	10.8	**162**	**I**
TOTAL		**857**		**349,210**					**13,524**	

[a] kw entries in *italic* are calculated based on hp rating / 1.34 hp/KW.

[b] hp entries in *italic* are calculated based on KW output * 1.34 hp/KW.

[c] Annual operating hours are based on the amount of hours allowed by the APEN exemption.

Table A-18. Exempt Internal Combustion Source List

Table 18, Continued

DIESEL EMERGENCY GENERATORS <600 hp

Location	Total hp	Total Actual hp-hr	% of Total	Potential hp-hr	% of Total
A	188	4665	2.02	93800	6.21
B	476	14380	6.24	237850	15.76
C	702	65618	28.47	351200	23.27
D	0	0	0.00	0	0.00
E	0	0	0.00	0	0.00
F	1201	122385	53.10	350500	23.22
G	0	0	0.00	0	0.00
H	241	6725	2.92	120600	7.99
I	888	16690	7.24	355450	23.55
Total	**3696**	**230463**	**100**	**1509400**	**100.00**

DIESEL EMERGENCY GENERATORS >600 HP

Location	Total hp	Total Actual hp-hr	% of Total	Potential hp-hr	% of Total
A	0	0	0.00	0	0.00
B	0	0	0.00	0	0.00
C	0	0	0.00	0	0.00
D	706	49773	85.11	176500	51.31
E	0	0	0.00	0	0.00
F	0	0	0.00	0	0.00
G	0	0	0.00	0	0.00
H	670	8710	14.89	167500	48.69
I	0	0	0.00	0	0.00
Total	**1376**	**58483**	**100**	**344000**	**100.00**

NATURAL GAS, PROPANE AND GASOLINE-FIRED EMERGENCY GENERATORS

Location	Total hp	Total Actual hp-hr	% of Total	Potential hp-hr	% of Total
A	78	6399	47.31	38860	11.13
B	80	736	5.44	40000	11.45
C	317	1490	11.02	79250	22.69
D	0	0	0.00	0	0.00
E	0	0	0.00	0	0.00
F	275	3723	27.53	137600	39.40
G	0	0	0.00	0	0.00
H	67	730	5.40	33500	9.59
I	40	447	3.31	20000	5.73
Total	**857**	**13524**	**100**	**349210**	**100.00**

Table A-19. New Internal Combustion

Emission Unit	Size (hp)	Maximum hp	Projected Actual Hours of Operation	Projected Actual hp-hr	Hours of Operation Limit	Maximum Annual hp-hr	Max No. 2 Oil Sulfur Content (%)
Internal Combustion Units							
GTA EIS 3@749 hp	749	2247	132	98,868	250	561,750	0.05
GTA EA							
Area A	749	749	44	32,956	250	187,250	0.05
Area C	749	749	44	32,956	250	187,250	0.05
Area H	749	749	44	32,956	250	187,250	0.05
Warrior in Transition	749	749	44	32,956	250	187,250	0.05
BRAC							
Area C - C2F Generator (2126 hp)	2126	2126	44	93,544	250	531,500	0.05
Area C	1000	1000	44	44,000	250	250,000	0.05
Area E	500	500	44	22,000	250	125,000	0.05
Area E	150	150	44	6,600	250	37,500	0.05
Source Category Total							

[1] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate a maximum of 250 hours per year. The emission factors for NOx, COand PM/PM_{10} are based on US EPA's Tier 2 standards for engines with a rated power of greater than 560 kw: 4.8 g/hp-hr for NOx (non-methane hydrocarbon+NOx standard), 2.6 g/hp-hr for CO and 0.15 g/hp-hr for PM (40 CFR PART 89.112). All PM was assumed to be PM_{10}. The remaining criteria pollutant emission factors are from Section 3.4 OF AP-42. A sulfur content of 0.05 weight percent was assumed.

[2] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate on a maximum of 250 hrs per year. The emission factors for Nox, CO and PM/PM_{10} are based on USEPA's Tier 3 emission standards for generators with a rated power of 130 to 560 kw: 3.0 g/hp-hr for non-methane hydrocarbon+NOx, 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM. All PM was assumed to be PM_{10}. The remaining criteria pollutant emission factors are from Section 3.4 of AP-42. A sulfur content of 0.05 weight percent was assumed.

Table A-19. New Internal Combustion

Table A-19, continued

Emission Unit	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**	**Pseudo Source Location**
	Emission Factor (lb/hp-hr)[1, 2]						
Internal Combustion Units							
GTA EIS 3@749 hp	3.31E-04	3.31E-04	1.06E-02	5.73E-03	4.05E-04	6.42E-04	G
GTA EA							
Area A	3.31E-04	3.31E-04	1.06E-02	5.73E-03	4.05E-04	6.42E-04	A
Area C	3.31E-04	3.31E-04	1.06E-02	5.73E-03	4.05E-04	6.42E-04	C
Area H	3.31E-04	3.31E-04	1.06E-02	5.73E-03	4.05E-04	6.42E-04	H
Warrior in Transition	3.31E-04	3.31E-04	1.06E-02	5.73E-03	4.05E-04	6.42E-04	F
BRAC							
Area C - C2F Generator (2126 hp)	8.81E-05	8.81E-05	1.21E-02	1.39E-03	8.08E-03	1.32E-04	C
Area C	3.31E-04	3.31E-04	1.06E-02	5.73E-03	4.05E-04	6.42E-04	C
Area E	3.40E-04	3.40E-04	6.70E-03	5.80E-03	4.05E-04	6.42E-04	E
Area E	3.40E-04	3.40E-04	6.70E-03	5.80E-03	4.05E-04	6.42E-04	E
Source Category Total							

[1] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate a maximum of 250 hours per year. The emission factors for NOx, COand PM/PM_{10} are based on US EPA's Tier 2 standards for engines with a rated power of greater than 560 kw: 4.8 g/hp-hr for NOx (non-methane hydrocarbon+NOx standard), 2.6 g/hp-hr for CO and 0.15 g/hp-hr for PM (40 CFR PART 89.112). All PM was assumed to be PM_{10}. The remaining criteria pollutant emission factors are from Section 3.4 OF AP-42. A sulfur content of 0.05 weight percent was assumed.

[2] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate on a maximum of 250 hrs per year. The emission factors for Nox, CO and PM/PM_{10} are based on USEPA's Tier 3 emission standards for generators with a rated power of 130 to 560 kw: 3.0 g/hp-hr for non-methane hydrocarbon+NOx, 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM. All PM was assumed to be PM_{10}. The remaining criteria pollutant emission factors are from Section 3.4 of AP-42. A sulfur content of 0.05 weight percent was assumed.

Table A-20. New Internal Combustion Emissions

PROPOSED INTERNAL COMBUSTION SOURCES - PROJECTED ACTUAL ANNUAL EMISSIONS

Emission Unit	Total Emissions (tpy)						Pseudo Source Location
	PM	PM_{10}	NO_X	CO	SO_X	VOC	
Internal Combustion Units							
GTA EIS	1.64E-02	1.64E-02	5.24E-01	2.83E-01	2.00E-02	3.17E-02	G
GTA EA							
Area A	5.45E-03	5.45E-03	1.75E-01	9.44E-02	6.67E-03	1.06E-02	A
Area C	5.45E-03	5.45E-03	1.75E-01	9.44E-02	6.67E-03	1.06E-02	C
Area H	5.45E-03	5.45E-03	1.75E-01	9.44E-02	6.67E-03	1.06E-02	H
Warrior in Transition	5.45E-03	5.45E-03	1.75E-01	9.44E-02	6.67E-03	1.06E-02	F
BRAC							
Area C	4.12E-03	4.12E-03	5.68E-01	6.49E-02	3.78E-01	6.18E-03	C
Area C	7.28E-03	7.28E-03	2.33E-01	1.26E-01	8.91E-03	1.41E-02	C
Area E	3.74E-03	3.74E-03	7.37E-02	6.38E-02	4.46E-03	7.06E-03	E
Area E	1.12E-03	1.12E-03	2.21E-02	1.91E-02	1.34E-03	2.12E-03	E
Source Category Total	**0.05**	**0.05**	**2.12**	**0.93**	**0.44**	**0.10**	

PROPOSED INTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

Emission Unit	Total Emissions (tpy)						Pseudo Source Location
	PM	PM_{10}	NO_X	CO	SO_X	VOC	
Internal Combustion Units							
GTA EIS	0.09	0.09	2.98	1.61	0.11	0.18	G
GTA EA							
Area A	0.03	0.03	0.99	0.54	0.04	0.06	A
Area C	0.03	0.03	0.99	0.54	0.04	0.06	C
Area H	0.03	0.03	0.99	0.54	0.04	0.06	H
Warrior in Transition	0.03	0.03	0.99	0.54	0.04	0.06	F
BRAC							
Area C	0.02	0.02	3.23	0.37	2.15	0.04	C
Area C	0.04	0.04	1.33	0.72	0.05	0.08	C
Area E	0.02	0.02	0.42	0.36	0.03	0.04	E
Area E	0.01	0.01	0.13	0.11	0.01	0.01	E
Source Category Total	**0.31**	**0.31**	**12.04**	**5.31**	**2.50**	**0.59**	

PROPOSED INTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

Emission Unit	Total Emissions (lb/hr)						Pseudo Source Location
	PM	PM_{10}	NO_X	CO	SO_X	VOC	
Internal Combustion Units							
GTA EIS	0.74	0.74	23.82	12.88	0.91	1.44	G
GTA EA							
Area A	0.25	0.25	7.94	4.29	0.30	0.48	A
Area C	0.25	0.25	7.94	4.29	0.30	0.48	C
Area H	0.25	0.25	7.94	4.29	0.30	0.48	H
Warrior in Transition	0.25	0.25	7.94	4.29	0.30	0.48	F
BRAC							
Area C	0.19	0.19	25.80	2.95	17.19	0.28	C
Area C	0.33	0.33	10.60	5.73	0.41	0.64	C
Area E	0.17	0.17	3.35	2.90	0.20	0.32	E
Area E	0.05	0.05	1.01	0.87	0.06	0.10	E
Source Category Total	**2.47**	**2.47**	**96.33**	**42.49**	**19.98**	**4.71**	

Table A-20, Continued

PROPOSED INTERNAL COMBUSTION SOURCES - PROJECTED ACTUAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.01	0.01	0.17	0.09	0.01	0.0
B	0.00	0.00	0.00	0.00	0.00	0.0
C	0.02	0.02	0.98	0.29	0.39	0.0
D	0.00	0.00	0.00	0.00	0.00	0.0
E	0.00	0.00	0.10	0.08	0.01	0.0
F	0.01	0.01	0.17	0.09	0.01	0.0
G	0.02	0.02	0.52	0.28	0.02	0.0
H	0.01	0.01	0.17	0.09	0.01	0.0
I	0.00	0.00	0.00	0.00	0.00	0.0
Source Category Total	**0.05**	**0.05**	**2.12**	**0.93**	**0.44**	**0.10**

PROPOSED INTERNAL COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

	Total Emissions (tpy)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.03	0.03	0.99	0.54	0.04	0.1
B	0.00	0.00	0.00	0.00	0.00	0.0
C	0.10	0.10	5.54	1.62	2.24	0.2
D	0.00	0.00	0.00	0.00	0.00	0.0
E	0.03	0.03	0.54	0.47	0.03	0.1
F	0.03	0.03	0.99	0.54	0.04	0.1
G	0.09	0.09	2.98	1.61	0.11	0.2
H	0.03	0.03	0.99	0.54	0.04	0.1
I	0.00	0.00	0.00	0.00	0.00	0.0
Source Category Total	**0.31**	**0.31**	**12.04**	**5.31**	**2.50**	**0.59**

PROPOSED INTERNAL COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

	Total Emissions (lb/hr)					
Pseudo Source Location	**PM**	**PM_{10}**	**NO_X**	**CO**	**SO_X**	**VOC**
A	0.25	0.25	7.94	4.29	0.30	0.5
B	0.00	0.00	0.00	0.00	0.00	0.0
C	0.77	0.77	44.34	12.97	17.89	1.4
D	0.00	0.00	0.00	0.00	0.00	0.0
E	0.22	0.22	4.36	3.77	0.26	0.4
F	0.25	0.25	7.94	4.29	0.30	0.5
G	0.74	0.74	23.82	12.88	0.91	1.4
H	0.25	0.25	7.94	4.29	0.30	0.5
I	0.00	0.00	0.00	0.00	0.00	0.0
Source Category Total	**2.47**	**2.47**	**96.33**	**42.49**	**19.98**	**4.71**

Table A-21. Miscellaneous Non-Combustion Emissions

Emission Unit	Pseudo Source Location[1]	2006 ACTUAL EMISSIONS					
		PM (tpy)	PM10 (tpy)	NOX (tpy)	CO (tpy)	SOX (tpy)	VOC (tpy)
Coating Activities							
Bldg 207 Paint Booth	A	0.0011	0.0011	0.00	0.00	0.00	0.089
Bldg 2427 Paint Booths	H	0.0032	0.0032	0.00	0.00	0.00	0.23
Bldg 8000 Paint Booths	B	0.45	0.45	0.00	0.00	0.00	5.15
Bldg 9551 Range Paint Booth	I	0.00	0.00	0.00	0.00	0.00	0.0
Bldg 9635 (Butts Air Field Paint Booth)	I	0.061	0.061	0.00	0.00	0.00	0.15
Categorically Exempt Storage Tanks and Associated Operations							
Diesel (No. 2 Oil) Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	0.42
Glycol Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	0.00036
JP-8 Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	9.53
MOGAS Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	7.78
Military Training							
Munition Firing	J	0.00	0.00	0.00	0.00	0.00	0.0080
Open Burning/Open Detonation	J	0.015	0.015	7.78E-05	0.0017	5.35E-06	8.99E-05
Mechanical Smoke Generators	J	0.00	0.00	0.00	0.00	0.00	0.00
Obscurants	J	0.42	0.42	0.00	0.00	0.00	0.00
Chemical Usage							
Basewide Chemical Usage	---	0.00	0.00	0.00	0.00	0.00	2.67
Pesticide Use	---	0.00	0.00	0.00	0.00	0.00	2.51
Solvent Use	---	0.00	0.00	0.00	0.00	0.00	3.63
Road Paint Striping	K	6.85	6.85	0.00	0.00	0.00	1.00
X-Ray	---	0.00	0.00	0.00	0.00	0.00	0.012
Landfill-Related Emissions							
Municipal Landfill	---	0.00	0.00	0.00	0.00	0.00	2.27
Miscellaneous Particulate Emissions							
Abrasive Blasting	B	0.0030	0.0030	0.00	0.00	0.00	0.00
Bldg 1864 Cooling Towers	D	0.51	0.51	0.00	0.00	0.00	0.00
Bldg 7501 Cooling Towers	F	0.72	0.72	0.00	0.00	0.00	0.00
LB&B Yard	K	0.77	0.32	0.00	0.00	0.00	0.00
Rocky Mountain Asphalt Yard	K	1.12	0.34	0.00	0.00	0.00	0.00
Troop Construction Yard	K	1.13	0.50	0.00	0.00	0.00	0.00
Fire Training							
Fire Training Facility	H	0.013	0.013	0.059	0.021	0.00	0.034
Miscellaneous APEN/Permit Exempt Sources							
Industrial Wastewater Treatment Plant	---	0.00	0.00	0.00	0.00	0.00	0.0022
Sewage Treatment Plant	---	0.00	0.00	0.00	0.00	0.00	0.065
Installation-wide Total		**12.07**	**10.21**	**0.06**	**0.02**	**0.00**	**35.55**

[1] Only sources with PM, PM10, NOx, or CO emissions are assigned to a pseudo source, because only those pollutants are modeled.

Table A-21. Miscellaneous Non-Combustion Emissions

Table 21, Continued

Emission Unit	Pseudo Source Location[1]	ANNUAL PTE PM (tpy)	PM10 (tpy)	NOX (tpy)	CO (tpy)	SOX (tpy)	VOC (tpy)	Method of Determining PTE
Coating Activities								
Bldg 207 Paint Booth	A	0.0013	0.0013	0.00	0.00	0.00	0.11	Actual emissions multiplied by a growth factor of 1.25
Bldg 2427 Paint Booths	H	0.0040	0.0040	0.00	0.00	0.00	0.29	Actual emissions multiplied by a growth factor of 1.25
Bldg 8000 Paint Booths	B	0.84	0.84	0.00	0.00	0.00	15.66	Requested permit limits
Bldg 9551 Range Paint Booth	I	0.0091	0.0091	0.00	0.00	0.00	0.65	Based on a growth factor of 1.25 and the 2002 actual emissions
Bldg 9635 (Butts Air Field Paint Booth)	I	0.27	0.27	0.00	0.00	0.00	0.44	Permit limits
Categorically Exempt Storage Tanks and Associated Operations								
Diesel (No. 2 Oil) Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	0.42	24 turnovers per year
Glycol Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	3.55E-04	24 turnovers per year
JP-8 Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	9.5	24 turnovers per year
MOGAS Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	9.73	Actual emissions multiplied by a growth factor of 1.25
Military Training								
Munition Firing	J	0.00	0.00	0.00	0.00	0.00	0.010	Actual emissions multiplied by a growth factor of 1.25
Open Burning/Open Detonation	J	0.019	0.019	0.0001	0.002	0.00001	0.0001	Actual emissions multiplied by a growth factor of 1.25
Mechanical Smoke Generators	J	31.82	31.82	0.00	0.00	0.00	31.82	Permit Limits
Obscurants	J	32.11	32.11	0.00	0.00	0.00	39.00	Permit Limits
Chemical Usage								
Basewide Chemical Usage	---	0.00	0.00	0.00	0.00	0.00	3.34	Actual emissions multiplied by a growth factor of 1.25
Pesticide Use	---	0.00	0.00	0.00	0.00	0.00	3.14	Actual emissions multiplied by a growth factor of 1.25
Solvent Use	---	0.00	0.00	0.00	0.00	0.00	13.20	Permit limits
Road Paint Striping	K	8.6	8.6	0.00	0.00	0.00	1.3	Actual emissions multiplied by a growth factor of 1.25
X-Ray	---	0.00	0.00	0.00	0.00	0.00	0.015	Actual emissions multiplied by a growth factor of 1.25
Landfill-Related Emissions								
Municipal Landfill	---	0.00	0.00	0.00	0.00	0.00	2.27	Based on actual emissions, landfill is closed
Miscellaneous Particulate Emissions								
Abrasive Blasting	B	0.07	0.07	0.00	0.00	0.00	0.00	Permit limits
Bldg 1864 Cooling Towers	D	0.51	0.51	0.00	0.00	0.00	0.00	8760 hours of operation per year
Bldg 7501 Cooling Towers	F	0.72	0.72	0.00	0.00	0.00	0.00	8760 hours of operation per year
LB&B Yard	K	0.97	0.41	0.00	0.00	0.00	0.00	Actual emissions multiplied by a growth factor of 1.25
Rocky Mountain Asphalt Yard	K	1.40	0.42	0.00	0.00	0.00	0.00	Actual emissions multiplied by a growth factor of 1.25
Troop Construction Yard	K	1.41	0.62	0.00	0.00	0.00	0.00	Actual emissions multiplied by a growth factor of 1.25
Fire Training								
Fire Training Facility	H	0.023	0.023	0.11	0.04	0.00	0.06	APEN limit of 4000 gal/CDPHE concurrence
Miscellaneous APEN/Permit Exempt Sources								
Industrial Wastewater Treatment Plant	---	0.00	0.00	0.00	0.00	0.00	0.003	Actual emissions multiplied by a growth factor of 1.25
Sewage Treatment Plant	---	0.00	0.00	0.00	0.00	0.00	0.081	Actual emissions multiplied by a growth factor of 1.25
Installation-wide Total		**78.74**	**76.42**	**0.11**	**0.04**	**0.00**	**131.02**	

[1] Only sources with PM, PM10, NOx, or CO emissions are assigned to a pseudo

Table A-21. Miscellaneous Non-Combustion Emissions

Table 21, Continued

Emission Unit	Pseudo Source Location[1]	HOURLY EMISSION RATE PM (lb/hr)	PM10 (lb/hr)	NOX (lb/hr)	CO (lb/hr)	SOX (lb/hr)	VOC (lb/hr)	Method of Determining Hourly Emission Rate
Coating Activities								
Bldg 207 Paint Booth	A	0.00	0.00	0.00	0.00	0.00	0.11	2080 work hours per year
Bldg 2427 Paint Booths	H	0.00	0.00	0.00	0.00	0.00	0.28	2080 work hours per year
Bldg 8000 Paint Booths	B	0.81	0.81	0.00	0.00	0.00	15.06	2080 work hours per year
Bldg 9551 Range Paint Booth	I	0.01	0.01	0.00	0.00	0.00	0.63	2080 work hours per year
Bldg 9635 (Butts Air Field Paint Booth)	I	0.26	0.26	0.00	0.00	0.00	0.42	2080 work hours per year
Categorically Exempt Storage Tanks and Associated Operations								
Diesel (No. 2 Oil) Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	0.10	8760 hours of operation per year
Glycol Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	0.00	8760 hours of operation per year
JP-8 Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	2.18	8760 hours of operation per year
MOGAS Storage Tanks	---	0.00	0.00	0.00	0.00	0.00	2.22	8760 hours of operation per year
Military Training								
Munition Firing	J	0.00	0.00	0.00	0.00	0.00	0.01	2080 work hours per year
Open Burning/Open Detonation	J	4.78	4.78	0.02	0.55	0.00	0.03	All emissions conservatively assumed to take place in one 8-hour shift
Mechanical Smoke Generators	J	63.13	63.13	0.00	0.00	0.00	63.13	1008 hours (8 hours per day over six 21-day exercises)
Obscurants	J	63.71	63.71	0.00	0.00	0.00	77.38	1008 hours (8 hours per day over six 21-day exercises)
Chemical Usage								
Basewide Chemical Usage	---	0.00	0.00	0.00	0.00	0.00	3.21	2080 work hours per year
Pesticide Use	---	0.00	0.00	0.00	0.00	0.00	3.02	2080 work hours per year
Solvent Use	---	0.00	0.00	0.00	0.00	0.00	12.69	2080 work hours per year
Road Paint Striping	K	8.24	8.24	0.00	0.00	0.00	1.20	2080 work hours per year
X-Ray	---	0.00	0.00	0.00	0.00	0.00	0.01	2080 work hours per year
Landfill-Related Emissions								
Municipal Landfill	---	0.00	0.00	0.00	0.00	0.00	0.52	8760 hours of operation per year
Miscellaneous Particulate Emissions								
Abrasive Blasting	B	0.07	0.07	0.00	0.00	0.00	0.00	2080 work hours per year
Bldg 1864 Cooling Towers	D	0.49	0.49	0.00	0.00	0.00	0.00	2080 hours of operation per year
Bldg 7501 Cooling Towers	F	0.69	0.69	0.00	0.00	0.00	0.00	2080 hours of operation per year
LB&B Yard	K	0.93	0.39	0.00	0.00	0.00	0.00	2080 work hours per year
Rocky Mountain Asphalt Yard	K	1.34	0.41	0.00	0.00	0.00	0.00	2080 work hours per year
Troop Construction Yard	K	1.36	0.60	0.00	0.00	0.00	0.00	2080 work hours per year
Fire Training								
Fire Training Facility	H	5.66	5.66	27.90	9.09	0.00	14.74	All emissions conservatively assumed to take place in one 8-hour shift
Miscellaneous APEN/Permit Exempt Sources								
Industrial Wastewater Treatment Plant	---	0.00	0.00	0.00	0.00	0.00	0.00	8760 hours of operation per year
Sewage Treatment Plant	---	0.00	0.00	0.00	0.00	0.00	0.02	8760 hours of operation per year
Installation-wide Total		**151.49**	**149.26**	**27.92**	**9.63**	**0.00**	**196.95**	

[1] Only sources with PM, PM10, NOx, or CO emissions are assigned to a pseudo

Table 21, Continued

MISCELLANEOUS NON-COMBUSTION SOURCES - ACTUAL ANNUAL EMISSIONS

Pseudo Source Location	Total Emissions (tpy)				
	PM	PM_{10}	NO_X	CO	SO_X
A	0.00	0.00	0.00	0.00	0.00
B	0.45	0.45	0.00	0.00	0.00
C	0.00	0.00	0.00	0.00	0.00
D	0.51	0.51	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00
F	0.72	0.72	0.00	0.00	0.00
G	0.00	0.00	0.00	0.00	0.00
H	0.02	0.02	0.06	0.02	0.00
I	0.06	0.06	0.00	0.00	0.00
J	0.44	0.44	0.00	0.00	0.00
K	9.87	8.02	0.00	0.00	0.00
Source Category Total	**12.07**	**10.21**	**0.06**	**0.02**	**0.00**

MISCELLANEOUS NON-COMBUSTION SOURCES - POTENTIAL ANNUAL EMISSIONS

Pseudo Source Location	Total Emissions (tpy)				
	PM	PM_{10}	NO_X	CO	SO_X
A	0.00	0.00	0.00	0.00	0.00
B	0.91	0.91	0.00	0.00	0.00
C	0.00	0.00	0.00	0.00	0.00
D	0.51	0.51	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00
F	0.72	0.72	0.00	0.00	0.00
G	0.00	0.00	0.00	0.00	0.00
H	0.03	0.03	0.11	0.04	0.00
I	0.28	0.28	0.00	0.00	0.00
J	63.95	63.95	0.00	0.00	0.00
K	12.34	10.02	0.00	0.00	0.00
Source Category Total	**78.74**	**76.42**	**0.11**	**0.04**	**0.00**

MISCELLANEOUS NON-COMBUSTION SOURCES - MAXIMUM HOURLY EMISSIONS

Pseudo Source Location	Total Emissions (lb/hr)				
	PM	PM_{10}	NO_X	CO	SO_X
A	0.00	0.00	0.00	0.00	0.00
B	0.88	0.88	0.00	0.00	0.00
C	0.00	0.00	0.00	0.00	0.00
D	0.49	0.49	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00
F	0.69	0.69	0.00	0.00	0.00
G	0.00	0.00	0.00	0.00	0.00
H	5.66	5.66	27.90	9.09	0.00
I	0.27	0.27	0.00	0.00	0.00
J	131.63	131.63	0.02	0.55	0.00
K	11.87	9.63	0.00	0.00	0.00
Source Category Total	**151.49**	**149.26**	**27.92**	**9.63**	**0.00**

APPENDIX B

Table B-1. Modeling Summary Emissions
Fort Carson Military Reservation

24 hour PTE (tons per day)

Pollutant	Heavy Convoy			Light Convoy		Deployment	Range Traffic		Light Battalion Maneuver	Heavy Battalion Maneuver
	AB	BC	CD	AE	ED	GH	AB	BF		
$PM_{2.5}$	1.6	0.2	1.3	0.1	0.4	0.3	0.7	0.4	0.4	1.1
PM_{10}	7.6	0.3	8.7	1.0	2.5	2.1	4.6	0.6	2.5	7.2
PM	40.7	2.0	28.1	3.2	7.9	7.3	23.5	2.8	7.9	23.2

Annual PTE (tons per year)

Pollutant	Heavy Convoy			Light Convoy		Deployment	Range Traffic		Light Battalion Maneuver	Heavy Battalion Maneuver
	AB	BC	CD	AE	ED	GH	AB	BF		
$PM_{2.5}$	12.5	1.2	5.2	0.6	0.7	3.7	206	115	15.5	90.5
PM_{10}	60.7	2.3	34.9	3.9	4.9	24.5	1375	187	103.5	603.6
PM	325.7	15.7	112.5	12.7	15.9	101.9	7048	843	333.8	1947.1

Table B-2. Heavy Convoy Emissions
Fort Carson Military Reservation

HEAVY BATTALION CONVOY

Legend for abreviations
1 PR = paved road
2 UDR = untreated dirt road
3 TDR = treated dirt road
4 GR = gravel road

Value	Calculations/Comments
2	Number of long convoys (ABCD) per year
2	Number of short convoys (ABC) per year
24	Hours per one-way trip

Dust Suppressant Control Efficiency[a]

Pollutant	Lowest control efficiency (%)	Highest control efficiency (%)
$PM_{2.5}$	58%	59%
PM_{10}	88%	90%
PM	75%	86%

[a] Control efficiency for DustGuard (30% sol. $MgCl_2$)
from EPA/600/R-05/127S/January 2006

CONVOY SEGMENT DESCRIPTION:

Segment	Wheeled Vehicle Road Surface Type	Tracked Vehicle Road Surface Type	Segment Length
AB	PR	TDR	24
BC	TDR	TDR	2
CD	UDR	UDR	14

UNPAVED ROAD SEGMENT EMISSION CALCULATIONS

HEAVY CONVOY PM_{10} EMISSION FACTORS FOR UNPAVED ROADS

Vehicles[a]	Vehicle wt.(tons)[b]	Emission Factor (EF)[c] ($g-PM_{10}$/vkt km/hr)	Emission Factor (EF)[d] ($lb-PM_{10}$/vmt)
SUPPLY VEHICLES			
Utility Trucks HV M1097A2	2.8	7.6	0.9
Ambulance 4 LIT M997A1	3.8	10.2	1.2
Cargo Truck 10T HEMTT M977	19.4	52.8	6.0
Cargo Truck LMTV2.5T M1078A1	10.3	27.9	3.2
Truck 5/4T HMMWV M998A1	2.7	7.3	0.8
Cargo Truck MTV 5T M1083	11.7	32.0	3.6
COMBAT VEHICLES (Tracked)			
Bradley FTG VEH M2A2	32.8	89.5	10.2
Tank CBT 120MM M1A2	64.3	175.3	20.0
Recov Veh FT MED M88A1	53.9	146.9	16.8
Carrier 120MM Mort M1064A3	14.4	39.2	4.5
Carrier CMD Post M1068A3	12.9	35.2	4.0
Carrier Pers M113A3	11.9	32.4	3.7
Carrier CMD Post M577A3	12.8	34.8	4.0

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).

[b] Vehicle weights from Equipment Cheat Sheet 2005, provided by Patty Martinez, Fort Carson Transportation Office (Fort Carson 2005).

[c] Emission factor = 0.003 x (vehicle weight [kg]) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute (DRI 2006).

[d] Average vehicles speed is 20 miles per hour (Meister 2008f).

[e] Duration of training exercise provided by Fort Carson DPW and Range Control personnel (Fort Carson 2008).

Table B-2. Heavy Convoy Emissions
Fort Carson Military Reservation

Table B-2, Continued

HEAVY CONVOY UNCONTROLLED PM_{10} EMISSIONS FROM UNPAVED ROADS

Vehicles[a]	Vehicles per Convoy [a]	Segment Length (miles)			Total VMT (miles)			Uncontrolled Emissions (tons per segment per convoy)		
		AB	BC	CD	AB	BC	CD	AB	BC	CD
SUPPLY VEHICLES (Wheeled)										
Utility Trucks HV M1097A2	27	N/A	3.5	12.5	---	94.5	337.5	---	0.04	0.15
Ambulance 4 LIT M997A1	4	N/A	3.5	12.5	---	14	50	---	0.01	0.03
Cargo Truck 10T HEMTT M977	40	N/A	3.5	12.5	---	140	500	---	0.42	1.51
Cargo Truck LMTV2.5T M1078A1	69	N/A	3.5	12.5	---	241.5	862.5	---	0.38	1.37
Truck 5/4T HMMWV M998A1	77	N/A	3.5	12.5	---	269.5	962.5	---	0.11	0.40
Cargo Truck MTV 5T M1083	12	N/A	3.5	12.5	---	42	150	---	0.08	0.27
COMBAT VEHICLES (Tracked)										
Bradley FTG VEH M2A2	27	24.0	3.5	12.5	648.0	94.5	337.5	3.31	0.48	1.72
Tank CBT 120MM M1A2	14	24.0	3.5	12.5	336.0	49	175	3.36	0.49	1.75
Recov Veh FT MED M88A1	8	24.0	3.5	12.5	192.0	28	100	1.61	0.23	0.84
Carrier 120MM Mort M1064A3	5	24.0	3.5	12.5	120.0	17.5	62.5	0.27	0.04	0.14
Carrier CMD Post M1068A3	3	24.0	3.5	12.5	72.0	10.5	37.5	0.14	0.02	0.08
Carrier Pers M113A3	13	24.0	3.5	12.5	312.0	45.5	162.5	0.58	0.08	0.30
Carrier CMD Post M577A3	6	24.0	3.5	12.5	144.0	21	75	0.29	0.04	0.15
Subtotal								**9.56**	**2.44**	**8.72**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a,b,c,d,e,f; Fort Carson 2008).

0.15	$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.2-2)
0.31	PM_{10} fraction of PM (derived from AP-42, Table 13.2.2-2)

TOTAL EMISSIONS FROM UNPAVED ROAD SEGMENTS

Pollutant	Uncontrolled Emissions Per Segment			Controlled Emissions Per Segment[a,b]		
	AB	BC	CD	AB	BC	CD
$PM_{2.5}$	1.43	0.37	1.31	0.60	0.15	1.31
PM_{10}	9.56	2.44	8.72	1.15	0.29	8.72
PM	30.84	7.87	28.11	7.71	1.97	28.11

[a] Dust suppresant is applied annually, subject to available funds. The lowest control efficiency for the type of dust suppressant was assumed.

[b] Control efficiency is only applicable to treated dirt road segments AB and BC.

Table B-2, Continued

PAVED ROAD SEGMENT EMISSION CALCULATIONS

WEIGHTED AVERAGE VEHICLE WEIGHT FOR WHEELED VEHICLES ON PAVED ROAD SEGMENTS

Vehicles[a]	Vehicle wt.(lbs)	Vehicle wt.(tons)	No. Vehicles	Total Wt. (tons)
Utility Trucks HV M1097A2	5,600	2.80	27	76
Ambulance 4 LIT M997A1	7,500	3.75	4	15
Cargo Truck 10T HEMTT M977	38,800	19.40	40	776
Cargo Truck LMTV2.5T M1078A1	20,500	10.30	69	707
Truck 5/4T HMMWV M998A1	5,380	2.70	77	207
Cargo Truck MTV 5T M1083	23,463	11.70	12	141
Supply Vehicle Subtotal[b]	**101,243**	**51**	**229**	**1,922**
			Weighted Average Vehicle Weight (tons)	**8.4**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).

Paved Road Emission Factor Equation (AP-42, 13.2.1):

EF = [k*(sL/2)^0.65*(W/3)^1.5-C]

Inputs/Assumptions:

W, weighted vehicle weight =	8.4	tons
k, particle size multiplier (AP-42, 13.2.1) =	0.0024	lb/VMT $PM_{2.5}$
	0.016	lb/VMT PM_{10}
	0.082	lb/VMT PM_{30}
C, Tire and brake wear (AP-42, 13.2.1-2)	0.00047	lb/VMT for PM_{10} and TSP
	0.00036	lb/VMT for $PM_{2.5}$
sL, silt load factor (g/m^2) (AP-42, 13.2.1-2)	400	g/m^2 - the highest limit found for silt loading (corresponding to 75% silt and clay)
One Way Trip Mileage:	24	miles
Total VMT	5496	miles

HEAVY CONVOY EMISSIONS FROM PAVED ROAD SEGMENT AB

Pollutant	Emission Factor (lbs/VMT)	Total Emissions[a] per event	
		lbs	tons
$PM_{2.5}$	3.51E-01	1,930	1.0
PM_{10}	2.34E+00	12,878	6.4
PM	1.20E+01	66,012	33.0

[a] Emissions are based on AP-42 13.2.1 Paved Roads, revised draft 01/2006.

Table B-2. Heavy Convoy Emissions
Fort Carson Military Reservation

Table B-2, Continued

TOTAL HEAVY CONVOY EMISSIONS PER SEGMENT - WHEELED AND TRACKED VEHICLES

Pollutant	24-hr Controlled Emissions Per Segment (tons)[a,b]			One-way Short Convoy (ABC) Emissions (tons)	One-way Long Convoy (ABCD) Emissions (tons)
	AB	BC	CD		
$PM_{2.5}$	1.57	0.15	1.31	1.72	3.03
PM_{10}	7.59	0.29	8.72	7.88	16.59
PM	40.72	1.97	28.11	42.68	70.80

TOTAL ANNUAL EMISSIONS FROM HEAVY CONVOYS

Pollutant	Convoys per year		Short Convoy (ABC) Emissions (tpy)		Long Convoy (ABCD) Emissions (tpy)		Total
	Short	Long	Round Trip	Annual Total	Round Trip	Annual Total	(tpy)
$PM_{2.5}$	2	2	3.44	6.88	6.06	12.11	19.00
PM_{10}	2	2	15.76	31.52	33.19	66.38	97.89
PM	2	2	85.37	170.73	141.59	283.19	453.92

Table B-3 Light Convoy Emissions
Fort Carson Military Reservation

LIGHT BATTALION CONVOY

Legend for abreviations
1 PR = paved road
2 UDR = untreated dirt road
3 TDR = treated dirt road
4 GR = gravel road

Value	Calculations/Comments
1	Number of long convoys (AED) per year
1	Number of short convoys (AE) per year
24	Hours per one-way trip

CONVOY SEGMENT DESCRIPTION:

Segment	Wheeled Vehicle Road Surface Type	Tracked Vehicle Road Surface Type	Segment Length
AE	UDR	UDR	6
ED	UDR	UDR	15

LIGHT CONVOY PM_{10} EMISSION FACTORS FOR UNPAVED ROADS

Vehicles[a]	Vehicle wt.(tons)[b]	Emission Factor (EF)[c] (g-PM_{10}/vkt km/hr)	Emission Factor (EF)[d] (lb-PM_{10}/vmt)
Utility Trucks HV M1097A2	2.8	7.6	0.9
Ambulance 4 LIT M997A1	3.8	10.2	1.2
Cargo Truck LMTV2.5T M1078A1	10.3	27.9	3.2
Truck 5/4T HMMWV M998A1	2.7	7.3	0.8
Cargo Truck MTV 5T M1083	11.7	32.0	3.6
Cargo Truck D/S 5T M923A1	11.1	30.2	3.4

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).

[b] Vehicle weights from Equipment Cheat Sheet 2005, provided by Patty Martinez, Fort Carson Transportation Office (Fort Carson 2005).

[c] Emission factor = 0.003 x (vehicle weight [kg]) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute (DRI 2006).

[d] Average vehicles speed is 20 miles per hour (Meister 2008f).

[e] Duration of training exercise provided by Fort Carson DPW and Range Control personnel (Fort Carson 2008).

Table B-3 Light Convoy Emissions
Fort Carson Military Reservation

Table B-3, Continued

LIGHT CONVOY UNCONTROLLED PM_{10} EMISSIONS FROM UNPAVED ROADS

Vehicles[a]	Vehicles per Convoy [a]	Segment Length (miles)		Total VMT (miles)		Uncontrolled Emissions (tons/segment)	
		AE	ED	AE	ED	AE	ED
Utility Trucks HV M1097A2	28	6	15	168	420	0.07	0.18
Ambulance 4 LIT M997A1	4	6	15	24	60	0.01	0.03
Cargo Truck LMTV2.5T M1078A1	26	6	15	156	390	0.25	0.62
Truck 5/4T HMMWV M998A1	148	6	15	888	2220	0.37	0.93
Cargo Truck MTV 5T M1083	15	6	15	90	225	0.16	0.41
Cargo Truck D/S 5T M923A1	11	6	15	66	165	0.11	0.28
Subtotal						**0.99**	**2.46**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).

0.15	$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.2-2)
0.31	PM_{10} fraction of PM (derived from AP-42, Table 13.2.2-2)

TOTAL EMISSIONS FROM LIGHT CONVOY ROAD SEGMENTS

Pollutant	Uncontrolled Emissions Per Segment (tons)		One-way Short Convoy (AE) Emissions (tons)	One-way Long Convoy (AED) Emissions (tons)
	AE	ED		
$PM_{2.5}$	0.15	0.37	0.15	0.52
PM_{10}	0.99	2.46	0.99	3.45
PM	3.18	7.95	3.18	11.13

TOTAL ANNUAL EMISSIONS FROM LIGHT CONVOYS

Pollutant	Convoys per year		Short Convoy (AE) Emissions (tpy)		Long Convoy (AED) Emissions (tpy)		Total
	Short	Long	Round Trip	Annual Total	Round Trip	Annual Total	(tpy)
$PM_{2.5}$	1	1	0.30	0.30	1.03	1.03	1.33
PM_{10}	1	1	1.97	1.97	6.90	6.90	8.87
PM	1	1	6.36	6.36	22.25	22.25	28.61

Table B-4. Maneuver Emissions
Fort Carson Military Reservation

Legend for abreviations
1 PR = paved road
2 UDR = untreated dirt road
3 TDR = treated dirt road
4 GR = gravel road

Value	Calculations/Comments
1	Number of Annual Training Events
19	Number of Days per Annual Training Event
24	Hours of training per day
0.15	$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.2-2)
0.31	PM_{10} fraction of PM (derived from AP-42, Table 13.2.2-2)
2	Number of Light Battalion maneuvers per year

Maneuver Assumptions: 4 designated areas for maneuvers **21 days per year maneuver exercise**

Worst case 24-hour assumption: 2 maneuver areas on UDR active in the same time with either a calvary or armored company. Total VMT per vehicle type per 24-hour period is equal to the average total VMT per vehicle type for the entire training period of 21 days.

A total of 6 battalions, 4 heavy and 2 light will maneuver annualy.

One Light Battalion maneuvers on UDR for a Maximum of 21 days

Vehicles[a]	Vehicle wt. (tons)[b]	Total No. Vehicles[a] per battalion	Factor (EF)[c] ($g-PM_{10}$/vkt km/hr)	Emission Factor (EF)[d] ($lb-PM_{10}$/vmt)	Daily Miles per Active Vehicle[a]	# Days[e]	Total VMT (miles)	Uncontrolled Emissions (tons/training event)
Utility Trucks HV M1097A2	2.8	28	7.6	1.3	10	19	5,320	3.48
Ambulance 4 LIT M997A1	3.8	4	10.2	1.7	10	19	760	0.66
Cargo Truck LMTV2.5T M1078A1	10.3	26	27.9	4.8	10	19	4,940	11.81
Truck 5/4T HMMWV M998A1	2.7	148	7.3	1.3	10	19	28,120	17.65
Cargo Truck MTV 5T M1083	11.7	15	32.0	5.5	10	19	2,850	7.80
Cargo Truck D/S 5T M923A1	11.1	11	30.2	5.2	10	19	2,090	5.41
Subtotal							**Supply Vehicle Subtotal**	**47**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008)

[b] Vehicle weights from Equipment Cheat Sheet 2005, provided by Patty Martinez, Fort Carson Transportation Office (Fort Carson 2005).

[c] Emission factor = 0.003 x (vehicle weight [kg]) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute (DRI 2006).

[d] Average vehicles speed is 20 miles per hour (Meister 2008f).

[e] Duration of training exercise provided by Fort Carson DPW and Range Control personnel (Fort Carson 2008).

Table B-4. Maneuver Emissions
Fort Carson Military Reservation

Table B-4, Continued

One Heavy Battalion Maneuvers on UDR for a Maximum of 21 days

Vehicles[a]	Vehicle wt.(tons)[b]	No. Active Vehicles Per Day[a] for a company	Factor (EF)[c] (g-PM_{10}/vkt km/hr)	Emission Factor (EF)[d] (lb-PM_{10}/vmt)	Daily Miles per Active Vehicle[a]	# Days[e]	Total VMT (milles)	Uncontrolled Emissions (tons/training event)
SUPPLY VEHICLES								
Utility Trucks HV M1097A2	2.8	27	7.6	1.3	5	19	2,565	1.68
Ambulance 4 LIT M997A1	3.8	1	10.2	1.7	10	19	190	0.17
Ambulance 4 LIT M997A1	3.8	3	10.2	1.7	5	19	285	0.25
Cargo Truck 10T HEMTT M977	19.4	1	52.8	9.1	14.78	19	281	1.27
Cargo Truck 10T HEMTT M977	19.4	39	52.8	9.1	5	19	3,705	16.77
Cargo Truck LMTV2.5T M1078A1	10.3	69	27.9	4.8	5	19	6,555	15.67
Truck 5/4T HMMWV M998A1	2.7	2	7.3	1.3	27.23	19	1,035	0.65
Truck 5/4T HMMWV M998A1	2.7	75	7.3	1.3	5	19	7,125	4.47
Cargo Truck MTV 5T M1083	11.7	1	32.0	5.5	20.14	19	383	1.05
Cargo Truck MTV 5T M1083	11.7	11	32.0	5.5	5	19	1,045	2.86
Subtotal		**229**					**Supply Vehicle Subtotal**	**45**
COMBAT VEHICLES (Tracked)								
Bradley FTG VEH M2A2	32.8	27	89.5	15.3	5	19	2,565	19.65
Tank CBT 120MM M1A2	64.3	14	175.3	30.0	12.8	19	3,405	51.11
Recov Veh FT MED M88A1	53.9	1	146.9	25.2	17.28	19	328	4.13
Recov Veh FT MED M88A1	53.9	7	146.9	25.2	5	19	665	8.36
Carrier 120MM Mort M1064A3	14.4	5	39.2	6.7	5	19	475	1.60
Carrier CMD Post M1068A3	12.9	3	35.2	6.0	5	19	285	0.86
Carrier Pers M113A3	11.9	1	32.4	5.6	21.22	19	403	1.12
Carrier Pers M113A3	11.9	12	32.4	5.6	5	19	1,140	3.16
Carrier CMD Post M577A3	12.8	6	34.8	6.0	5	19	570	1.70
Subtotal		**76**					**Combat Vehicle Subtotal**	**92**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008)

[b] Vehicle weights from Equipment Cheat Sheet 2005, provided by Patty Martinez, Fort Carson Transportation Office (Fort Carson 2005).

[c] Emission factor = 0.003 x (vehicle weight [kg]) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute (DRI 2006).

[d] Average vehicles speed is 20 miles per hour (Meister 2008f).

[e] Duration of training exercise provided by Fort Carson DPW and Range Control personnel (Fort Carson 2008).

Proposed PTE for Maneuvers on UDR

Pollutant	Total Uncontrolled Emissions from one Light Company (24 hrs)		Total Uncontrolled Emissions from one Heavy Company (24 hrs)		Total Annual Uncontrolled Emissions from 4 Heavy and 2
	lbs/day	tons/day	lbs/day	tons/day	tpy
$PM_{2.5}$	739	0	2,156	1	106
PM_{10}	4,927	2	14,371	7	707
PM	15,893	8	46,358	23	2,281

Table B-5. Deployment Emissions
Fort Carson Military Reservation

Legend for Abreviations
1 PR = paved road
2 UDR = untreated dirt road
3 TDR = treated dirt road
4 GR = gravel road

Assumption: 1 Light and 1 heavy brigade travel on deployment route GH = 4 total miles one way
One Heavy and one Light Brigade deploys over 3 days one way, once a year
Duration of one way trip = 3 Days

Light Brigade Travels on Segment GH = 4 Miles PR

Vehicles[a]	Vehicle wt.(lbs)	Vehicle wt.(tons)[a]	No. Vehicles	Total Wt. (tons)
Utility Trucks HV M1097A2	5,600	2.8	111	311
Ambulance 4 LIT M997A1	7,500	3.8	17	64
Cargo Truck LMTV2.5T M107	20,500	10.3	103	1056
Truck 5/4T HMMWV M998A1	5,380	2.7	591	1590
Cargo Truck MTV 5T M1083	23,463	11.7	60	704
Cargo Truck D/S 5T M923A1	22,175	11.1	43	477
Total	**84,618**	**42**	**925**	**4,201**
	Weighted Average Vehicle Weight (tons)			**4.5**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).

Paved Roads (AP-42, 13.2.1)
Emission Factor Equation:
EF = [k*(sL/2)^0.65*(W/3)^1.5-C]*(1-P/4N)

Inputs/Assumptions:

k, particle size multiplier (AP-42, 13.2.1) =	0.0024	lb/VMT PM-2.5
	0.016	lb/VMT PM-10
	0.082	lb/VMT PM-30
C, Tire and brake wear (AP-42, 13.2.1-2)	0.00047	lb/VMT for PM-10 and TSP
	0.00036	lb/VMT for PM-25
sL, silt load factor (g/m^2) (AP-42, 13.2.1-2)	400	g/m^2 - the highest limit found for silt loading (corresponding at 75% silt and clay)
Total one way trip mileage for two brigades	4	miles based on calculation from the drawing (1 inch road length = 2539 m, 4 miles one way)
Number of one way trips for a deployment event	2	trips
Number of projected annual events:	1	trips
Duration of one way trip	3	days

Proposed PTE for Light brigade on Wheeled Vehicles on Segment GH = 4 miles

Pollutant	Emission Factor (lbs/VMT)	Total Emissions[a] (24hrs) lbs	Total Emissions[a] (24hrs) tons	Total Annual Emissions[a] lbs/yr	Total Annual Emissions[a] tpy
$PM_{2.5}$	1.40E-01	172	0.1	1,033	1
PM_{10}	9.33E-01	1,150	1	6,901	3
PM	4.78E+00	5,897	3	35,381	18

[a] Emissions are based on AP-42 13.2.1 Paved Roads, revised draft 01/2006.

Table B-5, Continued

Heavy Brigade Travels with Wheeled Vehicles on Segment GH = 4 Miles

Vehicles[a]	Wheeled or Tracked?	Vehicle wt.(lbs)	Vehicle wt.(tons)	No. Vehicles	Total Wt. (tons)
Supply Vehicles					
Utility Trucks HV M1097A2	Wheeled	5,600	2.80	107	300
Ambulance 4 LIT M997A1	Wheeled	7,500	3.8	17	64
Cargo Truck 10T HEMTT M977	Wheeled	38,800	19.40	158	3,065
Cargo Truck LMTV2.5T M1078A1	Wheeled	20,500	10.30	276	2,829
Truck 5/4T HMMWV M998A1	Wheeled	5,380	2.70	308	829
Cargo Truck MTV 5T M1083	Wheeled	23,463	11.70	45	528
Supply Vehicle Subtotal[b]		**101,243**	**51**	**911**	**7,614**
				Weighted Average Vehicle Weight (tons)	**8.4**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).

Paved Roads (AP-42, 13.2.1)

Emission Factor Equation:

EF = [k*(sL/2)^0.65*(W/3)^1.5-C]*(1-P/4N)

Inputs/Assumptions:

k, particle size multiplier (AP-42, 13.2.1) =	0.0024	lb/VMT PM-2.5
	0.016	lb/VMT PM-10
	0.082	lb/VMT PM-30
C, Tire and brake wear (AP-42, 13.2.1-2)	0.00047	lb/VMT for PM-10 and TSP
	0.00036	lb/VMT for PM-25
sL, silt load factor (g/m^2) (AP-42, 13.2.1-2)	400	g/m^2 - the highest limit found for silt loading (corresponding at 75% silt and clay)
Total one way trip mileage for two brigades	4	miles based on calculation from the drawing (1 inch road length = 2539 m, 4 miles one way)
Number of one way trips for a deployment event	2	trips
Number of projected annual events:	1	trips
Duration of one way trip	3	days

Proposed PTE for Heavy Brigade Wheeled Vehicles on Segment GH = 4 Miles

Pollutant	Emission Factor	Total Emissions[a] (24hrs)		Total Annual Emissions[a]	
	(lbs/VMT)	lbs	tons	lbs/yr	tpy
$PM_{2.5}$	3.49E-01	424	0	2,544	1
PM_{10}	2.33E+00	2,829	1	16,973	8
PM	1.19E+01	14,500	7	87,003	44

[a] Emissions are based on AP-42 13.2.1 Paved Roads, revised draft 01/2006.

Table B-5, Continued

Heavy Convoy Uncontrolled PM_{10} Emissions from TDR Segment GH

Vehicles[a]	No. Vehicles[a]	Vehicle wt.(tons)[b]	Emission Factor (EF)[c] (g-PM_{10}/vkt km/hr)	Emission Factor (EF)[d] (lb-PM_{10}/vmt)	Segment Length (miles)	Total VMT (miles)	Uncontrolled Emissions (tons/segment)
Combat Vehicles (Tracked)							
Bradley FTG VEH M2A2	108	32.8	89.5	10.2	4	432	2.21
Tank CBT 120MM M1A2	58	64.3	175.3	20.0	4	232	2.32
Recov Veh FT MED M88A1	29	53.9	146.9	16.8	4	116	0.97
Carrier 120MM Mort M1064A3	18	14.4	39.2	4.5	4	72	0.16
Carrier CMD Post M1068A3	9	12.9	35.2	4.0	4	36	0.07
Carrier Pers M113A3	51	11.9	32.4	3.7	4	204	0.38
Carrier CMD Post M577A3	24	12.8	34.8	4.0	4	96	0.19
Subtotal							**6.30**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).
[b] Vehicle weights from Equipment Cheat Sheet 2005, provided by Patty Martinez, Fort Carson Transportation Office (Fort Carson 2005).
[c] Emission factor = 0.003 x (vehicle weight [kg]) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute (DRI 2006).
[d] Average vehicles speed is 20 miles per hour (Meister 2008f).
[e] Duration of training exercise provided by Fort Carson DPW and Range Control personnel (Fort Carson 2008).

0.15	$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.2-2)
0.31	PM_{10} fraction of PM (derived from AP-42, Table 13.2.2-2)

Number of one way trips for a deployment event	2 trips
Number of projected annual events:	1 trips
Duration of one way trip	3 days

Total Emissions from Tracked Vehicles on TDR Segment GH

Pollutant	Total Emissions (24hrs)		Total Annual Emissions[a]	
	lbs	tons	lbs/yr	tpy
$PM_{2.5}$	630	0.3	3,782	1.9
PM_{10}	4,202	2.1	25,213	12.6
PM	13,555	6.8	81,331	40.7

Total Emissions from all Vehicles Segment GH

Pollutant	Total Emissions[a] (24hrs)		Total Annual Emissions[a]	
	lbs	tons	lbs/yr	tpy
$PM_{2.5}$	630	0.3	7,359	4
PM_{10}	4,202	2.1	49,087	25
PM	14,500	7.3	203,715	102

Table B-6. Range Traffic Emissions
Fort Carson Military Reservation

Legend for abreviations
1 PR = paved road
2 UDR = untreated dirt road
3 TDR = treated dirt road
4 GR = gravel road

ROAD SEGMENT DESCRIPTION:

Segment	Wheeled Vehicle Road Surface Type	Segment Length
AB	PR	24
BF	GR	4

Assumption: 100 vehicles per day based on heavy BCT weighted average, travel on down-range route ABF= AB + BF = 28 miles one way
AB = 24 miles one way on PR
BF = 5 miles one way on GR
Assumption: For gravel road will consider the highest efficiency control used to calculate dust control on trated dust roads using the same type of suppresant $MgCl_2$.

Paved Roads (AP-42, 13.2.1)
Emission Factor Equation:
EF = [k*(sL/2)^0.65*(W/3)^1.5-C]*(1-P/4N)

Inputs/Assumptions:

W, weighted vehicle weight =	8.4	tons
k, particle size multiplier (AP-42, 13.2.1) =	0.0024	lb/VMT PM-2.5
	0.016	lb/VMT PM-10
	0.082	lb/VMT PM-30
C, Tire and brake wear (AP-42, 13.2.1-2)	0.00047	lb/VMT for PM-10 and TSP
	0.00036	lb/VMT for PM-25
sL, silt load factor (g/m^2) (AP-42, 13.2.1-2)	292	g/m^2 - the highest mean found for silt loading ("Copper Smelting" value) (corresponding at 75% silt and clay)
Total trip mileage over 24 hrs:	24	miles based on calculation from the drawing (1 inch road length = 2539 m, 24 miles one way)
Number of projected round trips per day:	100	trips
Daily VMT:	2400	miles
Number of active days per year:	300	days

Proposed PTE for 100 Vehicles Traveling to the Range on Portion AB = 24 miles PR

Pollutant	Emission Factor	Total Emissions[a] (24hrs)		Total Annual Emissions[a]	
	(lbs/VMT)	lbs	tons	lbs/yr	tpy
$PM_{2.5}$	2.86E-01	1,374	0.7	412,069	206
PM_{10}	1.91E+00	9,166	4.6	2,749,906	1,375
PM	9.79E+00	46,987	23.5	14,096,062	7,048

[a] Emissions are based on AP-42 13.2.1 Paved Roads, revised draft 01/2006.

100 Vehicles Travel on Range Traffic Portion BF = 4 miles on GR

Vehicles[a]		Average Vehicle wt.(tons)	No. Active Vehicles per Day	Emission Factor (EF)[c] (g-PM_{10}/vkt km/hr)	Emission Factor (EF)[d] (lb-PM_{10}/vmt)	Daily Miles per Active Vehicle[a]	# Days[e]	Total VMT (milles)	Uncontrolled Emissions (tons/day)
		8	**100**	**272**	**31**	**4.00**	**1.00**	**400**	**6.2**

[a] Vehicle information provided by Fort Carson DPW and Range Control personnel, (Meister 2008a, 2008b, 2008c, 2008d, 2008e, 2008f; Fort Carson 2008).
[b] Vehicle weights from Equipment Cheat Sheet 2005, provided by Patty Martinez, Fort Carson Transportation Office (Fort Carson 2005).
[c] Emission factor = 0.003 x (vehicle weight [kg]) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute (DRI 2006).
[d] Average vehicles speed is 20 miles per hour (Meister 2008f).
[e] Duration of training exercise provided by Fort Carson DPW and Range Control personnel (Fort Carson 2008).

0.15	$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.2-2)
0.31	PM_{10} fraction of PM (derived from AP-42, Table 13.2.2-2)

Table B-6, Continued

Dust Suppressant Control Efficiency[a]

Pollutant	Highest control efficiency (%)
$PM_{2.5}$	59%
PM_{10}	90%
PM	86%

[a] Control efficiency for DustGuard (30% sol. $MgCl_2$) from EPA/600/R-05/127S/January 2006.

Proposed PTE for 100 vehicles traveling to the range on portion BF = 4 miles GR

	Total Uncontrolled Emissions per Event (24 hrs)		Total Annual Uncontrolled Emissions		Total Controlled Emissions per Event (24 hrs)[a]		Total Annual Controlled Emissions	
	lbs/hr[a]	Tons	lbs/yr	tpy	lbs/hr[a]	Tons	lbs/yr	tpy
$PM_{2.5}$	1,866	1	559,894	280	765	0	229,556	115
PM_{10}	12,442	6	3,732,624	1866	1,244	1	373,262	187
PM	40,136	20	12,040,723	6,020	5,619	3	1,685,701	843

[a] The highest dust control efficiency was assumed for the gravel road as follows: $PM_{2.5}$: 59%; PM_{10}: 90%; and PM: 86% (see above).

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FINAL

Prevention of Significant Deterioration (PSD) Applicability Analysis

for

Infantry Brigade Combat Team (IBCT) US Army Garrison (USAG) Fort Carson

Prepared for:

Department of the Army

Directorate of Public Works, Environmental Division

USAG Fort Carson

Fort Carson, Colorado

URS

8181 E. Tufts Avenue
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January 2009

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PREVENTION OF SIGNIFICANT DETERIORATION (PSD) APPLICABILITY ANALYSIS

for

Infantry Brigade Combat Team (IBCT)
US Army Garrison (USAG) Fort Carson
Fort Carson, Colorado

Prepared for
USAG Fort Carson
Directorate of Public Works, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078, Delivery Order 0005 (URS Project No. 39455606)

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12 January 2009

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Tables

Appendices

List of Acronyms

AAFES	Army and Air Force Exchange Service
bhp	brake horsepower
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
CY	calendar year
DECAM	Fort Carson Directorate of Environmental Compliance and Management
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
Fort Carson	US Army Garrison (USAG) Fort Carson
GTA	Grow the Army
IBCT	Infantry Brigade Combat Team
km^2	square kilometers
MMBtu/hr	million British thermal units per hour
NO_x	nitrogen oxides
PM_{10}	Particulate Matter with an aerodynamic diameter less than 10 micrometers
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
SIC	Standard Industrial Classification
SO_x	sulfur oxides
tpy	tons per year
USAG	US Army Garrison
VOC	volatile organic compound

Executive Summary

Emissions from the proposed Infantry Brigade Combat Team (IBCT) were analyzed for major source Prevention of Significant Deterioration (PSD) permitting applicability in support of the Grow the Army Environmental Impact Statement (EIS) for the US Army Garrison (USAG) Fort Carson (Fort Carson). New major stationary sources of air emissions or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology.

For purposes of this PSD analysis, the modification is defined as the IBCT sources: although the Combat Aviation Brigade (CAB) is also included in the GTA EIS, this is done for convenience. The CAB is not considered part of the same modification under PSD rules and, therefore, is not included in this analysis. This document demonstrates that the proposed IBCT activities at will not be subject to the PSD permitting requirements under New Source Review regulations based on the following:

- Fort Carson is currently classified as a major stationary source because it has the potential to emit (PTE) over 250 tons per year (tpy) of nitrogen oxides (NOx), as shown in Table ES-1.
- Fort Carson's boilers and hot water generators are classified as a major stationary source because they have a combined heat input of over 250 million British thermal units per hour, and they have a PTE over 100 tpy of NO_x and carbon monoxide (CO).
- The increase in emissions due to IBCT activities is less than the applicable major modification threshold for all criteria pollutants, as shown in Table ES-2.

Table ES-1. Current PTE at Fort Carson

Pollutant	Post-wide PTE (tpy)	Boilers and Hot Water Generators PTE (tpy)
NO_x	**312.29**	**168.95**
Sulfur Oxides (SO_x)	65.73	46.82
CO	210.56	**148.85**
Volatile Organic Compounds (VOCs)	94.58	9.77
Particulate Matter	55.84	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	55.20	14.95

Table ES-2. PTE Increase from Proposed Stationary Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOCs (tpy)	Lead (tpy)
Proposed Stationary Point Sources	3.04	16.93	34.17	0.35	2.31	negligible
Major Modification Threshold	15	40	100	40	40	0.6

1.0 Background

Due to activities associated with Infantry Brigade Combat Team (IBCT), the number of personnel at US Army Garrison (USAG) Fort Carson (Fort Carson) and its support facilities will increase. Consequently, emissions will increase due to the addition of the following emission sources:

- Stationary external combustion sources (i.e., boilers, hot water generators, furnaces, space heaters, and domestic water heaters) with a combined total heat input of approximately 90 million British thermal units per hour (MMBtu/hr); and
- Three stationary internal combustion sources (i.e., emergency generators) with a brake horsepower (bhp) rating of 749 each.

New major stationary sources or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology. This document demonstrates that the proposed modifications at Fort Carson are not a major modification and, therefore, will not be subject to PSD permitting.

2.0 Location Description

Fort Carson consists of military support facilities and extensive training areas, including over fifty ranges, other training locations, and the Butts Army Air Field. The Army installation is located in the east-central portion of Colorado at the foot of the Rocky Mountain Front Range. Fort Carson occupies land between the cities of Colorado Springs and Pueblo, a distance of approximately 25 miles. The northwest tip of the installation is located in El Paso County and lies within the Colorado Springs metropolitan area, approximately 8 miles south of downtown Colorado Springs (population 360,890). This area comprises approximately 22.3 square kilometers (km^2) and is known as the cantonment area. The cantonment area contains military housing, facilities, and the Post Headquarters. The balance of training rangeland occupies approximately 535 km^2 in southern El Paso, Fremont, and Pueblo Counties. Fort Carson's boundaries are adjacent to Colorado Springs to the north, State Highway 115 to the west, private land to the south, and Interstate 25 to the east. Land use adjacent to Fort Carson includes municipal, residential, agricultural, industrial, and other privately held interests. Fort Carson measures from 2 to 15 miles in width east to west and 24 miles in length north to south.

The majority of the air pollutant-emitting sources at Fort Carson are located in the cantonment area, which is located in El Paso County. Other than military training involving fog oil and graphite, there are no significant stationary point sources located in the training range area.

Fort Carson is located in an attainment area for all criteria pollutants. The Great Sand Dunes National Park and Preserve is a federal Class I designated area within 100 kilometers of the facility. Florissant Fossil Beds National Monument is a Class II area within 100 kilometers of the facility which has been designated by the State of Colorado to have the same sulfur dioxide increment as a federal Class I area. [Colorado Department of Public Health and Environment (CDPHE) Regulation 3, Part D, VIII.B]

3.0 PSD Program Description

New major stationary sources or major modifications to existing stationary sources are required to obtain PSD preconstruction permits. The PSD permitting process requires the applicant to demonstrate that the project will have no significant deterioration of ambient air quality in an attainment area. The following are elements and associated information necessary for determining PSD applicability of a new source:

- Define the source by determining all related activities under the same two-digit Standard Industrial Classification (SIC) code that are controlled by the same owner or operator and located on contiguous or adjacent properties, including all support facilities.
- Define the applicability thresholds for the major stationary source.
- Define the source's potential to emit (PTE) by determining the sum of emissions for each pollutant from each emission unit. This calculation includes fugitive emissions from the 28 source categories listed in Table 3-1 and sources subject to New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants as of 7 August 1980.
- Assess local area attainment status by determining whether the area is in an attainment or unclassifiable region for at least one criteria pollutant. PSD applies only in attainment or unclassifiable regions.
- Determine the pollutants that are subject to PSD review. Each attainment and other regulated pollutant emitted in "significant" quantities are also included.
- Compare the source's PTE to the appropriate major source thresholds. The source is a major source if the emissions of any pollutant exceed applicable threshold regardless of the area designation (i.e., attainment, non-attainment, or non-criteria pollutants). If an individual unit is classified as one of the 28 regulated source categories (Table 3-1) and its emissions exceed 100 tons per year (tpy), then the unit is a major source. The facility can also be a PSD major source if its facility-wide emissions exceed 250 tpy, regardless of having a listed PSD source category.

Table 3-1. PSD Source Categories with 100 tpy Major Source Thresholds

1. Coal cleaning plants (with thermal dryers)	15. Coke oven batteries
2. Kraft pulp mills	16. Sulfur recovery plants
3. Portland cement plants	17. Carbon black plants (furnace process)
4. Primary zinc smelters	18. Primary lead smelters
5. Iron and steel mills	19. Fuel conversion plants
6. Primary aluminum ore reduction plants	20. Sintering plants
7. Primary copper smelters	21. Secondary metal production plants
8. Municipal incinerators capable of charging more than 250 tons of refuse per day	22. Chemical process plants
9. Hydrofluoric acid plants	23. Fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr heat input
10. Sulfuric acid plants	24. Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels
11. Nitric acid plants	25. Taconite ore processing plants
12. Petroleum refineries	26. Glass fiber processing plants
13. Lime plants	27. Charcoal production plants
14. Phosphate rock processing plants	28. Fossil fuel-fired steam electric plants of more than 250 MMBtu/hr heat input

Major modifications are subject to the PSD review only if:

- The existing source that is modified is a "major" source and the net emissions increase resulting from the modification is "significant"; or
- The modification is made at a minor source, and that change by itself qualifies as a new major source.

4.0 Current PSD Status

The first step in determining PSD applicability at Fort Carson is to determine whether the facility is classified as a major stationary source. This determination is based on the facility's PTE, which is defined as follows.

> "Potential to emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable." [40 *Code of Federal Regulations* (CFR) 52.21(b)(4)].

Several source categories at Fort Carson were not included when calculating PTE, based on United States Environmental Protection Agency (EPA) guidance:

- Mobile sources and non-road engines were excluded based on EPA guidance, which states "Nonroad engines are a category of units/equipment that, under the Clean Air Act Section 302(z), are excluded from the definition of 'stationary source,' and, hence, are exempt from stationary source permitting requirements." (EPA 2001).
- Sources under the control of the National Guard were excluded based on EPA guidance, which states "when making major source determinations at a military installation, the Agency believes it is appropriate to consider pollutant-emitting activities that are under the control of different military services not to be under common control. Activities under the control of the National Guard may be considered under separate control from activities under the control of military services." (EPA 1996).
- Certain personnel-related activities, including Army and Air Force Exchange Service gas stations (SIC code 55), residential housing (SIC code 95), and schools (SIC code 82) were excluded from PTE calculations based on EPA guidance, which states "Military installations include numerous activities that are not normally found at other types of sources. These types of activities include residential housing, schools, day care centers, churches, recreational parks, theaters, shopping centers, grocery stores, gas stations, and dry cleaners. These activities are located on military installations for the convenience of military personnel (both active duty and retired), their dependents, and Department of Defense (DoD) civilian employees working on the base, and they often do not represent essential activities related to the primary military activity(ies) of the base. Therefore, the EPA believes these types of activities may appropriately be considered not to be support facilities to the primary military activities of a base. As such, these activities may be treated as separate sources for all purposes for which an industrial grouping distinction is allowed. Such activities should be separately evaluated for common control, SIC code, and support facility linkages to determine if a major source is present." (EPA 1996).

- Fugitive emission sources were excluded based on EPA guidance, which states "if the primary activity of a stationary source falls within a source category that is not listed, then as a general matter, fugitive emissions from the emissions units at the source are not included in determining whether the source is a major stationary source. However, if the source also contains emission units which do fall within a listed source category (or categories), then you include fugitive emissions from these listed emissions units to determine if the source is a major stationary source." (EPA 2003).

The sources included in the PTE calculation are listed in Appendix A, Table A-1. The current PTE for each source and the assumptions used to calculate it are provided in Appendix A, Table A-2. Additional details on PTE calculations are provided in the Fort Carson Air Emission Inventory for Calendar Year (CY) 2006 (Fort Carson Directorate of Environmental Compliance and Management [DECAM] 2007).

Fort Carson is subject to regulation as a major stationary source if its PTE exceeds the following applicability thresholds:

- <u>Boilers and hot water generators – 100 tpy threshold:</u> Fort Carson's boilers and hot water generators have a total combined heat input of approximately 599 MMBtu/hr. Therefore, they are regulated as one of the 28 PSD source categories (i.e., Category 23, fossil-fuel boilers [or combination thereof] totaling more than 250 MMBtu/hr) and are subject to a major source threshold of 100 tpy [40 CFR 52.21(b)(1)(i)(a)].
- <u>Post-wide - 250 tpy threshold:</u> Fort Carson as a whole is subject to a major source threshold of 250 tpy [40 CFR 52.21(b)(1)(i)(b)].

As shown in Table 4-1, Fort Carson is currently classified as a major stationary source because it has a PTE over 250 tpy of nitrogen oxides (NO_x) (i.e., PTE of 312 tpy). Additionally, Fort Carson's boilers and hot water generators are classified as a major source (source within a source) because they have the PTE over 100 tpy of NO_x and carbon monoxide (CO) (i.e., PTE of 169 and 149 tpy, respectively). Based on its status as a major source, Fort Carson is subject to PSD permitting if it exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2.:

Table 4-1. Fort Carson Actual Emissions and Current PTE

Pollutant	Post-wide		Boilers and Hot Water Generators Only	
	CY 2006 Actual Emissions (tpy)	**Current PTE (tpy)**	**CY 2006 Actual Emissions (tpy)**	**Current PTE (tpy)**
NO_x	61.6	**312.29**	34.18	**168.95**
Sulfur Oxides (SO_x)	2.0	65.73	0.39	46.82
CO	42.2	210.56	30.9	**148.85**
Volatile Organic Compounds (VOCs)	39.3	94.58	2.02	9.77
Particulate Matter	16.7	55.84	2.82	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	14.8	55.20	2.81	14.95

Table 4-2. Major Modification Thresholds Applicable to Proposed Sources at Fort Carson

	PM_{10} (tpy)	**NO_X (tpy)**	**CO (tpy)**	**SO_X (tpy)**	**VOC (tpy)**	**Lead (tpy)**
Major Source Modification Threshold	15	40	100	40	40	0.6

5.0 PSD Applicability

Based on its status as a major source, Fort Carson is subject to PSD permitting if the PTE increase from the proposed modification exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2. For purposes of this analysis, the modification is defined as the IBCT sources included in the GTA Environmental Impact Statement (EIS). Although the Combat Aviation Brigade (CAB) is also included in the GTA EIS, this is done for convenience. The CAB is not considered part of the same modification and, therefore, is not included in this analysis. The treatment of the IBCT and CAB sources as two separate modifications is supported by EPA guidance (EPA 1989) and a CDPHE concurrence letter (CDPHE 2008).

Using Fort Carson specifications, new external combustion sources for this project were assumed to be equipped with low-NO_x burners with a NO_x emission concentration of 30 parts per million (ppm) or lower. Internal combustion sources for this project were assumed to meet Tier III emission standards (40 CFR Part 89.112), and be permitted with an operational limit of 250 hours per year.

Assumptions used to calculate the proposed PTE increase are provided in Table 5-1. The PTE for the proposed modification is shown in Table 5-2. Detailed emission calculations are provided in Appendix A, Tables A-3 through A-6.

Table 5-1. Proposed Combustion Sources at Fort Carson

Description	Size	Annual Hours of Operation
Proposed Exempt External Combustion Units, Low-NO_x (30 ppm)	90.3 MMBtu/hr Total	8,760
Proposed Exempt Internal Combustion Units, Emergency Generators >600 horsepower	2,247 bhp Total	250

Table 5-2. Potential Emission Increase from Proposed Combustion Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	VOC (tpy)	Lead (tpy)
Proposed Combustion Units	3.04	16.93	34.17	0.35	2.31	negligible
Major Modification Threshold	15	40	100	40	40	0.6

As shown in Table 5-2, the proposed modifications at Fort Carson will not be subject to PSD review because the proposed emission increase will be below the major modification threshold.

6.0 References

CDPHE. 2008. Letter to Hal Alguire, Director, Public Works, regarding CAB Project, dated 7 October 2008.

DECAM. 2007. *Air Emission Inventory for Calendar Year 2006, Fort Carson Colorado.* April 2007.

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EPA. 1996. US EPA OAQPS. *Major Source Determinations for Military Installations under the Air Toxics, New Source Review, and Title V Operating Permit Programs of the Clean Air Act.* August 1996.

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EPA. 2001. US EPA Region IX. *Letter to the Law Office of Marc Chytilo.* December 14, 2001.

EPA. 2003. US EPA Air and Radiation Division (A-18J). *Clarification on Fugitive Emissions Policy letter to Janet McCabe, Indiana Department of Environmental Management.* March 6, 2003.

EPA. 2005. *Compilation of Air Pollutant Emission Factors (AP-42)*, Fifth Edition, Volume I Supplements A, B, C, D, E, F, Updates 2001 through 2008.

Appendix A

Emission Calculations for Grow the Army Projects – 2008 Construction EIS

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Boilers and Hot Water Generators				
Bldg 1860 Hot Water Generators (2 @ 47 MMBtu/hr each)	Y	Y	Y	YES
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	Y	Y	Y	YES
Bldg 6290 Boilers (2 @ 40 MMBtu/hr each)	Y	Y	Y	YES
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	Y	Y	Y	YES
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	Y	Y	Y	YES
Bldg 8300 Boiler (12.553 MMBtu/hr)	Y	Y	Y	YES
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	Y	Y	Y	YES
Existing Categorically Exempt Boilers Standard Configuration	Y	Y	Y	YES
Existing Categorically Exempt Low NOx Boilers	Y	Y	Y	YES
Proposed Exempt Low NOx Boilers	Y	Y	Y	YES
Other External Combustion Sources				
Existing Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
Proposed Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
External Combustion Units in Residential Housing	Y	Y	N	NO
Internal Combustion Units				
Bldg 1550 Generator	Y	Y	Y	YES
Bldg 3909 Generator	Y	Y	Y	YES
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	Y	Y	Y	YES
Bldg 8000 Dynamometers	Y	Y	Y	YES
Butts Air Field Engine Test Stand	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators <600hp	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators >600hp	Y	Y	Y	YES
Categorically Exempt Natural Gas/Propane Emergency Generators	Y	Y	Y	YES
Auxiliary Ground Power Units	N	Y	Y	NO
Coating Activities				
Bldg 207 Paint Booth	Y	Y	Y	YES
Bldg 2427 Paint Booth	Y	Y	Y	YES
Bldg 8000 Paint Booths	Y	Y	Y	YES
Bldg 9551 Range Paint Booth	Y	Y	Y	YES
Bldg 9635 (Butts Air Field Paint Booth)	Y	Y	Y	YES
Fuel Dispensing				
Bldg 900 Service Station	Y	Y	N	NO
Bldg 1515 Service Station	Y	Y	N	NO
Bldg 3600 Service Station	Y	Y	N	NO
COCO Facility--Refueling (Service Stations and Bulk Fuel)	Y	Y	Y	YES
Categorically Exempt Storage Tanks and Associated Operations				
Diesel (No. 2 Oil) Storage Tanks	Y	Y	Y	YES
Glycol Storage Tanks	Y	Y	Y	YES
JP-8 Storage Tanks	Y	Y	Y	YES
MOGAS Storage Tanks	Y	Y	Y	YES
Military Training				
Munition Firing	N	N	Y	NO
Smoke Munitions	N	N	Y	NO
Open Burning/Open Detonation	N	N	Y	NO
Fog Oil and Graphite	Y	Y	Y	YES

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Chemical Usage				
Basewide Chemical Usage	N	N	Y	NO
Pesticide Use	N	N	Y	NO
Road Paint Striping	N	N	Y	NO
Solvent Use	Y	N	Y	NO
X-Ray	Y	N	Y	NO
Landfill-Related Emissions				
Municipal Landfill	Y	N	Y	NO
Miscellaneous Particulate Emissions				
Abrasive Blasting	Y	Y	Y	YES
Bldg 1864 Cooling Towers	Y	N	Y	NO
Bldg 7501 Cooling Towers	Y	N	Y	NO
LB&B Yard	Y	N	Y	NO
Rocky Mountain Asphalt Yard	Y	N	Y	NO
Troop Construction Yard	Y	N	Y	NO
Tank Trails	Y	N	Y	NO
Fire Training				
Fire Training Facility	Y	Y	Y	YES
Prescribed Burning				
Prescribed Burning	Y	N	Y	NO
Miscellaneous APEN/Permit Exempt Sources				
Industrial Wastewater Treatment Plant	Y	N	Y	NO
Sewage Treatment Plant	Y	N	Y	NO
Soil Vapor Extraction Systems	Y	Y	Y	YES

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Method of Determining PTE
Boilers and Hot Water Generators							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	2.01	2.01	23.00	12.83	19.60	0.85	Permit limits (95OPEP110)
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	1.08	0.83	7.95	7.26	9.80	0.48	Permit limits (07EP0205)
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.96	0.96	7.22	6.29	8.91	0.42	Permit limits (95OPEP110)
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.57	0.57	7.50	6.30	0.05	0.41	Permit limits (95OPEP110)
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.77	0.68	4.11	6.80	7.15	0.45	Permit limits (95OPEP110)
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.08	0.08	1.00	0.84	0.01	0.06	Permit limits (95OPEP110)
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.14	0.14	1.80	1.51	0.01	0.10	Permit limits (95OPEP110)
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.06	0.06	0.75	0.63	0.005	0.04	Permit limits (95OPEP110)
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.36	0.36	4.65	3.82	0.56	0.25	Permit limits (95OPEP110)
Existing Categorically Exempt Boilers Standard Configuration	8.15	8.15	107.21	90.05	0.64	5.90	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 20 ppm	1.00	1.00	3.15	11.04	0.08	0.72	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 30 ppm	0.14	0.14	0.62	1.49	0.01	0.10	8760 hours of operation
Source Category Total	**15.30**	**14.95**	**168.95**	**148.85**	**46.82**	**9.77**	
Other External Combustion Sources							
Categorically Exempt Miscellaneous External Combustion Units	3.33	3.33	43.83	36.81	0.26	2.41	8760 hours of operation
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.08	0.08	1.42	1.75	0.04	0.21	Permit limits (07EP0293)
Bldg 1550 Generator (1550 hp)	0.27	0.16	9.30	2.13	1.57	0.25	Permit limits (95OPEP110)
Bldg 3909 Generator (1620 hp)	0.28	0.16	9.72	2.23	1.64	0.26	Permit limits (95OPEP110)
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	0.26	0.26	29.03	4.62	9.43	0.26	Permit limits (05EP0230) & APEN
Bldg 8000 Dynamometers	1.10	1.10	15.50	3.34	2.02	1.26	Permit limits (95OPEP110)
Butts Air Field Engine Test Stand	0.34	0.34	3.03	4.33	1.71	1.63	Permit limits (95OPEP110)
Categorically Exempt Diesel Emergency Generators <600hp	1.66	1.66	23.40	5.04	1.55	1.86	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Diesel Emergency Generators >600hp	0.12	0.07	4.13	0.95	0.70	0.12	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Natural Gas/Propane Emergency Generators	0.047	0.047	3.87	0.47	0.0007	0.15	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Source Category Total	**4.16**	**3.87**	**99.40**	**24.86**	**18.65**	**5.99**	

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Method of Determining PTE
Coating Activities							
Bldg 207 Paint Booth	0.0013	0.0013	0	0	0	0.11	Actual emissions multiplied by a growth factor of 1.25
Bldg 2427 Paint Booth	0.0040	0.0040	0	0	0	0.29	Actual emissions multiplied by a growth factor of 1.25
Bldg 8000 Paint Booths	0.84	0.84	0	0	0	15.66	Permit limits (95OPEP110)
Bldg 9551 Range Paint Booth	0.0091	0.0091	0	0	0	0.65	CY 2002 actual emissions multiplied by a growth factor of 1.25
Bldg 9635 (Butts Air Field Paint Booth)	0.2744	0.2744	0	0	0	0.44	Permit limits (95OPEP110)
Source Category Total	**1.13**	**1.13**	**0.00**	**0.00**	**0.00**	**17.15**	
Fuel Dispensing							
COCO Facility--Refueling (Service Stations and Bulk Fuel)	0	0	0	0	0	7.69	Permit Limits (04EP0762)
Categorically Exempt Storage Tanks and Associated Operations							
Diesel (No. 2 Oil) Storage Tanks	0	0	0	0	0	0.42	24 turnovers per year
Glycol Storage Tanks	0	0	0	0	0	0.00036	24 turnovers per year
JP-8 Storage Tanks	0	0	0	0	0	9.5	24 turnovers per year
MOGAS Storage Tanks	0	0	0	0	0	9.73	Actual emissions multiplied by a growth factor of 1.25
Source Category Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.68**	
Military Training							
Mechanical Smoke Generators	31.82	31.82	0.00	0.00	0.00	31.82	Permit limits (95OPEP110)
Miscellaneous Particulate Emissions							
Abrasive Blasting	0.07	0.07	0	0	0	0	Permit limits (95OPEP110).
Fire Training							
Fire Training Facility	0.02	0.02	0.11	0.04	0.00	0.06	APEN limit of 4000 gal/CDPHE concurrence
Installation-wide Subtotal *(Boilers and Hot Water Generators Only)*	15.30	14.95	168.95	148.85	46.82	9.77	
Installation-wide Total	**55.84**	**55.20**	**312.29**	**210.56**	**65.73**	**94.58**	

Table A-3. Criteria Pollutant
Grow the Army - Emission Summary

Potential Emissions

Pollutant	External Combustion		Internal Combustion		Total	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
NOx	3.19	13.95	23.78	2.97	26.96	16.93
CO	7.43	32.56	12.88	1.61	20.31	34.17
VOC	0.49	2.13	1.44	0.18	1.93	2.31
SO2	0.05	0.23	0.91	0.11	0.96	0.35
PM10	0.67	2.95	0.74	0.09	1.42	3.04

Table A-4. Grow the Army - IBCT
Internal Combustion Heat Input Estimates

Grow the Army - IBCT Projects (2008 Construction EIS)					
PROJECT NUMBER	**PROJECT NAME**	**SQUARE FOOTAGE[1]**	**Number of Bldg./ Stories**	**TOTAL HEAT INPUT (BTU/HR/Sq.Ft.)[2]**	**TOTAL HEAT INPUT (MMBtu/hr)**
71176	**Brigade Combat Team (L) H.Q.**	**145,176**			
Reviewed	Total Heated Sq. Ft.	**145,176**			
4/10/2008	Total Parking Sq. Ft.	**0**			
*	*Brigade H.Q.*	40,300	2	60	2.4
	Battalion H.Q.	104,876	2	60	6.3
69121	**BCT (L) Barracks and DFAC**	**587,344**			
Reviewed	Total Heated Sq. Ft.	**553,540**			
4/10/2008	Total Parking Sq. Ft.	**33,804**			
	Unac. Enl. Housing (barracks)	527,040	4/4	55	29.0
	POV Parking	33,804			
	Dinning Facility	26,500	1	150	4.0
71178	**BCT (L) Company Ops.**	**472,134**			
Reviewed	Total Heated Sq. Ft.	**368,964**			
4/10/2008	Total Parking Sq. Ft.	**103,170**			
	Company Operations Facilities	368,964	2	60	22.1
	Access and Service Surfaces	38,574			
	Company Operations Covered Hardstands	64,596			
71198	**BCT (L) TEMF Tact. Equip. Maintenance**	**1,638,215**			
Reviewed	Total Heated Sq. Ft.	**224,810**			
4/10/2008	Total Parking Sq. Ft.	**1,413,405**			
	Vehicle Maintenance Shop	159,870	1	75	12.0
	Organizational Vehicle Parking	1,399,599			
	Organizational Storage Facility	42,300	1	55	2.3
	Oil Storage Building	2,820	1	35	0.1
	HAZMAT Storage Building	2,820	1	35	0.1
	Tact. Unmanned Aerial Veh. Hanger	9,000	1	45	0.4
	Dist. Company Storage	8,000	1	45	0.4
	Open Dist. Company Storage	4,005	1		
69795	**Quarter Master Facilities**	**289,189**			
Reviewed	Total Heated Sq. Ft.	**38,530**			
4/10/2008	Total Parking Sq. Ft.	**250,659**			
	Vehicle Maintenance Shop	18,000	1	75	1.4
	Organizational Vehicle Parking	202,059			
	Company Operations Facilities	17,730	2	60	1.1
	Covered Hardstand	3,000			
	Organizational Storage Facility	2,800	1	55	0.2
67137	**EN BN Complex**	**326,415**			
Reviewed	Total Heated Sq. Ft.	**92,829**			
4/10/2008	Total Parking Sq. Ft.	**233,586**			
	Vehicle Maintenance Shop	25,152	1	75	1.9
	Organizational Vehicle Parking	62,136			
	POV Parking	171,450			
	Company Operations Facilities	64,802	2	60	3.9
	Oil Storage Building	660	1	35	0.0
	Deployed Equipment Storage	2,215	1	55	0.1
71171	**Child Development Center (2)(Totals)**	**71,650**			
Reviewed	Total Heated Sq. Ft.	**31,650**			
4/10/2008	Total Parking Sq. Ft.	**40,000**			
	Building	31,650	1	85	2.7
	Parking	40,000			
XXXX	**BCT Infrastructure (Cantonment)**	**0**			
Reviewed	Total Heated Sq. Ft.	**0**			
4/10/2008	Total Parking Sq. Ft.	**0**			
XXXX	**Land Fill Removal (partial or whole)**	**0**			
Reviewed	Total Heated Sq. Ft.	**0**			
4/10/2008	Total Parking Sq. Ft.	**0**			
Total Heated Sq. Ft. for Boilers/Other External Combustion Units		1,455,499		1,175	90.3

1.) Heated Sq. Ft. estimate made from Project 1391 numbers.
2.) BTU input taken from BRAC projects that were similar in scope and size for which we have estimates from the COE, or actual data from project plan reviews.

Table A-5. Grow the Army - IBCT External Combustion Emissions

Fuel Heating Value (LHV)	1020	Btu/scf
Total Heat Rate (LHV)	90.27	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	775.24	MMscf/yr

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	PTE Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	36.00	90.27	8760	3.19	13.95	Fort Carson[1]
CO	84.00	90.27	8760	7.43	32.56	AP-42[2]
VOC	5.50	90.27	8760	0.49	2.13	AP-42[3]
SO2	0.60	90.27	8760	0.05	0.23	AP-42[3]
PM10	7.60	90.27	8760	0.67	2.95	AP-42[3]

[1] NOx emissions based on natural gas-fired combustion equipment with NOx concentration of 30 ppm in exhaust per Fort Carson specifications.

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

Table A-6. Grow the Army Internal Combustion Emissions

Engine Usage	Emergency Generator	
Engine Configuration	Diesel	
Emission Controls	None	
Number of Engines	3	
Site Rating	749	BHP each
Potential Operation	250	hr/yr

Potential Emissions - Per Engine

Pollutant	Emission Factor		Nominal Rating	PTE Hrs of Operation	Estimated Emissions per Engine		Source of Emission Factor
	lb/hp-hr	(g/hp-hr)	(hp)	(hrs/yr)	(lb/hr)	(tpy)	
NOx	0.0106	4.80	749	250	7.93	0.99	40 CFR Part 89[1]
CO	0.0057	2.60	749	250	4.29	0.54	40 CFR Part 89[1]
VOC	0.00064	0.29	749	250	0.48	0.06	AP-42[2]
SO2	4.05E-04	0.18	749	250	0.30	0.04	AP-42[2]
PM10	0.00033	0.15	749	250	0.25	0.03	40 CFR Part 89[1]

[1] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate a maximum of 250 hours per year. The emission factors for NOx, CO and PM/PM10 are based on us EPA's Tier 3 emission standards for generators with a rated power of 130 to 560 KW. 3.0 g/hp-hr for NOx (non-methane hydrocarbon+NOx standard), 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM. All PM was assumed to be PM10. The remaining criteria pollutant emission factors are from Section 3.4 of AP-42. A sulfur content of 0.05 weight percent was assumed.

[2] EPA AP-42, Volume I, Fifth Edition - October 1996, Table 3.3-1, Uncontrolled Emission Factors for Diesel Industrial Engines

Total Emissions - All Three Engines

Pollutant	Estimated Emissions All Engines	
	(lb/hr)	(tpy)
NOx	23.78	2.97
CO	12.88	1.61
VOC	1.44	0.18
SO2	0.91	0.11
PM10	0.74	0.09

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FINAL

Prevention of Significant Deterioration (PSD) Applicability Analysis

For

Combat Aviation Brigade (CAB), US Army Garrison (USAG) Fort Carson

Prepared for:

Department of the Army

Directorate of Public Works, Environmental Division

USAG Fort Carson

Fort Carson, Colorado

URS

8181 E. Tufts Avenue
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January 2009

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PREVENTION OF SIGNIFICANT DETERIORATION (PSD) APPLICABILITY ANALYSIS

for

Combat Aviation Brigade (CAB), US Army Garrison (USAG) Fort Carson Fort Carson, Colorado

Prepared for
USAG Fort Carson
Directorate of Public Works, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078, Delivery Order 0016 (URS Project No. 39455606)

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12 January 2009

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List of Acronyms

AAFES	Army and Air Force Exchange Service
bhp	brake horsepower
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
CY	calendar year
DECAM	Fort Carson Directorate of Environmental Compliance and Management
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
Fort Carson	US Army Garrison (USAG) Fort Carson
GTA	Grow the Army
IBCT	Infantry Brigade Combat Team
km^2	square kilometers
MMBtu/hr	million British thermal units per hour
NO_x	nitrogen oxides
PM_{10}	Particulate Matter with an aerodynamic diameter less than 10 micrometers
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
SIC	Standard Industrial Classification
SO_x	sulfur oxides
tpy	tons per year
USAG	US Army Garrison
VOC	volatile organic compound

Executive Summary

Emissions from the proposed Combat Aviation Brigade (CAB) were analyzed for major source Prevention of Significant Deterioration (PSD) permitting applicability in support of the Grow the Army Environmental Impact Statement (EIS) for the US Army Garrison (USAG) Fort Carson (Fort Carson). New major stationary sources of air emissions or major modifications to existing stationary sources are required to obtain PSD preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology.

For purposes of this PSD analysis, the modification is defined as the CAB sources: although the Infantry Brigade Combat Team (IBCT) is also included in the GTA EIS, this is done for convenience. The IBCT is not considered part of the same modification under PSD rules and, therefore, is not included in this analysis. This document demonstrates that the proposed CAB activities will not be subject to the PSD permitting requirements under New Source Review regulations based on the following:

- Fort Carson is currently classified as a major stationary source because it has the potential to emit (PTE) over 250 tons per year (tpy) of nitrogen oxides (NO_x), as shown in Table ES-1.
- Fort Carson's boilers and hot water generators are classified as a major stationary source because they have a combined heat input of over 250 million British thermal units per hour, and they have a PTE over 100 tpy of NO_x and carbon monoxide (CO).
- The increase in emissions due to CAB activities is less than the applicable major modification threshold for all criteria pollutants, as shown in Table ES-2.

Table ES-1. Current PTE at Fort Carson

Pollutant	Post-wide PTE (tpy)	Boilers and Hot Water Generators PTE (tpy)
Nitrogen Oxides (NO_x)	**312.29**	**168.95**
Sulfur Oxides (SO_x)	65.73	46.82
Carbon Monoxide (CO)	210.56	**148.85**
Volatile Organic Compounds (VOCs)	94.58	9.77
Particulate Matter	55.84	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	55.20	14.95

Table ES-2. PTE Increase from Proposed Stationary Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOCs (tpy)	Lead (tpy)
Proposed Stationary Point Sources	2.46	14.22	27.80	0.30	1.90	negligible
Major Modification Threshold	15	40	100	40	40	0.6

1.0 Background

Due to the addition of a Combat Aviation Brigade (CAB), the number of personnel and support facilities at US Army Garrison (USAG) Fort Carson (Fort Carson) will increase. Consequently, emissions will increase due to the addition of the following emission sources:

- Stationary external combustion sources (i.e., boilers, hot water generators, furnaces, space heaters, and domestic water heaters) with a combined total heat input of approximately 73 million British thermal units per hour (MMBtu/hr); and
- Three stationary internal combustion sources (i.e., emergency generators) with a brake horsepower (bhp) rating of 755 each.

New major stationary sources or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology. This document demonstrates that the proposed modifications at Fort Carson are not a major modification and, therefore, will not be subject to PSD permitting.

2.0 Location Description

Fort Carson consists of military support facilities and extensive training areas, including over fifty ranges, other training locations, and the Butts Army Air Field. The Army installation is located in the east-central portion of Colorado at the foot of the Rocky Mountain Front Range. Fort Carson occupies land between the cities of Colorado Springs and Pueblo, a distance of approximately 25 miles. The northwest tip of the installation is located in El Paso County and lies within the Colorado Springs metropolitan area, approximately 8 miles south of downtown Colorado Springs (population 360,890). This area comprises approximately 22.3 square kilometers (km^2) and is known as the cantonment area. The cantonment area contains military housing, facilities, and the Post Headquarters. The balance of training rangeland occupies approximately 535 km^2 in southern El Paso, Fremont, and Pueblo Counties. Fort Carson's boundaries are adjacent to Colorado Springs to the north, State Highway 115 to the west, private land to the south, and Interstate 25 to the east. Land use adjacent to Fort Carson includes municipal, residential, agricultural, industrial, and other privately held interests. Fort Carson measures from 2 to 15 miles in width east to west and 24 miles in length north to south.

The majority of the air pollutant-emitting sources at Fort Carson are located in the cantonment area, which is located in El Paso County. Other than military training involving fog oil and graphite, there are no significant stationary point sources located in the training range area.

Fort Carson is located in an attainment area for all criteria pollutants. The Great Sand Dunes National Park and Preserve is a federal Class I designated area within 100 kilometers of the facility. Florissant Fossil Beds National Monument is a Class II area within 100 kilometers of the facility which has been designated by the State of Colorado to have the same sulfur dioxide increment as a federal Class I area. [Colorado Department of Public Health and Environment (CDPHE) Regulation 3, Part D, VIII.B]

3.0 PSD Program Description

New major stationary sources or major modifications to existing stationary sources are required to obtain PSD preconstruction permits. The PSD permitting process requires the applicant to demonstrate that the project will have no significant deterioration of ambient air quality in an attainment area. The following are elements and associated information necessary for determining PSD applicability of a new source:

- Define the source by determining all related activities under the same two-digit Standard Industrial Classification (SIC) code that are controlled by the same owner or operator and located on contiguous or adjacent properties, including all support facilities.
- Define the applicability thresholds for the major stationary source.
- Define the source's potential to emit (PTE) by determining the sum of emissions for each pollutant from each emission unit. This calculation includes fugitive emissions from the 28 source categories listed in Table 3-1 and sources subject to New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants as of 7 August 1980.
- Assess local area attainment status by determining whether the area is in an attainment or unclassifiable region for at least one criteria pollutant. PSD applies only in attainment or unclassifiable regions.
- Determine the pollutants that are subject to PSD review. Each attainment and other regulated pollutant emitted in "significant" quantities is also included.
- Compare the source's PTE to the appropriate major source thresholds. The source is a major source if the emissions of any pollutant exceed the applicable threshold regardless of the area designation (i.e., attainment, non-attainment, or non-criteria pollutants). If an individual unit is classified as one of the 28 regulated source categories (Table 3-1) and its emissions exceed 100 tons per year (tpy), then the unit is a major source. The facility can also be a PSD major source if its facility-wide emissions exceed 250 tpy, regardless of having a listed PSD source category.

Table 3-1. PSD Source Categories with 100 tpy Major Source Thresholds

1. Coal cleaning plants (with thermal dryers)	15. Coke oven batteries
2. Kraft pulp mills	16. Sulfur recovery plants
3. Portland cement plants	17. Carbon black plants (furnace process)
4. Primary zinc smelters	18. Primary lead smelters
5. Iron and steel mills	19. Fuel conversion plants
6. Primary aluminum ore reduction plants	20. Sintering plants
7. Primary copper smelters	21. Secondary metal production plants
8. Municipal incinerators capable of charging more than 250 tons of refuse per day	22. Chemical process plants
9. Hydrofluoric acid plants	23. Fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr heat input
10. Sulfuric acid plants	24. Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels
11. Nitric acid plants	25. Taconite ore processing plants
12. Petroleum refineries	26. Glass fiber processing plants
13. Lime plants	27. Charcoal production plants
14. Phosphate rock processing plants	28. Fossil fuel-fired steam electric plants of more than 250 MMBtu/hr heat input

Major modifications are subject to the PSD review only if:

- The existing source that is modified is a "major" source and the net emissions increase resulting from the modification is "significant"; or
- The modification is made at a minor source, and that change by itself qualifies as a new major source.

4.0 Current PSD Status

The first step in determining PSD applicability at Fort Carson is to determine whether the facility is classified as a major stationary source. This determination is based on the facility's PTE, which is defined as follows.

> "Potential to emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable." [40 *Code of Federal Regulations* (CFR) 52.21(b)(4)]

Several source categories at Fort Carson were not included when calculating PTE, based on United States Environmental Protection Agency (EPA) guidance:

- Mobile sources and non-road engines were excluded based on EPA guidance, which states "Nonroad engines are a category of units/equipment that, under the Clean Air Act Section 302(z), are excluded from the definition of 'stationary source,' and, hence, are exempt from stationary source permitting requirements." (EPA 2001)
- Sources under the control of the National Guard were excluded based on EPA guidance, which states "when making major source determinations at a military installation, the Agency believes it is appropriate to consider pollutant-emitting activities that are under the control of different military services not to be under common control. Activities under the control of the National Guard may be considered under separate control from activities under the control of military services." (EPA 1996)
- Certain personnel-related activities, including Army and Air Force Exchange Service gas stations (SIC code 55), residential housing (SIC code 95), and schools (SIC code 82) were excluded from PTE calculations based on EPA guidance, which states "Military installations include numerous activities that are not normally found at other types of sources. These types of activities include residential housing, schools, day care centers, churches, recreational parks, theaters, shopping centers, grocery stores, gas stations, and dry cleaners. These activities are located on military installations for the convenience of military personnel (both active duty and retired), their dependents, and Department of Defense (DoD) civilian employees working on the base, and they often do not represent essential activities related to the primary military activity(ies) of the base. Therefore, the EPA believes these types of activities may appropriately be considered not to be support facilities to the primary military activities of a base. As such, these activities may be treated as separate sources for all purposes for which an industrial grouping distinction is allowed. Such activities should be separately evaluated for common control, SIC code, and support facility linkages to determine if a major source is present." (EPA 1996)

- Fugitive emission sources were excluded based on EPA guidance, which states “if the primary activity of a stationary source falls within a source category that is not listed, then as a general matter, fugitive emissions from the emissions units at the source are not included in determining whether the source is a major stationary source. However, if the source also contains emission units which do fall within a listed source category (or categories), then you include fugitive emissions from these listed emissions units to determine if the source is a major stationary source.” (EPA 2003)

The sources included in the PTE calculation are listed in Appendix A, Table A-1. The current PTE for each source and the assumptions used to calculate it are provided in Appendix A, Table A-2. Additional details on PTE calculations are provided in the Fort Carson Air Emission Inventory for Calendar Year (CY) 2006. [Fort Carson Directorate of Environmental Compliance and Management (DECAM) 2007]

Fort Carson is subject to regulation as a major stationary source if its PTE exceeds the following applicability thresholds:

- Boilers and hot water generators – 100 tpy threshold: Fort Carson’s boilers and hot water generators have a total combined heat input of approximately 599 MMBtu/hr. Therefore, they are regulated as one of the 28 PSD source categories [i.e., Category 23, fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr] and are subject to a major source threshold of 100 tpy [40 CFR 52.21(b)(1)(i)(a)].
- Post-wide - 250 tpy threshold: Fort Carson as a whole is subject to a major source threshold of 250 tpy [40 CFR 52.21(b)(1)(i)(b)].

As shown in Table 4-1, Fort Carson is currently classified as a major stationary source because it has a PTE over 250 tpy of nitrogen oxides (NO_x) (i.e., PTE of 312 tpy). Additionally, Fort Carson’s boilers and hot water generators are classified as a major source (source within a source) because they have the PTE over 100 tpy of NO_x and carbon monoxide (CO) (i.e., PTE of 169 and 149 tpy, respectively). Based on its status as a major source, Fort Carson is subject to PSD permitting if it exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2.

Table 4-1. Fort Carson
Actual Emissions and Current PTE

Pollutant	Post-wide		Boilers and Hot Water Generators Only	
	CY 2006 Actual Emissions (tpy)	Current PTE (tpy)	CY 2006 Actual Emissions (tpy)	Current PTE (tpy)
NO_x	61.6	**312.29**	34.18	**168.95**
Sulfur Oxides (SO_x)	2.0	65.73	0.39	46.82
CO	42.2	210.56	30.9	**148.85**
Volatile Organic Compounds (VOCs)	39.3	94.58	2.02	9.77
Particulate Matter	16.7	55.84	2.82	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	14.8	55.20	2.81	14.95

Table 4-2. Major Modification Thresholds Applicable to
Proposed Sources at Fort Carson

	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Lead (tpy)
Major Source Modification Threshold	15	40	100	40	40	0.6

5.0 PSD Applicability

Based on its status as a major source, Fort Carson is subject to PSD permitting if the PTE increase from the proposed modification exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2. For purposes of this analysis, the modification is defined as the CAB sources included in the Grow the Army (GTA) Environmental Impact Statement (EIS). While both the CAB and Infantry Brigade Combat Team (IBCT) sources are included in the GTA EIS, this is done for convenience. The CAB is not considered part of the same modification as the IBCT; therefore, the IBCT is not included in this analysis. The treatment of the CAB and IBCT sources as two separate modifications is supported by EPA guidance (EPA 1989) and a CDPHE concurrence letter (CDPHE 2008).

Using Fort Carson specifications, new external combustion sources for this project were assumed to be equipped with low-NO_x burners with a NO_x emission concentration of 30 parts per million (ppm) or lower. Internal combustion sources for this project were assumed to meet Tier III emission standards (40 CFR Part 89.112), and be permitted with an operational limit of 250 hours per year.

Assumptions used to calculate the proposed PTE increase are provided in Table 5-1. The PTE for the proposed modification is shown in Table 5-2. Detailed emission calculations are provided in Appendix A, Tables A-3 through A-6.

Table 5-1. Proposed Combustion Sources at Fort Carson

Description	Size	Annual Hours of Operation
Proposed Exempt External Combustion Units, Low-NO_x (30 ppm)	72.6 MMBtu/hr Total	8,760
Proposed Exempt Internal Combustion Units, Emergency Generators >600 horsepower	2,265 bhp Total	250

Table 5-2. Potential Emission Increase from Proposed Combustion Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	VOC (tpy)	Lead (tpy)
Proposed Combustion Units	2.46	14.22	27.80	0.30	1.90	negligible
Major Modification Threshold	15	40	100	40	40	0.6

As shown in Table 5-2, the proposed modifications at Fort Carson will not be subject to PSD review because the proposed emission increase will be below the major modification threshold.

6.0 References

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Appendix A

Emission Calculations for Combat Aviation Brigade Projects – 2008 Construction EIS

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Boilers and Hot Water Generators				
Bldg 1860 Hot Water Generators (2 @ 47 MMBtu/hr each)	Y	Y	Y	YES
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	Y	Y	Y	YES
Bldg 6290 Boilers (2 @ 40 MMBtu/hr each)	Y	Y	Y	YES
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	Y	Y	Y	YES
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	Y	Y	Y	YES
Bldg 8300 Boiler (12.553 MMBtu/hr)	Y	Y	Y	YES
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	Y	Y	Y	YES
Existing Categorically Exempt Boilers Standard Configuration	Y	Y	Y	YES
Existing Categorically Exempt Low NOx Boilers	Y	Y	Y	YES
Proposed Exempt Low NOx Boilers	Y	Y	Y	YES
Other External Combustion Sources				
Existing Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
Proposed Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
External Combustion Units in Residential Housing	Y	Y	N	NO
Internal Combustion Units				
Bldg 1550 Generator	Y	Y	Y	YES
Bldg 3909 Generator	Y	Y	Y	YES
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	Y	Y	Y	YES
Bldg 8000 Dynamometers	Y	Y	Y	YES
Butts Air Field Engine Test Stand	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators <600hp	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators >600hp	Y	Y	Y	YES
Categorically Exempt Natural Gas/Propane Emergency Generators	Y	Y	Y	YES
Auxiliary Ground Power Units	N	Y	Y	NO
Coating Activities				
Bldg 207 Paint Booth	Y	Y	Y	YES
Bldg 2427 Paint Booth	Y	Y	Y	YES
Bldg 8000 Paint Booths	Y	Y	Y	YES
Bldg 9551 Range Paint Booth	Y	Y	Y	YES
Bldg 9635 (Butts Air Field Paint Booth)	Y	Y	Y	YES
Fuel Dispensing				
Bldg 900 Service Station	Y	Y	N	NO
Bldg 1515 Service Station	Y	Y	N	NO
Bldg 3600 Service Station	Y	Y	N	NO
COCO Facility--Refueling (Service Stations and Bulk Fuel)	Y	Y	Y	YES
Categorically Exempt Storage Tanks and Associated Operations				
Diesel (No. 2 Oil) Storage Tanks	Y	Y	Y	YES
Glycol Storage Tanks	Y	Y	Y	YES
JP-8 Storage Tanks	Y	Y	Y	YES
MOGAS Storage Tanks	Y	Y	Y	YES

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Military Training				
Munition Firing	N	N	Y	NO
Smoke Munitions	N	N	Y	NO
Open Burning/Open Detonation	N	N	Y	NO
Fog Oil and Graphite	Y	Y	Y	YES
Chemical Usage				
Basewide Chemical Usage	N	N	Y	NO
Pesticide Use	N	N	Y	NO
Road Paint Striping	N	N	Y	NO
Solvent Use	Y	N	Y	NO
X-Ray	Y	N	Y	NO
Landfill-Related Emissions				
Municipal Landfill	Y	N	Y	NO
Miscellaneous Particulate Emissions				
Abrasive Blasting	Y	Y	Y	YES
Bldg 1864 Cooling Towers	Y	N	Y	NO
Bldg 7501 Cooling Towers	Y	N	Y	NO
LB&B Yard	Y	N	Y	NO
Rocky Mountain Asphalt Yard	Y	N	Y	NO
Troop Construction Yard	Y	N	Y	NO
Tank Trails	Y	N	Y	NO
Fire Training				
Fire Training Facility	Y	Y	Y	YES
Prescribed Burning				
Prescribed Burning	Y	N	Y	NO
Miscellaneous APEN/Permit Exempt Sources				
Industrial Wastewater Treatment Plant	Y	N	Y	NO
Sewage Treatment Plant	Y	N	Y	NO
Soil Vapor Extraction Systems	Y	Y	Y	YES

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM10 (tpy)	NOX (tpy)	CO (tpy)	SOX (tpy)	VOC (tpy)	Method of Determining PTE
Boilers and Hot Water Generators							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	2.01	2.01	23.00	12.83	19.60	0.85	Permit limits (95OPEP110)
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	1.08	0.83	7.95	7.26	9.80	0.48	Permit limits (07EP0205)
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.96	0.96	7.22	6.29	8.91	0.42	Permit limits (95OPEP110)
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.57	0.57	7.50	6.30	0.05	0.41	Permit limits (95OPEP110)
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.77	0.68	4.11	6.80	7.15	0.45	Permit limits (95OPEP110)
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.08	0.08	1.00	0.84	0.01	0.06	Permit limits (95OPEP110)
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.14	0.14	1.80	1.51	0.01	0.10	Permit limits (95OPEP110)
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.06	0.06	0.75	0.63	0.005	0.04	Permit limits (95OPEP110)
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.36	0.36	4.65	3.82	0.56	0.25	Permit limits (95OPEP110)
Existing Categorically Exempt Boilers Standard Configuration	8.15	8.15	107.21	90.05	0.64	5.90	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 20 ppm	1.00	1.00	3.15	11.04	0.08	0.72	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 30 ppm	0.14	0.14	0.62	1.49	0.01	0.10	8760 hours of operation
Source Category Total	**15.30**	**14.95**	**168.95**	**148.85**	**46.82**	**9.77**	
Other External Combustion Sources							
Categorically Exempt Miscellaneous External Combustion Units	3.33	3.33	43.83	36.81	0.26	2.41	8760 hours of operation
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.08	0.08	1.42	1.75	0.04	0.21	Permit limits (07EP0293)
Bldg 1550 Generator (1550 hp)	0.27	0.16	9.30	2.13	1.57	0.25	Permit limits (95OPEP110)
Bldg 3909 Generator (1620 hp)	0.28	0.16	9.72	2.23	1.64	0.26	Permit limits (95OPEP110)
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	0.26	0.26	29.03	4.62	9.43	0.26	Permit limits (05EP0230) & APEN
Bldg 8000 Dynamometers	1.10	1.10	15.50	3.34	2.02	1.26	Permit limits (95OPEP110)
Butts Air Field Engine Test Stand	0.34	0.34	3.03	4.33	1.71	1.63	Permit limits (95OPEP110)
Categorically Exempt Diesel Emergency Generators <600hp	1.66	1.66	23.40	5.04	1.55	1.86	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Diesel Emergency Generators >600hp	0.12	0.07	4.13	0.95	0.70	0.12	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Natural Gas/Propane Emergency Generators	0.047	0.047	3.87	0.47	0.0007	0.15	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Source Category Total	**4.16**	**3.87**	**99.40**	**24.86**	**18.65**	**5.99**	

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM10 (tpy)	NOX (tpy)	CO (tpy)	SOX (tpy)	VOC (tpy)	Method of Determining PTE
Coating Activities							
Bldg 207 Paint Booth	0.0013	0.0013	0	0	0	0.11	Actual emissions multiplied by a growth factor of 1.25
Bldg 2427 Paint Booth	0.0040	0.0040	0	0	0	0.29	Actual emissions multiplied by a growth factor of 1.25
Bldg 8000 Paint Booths	0.84	0.84	0	0	0	15.66	Permit limits (95OPEP110)
Bldg 9551 Range Paint Booth	0.0091	0.0091	0	0	0	0.65	CY 2002 actual emissions multiplied by a growth factor of 1.25
Bldg 9635 (Butts Air Field Paint Booth)	0.2744	0.2744	0	0	0	0.44	Permit limits (95OPEP110)
Source Category Total	**1.13**	**1.13**	**0.00**	**0.00**	**0.00**	**17.15**	
Fuel Dispensing							
COCO Facility--Refueling (Service Stations and Bulk Fuel)	0	0	0	0	0	7.69	Permit Limits (04EP0762)
Categorically Exempt Storage Tanks and Associated Operations							
Diesel (No. 2 Oil) Storage Tanks	0	0	0	0	0	0.42	24 turnovers per year
Glycol Storage Tanks	0	0	0	0	0	0.00036	24 turnovers per year
JP-8 Storage Tanks	0	0	0	0	0	9.5	24 turnovers per year
MOGAS Storage Tanks	0	0	0	0	0	9.73	Actual emissions multiplied by a growth factor of 1.25
Source Category Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.68**	
Military Training							
Mechanical Smoke Generators	31.82	31.82	0.00	0.00	0.00	31.82	Permit limits (95OPEP110)
Miscellaneous Particulate Emissions							
Abrasive Blasting	0.07	0.07	0	0	0	0	Permit limits (95OPEP110).
Fire Training							
Fire Training Facility	0.02	0.02	0.11	0.04	0.00	0.06	APEN limit of 4000 gal/CDPHE concurrence
Installation-wide Subtotal *(Boilers and Hot Water Generators Only)*	15.30	14.95	168.95	148.85	46.82	9.77	
Installation-wide Total	**55.84**	**55.20**	**312.29**	**210.56**	**65.73**	**94.58**	

Table A-3. Criteria Pollutant
Combat Aviation Brigade - Emission Summary

Potential Emissions

Pollutant	External Combustion		Internal Combustion		Total	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
NOx	2.56	11.22	23.97	3.00	26.53	14.22
CO	5.98	26.18	12.98	1.62	18.96	27.80
VOC	0.39	1.71	1.45	0.18	1.85	1.90
SO2	0.04	0.19	0.92	0.11	0.96	0.30
PM10	0.54	2.37	0.75	0.09	1.29	2.46

Table A-4. Combat Aviation Brigade
Internal Combustion Heat Input Estimates

Combat Aviation Brigade Projects (2008 Construction EIS)					
Project Number	POV Parking	Square Footage[1]	Number of Bldg./ Stories	Total Heat Input (Btu/hr/sq.Ft.)[2]	Total Heat Input (MMBtu/hr)
11120	**Rotary Wing Runway (Surfaced)**	**686,097**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	686,097			
11140	**Hover Points (4) 150' x 150'**	**22,500**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	22,500			
11221	**New and Rebuilt Taxi ways**	**90,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	90,000			
11320	**Rotary Runway Parking Apron**	**1,170,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	1,170,000			
11330	**Aircraft Maintenace Apon**	**126,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	126,000			
11340	**Hanger Access Apron**	**65,700**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	65,700			
11370	**Aircraft Wash Apron**	**56,988**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	56,988			
11610	**Aircraft Compass Swing Base**	**37,494**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	37,494			
13320	**Install FBPAR (radar)**	**350**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	350			
13410	**Radio Beacon (off post, est.)**	**250**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	250			
13430	**Ground Control Approach System (est.)**	**300**			
	Total Heated Sq. Ft.	300			0.0
	Total Parking Sq. Ft.	0			
13440	**Intrument Landing System (est.)**	**1,000**			
	Total Heated Sq. Ft.				0.0
	Total Parking Sq. Ft.	1,000			
13450	**Navigational Lighting (est.)**	**1,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	1,000			
13420	**Wind Direction Indicator (2, est)**	**200**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	200			
136	**Run-way lighting (est.)**	**1,480**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	1,480			
14112	**Aviation Unit Operations Bldg. (additional)**	**17,922**			
	Total Heated Sq. Ft.	17,922	2	60	1.1
	Total Parking Sq. Ft.	0			
14113	**Access Control Buildings (2)**	**60**			
	Total Heated Sq. Ft.	60	1	100	0.01
	Total Parking Sq. Ft.	0			
14182	**Brigade HQ**	**20,656**			
	Total Heated Sq. Ft.	20,656	2	60	1.2
	Total Parking Sq. Ft.	0			

Table A-4. Combat Aviation Brigade
Internal Combustion Heat Input Estimates

Combat Aviation Brigade Projects (2008 Construction EIS)					
Project Number	**POV Parking**	**Square Footage[1]**	**Number of Bldg./ Stories**	**Total Heat Input (Btu/hr/sq.Ft.)[2]**	**Total Heat Input (MMBtu/hr)**
14183	**Battalion HQ**	**63,305**			
	Total Heated Sq. Ft.	63,305	2	60	3.8
	Total Parking Sq. Ft.	0			
14185	**Company Head Quarters**	**302,623**			
	Total Heated Sq. Ft.	302,623	3	60	18.2
	Total Parking Sq. Ft.	0			
17119	**Battalion Classrooms**	**22,925**			
	Total Heated Sq. Ft.	22,925	2	60	1.4
	Total Parking Sq. Ft.	0			
17210	**Simulator bldgs.**	**50,939**			
	Total Heated Sq. Ft.	50,939	1	55	2.8
	Total Parking Sq. Ft.	0			
21110	**Aircraft Maintenance Hangers**	**173,894**			
	Total Heated Sq. Ft.	173,894	1	75	13.0
	Total Parking Sq. Ft.	0			
21113	**Aircraft Parts Storage**	**16,000**			
	Total Heated Sq. Ft.	16,000	1	45	0.7
	Total Parking Sq. Ft.	0			
21410	**Vehicle Maintenance Shop**	**46,192**			
	Total Heated Sq. Ft.	46,192	1	75	3.5
	Total Parking Sq. Ft.	0			
21470	**Oil Storage Bldg.**	**3,260**			
	Total Heated Sq. Ft.	3,260	1	35	0.1
	Total Parking Sq. Ft.	0			
44224	**Unit Storage**	**23,100**			
	Total Heated Sq. Ft.	23,100	1	45	1.0
	Total Parking Sq. Ft.	0			
55010	**Troop Med. Clinic**	**14,000**			
	Total Heated Sq. Ft.	14,000	1	120	1.7
	Total Parking Sq. Ft.	0			
72111	**UEPH**	**346,602**			
	Total Heated Sq. Ft.	346,602	3/4	55	19.1
	Total Parking Sq. Ft.	0			
72210	**DFAC**	**23,730**			
	Total Heated Sq. Ft.	23,730	1	150	3.6
	Total Parking Sq. Ft.	0			
74028	**Fitness Center**	**32,000**			
	Total Heated Sq. Ft.	32,000	1	45	1.4
	Total Parking Sq. Ft.	0			
85215	**Org. Vehicle Parking**	**855,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	855,000			
85210	**POV Parking**	**900,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	900,000			
Total Heated Sq. Ft. for Boilers/Other External Combustion		**1,157,208**			**72.6**

[1] Heated Sq. Ft. estimate made from project 1391 numbers.

[2] BTU input taken from BRAC projects that were similar in scope and size for which we have estimates from the COE, or actual data from project plan reviews.

Table A-5. Combat Aviation Brigade External Combustion Emissions

Fuel Heating Value (LHV)	1020	Btu/scf
Total Heat Rate (LHV)	72.58	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	623.3	MMscf/yr

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	PTE Hrs of Operation (hrs/yr)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	36.00	72.58	8760	2.56	11.22	Fort Carson[1]
CO	84.00	72.58	8760	5.98	26.18	AP-42[2]
VOC	5.50	72.58	8760	0.39	1.71	AP-42[3]
SO2	0.60	72.58	8760	0.04	0.19	AP-42[3]
PM10	7.60	72.58	8760	0.54	2.37	AP-42[3]

[1] NOx emissions based on natural gas-fired combustion equipment with NOx concentration of 30 ppm in exhaust per Fort Carson specifications.

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

Table A-6. Combat Aviation Brigade Internal Combustion Emissions

Engine Usage	Emergency Generator	
Engine Configuration	Diesel	
Emission Controls	None	
Number of Engines	3	
Site Rating	755	BHP each
Potential Operation	250	hr/yr

Potential Emissions - Per Engine

Pollutant	**Emission Factor**		**Nominal Rating**	**PTE Hrs of Operation**	**Estimated Emissions per Engine**		**Source of Emission**
	lb/hp-hr	(g/hp-hr)	(hp)	(hrs/yr)	(lb/hr)	(tpy)	Factor
NOx	0.0106	4.80	755	250	7.99	1.00	40 CFR Part 89[1]
CO	0.0057	2.60	755	250	4.33	0.54	40 CFR Part 89[1]
VOC	0.00064	0.29	755	250	0.48	0.06	AP-42[2]
SO2	4.05E-04	0.18	755	250	0.31	0.04	AP-42[2]
PM10	0.00033	0.15	755	250	0.25	0.03	40 CFR Part 89[1]

[1] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate a maximum of 250 hours per year. The emission factors for NOx, CO and PM/PM10 are based on us EPA's Tier 3 emission standards for generators with a rated power of 130 to 560 KW. 3.0 g/hp-hr for NOx (non-methane hydrocarbon+NOx standard), 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM. All PM was assumed to be PM10. The remaining criteria pollutant emission factors are from Section 3.4 of AP-42. A sulfur content of 0.05 weight percent was assumed.

[2] EPA AP-42, Volume I, Fifth Edition - October 1996, Table 3.3-1, Uncontrolled Emission Factors for Diesel Industrial Engines

Total PTE - All Three Engines

Pollutant	**Estimated Emissions All Engines**	
	(lb/hr)	**(tpy)**
NOx	23.97	3.00
CO	12.98	1.62
VOC	1.45	0.18
SO2	0.92	0.11
PM10	0.75	0.09

FINAL

AIR QUALITY ANALYSIS MODELING REPORT

For the

Piñon Canyon Maneuver Site (PCMS)

Prepared for
USAG Fort Carson
DPW, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078, Delivery Order 0005 (URS Project No. 39455606)

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December 2008

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Appendices

Acronyms

%	percent
A_0	total area
AAQS	ambient air quality standards
AERMET	a meteorological preprocessor for AERMOD
AERMOD	AMS/EPA regulatory model
AERSURFACE	AMS/EPA regulatory model surface characteristics development tool
AMS	American Meteorological Society
AQRV	air quality related value
ArcGIS	an integrated collection of geographic information system software products
ArcMap	a geographic information system application
BCT	brigade combat team
bhp	brake horsepower
BPIP	building profile input program
CAAQS	Colorado ambient air quality standards
CALGRID	California photochemical grid model
CALMET	California meteorological model—a pre-processor component of the CALPUFF modeling system
CALPOST	a post-processing component of the CALPUFF modeling system
CALPUFF	California puff air quality dispersion modeling system
CDPHE	Colorado Department of Public Health and Environment
CO	carbon monoxide
CY	calendar year
DAT	deposition analysis threshold
DEM	digital elevation model
DPW	Directorate of Public Works
DUSTRAN	dust transport atmospheric modeling system
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
ft	feet
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLM	Federal Land Manager
Fort Carson	US Army Garrison (USAG) Fort Carson, Colorado
GIS	geographic information system
GTA	Grow the Army
HBCT	heavy brigade combat team
IBCT	infantry brigade combat team
IWAQM	Interagency Workgroup on Air Quality Modeling
kg/ha/yr	kilogram per hectare per year
km	kilometer
km^2	square kilometers
lb/hp-hr	pounds per horsepower-hour
MM5	Fifth-Generation NCAR/Penn State Mesoscale Model

MMBtu/hr	million British thermal units per hour
mph	mile per hour
m/s	meters per second
N_2	Nitrogen
NAAQS	national ambient air quality standards
NAD	North American datum
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPS	National Park Service
PCMS	Piñon Canyon Maneuver Site
PCRAMMET	EPA personal computer version of the meteorological preprocessor for the RAM program
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
PNNL	Pacific Northwest National Laboratory
POSTUTIL	an inorganic chemistry parameterization component of the CALPUFF modeling system
ppb	parts per billion
PSD	Prevention of Significant Deterioration
PTE	potential to emit
RMNP	Rocky Mountain National Park
S	sulfur
SIL	significant impact levels
SO_2	sulfur dioxide
SO_x	sulfur oxides
USAG	United States Army Garrison
VOC	volatile organic compound

EXECUTIVE SUMMARY

Air dispersion modeling was performed to assess the cumulative impacts on ambient air quality from existing, recently added, and proposed emission sources at Piñon Canyon Maneuver Site (PCMS). The modeling was initiated in support of the Grow the Army Environmental Impact Statement for the US Army Garrison, Fort Carson, Colorado (Fort Carson). Emission estimates were calculated for the following criteria pollutants:

- Carbon monoxide (CO),
- Nitrogen oxides (NO_x),
- Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}),
- Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$),
- Sulfur dioxide (SO_2) or sulfur oxides (SO_x), and
- Volatile organic compounds (VOC).

The near-field/off-post concentrations of these pollutants were determined using the American Meteorological Society (AMS)/United States Environmental Protection Agency's (EPA) Regulatory Model (AERMOD) (Version 07026). The model was run using surface meteorological data from the Perry E. Stokes Airport in Trinidad and upper-air data from the Denver Stapleton International Airport (WebMET 2002).

Particulate matter near-field 24-hour concentrations were determined using the dust transport atmospheric modeling system (DUSTRAN). This model was developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) to assist the US Department of Defense in addressing particulate air quality issues at military training installations. DUSTRAN is based on Environmental System Research Institute's ArcMap geographical information system (Version 9.x), the EPA-approved California puff air quality dispersion modeling system (CALPUFF) and the widely used California grid dispersion model (CALGRID). The California meteorological (CALMET) model provides meteorological parameter values for the CALPUFF and CALGRID models. For this analysis, the Pueblo Memorial Airport meteorological monitored values were input to CALMET, which were considered conservative, and a 4-kilometer (km) (2.5 mile) resolution meteorological grid was created.

The far-field (greater than 50 km [31 miles]) air quality related value (AQRV) impacts were analyzed using the CALPUFF dispersion model suite. AQRV impacts include comparison of modeled pollutant concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation for the appropriate Class I and sensitive Class II federal areas. The CALPUFF models were created using meteorological years 2001, 2002, and 2003

CALMET output, which were derived from over 40 surface, 50 precipitation, and two upper-air raw data sets located throughout the modeling domain.

Results of the three modeling analyses (AERMOD, DUSTRAN, and CALPUFF) are summarized below:

None of the AERMOD predicted ambient concentrations of criteria pollutants (i.e., modeled maximum concentration plus background concentration) exceeded the corresponding national ambient air quality standards (NAAQS) or Colorado ambient air quality standards (CAAQS).

DUSTRAN-modeled 24-hour particulate concentrations did not exceed the applicable NAAQS or CAAQS.

CALPUFF results showed a PM_{10} 24-hour concentration above the SIL for one day out of the three years modeled at the Great Sand Dunes National Monument and Preserve. However, the predicted cumulative 24-hr PM_{10} concentration at this location was below the NAAQS. All other maximum modeled pollutants' (NO_x, SO_x, and PM_{10}) annual average concentrations and short-term concentrations were below their respective Class I increment SILs. The maximum predicted nitrogen and sulfur deposition rates were below the deposition analysis threshold of 0.005 kilograms/hectare/year for all Class I or sensitive Class II federal areas that were modeled.

The CALPUFF results also predicted there would be no noticeable visibility impacts for all but one Class I area, the Great Sand Dunes National Park and Preserve, which showed noticeable visibility impacts for one day out of the three years modeled. The visibility assessment is expressed as the number of days for each modeled year that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; therefore, greater deciview levels represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals. A visibility change of greater than one deciview was observed for one day out of the three years modeled at the Great Sand Dunes National Park and Preserve. No other visibility changes of greater than one deciview were observed for the modeled Class I areas. However, visibility changes of greater than one deciview were observed for some of the sensitive Class II areas. The greatest number of days with visibility changes occurred at the Southern Parcel, a scenic and/or important view located within PCMS.

1.0 BACKGROUND

Emissions of air pollutants at Piñon Canyon Maneuver Site (PCMS) will increase due to the addition of personnel associated with the Grow the Army (GTA) project (i.e., there will be an increase the amount of training conducted in existing training areas). Consequently, emissions primarily consisting of fugitive dust from increased use of military ranges and maneuver areas will increase.

Three air quality analyses were conducted to assess the cumulative impacts associated with the anticipated level of military training activity at PCMS:

- The near-field (within 50 kilometers [km] [31 miles])/off-post concentrations of criteria pollutants were determined using the American Meteorological Society (AMS)/United States Environmental Protection Agency's (EPA) Regulatory Model (AERMOD) Version 07026.

- Particulate matter near-field 24-hour concentrations were determined using DUSTRAN, which was developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) to assist the US Department of Defense (DoD) in addressing particulate air quality issues at military training installations.

- The far-field (greater than 50 km [31 miles]) impacts were determined using the EPA-approved California puff air quality dispersion modeling system (CALPUFF). A 3-km (1.8-mile) receptor grid covered the approximate 3.55×10^{11} square meter (1.37×10^{5} square mile) modeling domain, which includes most of Colorado, much of northern New Mexico, and parts of the Oklahoma and Texas pan handles. The far-field analysis focused on air quality related values (AQRVs).

Air quality impacts to several nearby Class I and sensitive Class II federal areas were evaluated in this assessment. Additionally, based on Colorado Department of Public Health and Environment (CDPHE) guidance, impacts were evaluated at several nearby Colorado locations that have scenic and/or important views (CDPHE 2005, Campbell 2006).

2.0 LOCATION DESCRIPTION

PCMS is an approximately 235,000-acre maneuver training area dedicated to training units stationed at or otherwise under the responsibility of US Army Garrison, Fort Carson, Colorado (Fort Carson). This maneuver area is located in southeastern Colorado in Las Animas County, approximately 155 miles southeast of Fort Carson. The installation is bounded by U.S. 350 to the west, Purgatoire River Canyon to the east, Van Bremer Arroyo to the south, and Otero County to the north. Nearby cities and towns include Trinidad and Model to the southwest, and Timpas and La Junta to the northeast.

The cantonment area comprises approximately 1,660 acres, which provides limited, austere Soldier and installation support facilities. Limited full-time Department of the Army civilian and contracted personnel are currently assigned to PCMS. The regional air quality is considered good as PCMS is located in an attainment area for all criteria pollutants (see Figure 1).

Class I areas located within 280 km (174 miles) of PCMS include the Wheeler Peak Wilderness Area, La Garita Wilderness Area, Weminuche Wilderness Area, Great Sand Dunes National Park and Preserve, and Pecos Wilderness Area. Additionally, several nearby Colorado locations that have scenic and/or important views have been designated by Federal Land Managers (FLM) as sensitive Class II areas (CDPHE 2005b).

3.0 SOURCE CHARACTERIZATION

3.1 Air Emission Inventory

The air emission inventory for PCMS consists largely of fugitive dust emission sources, although military training involving smoke and obscurants is also a significant emission source. A few small (maximum heat input rate of less than two million British thermal units per hour [MMBtu/hr]) external combustion sources are located in the cantonment area and at austere camps located through PCMS. For inventory purposes, emission sources were grouped based on the following similar emission characteristics (see Appendix A):

- Fugitive emissions from maneuvers and convoys;
- Vehicle exhaust from maneuvers and convoys;
- Military smoke and obscurants; and
- Stationary external combustion sources (i.e., boilers, furnaces, space heaters, and domestic hot water heaters).

Annual and 24-hour emissions were calculated on a potential to emit (PTE) basis. Each source's PTE was determined based on its maximum capacity to emit any air pollutant under its physical and operational design. Assumptions used to calculate emissions are described in the following sections.

3.1.1 Stationary External Combustion Sources

Annual PTE: Existing stationary sources were identified based on the calendar year (CY) 2006 PCMS air emission inventory (PCMS 2007). No new (i.e., post 2006) stationary sources were added, proposed, or projected to be added as part of GTA, or other projects. Since all PCMS stationary external combustion sources are permit-exempt, PTE was determined based on 8,760 hours of operation per year.

24-hour PTE: Existing stationary sources were identified based on the CY 2006 PCMS air emission inventory. PTE was calculated for a 24-hour period based on every source operating at its maximum heat input rate.

3.1.2 Fugitive Particulate Sources

Fugitive particulate emissions occur when military vehicles conduct training maneuvers, convoy to and from PCMS, and convoy within PCMS. Fugitive particulate emissions were calculated for two types of brigade combat teams (BCTs): an infantry (light) (IBCT) and a heavy (HBCT). The BCT is the basic deployable unit of maneuver in the US Army. An IBCT contains only wheeled vehicles; whereas, an HBCT includes both wheeled vehicles and tracked, tactical vehicles. An HBCT is the largest size group that can conduct maneuvers at PCMS. Battalion groups, which are subsets of BCTs, also conduct training exercises at PCMS and are included in the annual emission calculations.

Annual PTE: The annual PTE from maneuvers and convoys was calculated based on the following assumptions (Ford 2008a, 2008b):

- Three HBCTs, each containing approximately 824 wheeled vehicles and 329 tracked vehicles, maneuver at PCMS per year. The HBCTs originate from Fort Carson. Tracked vehicles move by rail to and from PCMS. Wheeled vehicles convoy to and from PCMS. Both tracked and wheeled vehicles travel to maneuver training sites on PCMS via convoy;
- Two IBCTs, each containing approximately 851 wheeled vehicles, maneuver at PCMS per year. The IBCTs originate from Fort Carson and convoy to, from, and within PCMS;
- Fifteen battalions maneuver at PCMS per year and convoy to, from, and within PCMS. Each battalion contains between 86 and 159 vehicles. Light battalions contain only wheeled vehicles. Heavy battalions contain both wheeled and tracked vehicles;
- Wheeled vehicles travel at 35 miles per hour (mph). Tracked vehicles travel at 25 mph. In locations where the convoy route is close to the property boundary, vehicle speeds are limited to 15 mph;
- Tracked vehicles travel on untreated dirt roads; and
- Wheeled vehicles travel on graveled routes that reduce dust emissions by 53.6 percent (%) (Refer to Appendix A, Table A-2 for control factor calculation).

24-hour PTE: The 24-hour PTE was calculated for two worst case scenarios:

- An HBCT convoy day; and
- An HBCT maneuver day.

Emissions were calculated based on the following assumptions:

- Vehicles convoy to staging areas at PCMS over two days, with half of the vehicles convoying each day. Convoy routes are shown in Figure 2. Appendix A, Table A-2 shows the number and type of vehicles traveling on each route;
- In locations where the convoy route is close to the property boundary, vehicle speeds are limited to 15 mph;
- Tracked vehicles travel on untreated dirt roads; and
- Wheeled vehicles travel on graveled routes that reduce dust emissions by 53.6%.

The highest 24-hour emissions occurred when an HBCT conducted maneuvers. Convoy emissions, though lower, were emitted from a small area.

3.1.3 Vehicle Exhaust Emissions

Annual PTE: The annual vehicle exhaust PTE was calculated based on the following assumptions:

- Three HBCTs maneuver at PCMS per year. The HBCTs originate from Fort Carson. Tracked vehicles move by rail to and from PCMS. Wheeled vehicles convoy to and from PCMS. Both tracked and wheeled vehicles travel to maneuver training sites on PCMS via convoy;
- Two IBCTs maneuver at PCMS per year and convoy to, from, and within PCMS;
- Fifteen battalions maneuver at PCMS per year and convoy to, from, and within PCMS;
- Vehicles convoy to staging areas at PCMS over two days, with half of the vehicles convoying each day;
- All vehicles are active on maneuver days;
- On either days (convoy or maneuver), each active vehicle operates four hours per day at its full horsepower rating; and
- Since military vehicles are exempt from mobile source emission control requirements, AP-42 (EPA 1996a, EPA 1996b) emission factors (in pounds per horsepower-hour [lb/hp-hr]) were multiplied by horsepower-hours to calculate emissions.

24-hour PTE: The 24-hour PTE was calculated for two scenarios:

- An HBCT convoy day; and
- An HBCT maneuver day.

Emissions were calculated based on the following assumptions:

- Vehicles convoy to staging areas at PCMS over two days, with half of the vehicles convoying each day;
- All vehicles are active on maneuver days;
- On either days (convoy or maneuver), each active vehicle operates four hours per day at its full horsepower rating; and
- Since military vehicles are exempt from mobile source emission control requirements, AP-42 (EPA 1996a, EPA 1996b) emission factors were used to calculate emissions.

3.1.4 Wind Erosion Emissions

The wind erosion emission factor was calculated based on a maximum wind speed of 19.5 meters per second (m/s) [43.6 mph], which was determined using five years of Trinidad surface meteorological data at the 99.99 percentile (WebMET 2002). Particulate matter emissions per area of disturbance were calculated from the threshold friction velocity derived from the maximum wind speed. Lastly, the AP-42 calculation method, equations, and factors were applied to determine an applicable and conservative wind erosion emissions factor (EPA 2006).

Annual PTE: The total land disturbance area (in square meters) from maneuver and convoy exercises for the year was multiplied by the emission factor to determine the maneuver and convoy "induced" wind erosion emissions. Constant hourly emission rates were determined by dividing the annual PTE by 8,760 hours per year.

24-hour PTE: All vehicle-accessible portions of the maneuver area were assumed to be previously disturbed and subject to wind erosion. Additionally, all convoy and maneuver vehicle travel during the 24-hour period was assumed to result in additional disturbance. The total disturbed area (i.e., previously disturbed area plus area disturbed during a 24-hour period) was multiplied by the wind erosion emission rate (calculated as described above) and divided by 24 hours to determine an hourly emission rate.

3.1.5 Smoke and Obscurant Emissions

Annual PTE: Based on the current training mission, PCMS does not anticipate smoke and obscurant use in excess of the current permit limits. Therefore, annual PTE from smoke and obscurants was conservatively estimated to equal the permitted emission limits[1] (CDPHE 2007).

24-hour PTE: The 24-hour PTE was conservatively estimated (as a worst case scenario) to equal the annual emission limits from the construction permit (i.e., the entire annual permitted amount was emitted in one day).

3.2 Emission Source Locations

To facilitate the modeling analyses and ensure a conservative assessment, all external combustion point source emissions were assigned to a single location (i.e., a pseudo source) in the cantonment area. This location is represented as "Cantonment_Point_Source" in Figure 2.

Particulate matter emissions from vehicle travel (including vehicle convoys to maneuver areas) were represented by 206 equally spaced (500-meter [1,640-foot] spacing) volume sources that represent 78.2 km (48.6 miles) of pathways (see Figure 2). Particulate matter emissions associated with the maneuver training exercises, including both fugitive dust and smoke/obscurants, are modeled as four area sources representing the portion of PCMS that is accessible by vehicles for maneuver exercises (see Figure 2 – Areas 1, 2, 3, and 4).

[1] Per Condition 7 of Construction Permit 96LA1082 for the use of smoke munitions and the generation of obscurant smoke in conjunction with the training of military personnel, emissions of air pollutants shall not exceed the following limitations: VOCs: 54.29 tons per year (tpy); PM: 54.29 tpy; and PM_{10}: 54.29 tpy (CDPHE 2007).

4.0 NEAR-FIELD (AERMOD) DISPERSION MODEL ANALYSIS

Near-field air quality impacts in the Class II areas located less than 50 km (31 miles) from the facility were determined with the latest version of the AMS/EPA/AERMOD (Version 07026). Due to the source types/distribution of emissions and nature of the surrounding topography, the following model "options" were selected:

- Calculation of wet and dry deposition of particulate matter;
- AERMOD toxics option;
- Elevated terrain effects; and
- Rural dispersion parameter values.

The AERMOD model includes rural and urban algorithm options. These options affect the wind speed profile, dispersion rates, and mixing-height formula used in calculating ground-level pollutant concentrations. An EPA-protocol document provides a classification guideline for selecting either the rural or urban algorithm based on average heat flux, land use, or population density within a 3-km (1.8 mile) radius from the modeled facility (Auer 1978). Of the three criteria, land use is the most definitive. The urban/rural classification scheme based on land use is as follows:

> *"The land use within the total area, total area (A_0), circumscribed by a 3-km circle about the source, is classified using the meteorological land use-typing scheme proposed by Auer (1978). The classification scheme requires that more than 50% of the area, total area (A_0), be from the following land use types in order to be considered urban for dispersion modeling purposes: heavy industrial; light-moderate industrial; commercial; single-family compact residential; and multi-family compact residential. Otherwise, the use of rural dispersion coefficients is appropriate."*

PCMS has little, if any, heavy industrial, light-moderate industrial, commercial land, single-family compact residential, or multi-family compact residential land within 3-km (1.8 mile) of the fence line. Based on EPA's definition, PCMS is considered a rural area; therefore, the rural option was used.

4.1 AERMOD Set-Up for Short-Term Impacts

To be conservative, two possible worst-case scenarios were considered to assess short-term 24-hour particulate matter (PM_{10} and $PM_{2.5}$), 3- and 24-hour SO_2, and 1- and 8-hour CO impacts.

Scenario 1 – One HBCT conducts maneuver exercises over a 12-hour period (see Figure 2 – Areas 1, 2, 3, and 4).

Scenario 2 – One-half of the vehicles in an HBCT convoy from the cantonment area to three remote staging areas over a 12-hour period (see Figure 3 – Convoy routes A-B, A-C, and A-D-E) during one day of a two-day convoy.

Modeling assumptions for the "worst-case" 24-hour emission scenarios were as follows:

- Emissions from maneuver exercises (i.e., fugitive particulate, vehicle exhaust, smoke and obscurant use, and wind erosion) are spread evenly across the four area sources;
- Emissions from convoys (i.e., fugitive particulate, vehicle exhaust, and wind erosion) are distributed among the convoy route volume sources. Emissions are reduced to account for reduced vehicle speed where indicated (see Figure 2);
- Emissions from maneuvers and convoys take place over a 12-hour period from 7:00 a.m. to 7:00 p.m.;
- A pseudo point source located in the cantonment area, representing all PCMS external combustion sources, (see Figure 2) emits at a constant hourly rate 24-hours per day. Constant hourly emission rates are determined by dividing the annual PTE by one year (8,760 hours); and
- Wind erosion emissions occur at the 24-hour PTE hourly emission rate (see Section 3.1.4) only during hours when the AERMOD default wind speed threshold of 10.8 m/s (22.4 mph) is met or exceeded.

The pseudo point source stack exhaust parameters (i.e., flow rates, exit diameter, and temperature) are shown in Appendix A, Table A-6. Modeled emission rates and three-dimensional values for all sources are shown in Tables 1 and 2.

4.2 AERMOD Set-Up for Annual Impacts

One emission scenario was analyzed for the annual particulate matter (PM_{10} and $PM_{2.5}$), NO_x, and SO_2 concentration modeling. In this scenario, it was assumed three HBCTs, two IBCTs, and fifteen battalions would conduct maneuvers at PCMS per year. HBCTs, IBCTs and battalions originate from Fort Carson. Tracked vehicles move by rail to and from PCMS. Wheeled vehicles convoy to and from PCMS. Both tracked and wheeled vehicles travel to maneuver training sites on PCMS via convoy.

Modeling assumptions for the annual emission scenario are described below:

- Emissions from maneuver exercises (i.e., fugitive particulate, vehicle exhaust, smoke and obscurant use, and wind erosion) are spread evenly across the four area sources;
- Emissions from convoys (i.e., fugitive particulate, vehicle exhaust, and wind erosion) are distributed among the convoy route volume sources. Emissions are reduced to account for reduced vehicle speed where indicated (see Figure 2);
- A pseudo point source located in the cantonment area, representing all PCMS external combustion sources, (see Figure 2) emits at a constant hourly rate 24-hours

per day. Constant hourly emission rates were determined by dividing the annual PTE by one year (8,760 hours); and

- Wind erosion emissions occur at the 24-hour PTE hourly emission rate (see Section 3.1.4) only during hours when the AERMOD default wind speed threshold of 10.8 m/s (22.4 mph) is met or exceeded.

The pseudo point source stack exhaust parameters (i.e., flow rate, exit diameter, and temperature) are shown in Appendix A, Table A-6. Modeled annual average emission rates and three dimensional values for all sources are shown in Table 3.

4.3 AERMOD Receptor Grid

A receptor grid, or network, defines the locations of predicted air concentrations that are used to assess compliance with the relevant standards or guidelines (see Figure 2). The following near-field receptor network was used for this analysis:

- A universal transverse Mercator Cartesian (x, y) grid was designed based on the projected coordinate system: North American datum (NAD) 1927, Zone 13 North;
- 1000-meter (3,281-foot) spacing along the fence line represents the ambient boundary;
- No “flag pole” (i.e. elevated) heights were assigned to receptors; and
- The above sea-level elevation for each receptor was determined by geographical software (AERMAP) interpolation for associated 7.5 minute (at least 30 meter or 98 ft resolution) Digital Elevation Model (DEM) output.

4.4 Meteorological Data Processing for AERMOD

The AERSURFACE land surface characteristics determination program was used to create representative surface characteristics parameter values for input to the meteorology processor AERMET (Version 06341). A representative Colorado Land Usage file was input to AERSURFACE, with a central location of the “representative” surface station. For each year of Colorado Springs’ meteorology, annual rainfall was compared to its 30-year mean to determine the AERSURFACE input parameter value used to calculate the Bowen Ratio. It was also assumed that snowfall occurs frequently from December to February. Monthly values were calculated for twelve 30-degree sectors.

Five years (2002-2006) of Integrated Surface Hourly Data from Trinidad’s surface meteorology was obtained from the National Climatic Data Center (NCDC 2005) and was merged with five years (2002-2006) of Denver Stapleton vertical meteorology profile data, using the meteorology processor, AERMET version 06341. AERMET then took the merged data and representative surface characteristics created by AERSURFACE and created an AERMOD-ready meteorology data set.

4.5 AERMOD Results

Predicted (modeled) maximum criteria pollutant concentrations are presented in Table 4. For each criteria pollutant, the maximum predicted concentration is defined as follows:

- For the NO_x, SO_2, PM_{10}, and $PM_{2.5}$ annual averages, the maximum predicted concentration is the highest modeled annual average value;
- For CO and SO_2 short-term averages (1-hour, 8-hour, 3-hour, and 24-hour), the maximum predicted concentration is the highest of the first-high values for each receptor;
- For the PM_{10} short-term average (24-hour), the maximum predicted concentration is the highest of the second-high values for each receptor; and
- For the $PM_{2.5}$ short-term average (24-hour), the maximum predicted concentration is the highest of the eighth-high (98th percentile) values for each receptor.

Predicted maximum criteria pollutant concentrations were added to applicable background concentrations and the total maximum predicted concentrations were compared to the applicable NAAQS and CAAQS (see Table 4). Background concentrations indicate existing pollutant concentrations and are based on ambient air quality monitoring data. Background particulate matter concentrations for nearby Elbert County's monitors and background NO_2 and SO_2 concentrations for Colorado Springs' monitors were obtained from CDPHE (Chick 2008). Background CO concentrations for Denver, Colorado were obtained from the EPA's AirData website (http://www.epa.gov/oar/data/). None of the predicted ambient concentrations (modeled maximum concentration plus background concentration) exceeded the corresponding NAAQS or CAAQS.

5.0 DUSTRAN PARTICULATE MATTER MODELING ANALYSIS

DUSTRAN atmospheric modeling system was also used to quantify the potential near-field particulate matter 24-hour average concentrations.

5.1 Model System Description/Information

DUSTRAN is based on Environmental System Research Institute's ArcMap Geographical Information System (Version 9.x), the EPA-approved CALPUFF dispersion model, and the widely used CALGRID dispersion model. The CALMET model provides meteorological parameter values for the CALPUFF and CALGRID models (PNNL 2006).

Several key features of the modeling system are:

- Multiple point, area, and line releases can be accommodated and specified graphically;
- Simulation periods are typically a few hours to a few days;
- The atmospheric models treat wet and dry deposition and complex terrain effects; and
- Multiple particle sizes can be simulated at one time.

5.2 Model System Source Set-up Scenarios

Two simulations of four different 48-hour emission scenarios were run to predict 24-hour average PM_{10} and $PM_{2.5}$ concentrations. Each scenario is described below and is considered "worst case" with respect to the operations performed for the 48-hour period (see Figure 3 for source locations). Each emission scenario was modeled assuming two different wind directions (see Section 5.4 below).

Scenario 1 – One HBCT conducts maneuver training only at PCMS for 48 hours (i.e., no convoy exercises). It is assumed that emissions from maneuver exercises (i.e., fugitive particulate and wind erosion) are spread evenly across two area sources (see Figure 3), and wind erosion occurs for all paths and areas within PCMS. One pseudo-point source, emitting at a constant hourly rate, represents all stationary external combustion emissions.

Scenario 2 – One HBCT convoys to staging areas at PCMS over 48 hours (i.e. no maneuver training occurs). It is assumed that emissions from convoys (i.e., fugitive particulate and wind erosion) are spread evenly across the convoy routes (see Figure 3 – Convoy routes A-B, A-C, D-E), and wind erosion occurs for all paths and areas within PCMS. One pseudo-point source, emitting at a constant hourly rate, represents all stationary external combustion emissions. Vehicle speeds are limited to 15 mph on Segment 2 of Path A-B and Segment 1 of Path A-C.

Scenario 3 – During the first 24 hours, one HBCT convoys to staging areas at PCMS. Emissions from convoys (i.e., fugitive particulate and wind erosion) are spread evenly across the convoy routes (see Figure 3 – A-B, A-C, D-E). During the next 24 hours, one HBCT conducts maneuver training at PCMS. It is assumed that emissions from maneuver exercises (i.e., fugitive particulate and wind erosion) are spread evenly across two area sources (see Figure 3) and wind erosion occurs for all paths and areas within PCMS. One pseudo-point source, emitting at a constant hourly rate, represents all stationary external combustion emissions. Vehicle speeds are limited to 15 mph on Segment 2 of Path A-B and Segment 1 of Path A-C.

Scenario 4 – During the first 24 hours, one HBCT conducts maneuver training at PCMS. It is assumed that emissions from maneuver exercises (i.e., fugitive particulate and wind erosion) are spread evenly across two area sources (see Figure 3). During the second 24 hours, one HBCT convoys to staging areas at PCMS. Emissions from convoys (fugitive particulate and wind erosion) are spread evenly across the convoy routes (see Figure 3 - A-B, A-C, D-E). Wind erosion occurs for all paths and areas within the PCMS boundary for both days. One pseudo-point source, emitting at a constant hourly rate, represents all stationary external combustion emissions. Vehicle speeds are limited to 15 mph on Segment 2 of Path A-B and Segment 1 of Path A-C.

5.3 Model System Source Emissions Calculations

Table 4 (DUSTRAN emission sources inputs) lists emission sources, parameter values, and DUSTRAN inputs for each scenario. To calculate the emission rates, specific DUSTRAN vehicle-generated dust emissions factors (Desert Research Institute 2006) were used, as well as project-specific vehicle information (Ford 2008a, 2008b). These rates were manually applied to the emissions sources via DUSTRAN graphical user interfaces. Wind erosion emissions, derived using the AP-42 industrial wind erosion factors (EPA 2006), were also included in the emissions rates. It was conservatively assumed that each convoy route and maneuver area was disturbed daily, and the fugitive emissions were emitted by a maximum wind magnitude, which was derived from a five-year Trinidad meteorology data set (WebMET 2002). For derivation of wind erosion emissions, it was conservatively assumed that the maximum wind magnitude blows continuously all day for maneuver exercise activities (i.e., all dust for daily maneuver vehicle travel surface disturbances was emitted and AP-42 emissions factors and methods were applied).

5.4 Meteorological Conditions Applied to DUSTRAN

Each emission scenario for DUSTRAN was modeled twice to account for two wind directions: from the northeast at 45 degrees and from the southwest at 200 degrees. These wind directions were selected due to PCMS' proximity to the nearby communities of Trinidad, La Junta, and Rocky Ford (see Figure 3) and would correspond to maximum potential particulate matter impacts at these communities. Wind directions are shown in the concentration contour plots in Figures 4–11. Figure 12 shows the monitored wind speed and direction frequency for years 2002–2006 at the nearby meteorological station in Trinidad.

The "single observation" meteorological conditions input to CALMET were based on the following parameters:

- Mixing height was set equal to 2,000 meters (6562 feet) (the 2-year Colorado Springs average);

- Ambient atmospheric pressure was set equal to 807 millibars (Colorado Springs meteorology data set average);
- Wind speed was set equal to 2 m/s (4.5 mph). To conservatively estimate PM_{10} and $PM_{2.5}$ concentrations, a high wind speed (19.5 m/s [43.6 mph]) was used initially to calculate wind erosion emissions. However, modeling indicated that light winds led to high particulate concentrations due to reduced dispersion. Consequently, a 2-m/s (4.5 mph) wind speed was input to CALMET;
- Atmospheric stability was set to "F" (stable atmosphere), which does not allow vertical mixing. (Modeling iterations indicated that stable conditions result in higher concentrations of particulate matter.); and
- Wind direction was set blowing from the northeast (45 degrees) and southwest (200 degrees).

The wind directions were adjusted due to variations in terrain elevations. Land surface characteristics were incorporated from ArcMap layers to create a 4-km (2.5-mile) resolution gridded three-dimensional field of meteorological parameter values.

5.5 Existing Pollutant Concentrations

Background/existing particulate matter concentrations for nearby Elbert County monitors were obtained from CDPHE (Chick 2008) (see Table 6). These background concentration values were added to the predicted concentration contours in Figures 4–11 to estimate predicted ambient concentrations for the nearby communities.

5.6 DUSTRAN Results

The highest predicted particulate matter concentrations occurred during the second 24-hour period and always followed a previous day of maneuver exercises (Section 5.2, Scenarios 1 and 4). Eight 24-hour average concentration contour plots showing simulation results for Scenarios 1 and 4 are presented (see Figures 4–11). Each plot shows the modeled result for either $PM_{2.5}$ or PM_{10} for one of the two emission scenarios (convoy or maneuver) and for one of the two wind directions. Four figures are presented for $PM_{2.5}$, and four figures are presented for PM_{10}.

For each figure, the following information is depicted:

- Concentration contours are green and labeled with the modeled concentrations;
- A legend shows sources as different colors with a different symbol for each source type (point, area, and line);
- Nearby community locations are shown;
- Terrain map is used as a base map, which shows the underlying complex terrain;
- Wind vectors are shown in blue; and

- The second-day particulate matter average concentrations are presented in all figures, since the second-day (24-hour) average predicted values were of greater magnitude and extended greater distances from PCMS in all scenarios.

As discussed in Section 5.4, two wind directions were chosen due to the nearby community locations: northeasterly winds transport particulate matter into the Trinidad area and are shown in Figures 4, 6, 8, and 10; southwesterly winds transport particulate matter into the La Junta and Rocky Ford areas and are shown in Figures 5, 7, 9, and 11. The maximum particulate matter DUSTRAN modeled concentrations shown in these figures can be added to the nearby community ambient monitored particulate matter concentrations shown in Table 6 to determine the possible predicted total concentration within a reasonable distance of the ambient monitor.

Concentration contour values that intersect/coincide with a nearby community plus the reported monitored particulate matter values in Table 6 do not amount to a total concentration that exceeds the applicable NAAQS and CAAQS. While there is a definite measurable impact, it is also reasonable to assume that the monitored values in the nearby communities are reporting concentrations that are partially due to emissions from PCMS. Therefore, the previously stated method for determining total concentrations could be "double counting" some of the installation's area of influence and considered a conservative approach.

6.0 Far-field (CALPUFF) Analysis for Class I Air Quality Related Values Impacts

Far-field impacts up to 280 km (174 miles) from PCMS' boundary were assessed by modeling projected emission rates with the EPA-recommended CALPUFF model. This model is an advanced, integrated Gaussian puff-type modeling system that can incorporate four-dimensional varying wind fields, wet and dry deposition, and atmospheric gas and particle phase chemistry. The three main components are CALMET (a diagnostic three-dimensional meteorological model), the CALPUFF air dispersion model, and CALPOST (a post processing package). Additionally, it includes numerous other processors that may be used to prepare geophysical data, meteorological data, and interfaces with other models. It is designed to simulate the dispersion of buoyant, puff, or continuous point and area pollution sources, as well as the dispersion of buoyant, continuous line sources. CALPUFF is the only EPA-approved non-Eulerian model that can be used for source-receptor distances greater than 50 km (31 miles).

The far-field analysis focused on AQRVs, including comparison of modeled concentrations to significant impact levels (SILs), assessment of visibility impacts, and a deposition evaluation, for the following Class I areas or sensitive Class II federal areas (see Figure 13):

- Wheeler Peak Wilderness Area
- La Garita Wilderness Area
- Weminuche Wilderness Area
- Great Sand Dunes National Park and Preserve
- Pecos Wilderness Area
- Dinosaur Tracks
- Southern Parcel
- Spanish Peaks
- Rourke Ranch
- Comanche National Grassland, Picture Canyon

6.1 Meteorological Data

An extensive 3-km (1.8-mile) spaced 3.55×10^{11} square meter (1.37×10^{5} square mile) grid covering most of Colorado, most of northern New Mexico and parts of the Texas and Oklahoma pan handles was spatially designed to allow complex terrain puff "meandering" and included a buffer greater than 25 km (15.5 miles) from the farthest Class I receptor for puff "recirculation" (see Figure 13). The modeling domain grid size was designed to accommodate the long range pollutant transport modeling analyses for both Fort Carson and PCMS. A unique Lambert Conic Conformal coordinate system was used, for which the center was located half-way between Fort Carson and PCMS. Ten vertical layers were allocated at heights of: 20; 40; 80; 160; 300; 600; 1,000; 1,500; 2,200; and 3,500 meters (66;

131; 263; 525; 984; 1,968; 3,281; 4,921; 7,218; and 11,483 feet) above ground level (see Figure 13 for the extent of the horizontal grid). A combination of several meteorological data sets was input to CALMET to derive meteorological parameter values needed by the CALPUFF modeling program. Mesoscale Meteorological Model (MM5) 36-km (22-mile) spaced grid data sets were input as “first guess” meteorological conditions to the CALMET model (Pennsylvania State University / National Center for Atmospheric Research numerical model home page 2008). The MM5 data were extracted from the 2001, 2002, and 2003 MM5 datasets provided by CDPHE. The CALMET meteorological program was then loaded with over 40 NCDC surface station meteorological data sets for geographical locations between and including Amarillo, Texas and Fort Collins, Colorado (NCDC 2005). The Grand Junction and Denver Stapleton upper-air data set, from the National Oceanic and Atmospheric Administration [NOAA] website, along with 50 widely dispersed precipitation station data sets, were also input to the CALMET program. The surface, upper-air, and precipitation data sets along with geographic land use/characteristics domain representative data were used to adjust the “first guess” MM5 meteorological fields to produce final CALPUFF input data. The adjustment produced a modeling grid that represented finer resolution meteorology monitored phenomena.

6.2 Receptor Grids

Coordinates of Class I receptor locations (National Park Service 2008) were converted to the modeling analysis’ specific coordinate system and input to the CALPUFF model. Receptors were obtained and processed for the following Class I federal areas.

- Wheeler Peak Wilderness Area
- La Garita Wilderness Area
- Weminuche Wilderness Area
- Great Sand Dunes National Park and Preserve
- Pecos Wilderness Area

In addition to those receptors, one discrete receptor was placed to assess far-field AQRVs at the following Class II locations identified by CDPHE as scenic views (see Figure 13) (CDPHE 2005):

- Dinosaur Tracks
- Southern Parcel
- Spanish Peaks
- Rourke Ranch
- Comanche National Grassland, Picture Canyon

6.3 CALPUFF / CALPOST / POSTUTIL Model Options and Inputs

Table 7 shows several CALPUFF and CALPOST modeling options and inputs utilized in this analysis. Some of the most important model inputs are summarized below:

- The full chemistry option was enabled (MCHEM =1, MESOPUFF II scheme);
- The deposition option was enabled (MWET = 1 and MDRY = 1);
- Method two was selected for estimating light extinction (MVISBK); therefore, hourly humidity adjustment factors were needed by CALPOST for each analysis area (Class I or sensitive Class II). The hourly humidity factors were provided as output from the CALPUFF model. The recommended Federal Land Managers' Air Quality Related Values Workgroup (FLAG) natural background aerosol concentrations for the western portion of the United States were input to CALPOST (FLM 2005);
- The options and scaling parameters selected for POSTUTIL conformed to the FLM modeling guidance (FLM 2005);
- Hourly ground-level ozone data for 2001, 2002 and 2003 were obtained from the Clean Air Status and Trends Network for the Gothic (GTH161), Rocky Mountain National Park (ROM206), and Mesa Verde (MEV405) monitors (EPA 2008);
- Monthly ammonia concentrations input to CALPUFF were based on the surrounding land use for each area (Class I or sensitive Class II area) analyzed. The Interagency Workgroup on Air Quality Modeling (IWAQM) recommendations suggest that typical values are 10 parts per billion (ppb) for grasslands, 0.5 ppb for forested lands, and 1 ppb for arid lands at 20 degrees Celsius. A value of 5 ppb was input to CALPUFF based on the surrounding area's use as arid grassland; and
- Default light extinction coefficients for all applicable species concentrations were applied in the CALPOST post-processing.

6.4 Emission Sources and Modeled Emission Rates Determination (Far-field Analysis)

Emissions and locations for sources modeled in CALPUFF were established similarly to those modeled in AERMOD for the annual averaging periods, as described in Sections 3.1, 3.2, 4.2, and 4.3. All emission sources and activities are the same. Per guidance by Fort Carson Department of Public Works (DPW) personnel, the time to complete all maneuver and convoy training exercises is approximately one year (Ford 2008a, 2008b). Therefore, total fugitive particulate matter emissions from these activities were divided by 8,760 hours to determine their representative hourly emissions rates.

Wind erosion emissions for all surface disturbances associated with the total maneuver and convoy exercises were also divided by a 365-day time period (8,760 hours). As a conservative measure, wind erosion emissions (calculated using a maximum wind speed of 19.5 m/s [43.6]) were assumed to be emitted at all wind speeds in the CALPUFF model. The cantonment area pseudo point source emitted at a constant hourly rate, which was derived by dividing the annual PTE emissions by a one year period (8,760 hours). Table 8 shows the source parameters values input for the CALPUFF models and Figure 14 shows the source locations for the CALPUFF models.

6.5 CALPUFF Results and AQRV Analysis

CALPUFF modeling results for PCMS emissions are presented in Table 9. Maximum predicted values are reported for all modeled criteria pollutants, including maximum nitrogen (N) and sulfur (S) deposition values and a visibility assessment, for each Class I area/group of receptors within the modeling domain. Maximum modeled criteria pollutant concentrations were compared to the Class I increment SILs, and deposition rates were compared to a deposition analysis threshold (DAT) value of 0.005 kilogram per hectare per year (kg/ha/yr). The visibility assessment is expressed as the number of days for each modeled year that the change in visibility exceeded 1.0 deciview. A change of one deciview is approximately equal to a 10% change in atmospheric light extinction. Greater visibility changes are indicated by greater deciview changes and represent poorer visibility. A one deciview change translates to a "just noticeable" change in visibility for most individuals.

CALPUFF results showed a PM_{10} 24-hour concentration above the SIL for one day out of the three years modeled at the Great Sand Dunes National Monument and Preserve. All other maximum modeled NO_x, SO_2, and PM_{10} annual average concentrations and short-term concentrations were below their respective Class I increment SILs. Modeling did not show any exceedances of the DAT threshold of 0.005 kg/ha/yr in any Class I or sensitive Class II areas for either N or S deposition.

SILs are not thresholds for asserting negative environmental impacts; rather, they are used in Prevention of Significant Deterioration (PSD) permitting to provide a basic screening of potential impacts and justify the need for further analysis[2]. Concentrations above the SILs do not necessarily indicate that negative impacts will occur. Instead, the results indicate that further analysis is necessary to predict whether any negative impacts will occur. For Great Sand Dunes National Monument and Preserve, a cumulative concentration analysis was completed. Specifically, a representative background 24-hour PM_{10} concentration (79 ug/m^3), which represents current existing conditions for the Class I area, was obtained from the EPA's Air Data Monitor website (EPA 2007) and added to the maximum predicted concentration. The resulting concentration (79.5 ug/m^3) is well below the NAAQS of 150 ug/m^3. Therefore, it is reasonable to assume that the predicted cumulative impact is below the NAAQS.

A visibility change of greater than one deciview was observed for one day out of the three years modeled at the Great Sand Dunes National Park and Preserve. No other visibility changes of greater than one deciview were observed for the modeled Class I areas. Visibility changes of greater than one deciview were observed for some of the sensitive Class II areas. The greatest number of days with visibility changes occurred at the Southern Parcel, a scenic and/or important view located within PCMS.

[2] PSD SILs are for comparison only. PSD analysis is not required for this action.

7.0 References

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TABLES

Table 1 -- AERMOD Emission Source Inputs for 12-hour Maneuver Exercise Day Short-term Average PM, SO_2 and CO Models

Description		Emissions Rates				Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	SO_2 (g/sec)	CO (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
All Routes	Volumes	0.066	0.01	0.0	0.0	2.0	232.56	4.65
Maneuver Areas (4)	Areas	1,772.11	290.24	40.57	114.74	2.0	N/A	2.33
Cantonment Pseudo	Point	0.008	0.008	0.08	0.04	6.1	N/A	N/A

g/sec = grams per second
m = meters

Table 2 -- AERMOD Emission Source Inputs for 12-hour Convoy Exercise Day Short-term Average PM, SO_2 and CO Models

Description		Emissions Rates				Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	SO_2 (g/sec)	CO (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
Route A-B	Volumes	345.52	57.38	10.42	29.47	2.0	232.56	4.65
Route A-C	Volumes	275.62	45.77	8.99	25.42	2.0	232.56	4.65
Route A-D-E	Volumes	27.24	4.51	0.88	2.48	2.0	232.56	4.65
Maneuver Areas (4)	Areas	336.72	50.51	0.0	0.0	2.0	N/A	2.33
Cantonment Pseudo	Point	0.008	0.008	0.08	0.04	6.1	N/A	N/A

g/sec = grams per second
m = meters

Table 3 -- AERMOD Emission Sources Inputs for Long-term Average PM, NO_x and SO_2 Models

Description		Emissions Rates				Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	NO_x (g/sec)	SO_2 (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
All Routes	Volumes	22.11	3.60	7.67	0.61	2.0	232.56	4.65
Maneuver Areas (4)	Areas	143.95	24.59	42.17	3.27	2.0	N/A	2.33
Cantonment Pseudo	Point	0.008	0.008	0.16	0.08	6.1	N/A	N/A

g/sec = grams per second
m = meters

Table 4 -- AERMOD Predicted Impacts

Pollutants	Averaging Period	Maximum Predicted Concentration (µg/m^3)	Background Concentration (µg/m^3)[1]	Maximum Predicted + Background Concentration (µg/m^3)	Primary NAAQS (µg/m^3)	CAAQS (µg/m^3)
NO_2	Annual	2.31	30.6	32.91	100	100
CO	1-Hour	261.33	5,355	5,616.33	10,000	10,000
	8-Hour	48.63	3,609	3,657.63	40,000	40,000
SO_2	Annual	5.3	8	13.3	80	80
	3-Hour	66.6	24	90.6	365	365
	24-Hour	34.6	59	93.6	1,300	700
PM_{10} (Scenario 1)	24-Hour	94.02	48	142.02	150	150
PM_{10} (Scenario 2)	24-Hour	97.25	48	145.25	150	150
$PM_{2.5}$ (Scenario 1)	24-Hour	18.97	11	29.97	35	35
$PM_{2.5}$ (Scenario 2)	24-Hour	15.90	11	26.9	35	35
PM_{10}	Annual	5.05	17	22.05	N/A	50
$PM_{2.5}$	Annual	1.43	4.3	5.73	15	15

[1] Values provided by CDPHE PM_{10} values from monitor at Xcel Comanche Plant (2004/2005). $PM_{2.5}$ values from monitor in Elbert County, near Ben Kelly Road (2004-2006) (Chick 2008).

µg/m3 = microgram per cubic meter

Table 5 -- DUSTRAN Emission Source Inputs

			Emissions Rates		Stack / Source Dimensions	
	Sources (ID)	Type	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)	Release Height (m)	Initial Spread-z (m)
Scenario 1 (12-hour Maneuver Exercises)	Maneuver Area 1	Area	1,029.38	168.36	1.0	2.0
	Maneuver Area 2	Area	772.57	126.35	1.0	2.0
	Route A-B	Line	0.032	0.008	1.0	N/A
	Route A-C	Line	0.028	0.007	1.0	N/A
	Route D-E	Line	0.004	0.001	1.0	N/A
	Pseudo Point Source	Point	0.0078	0.0078	6.1	N/A
Scenario 2 (12-hour Convoy Exercises)	Route A-B Segment 1	Line	141.77	23.53	1.0	N/A
	Route A-B Segment 2[1]	Line	38.03	7.87	1.0	N/A
	Route A-B Segment 3	Line	165.75	27.51	1.0	N/A
	Route A-C Segment 1[1]	Line	65.42	12.17	1.0	N/A
	Route A-C Segment 2	Line	232.14	39.71	1.0	N/A
	Route D-E	Line	5.34	0.88	1.0	N/A
	Maneuver Areas 1 and 2	Area	306.89	46.03	1.0	2.0
	Pseudo Point Source	Point	0.0078	0.0078	6.1	N/A

[1] 15 mph speed limit assumed for this segment.

g/sec = grams per second
m = meters

Table 6 -- DUSTRAN Existing Pollutant Background Concentrations

PM_{10} ($\mu g/m^3$)[1]	$PM_{2.5}$ ($\mu g/m^3$)[1]
48	11

[1] Values provided by CDPHE.
PM_{10} values from monitor at Xcel Comanche Plant (2004/2005)
$PM_{2.5}$ values from monitor in Elbert County, near Ben Kelly Road (2004-2006) (Chick 2008)

μg/m3 = microgram per cubic meter

Table 7 -- CALPUFF/CALPOST Modeling Options

CALPUFF/ CALPOST Variable	Specified Value	Comment
IBTZ	7	Base Time Zone
CALMETDAT	cmet01-12.dat	Using CALMET Derived Meteorological Data
MGAUSS	1	Vertical Distribution Used In The Near Field
MCTADJ	3	Terrain Adjustment Method
MCTSG	0	Subgrid-Scale Complex Terrain Flag
MSLUG	0	Near-Field Puffs Modeled As Elongated 0
MTRANS	1	Transitional Plume Rise Modeled
MTIP	1	Stack Tip Downwash
MSHEAR	0	Vertical Wind Shear Modeled Above Stack Top
MSPLIT	0	Puff Splitting Allowed
MCHEM	1	Chemical Mechanism Flag
MWET	1	Wet Removal Modeled
MDRY	1	Dry Deposition Modeled
MDISP	3	Method Used To Compute Dispersion Coefficients
MTURBVW	3	Sigma-V/Sigma-Theta, Sigma-W Measurements Used
MROUGH	0	PG Sigma-Y,Z Adjusted For Roughness
MPARTL	1	Partial Plume Penetration Of Elevated Inversion (per IWAQM)
MTINV	0	Strength Of Temperature Inversion Provided In PROFILE.DAT Extended Records
MPDF	0	PDF Used For Dispersion Under Convective Conditions
MBCON	0	Boundary Conditions (Concentration) Modeled
MVISBK	6	Method used for background light extinction
MFRH	2	Particle growth curve f(RH) for hygroscopic species
PMAP	LCC	Map Projection
IUTMZN	13	UTM Zone (not used for LCC except to check O3 file)
UTMHEM	N	Hemisphere For UTM Projection
DATUM	NAS-C	Datum-Region For Output Coordinates
NX	192	No. X Grid Cells
NY	205	No. Y Grid Cells
NZ	10	No. Vertical Layers
DGRIDKM	3	Grid Spacing (km)
XORIGKM	-347.186	Reference Coordinate of Southwest Corner of (1,1)- X Coordinate
YORIGKM	-310.19	Reference Coordinate of Southwest Corner of (1,1)- Y Coordinate
RCUTR	30	Reference Cuticle Resistance
RGR	10	Reference Ground Resistance
REACTR	8	Reference Pollutant Reactivity
NINT	9	Number Of Particle-Size Intervals Used To Evaluate Effective Particle Deposition Velocity
IVEG	1	Vegetation State In Unirrigated Areas
MOZ	1	Ozone Data Input Option
MHFTSZ	0	Switch For Using Heffter Equation For Sigma Z As Above
WSCALM	.5	Minimum Wind Speed (m/s) Allowed For Non-Calm Conditions
XMAXZI	5,000m	Maximum Mixing Height (m)
XMINZI	50	Minimum Mixing Height (m)
BCKO3	Varies per hour per monitor	Hourly Background Ozone Concentration (ppb)
BCKNH3	5	Monthly Background Ammonia Concentration (ppb)

Table 8 -- CALPUFF Model Emission Source Inputs

Description		Emissions Rates				Stack / Source Dimensions		
Sources (ID)	Type (Point, Volume or Area)	PM coarse[1] (g/sec)	$PM_{2.5}$ (g/sec)	NO_x (g/sec)	SO_2 (g/sec)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
Route A-B (convoy)	Volumes	8.86	1.68	3.88	0.31	2.0	232.56	4.65
Route A-C (convoy)	Volumes	7.14	1.36	3.35	0.26	2.0	232.56	4.65
Route D-E (convoy)	Volumes	1.11	0.21	0.44	0.03	2.0	232.56	4.65
Maneuver Areas 1 and 2	Areas	119.36	24.59	42.17	3.27	2.0	N/A	4.65
Cantonment Pseudo	Point	0.0	0.008	0.16	0.036	6.1	N/A	N/A

[1] PM coarse = $PM_{10} – PM_{2.5}$

g/sec = grams per second
m = meters

Table 9 -- Maximum CALPUFF Predicted Impacts

Class I & Class II Areas↓	**Pollutant**	**NO_x**	**SO_x**			**PM_{10}**		**Visibility**[1]	**Deposition N**[2]	**Deposition S**[3]
	Modeling Period→	**Annual** $\mu g/m^3$	**3-hr** $\mu g/m^3$	**24-hr** $\mu g/m^3$	**Annual** $\mu g/m^3$	**24-hr** $\mu g/m^3$	**Annual** $\mu g/m^3$	**Deciview Change**	**kg/ha/yr**	**kg/ha/yr**
	↓Year/SIL→	**0.1 (1×10^{-1})**	**1**	**0.2 (2×10^{-1})**	**0.08 (8×10^{-2})**	**0.32 (3.2×10^{-1})**	**0.16 (1.6×10^{-1})**	**Days >=1.0**	**0.005 (5.0×10^{-3})**	**0.005 (5.0×10^{-3})**
Wheeler Peak Wilderness Area	2001	2.3640E-04	2.3332E-02	3.5290E-03	1.0406E-04	1.0113E-01	4.0848E-03	0	7.72E-04	1.58E-04
	2002	2.92E-04	3.00E-02	9.73E-03	3.16E-04	3.19E-01	7.03E-03	0	1.17E-03	3.11E-04
	2003	3.1723E-04	1.5204E-02	8.3451E-03	2.3216E-04	8.5887E-02	5.1294E-03	0	1.26E-03	3.05E-04
La Garita Wilderness Area	2001	9.61E-05	2.67E-02	7.20E-03	6.90E-05	2.07E-01	1.55E-03	0	2.31E-04	6.84E-05
	2002	6.85E-06	7.00E-03	2.04E-03	5.43E-05	4.04E-02	1.35E-03	0	1.92E-04	6.54E-05
	2003	6.1505E-05	1.8821E-02	6.5135E-03	7.9884E-05	1.2994E-01	1.9842E-03	0	2.46E-04	6.53E-05
Weminuche Wilderness Area	2001	7.37E-05	2.33E-02	4.72E-03	5.45E-05	1.36E-01	1.18E-03	0	1.84E-04	6.64E-05
	2002	5.94E-06	3.81E-03	1.76E-03	4.37E-05	3.62E-02	1.07E-03	0	1.79E-04	6.31E-05
	2003	7.0031E-05	2.5280E-02	7.9240E-03	7.5592E-05	1.5872E-01	1.8420E-03	0	2.50E-04	6.31E-05
Great Sand Dunes National Park and Preserve	2001	5.2453E-04	3.9882E-02	9.7926E-03	3.3892E-04	1.6518E-01	7.3462E-03	0	1.70E-03	3.41E-04
	2002	6.67E-04	5.98E-02	1.16E-02	4.50E-04	2.09E-01	1.04E-02	0	1.00E-03	3.24E-04
	2003	8.4442E-04	4.8144E-02	1.6586E-02	4.5594E-04	**4.0482E-01**	1.1741E-02	1	1.42E-03	3.90E-04
Pecos Wilderness Area	2001	2.24E-04	2.64E-02	7.32E-03	1.20E-04	1.58E-01	2.59E-03	0	5.14E-04	1.26E-04
	2002	4.75E-04	2.31E-02	6.81E-03	2.44E-04	2.31E-01	5.59E-03	0	5.00E-04	1.62E-04
	2003	1.3462E-04	1.7081E-02	4.3446E-03	1.3482E-04	6.4423E-02	2.9049E-03	0	5.33E-04	1.46E-04
Dinosaur Tracks[4]	2001	N/A	N/A	N/A	N/A	N/A	N/A	15	N/A	N/A
	2002	N/A	N/A	N/A	N/A	N/A	N/A	11	N/A	N/A
	2003	N/A	N/A	N/A	N/A	N/A	N/A	11	N/A	N/A
Southern Parcel[4]	2001	N/A	N/A	N/A	N/A	N/A	N/A	56	N/A	N/A
	2002	N/A	N/A	N/A	N/A	N/A	N/A	69	N/A	N/A
	2003	N/A	N/A	N/A	N/A	N/A	N/A	72	N/A	N/A

Table 9 -- Maximum CALPUFF Predicted Impacts, continued

Class I & Class II Areas↓	Pollutant	NO_x	SO_x			PM_{10}		Visibility[1]	Deposition N[2]	Deposition S[3]
	Modeling Period→	Annual μg/m³	3-hr μg/m³	24-hr μg/m³	Annual μg/m³	24-hr μg/m³	Annual μg/m³	Deciview Change	kg/ha/yr	kg/ha/yr
	↓Year/SIL→	0.1 (1×10^{-1})	1	0.2 (2×10^{-1})	0.08 (8×10^{-2})	0.32 (3.2×10^{-1})	0.16 (1.6×10^{-1})	Days >=1.0	0.005 (5.0×10^{-3})	0.005 (5.0×10^{-3})
Spanish Peaks[4]	2001	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A
	2002	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A
	2003	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A
Rourke Ranch[4]	2001	N/A	N/A	N/A	N/A	N/A	N/A	29	N/A	N/A
	2002	N/A	N/A	N/A	N/A	N/A	N/A	23	N/A	N/A
	2003	N/A	N/A	N/A	N/A	N/A	N/A	24	N/A	N/A
Comanche National Grassland, Picture Canyon[4]	2001	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
	2002	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A
	2003	N/A	N/A	N/A	N/A	N/A	N/A	1	N/A	N/A

[1] Number of days with deciview change >1.0
[2] Nitrogen deposition
[3] Sulfur deposition
[4] Colorado Scenic View (Class II) – Only visibility calculations

SIL = significant impact level
µg/m3 = microgram per cubic meter
kg/ha/yr = kilograms per hectare per year

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FIGURES

Figure 1 – PCMS Location and Surrounding Area

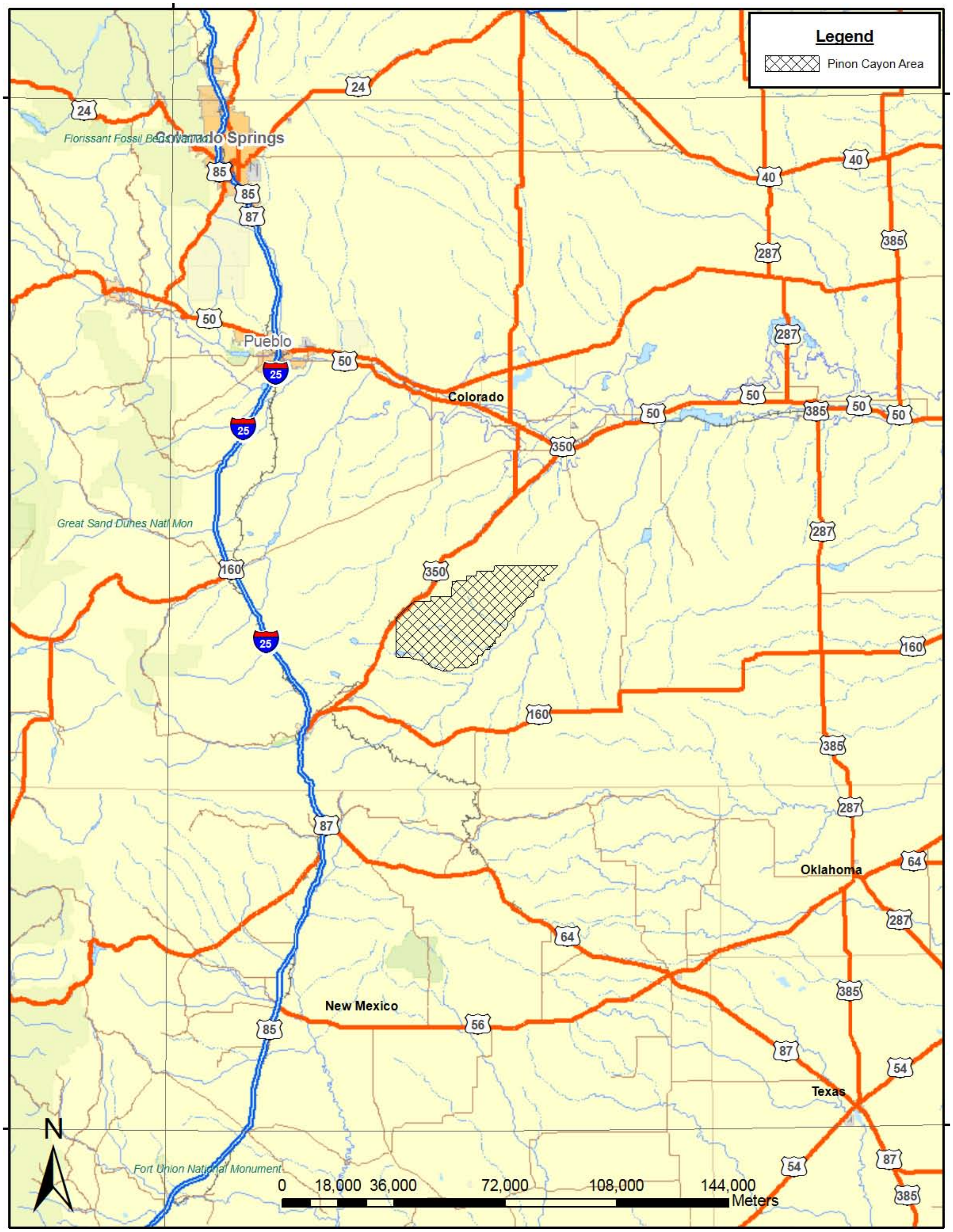


Figure 2 –AERMOD PCMS Source Locations and Receptors

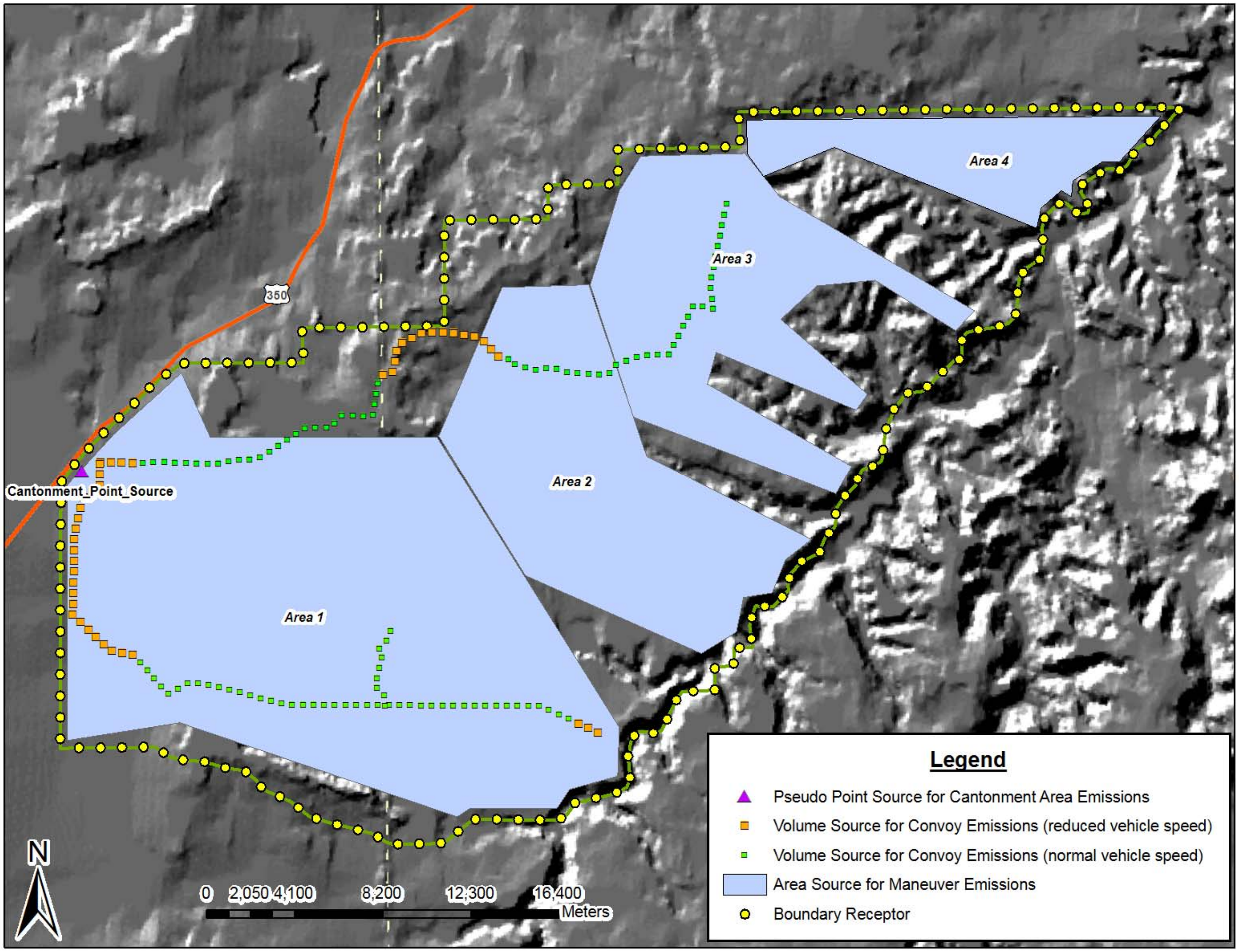


Figure 3 – DUSTRAN Source Layout

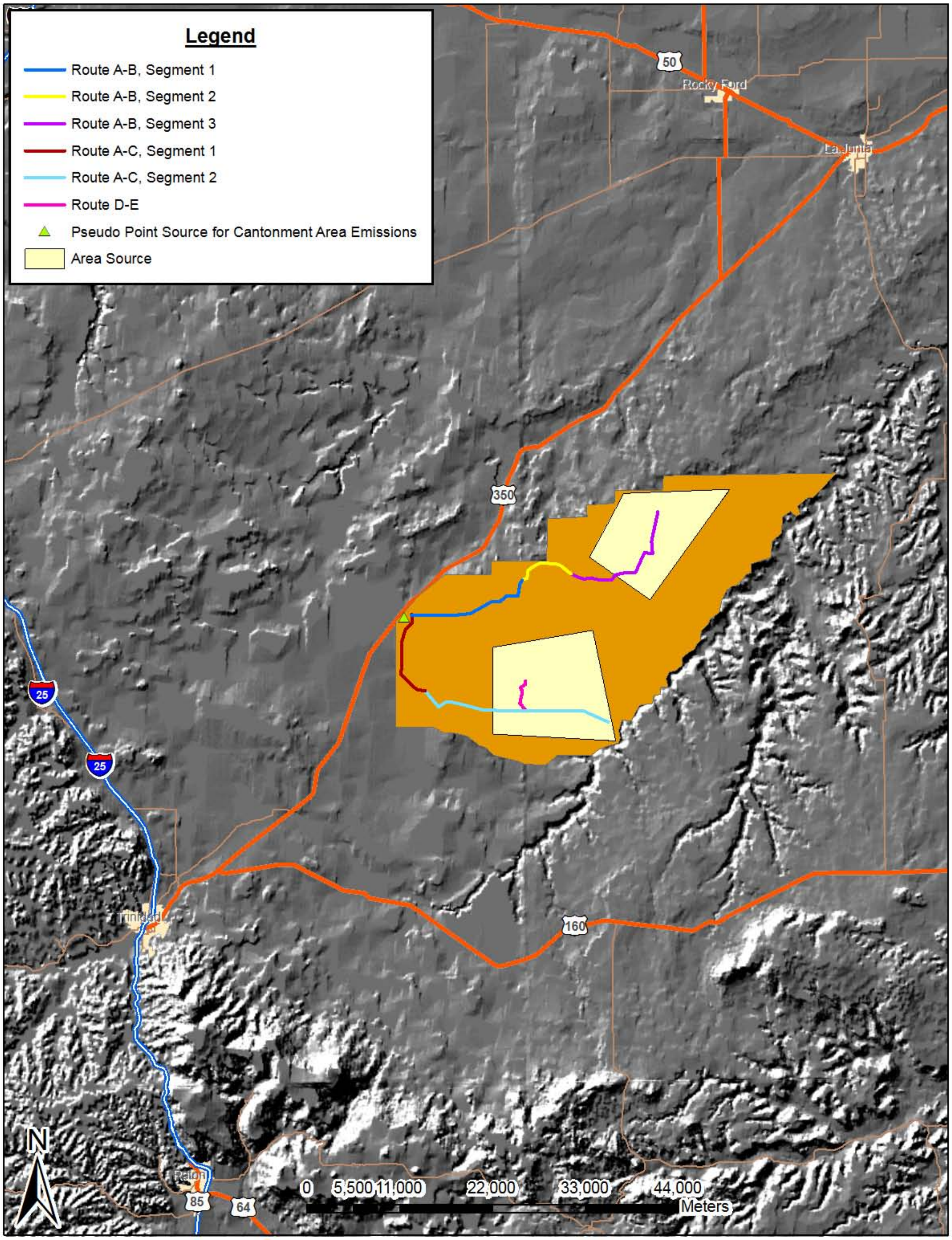
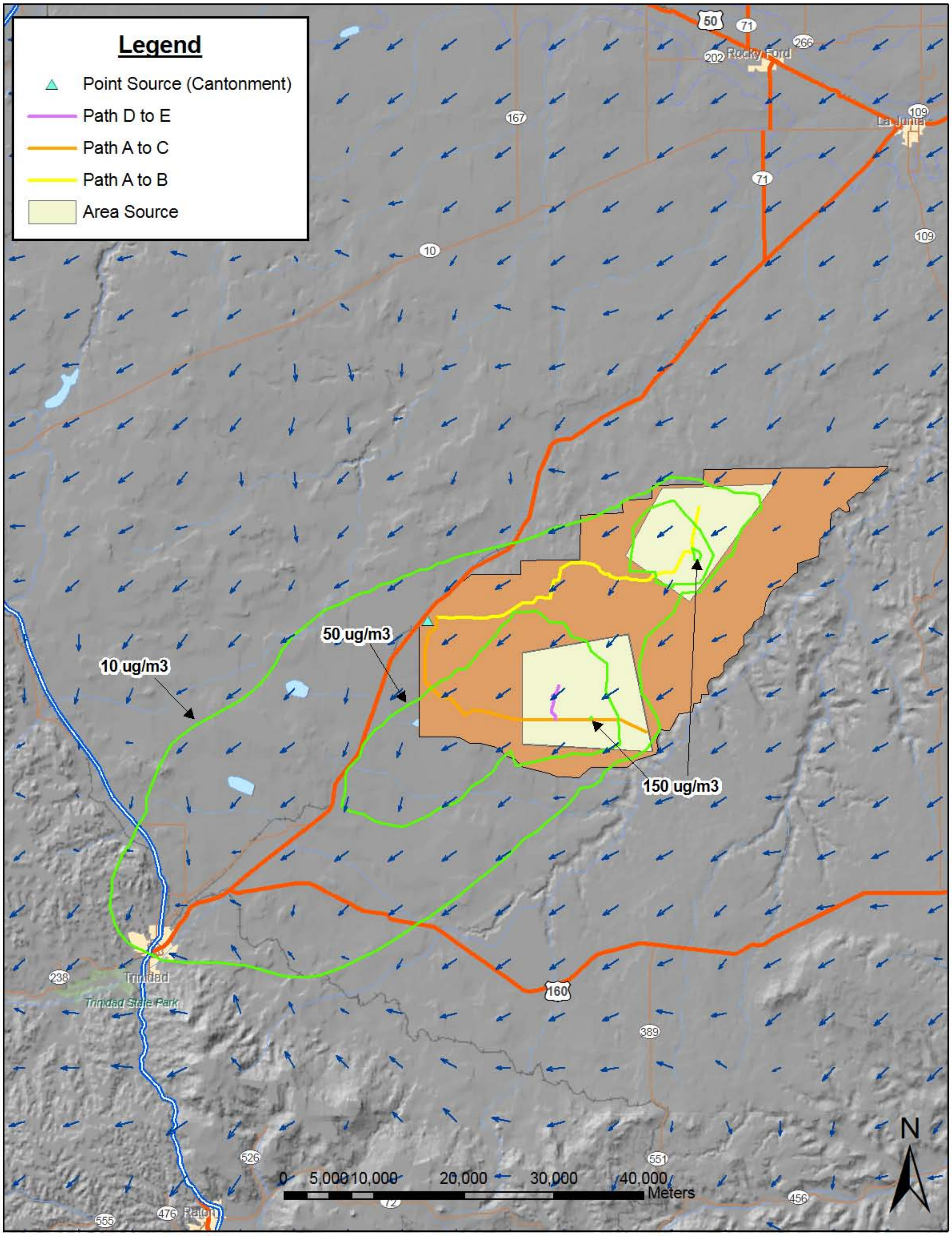
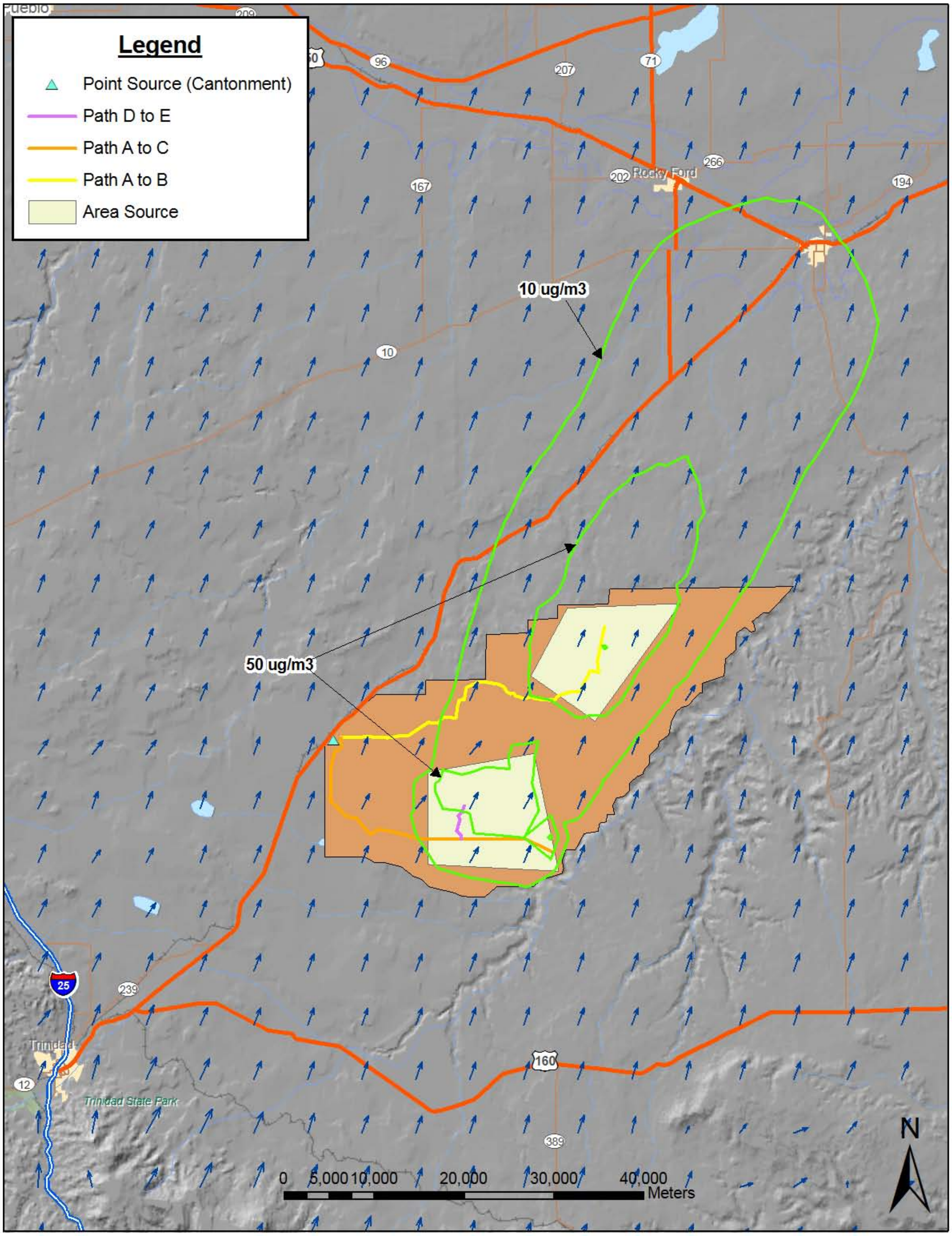


Figure 4 – DUSTRAN Maneuver Emission Scenario (PM_{10}), Northeast Wind[1]



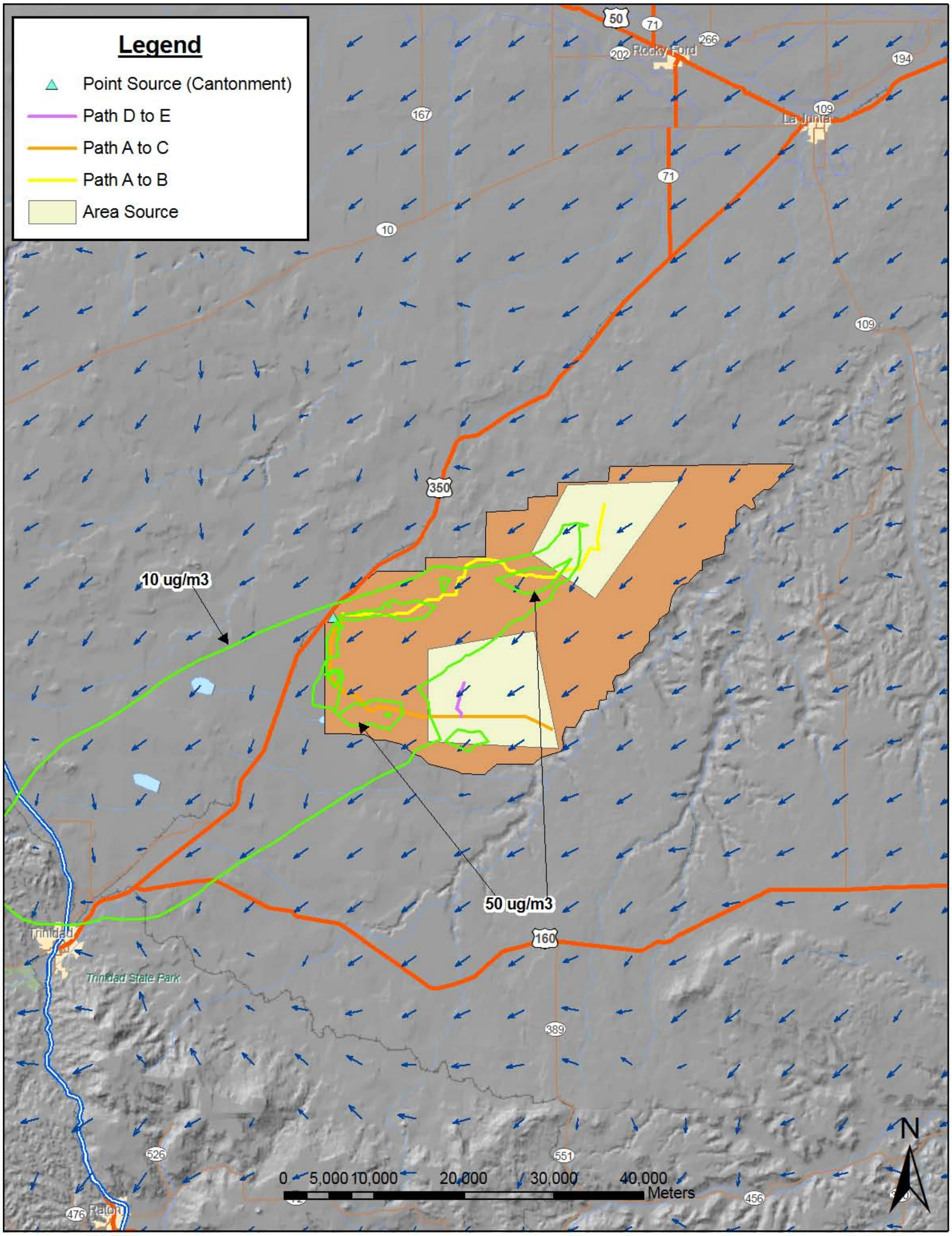
[1] Emission contours do not include background concentrations.

Figure 5 – DUSTRAN Maneuver Emission Scenario (PM_{10}), Southwest Wind[1]



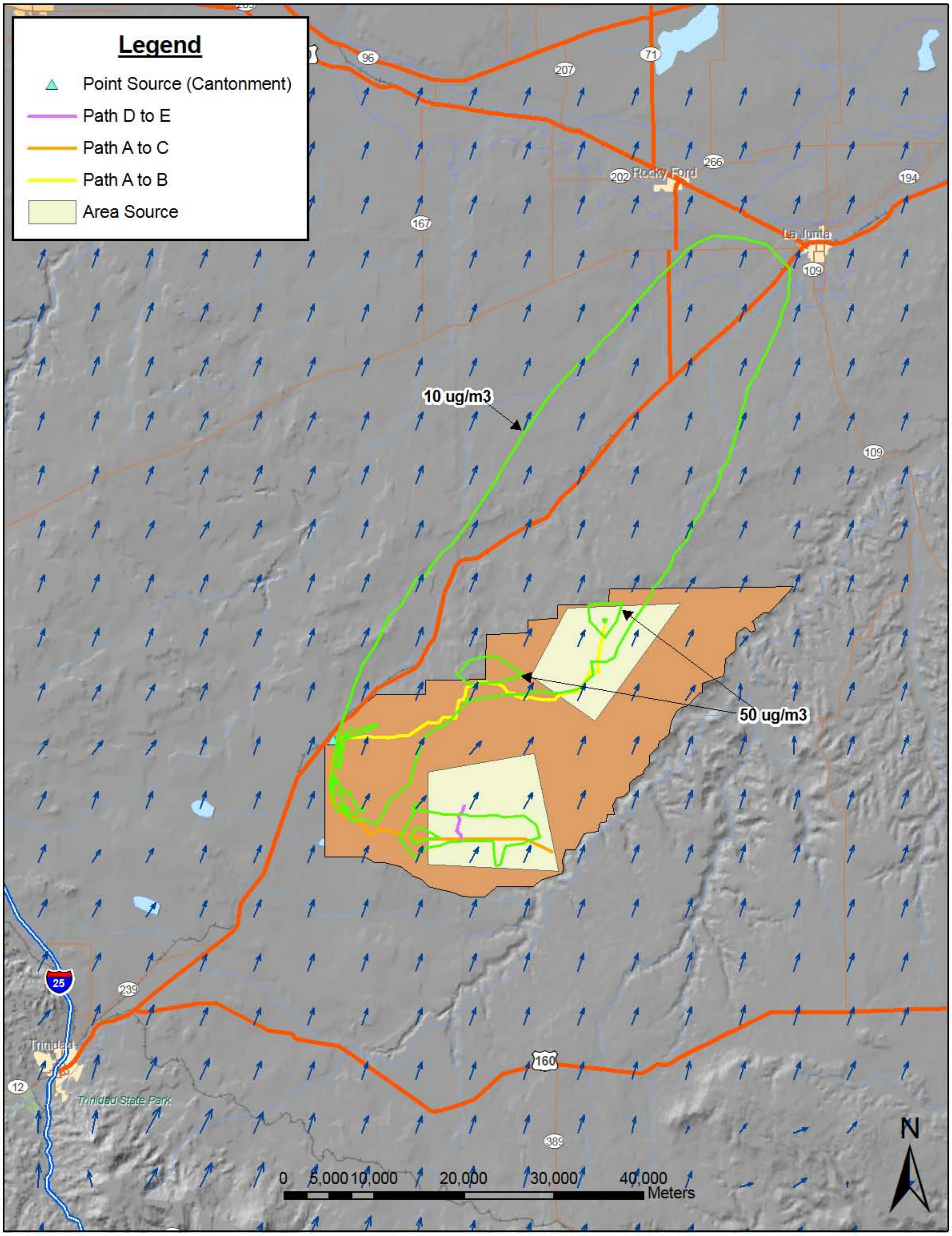
[1] Emission contours do not include background concentrations.

Figure 6 – DUSTRAN Convoy Emission Scenario (PM_{10}), Northeast Wind[1]



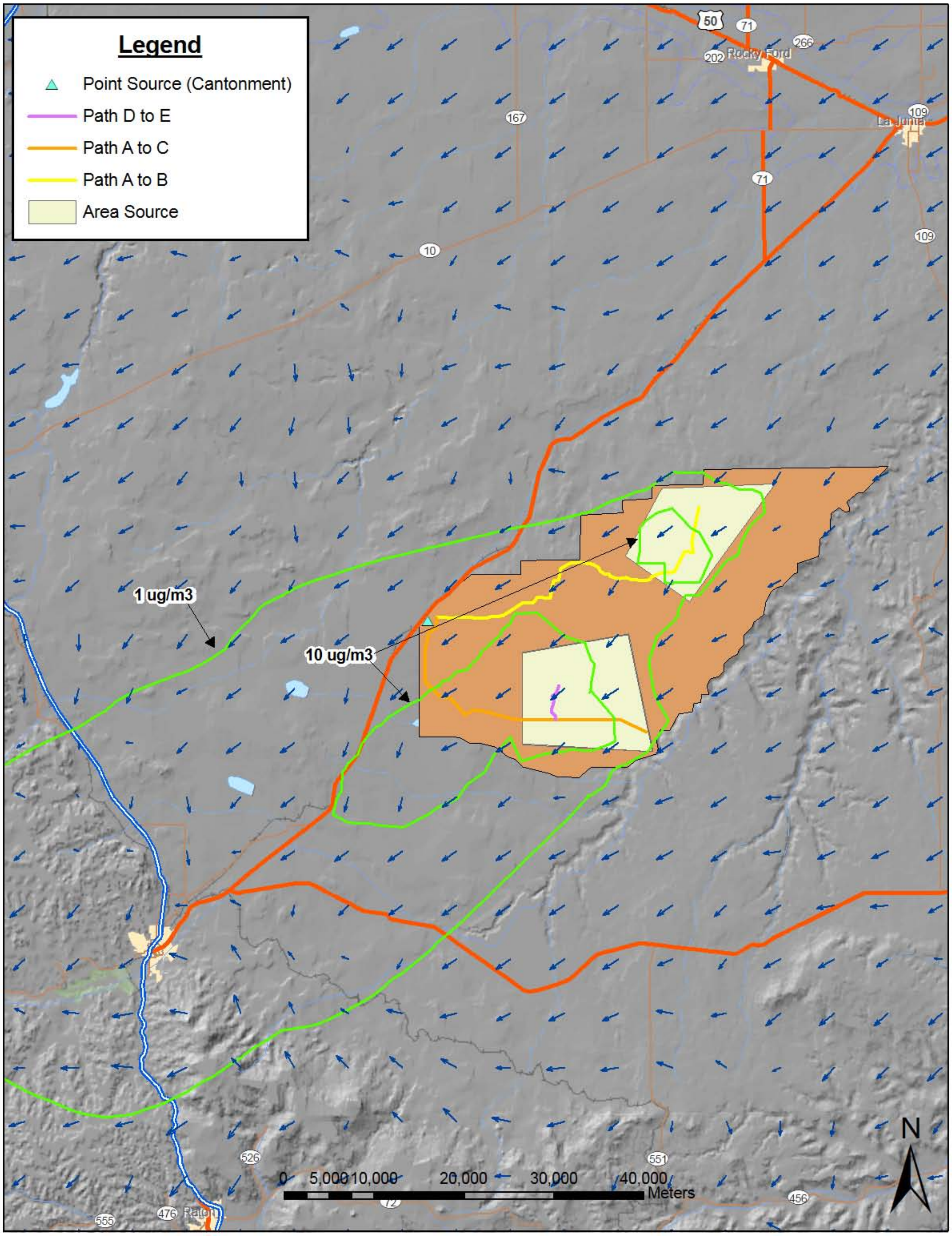
[1] Emission contours do not include background concentrations.

Figure 7 – DUSTRAN Convoy Emission Scenario (PM_{10}), Southwest Wind[1]



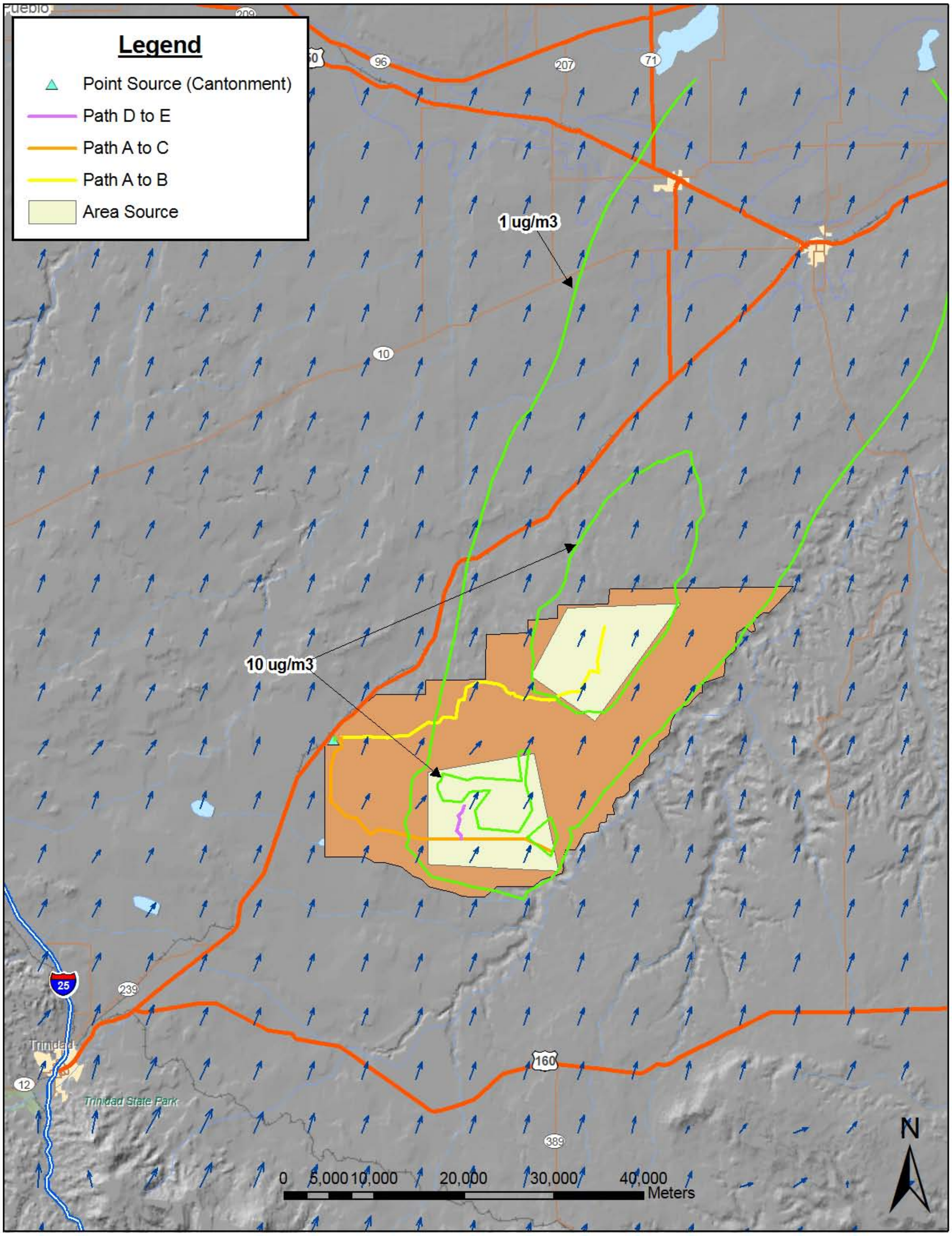
[1] Emission contours do not include background concentrations.

Figure 8 – DUSTRAN Maneuver Emission Scenario ($PM_{2.5}$), Northeast Wind[1]



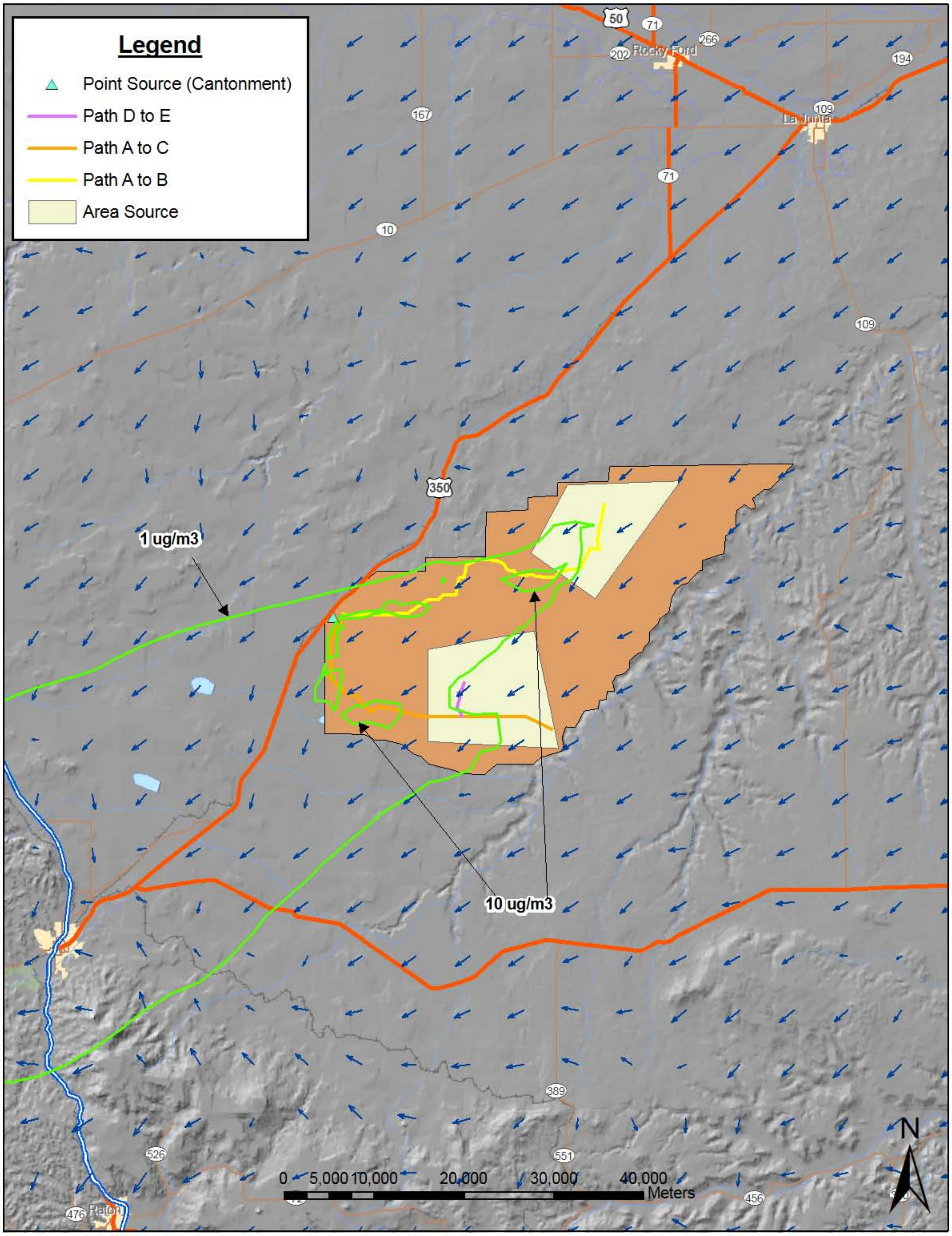
[1] Emission contours do not include background concentrations.

Figure 9 – DUSTRAN Maneuver Emission Scenario ($PM_{2.5}$), Southwest Wind[1]



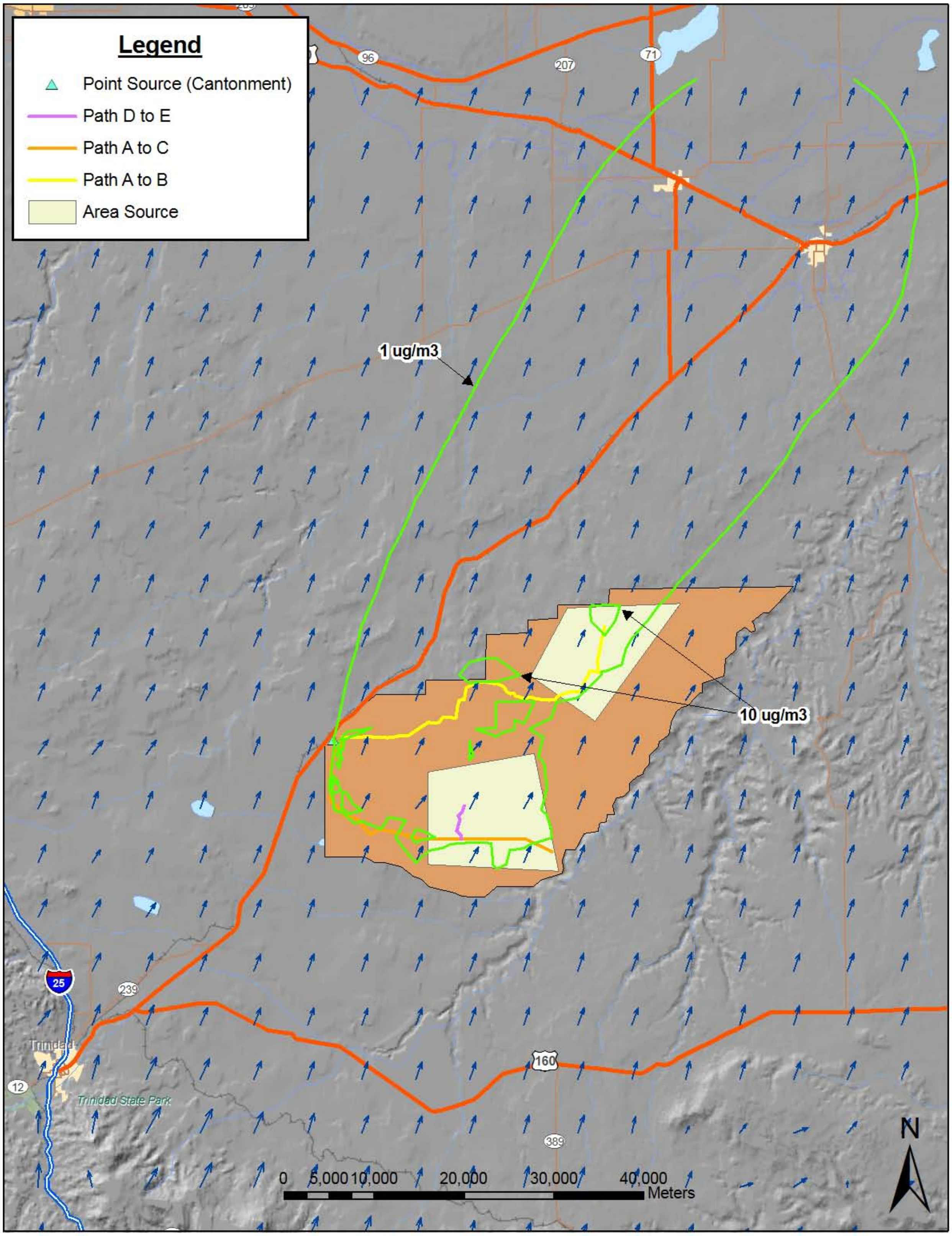
[1] Emission contours do not include background concentrations.

Figure 10 – DUSTRAN Convoy Emission Scenario ($PM_{2.5}$), Northeast Wind[1]



[1] Emission contours do not include background concentrations.

Figure 11 – DUSTRAN Convoy Emission Scenario ($PM_{2.5}$), Southwest Wind[1]



[1] Emission contours do not include background concentrations.

Figure 12 – 5 year Trinidad, Colorado Wind Rose

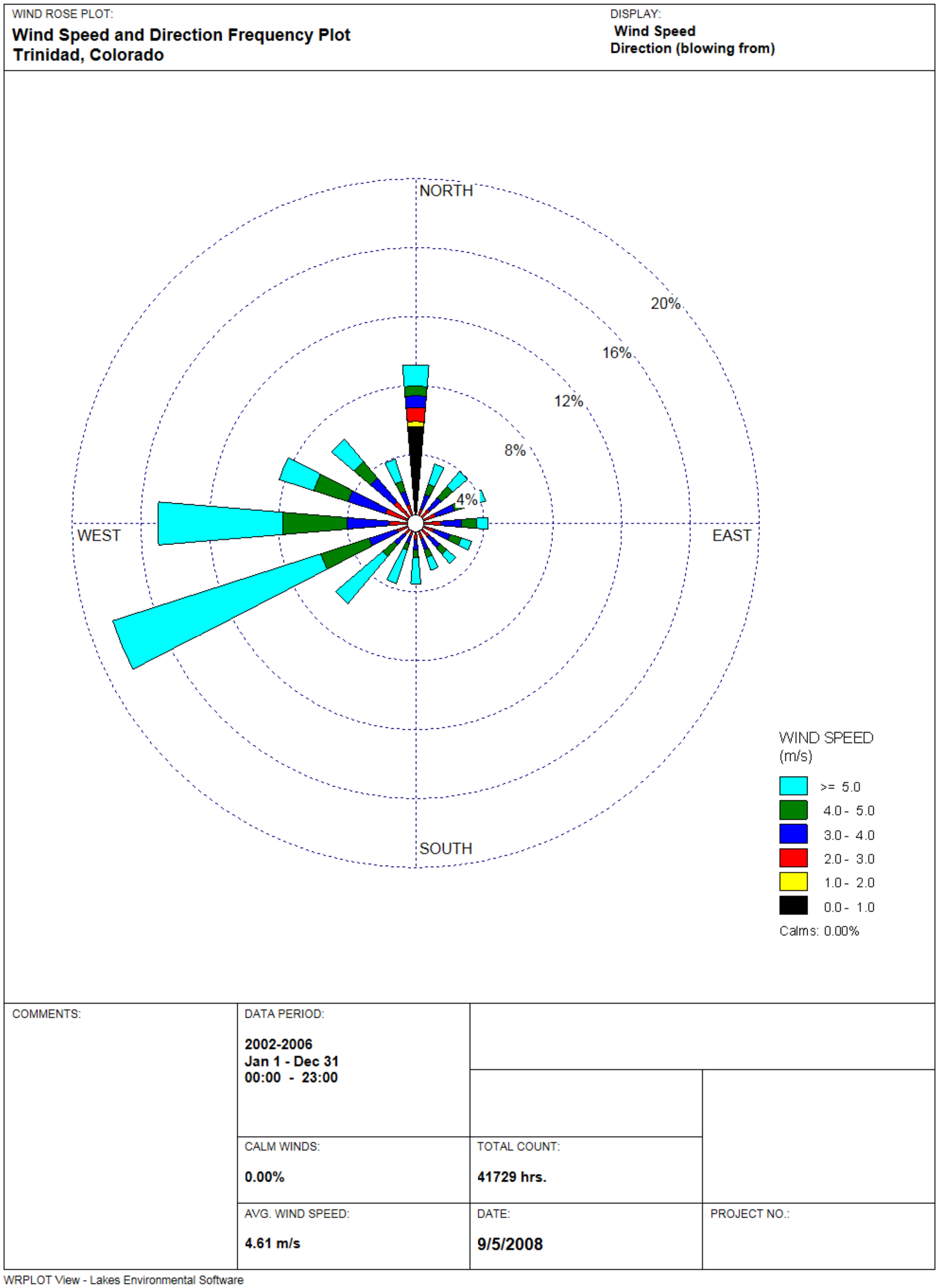


Figure 13 - CALPUFF Modeling Domain and Receptors

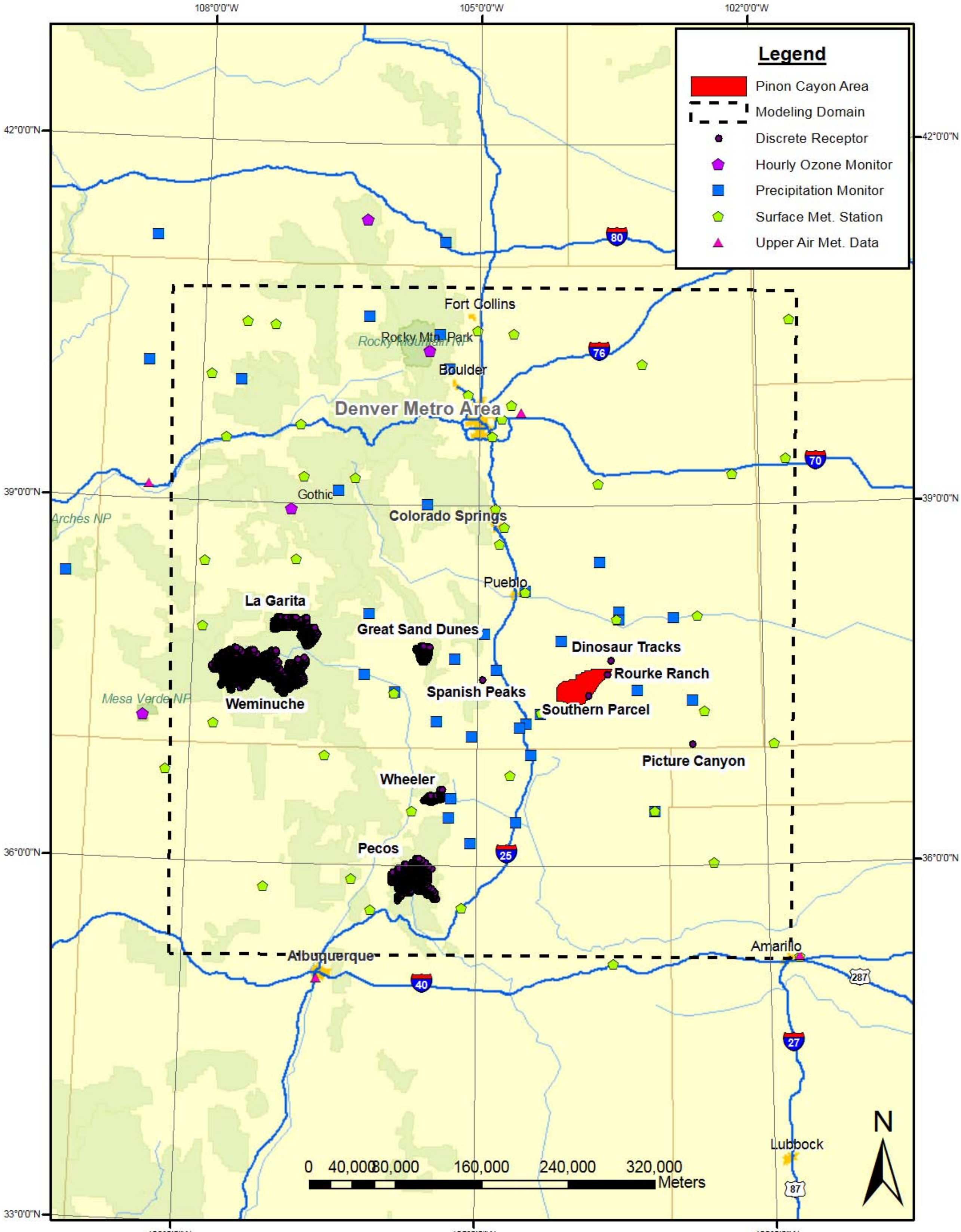
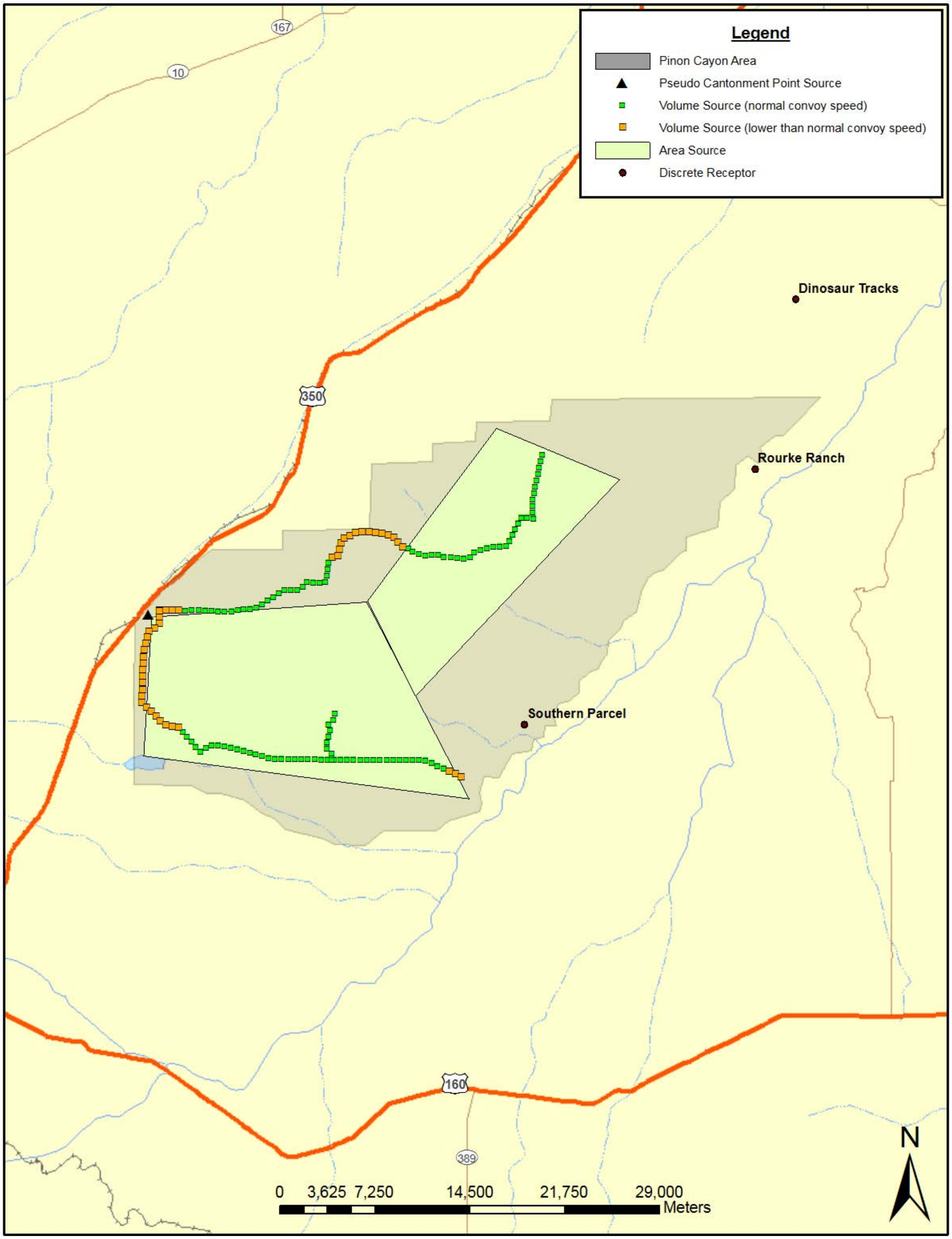


Figure 14 – Emission Sources for CALPUFF



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APPENDIX A

Table A-1. PCMS Criteria Pollutant Emissions Summary
Cumulative Impacts Modeling

WORST CASE 24-HR TRAINING EXERCISE SCENARIO 1:
TOTAL DAILY EMISSIONS FROM HBCT CONVOY

Emission Source	PM_{10} (tons/day)	$PM_{2.5}$ (tons/day)	VOC (tons/day)	NOx (tons/day)	CO (tons/day)	SO_2 (tons/day)
Convoy Path A-D-E	1.2	0.2	-----	-----	-----	-----
Convoy Path A-B	14.5	2.2	-----	-----	-----	-----
Convoy Path A-C	13.5	2.0	-----	-----	-----	-----
Wind Erosion Path A-D-E	0.11	0.02	-----	-----	-----	-----
Wind Erosion Path A-B	0.76	0.11	-----	-----	-----	-----
Wind Erosion Path A-C	0.65	0.10	-----	-----	-----	-----
Initial Wind Erosion	29.2	4.4	-----	-----	-----	-----
Vehicle Exhaust	0.7	0.7	0.8	12.3	2.7	1.0
Total (tons)	**60.6**	**9.7**	**0.8**	**12.3**	**2.7**	**1.0**

WORST CASE 24-HR TRAINING EXERCISE SCENARIO 2:
TOTAL DAILY EMISSIONS FROM HBCT MANEUVER

Emission Source	PM_{10} (tons/day)	$PM_{2.5}$ (tons/day)	VOC (tons/day)	NOx (tons/day)	CO (tons/day)	SO_2 (tons/day)
Maneuvers	83.0	12.5	-----	-----	-----	-----
Maneuver Area Wind Erosion	2.8	0.4	-----	-----	-----	-----
Initial Wind Erosion	29.2	4.4	-----	-----	-----	-----
Vehicle Exhaust	1.4	1.4	1.5	24.5	5.5	1.9
Smoke and Obscurants	55.7	55.7	54.3	-----	-----	-----
Total (tons)	**172.2**	**74.3**	**55.8**	**24.5**	**5.5**	**1.9**

ANNUAL EMISSIONS AT PCMS FROM TRAINING EXERCISES

Emission Unit	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	VOC (tpy)	NO_x (tpy)	CO (tpy)	SO_2 (tpy)
Convoys	615.2	92.3	-----	-----	-----	-----
Maneuvers	4,671.5	700.7	-----	-----	-----	-----
Wind Erosion	230.5	17.3	-----	-----	-----	-----
Vehicle Exhaust	98.7	98.7	108.9	1,732.4	385.7	134.9
Smoke and Obscurants	55.7	55.7	54.3	-----	-----	-----
Total (tons)	**5,616**	**909**	**109**	**1,732**	**386**	**135**

tpy = tons per year

PCMS FACILITY-WIDE ANNUAL EMISSIONS[a, b]

Emission Unit	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$[c] (tpy)	VOC (tpy)	NO_x (tpy)	CO (tpy)	SO_2 (tpy)
No. 2 Oil Boilers, Furnaces, & Heaters	0.45	0.24	0.24	0.08	4.47	1.12	1.59
Propane Furnaces & Heaters	0.03	0.03	0.03	0.04	1.04	0.14	1.04
Storage Tanks	---	---	---	0.00	---	---	---
20,000 Gal MOGAS UST	---	---	---	2.00	---	---	---
Other MOGAS Storage Tanks and Refueling	---	---	---	1.38	---	---	---
Smoke and Obscurants	55.7	55.7	55.7	54.3	---	---	---
Training exercises[d]		5560.2	853.3	54.7	1732.4	385.7	134.9
Facility-wide Total	**56.2**	**5616.1**	**909.2**	**112.4**	**1737.9**	**387.0**	**137.5**

[a]All emissions except training exercise PM emissions taken from 2006 PCMS emission inventory (PTE)

[b]Assume no prescribed burning

[c]For the combustion sources, PM_{10} emissions were assumed to be $PM_{2.5}$.

[d]Includes Convoys, Maneuvers, Wind Erosion, and Vehicle Exhaust.

tpy = tons per year

Table A-1. PCMS Criteria Pollutant Emissions Summary
Cumulative Impacts Modeling

Table A-1, Continued

EMISSIONS FROM CONVOYS TO/FROM FORT CARSON AND PCMS

TOTAL DAILY EMISSIONS FROM HBCT CONVOY

Emission Unit	PM_{10} (tons)	$PM_{2.5}$ (tons)	VOC (tons)	NOx (tons)	CO (tons)	SO2 (tons)
Fugitive Dust	0.2	0.016	---	---	---	---
Vehicle Exhaust	0.5	0.5	0.5	6.7	1.5	0.4
Total (tons)	**0.6**	**0.5**	**0.5**	**6.7**	**1.5**	**0.4**

ANNUAL EMISSIONS

Emission Unit	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	VOC (tpy)	NO_x (tpy)	CO (tpy)	SO_2 (tpy)
Fugitive Dust	4.4	0.4	---	---	---	---
Vehicle Exhaust	10.4	10.4	11.8	146.0	32.0	9.7
Total (tons)	**14.7**	**10.8**	**11.8**	**146.0**	**32.0**	**9.7**

tpy = tons per year

Table A-2. Convoy Emissions
Cumulative Impacts Modeling

CONVOYS PER YEAR:

Description	No of exercises
HBCT	3
IBCT	2
Heavy CAV	3
Heavy IN	3
Heavy AR	3
Light CAV	2
Light IN	4

Vehicle Speed (miles per hour [mph])

Wheeled Vehicles	35
Tracked Vehicles	25
All Dust Limit Areas	15

CONVOY SEGMENT DESCRIPTION:

Segment	Road Surface Type	Segment Length (meters)	Segment Length (miles)	Number of Volume Source per Segment	No. of Volume Sources with 15 mph Speed limit	No. of Volume Sources with 25 / 35 mph Speed limit	Percent with 25 / 35 mph Speed limit	Percent with 15 mph Speed limit
Ft Carson to PCMS	Paved	259097.3	161.0	NA	NA	NA	NA	NA
A-D-E	Gravel	28467	17.7	57.0	23.0	34.0	59.6%	40.4%
A-B	Gravel	39673	24.7	69.0	26.0	43.0	62.3%	37.7%
A-C	Gravel	34231	21.3	80.0	19.0	61.0	76.3%	23.8%

mph = miles per hour

Gravel control factor[a] *derived from AP 42 13.2.2 Equation 1a (11/06)*

E=k(s/12)a(W/3)b	
where k = 1.5, a = 0.9, b = 0.45	
s = 6.4% for gravel, 15% dirt *(Ref: WRAP fugitive dust handbook 09/06)*	
E (gravel)/E(dirt) = (6.4/15)^0.9 =	0.464
Gravel control factor = 1 - 0.464 =	0.536

[a] Gravel control factor applies to all wheeled vehicles.

Table A-2, Continued

PM_{10} EMISSION FACTORS FOR UNPAVED (GRAVEL AND DIRT) ROADS

Vehicle Type[a]	Wheeled or Tracked	Vehicle wt.(tons)	Emission Factor (EF)[b] (g-PM_{10}/ vkt km/hr)	Emission Factor (EF)[c] (lb-PM_{10}/vmt)			
				25 mph Uncontrolled	*35 mph Controlled (Gravel[d])*	*15 mph Uncontrolled*	*15 mph Controlled (Gravel[d])*
MTV	Wheeled	11.7	31.9	NA	3.0	NA	1.3
LMTV	Wheeled	10.3	28.1	NA	2.6	NA	1.1
HEMTT	Wheeled	19.4	52.8	NA	4.9	NA	2.1
HMMV	Wheeled	2.7	7.4	NA	0.7	NA	0.3
M1A2	Tracked	69.5	189.3	27.0	NA	16.2	NA
M2A3	Tracked	30.5	83.1	11.9	NA	7.1	NA
M3A3	Tracked	30.5	83.1	11.9	NA	7.1	NA
M88	Tracked	53.9	146.8	21.0	NA	12.6	NA
M109A3	Tracked	27.5	74.9	10.7	NA	6.4	NA
M548	Tracked	14.4	39.2	5.6	NA	3.4	NA
M1064A3	Tracked	13.8	37.6	5.4	NA	3.2	NA
M1068A3	Tracked	13.6	37.0	5.3	NA	3.2	NA
M113A3	Tracked	13.6	37.0	5.3	NA	3.2	NA
M577A1	Tracked	13.8	37.6	5.4	NA	3.2	NA

[a]Vehicle descriptions are included in Table A-8.

[b]Emission factor = 0.003 x (vehicle weight [kg]) x vehicle speed (kmph) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute, Gillies, J.A. et. al., March 2005.

[c]Normal average vehicle speed is 35 mph for wheeled and 25 mph for tracked. (Meister 2008).

[d]Only wheeled vehicles travel on gravel. (Meister 2008).

g-PM_{10}/ vkt km/hr = grams of PM_{10} per vehicle kilometer traveled per kilometer per hour

mph = miles per hour

lb-PM_{10}/vmt = pound of PM_{10} per vehicle mile traveled

Table A-2, Continued

HBCT CONVOY CONTROLLED PM_{10} EMISSIONS FROM UNPAVED (GRAVEL AND DIRT) ROADS

Vehicle Type[a]	2 STB Vehicles (No convoy)	3-16 FA Vehicles	Remaining HBCT vehicles		VMT per segment per day			Total VMT per convoy per day (1/2 brigade each day)	Days of convoy/yr	Total Annual VMT	PM_{10} emissions (tons per day) per segment			PM_{10} emissions (tons per day)	PM_{10} emissions (tons per year) per segment			PM10 emissions (tons per year)
		A-D-E	1/2 on A-B	1/2 on A-C	A-D-E	1/2 on A-B	1/2 on A-C				A-D-E	A-B	A-C		A-D-E	A-B	A-C	
MTV	2	3	57	57	27	703	606	1,335	12	16,024	0.03	0.81	0.77	1.6	0.36	9.78	9.29	19.4
LMTV	5	6	47	47	53	573	495	1,121	12	13,449	0.05	0.59	0.56	1.2	0.64	7.02	6.67	14.3
HEMTT	5	12	90	90	106	1,109	957	2,173	12	26,072	0.20	2.13	2.03	4.4	2.40	25.59	24.32	52.3
HMMV	93	51	130	130	451	1,602	1,383	3,436	12	41,233	0.12	0.43	0.41	1.0	1.42	5.14	4.89	11.5
M1A2	0	0	29	29	0	357	308	666	12	7,991	0.00	4.10	3.77	7.9	0.00	49.22	45.26	94.5
M2A3	2	0	38	38	0	468	404	873	12	10,470	0.00	2.36	2.17	4.5	0.00	28.30	26.02	54.3
M3A3	0	0	20	20	0	247	213	459	12	5,511	0.00	1.24	1.14	2.4	0.00	14.90	13.70	28.6
M88	0	0	13	13	0	160	138	298	12	3,582	0.00	1.43	1.31	2.7	0.00	17.11	15.73	32.8
M109A3	0	16	0	0	142	0	0	142	12	1,698	0.63	0.00	0.00	0.6	7.61	0.00	0.00	7.6
M548	0	0	2	2	0	25	21	46	12	551	0.00	0.06	0.05	0.1	0.00	0.70	0.65	1.3
M1064A3	0	0	4	4	0	49	43	92	12	1,102	0.00	0.11	0.10	0.2	0.00	1.35	1.24	2.6
M1068A3	0	0	6	6	0	74	64	138	12	1,653	0.00	0.17	0.15	0.3	0.00	1.99	1.83	3.8
M113A3	0	0	19	19	0	234	202	436	12	5,235	0.00	0.53	0.48	1.0	0.00	6.31	5.80	12.1
M577A1	2	8	20	20	71	240	207	519	12	6,222	0.16	0.55	0.50	1.2	1.91	6.58	6.05	14.5
Subtotal	109	96	474	474	849	5843	5041	11,733	168	140,794	1.2	14.5	13.5	**29.1**	14.3	174.0	161.4	**349.8**

[a]Vehicle descriptions are included in Table A-8.

VMT = vehicle miles traveled

IBCT CONVOY CONTROLLED PM_{10} EMISSIONS FROM UNPAVED (GRAVEL and DIRT) ROADS

Vehicle Type[a]	2 STB Vehicles (No convoy)	3-16 FA Vehicles	Remaining HBCT vehicles		VMT per segment per day			Total VMT per convoy per day (1/2 brigade each day)	Days of convoy/yr	Total Annual VMT	PM_{10} emissions (tons per day) per segment			PM10 emissions (tons per day)	PM_{10} emissions (tons per year) per segment			PM10 emissions (tons per year)
		A-D-E	1/2 on A-B	1/2 on A-C	A-D-E	1/2 on A-B	1/2 on A-C				A-D-E	A-B	A-C		A-D-E	A-B	A-C	
MTV	11	10	67	67	88	826	713	1,627	8	13015	0.10	1.0	0.9	2.0	0.8	7.7	7.3	19.2
LMTV	106	0	53	53	0	653	564	1,217	8	9736	0.00	0.7	0.6	1.3	0.0	5.3	5.1	12.7
HEMTT	4	0	8	8	0	92	80	172	8	1378	0.00	0.2	0.2	0.3	0.0	1.4	1.4	3.4
HMMV	100	87	192	192	769	2,367	2,042	5,178	8	41425	0.20	0.6	0.6	1.4	1.6	5.1	4.8	14.1
Subtotal	221	97	320	320				8,194		65,553	0.3	2.4	2.3	**5.1**	2.4	19.5	18.5	**49.4**

[a]Vehicle descriptions are included in Table A-8.

VMT = vehicle miles traveled

Table A-2, Continued

BATALLION CONVOY CONTROLLED PM_{10} EMISSIONS FROM UNPAVED (GRAVEL and DIRT) ROADS

Vehicle Type[a]	Number of Vehicles per Battalion					Heavy CAV Annual VMT		Heavy IN Annual VMT		Heavy AR Annual VMT		Light CAV Annual VMT		Light IN Annual VMT		Total Annual VMT		PM_{10} emissions (tons per year)	
	Heavy CAV	Heavy IN	Heavy AR	Light CAV	Light IN	A-B	A-C	A-B	A-C	A-B	A-C	A-B	A-C	A-B	A-C	A-B	A-C	A-B	A-C
MTV	2	1	1	6	7	148	128	74	64	74	64	296	255	690	596	1282	1106	1.5	1.4
LMTV	6	12	12	1	0	444	383	887	766	887	766	49	43	0	0	2268	1957	2.3	2.2
HEMTT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0
HMMV	57	41	41	83	79	4216	3637	3032	2616	3032	2616	4092	3531	7790	6722	22162	19122	5.9	5.6
M1A2	0	29	29	0	0	0	0	2145	1851	2145	1851	0	0	0	0	4290	3701	49.2	45.3
M2A3	0	38	38	0	0	0	0	2810	2425	2810	2425	0	0	0	0	5621	4850	28.3	26.0
M3A3	26	7	7	0	0	1923	1659	518	447	518	447	0	0	0	0	2958	2552	14.9	13.7
M88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0
M109A3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0
M548	0	2	2	0	0	0	0	148	128	148	128	0	0	0	0	296	255	0.7	0.6
M1064A3	0	4	4	0	0	0	0	296	255	296	255	0	0	0	0	592	510	1.3	1.2
M1068A3	0	6	6	0	0	0	0	444	383	444	383	0	0	0	0	887	766	2.0	1.8
M113A3	0	16	16	0	0	0	0	1183	1021	1183	1021	0	0	0	0	2367	2042	5.3	4.9
M577A1	27	3	3	0	0	1997	1723	222	191	222	191	0	0	0	0	2441	2106	5.6	5.1
Subtotal	118	159	159	90	86	8727	7530	11759	10146	11759	10146	4437	3829	8480	7317.1	45,163	38,968	**117.1**	**107.9**

[a]Vehicle descriptions are included in Table A-8.

VMT = vehicle miles traveled

TOTAL DAILY EMISSIONS FROM UNPAVED (GRAVEL and DIRT) ROAD SEGMENTS FOR HBCT CONVOY

	A-D-E	A-B	A-C	Total (tons)
PM_{10}	1.2	14.5	13.5	29.1
$PM_{2.5}$[a]	0.2	2.2	2.0	4.4

[a]$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.1-1) = 0.15

TOTAL ANNUAL EMISSIONS FROM CONVOYS ON UNPAVED (GRAVEL and DIRT) ROADS

	A-D-E	A-B	A-C	Total (tons)
PM_{10}	16.8	310.6	287.9	615.2
$PM_{2.5}$[a]	2.5	46.6	43.2	92.3

[a]$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.1-1) = 0.15

Table A-2, Continued

PAVED ROAD SEGMENT EMISSIONS

WEIGHTED AVERAGE VEHICLE WEIGHT FOR PAVED ROAD SEGMENTS

Vehicle Description		Number of Vehicles							Vehicle round trips per year Ft. Carson to PCMS	Round trips x Vehicle Weight
Vehicle Type[a]	Vehicle Weight (tons)	HBCT	IBCT	Heavy CAV	Heavy IN	Heavy AR	Light CAV	Light IN		
MTV	11.7	119	155	2	1	1	6	7	719	8,412
LMTV	10.3	104	106	6	12	12	1	0	616	6,345
HEMTT	19.4	197	19	0	0	0	0	0	629	12,203
HMMV	2.7	404	571	57	41	41	83	79	3,253	8,783
TOTAL	**44.1**	**824**	**851**	**65**	**54**	**54**	**90**	**86**	**5,217**	**35,743**

[a]Vehicle descriptions are included in Table A-8.

Weighted average vehicle weight (tons) **6.9**

Paved Road Emission Factor Equation -- AP-42, 13.2.1
EF = [k(sL/2)^0.65*(W/3)^1.5-C]*

Inputs/Assumptions:

W, weighted vehicle weight =	6.9	tons
k, particle size multiplier (AP-42, 13.2-1.1) =	0.0024	lb/VMT PM2.5
	0.016	lb/VMT PM10
C, Tire and brake wear (AP-42, 13.2.1-2)	0.00036	lb/VMT for PM2.5
	0.00047	lb/VMT for PM10
sL, silt load factor (g/m^2) (AP-42, 13.2.1-3)	0.06	g/m2
One Way Trip Mileage:	161.0	miles
Total VMT	1,679,874	miles
Daily HBCT Total VMT	66,332	miles (1/2 of vehicles travel per day one way)

TOTAL CONVOY EMISSIONS FROM PAVED ROADS (Ft. Carson to/from PCMS)

Pollutant	Emission Factor[a] (lbs/VMT)	Daily Total HBCT lbs	Daily Total HBCT tons	Total Emissions per year lbs	Total Emissions per year tons
PM_{10}	5.18E-03	344	**0.2**	8,705	**4.4**
$PM_{2.5}$	4.88E-04	32	**0.016**	819	**0.4**

[a]AP-42 13.2.1 Paved Roads (11/2006)

Table A-3. Wind Erosion Emissions
Cumulative Impacts Modeling

Pinon Canyon Area	969,832,871	m^2	239,646	acres	
Maximum wind speed	19.3	m/sec	43.17	mph	*5-year Trinidad data 99.99 percentile*
Calculated Friction Velocity (u*)	1.023	m/sec	*AP 42 13.2.5 Equation (4): $u^* = 0.053\, u_{10}^{+}$*		
Threshhold Friction Velocity (u_t)	1.020	m/sec	*AP42 13.2.5-2, Overburden from Western surface coal mine*		
Erosion Potential	0.073	g/m2	*AP 42 13.2.5 Equation (3): $58(u^*-u_t^*)^2 + 25(u^*-u_t^*)$*		

VMT per day of HBCT maneuver	21,958	mile/day	35,337,009	m/day
VMT per day of HBCT convoy	11,733	mile/day	18,881,664	m/day
Path A-B	*5,843*	*mile/day*	*9,402,501*	*m/day*
Path A-C	*5,041*	*mile/day*	*8,112,747*	*m/day*
Path A-D-E	*849*	*mile/day*	*1,366,416*	*m/day*

Area of initial land disturbance (75% of total Pinon Canyon area)	727,374,653	m^2
Area of travel for HBCT maneuver day (2 m road width)	70,674,019	m^2
Area of travel for HBCT convoy day (2 m road width)	37,763,328	m^2
Path A-B	*18,805,002*	m^2
Path A-C	*16,225,494*	m^2
Path A-D-E	*2,732,832*	m^2

VMT per year convoy total	290,478			
VMT per year maneuver total	1,491,208			
VMT per year all exercises total	1,781,686	miles	2,867,267,638	meters
Annual area of travel for all exercises (2m road width)	5,734,535,277	m^2		

24-Hr Scenario wind erosion PM emissions

Scenario	PM (tons)	PM_{10}[a]	$PM_{2.5}$[a]
Initial Disturbance	58.5	29.2	4.4
HBCT Maneuver	5.7	2.8	0.4
HBCT Convoy	3.0	1.5	0.2
Path A-B	1.5	0.8	0.1
Path A-C	1.3	0.7	0.1
Path A-D-E	0.2	0.1	0.02

[a]PM10 multiplier = 0.5; PM2.5 multiplier = 0.075 (AP-42 13.2.5-3 eqn. 2)

Annual wind erosion PM emissions

Scenario	PM (tons)	PM_{10}[a]	$PM_{2.5}$[a]
Annual Total all Maneuvers and Convoys	461.0	230.5	17.3

[a]PM10 multiplier = 0.5; PM2.5 multiplier = 0.075 (AP-42 13.2.5-3 eqn. 2)

Table A-4. Vehicle Exhaust Emissions
Cumulative Impacts Modeling

DAYS OF OPERATION PER YEAR BASED ON VEHICLE AND EXERCISE TYPE

Description	Wheeled/ Tracked	No. of exercises	No. of Convoy Days from Ft. Carson to PCMS per Exercisea	No. of Convoy Days w/in PCMS	No. of Maneuver Days per Exercise	Total Days of Convoy to/from PCMS per year	Total Days of Convoy at PCMS per year	Total Days of Maneuvers at PCMS per year
Heavy Brigade	Wheeled	3	4	4	13	12	12	39
Heavy Brigade	Tracked	3	0	4	13	0	12	39
Light Brigade	Wheeled	2	4	4	13	8	8	26
Heavy CAV Battalion	Wheeled	3	2	2	6	6	6	18
Heavy CAV Battalion	Tracked	3	0	2	6	0	6	18
Heavy IN Battalion	Wheeled	3	2	2	6	6	6	18
Heavy IN Battalion	Tracked	3	0	2	6	0	6	18
Heavy AR Battalion	Wheeled	3	2	2	6	6	6	18
Heavy AR Battalion	Tracked	3	0	2	6	0	6	18
Light CAV Battalion	Wheeled	2	2	2	6	4	4	12
Light IN Battalion	Wheeled	4	2	2	6	8	8	24

[a] Tracked vehicles are transported to PCMS on rails, so they only convoy at PCMS. For Brigade level exercises, half of vehicles travel each day.

FUEL BURNED:	JP-8
Hours of vehicle operation/day	4

EMISSION FACTORS

POLLUTANT	Engines >600 HP (lb/hp-hr)[a]	Engines <600 HP (lb/hp-hr)[b]
PM_{10}[c]	0.0007	0.0022
VOC[d]	0.0006	0.0025
NO_x	0.0240	0.0310
CO	0.0055	0.0068
SO_2[e]	0.0024	0.0021

[a]Emission factors for vehicles with a hp of 600 or greater are from AP-42, Table 3.4-1.

[b]Emission factors for vehicles with a hp of less than 600 are from AP-42, Table 3.3-1.

[c]Assume all PM_{10} is $PM_{2.5}$

[d]For vehicles with a hp rating of 600 or greater, VOC emission factor = 91% of TOC emission factor

[e]JP-8 Sulfur spec <0.3% (MIL-DTL-83133F 4/11/08)

Table A-4. Vehicle Exhaust Emissions
Cumulative Impacts Modeling

Table A-4, Continued

MANEUVERS AT PCMS

Vehicle Description[a]			Brigade Level Exercises				Battalion Level Exercises											TOTAL HP-HR FOR ALL VEHICLES/ YR
			HBCT		IBCT		Heavy CAV		Heavy IN		Heavy AR		Light CAV		Light IN		
Type	**HP**	**Wheeled or Tracked**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	**Total hp-hr per vehicle type per day**	**Maneuver Days at PCMS/yr**	
MTV	330	Wheeled	157,080	39	204,600	26	2,640	18	1,320	18	1,320	18	7,920	12	9,240	24	11,857,560
LMTV	275	Wheeled	114,400	39	116,600	26	6,600	18	13,200	18	13,200	18	1,100	12	0	24	8,100,400
HEMTT	450	Wheeled	354,600	39	34,200	26	0	18	0	18	0	18	0	12	0	24	14,718,600
HMMV	150	Wheeled	242,400	39	342,600	26	34,200	18	24,600	18	24,600	18	49,800	12	47,400	24	21,597,600
M1A2	1,500	Tracked	348,000	39	0		0	18	174,000	18	174,000	18					19,836,000
M2A3	600	Tracked	187,200	39	0		0	18	91,200	18	91,200	18					10,584,000
M3A3	600	Tracked	96,000	39	0		62,400	18	16,800	18	16,800	18					5,472,000
M88	1,050	Tracked	109,200	39	0		0	18	0	18	0	18					4,258,800
M109A3	275	Tracked	17,600	39	0		0	18	0	18	0	18					686,400
M548	275	Tracked	4,400	39	0		0	18	2,200	18	2,200	18					250,800
M1064A3	275	Tracked	8,800	39	0		0	18	4,400	18	4,400	18					501,600
M1068A3	275	Tracked	13,200	39	0		0	18	6,600	18	6,600	18					752,400
M113A3	275	Tracked	41,800	39	0		0	18	17,600	18	17,600	18					2,263,800
M577A1	275	Tracked	53,900	39	0		29,700	18	3,300	18	3,300	18					2,755,500
Subtotal hp <600			**1,008,180**		**698,000**		**73,140**		**73,220**		**73,220**		**58,820**		**56,640**		**63,484,660**
Subtotal hp >600			**740,400**		**0**		**62,400**		**282,000**		**282,000**		**0**		**0**		**40,150,800**
TOTAL			**1,748,580**		**698,000**		**135,540**		**355,220**		**355,220**		**58,820**		**56,640**		**103,635,460**

[a]Vehicle descriptions are included in Table A-8.

hp = horsepower

hp-hr = horsepower-hour

yr = year

EXHAUST EMISSIONS FROM MANEUVERS AT PCMS (TONS)

POLLUTANT	**Daily Total HBCT**	**Annual total for all exercises**
PM_{10}	1.4	83.9
$PM_{2.5}$	1.4	83.9
VOC	1.5	93
NO_x	24.5	1466
CO	5.5	326
SO_2	1.9	114

Table A-4, Continued

CONVOYS AT PCMS

Vehicle Description[a]			Brigade Level Exercises				Battalion Level Exercises										TOTAL HP-HR FOR ALL VEHICLES/ YR
			HBCT		IBCT		Heavy CAV		Heavy IN		Heavy AR		Light CAV		Light IN		
Type	HP	Wheeled or Tracked	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	Total hp-hr per vehicle type per day	Convoy Days at PCMS/yr	
MTV	330	Wheeled	78,540	12	102,300	8	2,640	6	1,320	6	1,320	6	7,920	4	9,240	8	1,898,160
LMTV	275	Wheeled	57,200	12	58,300	8	6,600	6	13,200	6	13,200	6	1,100	4	0	8	1,355,200
HEMTT	450	Wheeled	177,300	12	17,100	8	0	6	0	6	0	6	0	4	0	8	2,264,400
HMMV	150	Wheeled	121,200	12	171,300	8	34,200	6	24,600	6	24,600	6	49,800	4	47,400	8	3,903,600
M1A2	1,500	Tracked	174,000	12			0	6	174,000	6	174,000	6					4,176,000
M2A3	600	Tracked	93,600	12			0	6	91,200	6	91,200	6					2,217,600
M3A3	600	Tracked	48,000	12			62,400	6	16,800	6	16,800	6					1,152,000
M88	1,050	Tracked	54,600	12			0	6	0	6	0	6					655,200
M109A3	275	Tracked	8,800	12			0	6	0	6	0	6					105,600
M548	275	Tracked	2,200	12			0	6	2,200	6	2,200	6					52,800
M1064A3	275	Tracked	4,400	12			0	6	4,400	6	4,400	6					105,600
M1068A3	275	Tracked	6,600	12			0	6	6,600	6	6,600	6					158,400
M113A3	275	Tracked	20,900	12			0	6	17,600	6	17,600	6					462,000
M577A1	275	Tracked	26,950	12			29,700	6	3,300	6	3,300	6					541,200
Subtotal hp <600			**504,090**		**349,000**		**73,140**		**73,220**		**73,220**		**58,820**		**56,640**		**10,846,960**
Subtotal hp >600			**370,200**		**0**		**62,400**		**282,000**		**282,000**		**0**		**0**		**8,200,800**
TOTAL			**874,290**		**349,000**		**135,540**		**355,220**		**355,220**		**58,820**		**56,640**		**19,047,760**

[a]Vehicle descriptions are included in Table A-8.

hp = horsepower

hp-hr = horsepower-hour

yr = year

EXHAUST EMISSIONS FROM CONVOYS AT PCMS (TONS)

POLLUTANT	Daily Total HBCT	Annual total for all exercises
PM_{10}	0.7	14.8
$PM_{2.5}$	0.7	14.8
VOC	0.8	16.3
NO_x	12.3	266.5
CO	2.7	59.4
SO_2	1.0	21.1

Table A-4, Continued

CONVOYS TO / FROM PCMS

Vehicle Description[a]			Brigade Level Exercises				Battalion Level Exercises											TOTAL HP-HR FOR ALL VEHICLES/ YR
			HBCT		IBCT		Heavy CAV		Heavy IN		Heavy AR		Light CAV		Light IN		
Type	HP	Wheeled or Tracked	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	Total hp-hr per vehicle type per day	Days Convoy to/from PCMS/yr	
MTV	330	Wheeled	78,540	12	102,300	8	2,640	6	1,320	6	1,320	6	7,920	4	9,240	8	1,898,160
LMTV	275	Wheeled	57,200	12	58,300	8	6,600	6	13,200	6	13,200	6	1,100	4	0	8	1,355,200
HEMTT	450	Wheeled	177,300	12	17,100	8	0	6	0	6	0	6	0	4	0	8	2,264,400
HMMV	150	Wheeled	121,200	12	171,300	8	34,200	6	24,600	6	24,600	6	49,800	4	47,400	8	3,903,600
TOTAL			**434,240**		**349,000**		**43,440**		**39,120**		**39,120**		**58,820**		**56,640**		**9,421,360**

[a]Vehicle descriptions are included in Table A-8.

hp = horsepower

hp-hr = horsepower-hour

yr = year

EXHAUST EMISSIONS FROM CONVOYS TO / FROM PCMS (TONS)

POLLUTANT	Daily Total HBCT	Annual total for all exercises
PM_{10}	0.5	10.4
$PM_{2.5}$	0.5	10.4
VOC	0.5	12
NO_x	6.7	146
CO	1.5	32
SO_2	0.4	10

SUMMARY OF EXHAUST EMISSION AT PCMS (Does not include emissions from convoys to and from PCMS)

POLLUTANT	Daily Total HBCT (tons)		Annual total for all exercises (tons)		
	PCMS Maneuvers	PCMS Convoys	PCMS Maneuvers	PCMS Convoys	Total All Maneuvers and Convoys
PM_{10}	1.4	0.7	83.9	14.8	98.7
$PM_{2.5}$	1.4	0.7	83.9	14.8	98.7
VOC	1.5	0.8	93	16	109
NO_x	24.5	12.3	1466	267	1732
CO	5.5	2.7	326	59	386
SO_2	1.9	1.0	114	21	135

Table A-5. Maneuver Road Emissions
Cumulative Impacts Modeling

PM_{10} EMISSION FACTORS FOR UNPAVED ROADS

Vehicles[a]	Wheeled or Tracked	Vehicle weight (tons)	Emission Factor (EF)[b] (g-PM_{10}/vkt km/hr)	Emission Factor (EF) (lb-PM_{10}/vmt)[c]
MTV	Wheeled	11.7	31.9	6.4
LMTV	Wheeled	10.3	28.1	5.6
HEMTT	Wheeled	19.4	52.8	10.6
HMMV	Wheeled	2.7	7.4	1.5
M1A2	Tracked	69.5	189.3	27.0
M2A3	Tracked	30.5	83.1	11.9
M3A3	Tracked	30.5	83.1	11.9
M88	Tracked	53.9	146.8	21.0
M109A3	Tracked	27.5	74.9	10.7
M548	Tracked	14.4	39.2	5.6
M1064A3	Tracked	13.8	37.6	5.4
M1068A3	Tracked	13.6	37.0	5.3
M113A3	Tracked	13.6	37.0	5.3
M577A1	Tracked	13.8	37.6	5.4

[a]Vehicle descriptions are included in Table A-8.

[b]Emission factor = 0.003 x (vehicle weight [kg]) x vehicle speed (kmph) from "Characterizing and Quantifying Local and Regional Particulate Matter Emissions from Department of Defense Installations", Desert Research Institute, Gillies, J.A. et. al., March 2005.

[c]Normal average vehicle speed is 35 mph for wheeled and 25 mph for tracked. (Meister 2008).

g-PM_{10}/ vkt km/hr = grams of PM_{10} per vehicle kilometer traveled per kilometer per hour

lb-PM_{10}/vmt = pound of PM_{10} per vehicle mile traveled

MANEUVERS PER YEAR:

	Miles per maneuver day	No of exercises per year	Maneuver days per exercise	Maneuver days per year
HBCT (2 STB and 3-16 FA) [a]	10	3	13	39
HBCT (All Others) [a]	21	3	13	39
IBCT (4 STB and 2-77 FA) [a]	10	2	13	26
IBCT (All Others) [a]	21	2	13	26
Heavy CAV	21	3	6	18
Heavy IN	21	3	6	18
Heavy AR	21	3	6	18
Light CAV	21	2	6	12
Light IN	21	4	6	24

[a]Maneuver VMT = 21/day for all Battalions, except BSB and FA are 10 m/day

Table A-5. Maneuver Road Emissions
Cumulative Impacts Modeling

Table A-5, Continued

TOTAL NUMBER OF VEHICLES

Vehicle Type[a]	Vehicle Weight (tons)	HBCT		IBCT		Heavy CAV	Heavy IN	Heavy AR	Light CAV	Light IN
		STB and FA	All Others	STB and FA	All Others					
MTV	11.7	5	114	21	134	2	1	1	6	7
LMTV	10.3	11	93	0	106	6	12	12	1	0
HEMTT	19.4	17	180	4	15	0	0	0	0	0
HMMV	2.7	144	260	187	384	57	41	41	83	79
M1A2	69.5	0	58	0	0	0	29	29	0	0
M2A3	30.5	2	76	0	0	0	38	38	0	0
M3A3	30.5	0	40	0	0	26	7	7	0	0
M88	53.9	0	26	0	0	0	0	0	0	0
M109A3	27.5	16	0	0	0	0	0	0	0	0
M548	14.4	0	4	0	0	0	2	2	0	0
M1064A3	13.8	0	8	0	0	0	4	4	0	0
M1068A3	13.6	0	12	0	0	0	6	6	0	0
M113A3	13.6	0	38	0	0	0	16	16	0	0
M577A1	13.8	10	39	0	0	27	3	3	0	0
Total	**325.2**	**205**	**948**	**212**	**639**	**118**	**159**	**159**	**90**	**86**

[a]Vehicle descriptions are included in Table A-8.

Table A-5. Maneuver Road Emissions
Cumulative Impacts Modeling

Table A-5, Continued

MANEUVER VMT/day[a]

Vehicle Type[b]	HBCT	IBCT	Heavy CAV	Heavy IN	Heavy AR	Light CAV	Light IN
MTV	2,444	3,024	42	21	21	126	147
LMTV	2,063	2,226	126	252	252	21	0
HEMTT	3,950	355	0	0	0	0	0
HMMV	6,900	9,934	1,197	861	861	1,743	1,659
M1A2	1,218	0	0	609	609	0	0
M2A3	1,616	0	0	798	798	0	0
M3A3	840	0	546	147	147	0	0
M88	546	0	0	0	0	0	0
M109A3	160	0	0	0	0	0	0
M548	84	0	0	42	42	0	0
M1064A3	168	0	0	84	84	0	0
M1068A3	252	0	0	126	126	0	0
M113A3	798	0	0	336	336	0	0
M577A1	919	0	567	63	63	0	0
Total	**21,958**	**15,539**	**2,478**	**3,339**	**3,339**	**1,890**	**1,806**

[a]Maneuver VMT = 21/day for all battallions, except BSB and FA are 10 m/day

[b]Vehicle descriptions are included in Table A-8.

VMT/day = vehicle miles traveled per day

Table A-5. Maneuver Road Emissions
Cumulative Impacts Modeling

Table A-5, Continued

MANEUVER VMT/yr[a]

Vehicle Type[b]	HBCT	IBCT	Heavy CAV	Heavy IN	Heavy AR	Light CAV	Light IN	Total
MTV	95,316	78,624	756	378	378	1,512	3,528	180,492
LMTV	80,457	57,876	2,268	4,536	4,536	252	0	149,925
HEMTT	154,050	9,230	0	0	0	0	0	163,280
HMMV	269,100	258,284	21,546	15,498	15,498	20,916	39,816	640,658
M1A2	47,502	0	0	10,962	10,962	0	0	69,426
M2A3	63,024	0	0	14,364	14,364	0	0	91,752
M3A3	32,760	0	9,828	2,646	2,646	0	0	47,880
M88	21,294	0	0	0	0	0	0	21,294
M109A3	6,240	0	0	0	0	0	0	6,240
M548	3,276	0	0	756	756	0	0	4,788
M1064A3	6,552	0	0	1,512	1,512	0	0	9,576
M1068A3	9,828	0	0	2,268	2,268	0	0	14,364
M113A3	31,122	0	0	6,048	6,048	0	0	43,218
M577A1	35,841	0	10,206	1,134	1,134	0	0	48,315
Total	**856,362**	**404,014**	**44,604**	**60,102**	**60,102**	**22,680**	**43,344**	**1,491,208**

[a]Maneuver VMT = 21/day for all battallions, except BSB and FA are 10 m/day

[b]Vehicle descriptions are included in Table A-8.

VMT/yr = vehicle miles traveled per year

Table A-5. Maneuver Road Emissions
Cumulative Impacts Modeling

Table A-5, Continued

MANEUVER PM EMISSIONS

Vehicle Type[a]	HBCT 24-hour Emissions (tons per day)		Total Emissions All Maneuvers (tons per year)	
	PM_{10}	$PM_{2.5}$[b]	PM_{10}	$PM_{2.5}$[b]
MTV	7.8	1.2	574.8	86.2
LMTV	5.8	0.9	420.3	63.0
HEMTT	20.9	3.1	862.1	129.3
HMMV	5.1	0.8	470.8	70.6
M1A2	16.5	2.5	938.0	140.7
M2A3	9.6	1.4	544.0	81.6
M3A3	5.0	0.7	283.9	42.6
M88	5.7	0.9	223.1	33.5
M109A3	0.9	0.1	33.4	5.0
M548	0.2	0.0	13.4	2.0
M1064A3	0.5	0.1	25.7	3.9
M1068A3	0.7	0.1	37.9	5.7
M113A3	2.1	0.3	114.3	17.1
M577A1	2.5	0.4	129.8	19.5
Total	**83.0**	**12.5**	**4,671.5**	**700.7**

[a]Vehicle descriptions are included in Table A-8.

[b]$PM_{2.5}$ fraction of PM_{10} (derived from AP-42, Table 13.2.1-1) = 0.15

Table A-6. External Combustion Pseudo Source Stack Parameters
Cumulative Impacts Modeling

Parameter	Value	Units
Height	6.096	meters (m)
Exhaust Temperature	477.59	Kelvin (K)
Stack Diameter[a]	0.3556	m
Velocity[a]	5.7	meters per second (m/s)
Universal Transverse Mercator (UTM) North American Datum of 1927 (NAD27) Easti	574422	m
UTM NAD27 Northing	4150003	m
Base Elevation	1715.1	m

[a] Based on a Weil-McLain Model 94 boiler with a heat input rate of 2.526 MMBtu/hr (Weil-McLain 1995)

Table A-7. Brigade Vehicles
Cumulative Impacts Modeling

				HBCT				IBCT			
Vehicle Type[a,b]	*Wheeled or Tracked*	*Vehicle Weight (tons)*	*HP*	*2 STB Vehicles (No convoy in PCMS)*	*FA Vehicles (Path A-D-E convoy)*	*Remaining HBCT vehicles*	*Total Number of Vehicles per HBCT*	*4 STB Vehicles (No convoy in PCMS)*	*FA Vehicles (Path A-D-E convoy)*	*Remaining IBCT vehicles*	*Total Number of Vehicles per IBCT*
MTV	Wheeled	11.7	330	2	3	114	119	11	10	134	155
LMTV	Wheeled	10.3	275	5	6	93	104	0	0	106	106
HEMTT	Wheeled	19.4	450	5	12	180	197	4	0	15	19
HMMV	Wheeled	2.7	150	93	51	260	404	100	87	384	571
M1A2	Tracked	69.5	1,500	0	0	58	58	0	0	0	0
M2A3	Tracked	30.5	600	2	0	76	78	0	0	0	0
M3A3	Tracked	30.5	600	0	0	40	40	0	0	0	0
M88	Tracked	53.9	1,050	0	0	26	26	0	0	0	0
M109A3	Tracked	27.5	275	0	16	0	16	0	0	0	0
M548	Tracked	14.4	275	0	0	4	4	0	0	0	0
M1064A3	Tracked	13.8	275	0	0	8	8	0	0	0	0
M1068A3	Tracked	13.6	275	0	0	12	12	0	0	0	0
M113A3	Tracked	13.6	275	0	0	38	38	0	0	0	0
M577A1	Tracked	13.8	275	2	8	39	49	0	0	0	0
Total				*109*	*96*	*948*	***1153***	*115*	*97*	*639*	***851***

[a]Vehicle descriptions are included in Table A-8.

[b]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

HBCT = Heavy Brigade Combat Team
IBCT = Infantry Brigade Combat Team
CAV = Cavalry Battalion
BSB = Brigade Support Battalion
STB = Special Troops Battalion
FA = Field Artillery Battalion
IN = Infantry Battalion
AR = Armored Battalion

Table A-8. CAV Armored Reconnaissance Squadron Vehicles
Cumulative Impacts Modeling

Vehicle Type [a]	*Vehicle Description*	*Wheeled or Tracked*	*Vehicle Weight (tons)* [b]	*Number of Vehicles Heavy Unit*	*Number of Vehicles Light Unit*
MTV	Cargo Truck MTV 5T M1083	Wheeled	11.7	2	6
LMTV	Cargo Truck LMTV2.5T M1078A1	Wheeled	10.3	6	1
HEMTT	Cargo Truck 10T HEMTT M977	Wheeled	19.4	0	0
HMMV	Utility Trucks HV M1097A2	Wheeled	2.7	57	83
M1A2	Tank CBT 120MM M1A2	Tracked	69.5	0	0
M2A3	M2A3 (Bradley FTG VEH M2A2)	Tracked	30.5	0	0
M3A3	M3A3 (Bradley FTG VEH M2A2)	Tracked	30.5	26	0
M88	Recov Veh FT MED M88A1	Tracked	53.9	0	0
M109A3		Tracked	27.5	0	0
M548		Tracked	14.4	0	0
M1064A3	Carrier 120MM Mort M1064A3	Tracked	13.8	0	0
M1068A3		Tracked	13.6	0	0
M113A3	Carrier Pers M113A3	Tracked	13.6	0	0
M577A1		Tracked	13.8	27	0
Total				***118***	***90***

[a]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

[b]Vehicle weights from http://afvdb/50megs.com/usa/ and Equipment Cheat Sheet 2005, provided by Patty Martinez, FCCO Transportation Office. (Fort Carson 2005).

Table A-9. Brigade Support Battalion (BSB) Vehicles
Cumulative Impacts Modeling

Vehicle Type [a]	***Vehicle Description***	***Wheeled or Tracked***	***Vehicle Weight (tons)*** [b]	***Number of Vehicles Heavy Unit***	***Number of Vehicles Light Unit***
MTV	Cargo Truck MTV 5T M1083	Wheeled	11.7	110	114
LMTV	Cargo Truck LMTV2.5T M1078A1	Wheeled	10.3	63	95
HEMTT	Cargo Truck 10T HEMTT M977	Wheeled	19.4	180	15
HMMV	Utility Trucks HV M1097A2	Wheeled	2.7	121	143
M1A2	Tank CBT 120MM M1A2	Tracked	69.5	0	0
M2A3	M2A3 (Bradley FTG VEH M2A2)	Tracked	30.5	0	0
M3A3	M3A3 (Bradley FTG VEH M2A2)	Tracked	30.5	0	0
M88	Recov Veh FT MED M88A1	Tracked	53.9	26	0
M109A3		Tracked	27.5	0	0
M548		Tracked	14.4	0	0
M1064A3	Carrier 120MM Mort M1064A3	Tracked	13.8	0	0
M1068A3		Tracked	13.6	0	0
M113A3	Carrier Pers M113A3	Tracked	13.6	6	0
M577A1		Tracked	13.8	6	0
Total				***512***	***367***

[a]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

[b]Vehicle weights from http://afvdb/50megs.com/usa/ and Equipment Cheat Sheet 2005, provided by Patty Martinez, FCCO Transportation Office. (Fort Carson 2005).

Table A-10. Special Troops Battalion (STB) Vehicles Cumulative Impacts Modeling

Vehicle Type [a]	*Vehicle Description*	*Wheeled or Tracked*	*Vehicle Weight (tons)* [b]	*Number of Vehicles Heavy Unit*	*Number of Vehicles Light Unit*
MTV	Cargo Truck MTV 5T M1083	Wheeled	11.7	2	11
LMTV	Cargo Truck LMTV2.5T M1078A1	Wheeled	10.3	5	5
HEMTT	Cargo Truck 10T HEMTT M977	Wheeled	19.4	5	4
HMMV	Utility Trucks HV M1097A2	Wheeled	2.7	93	100
M1A2	Tank CBT 120MM M1A2	Tracked	69.5	0	0
M2A3	M2A3 (Bradley FTG VEH M2A2)	Tracked	30.5	2	0
M3A3	M3A3 (Bradley FTG VEH M2A2)	Tracked	30.5	0	0
M88	Recov Veh FT MED M88A1	Tracked	53.9	0	0
M109A3		Tracked	27.5	0	0
M548		Tracked	14.4	0	0
M1064A3	Carrier 120MM Mort M1064A3	Tracked	13.8	0	0
M1068A3		Tracked	13.6	0	0
M113A3	Carrier Pers M113A3	Tracked	13.6	0	0
M577A1		Tracked	13.8	2	0
Total				***109***	***120***

[a]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

[b]Vehicle weights from http://afvdb/50megs.com/usa/ and Equipment Cheat Sheet 2005, provided by Patty Martinez, FCCO Transportation Office. (Fort Carson 2005).

Table A-11. Field Artillery (FA) Vehicles
Cumulative Impacts Modeling

Vehicle Type [a]	*Vehicle Description*	*Wheeled or Tracked*	*Vehicle Weight (tons)* [b]	*Number of Vehicles Heavy Unit*	*Number of Vehicles Light Unit*
MTV	Cargo Truck MTV 5T M1083	Wheeled	11.7	3	10
LMTV	Cargo Truck LMTV2.5T M1078A1	Wheeled	10.3	6	5
HEMTT	Cargo Truck 10T HEMTT M977	Wheeled	19.4	12	0
HMMV	Utility Trucks HV M1097A2	Wheeled	2.7	51	87
M1A2	Tank CBT 120MM M1A2	Tracked	69.5	0	0
M2A3	M2A3 (Bradley FTG VEH M2A2)	Tracked	30.5	0	0
M3A3	M3A3 (Bradley FTG VEH M2A2)	Tracked	30.5	0	0
M88	Recov Veh FT MED M88A1	Tracked	53.9	0	0
M109A3		Tracked	27.5	16	0
M548		Tracked	14.4	0	0
M1064A3	Carrier 120MM Mort M1064A3	Tracked	13.8	0	0
M1068A3		Tracked	13.6	0	0
M113A3	Carrier Pers M113A3	Tracked	13.6	0	0
M577A1		Tracked	13.8	8	0
Total				***96***	***102***

[a]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

[b]Vehicle weights from http://afvdb/50megs.com/usa/ and Equipment Cheat Sheet 2005, provided by Patty Martinez, FCCO Transportation Office. (Fort Carson 2005).

Table A-12. Infantry (IN) Armed Battalion Vehicles
Cumulative Impacts Modeling

Vehicle Type [a]	*Vehicle Description*	*Wheeled or Tracked*	*Vehicle Weight (tons)* [b]	*Number of Vehicles Heavy Unit*	*Number of Vehicles Light Unit*
MTV	Cargo Truck MTV 5T M1083	Wheeled	11.7	1	7
LMTV	Cargo Truck LMTV2.5T M1078A1	Wheeled	10.3	12	0
HEMTT	Cargo Truck 10T HEMTT M977	Wheeled	19.4	0	0
HMMV	Utility Trucks HV M1097A2	Wheeled	2.7	41	79
M1A2	Tank CBT 120MM M1A2	Tracked	69.5	29	0
M2A3	M2A3 (Bradley FTG VEH M2A2)	Tracked	30.5	38	0
M3A3	M3A3 (Bradley FTG VEH M2A2)	Tracked	30.5	7	0
M88	Recov Veh FT MED M88A1	Tracked	53.9	0	0
M109A3		Tracked	27.5	0	0
M548		Tracked	14.4	2	0
M1064A3	Carrier 120MM Mort M1064A3	Tracked	13.8	4	0
M1068A3		Tracked	13.6	6	0
M113A3	Carrier Pers M113A3	Tracked	13.6	16	0
M577A1		Tracked	13.8	3	0
Total				***159***	***86***

[a]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

[b]Vehicle weights from http://afvdb/50megs.com/usa/ and Equipment Cheat Sheet 2005, provided by Patty Martinez, FCCC Transportation Office. (Fort Carson 2005).

Table A-13. Armor (AR) Battalion Vehicles
Cumulative Impacts Modeling

Vehicle Type [a]	***Vehicle Description***	***Wheeled or Tracked***	***Vehicle Weight (tons)*** [b]	***Number of Vehicles Heavy Unit***	***Number of Vehicles Light Unit***
MTV	Cargo Truck MTV 5T M1083	Wheeled	11.7	1	N/A
LMTV	Cargo Truck LMTV2.5T M1078A1	Wheeled	10.3	12	N/A
HEMTT	Cargo Truck 10T HEMTT M977	Wheeled	19.4	0	N/A
HMMV	Utility Trucks HV M1097A2	Wheeled	2.7	41	N/A
M1A2	Tank CBT 120MM M1A2	Tracked	69.5	29	N/A
M2A3	M2A3 (Bradley FTG VEH M2A2)	Tracked	30.5	38	N/A
M3A3	M3A3 (Bradley FTG VEH M2A2)	Tracked	30.5	7	N/A
M88	Recov Veh FT MED M88A1	Tracked	53.9	0	N/A
M109A3		Tracked	27.5	0	N/A
M548		Tracked	14.4	2	N/A
M1064A3	Carrier 120MM Mort M1064A3	Tracked	13.8	4	N/A
M1068A3		Tracked	13.6	6	N/A
M113A3	Carrier Pers M113A3	Tracked	13.6	16	N/A
M577A1		Tracked	13.8	3	N/A
Total				***159***	***0***

[a]Vehicle information provided by Rob Ford, GTA EIS Project Manager, Ft. Carson. (Ford 2008a, 2008b).

[b]Vehicle weights from http://afvdb/50megs.com/usa/ and Equipment Cheat Sheet 2005, provided by Patty Martinez, FCCO Transportation Office. (Fort Carson 2005).

APPENDIX D

NOISE SUPPORTING DOCUMENTATION

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Prepared by

U.S. Army Center for
Health Promotion and Preventive Medicine

Under Contract to
Army Environmental Center

for

U.S. Army, Fort Carson, Colorado

APPENDIX D

Noise Supporting Documentation

How is noise modeled?

The primary means of assessing military environmental noise is through computer modeling. Computer noise models require various operational data, such as types of operations/weapons and number, location, and time of training. The output from the models is summarized on installation land use maps in the form of noise contours. This fact sheet presents information about the various computer models used to generate noise contour maps. *Note: Noise contours are not generated from actual noise measurements because the process would be too labor- and equipment-intensive, requiring months of monitoring at hundreds of measurement sites.*

Calculating Average Noise Levels

Department of Defense bases/installations use computer modeling programs to determine the average daily noise for aircraft operations generated over the period of one year. Generally, moments of quiet are averaged together with moments where loud noises can be heard. The models also add a 10-decibel penalty to nighttime noise (10 pm to 7 am) to account for higher annoyance usually associated with nighttime noise events. In California, a 5-decibel penalty is also included for evening noise events (7 pm to 10 pm).

High-Energy Impulsive Noise (abrupt, short-duration noise such as from explosions and artillery)

The noise simulation program used to assess large-caliber (20-millimeter and greater) weapons is BNOISE2. It models the noise from the muzzle blast, the explosive detonation at impact, and the bow shock caused by the round going down range. The effects of terrain on sound travel (propagation) are also included. The BNOISE2 program requires operational data concerning type of weapons fired from each range or firing point, including demolitions, the number and type of rounds fired from each weapon, the location of targets for each range or firing point, the amount of propellant used to reach the target and time of day.

Aircraft Noise

Noise contours for aircraft activity at an airfield are generated using the NOISEMAP computer program. The required inputs to the program are the location of the flight tracks, aircraft altitudes, the number of each type of aircraft using each flight track and time of day.

Rotary-wing noise, including helicopters and tilt-rotors, is modeled using the Rotorcraft Noise Model (RNM) originally developed by NASA. RNM includes sound hemispheres around the aircraft based on various performance parameters and propagates noise in the rotor plane. Thus, rotary wing noise can be described fore and aft of the aircraft as well as in front of and behind the advancing blade.

The noise zones for the helicopter Nap of the Earth (NOE) routes and low-altitude flight tracks are generated using the HELOSLICE computer program. HELOSLICE is a simplified version of the NOISEMAP computer program, developed to predict the noise from operations at remote landing areas, flight tracks, and NOE routes. The required inputs to this model include the number and type of helicopter using each area or route and the altitude of the helicopter at the point of interest.

ROUTEMAP is a model that calculates the noise levels on the ground along a military training route (MTR). The inputs to the model are the altitude, power setting, speed and number of operations by aircraft type for a one-month period.

Small Arms Noise

The Small Arms Range Noise Assessment Model (SARNAM) computer program is used to generate the noise contours for small arms (up to 50-caliber) ranges weapon systems. It includes an extensive selection of weapons in the source library and can incorporate information from multiple ranges of various types.

Predicting Noise and Annoyance from Infrequent Events

Average daily noise levels can sometimes understate the severity of an infrequent, single-noise event because annoying noise peaks can be "averaged out." So it is helpful to be able to measure specific noise levels from single events, such as artillery firings or explosive detonations. This information can be useful when predicting annoyance and potential complaints. The BNOISE2 and SARNAM computer models include the capability to predict the single-event levels. The following models are also used to predict single-event levels.

High-Energy Impulsive Noise

The single-event noise levels from impulsive activities are predicted using the SHOT computer model. The effect of topography features between the noise source and the receiver is included in the model. The inputs to this model are the explosive weight or weapon and propellant charge size, distance between the source and the receiver, burial depth or elevation height if applicable, and location and height of a barrier, berm or hill, if one exists, between the source and receiver.

PEAKEST is a computer model used to predict the peak levels from the demolition of standard engineering and named explosives. It is used when the noise levels from an explosive detonation are required for planning and siting of these activities and for National Environmental Policy Act (NEPA) documentation.

Other Aircraft Noise

MR_NMAP is a computer model used to calculate the subsonic noise impact from aircraft operations in a military operations area (MOA) and in special use airspaces. The model includes an operations input program that describes the aircraft flight operation in existing or new airspace.

PCBOOM3 is a program that computes single-event sonic boom footprints from any supersonic vehicle maneuver. The use specifies the aircraft, the maneuver, and the atmosphere. The primary output is the sonic boom footprint in terms of equal over pressure on the ground, relative to the aircraft's position.

For more information about the Army's noise management program contact:

Operational Noise Program
U.S. Army Center for Health Promotion and Preventive Medicine
MCHB-TS- EON
Aberdeen Proving Ground, MD 21010-5403
410-436-3829
http://chppm-www.apgea.army.mil/dehe/morenoise/

For more information on the Navy's Noise Management Program contact:

Special Assistant for AICUZ and Encroachment
Commander Navy Installations
Naval Facilities Engineering Command
Washington Navy Yard, Washington DC 20374
202-685-9181

For more information on the Air Force's Noise Management Program contact:

AICUZ/Noise Program Manager
Bases and Units Branch
HQ USAF/ILEPB
1260 Air Force Pentagon
Washington, D.C. 20330.
703-604-5277

For more information on the Marine Corp's Noise Management Program contact:

Community and Land Use Planner for AICUZ
Headquarter Marine Corps
Washington DC, 20380-1775
703-695-8240, ext 3350

This fact sheet is part of *Tri-Services Community and Environmental Noise Primer*. This guide, along with its companion CD, can help you educate and engage stakeholders on and off your installation, and generate support for noise management activities.

Insert local contact information here

NOISE ZONES DESCRIPTIONS AND LAND USE GUIDELINES

1. Day Night Level Descriptions.

(a) The Noise Zone III consists of the area around the source of the noise in which the level is greater than 70 decibels (dB), C-weighted day-night sound level (CDNL) for large caliber weapons, greater than 104 PK15(met) for small arms and greater than 75 dB, A-weighted day-night sound level (ADNL) for aircraft activity. The noise level within Noise Zone III is considered so severe that noise-sensitive land uses should not be considered therein.

(b) The Noise Zone II consists of an area where the day-night sound level is between 62 and 70 dB CDNL for large caliber weapons; 87 and 104 PK15(met) for small arms; and 65 and 75 dB ADNL for aircraft activity. Exposure to noise within this area is considered significant, and use of land within Noise Zone II should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II areas must be used for residential purposes, then noise level reduction features of 25 to 30 decibels should be incorporated into the design and construction of the buildings.

(c) The Noise Zone I include all areas around a noise source in which the day-night sound level is less than 62 dB CDNL for large caliber weapons, less than 87 PK15(met) for small arms and 65 dB ADNL for aircraft activity. This area is usually acceptable for all types of land use activities.

(d) The Land Use Planning Zone (LUPZ) DNL noise contours, 57 dB CDNL and 60 dB ADNL, represent an annual average that separates the Noise Zone II from the Noise Zone I. Taking all operations that occur over the year and dividing by the number of training days generates the contours. But, the noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states "Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider." For residential land uses, depending on attitudes and other factors, a 57 CDNL or 60 ADNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is being included on the noise contour maps.

(e) See Table 1 for land use guidelines.

Table 1. Land Use Planning Guidelines.

Noise Zones	Large-Caliber Weapons (CDNL)	Aircraft Activity (ADNL)	Small Arms PK15(met)
LUPZ	57 – 62	60-65	NA
I	< 62	<65	<87
II	62 - 70	65-75	87-104
III	> 70	>75	>104

Note:
LUPZ = Land Use Planning Zone
< = less than
> = greater than

2. PK15(met) Noise Contour Description.

(a) Community annoyance due to many types of transportation and industrial noise is typically and appropriately assessed based on average noise level over a protracted time period. The DNL is the primary descriptor used for this purpose in the United States. The DNL is the time weighted energy average sound level with a 10-dB penalty added to the nighttime levels (2200 to 0700 hours). The use of average noise level over a protracted time period generally does not adequately assess community noise impact and complaint potential due to relatively infrequent blast noise events or weapon firing. For example, for a small arms range at which hundreds of rounds are fired each year, resultant peak levels (PK) can easily exceed 104 dB in regions that annual DNL values indicate to be adequately quiet for housing.

(b) To account for statistical variation in received weapons noise level due to weather, it is recommended that the PK15(met) noise level be calculated. The peak contours show the expected level that one would get on a sound level meter when a weapon was fired. Since weather conditions can cause noise levels to vary significantly from day to day (even from hour to hour) the programs calculate a range of peak levels. This range is based on weather conditions that favor or hinder sound propagation. By plotting the PK15(met) contour, events would be expected to fall within the contours 85% of the time. This gives the installation and the community a more realistic means to consider the areas impacted by training noise without putting stipulations on land that would only receive high sound levels under infrequent weather conditions that favor sound propagation. This metric represents the best available scientific quantification for assessing the complaint risk of large and small caliber weapons ranges. The complaint risk areas for PK15(met) noise contours are defined as follows:

(1) The high risk of complaint area consists of the area around the source of the noise in which PK15(met) noise contour is greater than 130 dB for large caliber weapons.

(2) The moderate risk of complaint area consists of an area where the PK15(met) noise contour is between 115 dB and 130 dB for large caliber weapons.

(3) The low risk of complaint area includes all areas around a noise source in which the PK15(met) noise contour is less than 115 dB for large caliber weapons.

(c) See Table 2 for complaint risk guidelines.

Table 2. Complaint Risk Guidelines.

Risk of Complaints	**Large Caliber Weapons (20mm and greater)**
	PK15(met) dB Noise Contour
Low	< 115
Moderate	115 - 130
High	> 130

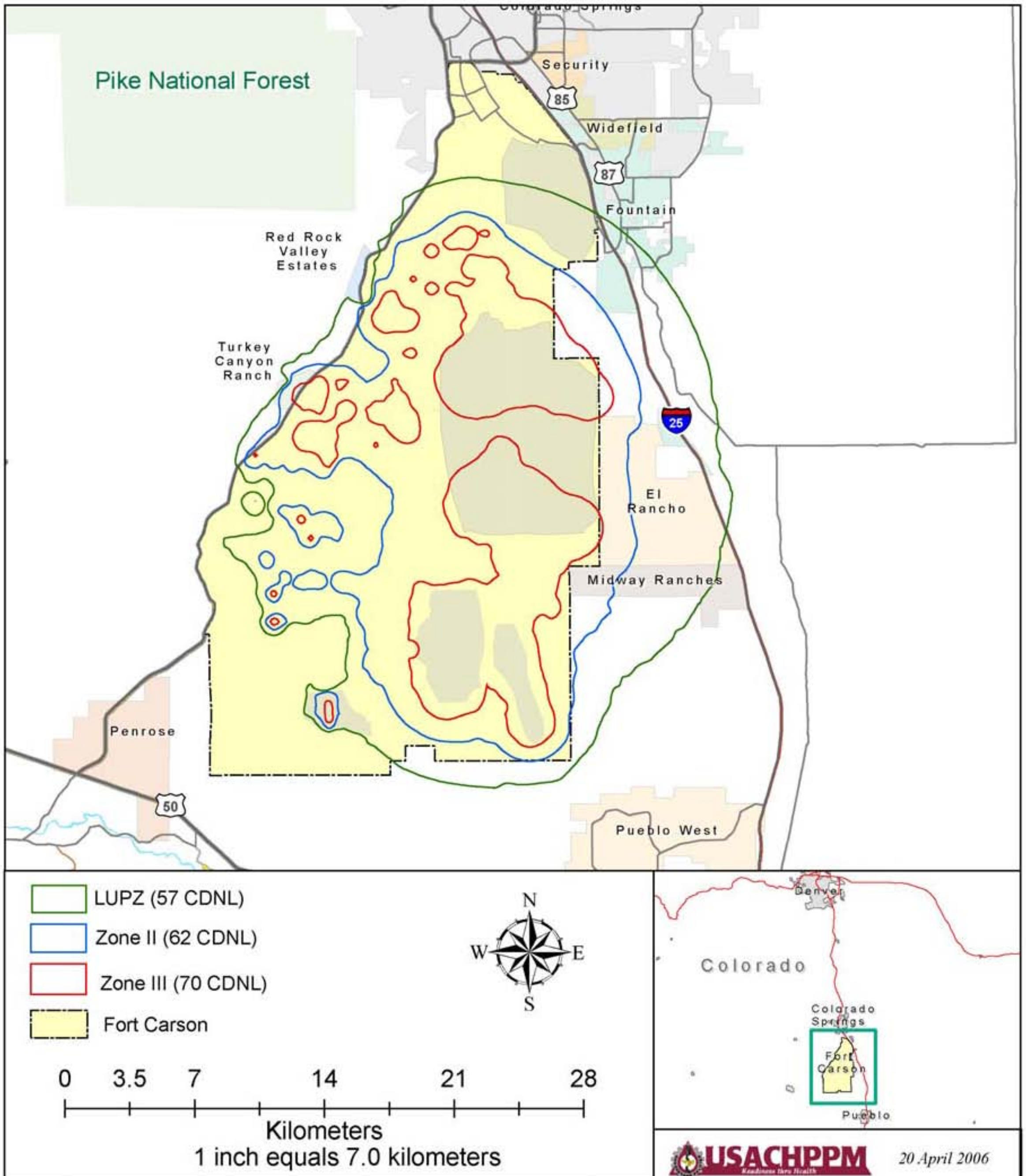

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FIGURE D-2
Fort Carson Existing Large Caliber Operational
Noise Contours

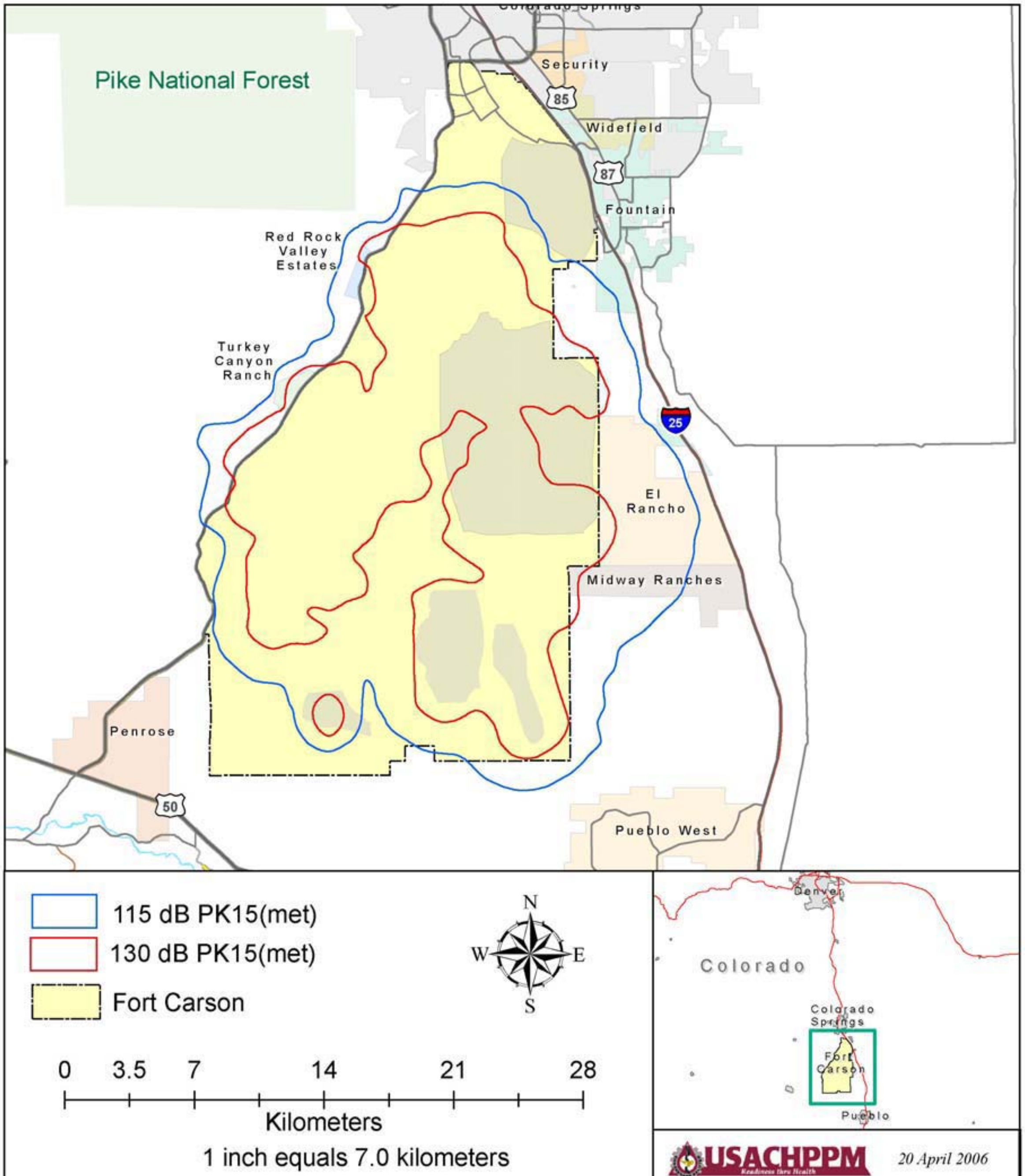

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FIGURE D-3
Fort Carson Large Caliber Operational
PK15(met) Noise Contours

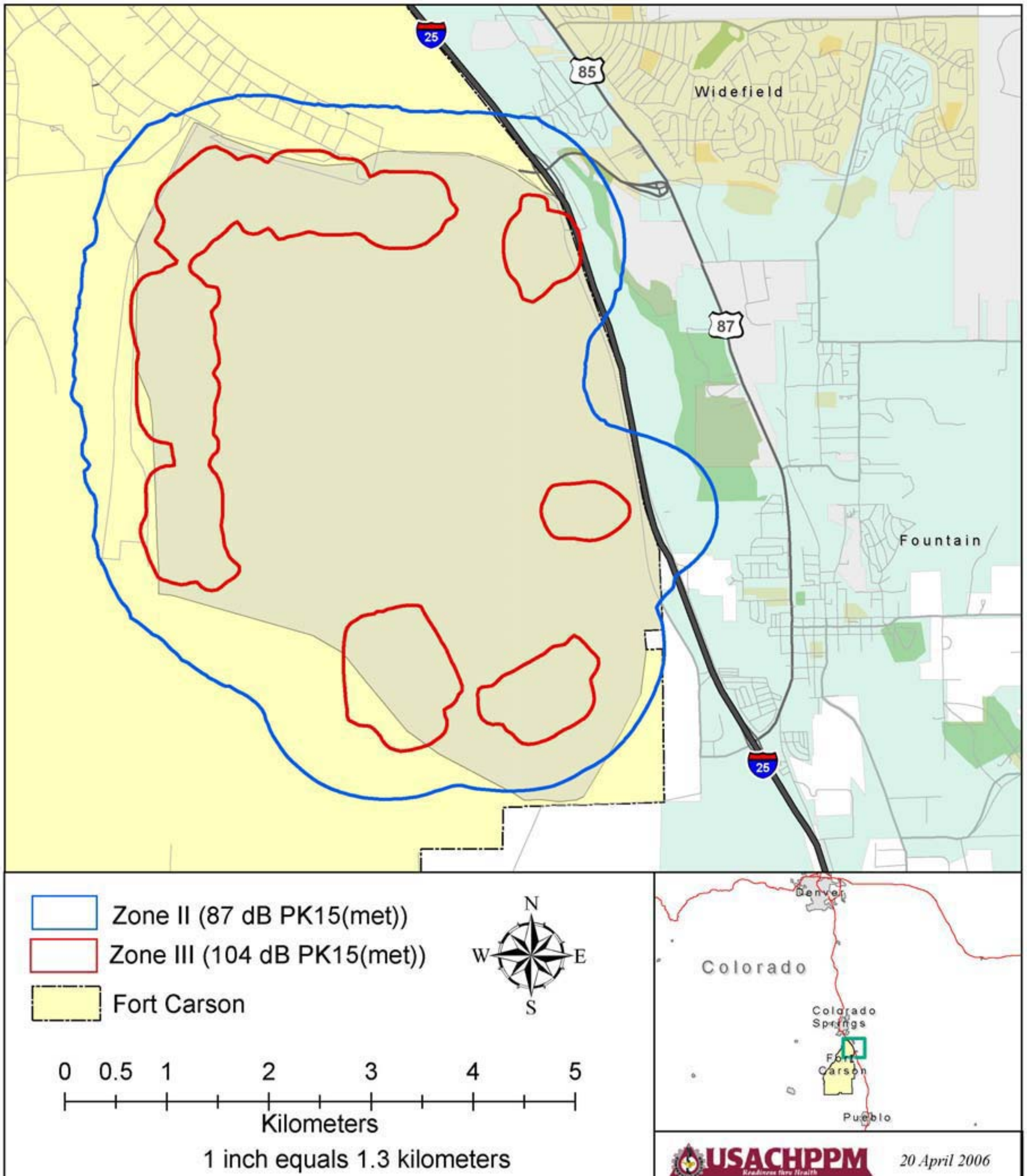

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FIGURE D-4
Fort Carson Small Caliber Operational
Noise Contours

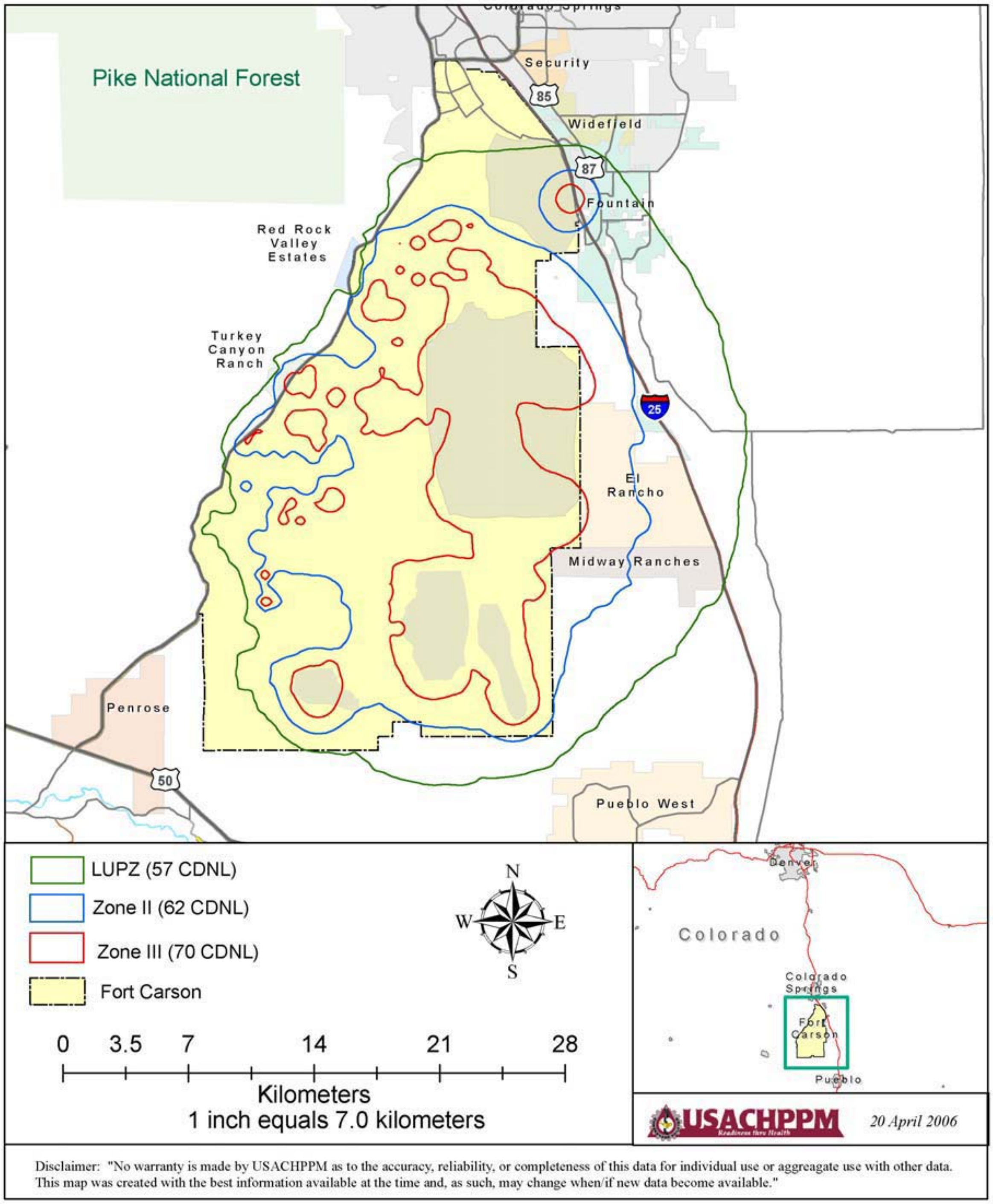

FIGURE D-5
Fort Carson Future Large Caliber Operational
Noise Contours

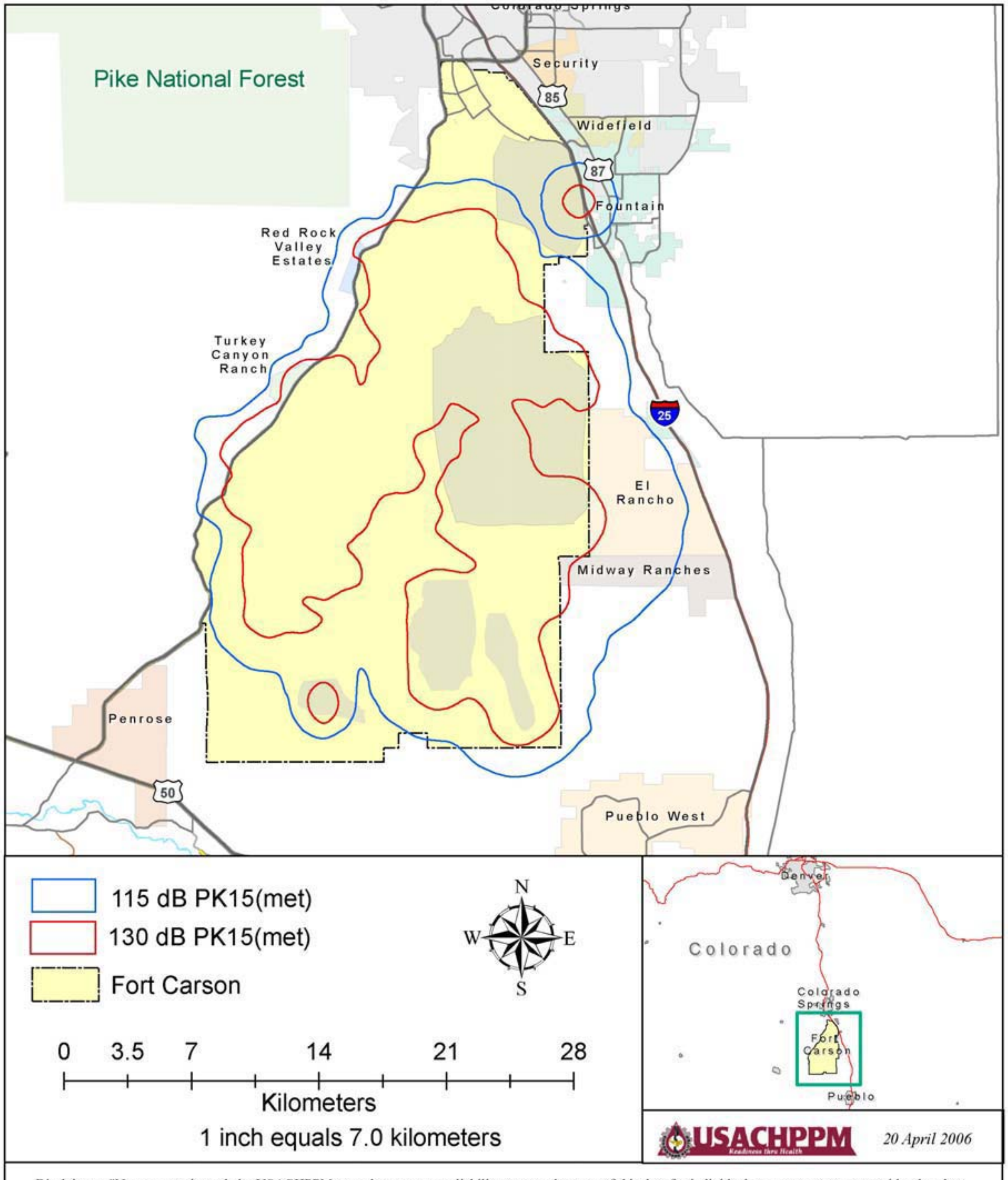

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FIGURE D-6
Fort Carson Future Large Caliber Operational
PK15(met) Noise Contours

Prepared by

U.S. Army Center for
Health Promotion and Preventive Medicine

Under Contract to
Army Environmental Center

for

Piñon Canyon Maneuver Site, Colorado

APPENDIX D

Noise Supporting Documentation

How is noise modeled?

The primary means of assessing military environmental noise is through computer modeling. Computer noise models require various operational data, such as types of operations/weapons and number, location, and time of training. The output from the models is summarized on installation land use maps in the form of noise contours. This fact sheet presents information about the various computer models used to generate noise contour maps. *Note: Noise contours are not generated from actual noise measurements because the process would be too labor- and equipment-intensive, requiring months of monitoring at hundreds of measurement sites.*

Calculating Average Noise Levels

Department of Defense bases/installations use computer modeling programs to determine the average daily noise for aircraft operations generated over the period of one year. Generally, moments of quiet are averaged together with moments where loud noises can be heard. The models also add a 10-decibel penalty to nighttime noise (10 pm to 7 am) to account for higher annoyance usually associated with nighttime noise events. In California, a 5-decibel penalty is also included for evening noise events (7 pm to 10 pm).

High-Energy Impulsive Noise (abrupt, short-duration noise such as from explosions and artillery)

The noise simulation program used to assess large-caliber (20-millimeter and greater) weapons is BNOISE2. It models the noise from the muzzle blast, the explosive detonation at impact, and the bow shock caused by the round going down range. The effects of terrain on sound travel (propagation) are also included. The BNOISE2 program requires operational data concerning type of weapons fired from each range or firing point, including demolitions, the number and type of rounds fired from each weapon, the location of targets for each range or firing point, the amount of propellant used to reach the target and time of day.

Aircraft Noise

Noise contours for aircraft activity at an airfield are generated using the NOISEMAP computer program. The required inputs to the program are the location of the flight tracks, aircraft altitudes, the number of each type of aircraft using each flight track and time of day.

Rotary-wing noise, including helicopters and tilt-rotors, is modeled using the Rotorcraft Noise Model (RNM) originally developed by NASA. RNM includes sound hemispheres around the aircraft based on various performance parameters and propagates noise in the rotor plane. Thus, rotary wing noise can be described fore and aft of the aircraft as well as in front of and behind the advancing blade.

The noise zones for the helicopter Nap of the Earth (NOE) routes and low-altitude flight tracks are generated using the HELOSLICE computer program. HELOSLICE is a simplified version of the NOISEMAP computer program, developed to predict the noise from operations at remote landing areas, flight tracks, and NOE routes. The required inputs to this model include the number and type of helicopter using each area or route and the altitude of the helicopter at the point of interest.

Fort Carson

ROUTEMAP is a model that calculates the noise levels on the ground along a military training route (MTR). The inputs to the model are the altitude, power setting, speed and number of operations by aircraft type for a one-month period.

Small Arms Noise

The Small Arms Range Noise Assessment Model (SARNAM) computer program is used to generate the noise contours for small arms (up to 50-caliber) ranges weapon systems. It includes an extensive selection of weapons in the source library and can incorporate information from multiple ranges of various types.

Predicting Noise and Annoyance from Infrequent Events

Average daily noise levels can sometimes understate the severity of an infrequent, single-noise event because annoying noise peaks can be "averaged out." So it is helpful to be able to measure specific noise levels from single events, such as artillery firings or explosive detonations. This information can be useful when predicting annoyance and potential complaints. The BNOISE2 and SARNAM computer models include the capability to predict the single-event levels. The following models are also used to predict single-event levels.

High-Energy Impulsive Noise

The single-event noise levels from impulsive activities are predicted using the SHOT computer model. The effect of topography features between the noise source and the receiver is included in the model. The inputs to this model are the explosive weight or weapon and propellant charge size, distance between the source and the receiver, burial depth or elevation height if applicable, and location and height of a barrier, berm or hill, if one exists, between the source and receiver.

PEAKEST is a computer model used to predict the peak levels from the demolition of standard engineering and named explosives. It is used when the noise levels from an explosive detonation are required for planning and siting of these activities and for National Environmental Policy Act (NEPA) documentation.

Other Aircraft Noise

MR_NMAP is a computer model used to calculate the subsonic noise impact from aircraft operations in a military operations area (MOA) and in special use airspaces. The model includes an operations input program that describes the aircraft flight operation in existing or new airspace.

PCBOOM3 is a program that computes single-event sonic boom footprints from any supersonic vehicle maneuver. The use specifies the aircraft, the maneuver, and the atmosphere. The primary output is the sonic boom footprint in terms of equal over pressure on the ground, relative to the aircraft's position.

For more information about the Army's noise management program contact:

Operational Noise Program
U.S. Army Center for Health Promotion and Preventive Medicine
MCHB-TS- EON
Aberdeen Proving Ground, MD 21010-5403
410-436-3829
http://chppm-www.apgea.army.mil/dehe/morenoise/

For more information on the Navy's Noise Management Program contact:

Special Assistant for AICUZ and Encroachment
Commander Navy Installations
Naval Facilities Engineering Command
Washington Navy Yard, Washington DC 20374
202-685-9181

For more information on the Air Force's Noise Management Program contact:

AICUZ/Noise Program Manager
Bases and Units Branch
HQ USAF/ILEPB
1260 Air Force Pentagon
Washington, D.C. 20330.
703-604-5277

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Table 2. Complaint Risk Guidelines.

Risk of Complaints	**Large Caliber Weapons (20mm and greater)**
	PK15(met) dB Noise Contour
Low	< 115
Moderate	115 - 130
High	> 130

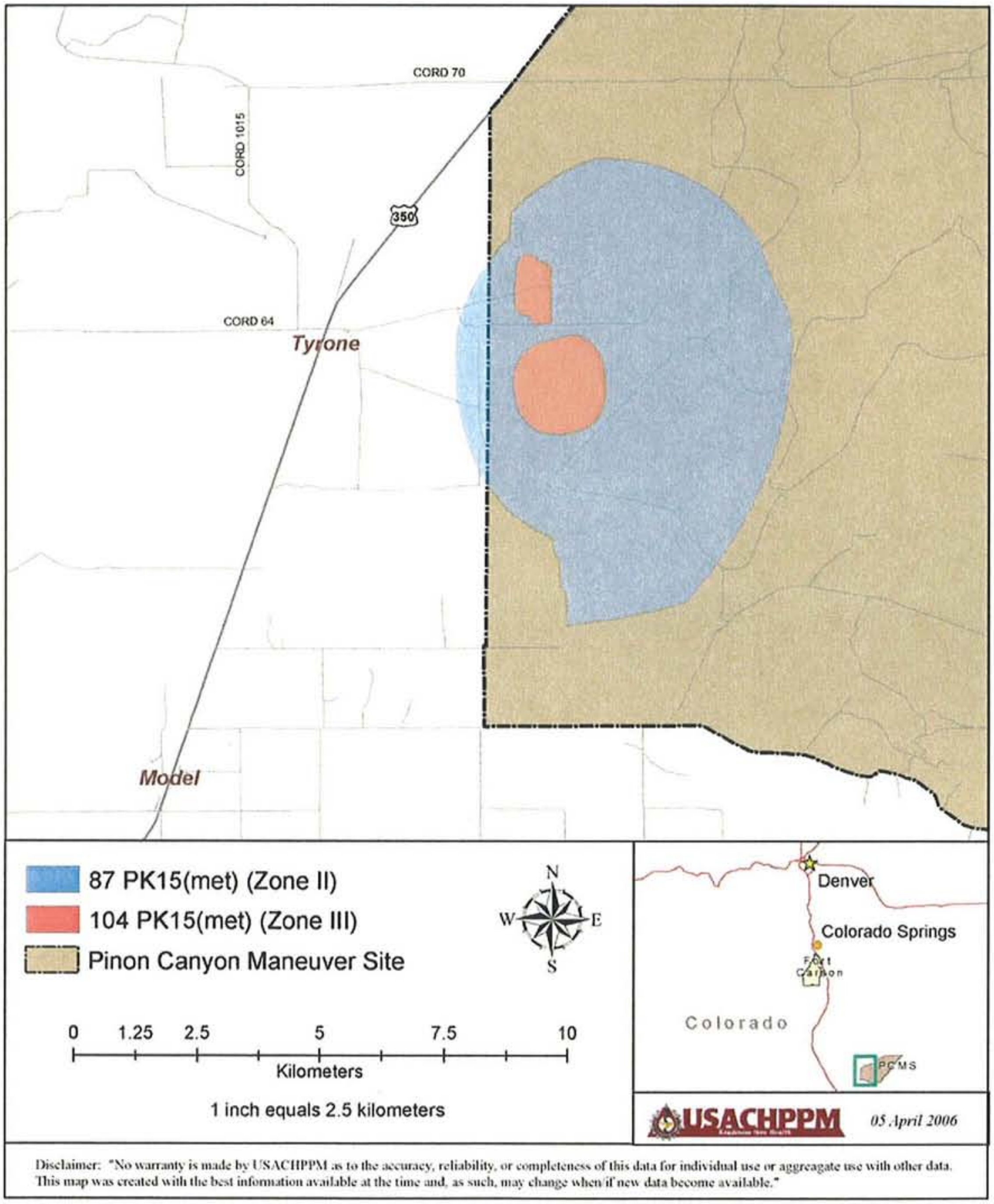

FIGURE D-1
PCMS Small-caliber Noise Contours

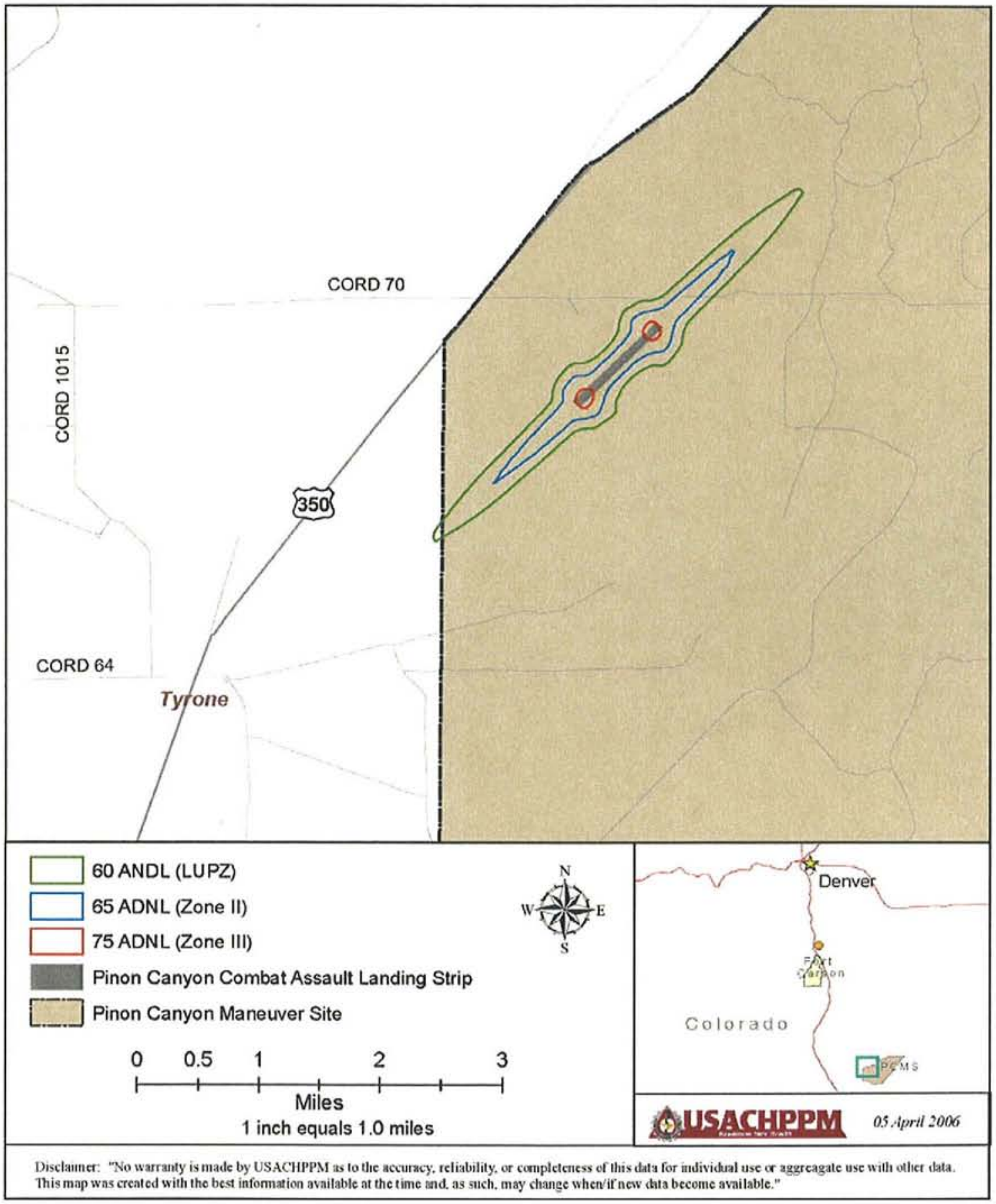

FIGURE D-2
PCMS Combat Assault Landing Strip
Existing Operations (C-130)

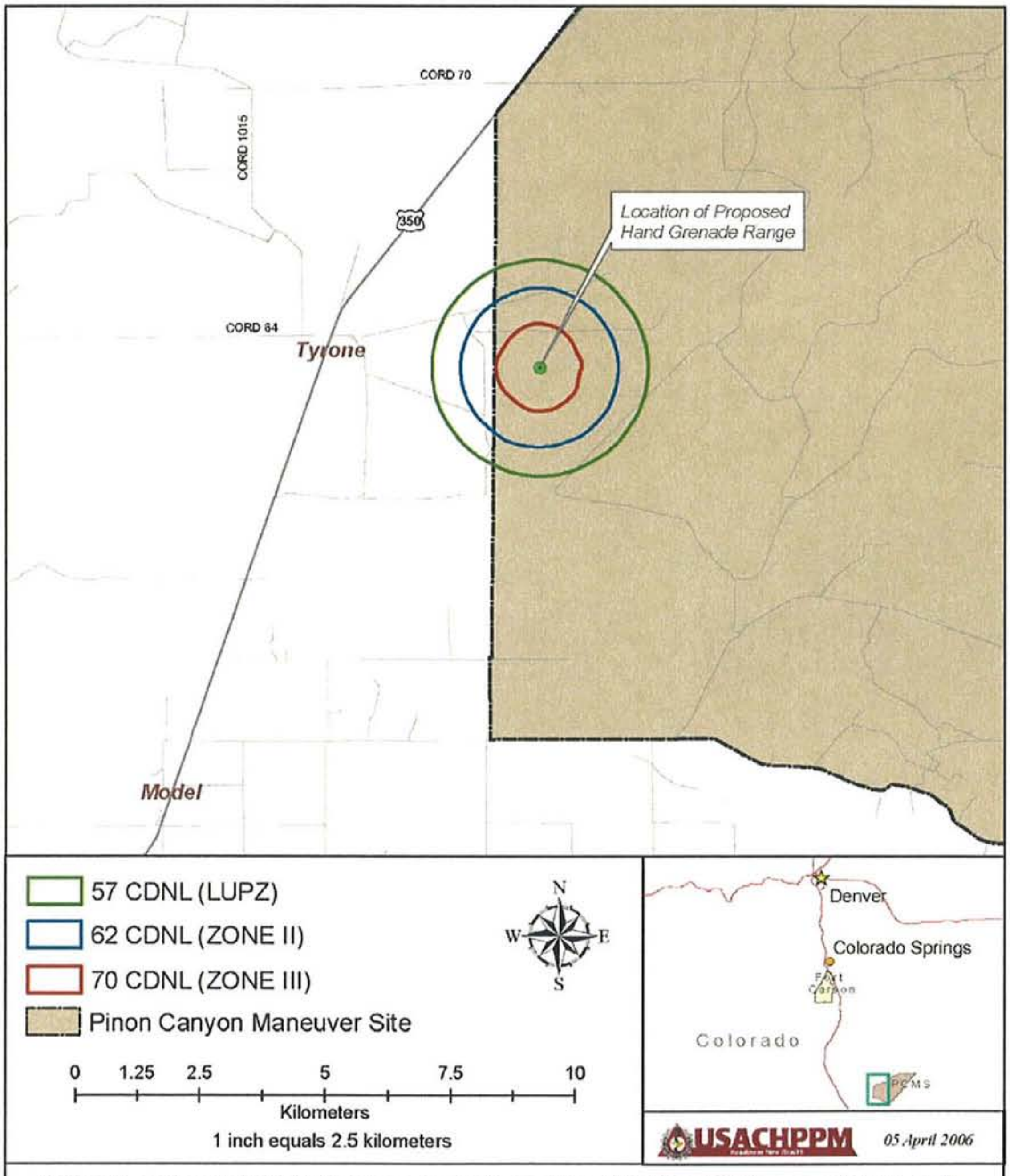

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FIGURE D-3
PCMS Proposed Hand-grenade Range
Large-caliber Noise Contours

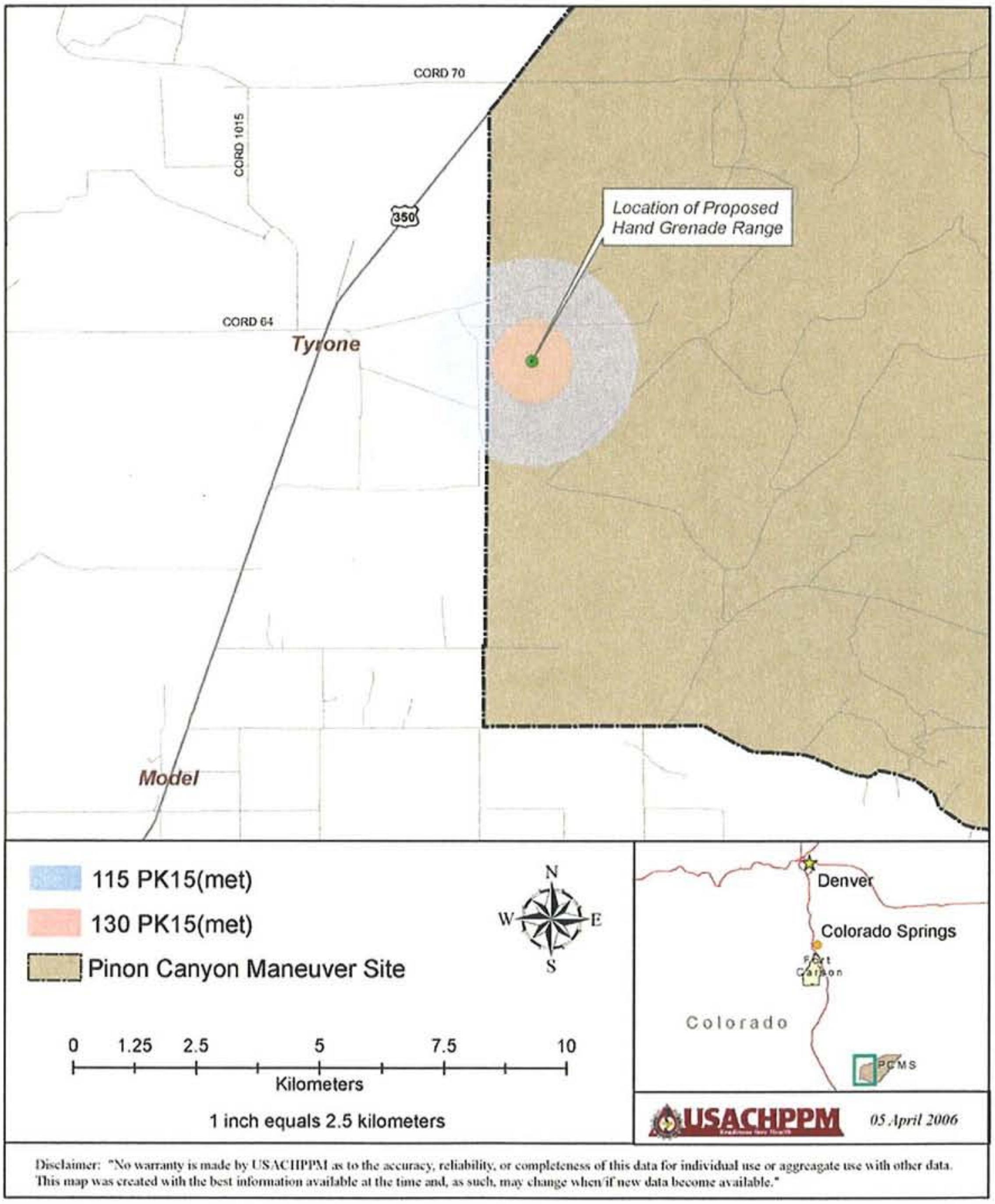

FIGURE D-4
PCMS Proposed Hand-grenade Range
Large-caliber PK 15 (met) Noise Contours

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DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-EON 16 OCT 2008

MEMORANDUM FOR

Environmental Planning Support Branch (SFIM-AEC-TSP/Ms. Alicia Booher), U.S. Army Environmental Command, 5179 Hoadley Road, Aberdeen Proving Ground, MD 21010-5401
Office of the Director (AFZC-ECM/Mr. Tom Warren), Directorate of Environmental Compliance and Management, 1638 Elwell Street, Fort Carson, CO 80913-4356

SUBJECT: Addendum to Operational Noise Consultation 52-ON-046N-06, Operational Noise Contours for Fort Carson, CO, April 2006

1. REFERENCES. Enclosure 1 contains the references utilized in this consultation.

2. AUTHORITY. The Army Environmental Command, Aberdeen Proving Ground, MD requested and funded this study.

3. PURPOSE. To provide the U.S. Army Environmental Command and Fort Carson additional documentation for the potential stationing of a Combat Aviation Brigade (CAB) at Fort Carson under the Grow the Army plan.

4. GENERAL.

a. This consultation should be used in conjunction with the January 2006 Fort Carson Installation Environmental Noise Management Plan (U.S. Army 2006a) and the April 2006 Operational Noise Consultation (U.S. Army 2006b).

b. A CAB includes AH-64, CH-47, OH-58, and UH-60 aircraft. The existing aircraft activity at Fort Carson and Piñon Canyon Maneuver Site (PCMS) include the AH-64, CH-47, and UH-60.

5. AIRFIELD ACTIVITY. The addition of a CAB to the exiting Butts Army Airfield (AAF) activity would be acoustically insignificant to the noise contours. Last calendar year, Butts AAF had 19,515 daytime and 9,210 nighttime flights. The estimated yearly CAB activity would be 3,600 daytime and 1,000 nighttime flights.

6. FLIGHT CORRIDORS.

a. Helicopters routinely fly from Fort Carson to PCMS. The area between Fort Carson and PCMS does not have established air corridors. The only restriction is that aircraft must maintain a minimum altitude of 700 feet AGL unless they are operating in a designated low-level or Nap-of-the Earth (NOE) training route.

b. Since the helicopter activity is dispersed over a vast region, the low number of aircraft operations utilizing the airspace will not generate A-weighted day-night average level (ADNL) noise contours of 65 dBA or greater. Yet, there is always the potential for individual aircraft overflights to generate complaints or annoy people when operating nearby.

c. Scandinavian Studies (Rylander 1974 and Rylander 1988) have found that a good predictor of annoyance at airfields with 50 to 200 operations per day is the maximum level of the 3 loudest events. The maximum noise levels for the aircraft utilized in the vicinity of Fort Carson and PCMS are listed in Table 1. These maximum levels are compared with the levels listed in Table 2 to determine the percent of the population that would consider itself highly annoyed. While levels may be lower in the flight corridors with fewer than 50 operations per day, it is a tool in providing some indication of the percent of people who might be annoyed by individual overflights.

TABLE 1. MAXIMUM NOISE LEVELS OF ROTARY WING AIRCRAFT.

Slant Distance (Feet)	Maximum Level, dBA			
	AH-64	CH-47D	OH-58	UH-60
50	102	102	99	100
100	98	98	93	94
200	92	92	87	88
500	83	84	79	80
700	80	81	76	77
1,500	73	74	70	69
2,000	70	71	65	66

TABLE 2. PERCENTAGE OF POPULATION HIGHLY ANNOYED FROM AIRCRAFT NOISE (Rylander 1974).

Maximum, dBA	Percentage Highly Annoyed
70	5
75	13
80	20
85	28
90	35

d. There is one low-level flight training route, Route Hawk, between Fort Carson and PCMS that is used for NOE training. While utilizing Route Hawk, aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.43 statute miles). Fort Carson may lower the typical altitude flown in Route Hawk from 100 feet above ground level (AGL) to 50 feet AGL. A detailed description of Route Hawk is contained in Enclosure 2.

e. The maximum levels in Table 1 are compared with the levels listed in Table 2 to determine the percent of the population that would consider itself highly annoyed. Based upon these levels, if aircraft in Route Hawk maintain a ½ nautical mile slant distance from buildings, people, livestock, and moving vehicles, the annoyance risk should remain low even if the allowed minimum flight altitude is lowered from 100 to 50 feet AGL within the route.

f. Helicopters flying from Fort Carson to PCMS, outside of Route Hawk, should maintain a slant distance 1,760 feet (0.3 statue miles) from buildings, people, livestock, and moving vehicles to reduce the potential for annoyance.

7. CONCLUSIONS.

a. LAND USE COMPATIBILITY. The addition of a CAB at Fort Carson would not create any additional Zone II noise contours at Butts AAF.

b. ANNOYANCE POTENTIAL. There is a potential that individual overflights of aircraft utilizing the airspace at Fort Carson and PCMS may cause annoyance to those living nearby. However, the low number of operations, minimum flight altitudes, and stand off distances imposed for NOE operations greatly minimize this potential.

8. RECOMMENDATIONS.

a. Include the information from this consultation in the appropriate National Environmental Policy Act documentation.

b. Although no Federal Law prohibits the Department of Defense training and testing activities from making noise, the Services have always tried to be good neighbors. Though there are currently few residences exposed to high noise levels, Fort Carson should continue to monitor both the noise environment and any proposed land use changes surrounding the installations.

9. Please contact us if this consultation or any of our services did not meet your needs or expectations.

10. The point of contact is Ms. Kristy Broska or Ms. Catherine Stewart, Operational Noise Program, USACHPPM, at DSN 584-3829, commercial (410) 436-3829, or e-mail: kristy.broska@us.army.mil or catherine.stewart@us.army.mil.

FOR THE COMMANDER:

2 Encls
as

DONALD F. ARCHIBALD
COL, MS
Director, Environmental Health Engineering

REFERENCES

1. U.S. Air Force, 2005, SELCalc2 Noise Model, Wright-Patterson Air Force Base, OH.

2. U.S. Army, 2006a, U.S. Army Center for Health Promotion and Preventive Medicine, Fort Carson Installation Environmental Noise Management Plan, January 2006.

3. U.S. Army, 2006b, U.S. Army Center for Health Promotion and Preventive Medicine, Operational Noise Consultation 52-ON-046N-06, Operational Noise Contours for Fort Carson, CO, April 2006.

4. Rylander, et.al., 1974, "Re-Analysis of Aircraft Noise Annoyance Data Against the dBA Peak Concept," Journal of Sound and Vibration, Volume 36, pages 399 - 406.

5. Rylander and Bjorkman, 1988, "Maximum Noise Levels as Indicators of Biological Effects," Journal of Sound and Vibration, Volume 127, pages 555 - 563.

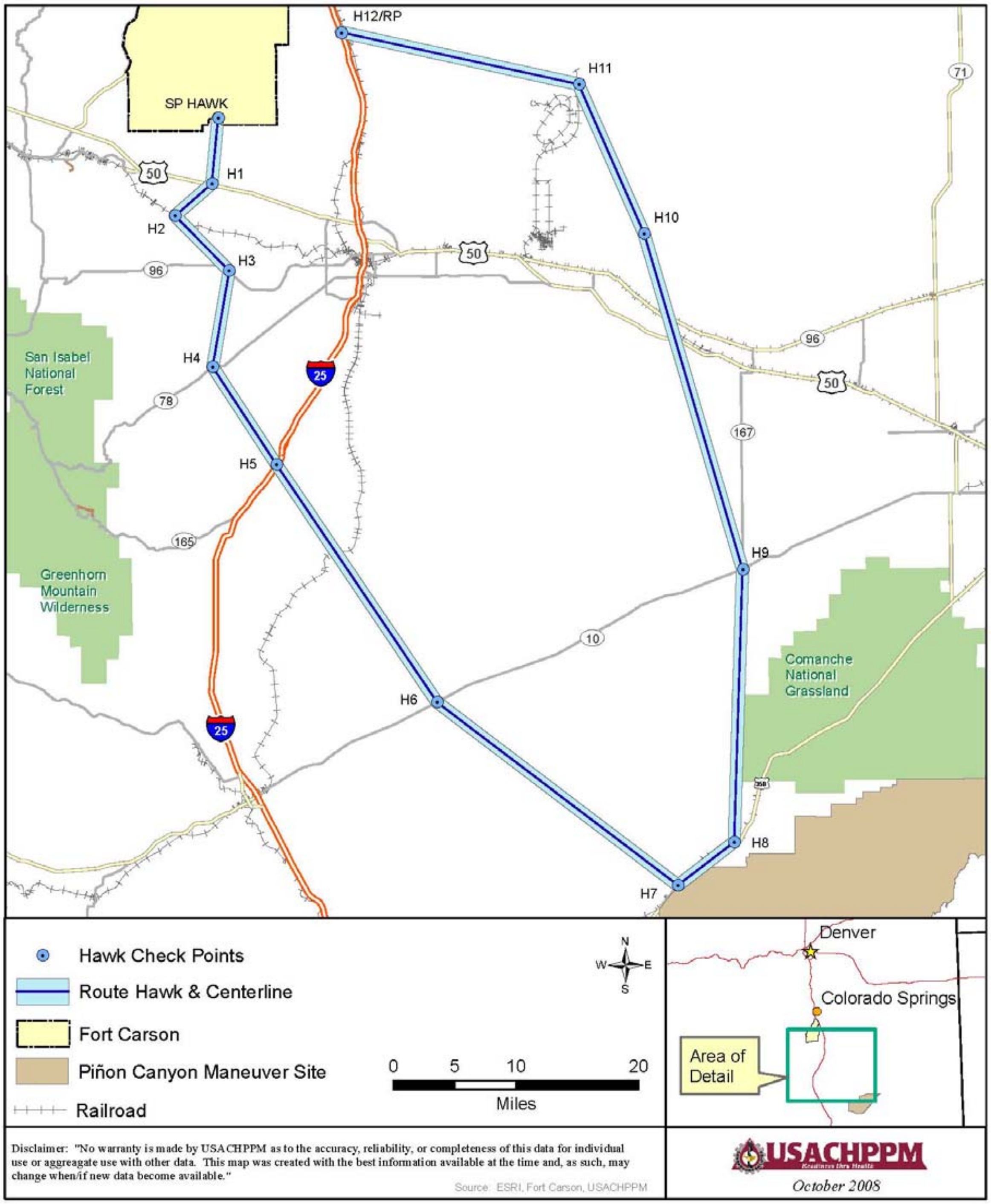
ROUTE HAWK OPERATIONAL DETAILS

1. Route Hawk is established for the purpose of conducting both day and night low-level tactical navigation operations. Route Hawk is 1 mile wide; ½ mile either side of centerline with a floor of 100 feet AGL and a ceiling of 300 feet AGL. For noise abatement, aircraft avoid all houses, buildings, people, livestock, and moving vehicles by a minimum slant range of ½ nautical miles (0.43 statute miles).

2. The figure depicts Route Hawk and is defined by the following check points:

a. SP Hawk, River Bridge vicinity EC 15365388
b. H-1, Highway Bridge vicinity EC 14544527
c. H-2, Railroad Bridge vicinity EC 09734105
d. H-3, Highway Bridge vicinity EC 16833383
e. H-4, Highway Bridge vicinity EC 14672121
f. H-5, I-25 Bridge vicinity EC 23040836
g. H-6, Highway T-Intersection vicinity EB 44167713
h. H-7, Railroad Bridge vicinity EB 75765310
i. H-8, Railroad Bridge vicinity EB 83205877
j. H-9, Highway T-Intersection vicinity EB 84299465
k. H-10, Road Triangle vicinity EC 71343870
l. H-11, Building on Railroad vicinity EC 62745833
m. H-12/RP, Railroad Bridge vicinity EC 31626513

FIGURE. ROUTE HAWK.



APPENDIX E

STORMWATER SIMULATIONS

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STORMWATER SIMULATIONS

GROW THE ARMY
ENVIRONMENTAL IMPACT STATEMENT
FORT CARSON AND PINON CANYON MANEUVER SITE

Prepared by:

Earth Tech AECOM
5575 DTC Parkway
Englewood, Colorado 80111

NEPA-level assessment intended to evaluate environmental impacts.

November 2008

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LIST OF ABBREVIATIONS AND ACRONYMS

BMP	best management practice
CAB	Combat Activation Brigade
cfs	cubic feet per second
CUHP	Colorado Urban Hydrograph Procedure
DEM	digital elevation map
DOT	Department of Transportation
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
Fort Carson	Fort Carson Military Reservation
GTA	Grow the Army
IBCT	Infantry Brigade Combat Team
NEPA	National Environmental Policy Act
NRCS	National Resource Conservation Service
ORTC	Operational Readiness Training Complex
PCMS	Pinon Canyon Maneuver Site
SCS	Soil Conservation Service
SWMM	Storm Water Management Model
TAB	Training Area Bravo
USGS	US Geological Survey
WARSSS	Watershed Assessment of River Stability and Sediment Supply

EXECUTIVE SUMMARY

FORT CARSON

As part of the Grow the Army (GTA) Environmental Impact Statement (EIS) at Fort Carson, Colorado, the B Ditch, Clover Ditch, and Rock Creek watersheds and a small portion of the Central Unnamed Ditch watershed were hydrologically modeled for a National Environmental Policy Act (NEPA)-level assessment. Modeling was conducted to evaluate the potential impacts from stormwater discharges within watersheds predicted to be affected by siting of construction for the Infantry Brigade Combat Team (IBCT) and the Combat Aviation Brigade (CAB). Seven different scenarios were analyzed including three alternative construction sites: Training Area Bravo (TAB), within the B Ditch and Clover Ditch watersheds; Tent City, located within the Rock Creek watershed; and Operational Readiness Training Complex (ORTC), located within the Rock Creek and Central Unnamed Ditch watersheds. Each scenario evaluated the impact that the proposed sites would have on the stormwater runoff in their respective watersheds for a 100-year rainfall event.

Precipitation intensities were derived from the *Precipitation-Frequency Atlas of the Western United States, Volume III – Colorado* (Miller et al. 1973) and were temporally distributed using the recommended methods of the *Urban Storm Drainage Criteria Manua* (Urban Drainage and Flood Control District 2001). Soil data for the watersheds were derived from the Natural Resource Conservation Service Web Soil Survey. Watershed boundaries were defined by topography, existing ditch systems, and roadway systems. The Manning's "n" roughness coefficient was determined from drainage inventories, site photos, and background knowledge of adjacent watersheds.

Channel cross sections were utilized for the analysis of hydraulic routing and floodplain analysis. Cross sections for the channels in B Ditch, Clover Ditch, and Central Unnamed Ditch were defined from survey data. Cross sections for channels in Rock Creek were defined in the XPSWMM program using a function that bases the cross sectional channel layout on the digital elevation map (DEM). This is appropriate because this area is still in a natural channel configuration. Modeling parameters, such as soil types, channel slopes, watershed boundaries, etc., remained constant for individual watersheds throughout the varying scenarios. The proposed layouts of the IBCT and CAB construction sites were used as a basis for determining the impermeable areas. The same impermeable area was applied to each scenario to determine the potential effects of the proposed build-out at the various sites at Fort Carson.

Stormwater modeling was conducted with the Federal Emergency Management Agency-approved XPSWMM program for one-dimensional analysis, which predicts discharge peaks, volumes, and flow rates. The program uses the Colorado Urban Hydrograph Procedure (CUHP), a regionally specific runoff calculation method, as derived by the Urban Drainage & Flood Control District in Denver, Colorado. The CUHP model is used throughout the Front Range since it takes into an account the rainfall-runoff relationship associated with convective thunderstorms, the storms primarily associated with flooding in the region in an urban or industrialized setting. The percent impervious area for each scenario was determined by modeling specific areas to be disturbed and the associated required facilities in conjunction with base maps of the B Ditch, Clover Ditch, Central Unnamed Ditch and Rock Creek watersheds, which outlined buildings, roads, parking lots, and other manmade features of the current and proposed conditions.

Flooding outside of the channel was also modeled using the XPSWMM software using the two-dimensional module, which uses the TuFlow algorithms. This two-dimensional module uses the peak discharges rates from the one-dimensional model and extrapolates the stormwater surface across the topography that has been defined from the DEM of the site.

The results in the table below show the increase in discharge above the existing 2007 conditions for each of the build-out scenarios as defined in Section 2.2, including proposed actions specific to each scenario in addition to the 2008 Fort Carson Master Plan:

Training Area Bravo		
Scenario	**Description**	**Increase in Peak Discharge above 2007 Scenario**
Scenario 1	100% of IBCT discharging to B Ditch	4%
Scenario 2	100% of IBCT discharging to Clover Ditch	2%
Scenario 3	50% of IBCT discharging to B Ditch and 50% discharging to Clover Ditch	3% B Ditch 2% Clover

Tent City		
Scenario	**Description**	**Increase in Peak Discharge above 2007 Scenario**
Scenario 4	100% of IBCT discharging to Rock Creek	1%
Operational Readiness Training Complex		
Scenario	**Description**	**Increase in Peak Discharge above 2007 Scenario**
Scenario 5	95% IBCT discharging to Rock Creek and 5% discharging to Central Unnamed Ditch	1% Rock Creek < 1% Central Unnamed Ditch
Scenario 6	100% CAB discharging to Rock Creek	1%
Scenario 7	95% IBCT discharging to Rock Creek and 5% discharging to Central Unnamed Ditch and 100% CAB discharging to Rock Creek	2% Rock Creek < 1% Central Unnamed Ditch

A dental facility, mini-mall, and chapel are also proposed as part of the GTA Initiative. Although these facilities are not associated with the above-mentioned scenarios, they are included in the Fort Carson 2008 Master Plan. As such, the cumulative analysis reflected in the various scenarios includes these three facilities. Improvements to Gate 6 (located within the western portion of Rock Creek watershed along State Highway 115) and Gate 19 (located downrange along the eastern portion of the post near Interstate 25) are also proposed under the GTA Initiative. The impacted area associated with these gate improvements is small, approximately 0.05 percent of the greater watersheds, and is not expected to have a substantial effect on stormwater flows. Accordingly, these have been included in modeling under Fort Carson's proposed 2008 Master Plan.

Pinon Canyon Maneuver Site

The Cantonment Area of the Pinon Canyon Maneuver Site (PCMS) was hydrologically modeled for the following conditions: baseline or natural conditions, existing, and the conditions defined in Appendix B of the *PCMS Transformation EIS* (CH2MHILL 2007). The baseline conditions are pre-development. The existing conditions represent PCMS as seen during the fall of 2008. These conditions include approximately 42 acres of impervious area associated with existing buildings and facilities, all of which are located in the Simpson Lake watershed. These buildings and facilities constitute 1 percent impervious area of the overall watershed. The conditions defined in Appendix B of the *PCMS Transformation EIS* increase the total impervious area to 1.5 percent of the overall watershed. This GTA EIS does not propose any construction within PCMS. Analysis is made of the construction described in the *PCMS Transformation EIS* that has not yet been undertaken. The Cantonment Area is located in a closed watershed that drains to Simpson Lake. It would take several 100-year storms in a row to fill this basin before it would spill into the Van Bremer Arroyo watershed. Surface water will either evaporate or infiltrate into the groundwater system and not flow out of this closed watershed. The analyzed conditions described in the *PCMS Transformation EIS* would only increase the elevation in Simpson Lake by 0.024 foot and by 6 acre-feet in storage.

Five other watersheds were modeled for baseline conditions: Timpas Creek, Big Arroyo, Van Bremer Arroyo, Taylor Arroyo, and Big Water Arroyo, which have the following peak discharges.

Watershed	**Modeled 100-Year Storm Event Peak Discharge (cfs)**	**Peak Velocity (ft/sec)**
Timpas Creek	5,630	8
Big Arroyo	15,410	7
Taylor Arroyo	43,900	9
Van Bremer Arroyo	52,300	> 20
Big Water Arroyo	13,850	15

cfs = cubic feet per second
ft/ sec = feet per second

1. INTRODUCTION

1.1 Fort Carson Army Post

As part of the Grow the Army (GTA) Environmental Impact Statement (EIS) for Fort Carson Military Reservation (Fort Carson), Colorado, the B Ditch, Clover Ditch, and Rock Creek watersheds were hydrologically modeled (Figure 1). Modeling was conducted to evaluate the potential impacts from stormwater discharges within watersheds potentially affected by alternative siting locations of the Infantry Brigade Combat Team (IBCT) and the Combat Aviation Brigade (CAB). Due to site conditions upgradient of Fort Carson, actual stream conditions may vary due to flooding in the upper reaches. Accordingly, these model results should not be used for site-specific design related to construction activities, but may be used in evaluating conditions on a watershed scale. This modeling is intended provide the relative environmental impacts of the numerous scenarios and conditions discussed throughout the EIS for assessment purposes. It is reasonable to assume that a higher discharge would be predicted if the entire drainage is modeled in two dimensions, which accounts for flood waters in the upper reaches continuing downstream towards the Post within steep narrow drainageways and not lost to infiltration on a large floodplain.

Seven different scenarios were analyzed to assess the three alternative IBCT construction sites as well as the construction site for the CAB: Training Area Bravo (TAB), located within the B Ditch and Clover Ditch watersheds; Tent City, located within the Rock Creek watershed; and the Operational Readiness Training Complex (ORTC), also located within the Rock Creek watershed with minor areas located in the Central Unnamed Ditch watershed. Each scenario evaluated the impact generated on the proposed site from stormwater runoff in the respective watersheds for a 100-year rainfall event.

The hydrologic model assists in determining flood hazards to personnel and buildings and is a quantitative reference for future required permitting and regulation compliance. Once alternatives have been selected, modeling can also be conducted to predict water quality and how groundwater interactions affect the surface water regime. This information could be available prior to this project being implemented. The modeling for all scenarios is conducted on a watershed scale; thus, the modeling accounts for the cumulative effects from multiple projects within a watershed. This emphasizes the goal of the Fort Carson Stormwater Program: to address the stormwater needs of Fort Carson as an interconnected whole rather than as separate, individual projects. One-dimensional modeling was conducted using XPSWMM (version 10.6.2) from XP Software, a Federal Emergency Management Agency (FEMA)-approved program. XPSWMM is a graphical user interface program that uses an enhanced Environmental Protection Agency (EPA) Storm Water Management Model (SWMM)-developed analytical engine. In addition to runoff and routing capabilities, XPSWMM's two-dimensional module is able to model flows that overtop channel banks and to define the floodplain associated with the 100-year storm event.

Modeling was conducted with the regionally calibrated Colorado Urban Hydrograph Procedure (CUHP) using rainfall derived from the *Precipitation-Frequency Atlas of the Western United States, Volume III – Colorado,* (Miller et al. 1973), which was modified in accordance with the recommendations of the *Urban Storm Drainage Criteria Manual, Volumes 1 & 2 (Manual)* (Urban Drainage and Flood Control District 2001). The parameters used are discussed in detail in Section 2.1, Modeling Parameters.

1.2 Pinon Canyon Maneuver Site

Modeling was also conducted for watersheds surrounding the Pinon Canyon Maneuver Site (PCMS) for the 100-year storm event. PCMS is located in Las Animas County, Colorado, approximately 30 miles northeast of Trinidad and 90 miles southeast of the Fort Carson Cantonment Area, near Colorado Springs. PCMS is bordered by Highway 350 to the northwest, the Las Animas County line to the north, the Purgatoire River to the southeast, and a hogback to the south (Figure 2).

Surface water on PCMS primarily drains to the Purgatoire River, which is located southeast of the site. A portion of PCMS drains to Timpas Creek to the north. Both systems eventually drain to the Arkansas River. The PCMS Cantonment Area is located in a closed basin that drains to Simpson Lake, located northwest of the Cantonment Area and west of US Route 350.

The Simpson Lake watershed was modeled for the 100-year, 24-hour storm event for the baseline (pre-development) conditions, the existing (existing buildings and facilities) conditions, and conditions described in the *PCMS Transformation EIS* (CH2M Hill 2007) to determine the potential volume of water delivered to the lake from these three conditions.

Runoff and routing were modeled using XPSWMM (version 10.6.2). The Soil Conservation Service (SCS) hydrology method was used for modeling at PCMS. The parameters and assumptions are discussed in Section 3.1.

1.3 Watershed Approach

The Fort Carson Stormwater Program is taking the same approach as the EPA's vision to manage water quality, in part stormwater, on a watershed-based level. Fort Carson plans to implement stormwater control measures and insist all projects on the Post follow the same watershed-based stormwater management guidelines.

Fort Carson's watershed management approach is an all-encompassing plan that evaluates individual construction sites on Fort Carson as well as the cumulative effects from all the sites (current and proposed) within the same watershed. This evaluation defines the overall health and stability of the drainages within a given watershed. This analysis assists in determining flood hazards to personnel and buildings on Fort Carson and is a quantitative reference for required permitting and regulation compliance in the management of Fort Carson's surface water resources under the guidance of EPA, Army Regulations 200-1, and Executive Order 11988.

To begin the watershed analysis, Fort Carson assessed each watershed under natural conditions (i.e., prior to the impacts from the Fort Carson installation) using surface water modeling techniques. A specific set of watershed characteristics was developed for each watershed based on existing data and was used throughout each of the comparisons. These characteristics included, but were not limited to:

- Soil classification,
- Channel configurations,
- Vegetation cover,
- Watershed and channel slopes, and
- Watershed boundaries.

By keeping the variables constant within each watershed, Fort Carson was able to evaluate and directly compare the effects from both the current site conditions and any future impacts to the watershed from proposed actions within a given watershed to natural conditions. Some of these impacts may originate from off-Post construction. This evaluation allowed for the direct comparison of human influence on each watershed throughout different periods of time: pre-Fort Carson, existing conditions, and proposed site actions (i.e., projects listed in the Fort Carson Master Plan). Development can either increase or decrease a land's impervious characteristics; therefore, it was important to compare discharge rates and volumes for the existing and proposed conditions.

The Fort Carson model evaluated several storm events; however, specific design criteria need to be coordinated with the Fort Carson Department of Public Works. The design storm events are listed below:

Storm Event Design Summary*

100-Year Event	To determine 100-year floodplains and to design for all primary road crossings and emergency spillway design
50-Year Event	Secondary road crossings
25-Year Event	Auxiliary road crossings
10-Year Event	Permanent best management practices (BMPs) and primary spillway design

* For design purposes, a safety factor of 1.5 should be applied to modeled results.

As part of the overall evaluation of Fort Carson's watersheds, a water quality model will be completed. This model initially utilizes typical water quality parameters and pollutant loading rates based on national industry-standard averages. As the program matures, actual water quality and flow data will be collected from various drainages and specific outfalls across Fort Carson. These data will be added to the model to further refine the predicted surface water quality at Fort Carson.

A Watershed Assessment of River Stability and Sediment Supply (WARSSS) assessment will be conducted at Fort Carson to aid in determining the health and stability of the major waterways. WARSSS is a geomorphology-based procedure for quantifying the effects of land uses on sediment relations and channel stability. This work is anticipated to begin in early 2009 for selected watersheds within Fort Carson's boundaries.

The results of the WARSSS assessment will reveal any significant adverse influences of land use on stream channel stability, sediment sources, and sediment yield that may affect the material and beneficial uses of rivers and streams. WARSSS data will be used for watershed planning, total maximum daily load (TMDL) assessments for non-point source pollution, and stability analysis for river restoration.

Along with the WARSSS assessment, a macro-invertebrate study will be conducted to determine the biota living in the streams and ditches. These evaluations will be revisited over the coming years to enhance the information available on the watershed's heath and stability. This work is anticipated to begin early 2009 for selected watersheds within Fort Carson's boundaries.

By assessing these watersheds with a consistent quantitative approach, the Stormwater Manager will be able to determine if degradation is occurring in the watershed and to make appropriate changes to the system through modified permitting requirements, channel modifications, and imposing improved or additional BMPs that will aid in minimizing the impact of development in the watershed.

2. FORT CARSON ARMY POST

2.1 Modeling Parameters

The hydrologic analysis focuses on several nodes, or points within the respective watersheds, for estimating discharge for the various scenarios. Runoff for each sub-watershed is calculated at a node; however, not all nodes represent a sub-watershed. Some nodes are used to connect channels. The separation of the primary watersheds (i.e., B Ditch, Clover Ditch, Central Unnamed Ditch, and Rock Creek) into sub-watersheds accounts for spatial variability, which allows for different modeling parameters to be input for each sub-watershed. The connections between the nodes where water travels are referred to as links. The links allow the discharge estimated at each node to be routed, or conveyed, down the drainageway. This allows for analysis of the cumulative runoff of multiple sub-watersheds through each link as the runoff moves towards Fountain Creek. Analysis of these links gives an indication of flooding at each section, or reach, of the channel. Surface water drainages were the focus of the modeling; storm drains and other below-ground piping networks were not included in this phase of modeling. Once specific designs have been chosen, modeling can be refined to include the piping network and water quality predictions. In all scenarios, the assumption is made that 100 percent of runoff from impervious areas travels onto pervious areas as the stormwater drains to the main ditches or creeks.

Watersheds were defined using a digital elevation map (DEM), the existing ditch systems, and roadway systems. Watershed characteristics remain constant throughout the various scenarios being analyzed. Watershed area, length, slope, distance to centroid, and lag time are calculated using XPSWMM based on the defined watersheds and sub-watersheds. The time of concentration is determined using the Kirpich equation and is calculated as:

$$Tc = 0.0078L^{0.77} \times S^{-0.385}$$

where:

Tc = time of concentration (minutes)

L = hydraulic length of watershed (feet)

S = average watershed slope (feet/feet) (Viessman and Lewis 2003)

The percent impervious area changes from watershed to watershed due to the overall acreage of the sub-watershed as compared to the area that was determined to be impervious from the IBCT and CAB footprint.

Runoff modeling was conducted using the CUHP, a regionally calibrated unit hydrograph method. The unit hydrograph method uses watershed characteristics to predict runoff from 1 inch of rainfall evenly distributed over the watershed over a specified length of time. The resulting hydrograph, referred to as a “unit hydrograph,” is then combined with the desired rainfall distribution (less any infiltration losses) to form the desired runoff hydrograph. This procedure can be calibrated, as is the case with the CUHP, to refine the shape of the hydrograph to better represent the rainfall-runoff relationship of the specific location being modeled.

The CUHP has been calibrated with historical data collected along the eastern Front Range of the Rocky Mountains. Because of the similarities in climate, topography, proximity to foothills, storm patterns, soil types, and land use, the CUHP is a valuable tool for hydrologic analysis of the Fort Carson watersheds.

Other methods, such as the SCS Hydrology Method, or rational method, are available for use in the XPSWMM program. Given the urban environment in the Front Range region, the CUHP provides more accurate results than other comparable methods.

2.1.1 Precipitation

Several different storm durations were evaluated in determining the CUHP-adjusted precipitation duration and intensity. The precipitation depths for the 100-year 1-hour, 2-hour, 6-hour, and 24-hour rainfall events for the Fort Carson region were determined from the *Precipitation-Frequency Atlas of the Western United States, Volume III-Colorado* (Miller et al. 1973). Given these values, 100-year, 3-hour rainfall events were calculated for the CUHP using equations provided in the *Manual* (Urban Drainage and Flood Control District 2001). When using the CUHP, the 2-hour rainfall event is suggested for use in watersheds with areas less than 10 square miles, the 3-hour rainfall event is suggested for use in watersheds with areas from 10 to 20 square miles, and the 6-hour rainfall event is suggested for use in watersheds with areas from 20 to 30 square miles. Since the B Ditch watershed area is 3.62 square miles and the Clover Ditch watershed area is 5.52 square miles, the 2-hour design storm was used for modeling those watersheds. The 100-year, 2-hour rainfall event was calculated to be 3.121 inches with a peak incremental rainfall rate of 0.675 inch per hour. The area of the Rock Creek watershed is 17.77 square miles and was modeled using the 3-hour design storm. The 100-year, 3-hour rainfall event was calculated to be 3.094 inches with a peak incremental rainfall rate of 0.608 inch per hour. The Central Unnamed Ditch watershed is 21.40 square miles and was modeled using the 6-hour design storm. The 100-year, 6-hour rainfall event was calculated to be 3.40 inches with a peak incremental rainfall rate of 0.547 inch per hour.

Intense, convective summer thunderstorms have historically been the cause of flooding in the region as determined through historical investigation by the Urban Drainage and Flood Control District. Flooding associated with these storms results from the high intensity of rainfall events. Accordingly, these regionally specific design storms suggested for use with the CUHP by the *Manual* have been designed and calibrated to represent this. With this rainfall distribution, the majority of rain falls quickly and intensely. The short duration and high intensity of the storm event are also seen in the SCS Type II storm event, which addresses storm events not associated with oceanic effects. The rainfall distribution used calibrated the Type II storm to more closely represent storms that occur along the Front Range.

Note the peak incremental rainfall depth for all lengths of design storm occurs within the first 30 minutes of the storm; the shorter the storm, the larger the peak rainfall intensity. Rainfall intensity has been emphasized as the key factor in urban flooding as shown by the Urban Drainage and Flood Control District. The total depth of rainfall is less a factor in urban flooding than rainfall intensity in intense, convective thunderstorms; thus, there is no clear trend in the total depth of the design storm.

Rainfall intensity controls flooding because it determines whether the stormwater can be infiltrated into the soil. If the rate of rainfall is greater than the rate of infiltration, the excess stormwater will flow overland and quickly concentrate in drainages, resulting in increased surface water flows and potential flooding. In contrast, if the stormwater is able to infiltrate into the subsurface, it must travel through the soil and will reach a drainage way slowly if at all. With a high-intensity rainstorm, such as the regionally specific design storms, little if any water is able to infiltrate and urban storm drains become less effective. These factors can lead to urban flooding.

Using a worst-case scenario, detention basins and reservoirs were modeled under full conditions to account for precipitation leading up to the 100-year event. As seen in a local event occurring on August 4, 1999, 3.98 inches of rain fell within a 24-hour period, which exceeds the 100-year 3-hour event. This illustrates that large quantities of precipitation have fallen on the site and that a worst-case scenario is possible.

2.1.2 Infiltration

The CUHP uses the Horton Infiltration Model to estimate infiltration into the subsurface during a storm event. The Horton Infiltration Parameters (initial infiltration rate, final infiltration rate, and decay coefficient) were used as inputs for the model. Soil data from the National Resource Conservation Service (NRCS) Web Soil Survey (NRCS 2007) were analyzed for the B Ditch, Clover Ditch, Central Unnamed Ditch, and Rock Creek watersheds to determine the hydrologic soil groups (Figures 3 through 5). The hydrologic soil group was overlain on each of the watersheds, and a percent hydrologic soil group by area was estimated for each sub-watershed. Horton's Infiltration Parameters can be determined from the hydrologic soil group in tables found in the *Manual* (Table 1a). An area-weighted average was used to determine the effective infiltration parameters for each sub-watershed (Table 1b).

2.1.3 Channel Configurations

Information regarding channel characteristics for channel sections within B Ditch, Clover Ditch, and Central Unnamed Ditch was derived from a 2007 topographic survey conducted by the Fort Carson Stormwater Program (see Appendix A, Cross Section Photos). The topographic data for the B Ditch and Clover Ditch channels were used to construct channel shapes in the XPSWMM model. Cross sectional surveys were not available for Rock Creek at the time of this analysis. Since this modeling effort addresses a large storm, the effects of the low-flow channel area are minimal. Cross sections for Rock Creek were obtained using functions within XPSWMM that define channel shapes based on the DEM. This portrays the major channel configuration in a drainage that has not been urbanized and is appropriate at this level of modeling. The DEM was created using National Elevation Dataset, which is a seamless mosaic of best-available U.S.

Geological Survey (USGS) elevation data for a 7.5' Universal Transverse Mercator, North American Datum 1983 projection, with a 10-meter triangulation resolution elevation grid to provide the base map topography, allowing for detailed cross section definitions when appropriate, and for two-dimensional floodplain mapping.

Manning's "n" value is a roughness coefficient used for routing flows down the watershed through channels. Pictures taken during the 2007 survey were used in coordination with tables in the Ohio Department of Transportation (DOT) Hydraulics Manual (2005) to determine a Manning's "n" number for the left bank, right bank, and channel bottom for each section in the evaluated drainages. The Ohio DOT Hydraulics Manual was used because the tables provide extensive and detailed Manning's "n" values for the channel and ditch types found at Fort Carson including, but not limited to, unmaintained channels with weeds and uncut brush and channels with trees growing in the channel bed. Manning's "n" values from adjacent and similar channel segments were considered in determining reasonable estimated values for areas where a ground survey was not completed. The assumption that Manning's "n" values from adjacent channels (B Ditch, Clover Ditch, and Central Unnamed Ditch) are applicable to values in Rock Creek was justified due to the similarities in channel shape, channel structure, vegetation, and its location between the other channels. The Manning's "n" values for Rock Creek were estimated to be 0.033 for the channel bed and 0.070 for the channel banks.

2.2 Alternative Analysis Scenarios

The XPSWMM model is structured by the geographic location of the three proposed building sites: TAB, Tent City, and ORTC. The following scenarios were modeled for the 100-year rainfall event and reflect the baseline conditions (i.e., conditions pre-Fort Carson), the existing conditions based on September 2007 data, and potential impacts of the proposed placement of the IBCT, CAB, and associated building activities as appropriate.

Training Area Bravo

- Baseline conditions for B Ditch and Clover Ditch
- Existing 2007 conditions for B Ditch and Clover Ditch
- Natural Environmental Policy Act (NEPA) Alternative Analysis
  - Scenario 1 - 100 percent of IBCT discharging to B Ditch
  - Scenario 2 - 100 percent of IBCT discharging to Clover Ditch

  - Scenario 3 - 50 percent of IBCT discharging to B Ditch and 50 percent discharging to Clover Ditch

Tent City

- Baseline conditions for Rock Creek
- Existing 2007 conditions for Rock Creek
- NEPA Alternative Analysis
  - Scenario 4 - 100 percent of IBCT discharging to Rock Creek

Operational Readiness Training Complex

- Baseline conditions for Rock Creek
- Existing 2007 conditions for Rock Creek
- NEPA Alternative Analysis
  - Scenario 5 - 95 percent IBCT discharging to Rock Creek and 5 percent discharging to Central Unnamed Ditch; no CAB placement
  - Scenario 6 - 100 percent CAB discharging to Rock Creek and no IBCT placement
  - Scenario 7 - 95 percent IBCT discharging to Rock Creek and 5 percent discharging to Central Unnamed Ditch and 100 percent CAB discharging to Rock Creek

The baseline scenario evaluated discharge assuming each watershed consisted of 100 percent natural conditions. This provides baseline data for the pre-development hydrology. The existing 2007 scenario evaluated each watershed using an estimated impervious area based on drawings provided by Fort Carson that outlined buildings, roads, parking lots, and other manmade features existing in September 2007. This analysis evaluated the proposed alternatives by considering the impervious areas of each option at its respective site in addition to the existing 2007 development and other proposed future projects indicated in the Fort Carson Master Plan dated January 2008.

The IBCT building option is associated with 0.1683 square mile of impervious area, while the CAB building option is associated with 0.1640 square mile of impervious area. The XPSWMM model looks at the percent impervious area within each watershed, estimating peak discharges. The percent impervious area for each scenario was calculated using the above areas for each of the representative watersheds; the data are summarized in Tables 2a, 2b and 2c.

2.3 Training Area Bravo

Modeling for the TAB simulation consisted of the baseline and existing conditions evaluations for Clover and B Ditches along with three different scenarios for the placement of IBCT, Scenarios 1 through 3 (Figures 6 and 9). Each model run addressed stormwater from either B

Ditch or Clover Ditch or as a combined scenario with stormwater flow going to both the B Ditch and Clover Ditch watersheds. The evaluations performed for the TAB include:

- Baseline B Ditch
- Baseline Clover Ditch
- Existing 2007 conditions, B Ditch
- Existing 2007 conditions, Clover Ditch
- NEPA Alternative Analysis
  - Scenario 1 - 100 percent of IBCT discharging to B Ditch
  - Scenario 2 - 100 percent of IBCT discharging to Clover Ditch
  - Scenario 3 - 50 percent of IBCT discharging to B Ditch and 50 percent discharging to Clover Ditch

2.3.1 Scenario 1

Scenario 1 simulated the construction of new IBCT facilities in TAB in which 100 percent of the stormwater discharge flows into B Ditch. Proposed IBCT construction located at the TAB site increases the impermeable area by 0.1683 square mile. This scenario is modeled within sub-watersheds B Ditch-18, B Ditch-20, and B Ditch-22 of the B Ditch watershed, which are shown on the right side of Figure 6. These three sub-watersheds have a combined drainage area of 0.857 square mile. The proposed IBCT building increases the impermeable area by 20 percent in these three sub-drainages and less than 5 percent of the total area within the B Ditch watershed as a whole. Due to the increase in impermeable area, peak discharge modeled from the three sub-watersheds increased from 680 cubic feet per second (cfs) to 760 cfs (approximately 12 percent) for B Ditch-18, from 900 cfs to 950 cfs (approximately 6 percent) for B Ditch-20, and from 370 cfs to 470 cfs (approximately 27 percent) for B Ditch-22. All changes are from the existing conditions scenario. For completeness and long-term analysis, the proposed construction of other sites depicted in the Fort Carson Master Plan (January 2008) was also included in the TAB scenario. Overall, peak flows in B Ditch increased from 1,940 cfs to 2,010 cfs, or approximately 4 percent. This includes the building activities in the TAB scenario and the build-outs depicted in the Fort Carson Master Plan. Figure 7 shows a dynamic cross section of B Ditch from TAB Scenario 1. As seen on Figure 8, the channel contains the flow through the site area, with the exception of the northwest corner, as the majority of the site is located outside of the predicted 100-year floodplain. It should be noted that other areas upstream of Scenario 1 do flood and have been included within this simulation.

2.3.2 Scenario 2

Scenario 2 simulated the construction of IBCT facilities in TAB with 100 percent of the stormwater discharge flowing into Clover Ditch (see Figure 9). The proposed IBCT construction at the TAB site creates an impermeable area of 0.1683 square mile. This scenario is modeled within the sub-watersheds Clvr 10.2, Clover 11 and Clover 12 in the Clover Ditch watershed. Sub-watershed Clvr 10.3 was not included because landfill areas are located within the sub-watershed boundaries, and construction in these areas would warrant further and more detailed evaluation than that provided in this analysis. The three sub-watersheds included in the modeling have a combined drainage area of 1.56 square miles. The proposed IBCT construction increases the impermeable area by 11 percent in these sub-drainages and approximately 3 percent of the total area within the Clover Ditch watershed as a whole. Due to the increase in impermeable area, the peak discharge modeled for these sub-watersheds increased from 230 cfs to 420 cfs (approximately 83 percent) in Clvr 10.2, from 430 cfs to 720 cfs (approximately 67 percent) in Clover 11, and from 1,170 cfs to 1,290 cfs (approximately 10 percent) in Clover 12. All changes are from the existing conditions scenario. For completeness, the proposed construction from other sites depicted in the Fort Carson Master Plan (January 2008) was also included in the TAB scenario. Overall, the proposed activity in this scenario increased peak discharge below the confluence of the northern branch and the main stem of the Clover Ditch from 2,310 cfs to 3,011 cfs, or approximately 23 percent. This includes the building activities in the TAB scenario and other buildouts as depicted in the Fort Carson Master Plan (January 2008). Figure 10 shows a dynamic cross section of the Clover Ditch through the TAB Scenario 2 site. Figure 11 represents the projected 100-year floodplain as it relates to TAB Scenario 2. Due to the flat gradient of the north tributary of Clover Ditch, stormwater flows out of the channel in a southern direction until it is intercepted by the main stream of Clover Ditch. The TAB site depicted in this scenario is located outside the predicted 100-year floodplain (Figure 11). It should be noted that other areas upstream of Scenario 2 flood and have been included within this simulation.

2.3.3 Scenario 3

In this scenario, the IBCT will be located in areas that drain into both the B Ditch and Clover Ditch watersheds. Modeling assumed that 50 percent of the site will be located in each of the two drainages. As in other scenarios, the proposed IBCT building site creates an impermeable area of 0.1683 square mile. This scenario is located within the same sub-watersheds described in Scenarios 1 and 2. Due to the increase in impermeable area in the affected B Ditch sub-watersheds, the peak discharge increased from 680 cfs to 700 cfs (approximately 3 percent) in B Ditch-18, from 900 cfs to 920 cfs (approximately 2 percent) for B Ditch-20, and from 370 cfs to 400 cfs (approximately 8 percent) for B Ditch-22. In the affected Clover Ditch sub-watersheds, the peak discharge increased from 230 cfs to 300 cfs (approximately 30 percent) in Clvr 10.2, from 430 cfs to 550 cfs (approximately 30 percent) in Clover-11, and from 1,170 cfs to 1,240 cfs (approximately 6 percent) in Clover 12. All changes are from the existing conditions scenario.

Modeling predicts that the cumulative impact within these watersheds is approximately 3 percent for B Ditch and 2 percent for Clover Ditch.

As with Scenarios 1 and 2, the TAB site, which is constructed within both the B Ditch and Clover Ditch watersheds, is located outside of the 100-year floodplain even though flooding does occur from the northern tributary and upstream in Clover Ditch.

2.4 Tent City

Modeling for construction of IBCT facilities at Tent City consisted of baseline and existing conditions evaluations for Rock Creek along with one scenario for the placement of the IBCT. Each model run addressed stormwater from sub-watersheds that flow into Rock Creek. The evaluations performed for the Tent City option were:

- Baseline Rock Creek
- Existing 2007 conditions Rock Creek
- NEPA Alternative Analysis
  - Scenario 4 - 100 percent of IBCT discharging to Rock Creek

2.4.1 Scenario 4

The proposed IBCT building site located at Tent City (Figure 12) creates an impermeable area of 0.1683 square mile. The Tent City site is modeled within the sub-watershed Rock Node 4 of the Rock Creek watershed. Rock Node 4 has an area of approximately 2.36 square miles. The proposed building creates an impermeable footprint of approximately 7 percent of the sub-watershed and less than one percent of the Rock Creek watershed as a whole. Due to the increase in the impermeable area, peak discharge modeled at sub-watershed Rock Node 4 increased from 1,890 cfs in the existing conditions to 1,960 cfs, or an approximate 4 percent increase. Overall, the proposed activity in this scenario increased peak discharge in Rock Creek less than 1 percent.

Figure 13 shows the dynamic cross section through the Tent City site, which indicates flooding at locations and in magnitudes similar to the existing condition. Figure 14 is the 100-year floodplain of Rock Creek. As can be seen on the figure, Rock Creek leaves its channel and flows into low-lying areas. The current footprint of the Tent City option is located on the border of the 100-year floodplain.

2.5 Operational Readiness Training Complex

Modeling for the construction of IBCT facilities at the ORTC site consisted of baseline, existing, and proposed conditions evaluations for Rock Creek with three scenarios for the placement of IBCT and CAB. Each model run addressed stormwater from sub-drainages that flow into Rock Creek. The evaluations performed for the ORTC option were:

- Baseline Rock Creek
- Existing 2007 conditions Rock Creek
- NEPA Alternative Analysis
  - Scenario 5 - 95 percent IBCT discharging to Rock Creek and 5 percent discharging to Central Unnamed Ditch; no CAB placement
  - Scenario 6 - 100 percent CAB discharging to Rock Creek and no IBCT placement
  - Scenario 7 - 95 percent IBCT discharging to Rock Creek and 5 percent discharging to Central Unnamed Ditch and 100 percent CAB discharging to Rock Creek

2.5.1 Scenario 5

The proposed alternative for construction of IBCT facilities at the ORTC site (Figure 15) creates an impermeable area of 0.1683 square mile. The impermeable area located within the Rock Creek watershed is 0.1599 square mile. This site is modeled within the sub-watershed of Rock Node 1 in the Rock Creek watershed. The Rock Node 1 sub-watershed has an area of 3.72 square miles. The IBCT site footprint creates an impermeable area of approximately 4 percent of this sub-watershed area and approximately 1 percent of the greater Rock Creek watershed. In the modeling scenarios that include the IBCT building option at the ORTC site, the peak discharge at Rock Node 1 increased from 2,480 cfs in the existing condition scenario to 2,850 cfs, an increase of approximately 15 percent. Overall, the proposed activity in this scenario increased peak discharge in Rock Creek less than 1 percent.

The portion of the IBCT building at the ORTC site that lies within the Central Unnamed Ditch watershed creates an impermeable area of 0.0084 square mile. This site is modeled within sub-watersheds CUD T78 and CUD T73, whose combined area is 0.9814 square mile. The area associated with the IBCT building at this site creates an increase of approximately 1 percent of the sub-watersheds affected and 0.04 percent of the Central Unnamed Ditch watershed as a whole. There is no noticeable change in peak discharges from these sub-watersheds as a result of the portion of the proposed IBCT building that lies within the Central Unnamed Ditch watershed. The total volume discharged from these two sub-watersheds increased from 3,300 acre-feet in the existing scenario to 3,330 acre-feet in the proposed scenario, an increase of approximately 1 percent.

Figure 16 shows the dynamic cross section of Rock Creek for this scenario. On this figure, Rock Creek flows above its channel to low-lying areas in a 100-year stormwater event. Figure 17 is a representation of the 100-year floodplain for Rock Creek; on the figure, Rock Creek leaves its channel in several places and flows into low-lying areas. Once this stream is properly surveyed, this minor flooding may change in one or more areas. The current footprint of the ORTC option appears to be located above the 100-year floodplain.

2.5.2 Scenario 6

The proposed CAB construction at the ORTC site is modeled within sub-watershed Rock Node 1 (Figure 18). The proposed CAB building creates an impermeable area of 0.1640 square mile. The area of sub-watershed Rock Node 1 is 3.72 square miles. Accordingly, the proposed site creates an impermeable area that is approximately 4 percent of the sub-watershed and less than 1 percent of the total Rock Creek watershed. In the modeling scenarios that include the CAB building option only at the ORTC site, the peak discharge at Rock Node 1 increased from 2,480 cfs in the existing conditions scenario to 2,830 cfs, an increase of approximately 15 percent. Overall, the proposed activity in this scenario increased peak discharge in Rock Creek approximately 1 percent. Figure 19 shows the dynamic cross section of Rock Creek for this scenario. Once this stream is properly surveyed, this minor flooding may change in one or more areas. The current footprint of the ORTC option appears to be located above the 100-year floodplain. The CAB is located well outside the projected 100-year floodplain as can be seen on Figure 20.

2.5.3 Scenario 7

Scenario 7 addresses the construction of both the IBCT and the CAB in the ORTC footprint (Figure 21). The total impervious area added to sub-watershed Rock Node 1 is 0.3239 square mile. This is an increase in impervious area in this sub-watershed of approximately 9 percent and in the total impervious area of the Rock Creek watershed of approximately 2 percent. The peak discharge in Rock Node 1 increases from 2,630 cfs in the existing conditions scenario to 3,170 cfs in this proposed scenario, or an increase of approximately 21 percent. Overall, the proposed activity in this scenario increased peak discharge in Rock Creek less than 1 percent. The influence of the portion of the IBCT option that lies within the Central Unnamed Ditch watershed does not noticeably affect peak flows in the Central Unnamed Ditch (see Scenario 5). Figure 22 shows the dynamic cross section of Rock Creek for this scenario. On this figure, Rock Creek flows above its channel in a 100-year stormwater event and flows out to low-lying areas. Once this stream is properly surveyed, this minor flooding may change in one or more areas. The current footprint of the ORTC/CAB option is located outside the 100-year floodplain, as seen on Figure 23.

2.6 Summary

The results for the seven alternative scenarios are summarized in Table 3, which shows the increase in discharge above the existing conditions scenarios within each drainage.

Table 3 shows that throughout the scenarios and watersheds, discharge does not increase more than 4 percent, indicating a relatively small change and low impact from these particular projects. As expected, in comparing the proposed scenarios' impervious area to the overall area of the respective watersheds, a minimal increase in peak discharge is seen. For the 100-year storm event, it is also expected that elevated discharge velocities would add to the erosive capability of the flood water. In general, for vegetated channels, a velocity over 4-6 feet per second becomes erosive and channel degradation occurs. It should be noted that the velocities in Table 3 are from a specific link in the channel. Depending on channel slope and channel constrictions, velocities can either increase or decrease as water moves through the system. In areas of high velocities, soils are eroded and carried downstream, where slow velocities let the large particles fall out of suspension, forming sand bars and deltas.

EPA has published guidelines stating that if the area of a watershed is more than 20 percent impervious, it should be considered "impaired". B Ditch and Clover Ditch are considered impaired since the 2007 impervious areas are 43 and 28 percent, respectively. In proposed Scenarios 1 through 3, the impervious areas would increase to 52 and 42 percent, respectively. The Central Unnamed Ditch would also be considered impaired due to its overall development, but the proposed scenarios would only increase the overall percentage by a fraction of a percent. The Rock Creek watershed would be considered not impaired due to the small impervious areas for both the existing 2007 and proposed scenarios.

In addition to the changes in flows, none of the footprint is entirely located within the predicted 100-year floodplain. In Scenario 1 (Figure 8), a very small portion of the IBCT footprint is located within the 100-year floodplain, at the far downstream end of the B Ditch. This portion is very small and could be avoided in final design if this location is chosen. In Scenario 2 (Figure 11), a very small portion of the IBCT footprint is located within the edge of the 100-year floodplain, near the middle portion of the footprint. This portion of the footprint is located in sub-watershed 10.3, where building was not considered because of the location of the landfill, as discussed in Section 2.3.2. Scenario 3 is a combination of these two scenarios.

In scenario 4 (Figure 14), the IBCT footprint is outside the 100-year floodplain, which is located along the southern boundary of the footprint. In Scenarios 5, 6 and 7, the proposed footprints are located entirely outside of the respective 100-year floodplains (Figures 17, 20, and 23).

A dental facility, mini-mall, and chapel are also proposed as part of the GTA Initiative. Although these facilities are not associated with the afore-mentioned scenarios, they have been included in the Fort Carson 2008 Master Plan. As such, the cumulative analysis reflected in the various scenarios includes these three facilities. Improvements to Gate 6 (located within the western portion of Rock Creek watershed along State Highway 115) and Gate 19 (located down range along the eastern portion of the Post near Interstate 25) are also proposed under the GTA Initiative. The impacted area associated with these gate improvements is small, approximately 0.05 percent of the greater watersheds, and is not expected to have a substantial effect on stormwater flows.

3. PINON CANYON MANEUVER SITE

3.1 Modeling Parameters

The hydrologic analysis focuses on several nodes, or points within the respective watersheds, for estimating discharge for the various scenarios. Runoff for each sub-watershed is calculated at a node; however, not all nodes represent a sub-watershed. Some nodes are used to connect channels. The connections between the nodes where water travels are referred to as links. The links allow the discharge estimated at each node to be routed, or conveyed, down the drainageway. This allows for the analysis of the cumulative runoff of multiple sub-watersheds through each link as the runoff moves downstream.

All watershed boundaries were determined from the base map topography derived from a DEM. Watershed area, slope, and length were determined by the XPSWMM program.

The time of concentration is determined using the Kirpich equation and is calculated as:

$$Tc = 0.0078L^{0.77} \times S^{-0.385}$$

where:

Tc = time of concentration (min)
L = hydraulic length of watershed (ft)
S = average watershed slope (ft/ft) (Viessman and Lewis 2003)

Within XPSWMM, runoff for PCMS was calculated using the SCS hydrology method rather than the CUHP. The SCS method allows for the different land cover types, which range from shrub-land to pavement, to be accounted for. Varying land cover types influence the quantity and intensity of runoff. This method was more appropriate than the CUHP because the CUHP utilizes a rainfall-runoff relationship that was empirically calibrated along the urban Eastern Rocky Mountain Front Range.

3.1.1 Precipitation

The 100-year, 24-hour rainfall depth was determined to be 5.1 inches using the *Precipitation-Frequency Atlas of the Western United States, Volume III-Colorado* (Miller et al. 1973). Unlike for Fort Carson, models for PCMS utilized the SCS Type II storm distribution. The storm distribution used at Fort Carson was developed from data collected along the Eastern Rocky Mountain Front Range and was not appropriate for the PCMS. The SCS Type II storm is applicable for the PCMS region and represents the most intense storm pattern of the SCS type storms (Hann et al. 1994). It should be noted that although this storm event is referred to as a 100-year, 24-hour event, due to the Type II distribution the rainfall intensity is similar to the rainfall distribution used for the CUHP in that the majority of the rain occurs intensely over a small period of time, not continuously for 24 hours.

3.1.2 SCS Hydrology Parameters

The SCS hydrology method uses a curve number to determine how much precipitation is lost to initial abstractions (such as depression storage and interception) and how much becomes runoff.

The curve numbers for the sub-watersheds within the primary PCMS watersheds were determined using tables for arid and semi-arid rangelands that define the curve number from cover type, hydrologic condition, and hydrologic soil group (Hann et al. 1994).

Cover Type	**Curve Number for Hydrologic Soil Group**			
	A	**B**	**C**	**D**
Pinyon-juniper: Pinyon, juniper, or both; grass understory	58	58	73	80
Desert Shrub: Major plants include saltbrush, greasewood, creosotebrush, blackbrush, bursage, palo verde, mesquite, and cactus	55	72	81	86
Effective Curve Number: 20% Pinyon-juniper, 80% Desert Shrub	55.6	69.2	79.4	84.8

Land cover was assumed to be 20 percent pinyon-juniper cover and 80 percent desert shrub cover. These values were determined from available site pictures, past reports such as *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987), and online aerial photos. It was assumed that the land was in “fair hydrologic condition,” meaning the ground is 30 to 70 percent covered with some type of vegetation. Soil hydrologic groups were determined by using soil data within sub-watershed boundaries and calculating the percent of each soil group by area (Figures 24 through 28). Using the percent soil group by area, an area-weighted curve number was calculated for each sub-watershed.

The initial abstraction is an estimate of precipitation losses that occur within a watershed prior to rainfall becoming runoff. The initial abstraction is assumed to be 0.2 times the potential maximum abstraction (S), where S is calculated as:

$$S = \left(\frac{1000}{CurveNumber} \right) - 10$$

An impervious percent was determined by applying the impervious area to the sub-watershed area. XPSWMM internally determines an adjusted curve number based on the increase in impervious percent for the existing and proposed scenarios by applying an impervious area curve number of 98.

3.1.3 Routing Parameters

The dynamic wave routing function was used to model runoff through the Simpson Lake, Timpas Creek, Big Arroyo, Van Bremer Arroyo, Taylor Arroyo, and Big Water Arroyo watersheds. Cross sections for these channels were determined using the function in XPSWMM that defines them based on the DEM. This is appropriate given the natural conditions of the area and the large flows passing through the channels. The Manning's roughness coefficient, "n," was estimated to be 0.035 for the channel beds and 0.050 for channel banks.

3.2 Simpson Lake Watershed

The Cantonment Area of PCMS is located within a closed basin that drains to Simpson Lake (Figure 29). The watershed is split into two sub-watersheds that both drain to the lake. The Cantonment Area is located in the larger sub-watershed, which is located to the southeast of the lake. Modeling was conducted for baseline (pre-development) conditions, existing conditions (existing buildings and facilities), and conditions defined in the *PCMS Transformation EIS* (CH2M HILL, 2007) to determine the potential volume of water that may be delivered to the lake during the 100-year, 24-hour rainfall. Figure 30 shows the elevation-surface area and elevation-volume relationships for Simpson Lake. This was accomplished using the DEM and measuring the area at each elevation interval. Aerial photos available from Google™ Maps showed Simpson Lake to be dry. This initial condition was assumed due to a lack of other available data and the prolonged dry years that have been present in Colorado. The elevation at the bottom of the lake is 5,573.67 feet.

The baseline condition was modeled using no impervious area for any of the contributing areas. This represents the watershed prior to the PCMS facility being built. The existing conditions, representing the conditions seen during fall of 2008, are approximately 42 acres of impervious area associated with existing buildings and facilities. This represents 1 percent of the sub-watershed area. The conditions defined in Appendix B of the *PCMS Transformation EIS* add an additional 20 acres of impervious area to the existing conditions, resulting in a total of 1.5 percent of the sub-watershed area as impervious area. This GTA EIS does not propose any construction within PCMS. Analysis is made of the construction described in the *PCMS Transformation EIS* that has not yet been undertaken.

Runoff hydrographs for the three scenarios are shown on Figures 31, 32, and 33. As the figures show, this addition of impervious area minimally affects the hydrographs. Other than a slight increase in peak flow through the cumulative scenario, the hydrographs are very similar in shape. The total volumes of stormwater generated from the 100-year event are summarized below.

	Maximum Elevation (feet)	**Total Volume (acre-feet)**	**Change in from Baseline Condition (acre-feet)**
Baseline	5585.752	1,339	NA
Existing	5585.769	1,343	4 ac/ ft (0.3% increase)
Cumulative	5585.776	1,345	6 ac/ ft (0.5% increase)

ac/ ft = acre feet
NA = not applicable

Using this analysis it can be shown that the construction activities at PCMS may increase the lake level by 0.024 foot or 0.288 inch above natural conditions. The predicted water level of Simpson Lake is shown on Figure 34.

3.3 Timpas Creek

The Timpas Creek watershed is located to the north of the PCMS Cantonment Area (Figure 35). The approximate 3.6 square miles of the watershed that is located within the PCMS boundary was included in modeling. Figure 36 shows the hydrograph for the farthest link downstream of the modeled area, link T28. This link reports the cumulative runoff from the four active sub-watersheds located within the installation. Other areas that are not within the installation were not considered for this phase of modeling. The peak discharge at this point is 5,630 cfs for a 100-year storm event.

Regression equations that predict peak discharges for the region are provided in *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987). The regression equations are empirically derived from stream flow records in the area and predict peak flows based on a relief factor, the effective drainage area, and rainfall. Using this method, the predicted 100-year peak discharge for this portion of Timpas Creek is calculated to be 4,510 cfs, with a margin of error of ± 1,890 cfs. The modeled value is well within the expected range.

3.4 Big Arroyo

The Big Arroyo watershed is located to the northeast of the PCMS cantonment area and directly east of the Timpas Creek watershed (Figure 37). Big Arroyo connects with Timpas Creek downstream of the PCMS boundary. The approximate 22.7 square miles of the Big Arroyo watershed located within the PCMS boundary was included in the modeling. Figure 38 shows the hydrograph for BA233, the farthest link downstream in the modeled area. This link reports cumulative runoff from the entire upstream area. The peak discharge at this point is 15,410 cfs for a 100-year storm event.

Using the regression equations provided in *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987), the predicted 100-year peak discharge is 16,990 cfs, with a margin of error of ± 7,130 cfs. The modeled value falls well within the expected range.

3.5 Van Bremer Arroyo

The Van Bremer Arroyo watershed is located to the southwest of the PCMS Cantonment Area. This watershed originates off-Post to the northwest of Highway 350 and flows diagonally to the southeast into the Purgatoire River (Figure 39). The approximately 152 square miles of the Van Bremer Arroyo watershed was included in the modeling. Figure 40 shows the hydrograph for the furthest link downstream in the modeled area, link 360. This link reports cumulative runoff from the entire upstream area. The peak discharge at this point is 52,300 cfs.

Using the regression equations provided in *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987), the predicted 100-year peak discharge is 24,500 cfs, with a margin of error of ± 6,860 cfs. This value is lower than the modeled value and may indicate the influence of in-stream losses on actual stream flow or rainfall distribution across a large watershed. The discrepancy in these values indicates further refinement and detail are needed.

3.6 Taylor and Big Water Arroyos

The Taylor Arroyo watershed is located to the northeast of the Van Bremer Arroyo watershed and south of the PCMS cantonment area (Figure 41). Big Water Arroyo connects with Taylor Arroyo approximately 5.5 miles upstream of the confluence between Taylor Arroyo and the Purgatoire River. The approximate 86 square miles of the Taylor and Big Arroyo watersheds, both located within the PCMS boundary, was included in the modeling. Figure 42 shows the hydrograph for the furthest link downstream in the modeled area, link 85.1. This link reports cumulative runoff from the entire upstream area, including stormwater from Big Water Arroyo. The peak discharge at this point is 43,900 cfs. Figure 43 shows the hydrograph from the reach where Big Water Arroyo joins Taylor Arroyo, link 242. This link reports cumulative runoff from Big Water Arroyo only. The peak discharge at this point is 13,850 cfs.

Using the regression equations provided in the *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987), the predicted peak 100-year discharge is 18,800 cfs, with a margin of error ± 5,270 cfs for Taylor Arroyo. This value is lower than the modeled value and may indicate the influence of in-stream losses on actual stream flow or rainfall distribution across a large watershed. The discrepancy in these values indicates further refinement and detail are needed.

Using the regression equations provided in the *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987), the predicted peak 100-year discharge is 13,720 cfs, with a margin of error ± 5,760 cfs. The modeled value is within the expected range.

3.7 Summary, Assumptions, and Limitations

Within the Simpson Lake watershed, 1,339 acre-feet of water were delivered to the lake in the baseline pre-development condition. In the existing condition, an additional 4 acre-feet, an increase of 0.3 percent, was delivered to the lake. In the condition described in the *PCMS Transformation EIS* (CH2MHILL 2007), an additional 2 acre-feet were delivered to the lake from the existing condition, for a total increase of 6 acre feet, or 0.5 percent, from the baseline condition.

The peak discharges of the other modeled watersheds are summarized below:

Watershed	Modeled Peak Discharge (cfs)	Peak Velocity (ft/sec)
Timpas Creek	5,630	8
Big Arroyo	15,410	7
Taylor Arroyo	43,900	9
Van Bremer Arroyo	52,300	> 20
Big Water Arroyo	13,850	15

As expected, in comparing the proposed scenario's impervious area to the overall area of the respective watersheds, a minimal increase in peak discharge is seen. Under the 100-year storm event, it is also expected that elevated discharge velocities would add to the erosive capability of the flood water. In general, for vegetated channels, a velocity over 4-6 feet per second become erosive and channel degradation occurs. It should be noted that the velocities in the above table are from a specific link in each channel. Depending on channel slope and channel constrictions, velocities can either increase or decrease as water moves through the system. In areas of high velocities, soils are eroded and carried downstream, where slow velocities let the large particles fall out of suspension, forming sand bars and deltas. Using the EPA's guideline for impaired streams due to impervious areas (see Section 2.6), all six of the drainages that were studied would be considered "not impaired."

Modeled peak discharges from the Timpas Creek, Big Arroyo, and Big Water Arroyo watersheds were within the expected range, while the ranges for the Van Bremer Arroyo and Taylor Arroyo watersheds were higher than the expected values.

Several assumptions were necessary to complete the current level of modeling. Although they lead to minor limitations, they do provide a satisfactory starting point for future, more robust endeavors.

In determining land cover, it was assumed that 80 percent was desert shrub and 20 percent was pinyon-juniper. While this is a suitable assumption for the large scale; more detailed and specific data would serve to further refine the model. This is possible with a ground-based reconnaissance or with the integration of existing geospatial GIS-based data.

As reported in *Hydrology of the US Army Pinon Canyon Maneuver Site* (Abbott et al. 1987), the surface water hydrology has multiple complex interactions that were not considered in this analysis. In-stream losses and agricultural return flows were both referenced in this report; however, they were not considered in this phase of modeling. Given that the rainfall of the SCS type II storm is very intense, the hydrologic response of the watersheds can be characterized as a very large, intense volume of water passing through the system in a relatively short amount of time. In-stream losses include channel storage and streambed infiltration. An intense discharge passing through the channel would be less susceptible to infiltration into the streambed because it is in the channel for such a short amount of time, thus these in-stream losses are assumed to be minimal. However, larger flows may extend outside the typical bank’s full width, making the water more susceptible to floodplain storage and water loss.

In comparison to the large, intense flows associated with the 100-year rainfall event, agricultural return flows are relatively small in volume and more drawn out over time. Given this, the influences of such flows are assumed to be minimal on stormwater flow. This same logic applies to base flow, which was also not considered in the modeling. It was also assumed that a higher percentage of impervious areas existed within these watersheds due to rock outcrops and incised channel walls. Although these increased impervious areas were not included in the model, they would be identical for each scenario, which would increase overall discharge from the watersheds by the same amount.

A WARSSS assessment would complement this stormwater model to aid in determining the stability of the watersheds in this phase of the PCMS evaluation.

Finally, modeling of the PCMS Cantonment Area within the Simpson Lake watershed assumed that all surface flows from the Cantonment Area travel along natural topographical gradients into the lake. Accordingly, any diversions or engineered stormwater controls were unknown at the time of this investigation and not accounted for in the model. Future reconnaissance and data gathering can determine if these exist and the level of influence they may or may not have.

The assumptions discussed above were necessary and provide a solid foundation to determine stormwater conditions of the areas modeled. From this foundation, more detailed and robust analyses can be preformed once the need and direction arise.

4. REFERENCES

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TABLES

TABLE 1a
HORTON'S INFILTRATION PARAMETERS

	Horton's Infiltration Parameters		
Hydrologic Soil Group	**f_i - Initial Infiltration Rate (in/hr)**	**f_o - Final Infiltration Rate (in/hr)**	**a - Decay Rate (1/sec)**
A	5.0	1.0	0.0007
B	4.5	0.6	0.0018
C	3.0	0.5	0.0018
D	3.0	0.5	0.0018

TABLE 1b
HORTON'S INFILTRATION PARAMETERS FOR SUB-WATERSHEDS

B Ditch

	Decimal Percent Within SubShed (by area)				**Effective**		
Subwatershed ID	**A**	**B**	**C**	**D**	f_i	f_o	***a***
Bditch 1	0.00	0.35	0.65	0.00	3.5	0.5	0.00180
Bditch 5	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Bditch 7	0.00	0.00	0.80	0.20	3.0	0.5	0.00180
Bditch 9	0.00	0.05	0.95	0.00	3.1	0.5	0.00180
Bditch 10	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Bditch 12	0.05	0.00	0.85	0.10	3.1	0.5	0.00175
Bditch 14	0.25	0.00	0.75	0.00	3.5	0.6	0.00153
Bditch 16	0.20	0.00	0.80	0.00	3.4	0.6	0.00158
Bditch 18	0.40	0.00	0.60	0.00	3.8	0.7	0.00136
Bditch 20	0.30	0.00	0.70	0.00	3.6	0.7	0.00147
Bditch 22	0.50	0.00	0.50	0.00	4.0	0.8	0.00125
Btrib 1	0.00	0.15	0.85	0.00	3.2	0.5	0.00180

Clover Ditch

	Decimal Percent Within Sub-Shed (by area)				**Effective**		
Subwatershed ID	A	B	C	D	f_i	f_o	*a*
Clover 1	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Clover 2	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Clover 3	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Clover 4	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Clover 5	0.15	0.00	0.70	0.15	3.3	0.6	0.00164
Clover 6	0.10	0.00	0.90	0.00	3.2	0.6	0.00169
Clover 7	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Clover 8	0.10	0.00	0.90	0.00	3.2	0.6	0.00169
Clover 9	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
Clover 10	0.00	0.00	1.00	0.00	3.0	0.5	0.00180
CLVR 10.2	0.60	0.00	0.40	0.00	4.2	0.8	0.00114
CLVR 10.3	0.50	0.00	0.50	0.00	4.0	0.8	0.00125
Clover 11	0.60	0.00	0.40	0.00	4.2	0.8	0.00114
Clover 12	0.45	0.00	0.55	0.00	3.9	0.7	0.00131
Clover 13	0.35	0.00	0.65	0.00	3.7	0.7	0.00142

TABLE 1b
HORTON'S INFILTRATION PARAMETERS FOR SUB-WATERSHEDS

Rock Creek

	Decimal Percent Within Sub-Shed (by area)				Effective		
Subwatershed ID	**A**	**B**	**C**	**D**	f_i	f_o	*a*
RockNode1	0.10	0.75	0.15	0.00	4.3	0.6	0.00169
RockNode2	0.25	0.60	0.15	0.00	4.4	0.7	0.00153
RockNode3	0.20	0.80	0.00	0.00	4.6	0.7	0.00158
RockNode4	0.10	0.75	0.05	0.10	4.3	0.6	0.00169
RockNode5	0.05	0.50	0.00	0.45	3.9	0.6	0.00175
RockNode6	0.00	0.05	0.00	0.95	3.1	0.5	0.00180
RockNode7	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode8	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode9	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode10	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode11	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode12	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode13	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode14	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode15	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode16	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode17	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode18	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode19	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode20	0.00	0.00	0.00	1.00	3.0	0.5	0.00180
RockNode21	0.00	0.00	0.00	1.00	3.0	0.5	0.00180

TABLE 2a
TRAINING AREA BRAVO PERCENT IMPERVIOUS BY AREA OF SUB-WATERSHEDS

Subwatershed	Baseline	Existing Conditions	Scenario 1 (100% to B Ditch)	Scenario 2 (100% to Clover Ditch)	Scenario 3 (50% B-Ditch, 50% Clover)
Bditch 1	20	30	40	-	40
Bditch 5	0	75	85	-	85
Bditch 7	0	60	75	-	75
Bditch 9	0	25	65	-	65
Bditch 10	0	70	75	-	75
Bditch 12	0	75	80	-	75
Bditch 14	0	35	65	-	65
Bditch 16	0	70	70	-	70
Bditch 18	0	30	34	-	32
Bditch 20	0	25	29	-	27
Bditch 22	0	5	18	-	12
Btrib 1	10	50	50	-	50
Clover 1	0	70	-	85	85
Clover 2	0	70	-	90	90
Clover 3	0	75	-	80	80
Clover 4	0	65	-	70	70
Clover 5	0	35	-	50	50
Clover 6	0	50	-	80	80
Clover 7	0	65	-	95	95
Clover 8	0	30	-	95	95
Clover 9	0	40	-	95	95
Clover 10	0	60	-	70	70
Clover 11	0	35	-	40	30
Clover 12	0	5	-	15	13
Clover 13	0	2	-	2	2
CLVR 10.2	0	5	-	34	20
CLVR 10.3	0	5	-	9	7

TABLE 2b
TENT CITY PERCENT IMPERVIOUS BY AREA OF SUB-WATERSHEDS

Subwatershed	Baseline	Existing Conditions	Scenario 4
RockNode1	0	10	10
RockNode2	0	2	2
RockNode3	0	5	5
RockNode4	0	2	9
RockNode5	5	5	5
RockNode6	10	10	10
RockNode7	10	10	10
RockNode8	10	10	10
RockNode9	10	10	10
RockNode10	10	10	10
RockNode11	10	10	10
RockNode12	10	10	10
RockNode13	10	10	10
RockNode14	10	10	10
RockNode15	10	10	10
RockNode16	10	10	10
RockNode17	10	10	10
RockNode18	10	10	10
RockNode19	10	10	10
RockNode20	10	10	10
RockNode21	10	10	10

TABLE 2c
OPERATIONAL READINESS TRAINING COMPLEX PERCENT IMPERVIOUS BY AREA OF SUB-WATERSHEDS

Subwatershed	Baseline	Existing Conditions	Scenario 5 (IBCT)	Scenario 6 (CAB)	Scenario 7 (IBCT & CAB)
RockNode1	0	10	10	14	19
RockNode3	0	5	5	5	5
RockNode4	0	2	2	2	2
RockNode5	5	5	5	5	5
RockNode6	10	10	10	10	10
RockNode7	10	10	10	10	10
RockNode8	10	10	10	10	10
RockNode9	10	10	10	10	10
RockNode10	10	10	10	10	10
RockNode11	10	10	10	10	10
RockNode12	10	10	10	10	10
RockNode13	10	10	10	10	10
RockNode14	10	10	10	10	10
RockNode15	10	10	10	10	10
RockNode16	10	10	10	10	10
RockNode17	10	10	10	10	10
RockNode18	10	10	10	10	10
RockNode19	10	10	10	10	10
RockNode20	10	10	10	10	10
RockNode21	10	10	10	10	10

TABLE 3
SCENARIO 1 THROUGH 7 SUMMARY

		Current % Impervious	Proposed % Impervious	Link Location	Percent Increase in Discharge	Proposed Peak Discharge (CFS)	Proposed Peak Velocity (FPS)
Scenario 1	100 % of IBCT discharging to B Ditch	43	52	35	4%	2010	3
Scenario 2	100 % of IBCT discharging to Clover Ditch	28	42	125	2%	2355	10
Scenario 3	50 % of IBCT discharging to B Ditch and 50% discharging to Clover Ditch	43	52	35	3 % B Ditch	2000	3
		28	41	125	2 % Clover	2350	10
Scenario 4	100 % of IBCT discharging to Rock Creek	7	8	A.1	1%	1880	8
Scenario 5	95 % IBCT discharging to Rock Creek and 5% discharging to Central Unnamed Ditch	7	8	A.1	1 % Rock Ck	1880	8
		Less then 0.05%	Less then 0.05%	T78	< 1 % CUD	330	7
Scenario 6	100 % CAB discharging to Rock Creek	7	8	A.1	1%	1880	8
Scenario 7	95 % IBCT discharging to Rock Creek and 5% discharging to Central Unnamed Ditch and 100% CAB discharging to Rock Creek	7	9	A.1	2 % Rock	1880	8
		Less then 0.05%	Less then 0.05%	T78	< 1 % CUD	330	7

Note:
cfs = cubic feet per second
fps = feet per second

:

FIGURES

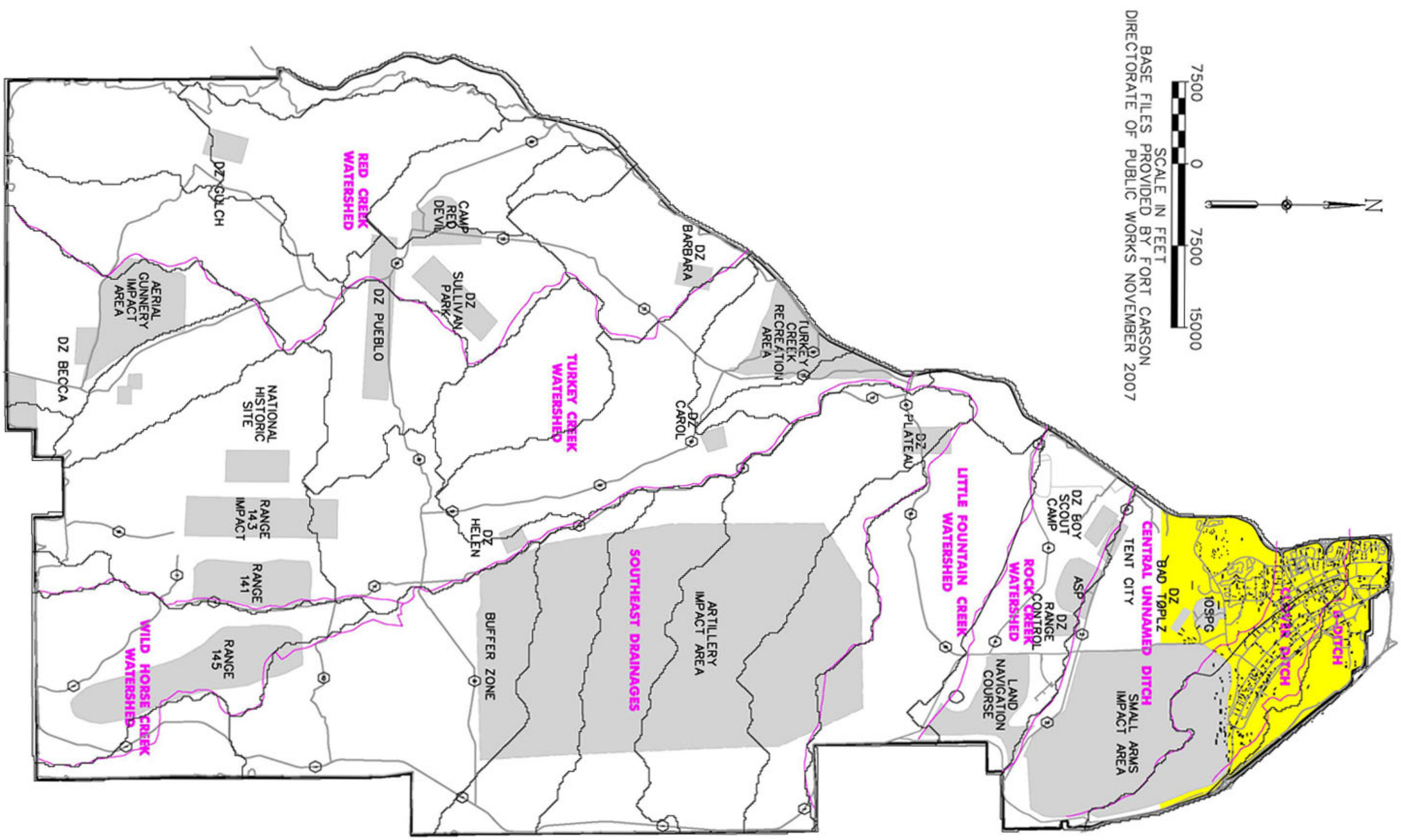

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Figure 1
Site Map
Fort Carson

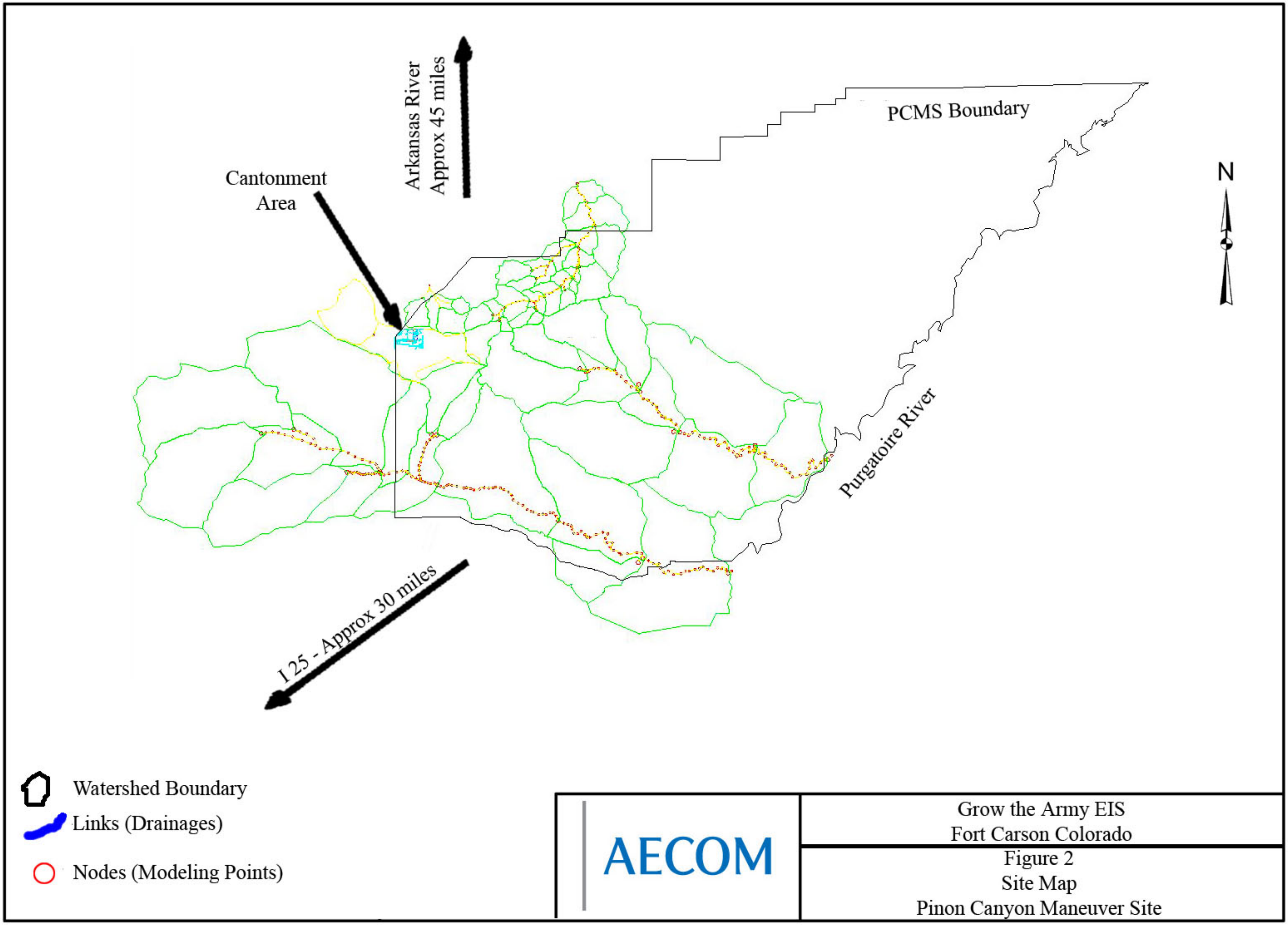

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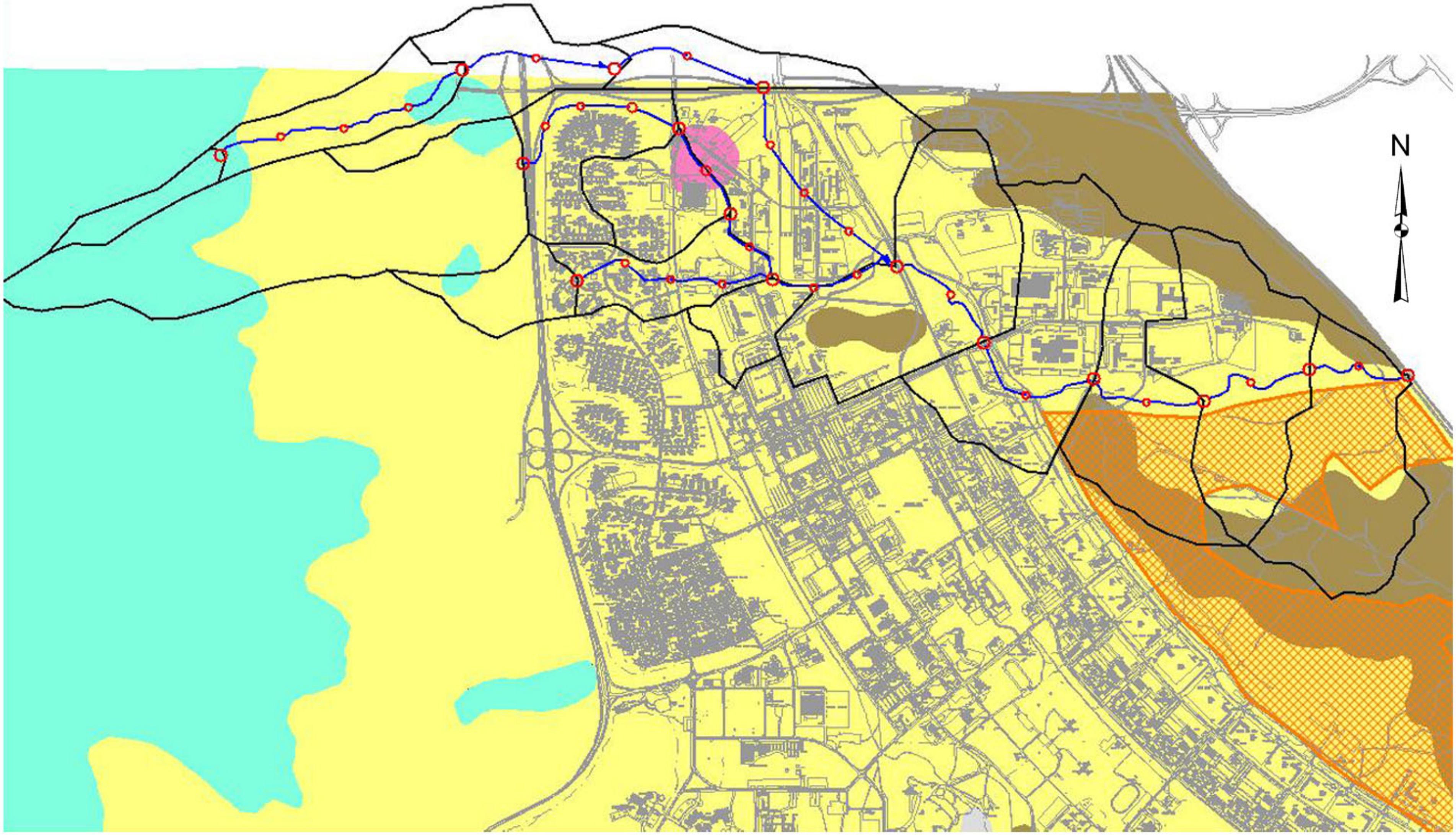
Figure 2
Site Map
Pinon Canyon Maneuver Site



Study Area

Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

Soil Type A

Soil Type B

Soil Type C

Soil Type D

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Figure 3
Hydrologic Soil Group Map - B Ditch

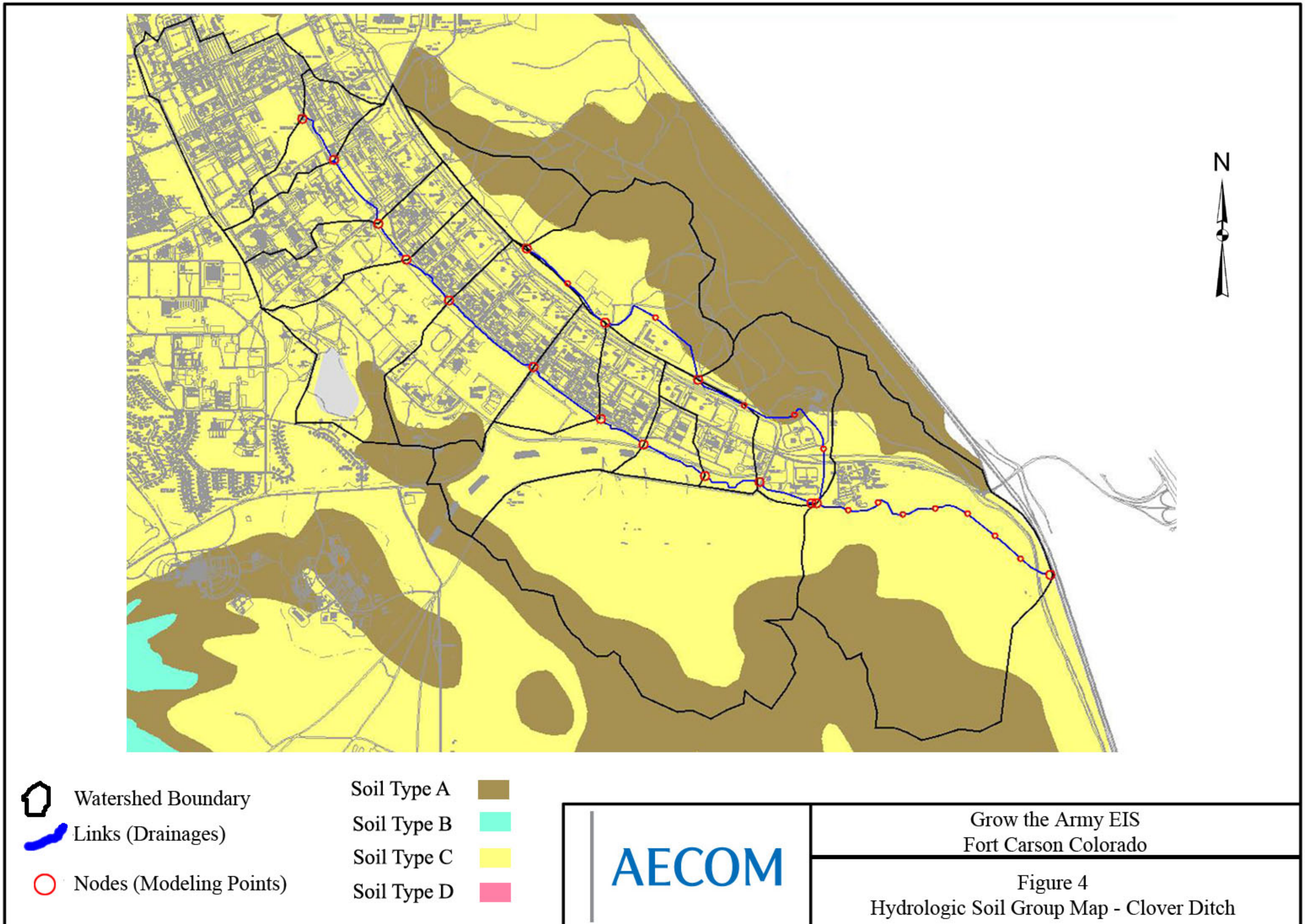

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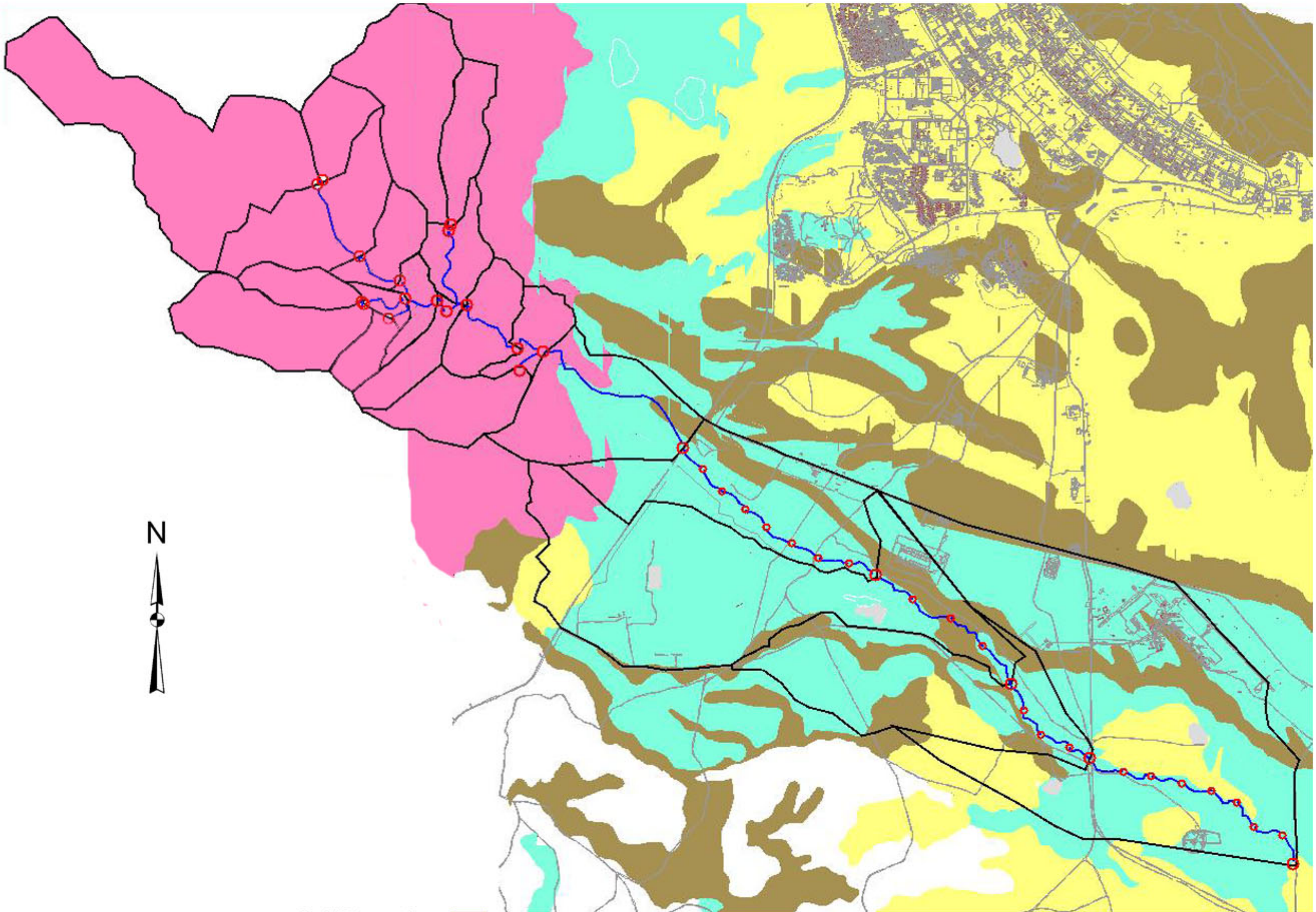
Figure 4
Hydrologic Soil Group Map - Clover Ditch



Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

Soil Type A

Soil Type B

Soil Type C

Soil Type D

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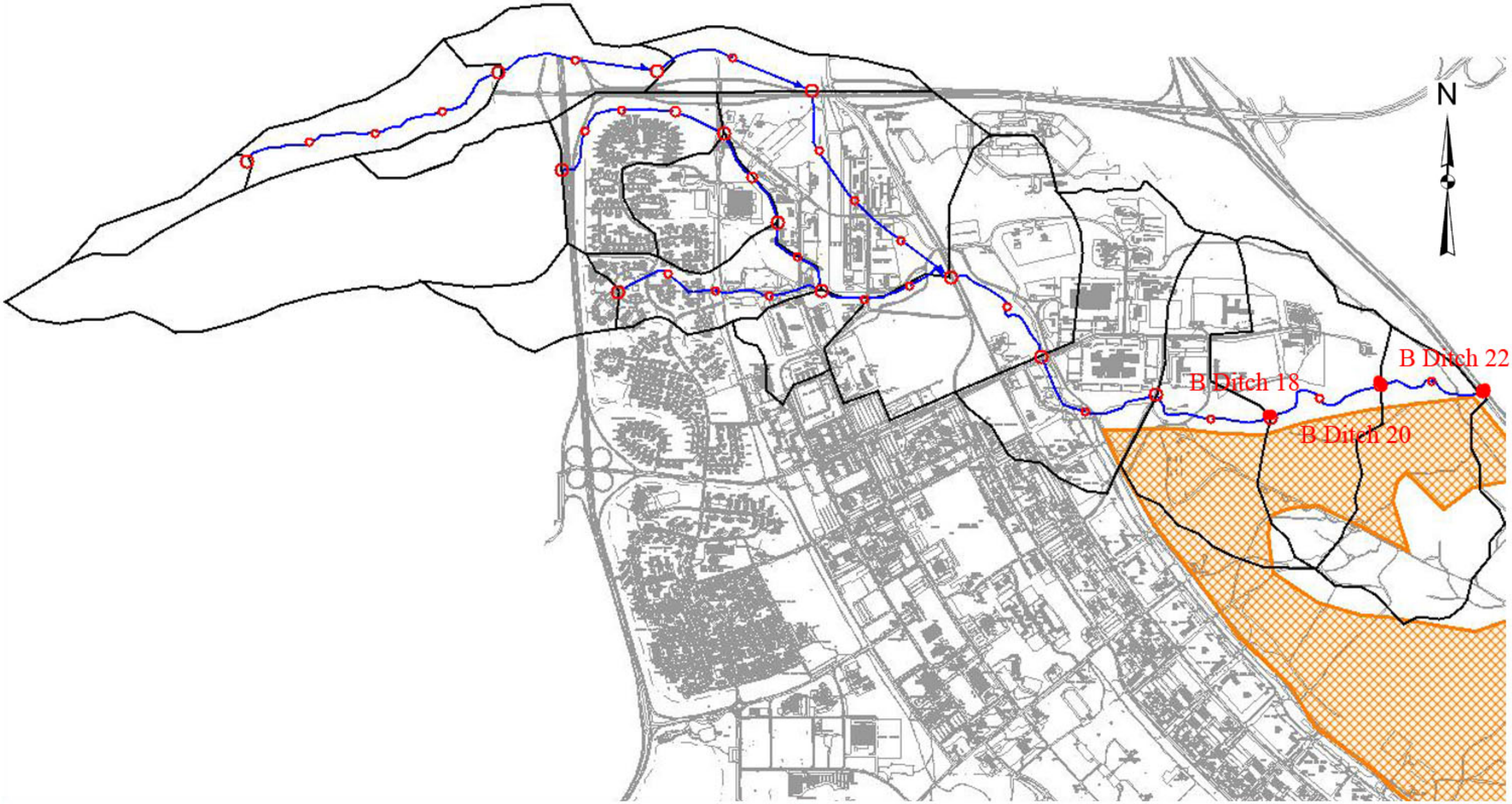
Figure 5
Hydrologic Soil Group Map - Rock Creek



Study Area

Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

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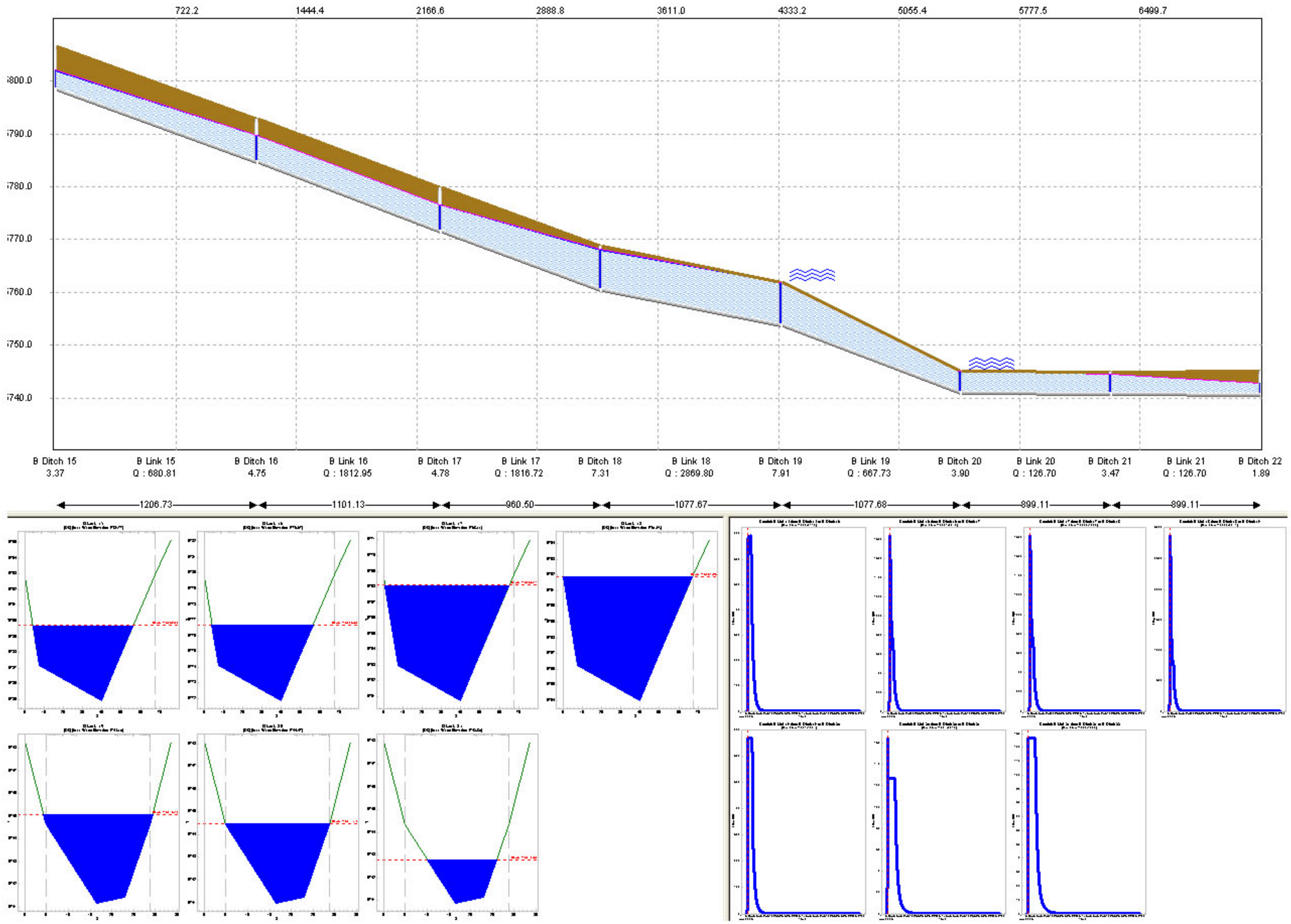
Figure 6
TAB - Scenario 1
Site Location Map - B Ditch



Flooding

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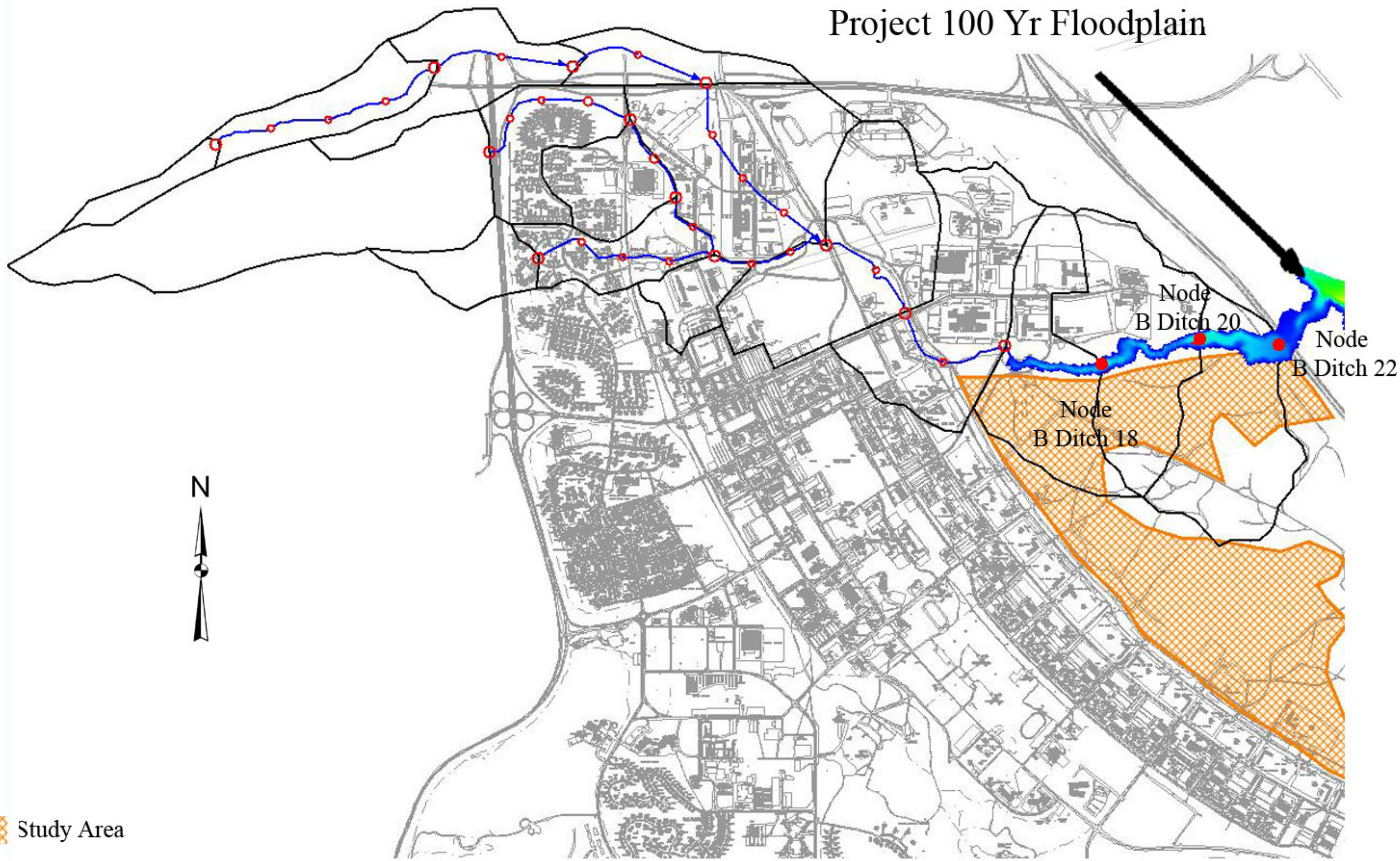
Figure 7
TAB - Scenario 1
Dynamic Cross Section - B Ditch



Study Area

Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

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Figure 8
TAB - Scenario 1
Projected 100 Year Floodplain - B Ditch

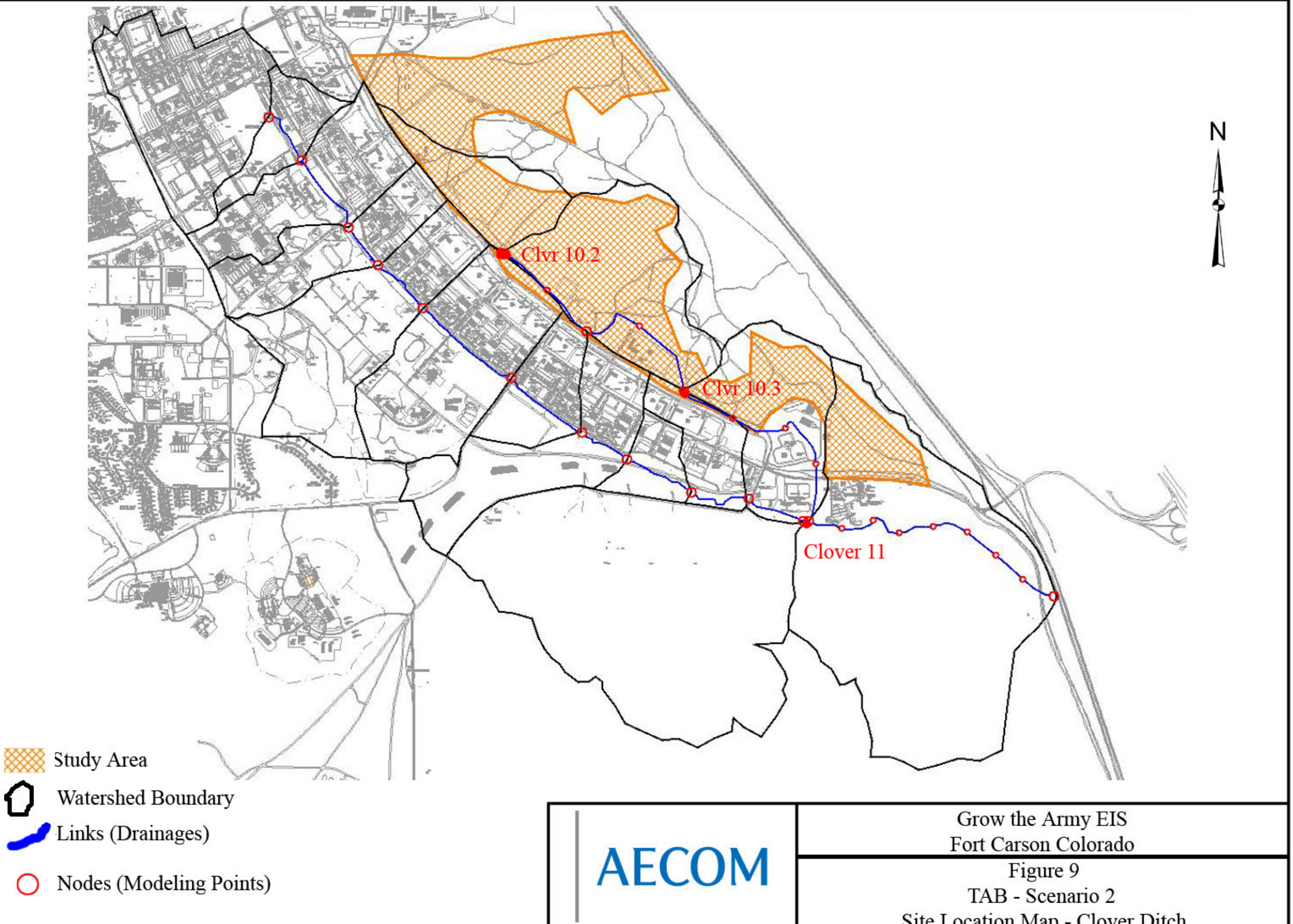

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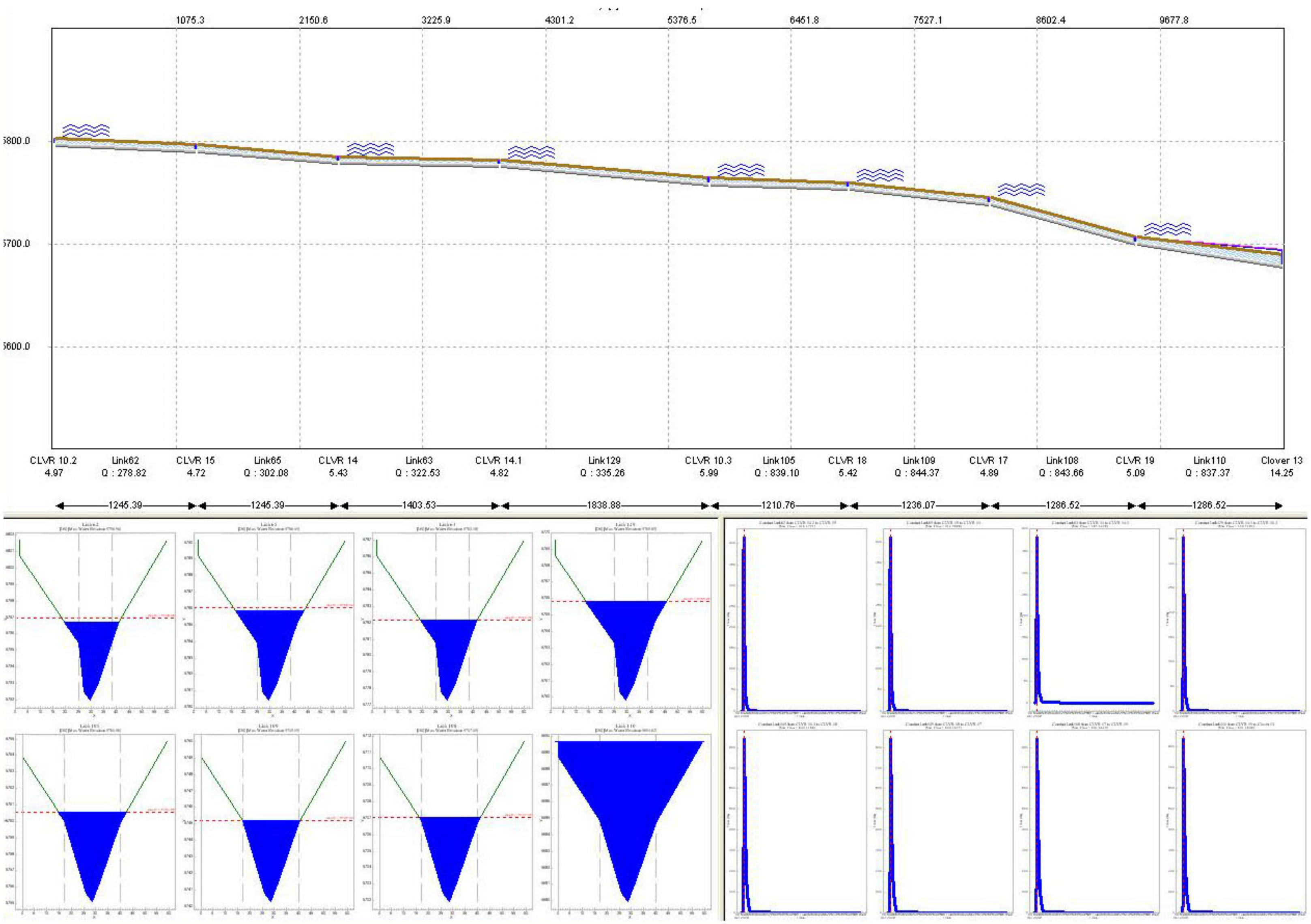
Figure 9
TAB - Scenario 2
Site Location Map - Clover Ditch



Flooding

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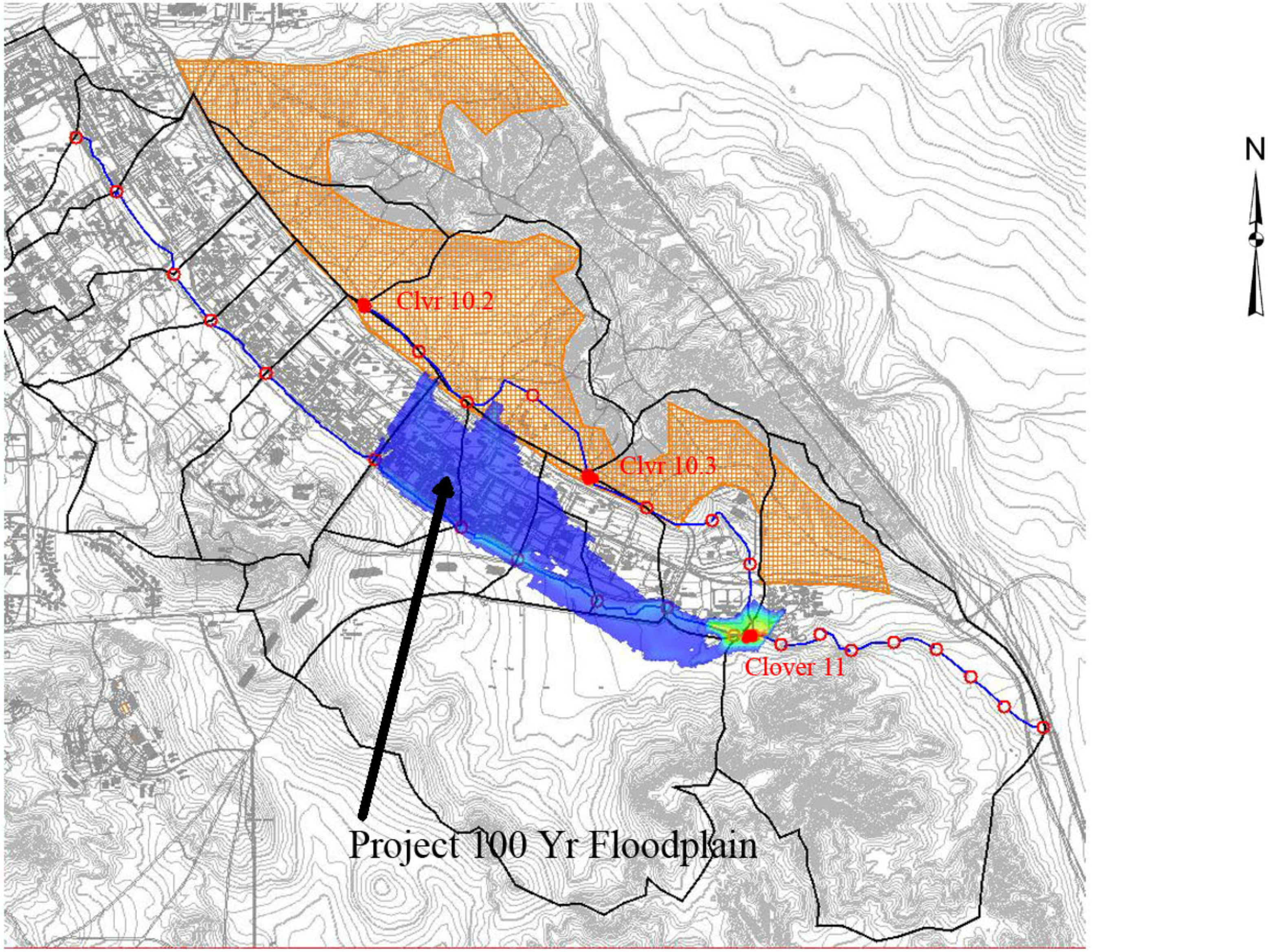
Figure 10
TAB - Scenario 2
Dynamic Cross Section - Clover Ditch



Study Area

Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

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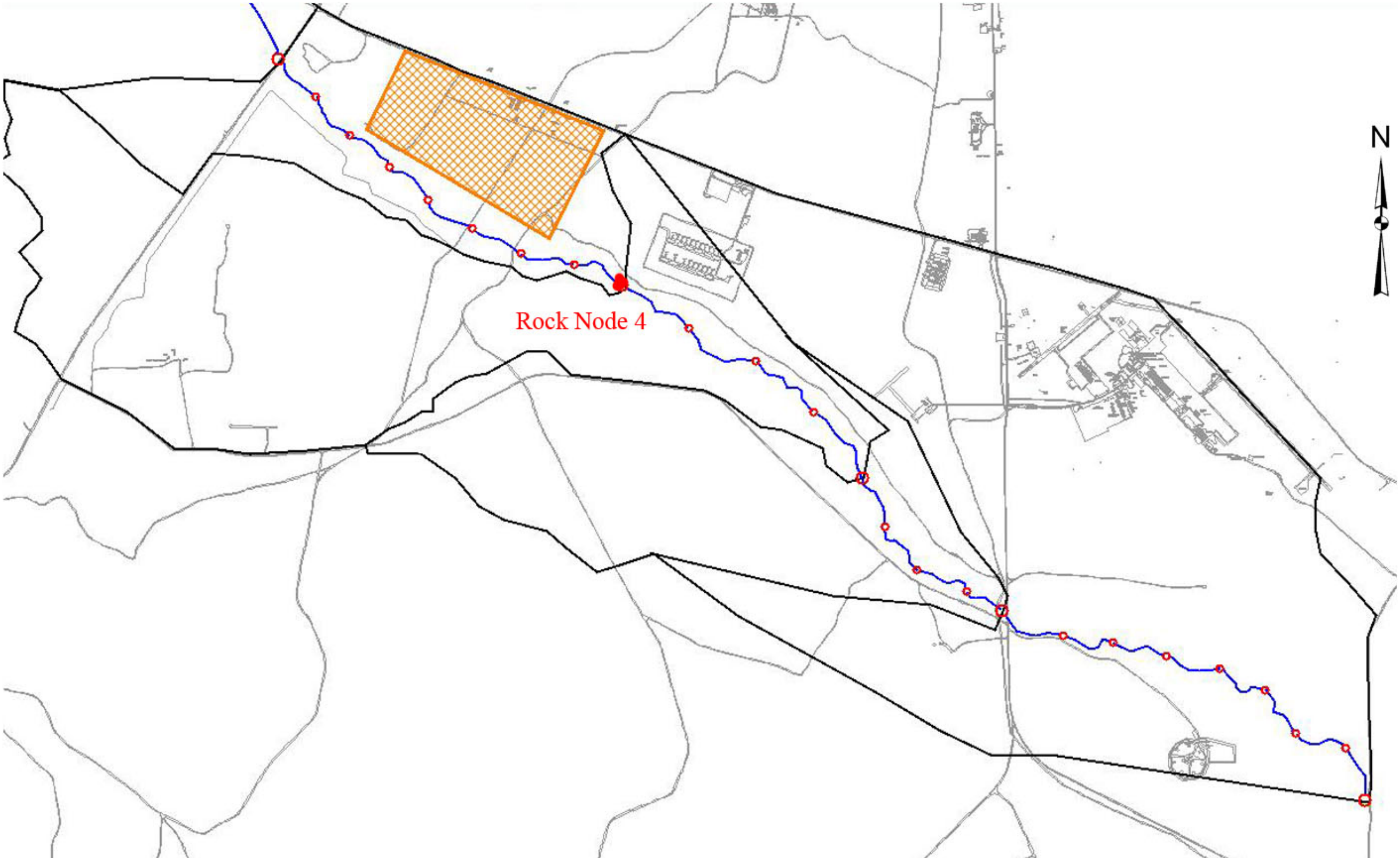
Figure 11
TAB - Scenario 2
Projected 100 Year Floodplain - Clover Ditch



Study Area

Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

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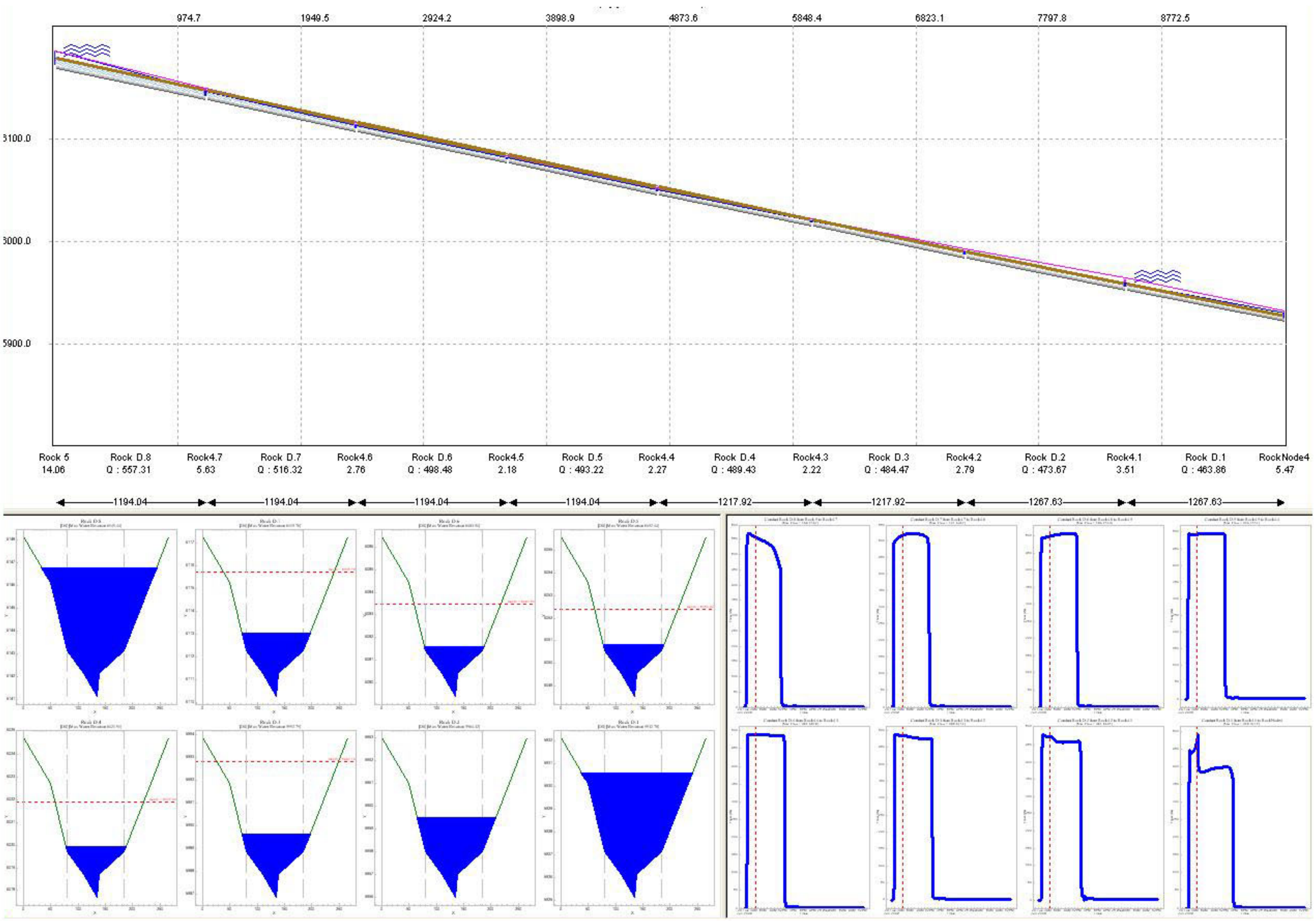
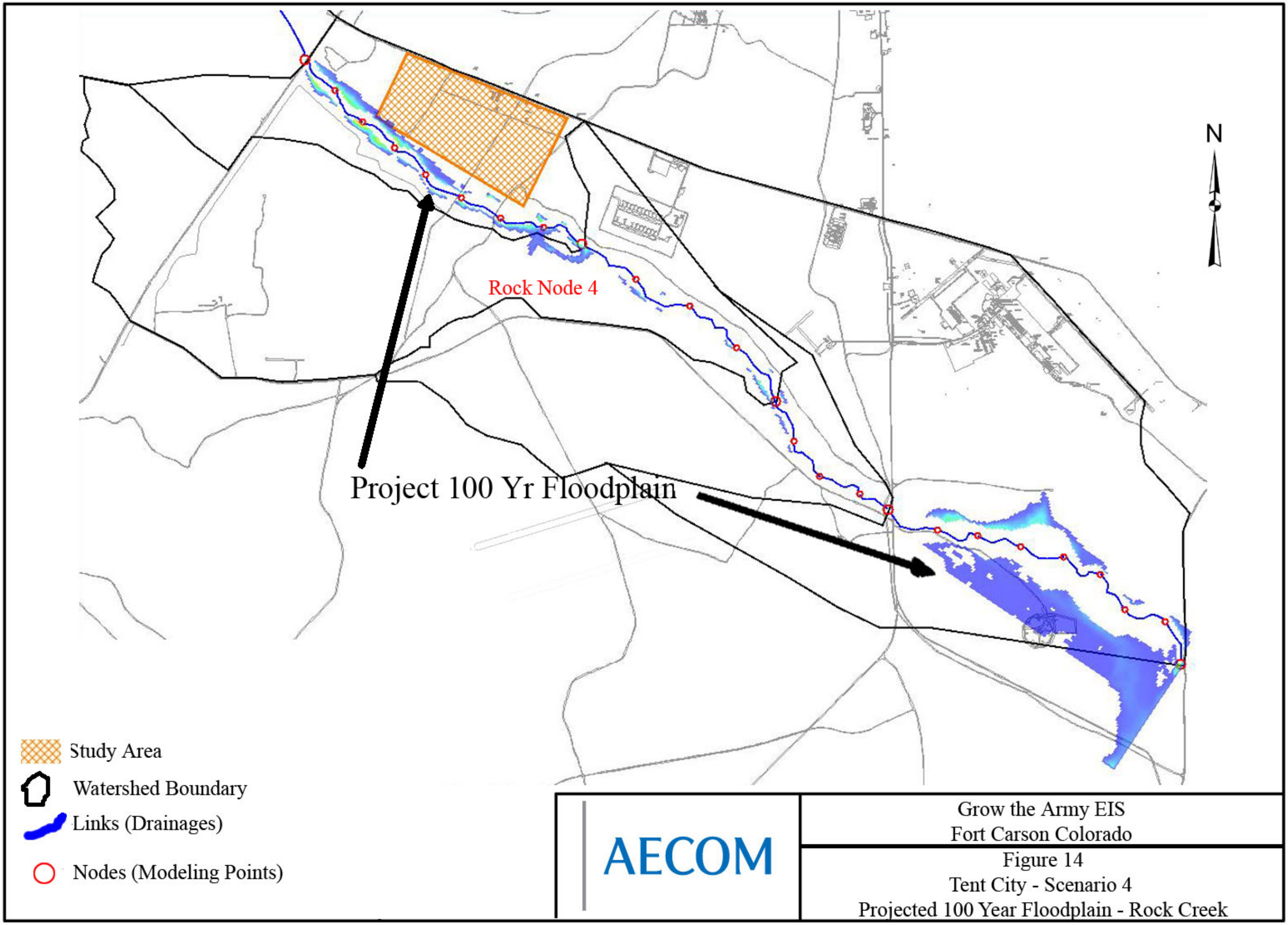
Figure 12
Tent City - Scenario 4
Site Location Map - Rock Creek



Flooding

AECOM	Grow the Army EIS Fort Carson Colorado
	Figure 13 Tent City - Scenario 4 Dynamic Cross Section - Rock Creek



N
Rock Node 4
Project 100 Yr Floodplain
Study Area
Watershed Boundary
Links (Drainages)
Nodes (Modeling Points)
AECOM
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Figure 14
Tent City - Scenario 4
Projected 100 Year Floodplain - Rock Creek

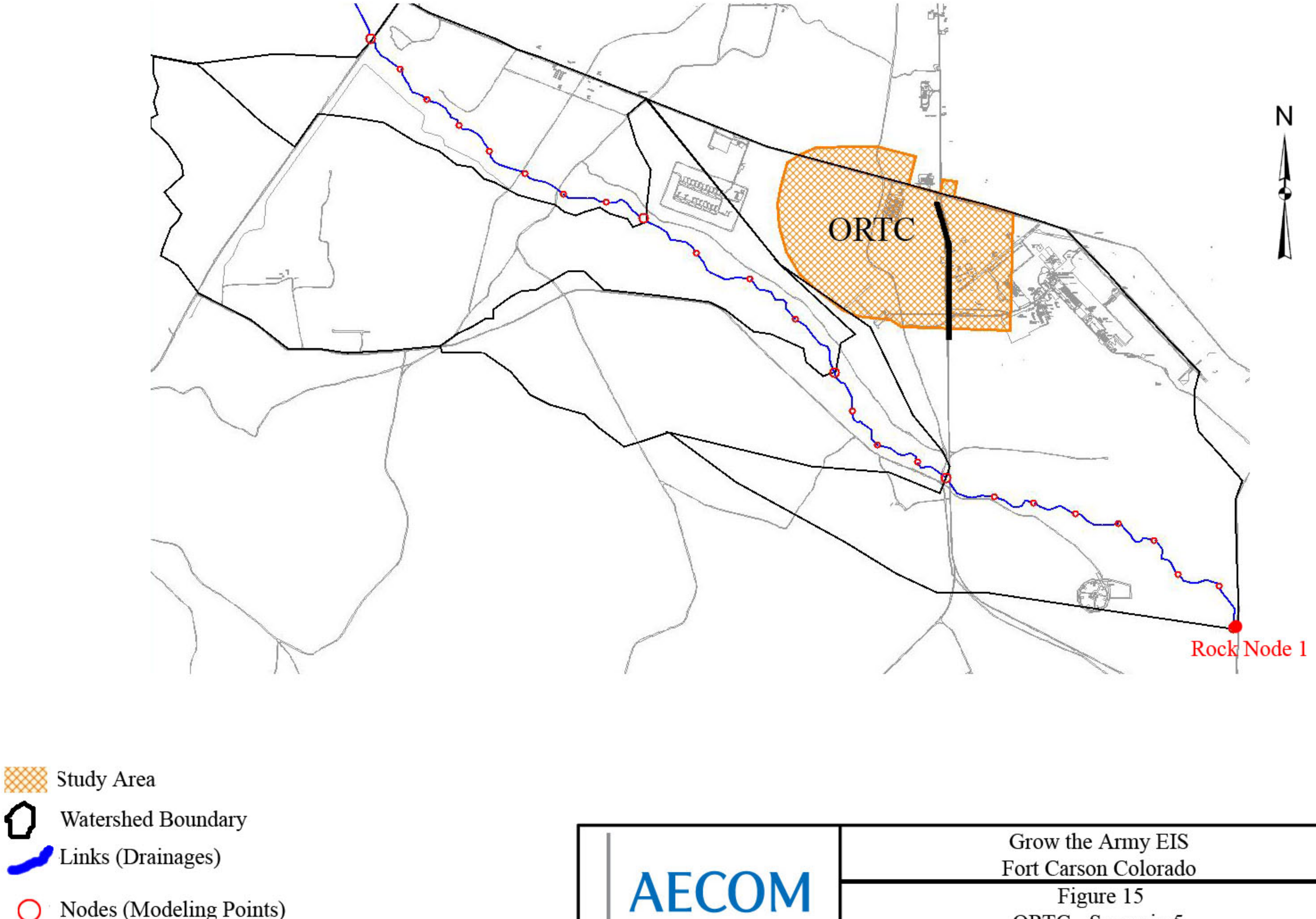

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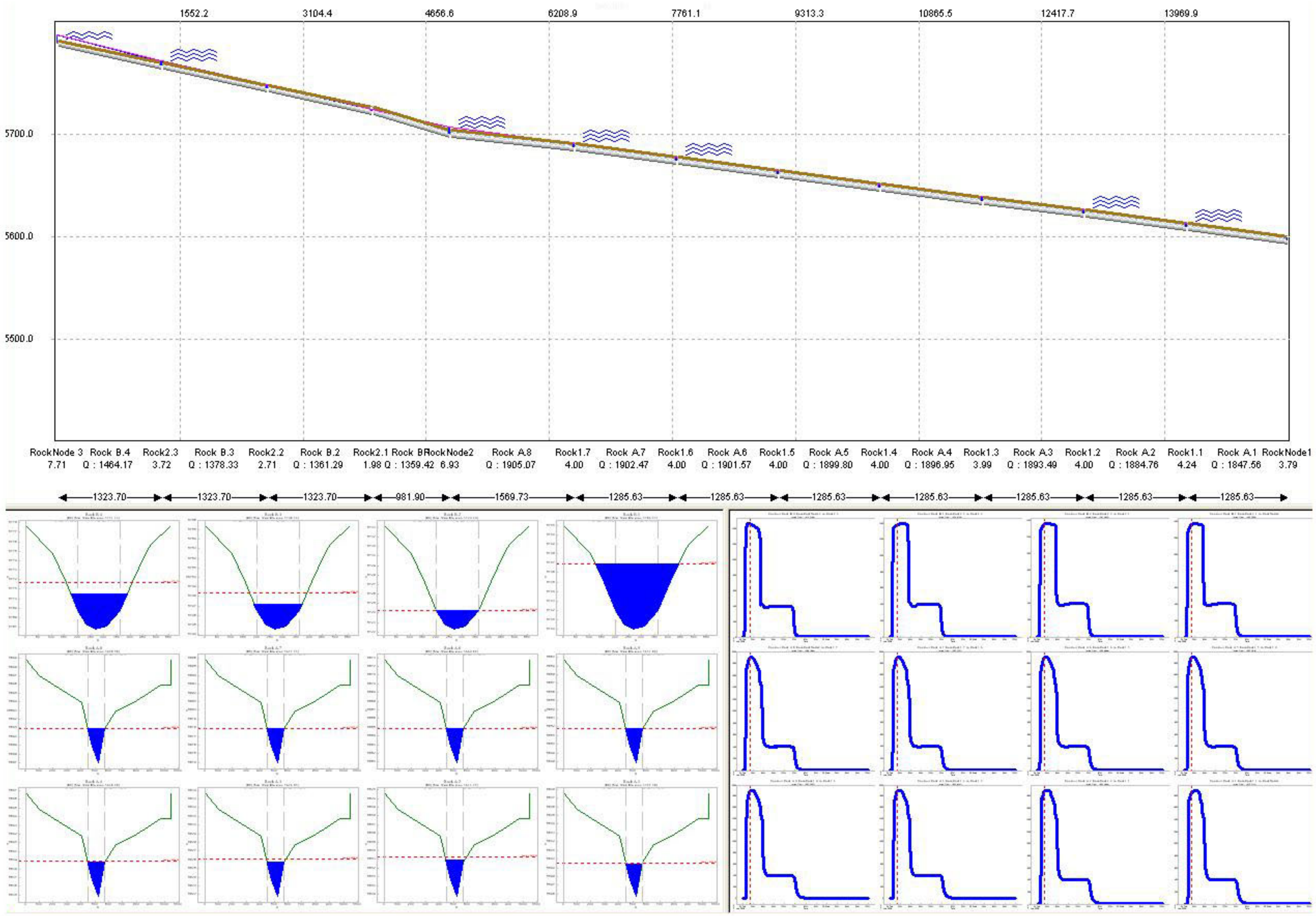
Figure 15
ORTC - Scenario 5
Site Location Map - Rock Creek



Flooding

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Figure 16
ORTC - Scenario 5
Dynamic Cross Section - Rock Creek

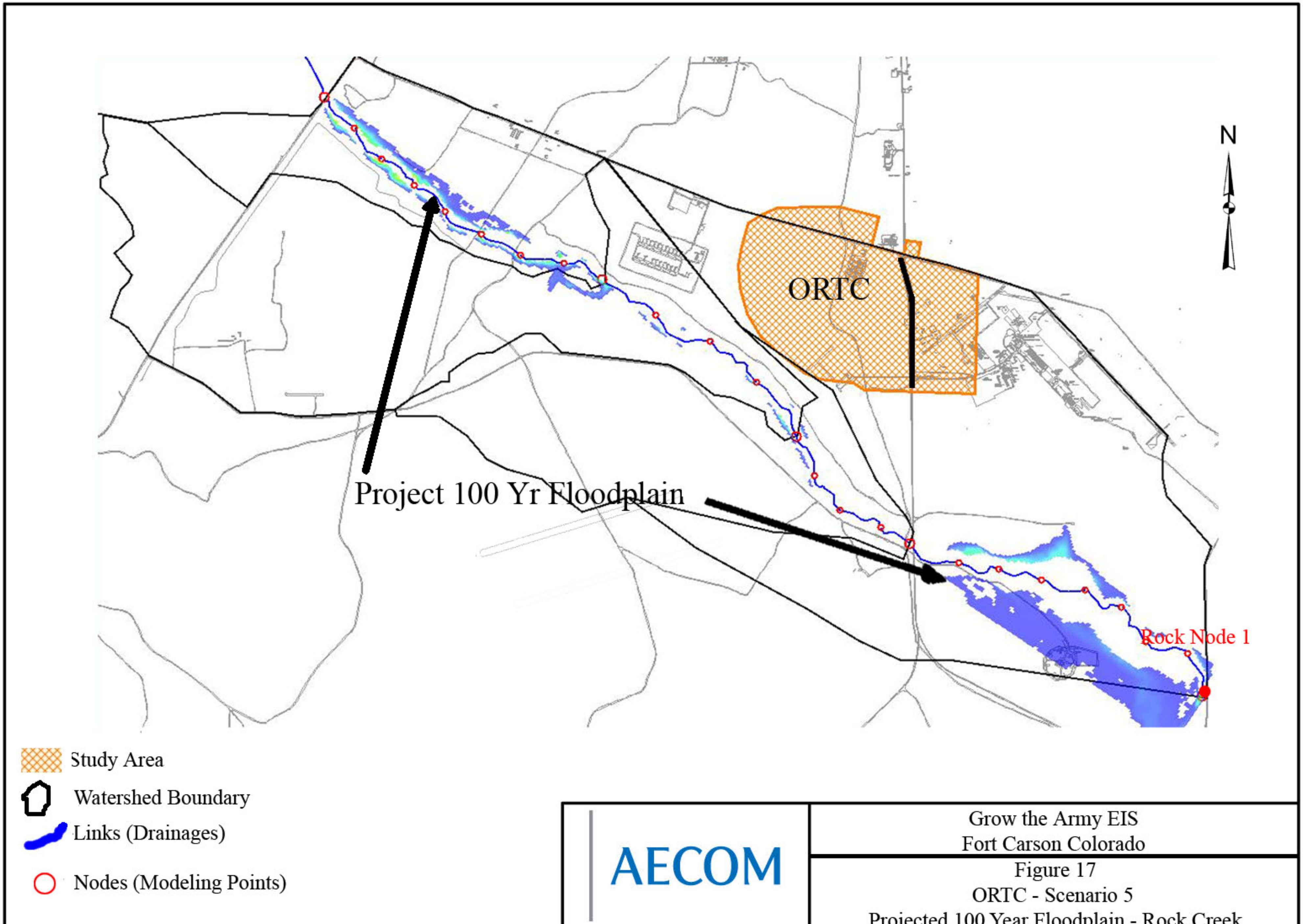

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Figure 17
ORTC - Scenario 5
Projected 100 Year Floodplain - Rock Creek

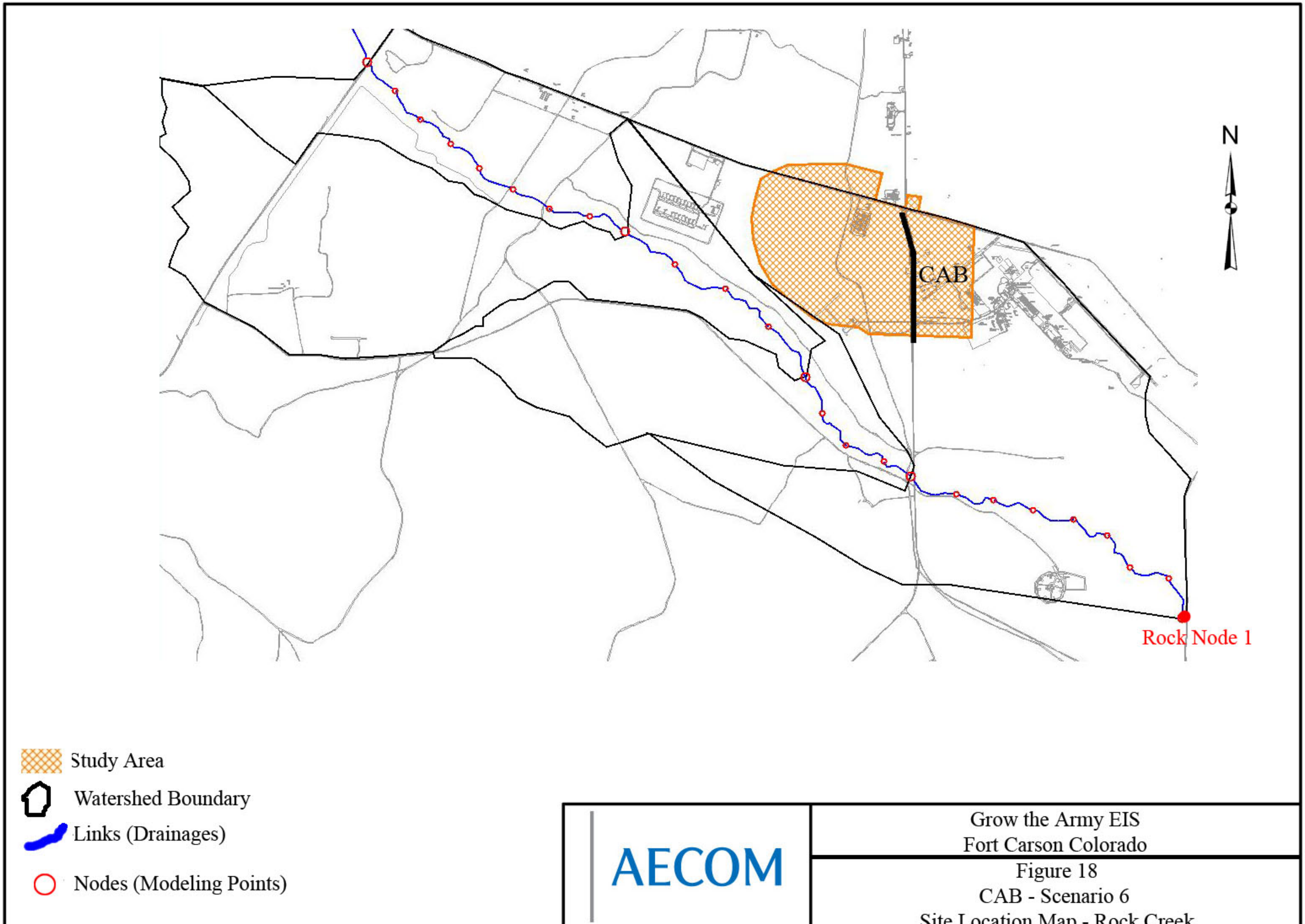

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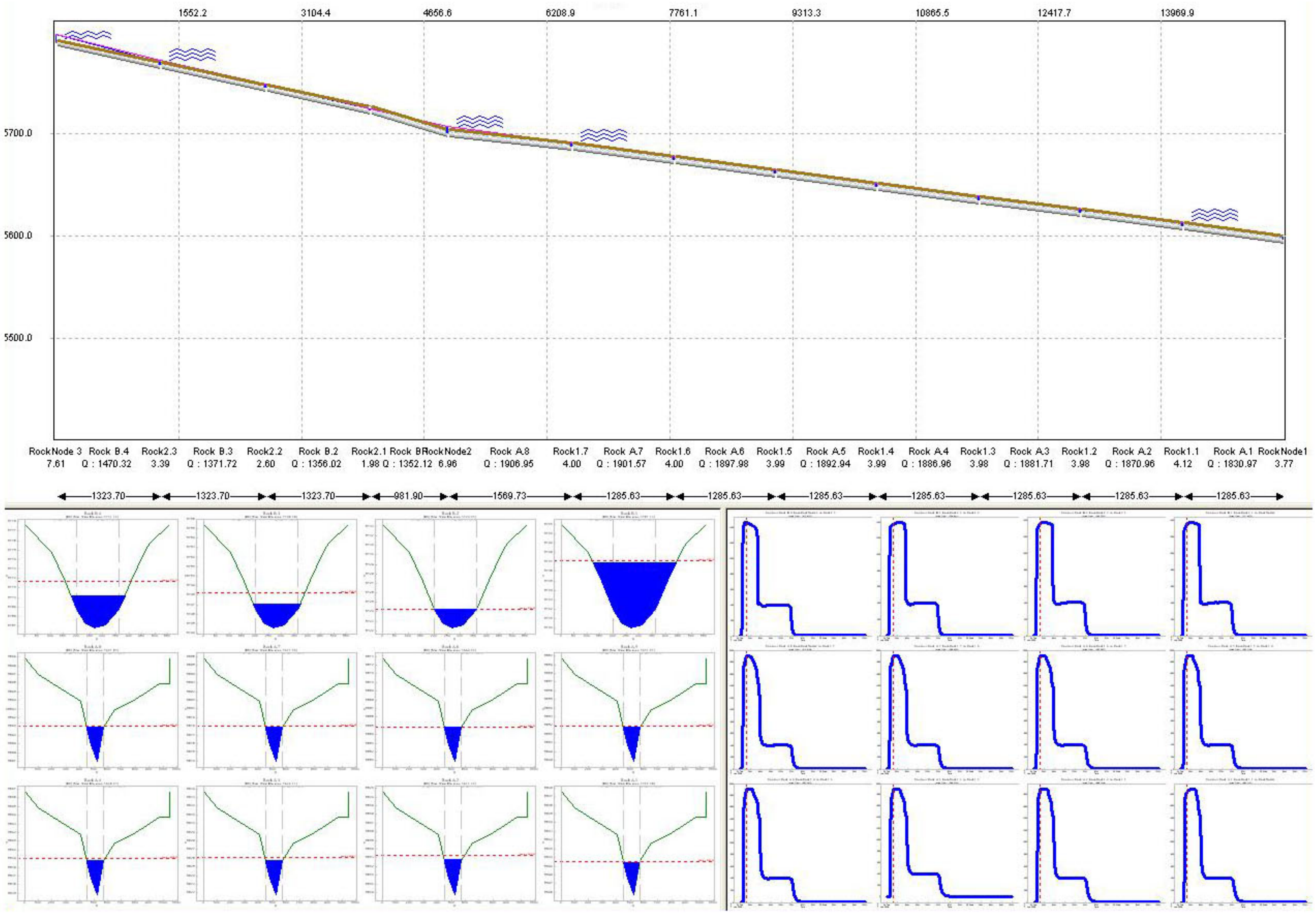
Figure 18
CAB - Scenario 6
Site Location Map - Rock Creek



Flooding

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Figure 19
CAB - Scenario 6
Dynamic Cross Section - Rock Creek

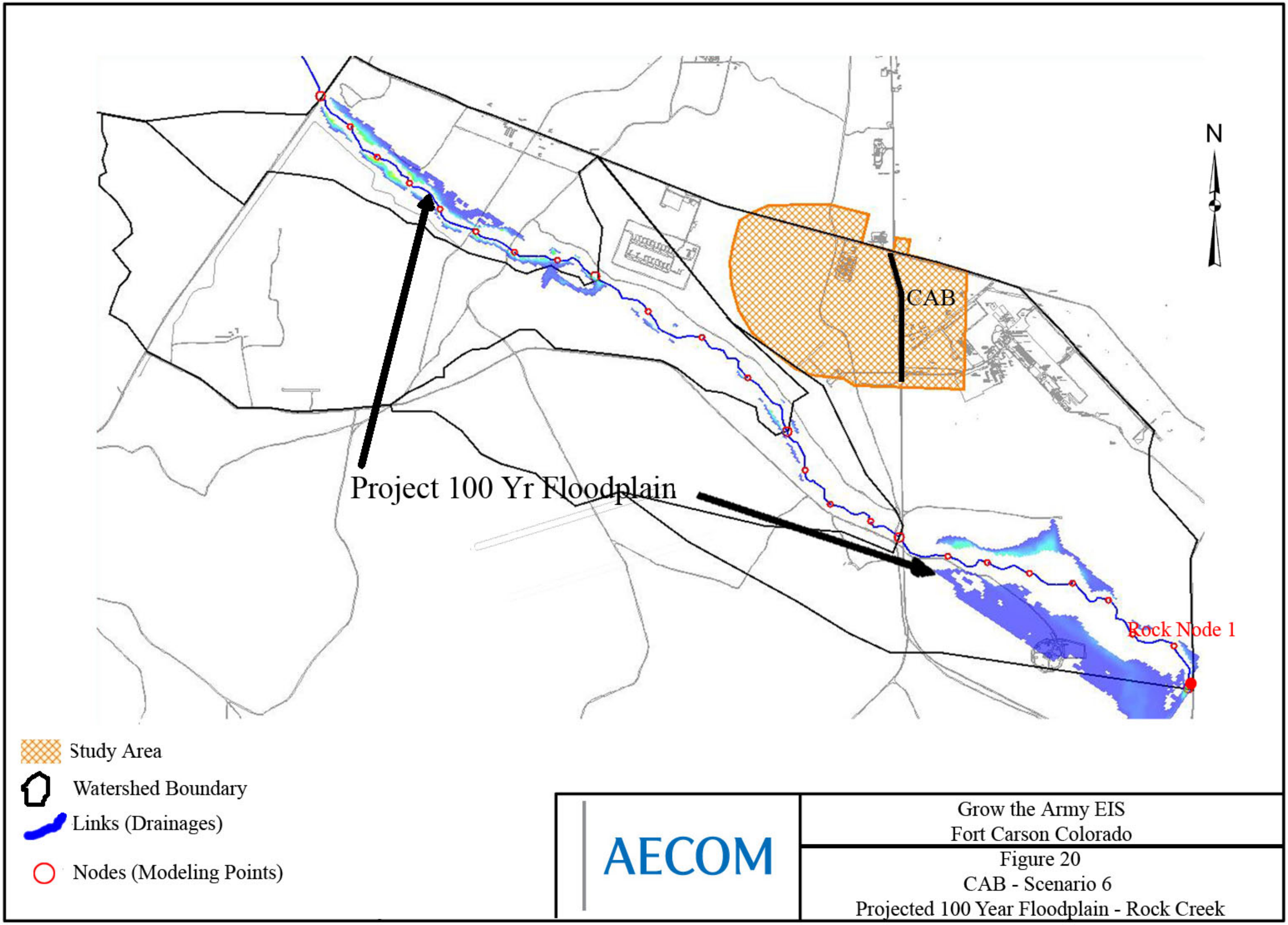

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Figure 20
CAB - Scenario 6
Projected 100 Year Floodplain - Rock Creek

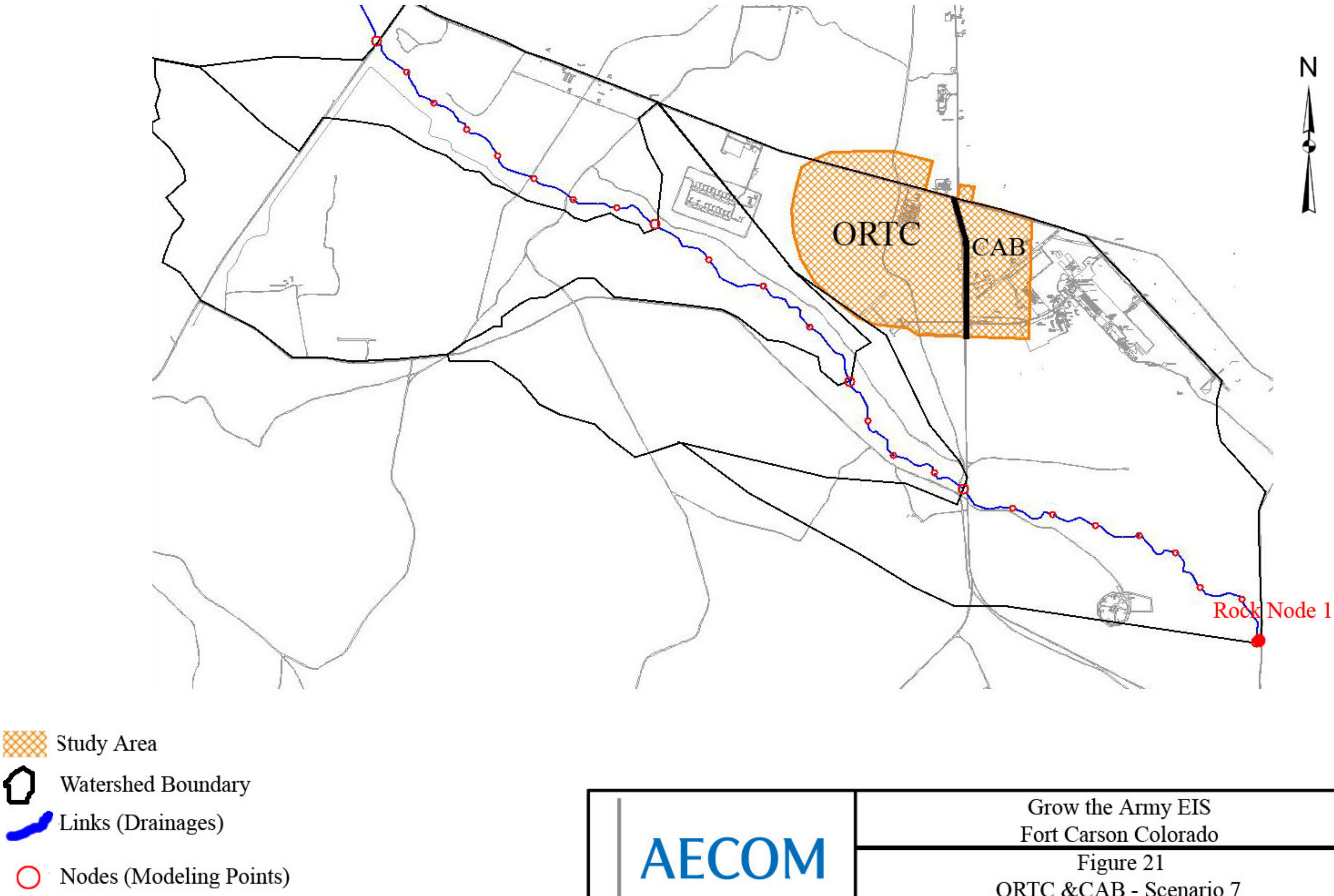

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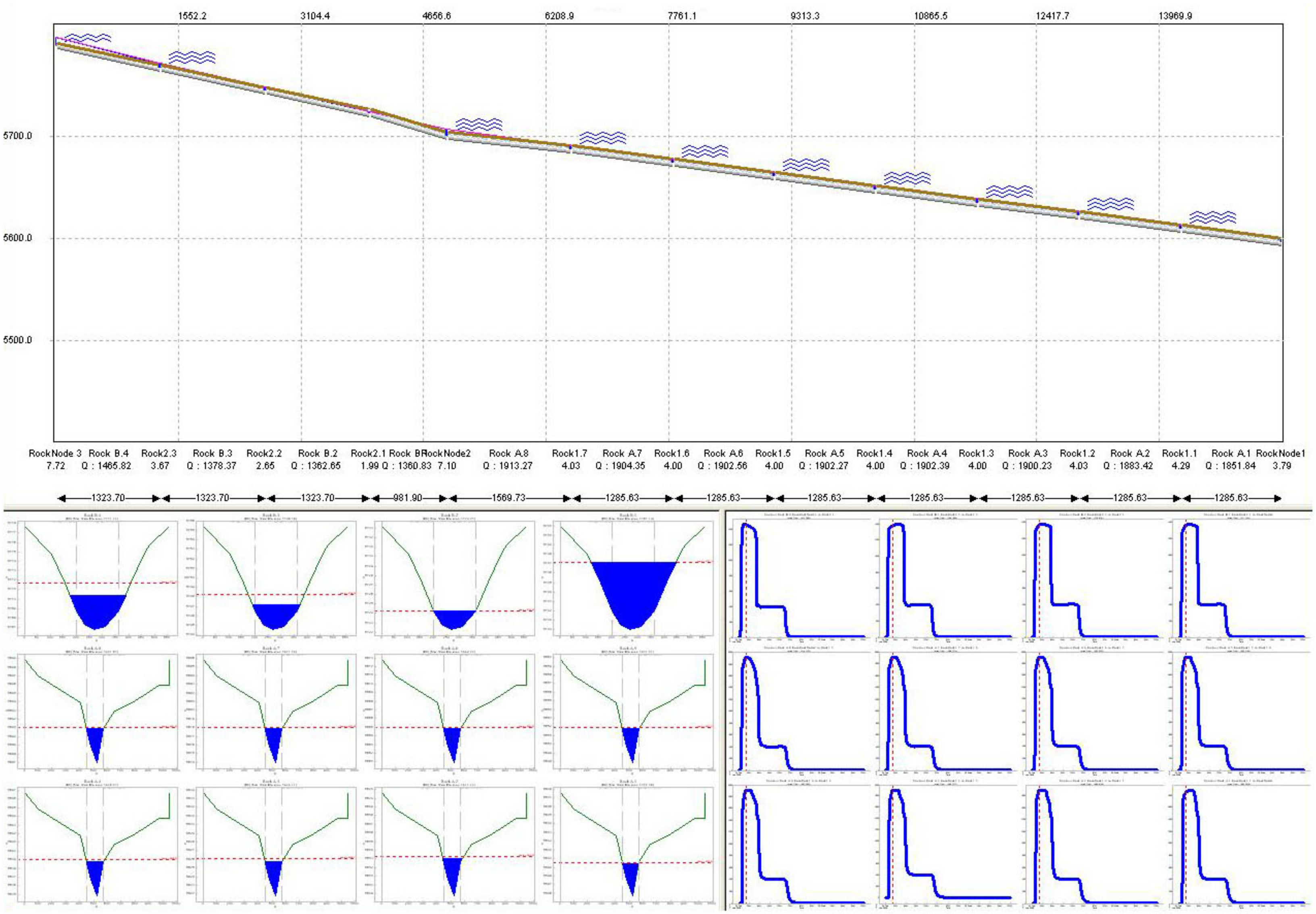
Figure 21
ORTC &CAB - Scenario 7
Site Location Map - Rock Creek



Flooding

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Figure 22
ORTC &CAB - Scenario 7
Dynamic Cross Section - Rock Creek

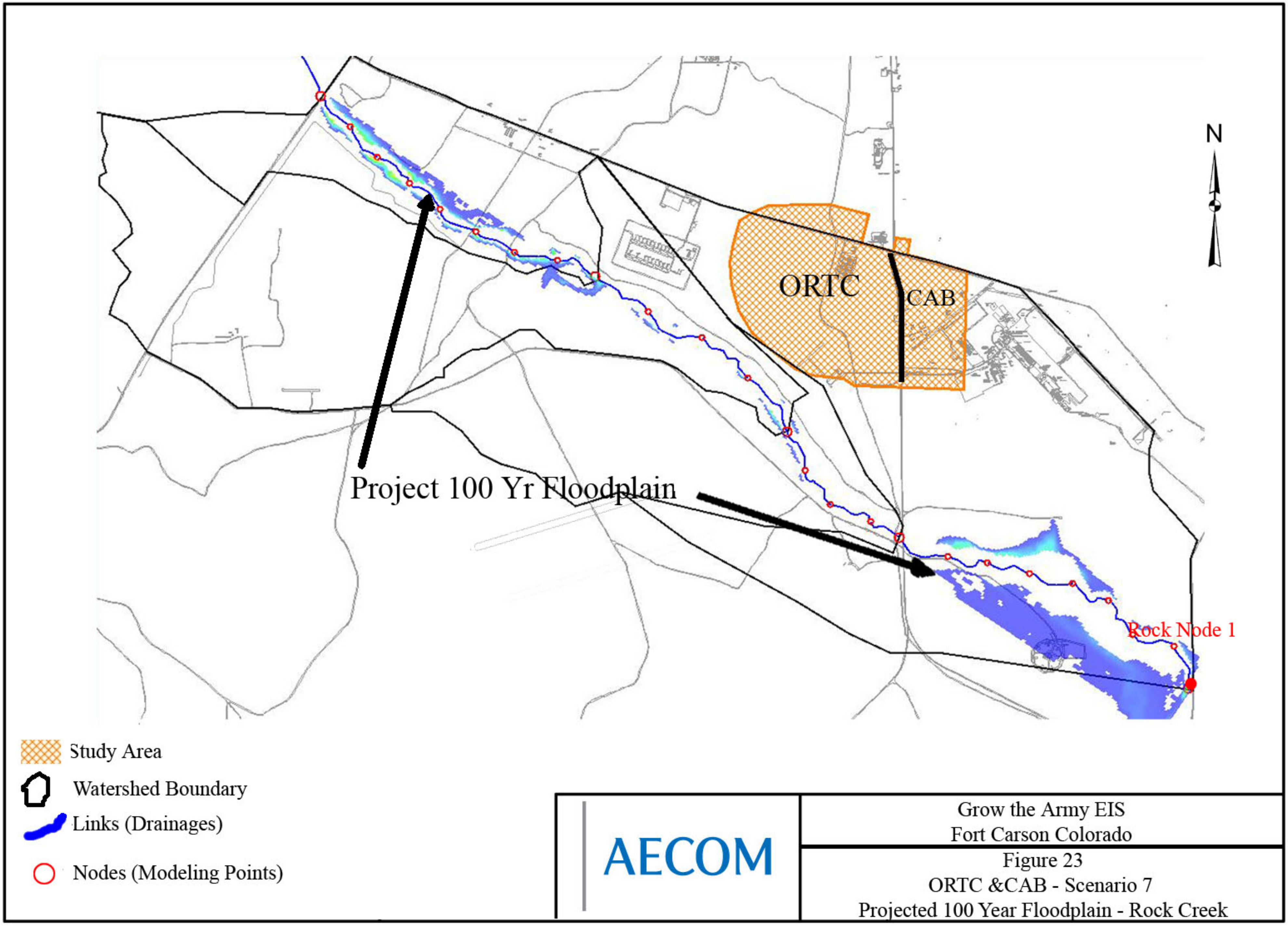

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Figure 23
ORTC &CAB - Scenario 7
Projected 100 Year Floodplain - Rock Creek

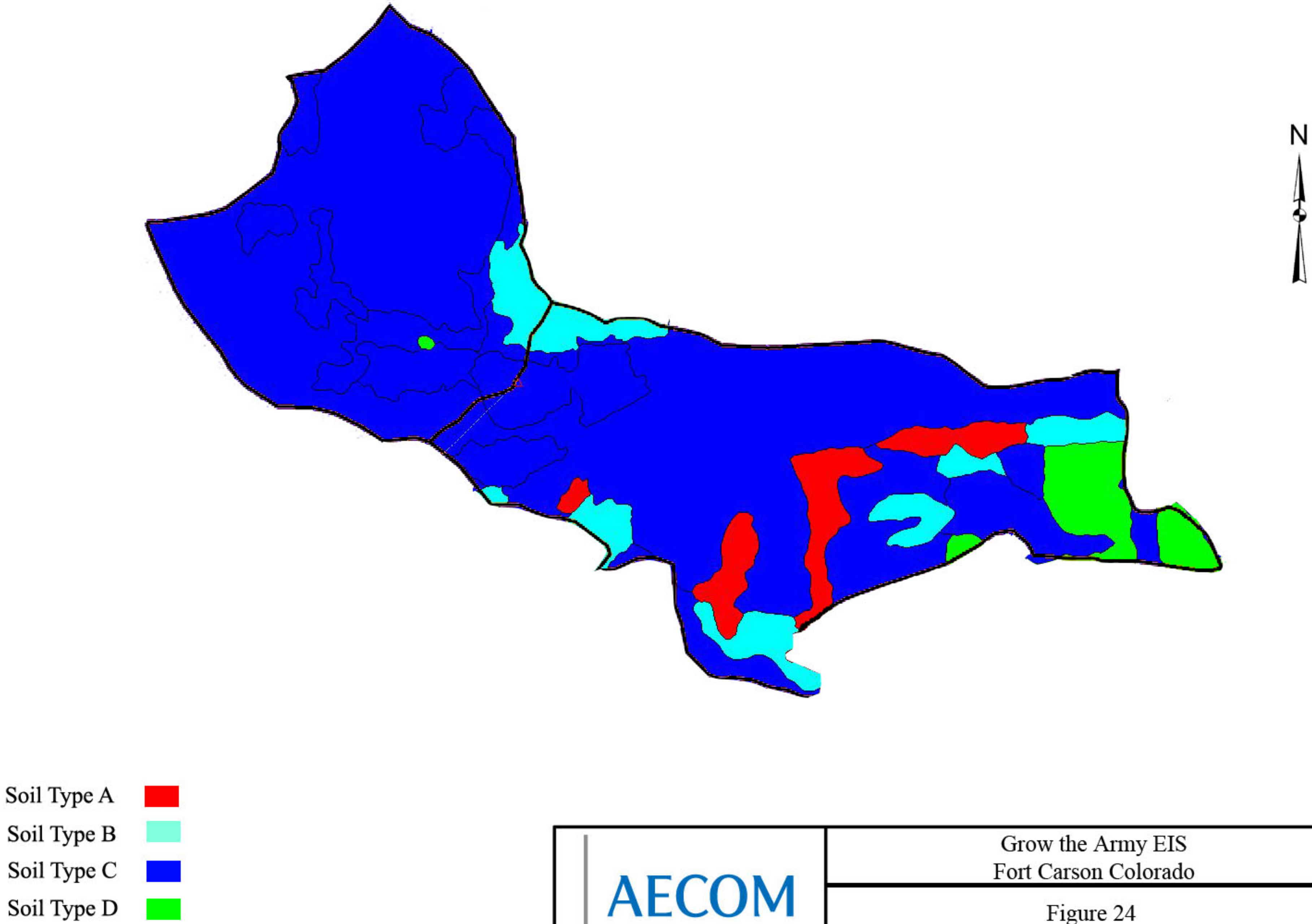

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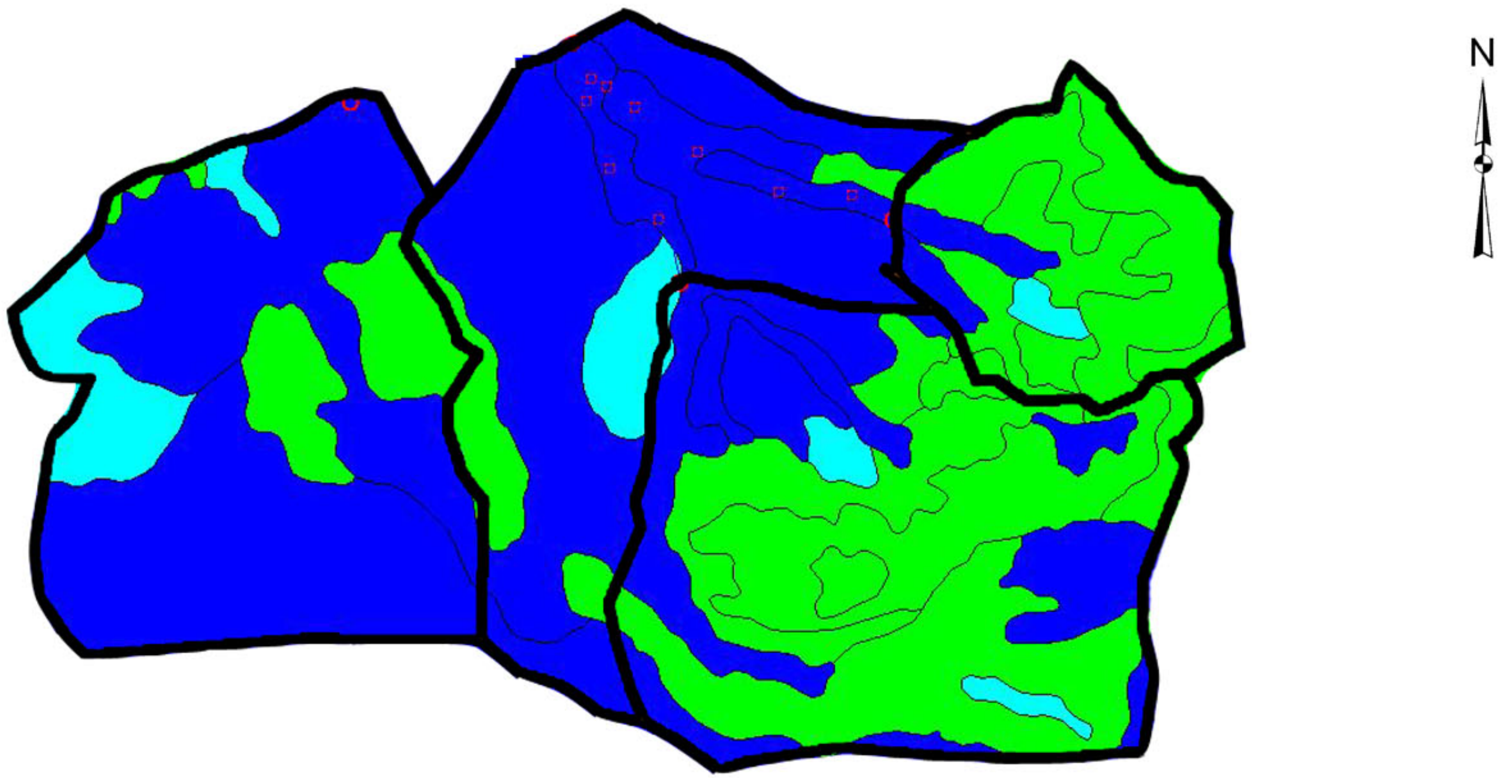
Figure 24
Hydrologic Soil Group Map - Simpson Lake



Soil Type A
Soil Type B
Soil Type C
Soil Type D

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Figure 25
Hydrologic Soil Group Map - Timpas Creek

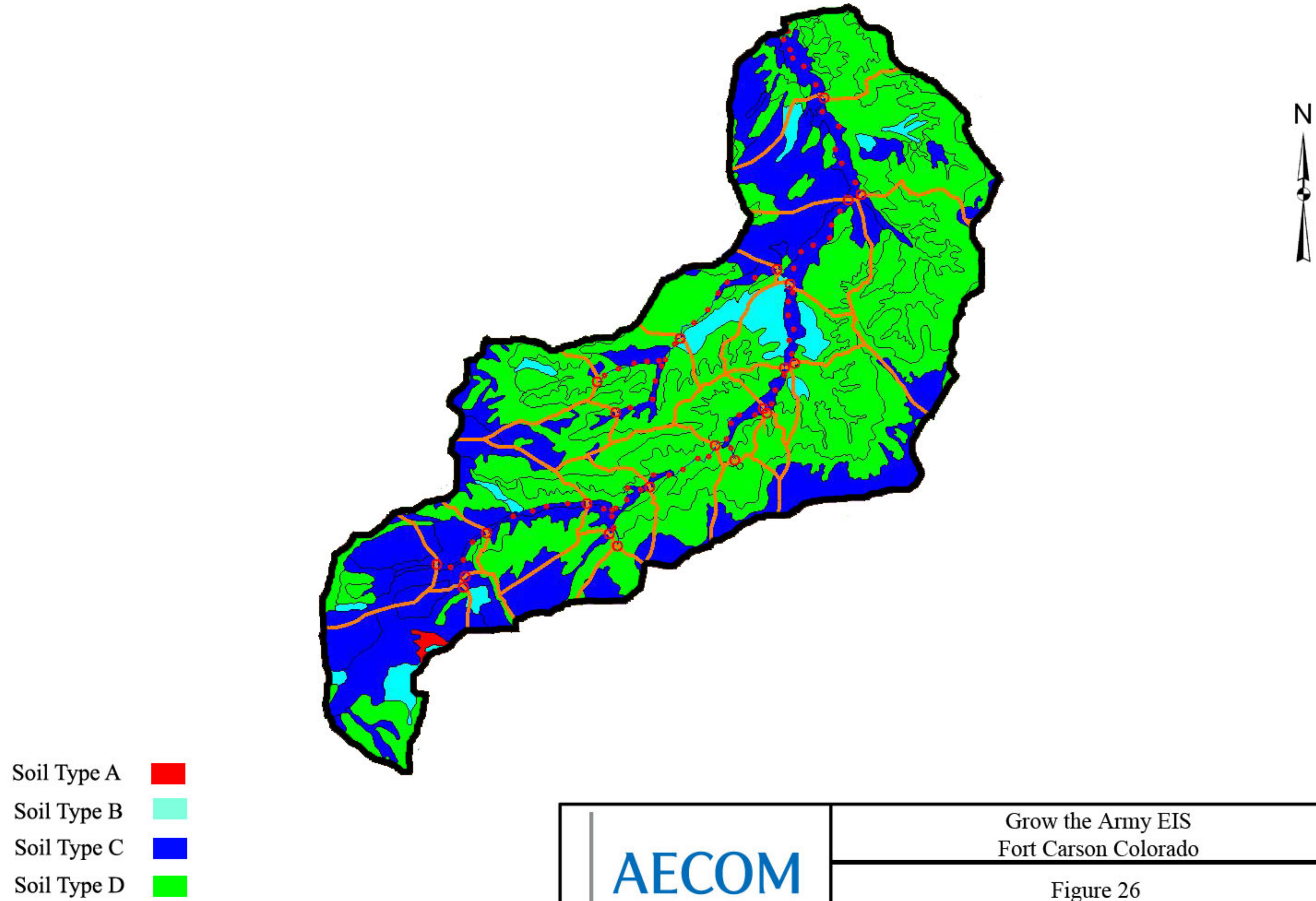

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Figure 26
Hydrologic Soil Group Map - Big Arroyo

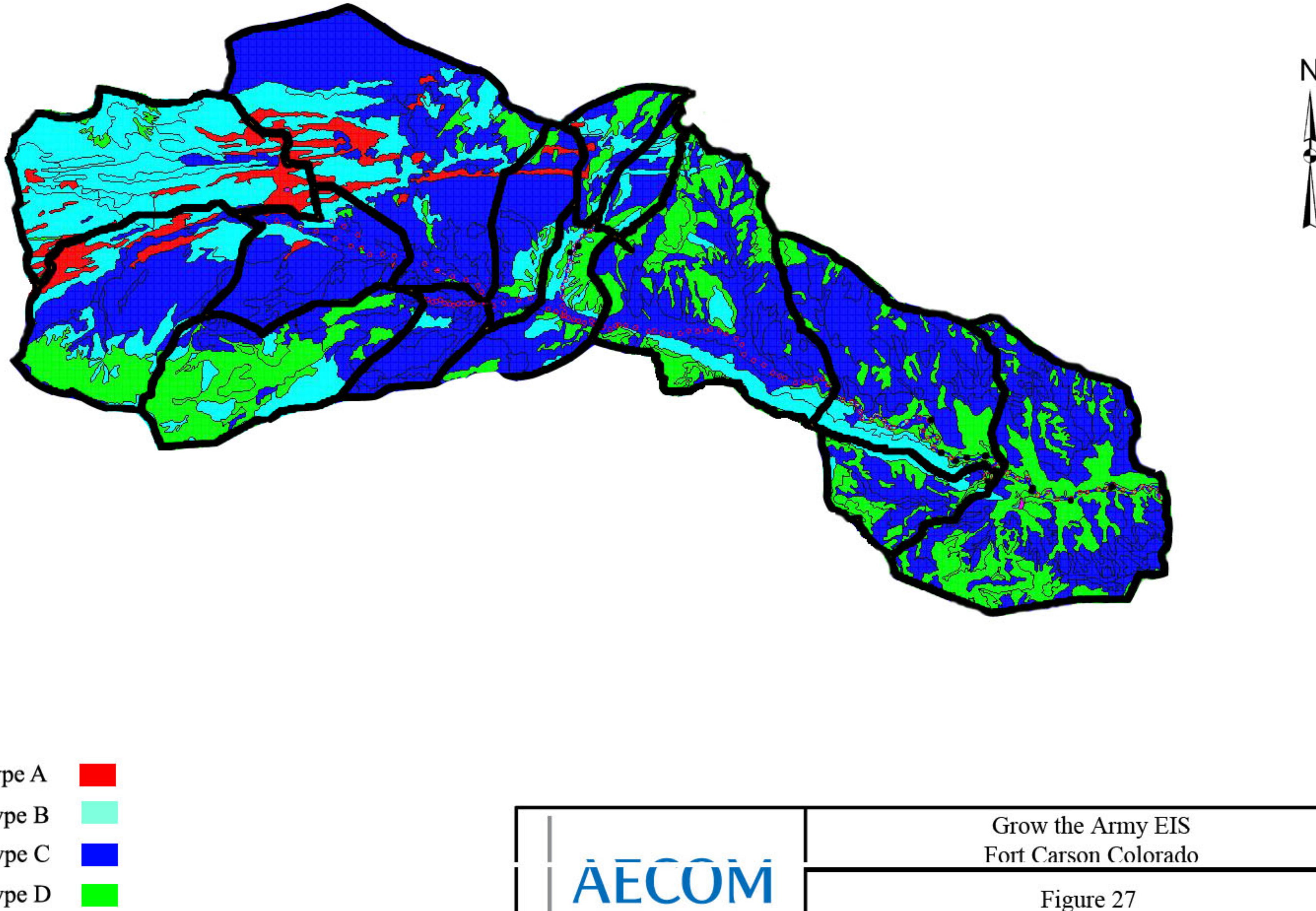

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Figure 27
Hydrologic Soil Group Map - Van Bremer

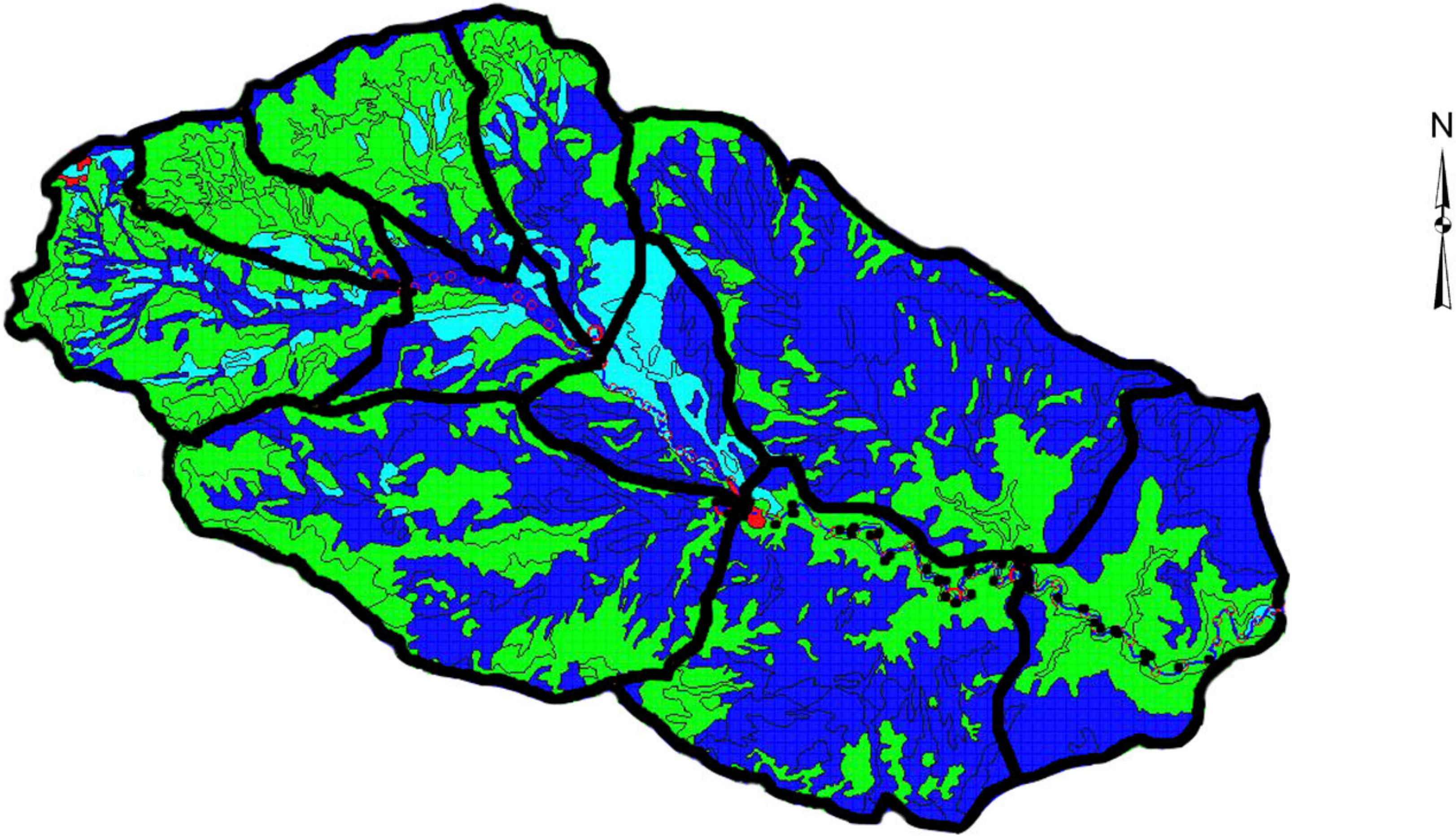

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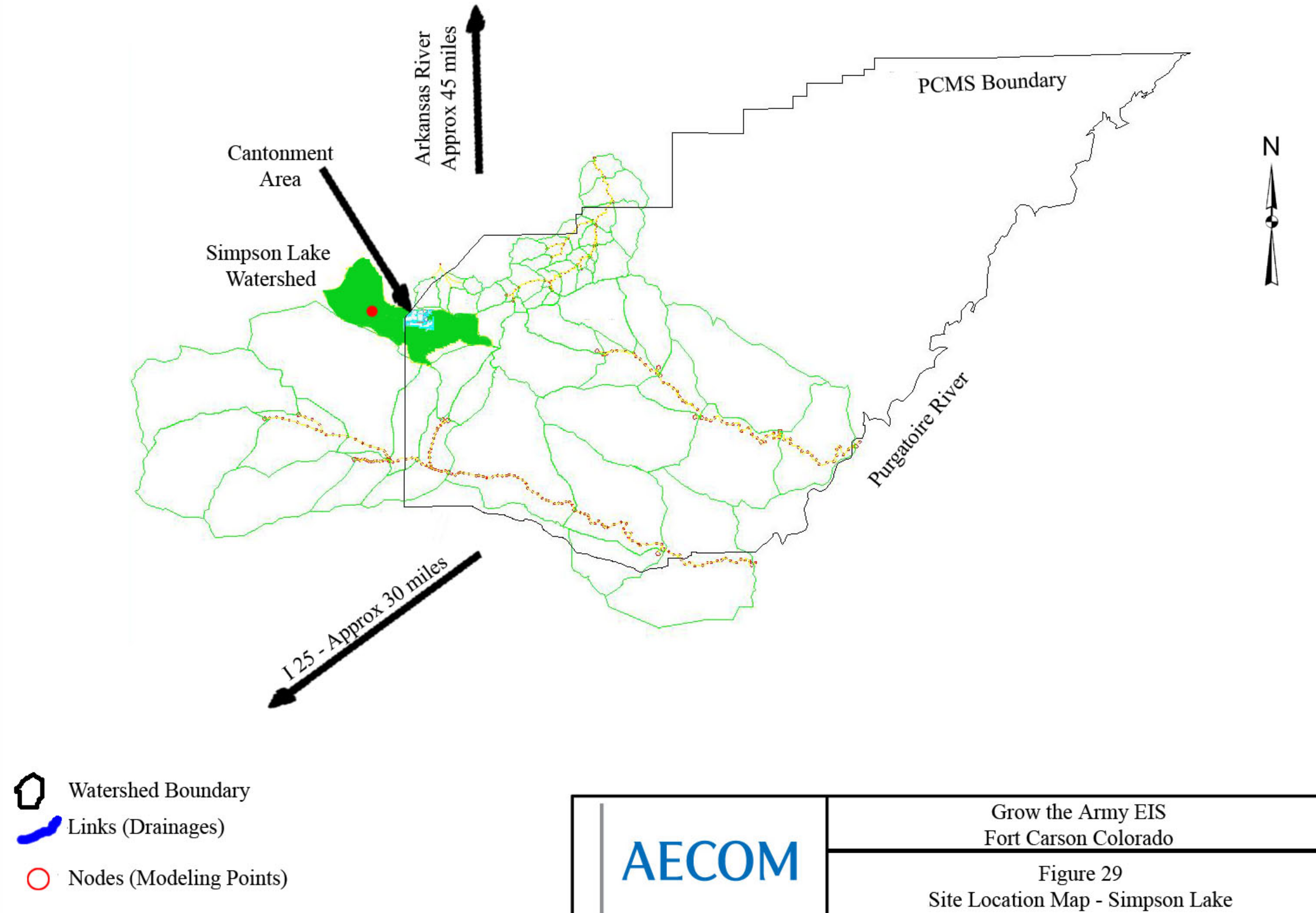
Figure 28
Hydrologic Soil Group Map
Taylor Arroyo and Big Water Arroyo



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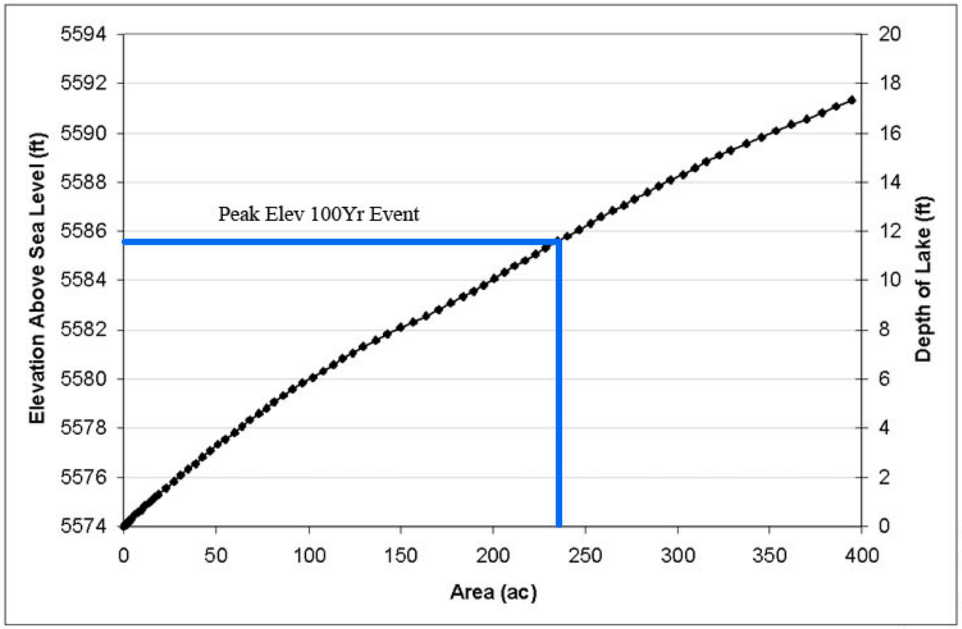
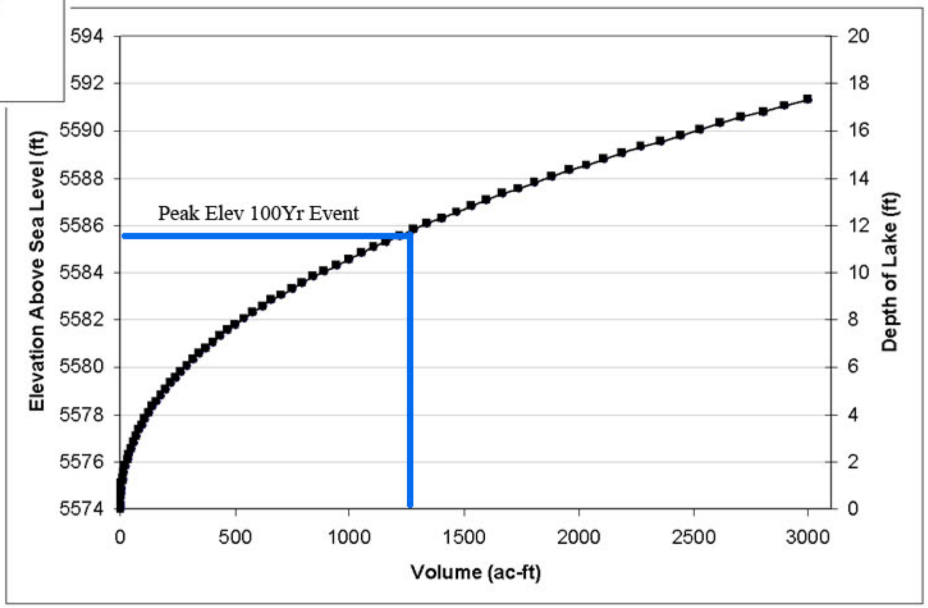
Fort Carson Colorado

Figure 29
Site Location Map - Simpson Lake



Peak elevation of cumulative scenario
build out is 0.024 feet above
peak baseline conditions



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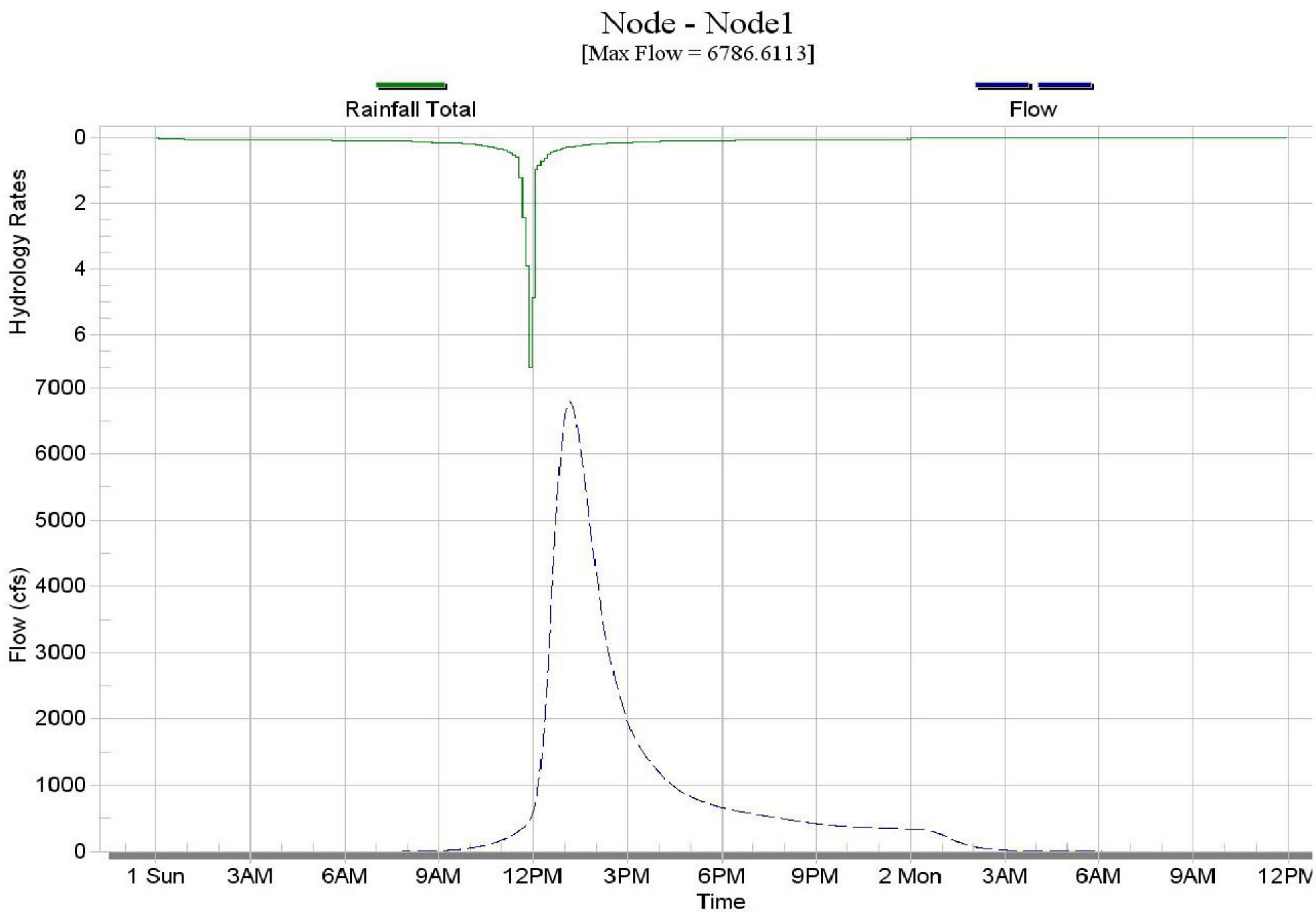
Fort Carson Colorado

Figure 30
Stage/Area & Stage/Volume Relationships
Simpson Lake



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Fort Carson Colorado

Figure 31
Baseline Conditions Hydrograph
Simpson Lake

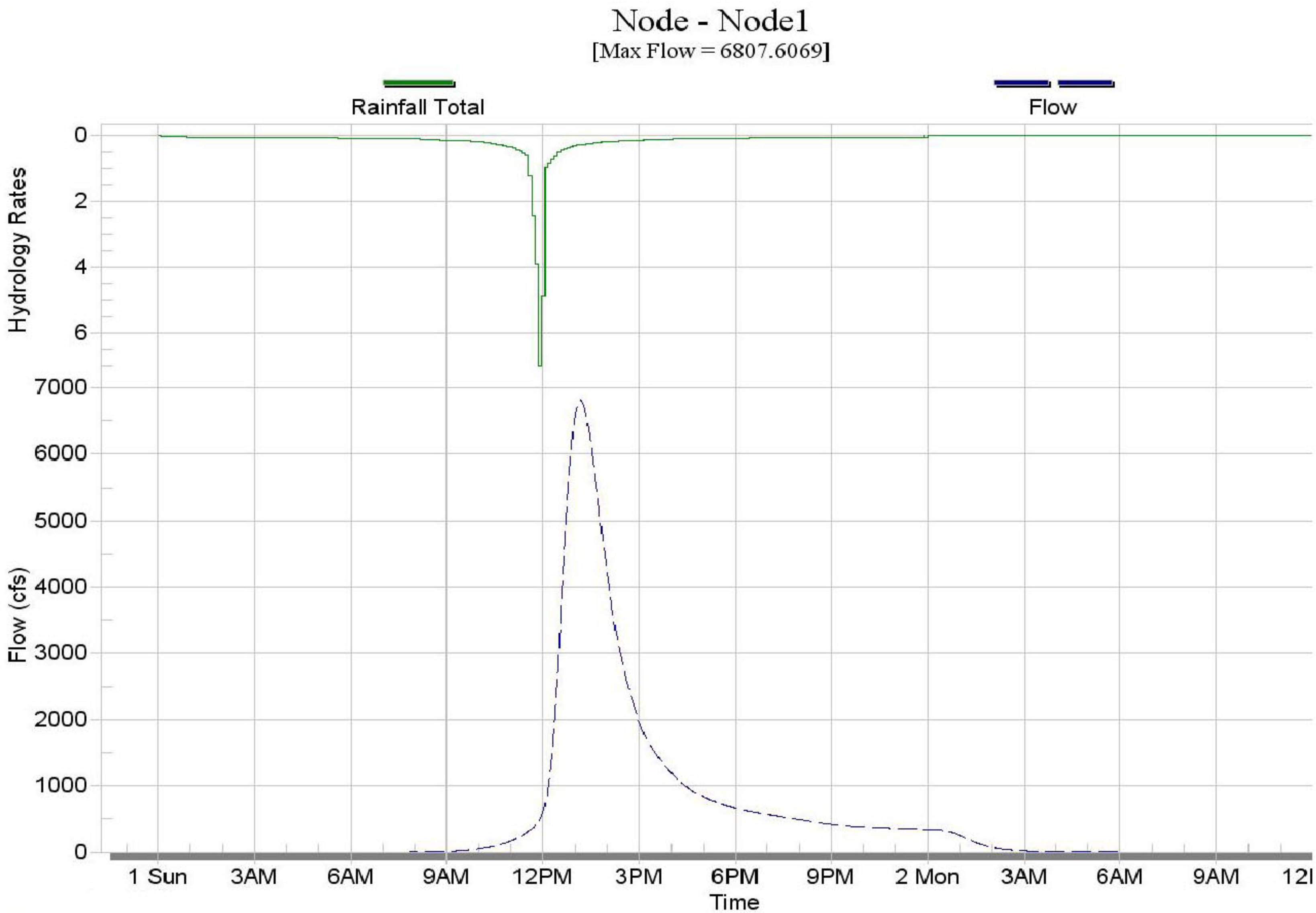

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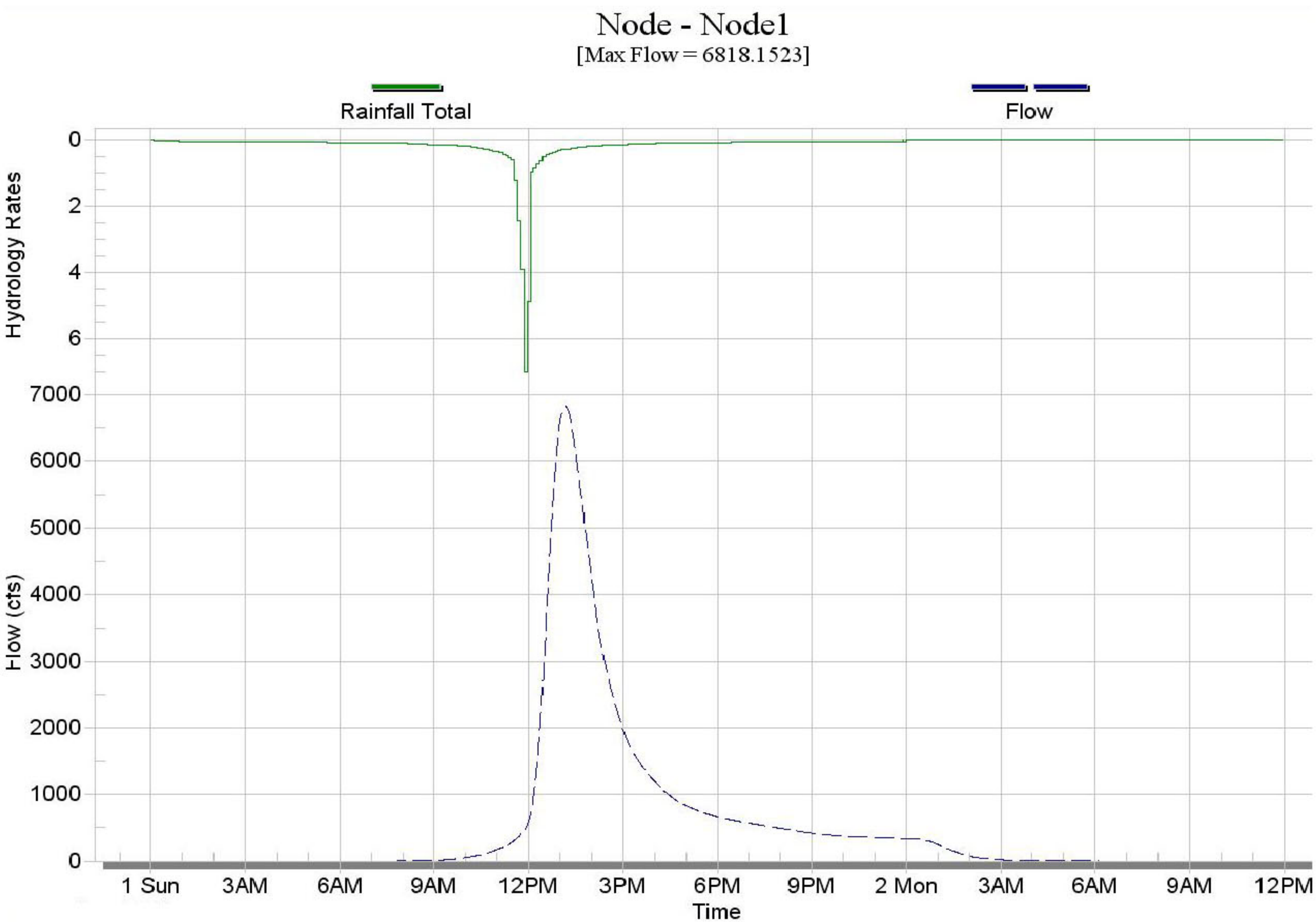
Figure 32
Existing Conditions Hydrograph
Simpson Lake



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Fort Carson Colorado

Figure 33
Cumulative Conditions Hydrograph
Simpson Lake

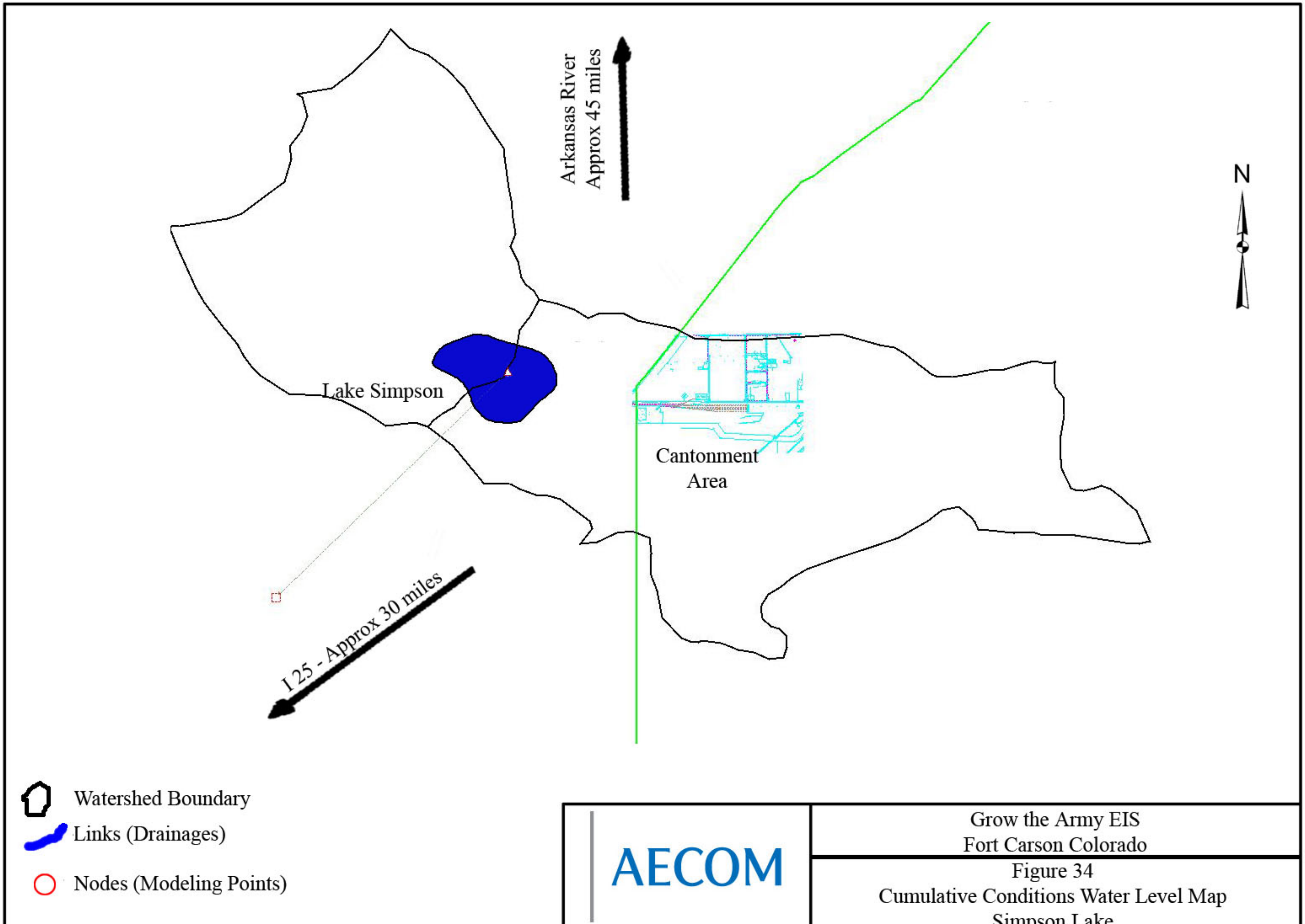

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Figure 34
Cumulative Conditions Water Level Map
Simpson Lake

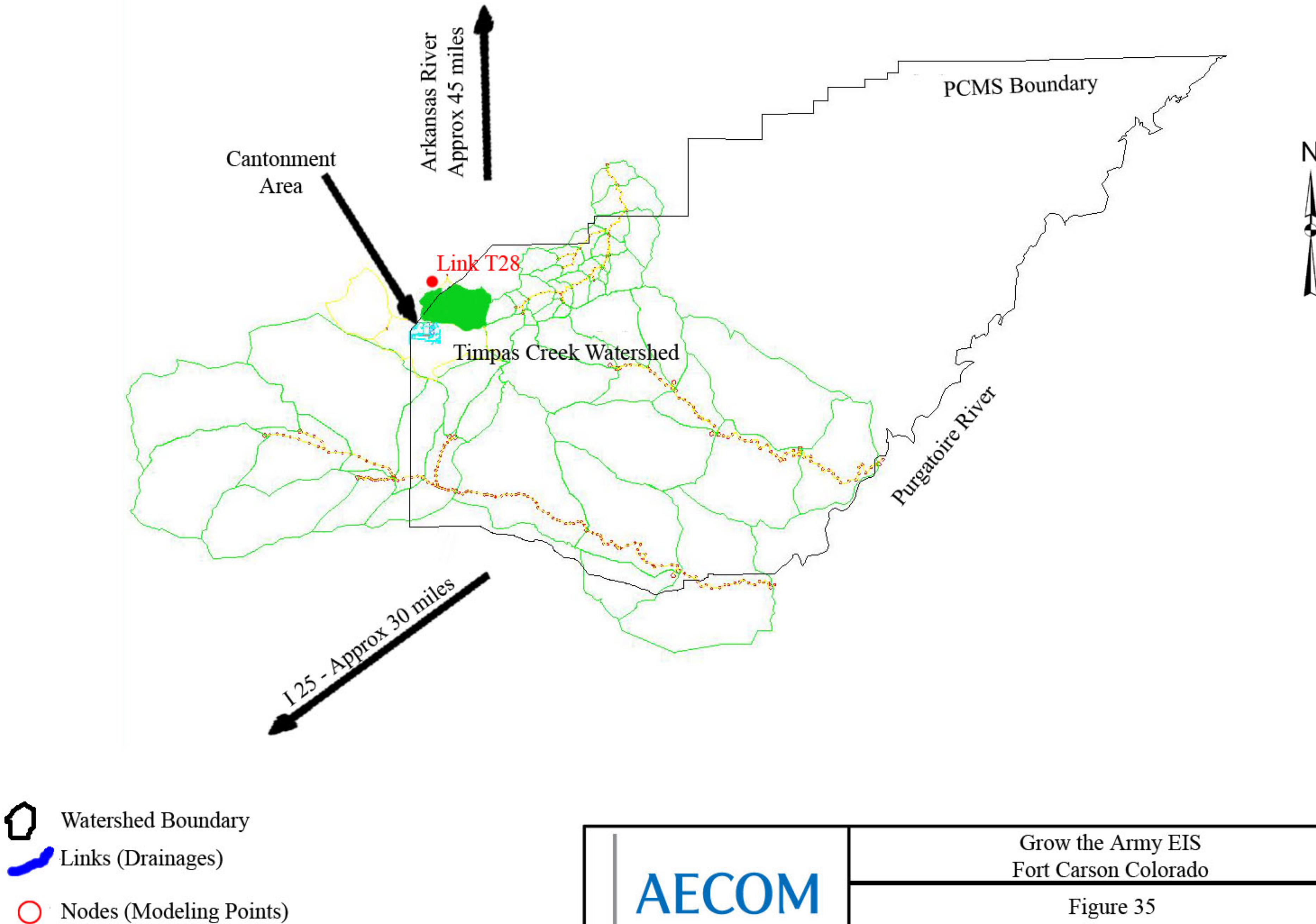

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Figure 35
Site Location Map - Timpas Creek

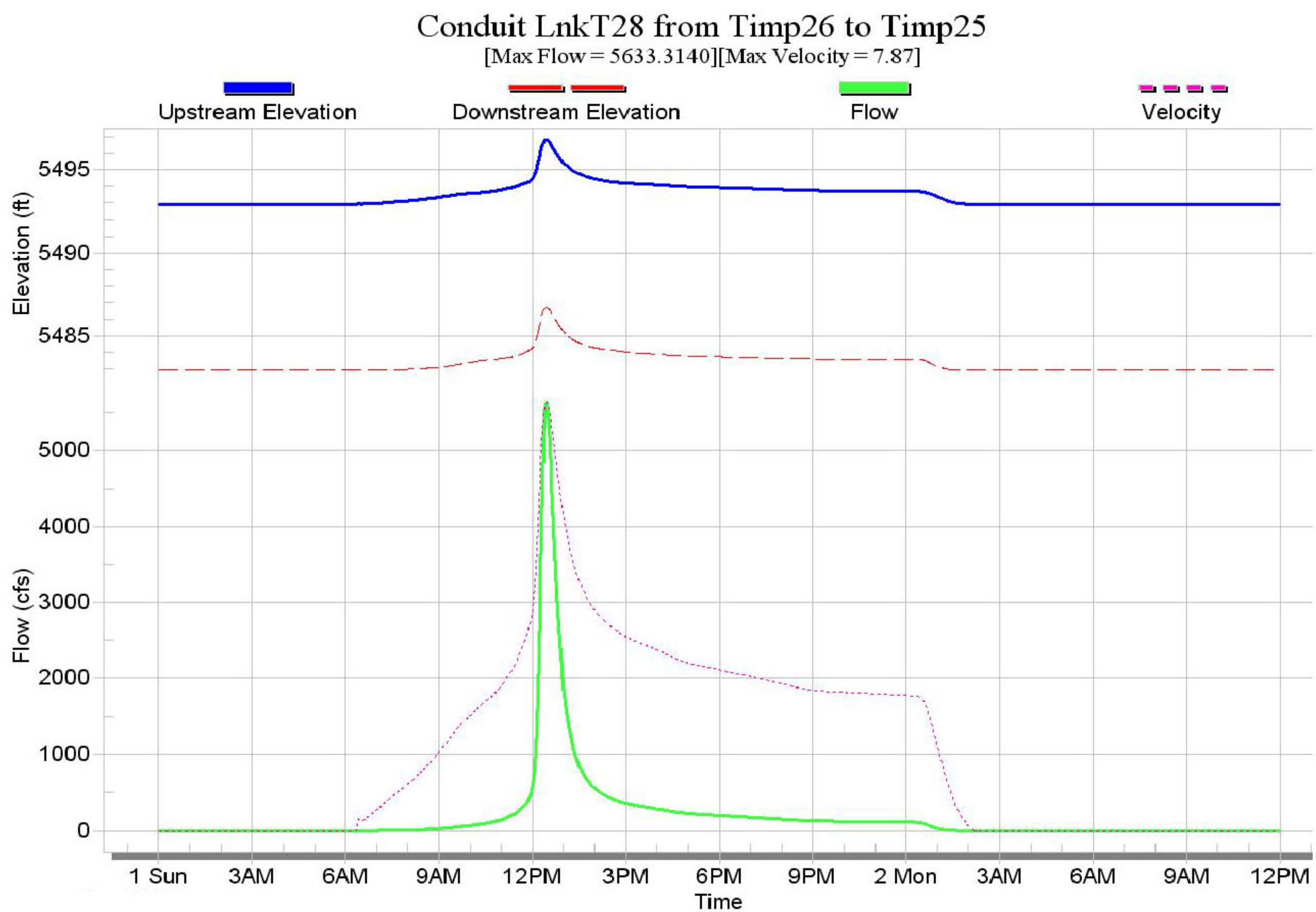

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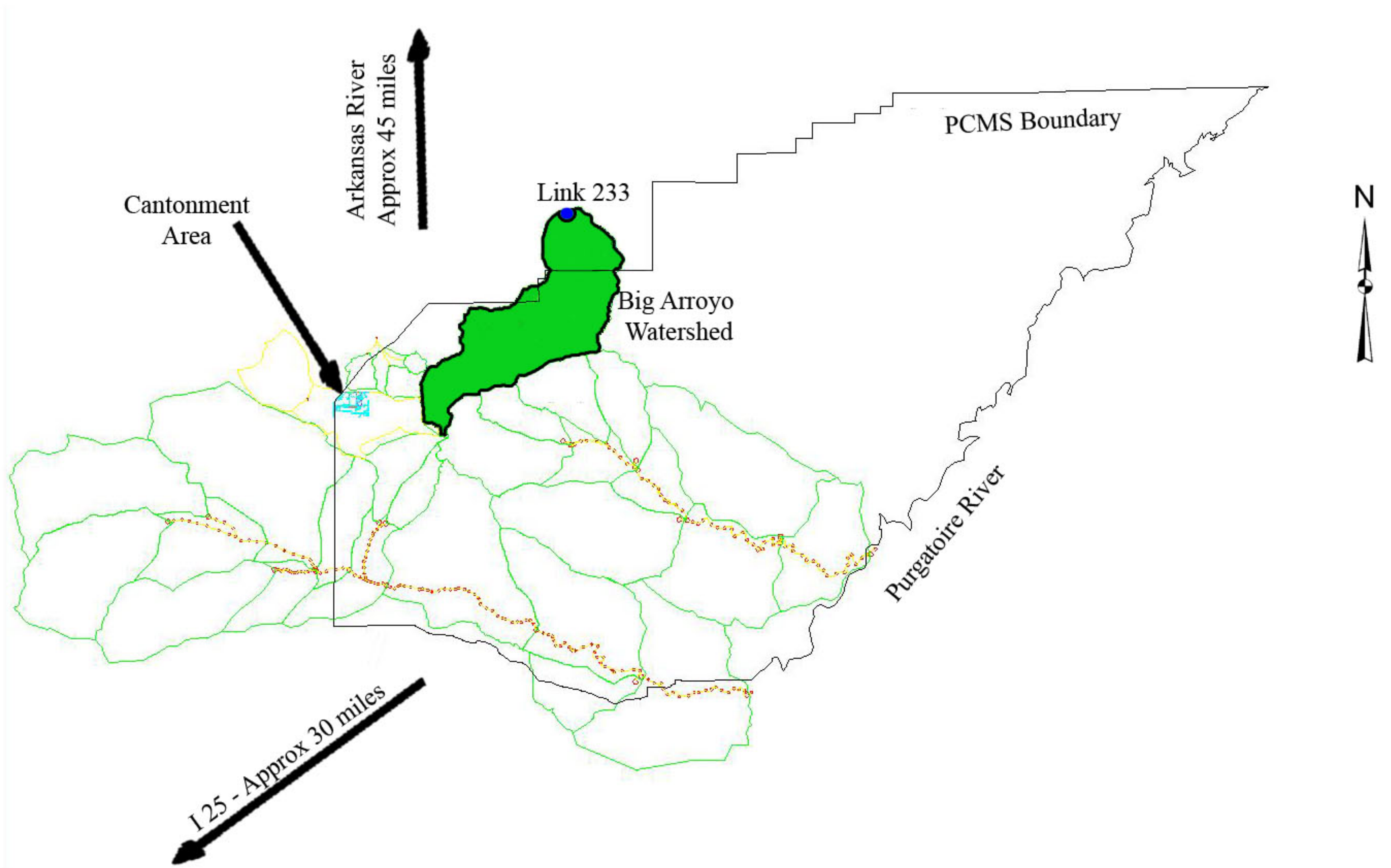
Figure 36
Hydrograph - Timpas Creek



Watershed Boundary

Links (Drainages)

Nodes (Modeling Points)

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Figure 37
Site Location Map - Big Arroyo

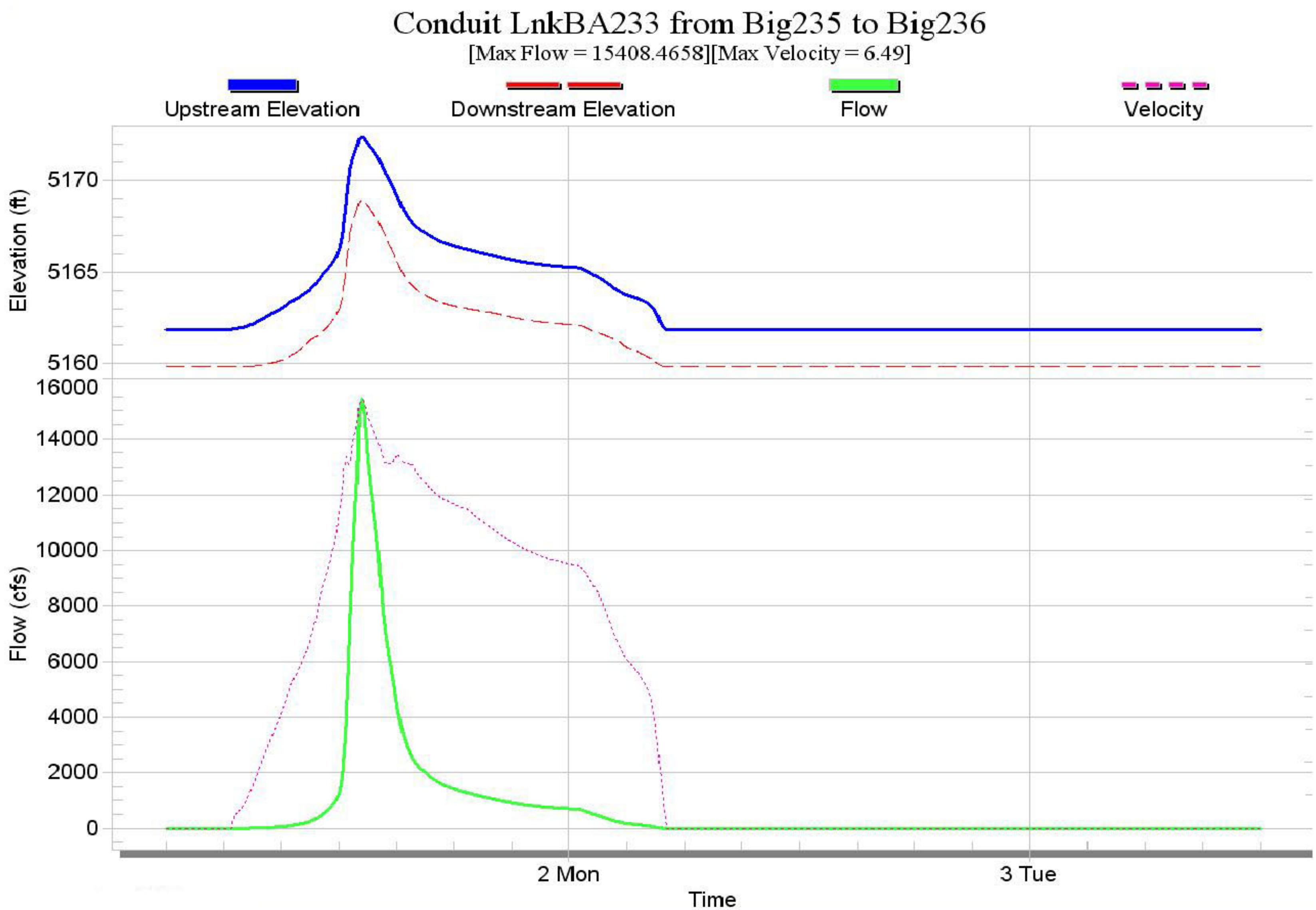

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Figure 38
Hydrograph - Big Arroyo

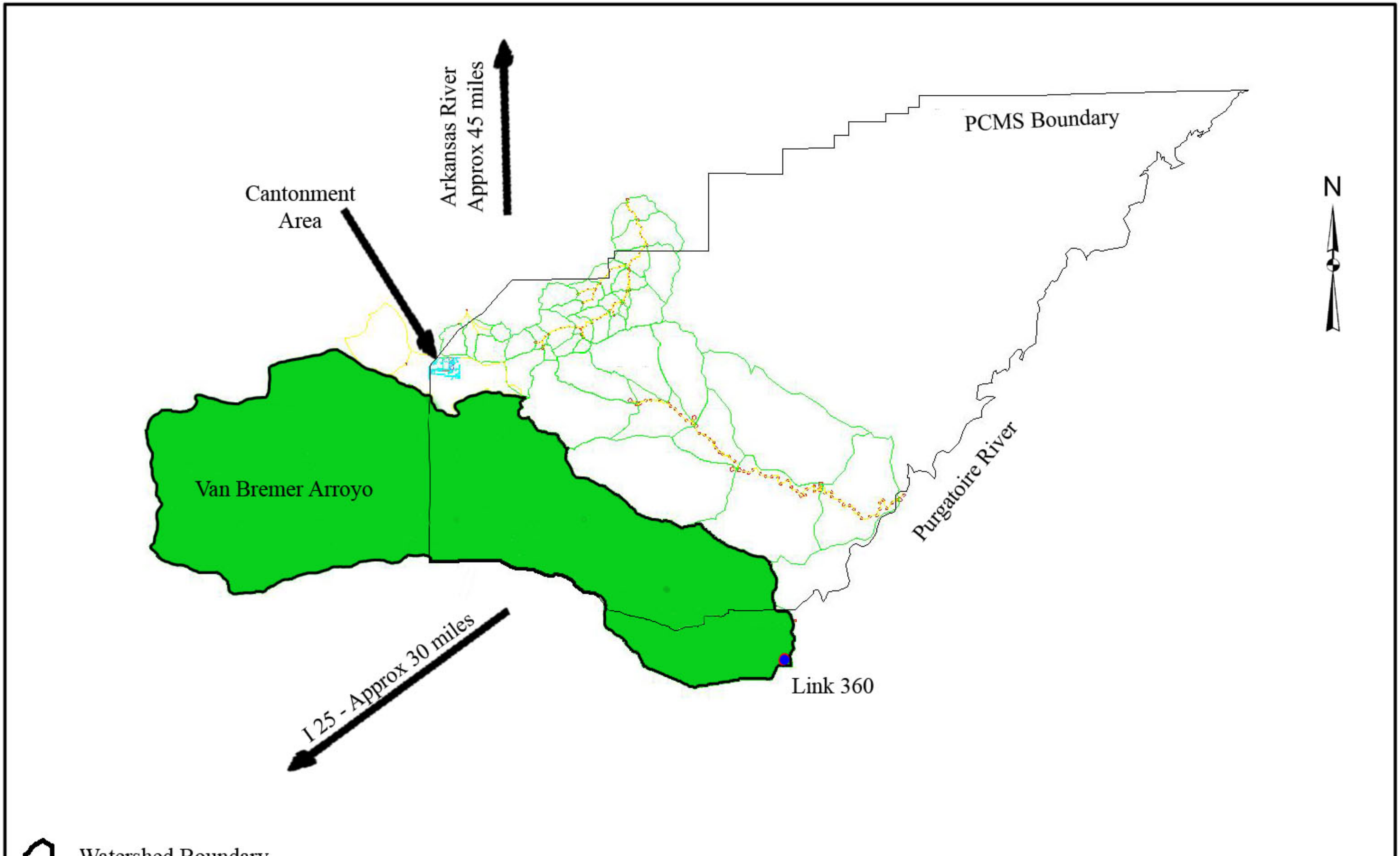

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Figure 39
Site Location Map - Van Bremer Arroyo

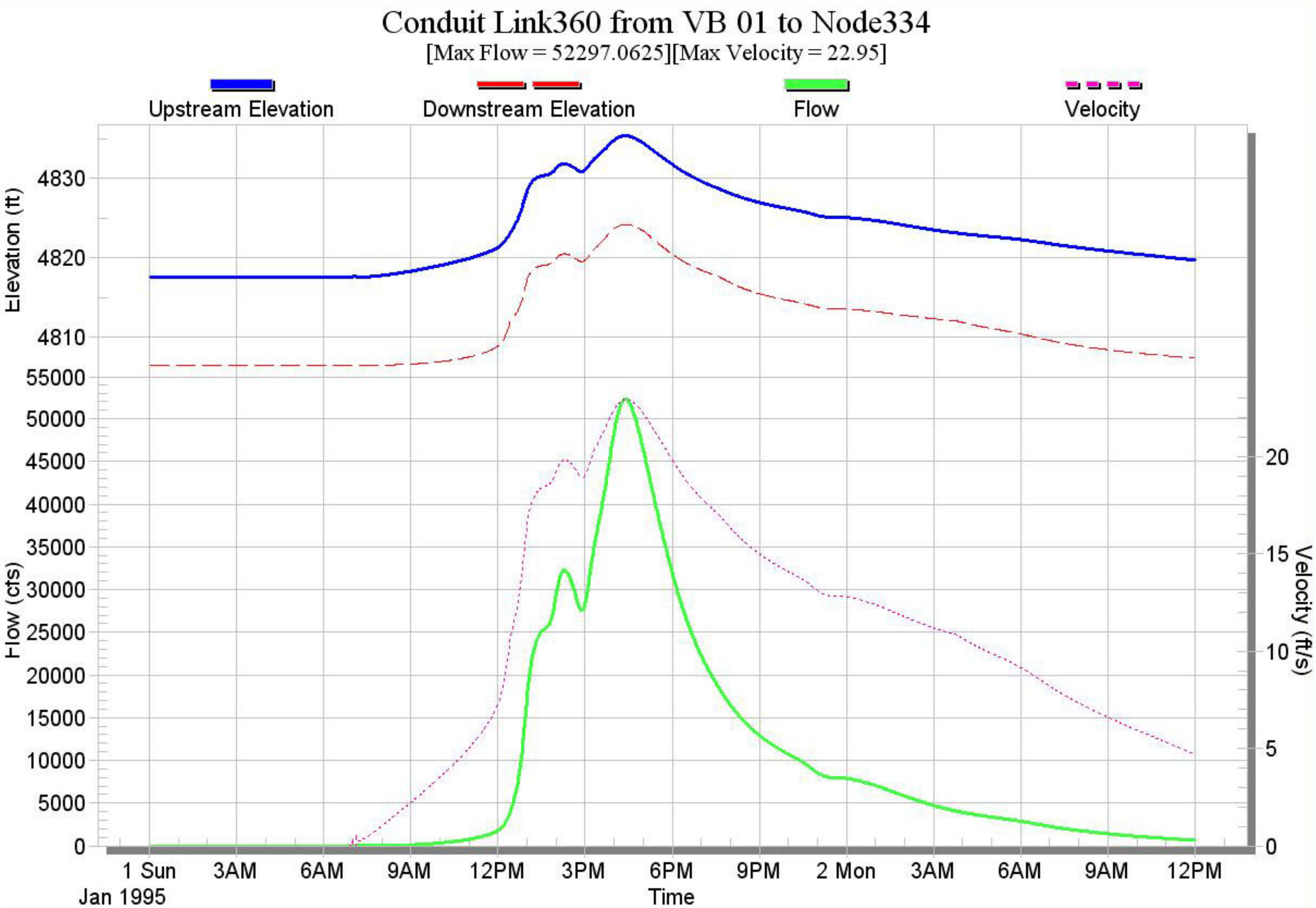

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Figure 40
Hydrograph - Van Bremer

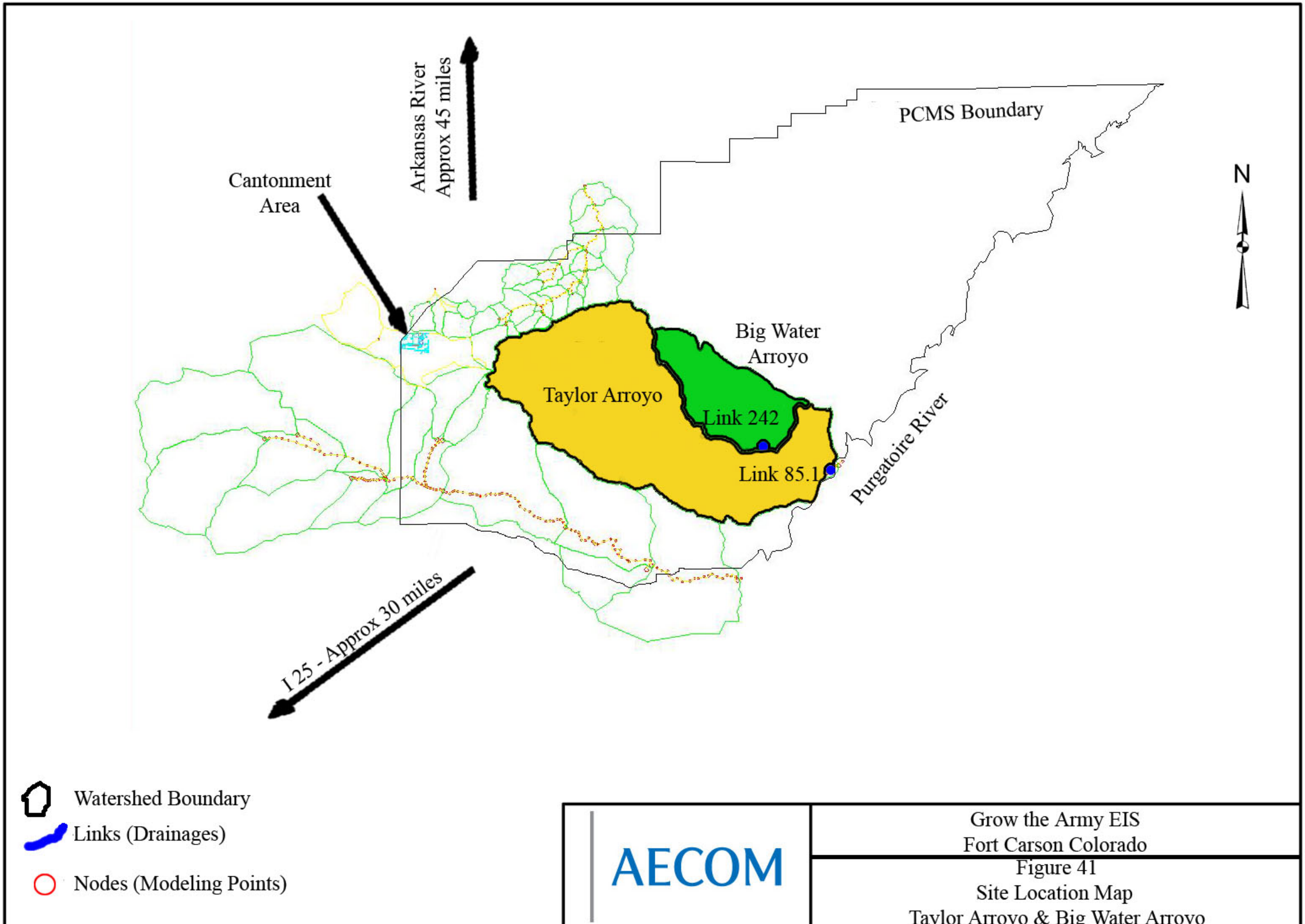

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Figure 41
Site Location Map
Taylor Arroyo & Big Water Arroyo

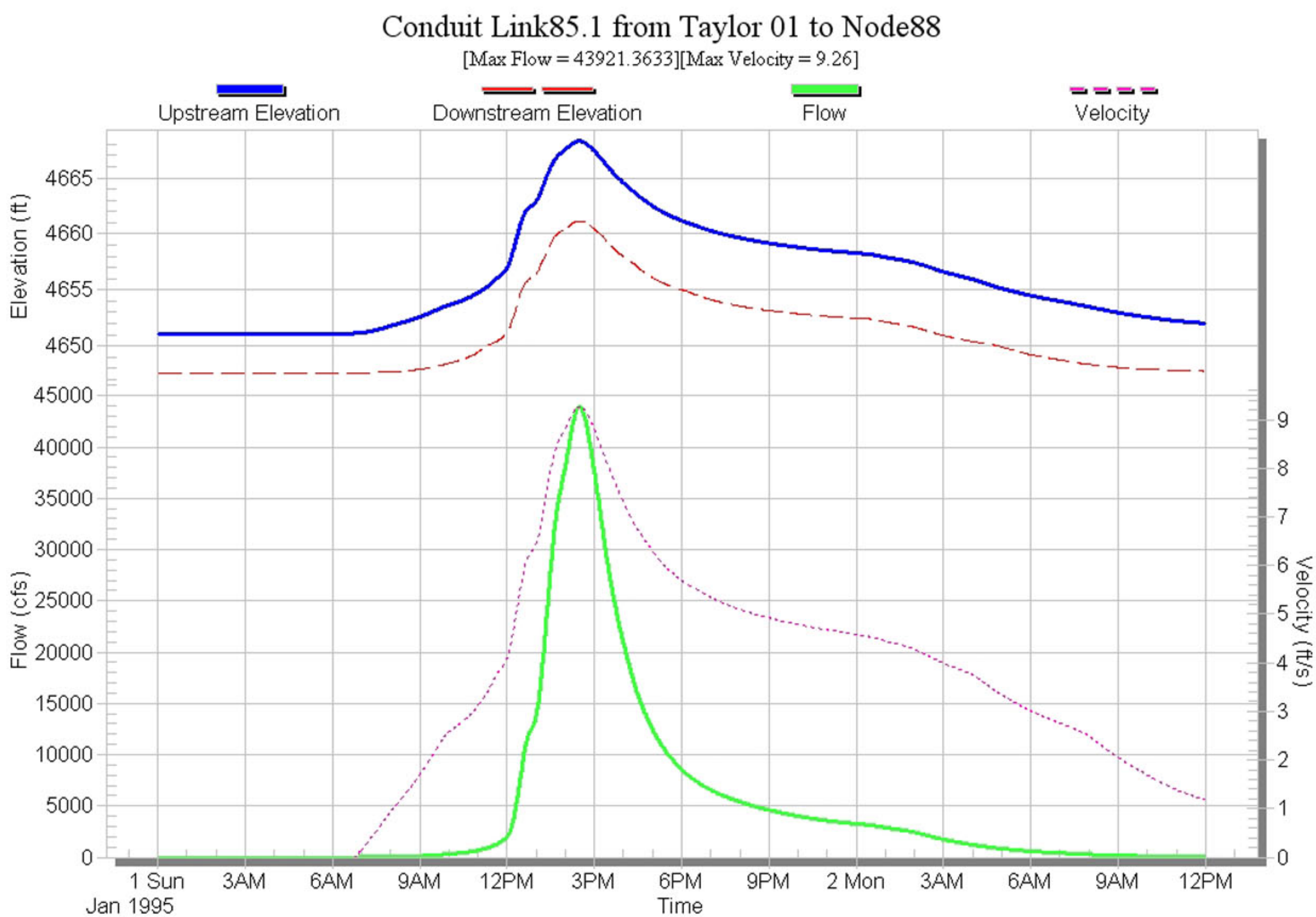

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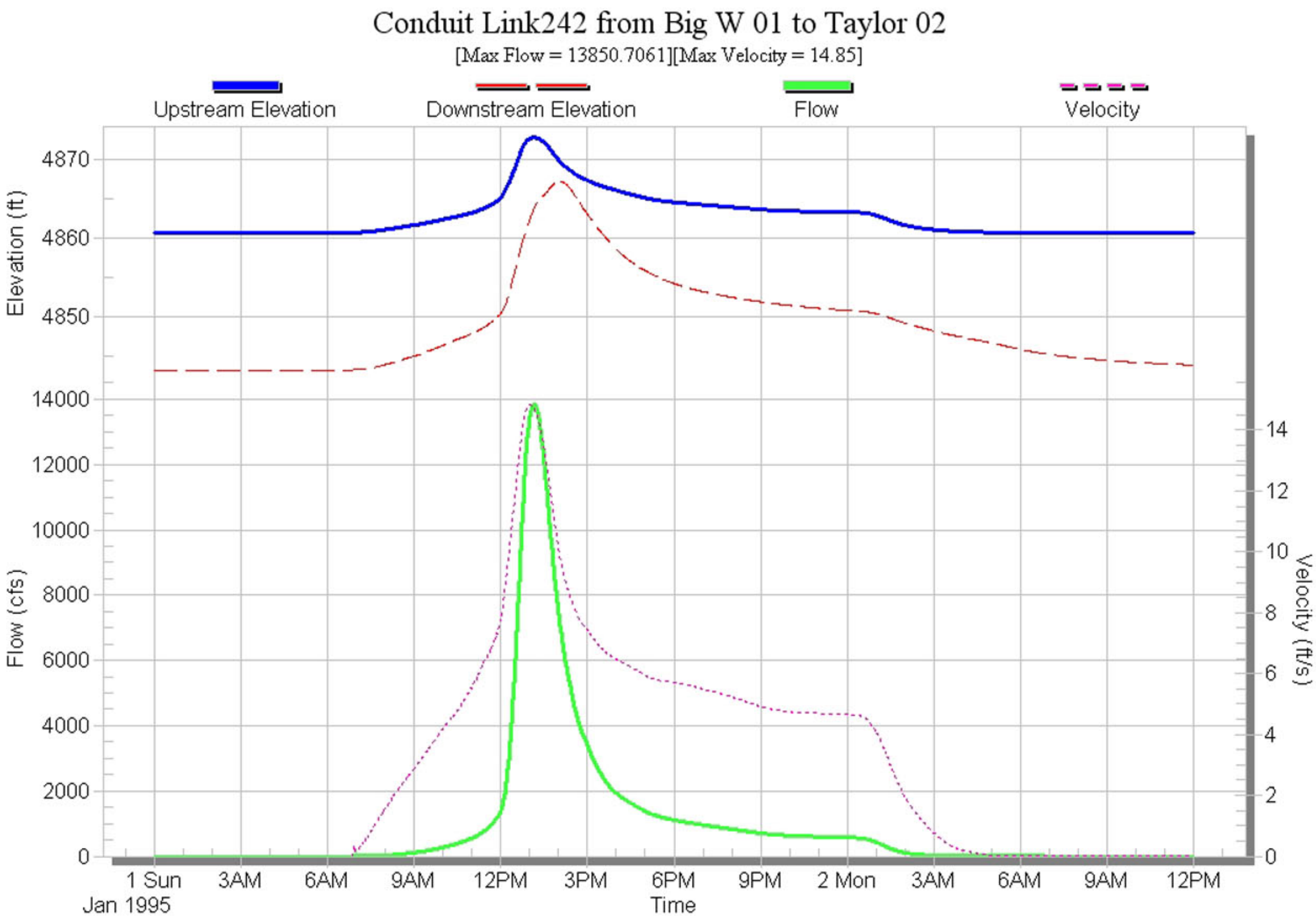
Figure 42
Hydrograph - Taylor Arroyo



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Fort Carson Colorado

Figure 43
Hydrograph - Big Water Arroyo

APPENDIX


Clover Ditch – Link 47


Clover Ditch – Link 48

Clover Ditch – Link 49

Clover Ditch – Link 104


Clover Ditch – Link 53


Clover Ditch – Link 54

Clover Ditch - Link 55

Clover Ditch – Link 56

Clover Ditch – Link 106

Clover Ditch - Link 62


B-Ditch – Link 45


B-Ditch – Link 44

B-Ditch – Link 41

B-Ditch – Link 43


B-Ditch – Link 40


B-Ditch – Link 39


B-Ditch – Link 84


B-Ditch – Link 85


B-Ditch – Link 35

APPENDIX F

BIOLOGICAL RESOURCES SUPPORTING DOCUMENTATION

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APPENDIX F.1

Fort Carson
Biological Resources Supporting Documentation

ATTACHMENT F.1.1

Plant Species Known to Occur at Fort Carson

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Angiosperms (Flowering Plants)					
Aceraceae (Maple Family)					
Acer glabrum	Mountain maple	P	N	T	C
Negundo aceroides, ssp. *interius*	Box elder	P	N	T	C
Agavaceae (Agave Family)					
Yucca glauca	Small soapweed	P	N	F	C
Alliaceae (Onion Family)					
Allium cernuum	Wild onion	P	N	F	W
Allium textile	Textile onion	P	N	F	C
Alsinaceae (Chickweed Family)					
Cerastium fontanum	Common mouse-ear	P	N	F	C
Eremogone fendleri	Fendler's sandwort	P	N	F	W
Eremogone hookeri	Hooker's sandwort	P	N	F	W
Paronychia jamesii	James nailwort	P	N	F	W
Amaranthaceae (Amaranth Family)					
Amaranthus retroflexus	Redroot amaranth	A	N	F	W
Anacardiaceae (Sumac Family)					
Rhus aromatica, ssp. *tribolata*	Skunkbrush, Lemonade bush	P	N	S	C
Toxicodendron rydbergii	Poison ivy	P	N	S	W
Apiaceae (Carrot Family)					
Berula erecta	Water parsnip	P	N	F	C
Conium maculatum	Poison hemlock	B	I	F	C
Cymopterus montanus	Mountain spring parsley	P	N	F	C
Heracleum sphondylium, ssp. *montanum*	Cow parsnip	P	N	F	C
Ligusticum porteri	Osha, Lovage	P	N	F	C
Lomatium orientale	Northern Idaho biscuitroot	P	N	F	C
Apocynaceae (Dogbane Family)					
Apocynum cannabinum	Indian hemp	P	N	F	W
Asclepiadaceae (Milkweed Family)					
Asclepias asperula	Spider milkweed	P	N	F	C
Asclepias engelmanniana	Englemann's milkweed	P	N	F	W
Asclepias incarnata	Swamp milkweed	P	N	F	W
Asclepias pumilla	Plains milkweed	P	N	F	W
Asclepias speciosa	Showy milkweed	P	N	F	C
Asclepias subverticillata	Whorled milkweed	P	N	F	W
Asclepias tuberose, ssp. *terminalis*	Butterflyweed	P	N	F	W
**Asclepias uncialis*	Dwarf milkweed	P	N	F	C
Asclepias viridiflora	Green milkweed	P	N	F	W
Asparagaceae (Asparagus Family)					
Asparagus officinalis	Garden asparagus	P	I	F	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Asteraceae (Daisy Family)					
Acosta diffusa	Diffuse knapweed, White knapweed	B	I	F	W
Acosta maculosa	Spotted knapweed	B/P	I	F	W
Acroptilon repens	Russian knapweed	P	I	F	W
Ambrosia psilostachya, var. *coronopifolia*	Western ragweed	P	N	F	W
Ambrosia trifida	Giant ragweed	A	I	F	W
Antennaria parvifolia	Littleleaf pussytoes	P	N	F	C
Antennaria rosea	Pink pussytoes	P	N	F	C
Arctium minus	Common burdock	P	I	F	W
Artemisia bigelovii	Bigelow's sagebrush	P	N	F	W
Artemisia frigida	Silver sagebrush	P	N	F	W
Artemisia ludoviciana	Louisiana sagebrush	P	N	F	W
Aster integrifolius	Thickstem aster	P	N	F	W
Aster porteri	Porter's aster	P	N	F	W
Baccharis wrightii	Wright's baccharis	P	N	F	W
Bahia dissecta	Ragleaf bahia	P	N	F	W
**Bolophyta tetraneuris*	Arkansas feverfew	P	N	F	W
Breea arvensis	Canada thistle	P	I	F	W
Brickellia californica	California brickellbush	P	N	F	W
Brickellia eupatorioides	False prairie boneset	P	N	F	W
Brickellia grandiflora	Tasselflower brickellbush	P	N	F	W
Brickellia rosmarinifolia, ssp. *chlorolepis*	Boneset	P	N	F	W
Carduus nutans, ssp. *macrolepis*	Musk thistle, Nodding plumeless thistle	P	I	F	W
Chrysothamnus nauseosus, ssp. *graveolens*	Rabbitbrush	P	N	S	W
Chrysothamnus parryi, ssp. *howardii*	Rabbitbrush	P	N	S	W
Cirsium undulatum	Wavyleaf thistle	P	N	F	W
Cirsium vulgare	Bull thistle	P	I	F	W
Conyza canadensis	Canadian horseweed	A	N	F	W
Coreopsis lanceolata	Lanceleaf tickseed	P	I	F	W
Coreopsis tinctoria	Plains coreopsis, Golden tickseed	A	N	F	W
Cyclachaena xanthifolia	Marsh-elder	A	N	F	C
Dyssodia aurea	Dogweed	A	N	F	W
Dyssodia papposa	Fetid marigold	A	N	F	W
Erigeron divergens	Spreading fleabane	P	N	F	W
Erigeron engelmannii	Engelmann's fleabane	P	N	F	W
Erigeron flagellaris	Trailing fleabane	P	N	F	W
Erigeron pumilus	Low fleabane	P	N	F	C
Erigeron subtrinervis	Threenerved fleabane	P	N	F	W
Gaillardia pinnatifida	Blanket flower	P	N	F	C
Grindelia revoluta	Rolled gumweed	B	N	F	W
Grindelia squarrosa	Curlycup gumweed	B	N	F	W
Gutierrezia sarothrae	Broom snakeweed	P	N	F	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Helianthus annuus	Annual sunflower	A	N	F	W
Helianthus petiolaris	Prairie sunflower	A	N	F	W
Heliomeris multiflora	Showy goldeneye	P	N	F	W
Heterotheca villosa	Shinners, Hairy goldaster	P	N	F	W
Hymenopappus filifolius	Fineleaf hymenopappus	P	N	F	C
Lactuca ludoviciana	Western wild lettuce	P	N	F	W
Lactuca serriola	Prickly lettuce	P	I	F	W
Lactuca tatarica, ssp. *pulchella*	Chicory lettuce	P	N	F	W
Leucanthemum vulgare	Ox-eye daisy	P	I	F	C
Leucelene ericoides	Sand aster	P	N	F	C
Liatris punctata	Dotted gayfeather	P	N	F	W
Lygodesmia juncea	Rush skeletonweed	P	N	F	W
Machaeranthera pinnatifida	Lacy tansyaster	P	N	F	C
Machaeranthera tanacetifolia	Tansyleaf aster	A	N	F	W
Melampodium leucanthum	Plains blackfoot daisy	P	N	F	C
Oligosporus caudatus	Sagewort wormwood	P	N	F	W
Oligosporus dracunculus, ssp. *glaucus*	Wild tarragon	P	N	F	W
Oligosporus filifolius	Sand sagebrush	P	N	S	W
Onopordum acanthium	Scotch thistle	B	I	F	W
* *Oonopsis foliosa*	Fremont goldenweed	P	N	F	W
Packera fendleri	Fendler groundsel	P	N	F	C
Packera neomexicana, ssp. *mutabilis*	Groundsel	P	N	F	C
Packera tridenticulata	Groundsel	P	N	F	C
Pectis angustifolia	Narrow-leaf pectis	P	N	F	W
Picradeniopsis oppositifolia	Plains bahia	P	N	F	W
Ratibida columnifera	Prairie coneflower	P	N	F	W
Rudbeckia lanciniata, var. *ampla*	Goldenglow	P	N	F	W
Senecio flaccidus, ssp. *douglasii*	Douglas groundsel	P	N	F	W
Senecio integerrimus	Lambstongue groundsel	P	N	F	W
Senecio spartioides	Broom groundsel	P	N	F	W
Solidago canadensis	Canada goldenrod	P	N	F	W
Solidago missouriensis	Prairie goldenrod	P	N	F	W
Solidago mollis	Velvety goldenrod	P	N	F	W
Solidago nana	Low goldenrod	P	N	F	W
Solidago velutina	Three-nerved goldenrod	P	N	F	W
Sonchus asper	Prickly sow thistle	A	I	F	C
Stephanomeria pauciflora	Desert wirelettuce	P	N	F	W
Taraxacum officinale	Common dandelion	P	I	F	C
Tetraneuris acaulis	Stemless hymenoxys	P	N	F	C
Thelesperma filifolium	Stiff greenthread	A	N	F	W
Thelesperma megapotamicum	Hopi-tea greenthread	P	N	F	C
Thelesperma subnudum	Navajo-tea greenthread	P	N	F	W

Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Townsendia exscapa	Stemless townsendia	P	N	F	C
Townsendia grandiflora	Largeflower townsendia daisy	P	N	F	C
Tragopogon dubius, ssp. *major*	Western salsify	P	I	F	C
Virgulus ericoides	White aster	P	N	F	W
Virgulus falcatus	Aster	P	N	F	W
Virgulus fendleri	Fendler's aster	P	N	F	W
Ximenesia encelioides	Golden crownbeard	A	N	F	W
Zinnia grandiflora	Rocky Mountain zinnia	P	N	F	C
Betulaceae (Birch Family)					
Alnus incana, ssp. *tenuifolia*	Speckled alder	P	N	S	C
Boraginaceae (Borage Family)					
Cryptantha minima	Little catseye	A	N	F	C
Cynoglossum offinicale	Hound's tongue	P	N	F	C
Hackelia floribunda	Large-flowered stickseed	P	N	F	W
Lappula redowskii	Blueburr stickseed	A	N	F	C
Lithospernum incisum	Narrowleaf gromwell	P	N	F	C
Mertensia lanceolata	Lanceleaf bluebells	P	N	F	C
Onosmodium molle, var. *occidentale*	Western marbleseed	P	N	F	C
Oreocarya suffruticosa	James cryptantha	P	N	F	C
Oreocarya thyrsiflora	Cluster cryptantha	P	N	F	C
Brassicaceae (Mustard Family)					
Barbarea vulgaris	Winter cress	P	I	F	C
Camelina microcarpa	Littlepod falseflax	A	I	F	C
Cardaria draba	Pepperweed whitetop	P	N	F	C
Descurania incisa	Tansey mustard	A	N	F	C
Descurainia sophia	Flimweed tanseymustard	A	I	F	C
Erysimum asperum	Western wallflower	P	N	F	C
Erysimum capitatum	Western wallflower	P	N	F	C
Lepidium alyssoides	Mesa pepperwort	P	N	F	C
Lepidium densiflorum	Common pepperweed	A	N	F	C
Lesquerella fendleri	Fendler's bladderpod	P	N	F	C
Lesquerella ludoviciana	Foothill bladderpod	P	N	F	C
Lesquirella montana	Mountain bladderpod	P	N	F	C
Nasturtium officinale	Watercress	P	N	F	C
Schoenocrambe linearifolia	Slimleaf plains mustard	P	N	F	C
Schoenocrambe linifolia	Skeleton mustard	P	N	F	C
Sinapsis arvensis	Charlock	A	I	F	C
Sisymbrium altissimum	Jim Hill mustard	A	I	F	C
Stanleya pinnata	Prince's plume	P	N	F	C
Thlaspi arvense	Field pennycress	A	I	F	C
Cactaceae (Cactus Family)					
Coryphantha vivipara	Nipple cactus	P	N	F	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Cylindropuntia imbricata	Candelabra cactus	P	N	S	C
Echinocereus reichenbachii, var. *perbellus*	Claret cup	P	N	F	C
Echinocereus triglochidiatus	Claret cup	P	N	F	C
Echinocereus viridiflorus	Hens-and-chickens	P	N	F	C
Opuntia macrorhiza	Twisted spine prickly pear	P	N	F	C
Opuntia phaeacantha	New Mexican prickly-pear	P	N	F	C
Opuntia polyacantha	Plains prickly-pear	P	N	F	C
Pediocactus simpsonii, var. *minor*	Ball cactus	P	N	F	C
Calochortaceae (Mariposa Family)					
Calochortus gunnisonii	Sego lily, Mariposa lily	P	N	F	W
Cannabaceae (Hops Family)					
Humulus lupulus, ssp. *americanus*	Wild hops	P	N	V	W
Capparidaceae (Caper Family)					
Cleome serrulata	Rocky Mountain beeplant	A	N	F	W
Polanisia dodecandra	Roughseed clammyweed	P	N	F	C
Caprifoliaceae (Honeysuckle Family)					
Symphoricarpos albus	White coralberry	P	N	F	C
Symphoricarpos occidentalis	Western snowberry	P	N	F	C
Symphoricarpos oreophilus	Mountain snowberry	P	N	F	C
Caryophyllaceae (Pink Family)					
Melandrium dioicum	White campion	P	I	F	W
Chenopodiaceae (Goosefoot Family)					
Atriplex argenta	Tumbling saltbush	A	N	F	W
Atriplex canescens	Fourwing saltbush	P	N	S	C
Atriplex confertifolia	Shadscale saltbush	P	N	S	W
Atriplex patula	Spear saltbush	P	N	F	W
Bassia sieversiana	Ironweed	A	I	F	W
Chenopodium album	Lambsquarters	A	I	F	W
Chenopodium desiccatum	Desert goosefoot	A	N	F	W
Chenopodium fremontii	Fremont goosefoot	A	N	F	W
Chenopodium incanum	Mealy goosefoot	A	N	F	W
Chenopodium leptophyllum	Slimleaf goosefoot	A	N	F	W
Krascheninnikovia lanata	Common winterfat	P	N	F	C
Salsola australis	Russian thistle,Tumbleweed	A	I	F	W
Sarcobatus vermiculatus	Black greasewood	P	N	S	C
Suaeda calceoliformis	Sea-blite	P	N	F	C
Commelinaceae (Spiderwort Family)					
Commelina dianthifolia	Birdbill dayflower	P	N	F	W
Commelina erecta, var. *angustifolia*	Whitemouth dayflower	P	N	F	W
Tradescantia occidentalis	Prairie spiderwort	P	N	F	C
Convallariaceae (Mayflower Family)					
Maianthemum stellatum	False Solomon’s seal	P	N	F	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Convolvulaceae (Morningglory Family)					
Convolvulus arvensis	Creeping jenny	P	I	F	W
Convolvulus equitans	Texas bindweed	P	N	F	C
Evolvulus nuttalianus	Arizona evolvulus	P	N	F	C
Ipomoea leptophylla	Bush morningglory	P	N	F	C
Cornaceae (Dogwood Family)					
Swida sericea	Red osier dogwood	P	N	T	C
Cucurbitaceae (Gourd Family)					
Cucurbita foetidissima	Buffalo gourd	P	N	F	W
Cyperaceae (Sedge Family)					
Carex emoryi	Emory's sedge	P	N	G	C
Carex hystericina	Bottlebrush sedge	P	N	G	C
Carex occidentalis	Western sedge	P	N	G	C
Carex pensylvanica, ssp. *heliophila*	Sun sedge	P	N	G	C
Carex stenophylla, ssp. *eleocharis*	Needleleaf sedge	P	N	G	C
Eleocharis palustris	Common spikerush	P	N	G	C
Mariscus fendlerianus	Fendlers flatsedge	P	N	G	W
Schoenoplectus lacustris, ssp. *acutis*	Tule bulrush	P	N	G	C
Schoenoplectus lacustris, ssp. *creber*	Hardstem bulrush	P	N	G	C
Schoenoplectus pungens	Bulrush	P	N	G	W
Scirpus pallidus	Cloaked bulrush				
Dipsacaceae (Teasel Family)					
Dipsacus fullonum	Fuller's teasel	B	I	F	W
Elaeagnaceae (Oleaster Family)					
Elaeagnus angustifolia	Russian olive	P	I	T	C
Ericaceae (Heath Family)					
Arctostaphylos uva-ursi	Bearberry	P	N	S	W
Euphorbiaceae (Spurge Family)					
Agaloma marginata	Snow-on-the-mountain	A	N	F	C
Chamaesyce fendleri	Sandmat	P	N	F	C
Chamaesyce glyptosperma	Small, Ribseed sandmat	A	N	F	C
Chamaesyce missurica	Prairie sandmat	A	N	F	W
Chamaesyce serpyllifolia	Thymeleaf sandmat	A	N	F	W
Chamaesyce stictospora	Slimseed sandmat	A	N	F	W
Poinsettia dentata	Toothed spurge	A	N	F	C
Tragia ramosa	Noseburn	P	N	F	C
Fabaceae (Pea Family)					
Amorpha fruticosa, var. *angustifolia*	False indigo	P	N	S	C
Astragalus adsurgens, var. *robustior*	Prairie milk-vetch	P	N	F	W
Astragalus bisulcatus	Two-grooved vetch	P	N	F	W
Astragalus drummondii	Drummond's milk-vetch	P	N	F	C
Astragalus missouriensis	Missouri milk-vetch	P	N	F	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Astragalus racemosus	Alkali milk-vetch	P	N	F	C
Astragalus tenellus	Looseflower milk-vetch	P	N	F	C
Caragana arborescens	Siberian pea-shrub	P	I	S	C
Dalea aurea	Silktop dalea	P	N	F	W
Dalea candida, var. *oligophylla*	White prairie clover	P	N	F	C
Dalea jamesii	James dalea	P	N	F	C
Dalea purpurea	Purple prairie clover	P	N	F	C
Glycyrrhiza lepidota	American licorice	P	N	F	C
Hoffmanseggia drepanocarpa	Sicklepod rushpea	P	N	F	C
Lathyrus eucosmus	Bush peavine	P	N	F	C
Lathrus latifolius	Perenial sweetpea	P	I	F	C
Medicago lupulina	Black medic	P	I	F	C
Medicago sativa	Alfalfa	P	I	F	C
Melilotus albus	White sweet clover	P	I	F	C
Melilotus officinalis	Yellow sweet clover	P	I	F	C
Oxytropis lambertii	Lambert crazyweed	P	N	F	C
Psoralidium tenuiflorum	Slimflower scurfpea	P	N	F	C
Robina neomexicana	New Mexico locust	P	N	T	C
Thermopsis divaricarpa	Golden banner	P	N	F	C
Trifolium pratense	Red clover	P	I	F	C
Vexibia nuttalliana	White loco	P	N	F	C
Vicia Americana, ssp. *americana*	American vetch	P	N	F	C
Fagaceae (Oak Family)					
Quercus gambelii	Gambel's oak	P	N	S	C
Quercus turbinella	Shrub live oak	P	N	S	C
Quercus undulata	Wavyleaf oak	P	N	S	C
Frankeniaceae (Frankenia Family)					
Frankenia jamesii	James frankenia	P	N	F	C
Geraniaceae (Geranium Family)					
Erodium cicutarium	Filaree	A	I	F	C
Geranium caespitosum, ssp. *caespitosum*	Parry geranium	P	N	F	C
Geranium richardsonii	Richardson's cranebill	P	N	F	C
Grossulariaceae (Currant or Gooseberry Family)					
Ribes aurem	Golden currant	P	N	S	C
Ribes cereum	Wax currant	P	N	S	C
Ribes leptanthum	Trumpet gooseberry	P	N	S	C
Helleboraceae (Hellebore Family)					
Delphinium carolinianum, ssp. *virescens*	Prairie larkspur	P	N	F	C
Delphinium nuttallianum	Nuttals’s larkspur	P	N	F	C
Hypericaceae (St. Johnswort Family)					
Hypericum perforatum	St. John’s wort	P	I	F	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Iridaceae (Iris Family)					
Iris missouriensis	Rocky Mountain iris	P	N	G	C
Sisyrinchium montanum	Blue-eyed grass	P	N	G	C
Juncaceae (Rush Family)					
Juncus arcticus, ssp. *ater*	Arctic rush	P	N	G	C
Juncus dudleyi	Path rush	P	N	G	C
Juncus gerardii	Inland rush	P	N	G	W
Juncus interior	Inland rush	P	N	G	C
Juncus nodosus	Jointed rush	P	N	G	W
Juncus torreyi	Torrey's rush	P	N	G	W
Juncaginaceae (Arrowgrass Family)					
Triglochin maritima	Seaside arrowgrass	P	I	G	C
Lamiaceae (Mint Family)					
Hedeoma drummondii	Drummond's false pennyroyal	P	N	F	C
Lycopus americanus	American bugleweed	P	N	F	W
Marrubium vulgare	Horehound	P	I	F	C
Mentha arvensis	Field mint	P	N	F	W
Nepeta cataria	Catnip	P	I	F	W
Prunella vulgaris	Common self-heal	P	N	F	W
Salvia reflexa	Lanceleaf sage	A	N	F	W
Teucrium laciniatum	Cutleaf germander	P	N	F	C
Lemnaceae (Duckweed Family)					
Lemna minor	Duckweed	A	N	F	W
Linaceae (Flax Family)					
Adenolinum lewisii	Wild blue flax	P	N	F	C
Mesynium puberulum	Plains flax	A	N	F	C
Loasaceae (Loasa Family)					
* *Nuttallia chrysantha*	Golden blazing star	P	N	F	C
Nuttallia multiflora	Manyflowered mentzelia	P	N	F	C
Malvaceae (Mallow Family)					
Sphaeralcea angustifolia, var. *cuspidata*	Narrowleaf globemallow	P	N	F	C
Sphaeralcea coccinea	Scarlet globemallow	P	N	F	C
Nyctaginaceae (Four-O'clock Family)					
Mirabilis multiflora	Colorado four-o'clock	P	N	F	C
Mirabilis oxybaphoides	Spreading four-o'clock	P	N	F	W
Oxybaphus linearis	Narrowleaf umbrellawort	P	N	F	C
Oxybaphus nyctagineus	Wild four-o'clock	P	N	F	C
**Oxybaphus rotundifolius*	Roundleaf four-o'clock	P	N	F	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Oleaceae (Olive Family)					
Fraxinus pensylvanica, var. *lanceolata*	Sargent, Green ash	P	N	T	C
Menodora scabra	Rough menodora	P	N	F	C
Onagraceae (Evening-Primrose Family)					
Calylophus lavandulifolius	Lavenderleaf evening primrose	P	N	F	C
Calylophus serrulatus	Plains yellow primrose	P	N	F	C
Epilobium ciliatum	Hairy willowherb	P	N	F	W
Gaura coccinea	Scarlet gaura	P	N	F	C
Gaura mollis	Smallflower gaura	P	N	F	C
Oenothera albicaulis	Prairie evening primrose	A	N	F	C
Oenothera coronopifolia	Crownleaf evening primrose	P	N	F	C
**Oenothera harringtonii*	Arkansas valley primrose	P	N	F	C
Oenothera villosa	Common evening primrose	P	N	F	W
Orobanchaceae (Broom-Rape Family)					
Aphyllon fasciculatum	Broomrape	P	N	T	W
Papaveraceae (Poppy Family)					
Argemone hispida	Hedgehog pricklypoppy	P	N	F	W
Plantaginaceae (Plantain Family)					
Plantago lanceolata	Narrowleaf plantain	P	N	F	C
Plantago major	Common plantain	P	N	F	C
Plantago patagonica	Woolly plantain	A	N	F	C
Poaceae (Grass Family)					
Achnatherum hymenoides	Indian ricegrass	P	N	G	C
Achnatherum robustum	Sleepygrass	P	N	G	C
Achnatherum scribneri	Scribner's needlegrass	P	N	G	C
Agropyron cristatum, ssp. *Cristatum*	Crested wheatgrass	P	I	G	W
Agropyron cristatum, ssp. *desertorum*	Crested wheatgrass	P	N	G	W
Agrostis stolonifera	Redtop bentgrass	P	I	G	W
Alopecurus aequalis	Short-awn foxtail	P	N	G	W
Andropogon gerardii	Big bluestem	P	N	G	W
Anisantha tectorum	Cheatgrass	A	I	G	C
Aristida divaricata	Poverty threeawn	P	N	G	W
Aristida purpurea	Purple threeawn	P	N	G	W
Avena fatua	Wild oat	A	I	G	C
Beckmannia syzigache, ssp. *baicalensis*	Sloughgrass	P	I	G	W
Bothriochloa bladhii	Australian bluestem	P	I	G	W
Bothriochloa laguroides, ssp. *torriana*	Silver bluestem	P	N	G	W
Bouteloua curtipendula	Sideoats grama	P	N	G	W
Bromopsis inermis	Smooth brome	P	I	G	C
Bromus japonicus	Japanese brome	A	I	G	C
Buchloe dactyloides	Buffalograss	P	N	G	W
Calamovilfa longifolia	Prairie sandreed	P	N	G	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Cenchrus longispinus	Sandbur	P	I	G	W
Chloris verticillata	Windmill grass	P	N	G	C
Chondrosum gracile	Blue grama	P	N	G	W
Chondrosum hirsutum	Hairy grama	P	N	G	W
Chondrosum prostratum	Mat grama	A	N	G	W
Critesion jubatum	Foxtail barley	P	N	G	W
Critesion pusillum	Little barley	A	N	G	C
Dactylis glomerata	Orchardgrass	P	I	G	C
Diplachne fascicularis	Sprangletop	P	N	G	W
Distichlis stricta	Inland saltgrass	P	N	G	W
Echinochloa crus-galli	Barnyardgrass	A	I	G	W
Elymus canadensis	Canada wildrye	P	N	G	W
Elymus elymoides	Bottlebrush squirreltail	P	N	G	C
Elymus lanceolatus	Streambank wheatgrass	P	N	G	W
Elymus trachycaulus	Slender wheatgrass	P	N	G	W
Eragrostis cilianensis	Stinkgrass	A	N	G	W
Eragrostis pilosa	Carolina lovegrass	A	N	G	W
Erioneuron pilosum	Hairy false tridens	P	N	G	C
Festuca arundinacea	Tall fescue	P	I	G	C
Festuca pratensis	Meadow fescue	P	I	G	C
Hesperostipa comata	Needle and thread	P	N	G	C
Hesperostipa neomexicana	New Mexico feathergrass	P	N	G	C
Hilaria jamesii	Galleta	P	N	G	C
Koeleria macrantha	Junegrass	P	N	G	C
Leymus ambiguus	Colorado wild rye	P	N	G	C
Leymus cinereus	Basin wild rye	P	N	G	C
Lycurus setosus	Common wolftail	P	N	G	W
Monroa squarrosa	False buffalograss	A	N	G	W
Muhlenbergia arenacea	Ear muhly	P	N	G	W
Muhlenbergia arenicola	Sand muhly	P	N	G	W
Muhlenbergia asperifolia	Alkali muhly	P	N	G	W
Muhlenbergia capillaris	Hairgrass	P	N	G	W
Muhlenbergia cuspidata	Plains muhly	P	N	G	W
Muhlenbergia montana	Mountain muhly	P	N	G	W
Muhlenbergia racemosa	Green muhly	P	N	G	W
Muhlenbergia torreyi	Ring muhly	P	N	G	W
Muhlenbergia wrightii	Wright's muhly	P	N	G	W
Nassella viridula	Green needlegrass	P	N	G	C
Oryzopsis pungens	Mountain ricegrass	P	N	G	C
Panicum capillare	Common witchgrass	A	N	G	W
Panicum obtusum	Vine mesquite	P	N	G	C
Panicum virgatum	Switchgrass	P	N	G	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Pascopyrum smithii	Western wheatgrass	P	N	G	C
Phleum pratense	Timothy	P	I	G	C
Phragmites australis	Common reed	P	N	G	W
Piptatherum micranthum	Littleseed ricegrass	P	N	G	W
Poa compressa	Canada bluegrass	P	N	G	W
Poa fendleriana	Muttongrass	P	N	G	C
Poa juncifolia	Alkali bluegrass	P	N	G	C
Poa palustris	Fowl bluegrass	P	I	G	W
Poa pratensis	Kentucky bluegrass	P	I	G	C
Polypogon monspeliensis	Rabbitfoot grass	A	I	G	C
Psathyrostachys juncea	Russian wild rye	A	I	G	C
Schedonnardus paniculatus	Tumblegrass	P	N	G	C
Schizachyrium scoparium	Little bluestem	P	N	G	W
Scleropogon brevifolius	Burro grass	P	N	G	W
Setaria viridis	Green foxtail	A	I	G	W
Sorgastrum avenaceum	Indian grass	P	N	G	W
Spartina gracilis	Alkali cordgrass	P	N	G	W
Spartina pectinata	Prairie cordgrass	P	N	G	W
Sphenopholus obtusata	Wedgegrass	P	N	G	C
Sporobolus airoides	Alkali sacaton	P	N	G	W
Sporobolus asper	Rough dropseed	P	N	G	W
Sporobolus cryptandrus	Sand dropseed	P	N	G	W
Thinopyrum intermedium	Intermediate wheatgrass	P	N	G	W
Tridens muticus, var. *elongatus*	Green tridens	P	N	G	W
Triticum aestivum	Wheat	A	I	G	C
Vulpia octoflora	Sixweeks fescue	A	N	G	C
Polemoniaceae (Phlox Family)					
Ipomopsis laxiflora	Iron skyrocket	P	N	F	C
Ipomopsis longiflora	Flaxflowered gilia	A	N	F	C
Ipomopsis spicata	Spike gilia	P	N	F	C
Leptodactylon pungens	Granite prickly gilia	P	N	F	C
Polygonaceae (Knotweed Family)					
Acetosella vulgaris	Sheep sorrel	P	I	F	C
Eriogonum effusum	Spreading buckwheat	P	N	F	W
Eriogonium fendlerianum	Small, Buckwheat	P	N	F	W
Eriogonum jamesii	James' buckwheat	P	N	F	W
Eriogonum tenellum	Matted wild buckwheat	P	N	F	W
Eriogonum umbellatum	Sulfur eriogonum	P	N	F	W
Persicaria maculata	Lady's thumb	A	I	F	W
Persicaria pennsylvanica	Pinkweed	A	N	F	W
Polygonum ramosissimum	Bushy knotweed	A	N	F	W
Pterogonum alatum	Winged buckwheat	P	N	F	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Rumex altissimus	Pale dock	P	N	F	C
Rumex crispus	Curly dock	P	I	F	C
Portulacaceae (Purslane Family)					
Portulaca oleracea	Common purslane	A	I	F	C
Potamogetonaceae (Pondweed Family)					
Potamogeton foliosus	Leafy pondweed	P	N	F	W
Potamogeton nodosus	Longleaf pondweed	P	N	F	W
Potomogeton pectinatus	Sago pondweed	P	N	F	W
Ranunculaceae (Buttercup Family)					
Batrachium longirostre	Water crowfoot	P	N	F	C
Clematis ligusticifolia	Western virginsbower	P	N	F	W
Coriflora hirsutissima	Sugarbowls	P	N	F	W
Halerpestes cymbalaria, ssp. *saximontana*	Alkali crowfoot	P	N	F	C
Resedaceae (Mignonette Family)					
Reseda lutea	Wild mignonette	P	I	F	C
Rhamnaceae (Buckthorn Family)					
Ceanothus herbaceus	New Jersey tea	P	N	F	C
Rosaceae (Rose Family)					
Agrimonia striata	Agrimony	P	N	F	W
Cerasus pumila, ssp. *besseyi*	Sand cherry	P	N	T	C
Cercocarpus montanus	Mountain mahogany	P	N	S	C
Crataegus erythropoda	Fleshy hawthorn	P	N	S	C
Crataegus succulenta	Fleshy hawthorn	P	N	S	C
Geum aleppicum	Yellow avens	P	I	F	W
Oreobatus deliciosus	Boulder raspberry	P	N	S	C
Padus virginiana, ssp. *melanocarpa*	Chokecherry	P	N	T	C
Physocarpus monogynus	Mountain ninebark	P	N	S	C
Potentilla pensylvanica	Pennsylvania cinquefoil	P	N	F	C
Potentilla supine, ssp. *paradoxa*	Bushy cinquefoil	P	N	F	W
Prunus americana	American plum	P	N	T	C
Rosa woodsii	Wood's rose	P	N	F	C
Rubus idaeus, var. *melanolasius*	Red raspberry	P	N	F	W
Sanguisorba minor	Small burnet	P	I	F	C
Rubiaceae (Madder Family)					
Galium spp.	Bedstraw	P	N	F	W
Rutaceae (Citrus Family)					
Ptelea trifoliata	Common hoptree	P	N	T	C
Salicaceae (Willow Family)					
Populus angustifolia	Narrowleaf cottonwood	P	N	T	C
Populus deltoids, spp. *monolifera*	Plains cottonwood	P	N	T	C
Populus x acuminata	Lanceleaf cottonwood	P	N	T	C
Salix amygdaloides	Peach-leaved willow	P	N	S	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Salix exigua	Coyote willow	P	N	S	C
Salix interior	Sandbar willow	P	N	S	C
Salix irrorata	Bluestem willow	P	N	S	C
Santalaceae (Sandlewood Family)					
Comandra umbellata	Bastard toadflax	P	N	F	C
Scrophulariaceae (Figwort Family)					
Castilleja integra	Indian paintbrush	P	N	F	W
Penstemon angustifolius	Broadbeard beard-tongue	P	N	F	C
Penstemon auriberbis	Colorado beard-tongue	P	N	F	C
Penstemon secundiflorus	Sidebells penstemon	P	N	F	C
Penstemon versicolor	Penstemon	P	N	F	C
Penstemon virens	Front Range beard-tongue	P	N	F	C
Penstemon virgatus, ssp. *asa-grayi*	Beard-tongue	P	N	F	C
Verbascum thapsus	Great mullein	P	I	F	C
Veronica americana	American brooklime	P	N	F	W
Veronica anagallis-aquatica	Water speedwell	P	I	F	W
Veronica catenata	Speedwell	P	I	F	W
Smilacaceae (Simlax Family)					
Smilax lasioneuron	Carrionflower	P	N	F	C
Solanaceae (Nightshade Family)					
Chamaesaracha coronopus	Green false nightshade	P	N	F	C
Physalis hederifolia, var. *cordifolia*	Clammy groundcherry	P	N	F	W
Physalis virginiana	Virginia groundcherry	P	N	F	C
Quincula lobata	Chinese lantern	P	N	F	C
Solanum rostratum	Buffalo bur	A	N	F	C
Tamaricaceae (Tamarisk Family)					
Tamarix ramosissima	Tamarisk	P	I	S	C
Thalictraceae (Meadow Rue Family)					
Thalictrum fendleri	Fendler's meadowrue	P	N	F	C
Typhaceae (Cattail Family)					
Typha angustifolia	Narrow-leaved cattail	P	N	G	C
Typha latifolia	Broad-leaved cattail	P	N	G	C
Ulmaceae (Elm Family)					
Celtis reticulata	Netleaf hackberry	P	N	T	C
Verbenaceae (Vervain Family)					
Glandularia bipinnatifida	Showy vervain	P	N	F	C
Verbena bracteata	Prostrate vervain	P	N	F	C
Verbena hastata	Blue vervain	P	N	F	W
Violaceae (Violet Family)					
Viola nuttallii	Nuttall's violet	P	N	F	C
Viscaceae (Mistletoe Family)					
Arceuthobium spp.	Dwarf mistletoe	P	N	F	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Vitaceae (Grape Family)					
Parthenocissus vitaceae	Thicket creeper	P	N	F	C
Vitis ripara	Riverbank grapes	P	N	F	C
Zygophyllaceae (Caltrop Family)					
Tribulus terrestris	Puncturevine	P	N	F	W
Gymnosperms (“Naked-Seed” Plants)					
Cupressaceae (Cypress Family)					
Sabina monosperma	One-seed juniper	P	N	T	C
Sabina scopulorum	Rocky Mountain juniper	P	N	T	C
Pinaceae (Pine Family)					
Abies concolor	White fir	P	N	T	C
Picea pungens	Colorado blue spruce	P	N	T	C
Pinus edulis	Pinyon pine	P	N	T	C
Pinus ponderosa, ssp. *scopulorum*	Ponderosa pine	P	N	T	C
Pseudotsuga menziesii	Douglas fir	P	N	T	C
Ferns and Fern Allies					
Equisetaceae (Horsetail Family)					
Hippochaete laevigata	Smooth horsetail	P	N	G	C
Selaginellaceae (Little Club-Moss Family)					
Selaginella densa	Little club moss	P	N	F	C
Selaginella mutica	Little club moss	P	N	F	C
Sinopteridaceae (Lipfern Family)					
Argyrochosma fendleri	Fendler’s falsecloak fern				
Cheilanthes eatonii	Eaton’s lipfern	P	N	F	C
Cheilanthes fendleri	Fendler’s lipfern	P	N	F	C
Woodsiaceae (Woodsia Family)					
Woodsia oregano, ssp. *cathcartiana*	Oregon woodsia	P	N	F	W
Addendum to the Fort Carson Species List					
Horticultural Species					
Aceraceae (Maple Family)					
Acer saccharinum	Silver maple	P	I	T	C
Fabaceae (Pea Family)					
Gleditsia triacanthos	Honey locust	P	I	T	C
Robina pseudoacacia	Black locust	P	I	T	C
Iridaceae (Iris Family)					
Iris spp.	Common iris	P	I	G	W
Juglandaceae (Walnut Family)					
Juglans nigra	Black walnut	P	I	T	W
Oleaceae (Olive Family)					
Syringia vulgaris	Common lilac	P	I	S	C

ATTACHMENT **F.1.1-1**

Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Rosaceae (Rose Family)					
Malus ioensis, var. *ionesis*	Crab apple	P	I	T	C
Malus pumila	Apple	P	I	T	C
Prunus persica, var. *persica*	Peach	P	I	T	W
Pyrus communis	Pear	P	I	T	W
Ulmaceae (Elm Family)					
Ulmus americana	American elm	P	I	T	C
Ulmus pumila	Siberian elm	P	I	T	C

Life Form: A = Annual, B = Biennial, P = Perennial;

Origin: N = Native, I = Introduced

Form: F = Forb, G = Grass, V = Vine, S = Shrub, T = Tree

Season: W = Warm Season, C = Cool Season

Source: DECAM, 2002.

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ATTACHMENT F.1.2

Vertebrate Species Known to Occur at Fort Carson

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ATTACHMENT **F.1.2-1**
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Campostoma anomalum	Osteichthyes	Stoneroller		
Ctenopharyngodon idella	Osteichthyes	Grass Carp		
Culaea inconstans	Osteichthyes	Brook Stickleback		
Cyprinus carpio	Osteichthyes	Carp		
Etheostoma cragini	Osteichthyes	Arkansas Darter	Candidate	Threatened
Fundulus zebrinus	Osteichthyes	Plains Killifish		
Gambusia affinis	Osteichthyes	Mosquitofish		
Ictalurus punctatus	Osteichthyes	Channel Catfish		
Lepomis cyanellus	Osteichthyes	Green Sunfish		
Lepomis macrochirus	Osteichthyes	Bluegill		
Notemigonus crysoleucas	Osteichthyes	Golden shiner		
Oncorhynchus clarki stomias	Osteichthyes	Greenback Cutthroat Trout	Threatened	Threatened
Phoxinus erythrogaster	Osteichthyes	Southern Redbelly Dace		Endangered
Pimephales promelas	Osteichthyes	Fathead Minnow		
Pomoxis nigromaculatus	Osteichthyes	Black crappie		
Rhinichthys cataractae	Osteichthyes	Longnose Dace		
Salmo clarki	Osteichthyes	Snake River Cutthroat trout		
Salmo gairdneri	Osteichthyes	Rainbow trout		
Salvelinus fontinalis	Osteichthyes	Brook Trout		
Semotilus atromaculatus	Osteichthyes	Creek Chub		
Ambystoma tigrinum	Amphibia	Tiger Salamander		
Spea bombifrons	Amphibia	Plains Spadefoot Toad		
Spea multiplicatus	Amphibia	New Mexico Spadefoot		
Bufo punctatus	Amphibia	Red-spotted Toad		
Bufo woodhousii	Amphibia	Woodhouse's Toad		
Pseudacris triseriata	Amphibia	Western chorus frog		
Rana blairi	Amphibia	Plains Leopard Frog		Special Concern
Rana catesbeiana	Amphibia	Bullfrog		
Rana pipiens	Amphibia	Northern Leopard Frog		Special Concern
Coluber constrictor flaviventris	Reptilia	Racer		
Heterodon nasicus nasicus	Reptilia	Western Hognose Snake		
Lampropeltis triangulum	Reptilia	Milk Snake		
Masticophis flagellum testaceus	Reptilia	Western Coachwhip		
Pituophis melanoleucus sayi	Reptilia	Bullsnake		
Thamnophis elegans	Reptilia	Western Terrestrial Garter Snake		
Chrysemys picta bellii	Reptilia	Painted Turtle		Special Concern
Holbrookia maculata	Reptilia	Lesser Earless Lizard		
Phrynosoma douglassi	Reptilia	Short-horned Lizard		
Sceloporus undulatus erythrocheilus	Reptilia	Orange-lipped Plateau Lizard		
Eumeces multivirgatus	Reptilia	Many-lined Skink		
Cnemidophorus neotesselatus	Reptilia	Triploid Checkered Whiptail		Special Concern
Cnemidophorus sexlineatus viridis	Reptilia	Six-lined Racerunner		
Crotalus viridis	Reptilia	Western Rattlesnake		
Anser albifrons	Aves	Greater White-fronted Goose		
Chen caerulescens	Aves	Snow Goose		
Branta hutchinsii	Aves	Cackling Goose		
Branta canadensis	Aves	Canada Goose		
Cygnus columbianus	Aves	Tundra Swan		
Aix sponsa	Aves	Wood Duck		
Anas strepera	Aves	Gadwall		
Anas americana	Aves	American Wigeon		
Anas platyrhynchos	Aves	Mallard		
Anas discors	Aves	Blue-winged Teal		
Anas cyanoptera	Aves	Cinnamon Teal		
Anas clypeata	Aves	Northern Shoveler		
Anas acuta	Aves	Northern Pintail		
Anas crecca	Aves	Green-winged Teal		
Aythya valisineria	Aves	Canvasback		
Aythya americana	Aves	Redhead		
Aythya collaris	Aves	Ring-necked Duck		

ATTACHMENT **F.1.2-1**
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Aythya marila	Aves	Greater Scaup		
Aythya affinis	Aves	Lesser Scaup		
Melanitta fusca	Aves	White-winged Scoter		
Bucephala albeola	Aves	Bufflehead		
Bucephala clangula	Aves	Common Goldeneye		
Lophodytes cucullatus	Aves	Hooded Merganser		
Mergus merganser	Aves	Common Merganser		
Mergus serrator	Aves	Red-breasted Merganser		
Oxyura jamaicensis	Aves	Ruddy Duck		
Alectoris chukar	Aves	Chukar		
Phasianus colchicus	Aves	Ring-necked Pheasant		
Meleagris gallopavo	Aves	Wild Turkey		
Colinus virginianus	Aves	Northern Bobwhite		
Callipepla squamata	Aves	Scaled Quail		
Gavia immer	Aves	Common Loon		
Podilymbus podiceps	Aves	Pied-billed Grebe		
Podiceps auritus	Aves	Horned Grebe		
Podiceps nigricollis	Aves	Eared Grebe		
Aechmophorus occidentalis	Aves	Western Grebe		
Aechmophorus clarkii	Aves	Clark's Grebe		
Pelecanus erythrorhynchos	Aves	American White Pelican		
Phalacrocorax auritus	Aves	Double-crested Cormorant		
Botaurus lentiginosus	Aves	American Bittern		
Ardea herodias	Aves	Great Blue Heron		
Ardea alba	Aves	Great Egret		
Egretta thula	Aves	Snowy Egret		
Bubulcus ibis	Aves	Cattle Egret		
Nycticorax nycticorax	Aves	Black-crowned Night-Heron		
Plegadis chihi	Aves	White-faced Ibis		
Cathartes aura	Aves	Turkey Vulture		
Pandion haliaetus	Aves	Osprey		
Ictinia misisippiensis	Aves	Mississippi Kite		
Haliaeetus leucocephalus	Aves	Bald Eagle	Threatened	Threatened
Circus cyaneus	Aves	Northern Harrier		
Accipiter striatus	Aves	Sharp-shinned Hawk		
Accipiter cooperii	Aves	Cooper's Hawk		
Accipiter gentilis	Aves	Northern Goshawk		
Buteo platypterus	Aves	Broad-winged Hawk		
Buteo swainsoni	Aves	Swainson's Hawk		
Buteo jamaicensis	Aves	Red-tailed Hawk		
Buteo regalis	Aves	Ferruginous Hawk		Special Concern
Buteo lagopus	Aves	Rough-legged Hawk		
Aquila chrysaetos	Aves	Golden Eagle		
Falco sparverius	Aves	American Kestrel		
Falco columbarius	Aves	Merlin		
Falco peregrinus	Aves	Peregrine Falcon		Special Concern
Falco mexicanus	Aves	Prairie Falcon		
Laterallus jamaicensis	Aves	Black Rail		
Rallus limicola	Aves	Virginia Rail		
Porzana carolina	Aves	Sora		
Fulica americana	Aves	American Coot		
Grus canadensis	Aves	Sandhill Crane		
Charadrius semipalmatus	Aves	Semipalmated Plover		
Charadrius vociferus	Aves	Killdeer		
Charadrius montanus	Aves	Mountain Plover		Special Concern
Himantopus mexicanus	Aves	Black-necked Stilt		
Recurvirostra americana	Aves	American Avocet		
Actitis macularia	Aves	Spotted Sandpiper		
Tringa solitaria	Aves	Solitary Sandpiper		
Tringa melanoleuca	Aves	Greater Yellowlegs		

ATTACHMENT **F.1.2-1**
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Catoptrophorus semipalmatus	Aves	Willet		
Tringa flavipes	Aves	Lesser Yellowlegs		
Bartramia longicauda	Aves	Upland Sandpiper		
Numenius americanus	Aves	Long-billed Curlew		Special Concern
Limosa fedoa	Aves	Marbled Godwit		
Calidris alba	Aves	Sanderling		
Calidris pusilla	Aves	Semipalmated Sandpiper		
Calidris mauri	Aves	Western Sandpiper		
Calidris minutilla	Aves	Least Sandpiper		
Calidris bairdii	Aves	Baird's Sandpiper		
Calidris melanotos	Aves	Pectoral Sandpiper		
Calisdris himantopus	Aves	Stilt Sandpiper		
Limnodromus scolopaceus	Aves	Long-billed Dowitcher		
Gallinago delicata	Aves	Wilson’s Snipe		
Scolopax minor	Aves	American Woodcock		
Phalaropus tricolor	Aves	Wilson's Phalarope		
Larus pipixcan	Aves	Franklin's Gull		
Larus philadelphia	Aves	Bonaparte's Gull		
Larus delawarensis	Aves	Ring-billed Gull		
Larus californicus	Aves	California Gull		
Larus argentatus	Aves	Herring Gull		
Chilidonias niger	Aves	Black Tern		
Sterna forsteri	Aves	Forster's Tern		
Columba livia	Aves	Rock Pigeon		
Patagioenas fasciata	Aves	Band-tailed Pigeon		
Streptopelia decaocto	Aves	Eurasian Collared-Dove		
Zenaida asiatica	Aves	White-winged Dove		
Zenaidura macroura	Aves	Mourning Dove		
Coccyzus americanus	Aves	Yellow-billed Cuckoo		
Geococcyx californianus	Aves	Greater Roadrunner		
Tyto alba	Aves	Barn Owl		
Megascops kennicottii	Aves	Western Screech-Owl		
Bubo virginianus	Aves	Great Horned Owl		
Glaucidium gnoma	Aves	Northern Pygmy-Owl		
Athene cunicularia	Aves	Burrowing Owl		Threatened
Strix occidentalis	Aves	Spotted Owl		
Strix occidentalis lucida	Aves	Mexican Spotted Owl	Threatened	Threatened
Asio otus	Aves	Long-eared Owl		
Asio flammeus	Aves	Short-eared Owl		
Aegolius acadicus	Aves	Northern Saw-whet Owl		
Chordeiles minor	Aves	Common Nighthawk		
Phalaenoptilus nuttalii	Aves	Common Poorwill		
Cypseloides niger	Aves	Black Swift		
Chaetura pelagica	Aves	Chimney Swift		
Aeronautes saxatalis	Aves	White-throated Swift		
Eugenes fulgens	Aves	Magnificent Hummingbird		
Archilochus colubris	Aves	Ruby-throated Hummingbird		
Archilochus alexandri	Aves	Black-chinned Hummingbird		
Stellula calliope	Aves	Calliope Hummingbird		
Selasphorus platycercus	Aves	Broad-tailed Hummingbird		
Selasphorus rufus	Aves	Rufous Hummingbird		
Ceryle alcyon	Aves	Belted Kingfisher		
Melanerpes lewis	Aves	Lewis's Woodpecker		
Melanerpes erythrocephalus	Aves	Red-headed Woodpecker		
Melanerpes formicivorus	Aves	Acorn Woodpecker		
Sphyrapicus thyroideus	Aves	Williamson's Sapsucker		
Sphyrapicus varius	Aves	Yellow-bellied Sapsucker		
Sphyrapicus nuchalis	Aves	Red-naped Sapsucker		
Picoides scalaris	Aves	Ladder-backed Woodpecker		
Picoides pubescens	Aves	Downy Woodpecker		

ATTACHMENT **F.1.2-1**
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Picoides villosus	Aves	Hairy Woodpecker		
Colaptes auratus	Aves	Northern Flicker		
Contopus cooperii	Aves	Olive-sided Flycatcher		
Contopus sordidulus	Aves	Western Wood-Pewee		
Empidonax traillii	Aves	Willow Flycatcher		
Empidonax minimus	Aves	Least Flycatcher		
Empidonax hammondii	Aves	Hammond's Flycatcher		
Empidonax wrightii	Aves	Gray Flycatcher		
Empidonax oberholseri	Aves	Dusky Flycatcher		
Empidonax occidentalis	Aves	Cordilleran Flycatcher		
Sayornis phoebe	Aves	Eastern Phoebe		
Sayornis saya	Aves	Say's Phoebe		
Myriarchus cinerascens	Aves	Ash-throated Flycatcher		
Tyrannus vociferans	Aves	Cassin's Kingbird		
Tyrannus verticalis	Aves	Western Kingbird		
Tyrannus tyrannus	Aves	Eastern Kingbird		
Tyrannus forticatus	Aves	Scissor-tailed Flycatcher		
Lanius ludovicianus	Aves	Loggerhead Shrike		
Lanius excubitor	Aves	Northern Shrike		
Vireo griseus	Aves	White-eyed Vireo		
Vireo plumbeus	Aves	Plumbeous Vireo		
Vireo cassinii	Aves	Cassin's Vireo		
Vireo solitarius	Aves	Blue-headed Vireo		
Vireo gilvus	Aves	Warbling Vireo		
Vireo olivaceus	Aves	Red-eyed Vireo		
Cyanocitta stellerii	Aves	Steller's Jay		
Cyanocitta cristata	Aves	Blue Jay		
Aphelocoma californica	Aves	Western Scrub-Jay		
Gymnorhinus cyanocephalus	Aves	Pinyon Jay		
Nucifraga columbiana	Aves	Clark's Nutcracker		
Pica hodsonia	Aves	Black-billed Magpie		
Corvus brachyrhynchos	Aves	American Crow		
Corvus cryptoleucus	Aves	Chihuahuan Raven		
Corvus corax	Aves	Common Raven		
Eremophila alpestris	Aves	Horned Lark		
Tachycineta bicolor	Aves	Tree Swallow		
Tachycineta thalassina	Aves	Violet-green Swallow		
Stelgidopteryx serripennis	Aves	Northern Rough-winged Swallow		
Riparia riparia	Aves	Bank Swallow		
Petrochelidon pyrrhonota	Aves	Cliff Swallow		
Hirundo rustica	Aves	Barn Swallow		
Poecile atricapilla	Aves	Black-capped Chickadee		
Poecile gambeli	Aves	Mountain Chickadee		
Baeolophus ridgwayi	Aves	Juniper Titmouse		
Psaltriparus minimus	Aves	Bushtit		
Sitta canadensis	Aves	Red-breasted Nuthatch		
Sitta carolinensis	Aves	White-breasted Nuthatch		
Sitta pygmaea	Aves	Pygmy Nuthatch		
Certhia americana	Aves	Brown Creeper		
Salpinctes obsoletus	Aves	Rock Wren		
Catherpes mexicanus	Aves	Canyon Wren		
Thyrothorus ludovicianus	Aves	Carolina Wren		
Thyromanes bewickii	Aves	Bewick's Wren		
Troglodytes aedon	Aves	House Wren		
Cistothorus palustris	Aves	Marsh Wren		
Cinclus mexicanus	Aves	American Dipper		
Regulus satrapa	Aves	Golden-crowned Kinglet		
Regulus calendula	Aves	Ruby-crowned Kinglet		
Polioptila caerulea	Aves	Blue-gray Gnatcatcher		
Sialia sialis	Aves	Eastern Bluebird		

ATTACHMENT **F.1.2-1**
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Sialia mexicana	Aves	Western Bluebird		
Sialia currucoides	Aves	Mountain Bluebird		
Myadestes townsendi	Aves	Townsend's Solitaire		
Catharus fuscescens	Aves	Veery		
Catharus ustulatus	Aves	Swainson's Thrush		
Catharus guttatus	Aves	Hermit Thrush		
Turdus migratorius	Aves	American Robin		
Dumetella carolinensis	Aves	Gray Catbird		
Mimus polyglottos	Aves	Northern Mockingbird		
Oreoscoptes montanus	Aves	Sage Thrasher		
Toxostoma rufum	Aves	Brown Thrasher		
Toxostoma curvirostre	Aves	Curve-billed Thrasher		
Sturnus vulgaris	Aves	European Starling		
Anthus rubescens	Aves	American Pipit		
Bombycilla garralus	Aves	Bohemian Waxwing		
Bombycilla cedrorum	Aves	Cedar Waxwing		
Vermivora pinus	Aves	Blue-winged Warbler		
Vermivora chrysoptera	Aves	Golden-winged Warbler		
Vermivora peregrina	Aves	Tennessee Warbler		
Vermivora celata	Aves	Orange-crowned Warbler		
Vermivora ruficapilla	Aves	Nashville Warbler		
Vermivora virginiae	Aves	Virginia's Warbler		
Parula americana	Aves	Northern Parula		
Dendroica petechia	Aves	Yellow Warbler		
Dendroica pensylvanica	Aves	Chestnut-sided Warbler		
Dendroica coronata	Aves	Yellow-rumped Warbler		
Dendroica nigrescens	Aves	Black-throated Gray Warbler		
Dendroica virens	Aves	Black-throated Green Warbler		
Dendroica townsendi	Aves	Townsend's Warbler		
Dendroica palmarum	Aves	Palm Warbler		
Dendroica striata	Aves	Blackpoll Warbler		
Mniotilta varia	Aves	Black-and-white Warbler		
Setophaga ruticilla	Aves	American Redstart		
Helmitheros vermivorus	Aves	Worm-eating Warbler		
Seiurus aurocapillus	Aves	Ovenbird		
Seiurus noveboracensis	Aves	Northern Waterthrush		
Oporornis tolmiei	Aves	MacGillivray's Warbler		
Geothlypis trichas	Aves	Common Yellowthroat		
Wilsonia citrina	Aves	Hooded Warbler		
Wilsonia pusilla	Aves	Wilson's Warbler		
Icteria virens	Aves	Yellow-breasted Chat		
Piranga flava	Aves	Hepatic Tanager		
Piranga rubra	Aves	Summer Tanager		
Piranga ludoviciana	Aves	Western Tanager		
Pipilo chlorurus	Aves	Green-tailed Towhee		
Pipilo maculatus	Aves	Spotted Towhee		
Pipilo fuscus	Aves	Canyon Towhee		
Aimophila cassini	Aves	Cassin's Sparrow		
Aimophila ruficeps	Aves	Rufous-crowned Sparrow		
Spizella arborea	Aves	American Tree Sparrow		
Spizella passerina	Aves	Chipping Sparrow		
Spizella pallida	Aves	Clay-colored Sparrow		
Spizella breweri	Aves	Brewer's Sparrow		
Spizella pusilla	Aves	Field Sparrow		
Pooecetes gramineus	Aves	Vesper Sparrow		
Chondestes grammacus	Aves	Lark Sparrow		
Amphispiza bilineata	Aves	Black-throated Sparrow		
Calamospiza melanocorys	Aves	Lark Bunting		
Passerculus sandwichensis	Aves	Savannah Sparrow		
Ammodramus savannarum	Aves	Grasshopper Sparrow		

ATTACHMENT F.1.2-1
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Passerella iliaca	Aves	Fox Sparrow		
Melospiza melodia	Aves	Song Sparrow		
Melospiza lincolnii	Aves	Lincoln's Sparrow		
Melospiza georgiana	Aves	Swamp Sparrow		
Zonotrichia albicollis	Aves	White-throated Sparrow		
Zonotrichia querula	Aves	Harris's Sparrow		
Zonotrichia leucophrys	Aves	White-crowned Sparrow		
Junco hyemalis	Aves	Dark-eyed Junco		
Calcarius mccownii	Aves	McCown's Longspur		
Calcarius lapponicus	Aves	Lapland Longspur		
Calcarius ornatus	Aves	Chestnut-collared Longspur		
Pheucticus ludovicianus	Aves	Rose-breasted Grosbeak		
Pheucticus melanocephalus	Aves	Black-headed Grosbeak		
Passerina caerulea	Aves	Blue Grosbeak		
Passerina amoena	Aves	Lazuli Bunting		
Passerina cyanea	Aves	Indigo Bunting		
Spiza americana	Aves	Dickcissel		
Dolichonyx oryzivorus	Aves	Bobolink		
Agelaius phoeniceus	Aves	Red-winged Blackbird		
Sturnella neglecta	Aves	Western Meadowlark		
Xanthocephalus xanthocephalus	Aves	Yellow-headed Blackbird		
Euphagus cyanocephalus	Aves	Brewer's Blackbird		
Quiscalus quiscula	Aves	Common Grackle		
Quiscalus mexicanus	Aves	Great-tailed Grackle		
Molothrus ater	Aves	Brown-headed Cowbird		
Icterus spurius	Aves	Orchard Oriole		
Icterus bullockii	Aves	Bullock's Oriole		
Leucosticte tephrocotia	Aves	Gray-crowned Rosy-Finch		
Leucosticte australis	Aves	Brown-capped Rosy-Finch		
Carpodacus cassinii	Aves	Cassin's Finch		
Carpodacus mexicanus	Aves	House Finch		
Loxia curvirostra	Aves	Red Crossbill		
Coccothraustes vespertinus	Aves	Evening Grosbeak		
Carduelis pinus	Aves	Pine Siskin		
Carduelis psaltria	Aves	Lesser Goldfinch		
Carduelis tristis	Aves	American Goldfinch		
Passer domesticus	Aves	House Sparrow		
Antilocapra americana	Mammalia	Pronghorn		
Ovis canadensis	Mammalia	Bighorn sheep		
Canis latrans	Mammalia	Coyote		
Urocyon cinereoargenteus	Mammalia	Gray fox		
Vulpes vulpes	Mammalia	Red fox		
Castor canadensis	Mammalia	Beaver		
Cervus elaphus	Mammalia	Wapiti (Elk)		
Odocoileus hemionus	Mammalia	Mule Deer		
Odocoileus virginianus	Mammalia	White-tailed deer		
Microtus longicaudus	Mammalia	Long-tailed vole		
Microtus ochrogaster	Mammalia	Prairie vole		
Microtus pennsylvanicus	Mammalia	Meadow vole		
Neotoma cinerea	Mammalia	Bushy-tailed woodrat		
Neotoma floridana	Mammalia	Eastern woodrat		
Neotoma mexicana	Mammalia	Mexican woodrat		
Ondatra zibethicus	Mammalia	Muskrat		
Onychomys leucogaster	Mammalia	Northern grasshopper mouse		
Peromyscus boylii	Mammalia	Brush mouse		
Peromyscus difficilis	Mammalia	Northern Rock Mouse		
Peromyscus leucopus	Mammalia	White-footed mouse		
Peromyscus maniculatus	Mammalia	Deer mouse		
Peromyscus truei	Mammalia	Pinon mouse		
Reithrodontomys megalotis	Mammalia	Western harvest mouse		
Reithrodontomys montanus	Mammalia	Plains harvest mouse		

ATTACHMENT F.1.2-1
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Erethizon dorsatum	Mammalia	Porcupine		
Felis concolor	Mammalia	Mountain lion		
Lynx rufus	Mammalia	Bobcat		
Chaetodipus hispidus	Mammalia	Hispid pocket mouse		
Dipodomys ordii	Mammalia	Ord's kangaroo rat		
Perognathus flavescens	Mammalia	Plains pocket mouse		
Perognathus flavus	Mammalia	Silky pocket mouse		
Lepus californicus	Mammalia	Black-tailed jack rabbit		
Sylvilagus audubonii	Mammalia	Desert cottontail		
Corynorhinus townsendii	Mammalia	Townsend’s Big-Eared Bat		Special Concern
Nyctinomops macrotis	Mammalia	Big free-tailed bat		
Pipistrellus subflavus	Mammalia	Eastern Pipistrelle		
Tadarida brasiliensis	Mammalia	Brazilian free-tailed bat		
Mus musculus	Mammalia	House mouse		
Mephitis mephitis	Mammalia	Striped skunk		
Mustela erminea	Mammalia	Ermine		
Mustela frenata	Mammalia	Long-tailed weasel		
Spilogale gracilis	Mammalia	Western Spotted Skunk		
Taxidea taxus	Mammalia	Badger		
Bassariscus astutus	Mammalia	Ringtail		
Procyon lotor	Mammalia	Raccoon		
Cynomys ludovicianus	Mammalia	Black-tailed prairie dog		Special Concern
Sciurus aberti	Mammalia	Abert's squirrel		
Sciurus niger	Mammalia	Fox squirrel		
Spermophilus spilosoma	Mammalia	Spotted ground squirrel		
Spermophilus tridecemlineatus	Mammalia	Thirteen-lined ground squirrel		
Spermophilus variegatus	Mammalia	Rock squirrel		
Spermphilus spilosoma	Mammalia	Spotted ground squirrel		
Tamias minimus	Mammalia	Least chipmunk		
Tamias quadrivittatus	Mammalia	Colorado chipmunk		
Tamiasciurus hudsonicus	Mammalia	Red squirrel		
Ursus americanus	Mammalia	Black bear		
Antrozous pallidus	Mammalia	Pallid bat		
Eptesicus fuscus	Mammalia	Big brown bat		
Lasiurus cinereus	Mammalia	Hoary bat		
Myotis yumanensis	Mammalia	Yuma myotis		

Source: DECAM, 2002a (Updated by DECAM in 2007)

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APPENDIX F.2

PCMS
Biological Resources Supporting Documentation

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ATTACHMENT F.2.1

Plants Known to Occur at the PCMS

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Scientific Name	Common Name	Life	Origin	Form	Season
Angiosperms (Flowering plants)					
Aceraceae (Maple family)					
Acer glabrum	Mountain maple	P	N	T	C
Agavaceae (Agave family)					
Yucca glauca	Small soapweed	P	N	F	C
Alismataceae (Water-Plantain family)					
Alisma trivale	Northern water plantain	N	P	F	W
Alisma spp. L.	Water plantain	N	P	F	W
Sagittaria spp. L.	Arrowhead	N	P	F	W
Alliaceae (Onion family)					
Allium cernuum	Wild onion	P	N	F	W
Allium textile	Textile onion	P	N	F	C
Alsinaceae (Chickweed family)					
Eremogone hookeri	Hooker sandwort	P	N	F	W
Paronychia sessiliflora	Creeping nailwort	P	N	F	W
Amaranthaceae (Amaranth family)					
Amaranthus blitoides	Mat amaranth	A	I	F	W
Anacardiaceae (Sumac family)					
Rhus aromatica ssp. *tribolata*	Skunkbrush, lemonade bush	P	N	S	C
Rhus aromatica ssp. *pilosissima*	Lemonade bush, skunkbrush	P	N	S	C
Toxicodendron rydbergii	Poison Ivy	P	N	S	W
Apiaceae (Carrot family)					
Conium maculatum L.	Poison hemlock	B	I	F	C
Cymopterus acaulis	Plains spring parsley	P	N	F	C
Cymopterus montanus	Mountain spring parsley	P	N	F	C
Heracleum sphondylium L. ssp. *montanum*	Cow parsnip	P	N	F	C
Lomatium orientale	Northern Idaho biscuitroot	P	N	F	C
Musineon divaricatum	Leafy wild parsley	P	N	F	C
Apocynaceae (Dogbane family)					
Apocynum cannabinum L.	Indian hemp	P	N	F	W
Asclepiadaceae (Milkweed family)					
Asclepias arenaria	Sand milkweed	P	N	F	W
Asclepias asperula	Spider milkweed	P	N	F	C
Asclepias engelmanniana	Englemann's milkweed	P	N	F	W
Asclepias incarnata L.	Swamp milkweed	P	N	F	W
Asclepias macrotis	Plains milkweed	P	N	F	W

Scientific Name	Common Name	Life	Origin	Form	Season
Asclepias speciosa	Showy milkweed	P	N	F	C
Asclepias subverticillata	Poison milkweed	P	N	F	W
**Asclepias uncialis*	Dwarf milkweed	P	N	F	C
Asclepias verticillata	Whorled milkweed	P	N	F	W
Asclepias viridiflora	Green milkweed	P	N	F	W
**Sarcostemma crispum*	Twinevine	P	N	F	W
Asteraceae (Daisy family)					
Acroptilon repens L.	Russian knapweed	P	I	F	W
Ambrosia psilostachya var. *coronopifolia*	Western ragweed	P	N	F	W
Ambrosia trifida L.	Giant ragweed	A	I	F	W
Antennaria howellii	Howell's pussytoes	P	N	F	C
Antennaria parvifolia	Littleleaf pussytoes	P	N	F	C
Arctium minus	Common burdock	P	I	F	W
Artemisia bigelovii	Bigelow's sagebrush	P	N	F	W
Artemisia frigida	Silver sagebrush	P	N	F	W
Artemisia ludoviciana	Louisiana sagebrush	P	N	F	W
Baccharis wrightii	Wright's baccharis	P	N	F	W
Brickellia brachyphylla	Plumed brickellbush	P	N	F	W
Brickellia californica	California brickellbush	P	N	F	W
Chrysothamnus nauseosus	Rabbitbrush	P	N	S	W
Chrysothamnus viscidiflorus	Green rabbitbrush	P	N	S	W
Cirsium undulatum	Wavyleaf thistle	P	N	F	W
Conyza canadensis L.	Canadian horseweed	A	N	F	W
Coreopsis tinctoria	Plains coreopsis	A	N	F	W
Cyclachaena xanthifolia	Marsh-elder	A	N	F	C
Dyssodia aurea	Dogweed	A	N	F	W
Erigeron divergens	Spreading fleabane	P	N	F	W
Erigeron pumilus	Low fleabane	P	N	F	C
Erigeron subtrinervis	Threenerved fleabane	P	N	F	C
Evax prolifera	Bighead pygmy cudweed	A	N	F	C
Gaillardia pinnatifida	Blanket flower	P	N	F	C
Grindelia squarrosa	Curlycup gumweed	P	N	F	W
Gutierrezia sarothrae	Broom snakeweed	P	N	F	W
Helianthus annuus L.	Annual sunflower	A	N	F	W
Helianthus petiolaris	Prairie sunflower	A	N	F	W
Heterotheca villosa	Hairy goldaster	P	N	F	W

Scientific Name	Common Name	Life	Origin	Form	Season
Hymenopappus filifolius	Fineleaf hymenopappus	P	N	F	C
Hymenopappus tenuifolius	Fineleaf hymenopappus	P	N	F	C
Iva axillaris	Poverty weed	P	N	F	W
Lactuca serriola L.	Prickly lettuce	P	I	F	W
Lactuca tatarica L. ssp. *pulchella*	Blue lettuce	P	N	F	W
Leucelene ericoides	Sand aster	P	N	F	C
Liatris punctata	Dotted gayfeather	P	N	F	W
Lygodesmia juncea	Rush skeletonweed	P	N	F	W
Machaeranthera pinnatifida	Lacy tansyaster	P	N	F	C
Machaeranthera tanacetifolia	Tansyleaf aster	A	N	F	W
Melampodium leucanthum	Plains blackfoot daisy	P	N	F	C
Nothocalis cuspidata	False dandelion	P	N	F	C
Oligosporus caudatus	Sagewort wormwood	P	N	F	W
Oligosporus dracunculus L. ssp. *glaucus*	Wild tarragon	P	N	F	W
Oligosporus filifolius	Sand sagebrush	P	N	S	W
Oonopsis foliosa	Fremont goldenweed	P	N	F	W
Packera neomexicana ssp. *mutabilis*	New Mexico groundsel	P	N	F	C
Packera pseudaurea	Falsegold groundsel	P	N	F	C
Packera tridenticulata	Threetooth ragwort	P	N	F	C
Palafoxia rosea var. *macrolepsis*	Rosy palafox	P	N	F	W
Pectis angustifolia	Narrow-leaf pectis	P	N	F	W
Picradeniopsis oppositifolia	Plains bahia	P	N	F	W
Ratibida columnifera	Prairie coneflower	P	N	F	W
Ratibida tagetes	Green prairie coneflower	P	N	F	W
Senecio riddellii	Riddell's ragwort	P	N	F	W
Solidago mollis	Velvety goldenrod	P	N	F	W
Solidago multiradiata	Mountain goldenrod	P	N	F	W
Solidago petiolaris	Downy goldenrod	P	N	F	W
Solidago velutina	Three-nerved goldenrod	P	N	F	W
Stephanomeria pauciflora	Desert wirelettuce	P	N	F	W
Taraxacum officinale	Common dandelion	P	I	F	C
Tetraneuris acaulis	Stemless hymenoxys	P	N	F	C
Thelesperma megapotamicum	Hopi-tea greenthread	P	N	F	C
Thelesperma subnudum	Navajo-tea greenthread	P	N	F	W
Townsendia exscapa	Stemless townsendia	P	N	F	C
Townsendia hookeri	Hooker's townsendia	P	N	F	C

Scientific Name	Common Name	Life	Origin	Form	Season
Tragopogon dubius ssp. *major* (	Western salsify	P	N	F	C
Virgulus ericoides L.	Heath aster	P	I	F	C
Virgulus falcatus	Cluster aster	P	N	F	W
Virgulus fendleri	Fendler's aster	P	N	F	W
Zinnia grandiflora	Rocky Mountain zinnia	P	N	F	C
Boraginaceae (Borage family)					
Cryptantha minima	Little catseye	A	N	F	C
Lappula marginata	Margined stickseed	A	I	F	C
Lappula redowskii (Hornemamm)	Desert stickseed	A	N	F	C
Lithospernum incisum	Narrowleaf gromwell	P	N	F	C
Onosmodium molle var. *occidentale*	Western marbleseed	P	N	F	C
Oreocarya bakeri	Baker's catseye	P	N	F	C
Oreocarya suffruticosa	James' catseye	P	N	F	C
Oreocarya thyrsiflora	Cluster catseye	P	N	F	C
Brassicaceae (Mustard family)					
Arabis hirsuta L.	Rockcress	A	I	F	C
Camelina microcarpa	Littlepod false flax	A	I	F	C
Descurainia incana L.	Mountain tanseymustard	P	N	F	C
Descurania incisa	Tansey muxtard	P	N	F	C
Descurainia pinnata	Western tanseymustard	A	I	F	C
Descurainia sophia L.	Herb sophia	A	I	F	C
Draba reptans	Carolina draba	A	N	F	C
Erysimum asperum	Western wallflower	P	N	F	C
Erysimum inconspicuum	Western wallflower	P	N	F	C
Lesquerella fendleri	Fendler's bladderpod	P	N	F	C
Lesquerella ovalifolia	Bladderpad	P	N	F	C
Stanleya pinnata	Prince's plume	P	N	F	C
Thelypodium wrightii ssp. *oklahomensis*	Oklahoma thelypody	P	N	F	W
Cactaceae (Cactus family)					
Coryphantha vivipara	Nipple cactus	P	N	C	C
Cylindropuntia imbricata	Candelabra cactus	P	N	S	C
Echinocereus reichenbackii var. *perbellus*	Claret cup	P	N	C	C
Echinocereus viridiflorus	Hens-and-chickens	P	N	C	C
Opuntia macrorhiza	Twisted spine prickly pear	P	N	C	C
Opuntia phaeacantha	New Mexican prickly-pear	P	N	C	C

Scientific Name	Common Name	Life	Origin	Form	Season
Opuntia polyacantha	Plains prickly-pear	P	N	C	C
Calochortaceae (Mariposa family)					
Calochortus gunnisonii	Sego lily, mariposa lily	P	N	F	W
Campanulaceae (BellFlower family)					
Lobelia cardinalis L. ssp. *graminea*	Cardinal flower	P	N	F	W
Capparidaceae (Caper family)					
Cleome serrulata	Rocky Mountain beeplant	A	N	F	W
Polanisia dodecandra L.	Roughseed clammyweed	P	N	F	C
Caprifoliaceae (Honeysuckle family)					
Sambucus canadensis L.	Elderberry	P	N	F	C
Symphoricarpos albus L.	White coralberry	P	N	F	C
Symphoricarpos occidentalis	Western snowberry	P	N	F	C
Symphoricarpos oreophilus	Mountain snowberry	P	N	F	C
Chenopodiaceae (Goosefoot family)					
Atriplex argenta	Tumbling saltbush	A	N	F	W
Atriplex canescens	Fourwing saltbush	P	N	S	C
Bassia sieversiana	Ironweed	A	I	F	W
Chenopodium album L.	Lambsquarters	A	I	F	W
Chenopodium desiccatum	Desert goosefoot	A	N	F	W
Chenopodium incanum	Mealy goosefoot	A	N	F	W
Chenopodium leptophyllum	Slimleaf goosefoot	A	N	F	W
Krascheninnikovia lanata	Common winterfat	P	N	H	C
Salsola australis	Russian thistle, tumbleweed	A	I	F	W
Sarcobatus vermiculatus	Black greasewood	P	N	S	C
Commelinaceae (Spiderwort family)					
Tradescantia occidentalis	Prairie spiderwort	P	N	F	C
Convolvulaceae (Morningglory family)					
Convolvulus arvensis L.	Creeping jenny	P	I	F	W
Evolvulus nuttallianus	Arizona evolvulus	P	N	F	C
Ipomoea leptophylla	Bush morningglory	P	N	F	C
Crossosomataceae					
Forsellesia planitierum	Greasebush	P	N	S	C
Cucurbitaceae (Gourd family)					
Cucurbita foetidissima	Buffalo gourd	P	N	V	W
Cyperaceae (Sedge family)					
Carex gravida var. *lunelliana*	Heavy sedge	P	N	G	C

Scientific Name	Common Name	Life	Origin	Form	Season
Carex lanuginosa	Bottlebrush sedge	P	N	G	C
Carex stenophylla ssp. *eleocharis*	Needleleaf sedge	P	N	G	C
Eleocharis palustris L.	Common spikerush	P	N	G	C
Mariscus filiculmis	Fern flatsedge	P	N	G	W
Mariscus schweinitzii	Schweinitz's flatsedge	P	N	G	W
Schoenoplectus lacustris L. ssp. *acutis*	Tule bulrush	P	N	G	C
Schoenoplectus pungens	Bulrush	P	N	G	W
Elaeagnaceae (Oleaster family)					
Elaeagnus angustifolia L.	Russian olive	P	I	T	C
Euphorbiaceae					
Alagloma marginata	Snow-on-the-mountain	A	N	F	W
Chamaesyce fendleri	Fendler's sandmat	P	N	F	C
Chamaesyce glyptosperma	Ribseed sandmat	A	N	F	C
Chamaesyce lata	Hoary sandmat	P	N	F	C
Chamaesyce missurica	Thymeleaf sandmat	A	N	F	W
Chamaesyce stictospora	Slimseed sandmat	A	N	F	W
Croton texensis	Texas croton	A	N	F	W
Poinsettia dentata	Toothed spurge	A	N	F	C
Tithymalus spathulatus	Warty spurge	A	N	F	C
Tragia ramosa	Noseburn	P	N	F	C
Fabaceae (Pea family)					
Amorpha fruticosa L. var. *angustifolia*	False indigo	P	N	S	C
**Amorpha nana*	Dwarf wild indigo	P	N	S	C
Astragalus crassiocarpus	Ground plum	P	N	F	C
Astragalus gracilis	Slender milkvetch	P	N	F	C
Astragalus missouriensis	Slender milkvetch	P	N	F	C
Astragalus nuttallianus var. *micranthiformis*	Turkeypeas	P	N	F	C
Astragalus paryii	Parry's milk-vetch	P	N	F	C
Astragalus puniceus	Trinidad milk-vetch	P	N	F	C
Astragalus racemosus	Alkali poisonvetch	P	N	F	C
Astragalus shortianus	Short's milk-vetch	P	N	F	C
Caesalpinia jamesii	James' holdback	P	N	F	C
Dalea aurea	Golden prarie clover	P	N	F	W
Dalea candida var. *oligophylla*	White prairie clover	P	N	F	C
Dalea enneandra	Nine anther prairie clover	P	N	F	W
Dalea jamesii	James dalea	P	N	F	C

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Dalea purpurea	Purple prairie clover	P	N	F	C
Glycyrrhiza lepidota	American licorice	P	N	F	C
Hedysarum boreale	Chainpod	P	N	F	W
Hoffmanseggia drepanocarpa	Sicklepod rushpea	P	N	F	C
Lathyrus eucosmus	Bush peavine	P	N	F	C
Lupinus pusillus	Rusty lupine	A/B	N	F	C
Medicago sativa L.	Alfalfa	P	I	F	C
Melilotus albus	White sweet clover	P	I	F	C
Melilotus officinalis L.	Yellow sweet clover	P	I	F	C
Oxytropis deflexa var. *sericea*	Pendulous pod	P	N	F	C
Oxytropis lambertii	Lambert crazyweed	P	N	F	C
Pediomelum hypogaeum	Indian potato	P	N	F	C
Psoralidium tenuiflorum	Slimflower scurfpea	P	N	F	C
Vexibia nuttalliana	White loco	P	N	F	C
Vicia americana ssp. *americana*	American vetch	P	N	F	C
Vicia americana ssp. *minor*	Mat vetch	P	N	F	C
Frankeniaceae (Frankenia family)					
Frankenia jamesii	James frankenia	P	N	S	C
Fumariaceae (Fumitory family)					
Corydalis aurea	Golden smoke	A	N	F	C
Corydalis curvisiliqua ssp. *occidentalis*	Golden smoke	A	N	F	C
Geraniaceae (Geranium family)					
Erodium cicutarium L.	Filaree	A	I	F	C
Grossulariaceae (Currant or Gooseberry family)					
Ribes aureum	Golden currant	P	N	S	C
Ribes cereum	Wax currant	P	N	S	C
Ribes leptanthum	Trumpet gooseberry	P	N	S	C
Helleboraceae (Hellebore family)					
Delphinium carolinianum ssp. *virescens*	Prairie larkspur	P	N	F	C
Delphinium wootonii	Oregon mountain larkspur	P	N	F	C
Hydrangeaceae (Hydrangea family)					
Philadelphus microphyllus	Mock orange	P	N	S	C
Iridaceae (Iris family)					
Sisyrinchium montanum	Blue-eyed grass	P	N	G	C
Juncaceae					

Scientific Name	Common Name	Life	Origin	Form	Season
Juncus arcticus ssp. *ater*	Mountain rush	P	N	G	C
Juncus dudleyi	Rush	P	N	G	C
Juncus interior	Inland rush	P	N	G	C
Juncus torreyi	Torrey's rush	P	N	G	W
Juncaginaceae (Arrowgrass family)					
Triglochin maritima L.	Seaside arrowgrass	P	I	G	C
Lamiaceae					
Hedeoma drummondii	False pennyroyal	P	N	F	C
Marribium vulgare L.	Horehound	P	I	F	C
Monarda pectinata	Beebalm	P	N	F	C
Salvia reflexa	Lanceleaf sage	A	N	F	W
Teucrium laciniatum	Cutleaf germander	P	N	F	C
Liliaceae (Lily family)					
Leucrocrinum montanum	Sand lily	P	N	F	C
Linaceae (Flax family)					
Adenolinum lewisii	Wild blue flax	P	N	F	C
Mesynium puberulum	Plains flax	A	N	F	C
Mesynium rigidum	Yellow flax	A	N	F	C
Loasaceae (Loasa family)					
Acrolasia albicaulis	Whitestem blazingstar	A	N	F	C
Mentzelia oligosperma	Chickenthief	P	N	F	W
Nuttallia nuda	Bractless blazingstar	P	N	F	W
Nuttallia rusbyi	Bractless blazingstar	P	N	F	W
Malvaceae (Mallow family)					
Sphaeralcea angustifolia (Cavanilles) D.Don var. *cuspidata*	Narrowleaf globemallow	P	N	F	C
Sphaeralcea coccinea	Scarlet globemallow	P	N	F	C
Martyniaceae (Unicorn Plant family)					
Proboscidea louisianica	Devil's claw	P	A	F	W
Nyctaginaceae (Four-O'Clock family)					
Ambronia fragrans	Sand verbena	P	N	F	C
Mirabilis multiflora	Colorado four-o'clock	P	N	F	C
Oxybaphus hirsutus	Hairy four-o'clock	P	N	F	C
Oxybaphus linearis	Narrow leaved four-o'clock	P	N	F	C
**Oxybaphus rotundifolius*	Roundleaf four-o'clock	P	N	F	C
Tripterocalyx micranthus	Sand puff	A	N	F	C

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Onagraceae (Evening-Primrose family)					
Calylophus lavandulifolius	Lavenderleaf evening primrose	P	N	F	C
Gaura coccinea	Scarlet gaura	P	N	F	C
Gaura mollis	Smallflower gaura	P	N	F	C
Oenothera albicaulis	Prairie evening primrose	A	N	F	C
Oenothera caespitosa	Tufted evening primrose	P	N	F	C
**Oenothera harringtonii*	Arkansas valley primrose	P	N	F	C
Orobanchaceae (Broom-Rape family)					
Orobanche multiflora	Broomrape	P	N	F	W
Papaveraceae (Poppy family)					
Argemone hispida	Hedgehog pricklypoppy	P	N	F	W
Plantaginaceae (Plantain family)					
Plantago patagonica	Woolly plantain	A	N	F	C
Poaceae (Grass family)					
Achnatherum hymenoides	Indian ricegrass	P	N	G	C
Achnatherum robustum	Sleepygrass	P	N	G	C
Achnatherum scribneri	Scribner needlegrass	P	N	G	C
Agropyron cristatum L.	Crested wheatgrass	P	I	G	W
Agropyron cristatum L. ssp. *desertorum*	Crested wheatgrass	P	N	G	W
Agrostis stolinifera L.	Redtop bentrgrass	P	I	G	W
Alopecurus aequalis	Short-awn foxtail	P	N	G	W
Aristida purpurea	Purple threeawn	P	N	G	W
Andropogon gerardii	Big bluestem	P	N	G	W
Avena fatua L.	Wild oat	A	I	G	C
Bothriochloa laguroides ssp. *torreyana*	Silver bluestem	P	N	G	W
Bouteloua curtipendula	Sideoats grama	P	N	G	W
Bromopsis inermis	Smooth brome	P	I	G	C
Bromus japonicus	Japanese brome	A	I	G	C
Buchloe dactyloides	Buffalograss	P	N	G	W
Calamagrostis stricta	Reedgrass	P	N	G	W
Chondrosum eriopodum	Black grama	P	N	G	W
Chondrosum gracile	Blue grama	P	N	G	W
Chondrosum hirsutum	Hairy grama	P	N	G	W
Chondrosum prostratum	Mat grama	A	N	G	W
Critesion jubatum L.	Foxtail barley	P	N	G	W

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Critesion pusillum	Little barley	A	N	G	C
Dactylis glomerata L.	Orchardgrass	P	I	G	C
Echinochloa crus-galli L.	Barnyardgrass	A	I	G	W
Elymus canadensis L.	Canada wildrye	P	N	G	W
Elymus elymoides	Bottlebrush squirreltail	P	N	G	C
Elymus lanceolatus	Streambank wheatgrass	P	N	G	W
Erioneuron pilosum	Hairy false tridens	P	N	G	C
Hesperostipa comata	Needle and thread	P	N	G	C
Hilaria jamesii	Galleta	P	N	G	C
Koeleria macrantha	Junegrass	P	N	G	C
Lycurus setosus	Common wolftail	P	N	G	W
Monroa squarrosa	False buffalograss	A	N	G	W
Muhlenbergia arenacea	Ear muhly	P	N	G	W
Muhlenbergia arenicola	Sand muhly	P	N	G	W
Muhlenbergia asperifolia (	Alkali muhly	P	N	G	W
Muhlenbergia torreyi (	Ring muhly	P	N	G	W
Nassella viridula	Green needlegrass	P	N	G	C
Panicum capillare L.	Common witchgrass	P	N	G	C
Panicum obtusum	Vine mesquite	A	N	G	W
Pascopyrum smithii	Western wheatgrass	P	N	G	C
Phragmites australis	Common reed	P	N	G	W
Piptatherum micranthum	Littleseed ricegrass	P	N	G	W
Poa bigelovi	Bigelow's bluegrass	A	N	G	C
Poa pratensis L.	Kentucky bluegrass	P	I	G	C
Poa secunda	Sandberg bluegrass	P	N	G	C
Polypogon monspeliensis L.	Rabbitfoot grass	A	I	G	C
Schedonnardus paniculatus	Tumblegrass	P	N	G	C
Schizachyrium scoparium	Little bluestem	P	N	G	W
Scleropogon brevifolius	Burro grass	P	N	G	W
Sporobolus airoides	Alkali sacaton	P	N	G	W
Sporobolus cryptandrus	Sand dropseed	P	N	G	W
Sphenopholus obtusata	Wedgegrass	P	N	G	C
Tridens muticus var. *elongatus*	Green tridens	P	N	G	W
Vulpia octoflora	Sixweeks fescue	A	N	G	C
Polemoniaceae (Phlox family)					
Gilia opthalmoides	Eyed gilia	A	N	F	C
Giliastrum rigidulum ssp. *acerosum*	Blue bowls	P	N	F	C

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(Bentham) Rydberg					
Ipomopsis laxiflora	Iron skyrocket	P	N	F	C
Ipomopsis pumila	Manybranched gilia	A	N	F	C
Ipomopsis spicata	Spike gilia	P	N	F	C
Phlox longifolia	Longleaf phlox	P	N	F	C
Polygonaceae (Knotweed family)					
Eriogonum annuum	Annual buckwheat	A	N	F	W
Eriogonum effusum	Spreading buckwheat	P	N	F	W
Eriogonium fendlerianum	Buckwheat	P	N	F	W
Eriogonium gordonii	Gordon's buckwheat	A	N	F	W
Eriogonum jamesii	James' buckwheat	P	N	F	W
Eriogonum lachnogynum	Woollycup buckwheat	P	N	F	W
Eriogonum tenellum	Matted wild buckwheat	P	N	F	W
Eriogonum umbellatum	Sulfur eriogonum	P	N	F	W
Rumex crispus L.	Curly dock	P	I	F	C
Rumex stenophyllus	Narrow leaf dock	P	I	F	C
Portulacaceae (Purslane family)					
Portulaca oleracea L.	Common purslane	A	N	F	C
Portulaca halimoides L.	Silkcotton purslane	A	I	F	C
Ranunculaceae					
Clematis ligusticifolia	Western virginsbower	P	N	F	W
Rosaceae (Rose family)					
Amelanchier alnifolia	Saskatoon	P	N	S	C
Amelanchier utahensis	Serviceberry	P	N	S	C
Cerasus pensylvanica L.	Pin cherry	P	N	T	C
Cercocarpus montanus	Mountain mahogany	P	N	S	C
Drymocallis arguta	Sticky cinquefoil	P	N	F	W
Oreobatus deliciosus	Boulder raspberry	P	N	S	C
Padus virginiana L. ssp. *melanocarpa*	Chokecherry	P	N	T	C
Physocarpus monogynus	Mountain ninebark	P	N	S	C
Prunus americana	American plum	P	N	T	C
Rosa woodsii	Wood's rose	P	N	S	C
Rutaceae (Citrus family)					
Ptelea trifoliata L.	Common hoptree	P	N	T	C
Salicaceae (Willow family)					
Populus x acuminata	Lanceleaf cottonwood	P	N	T	C

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Populus angustifolia	Narrowleaf cottonwood	P	N	T	C
Populus deltoides spp. *monolifera*	Plains cottonwood	P	N	T	C
Populus tremuloides	Quacking aspen	P	N	T	C
Salix alba L. var. *vitellina* L. *fragilis* L.	Hybrid Golden osier/crack willow	P	N	S	C
Salix amygdaloides	Peach-leaved willow	P	N	S	C
Salix interior	Sandbar willow	P	N	S	C
Santalaceae (Sandlewood family)					
Comandra umbellata L.	Bastard toadflax	P	N	F	C
Sapindaceae (Soapberry family)					
**Sapindus saponaria* L. var. *drummondii*	Southern soapberry	P	N	S	C
Saxifragaceae					
Heuchera parvifolia	Little leaf alumroot	P	N	F	W
Scrophulariaceae (Figwort family)					
Castilleja integra	Indian paintbrush	P	N	F	W
Castilleja sessiliflora	Largeflowered Indian paintbrush	P	N	F	C
Penstemon angustifolius ssp *caudatus*	Colorado beard-tongue	P	N	F	C
Penstemon auriberbis	Colorado beard-tongue	P	N	F	C
Penstemon barbatus var. *torreyi*	Torrey's penstemon	P	N	F	W
Verbascum thapsus L.	Great mullein	P	I	F	C
Solanaceae (Nightshade family)					
Chamaesaracha conoides	Green false nightshade	P	N	F	C
Chamaesaracha coronopus	Green false nightshade	P	N	F	C
Lycium pallidum Miers	Pale woldberry	P	N	S	C
Physalis hederifolia var. *cordifolia*	Clammy groundcherry	P	N	F	W
Physalis virginiana	Virginia groundcherry	P	N	F	C
Quincula lobata	Chinese lantern	P	N	F	C
Solanum americanum	Black nightshade	A	N	F	C
Solanum elaeagnifolium	Silverleaf nightshade	P	N	F	C
Solanum rostratum	Buffalo bur	A	N	F	C
Solanum triflorum	Cutleaf nightshade	A	N	F	C
Tamaricaceae (Tamarisk family)					
Tamarix ramosissima	Salt cedar	P	I	T	C
Typhaceae (Cattail family)					
Typha angustifolia L.	Narrow-leaved cattail	P	N	G	C

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Typha latifolia L.	Broad-leaved cattail	P	N	G	C
Ulmaceae (Elm family)					
Celtis occidentalis L.	Hackberry	P	N	T	C
Celtis reticulata	Netleaf hackberry	P	N	T	C
Urticaceae (Nettle family)		A	N	F	C
Parietaria pensylvanica	Pennsylvania pellitory				
Verbenaceae (Vervain family)					
Glandularia bipinnatifida	Showy vervain	P	N	F	C
Phyla cuneifolia	Frog fruit	P	N	F	W
Verbena bracteata	Prostrate vervain	P	N	F	C
Violaceae (Violet family)					
Hybanthus verticillatus	Nodding green violet	P	N	F	C
Viola nuttallii	Nuttall's violet	P	N	F	C
Vitaceae (Grape family)					
Parthenocissus vitaceae	Thicket creeper	P	N	F	C
Vitis acerifolia Rafinesque	Long's grape	P	N	F	C
Gymnosperms					
Cupressaceae (Cypress family)					
Sabina monosperma.	One-seeded juniper	P	N	T	C
Sabina scopulorum	Rocky Mountain juniper	P	N	T	C
Pinaceae (Pine family)					
Pinus edulis	Pinyon pine	P	N	T	C
Pinus ponderosa ssp. *scopulorum*	Ponderosa pine	P	N	T	C
Ferns & Fern Allies					
Athyriaceae (Ladyfern family)					
Cystopteris fragilis L.	Brittle fern	P	N	F	C
Aspidaceae (Shieldfern family)					
Dryopteris felix-mas L.	Male fern	P	N	F	C
Equisetaceae (Horsetail family)					
Hippochaete laevigata	Smooth horsetail	P	N	G	C
Hippochaete variegata	Variegated scouring rush	P	N	G	W
Selaginellaceae (Little Club-Moss family)					
Selaginella densa	Little club moss	P	N	F	C
Selaginella mutica	Little club moss	P	N	F	C
Sinopteridaceae (Lipfern family)					

Scientific Name	Common Name	Life	Origin	Form	Season
Cheilanthes feei	Fee's lipfern	P	N	F	C
Cheilanthes fendleri	Fendler's lipfern	P	N	F	C
Viscaceae (Mistletoe family)					
Arceuthobium spp.	Dwarf mistletoe	P	N	F	W
Woodsiaceae (Woodsia family)					
Woodsia oregano ssp. *cathcartiana*	Oregon woodsia	P	N	F	W

Notes:

Life Form: A = Annual, B = Biennial, P = Perennial

Origin: N = Native, I = Introduced

Form: F = Forb, G = Grass, V = Vine, S = Shrub, T = Tree

Season: W = Warm Season, C = Cool Season

ATTACHMENT F.2.2

Vertebrate Species Known to Occur at the PCMS

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Campostoma	Central stoneroller	Osteichthyes		
Catostomus commersoni	White sucker	Osteichthyes		
Cyprinella lutrensis	Red shiner	Osteichthyes		
Cyprinus carpio	Common carp	Osteichthyes		
Fundulus zebrinus	Plains killifish	Osteichthyes		
Hybopsis gracilis	Flathead chub	Osteichthyes		Special concern
Ictalurus melas	Black bullhead	Osteichthyes		
Ictalurus punctatus	Channel catfish	Osteichthyes		
Lepomis cyanellus	Green sunfish	Osteichthyes		
Notropis stamineus	Sand shiner	Osteichthyes		
Pimephales promelas	Fathead minnow	Osteichthyes		
Rhinichtthys cataractae	Longnose dace	Osteichthyes		
Ambystoma tigrinum	Tiger salamander	Amphibia		
Bufo punctatus	Red-spotted toad	Amphibia		
Bufo woodhousii woodhousei	Woodhouse's toad	Amphibia		
Hyla arenicolor	Canyon treefrog	Amphibia		
Rana blairi	Plains leopard frog	Amphibia		Special concern
Rana catesbeiana	Bullfrog	Amphibia		
Scaphiopus bombifrons	Plains spadefoot	Amphibia		
Scaphiopus multiplicatus	New Mexico spadefoot	Amphibia		
Chelydra serpentina serpentina	Snapping turtle	Reptilia		
Terrapene ornata ornata	Western box turtle	Reptilia		
Cnemidophorus sexlineatus viridis	Six-lined racerunner	Reptilia		
Cnemidophorus tesselatus	Colorado checkered whiptail	Reptilia		Special concern
Crotaphytus collaris collaris	Collared lizard	Reptilia		
Eumeces obsoletus	Great Plains skink	Reptilia		
Holbrookia maculata maculata	Lesser earless lizard	Reptilia		
Phrynosoma cornutum	Texas horned lizard	Reptilia		Special concern
Phrynosoma douglassi	Short-horned lizard	Reptilia		
Sceloporus undulatus erythrocheilus	Eastern fence lizard	Reptilia		
Arizona elegans elegans	Glossy snake	Reptilia		
Coluber constrictor flaviventris	Eastern yellowbelly racer	Reptilia		
Crotalus viridis viridis	Western rattlesnake	Reptilia		

Scientific Name	Common Name	Class	Federal Status	State Status
Diadophis punctatus arnyi	Ring-necked snake	Reptilia		
Elaphe guttata emoryi	Corn snake	Reptilia		
Heterodon nasicus nasicus	Western hognose snake	Reptilia		
Hypsiglena torquata jani	Night snake	Reptilia		
Lampropeltis triangulum	Milk snake	Reptilia		
Leptotyphlops dulcis	Texas blind snake	Reptilia		Special concern
Masticophis flagellum testaceus	Coachwhip	Reptilia		
Pituophis melanoleucus sayi	Bullsnake	Reptilia		
Sonora semiannulata	Ground snake	Reptilia		
Tantilla nigriceps nigriceps	Plains blackhead snake	Reptilia		
Thamnophis cyrtopsis cyrtopsis	Blackneck garter snake	Reptilia		
Thamnophis elegans vagrans	Western terrestrial garter snake	Reptilia		
Thamnophis radix haydeni	Plains garter snake	Reptilia		
Podilymbus podiceps	Pied-billed grebe	Aves		
Podiceps nigricollis	Eared grebe	Aves		
Pelecanus erythrorhynchos	American white pelican	Aves		
Phalacrocorax auritus	Double-crested cormorant	Aves		
Botaurus lentiginosus	American bittern	Aves		
Ixobrychus exilis	Least bittern	Aves		
Ardea herodias	Great blue heron	Aves		
Egretta thula	Snowy egret	Aves		
Butorides virescens	Green heron	Aves		
Nycticorax nycticorax	Black-crowned night-heron	Aves		
Plegadis chihi	White-faced Ibis	Aves		
Chen caerulescens	Snow goose	Aves		
Chen rossii	Ross' goose	Aves		
Branta canadensis	Canada goose	Aves		
Aix sponsa	Wood duck	Aves		
Anas crecca	Green-winged teal	Aves		
Anas platyrhynchos	Mallard	Aves		
Anas acuta	Northern pintail	Aves		
Anas discors	Blue-winged teal	Aves		
Anas cyanoptera	Cinnamon teal	Aves		
Anas clypeata	Northern shoveler	Aves		

Scientific Name	Common Name	Class	Federal Status	State Status
Anas strepera	Gadwall	Aves		
Anas americana	American wigeon	Aves		
Aythya valisineria	Canvasback	Aves		
Aythya americana	Redhead	Aves		
Aythya collaris	Ring-necked duck	Aves		
Aythya affinis	Lesser scaup	Aves		
Melanitta fusca	White-winged scoter	Aves		
Bucephala clangula	Common goldeneye	Aves		
Bucephala albeola	Bufflehead	Aves		
Oxyura jamaicensis	Ruddy duck	Aves		
Cathartes aura	Turkey vulture	Aves		
Pandion haliaetus	Osprey	Aves		
Ictinia mississippiensis	Mississippi kite	Aves		
Haliaeetus leucocephalus	Bald eagle	Aves	Threatened	Threatened
Circus cyaneus	Northern harrier	Aves		
Accipiter striatus	Sharp-shinned hawk	Aves		
Accipiter cooperii	Cooper's hawk	Aves		
Accipiter gentilis	Northern goshawk	Aves		
Buteo platypterus	Broad-winged hawk	Aves		
Buteo swainsoni	Swainson's hawk	Aves		
Buteo jamaicensis	Red-tailed hawk	Aves		
Buteo jamaicensis calurus	Western red-tailed hawk	Aves		
Buteo regalis	Ferruginous hawk	Aves		Special concern
Buteo lagopus	Rough-legged hawk	Aves		
Aquila chrysaetos	Golden eagle	Aves		
Falco sparverius	American kestrel	Aves		
Falco columbarius	Merlin	Aves		
Falco peregrinus	Peregrine falcon	Aves		Special concern
Falco mexicanus	Prairie falcon	Aves		
Meleagris gallopavo	Wild turkey	Aves		
Colinus virginianus	Northern bobwhite	Aves		
Callipepla squamata	Scaled quail	Aves		
Rallus limicola	Virginia rail	Aves		
Porzana carolina	Sora	Aves		
Fulica americana	American coot	Aves		
Grus canadensis	Sandhill crane	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Charadrius semipalmatus	Semipalmated plover	Aves		
Charadrius vociferus	Killdeer	Aves		
Charadrius montanus	Mountain plover	Aves		Special concern
Himantopus mexicanus	Black-necked stilt	Aves		
Recurvirostra americana	American avocet	Aves		
Tringa melanoleuca	Greater yellowlegs	Aves		
Tringa flavipes	Lesser yellowlegs	Aves		
Tringa solitaria	Solitary sandpiper	Aves		
Catoptrophorus semipalmatus	Willet	Aves		
Actitis macularia	Spotted sandpiper	Aves		
Bartramia longicauda	Upland sandpiper	Aves		
Numenius americanus	Long-billed curlew	Aves		Special concern
Calidris alba	Sanderling	Aves		
Calidris pusilla	Semipalmated sandpiper	Aves		
Calidris mauri	Western sandpiper	Aves		
Calidris minutilla	Least sandpiper	Aves		
Calidris bairdii	Baird's sandpiper	Aves		
Calidris melanotos	Pectoral sandpiper	Aves		
Limnodromus scolopaceus	Long-billed dowitcher	Aves		
Gallinago gallinago	Common snipe	Aves		
Phalaropus tricolor	Wilson's phalarope	Aves		
Larus pipixcan	Franklin's gull	Aves		
Larus delawarensis	Ring-billed gull	Aves		
Columba livia	Rock dove	Aves		
Columba fasciata	Band-tailed pigeon	Aves		
Zenaida asiatica	White-winged dove	Aves		
Zenaida macroura	Mourning dove	Aves		
Coccyzus erythropthalmus	Black-billed cuckoo	Aves		
Coccyzus americanus	Yellow-billed cuckoo	Aves		Special concern
Geococcyx californianus	Greater roadrunner	Aves		
Tyto alba	Barn owl	Aves		
Otus kennicottii	Western screech-owl	Aves		
Bubo virginianus	Great horned owl	Aves		
Speotyto cunicularia	Burrowing owl	Aves		Threatened
Asio otus	Long-eared owl	Aves		
Asio flammeus	Short-eared owl	Aves		

Scientific Name	Common Name	Class	Federal Status	State Status
Chordeiles minor	Common nighthawk	Aves		
Phalaenoptilus nuttallii	Common poorwill	Aves		
Aeronautes saxatalis	White-throated swift	Aves		
Archilochus alexandri	Black-chinned hummingbird	Aves		
Stellula calliope	Calliope hummingbird	Aves		
Selasphorus platycercus	Broad-tailed hummingbird	Aves		
Selasphorus rufus	Rufous hummingbird	Aves		
Ceryle alcyon	Belted kingfisher	Aves		
Melanerpes lewis	Lewis' woodpecker	Aves		
Melanerpes erythrocephalus	Red-headed woodpecker	Aves		
Sphyrapicus nuchalis	Red-naped sapsucker	Aves		
Picoides scalaris	Ladder-backed woodpecker	Aves		
Picoides pubescens	Downy woodpecker	Aves		
Picoides villosus	Hairy woodpecker	Aves		
Colaptes auratus	Northern flicker	Aves		
Colaptes auratus auratus	Yellow-shafted flicker	Aves		
Colaptes auratus x cafer	Red-shafted flicker	Aves		
Contopus borealis	Olive-sided flycatcher	Aves		
Contopus sordidulus	Western wood-pewee	Aves		
Empidonax oberholseri	Dusky flycatcher	Aves		
Empidonax wrightii	Gray flycatcher	Aves		
Empidonax occidentalis	Cordilleran flycatcher	Aves		
Sayornis phoebe	Eastern phoebe	Aves		
Sayornis saya	Say's phoebe	Aves		
Myiarchus cinerascens	Ash-throated flycatcher	Aves		
Tyrannus vociferans	Cassin's kingbird	Aves		
Tyrannus verticalis	Western kingbird	Aves		
Tyrannus tyrannus	Eastern kingbird	Aves		
Tyrannus forficatus	Scissor-tailed flycatcher	Aves		
Eremophila alpestris	Horned lark	Aves		
Tachycineta bicolor	Tree swallow	Aves		
Tachycineta thalassina	Violet-green swallow	Aves		
Stelgidopteryx serripennis	Northern rough-winged swallow	Aves		
Riparia riparia	Bank swallow	Aves		

Scientific Name	Common Name	Class	Federal Status	State Status
Hirundo pyrrhonota	Cliff swallow	Aves		
Hirundo rustica	Barn swallow	Aves		
Cyanocitta stelleri	Steller's jay	Aves		
Cyanocitta cristata	Blue jay	Aves		
Aphelocoma coerulescens	Western scrub jay	Aves		
Gymnorhinus cyanocephalus	Pinyon jay	Aves		
Nucifraga columbiana	Clark's nutcracker	Aves		
Pica pica	Black-billed magpie	Aves		
Corvus brachyrhynchos	American crow	Aves		
Corvus cryptoleucus	Chihuahuan raven	Aves		
Corvus corax	Common raven	Aves		
Parus gambeli	Mountain chickadee	Aves		
Parus inornatus	Plain titmouse	Aves		
Psaltriparus minimus	Bushtit	Aves		
Sitta canadensis	Red-breasted nuthatch	Aves		
Sitta carolinensis	White-breasted nuthatch	Aves		
Sitta pygmaea	Pygmy nuthatch	Aves		
Certhia americana	Brown creeper	Aves		
Salpinctes obsoletus	Rock wren	Aves		
Catherpes mexicanus	Canyon wren	Aves		
Thryomanes bewickii	Bewick's wren	Aves		
Troglodytes aedon	House wren	Aves		
Cistothorus palustris	Marsh wren	Aves		
Regulus satrapa	Golden-crowned kinglet	Aves		
Regulus calendula	Ruby-crowned kinglet	Aves		
Polioptila caerulea	Blue-gray gnatcatcher	Aves		
Sialia mexicana	Western bluebird	Aves		
Sialia currucoides	Mountain bluebird	Aves		
Myadestes townsendi	Townsend's solitaire	Aves		
Catharus ustulatus	Swainson's thrush	Aves		
Catharus guttatus	Hermit thrush	Aves		
Turdus migratorius	American robin	Aves		
Dumetella carolinensis	Gray catbird	Aves		
Mimus polyglottos	Northern mockingbird	Aves		
Oreoscoptes montanus	Sage thrasher	Aves		
Toxostoma rufum	Brown thrasher	Aves		

Scientific Name	Common Name	Class	Federal Status	State Status
Toxostoma curvirostre	Curve-billed thrasher	Aves		
Anthus rubescens	American pipit	Aves		
Anthus spragueii	Sprague's pipit	Aves		
Bombycilla garrulus	Bohemian waxwing	Aves		
Bombycilla cedrorum	Cedar waxwing	Aves		
Lanius excubitor	Northern shrike	Aves		
Lanius ludovicianus	Loggerhead shrike	Aves		
Sturnus vulgaris	European starling	Aves		
Vireo vicinior	Gray vireo	Aves		
Vireo plumbeus	Plumbeous vireo	Aves		
Vireo gilvus	Warbling vireo	Aves		
Vireo olivaceus	Red-eyed vireo	Aves		
Vermivora celata	Orange-crowned warbler	Aves		
Vermivora ruficapilla	Nashville warbler	Aves		
Vermivora virginiae	Virginia's warbler	Aves		
Parula americana	Northern parula	Aves		
Dendroica petechia	Yellow warbler	Aves		
Dendroica pensylvanica	Chestnut-sided warbler	Aves		
Dendroica coronata	Yellow-rumped warbler	Aves		
Dendroica coronata coronata	Myrtle warbler	Aves		
Dendroica coronata auduboni	Audubon’s warbler	Aves		
Dendroica nigrescens	Black-throated gray warbler	Aves		
Dendroica townsendi	Townsend's warbler	Aves		
Setophaga ruticilla	American redstart	Aves		
Seiurus aurocapillus	Ovenbird	Aves		
Seiurus noveboracensis	Northern waterthrush	Aves		
Oporornis tolmiei	MacGillivray's warbler	Aves		
Geothlypis trichas	Common yellowthroat	Aves		
Wilsonia pusilla	Wilson's warbler	Aves		
Icteria virens	Yellow-breasted chat	Aves		
Piranga flava	Hepatic tanager	Aves		
Piranga rubra	Summer tanager	Aves		
Piranga ludoviciana	Western tanager	Aves		
Pheucticus ludovicianus	Rose-breasted grosbeak	Aves		
Pheucticus melanocephalus	Black-headed grosbeak	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Guiraca caerulea	Blue grosbeak	Aves		
Passerina amoena	Lazuli bunting	Aves		
Passerina cyanea	Indigo bunting	Aves		
Spiza americana	Dickcissel	Aves		
Pipilo chlorurus	Green-tailed towhee	Aves		
Pipilo	Spotted towhee	Aves		
Pipilo	Canyon towhee	Aves		
Aimophila cassinii	Cassin's sparrow	Aves		
Aimophila ruficeps	Rufous-crowned sparrow	Aves		
Spizella arborea	American tree sparrow	Aves		
Spizella passerina	Chipping sparrow	Aves		
Spizella pallida	Clay-colored sparrow	Aves		
Spizella breweri	Brewer's sparrow	Aves		
Pooecetes gramineus	Vesper sparrow	Aves		
Chondestes grammacus	Lark sparrow	Aves		
Amphispiza bilineata	Black-throated sparrow	Aves		
Calamospiza melanocorys	Lark bunting	Aves		
Passerculus sandwichensis	Savannah sparrow	Aves		
Ammodramus savannarum	Grasshopper sparrow	Aves		
Melospiza melodia	Song sparrow	Aves		
Melospiza lincolnii	Lincoln's sparrow	Aves		
Zonotrichia albicollis	White-throated sparrow	Aves		
Zonotrichia leucophrys	White-crowned sparrow	Aves		
Zonotrichia leucophrys oriantha	Mountain white-crowned sparrow	Aves		
Zonotrichia leucophrys gambelii	Gambel’s white-crowned sparrow	Aves		
Zonotrichia querula	Harris' sparrow	Aves		
Junco hyemalis	Dark-eyed junco	Aves		
Junco hyemalis aikeni	White-winged junco	Aves		
Junco hyemalis hyemalis	Slate-colored junco	Aves		
Junco hyemalis montanus/shufeldt	Oregon junco	Aves		
Junco hyemalis mearnsi	Pink-sided junco	Aves		
Junco hyemalis caniceps	Gray-headed junco	Aves		
Calcarius mccownii	McCown's longspur	Aves		
Calcarius lapponicus	Lapland longspur	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Calcarius ornatus	Chestnut-collared longspur	Aves		
Dolichonyx oryzivorus	Bobolink	Aves		
Agelaius phoeniceus	Red-winged blackbird	Aves		
Sturnella neglecta	Western meadowlark	Aves		
Xanthocephalus xanthocephalus	Yellow-headed blackbird	Aves		
Euphagus cyanocephalus	Brewer's blackbird	Aves		
Quiscalus mexicanus	Great-tailed grackle	Aves		
Quiscalus quiscula	Common grackle	Aves		
Molothrus ater	Brown-headed cowbird	Aves		
Icterus spurius	Orchard oriole	Aves		
Icterus galbula	Baltimore oriole	Aves		
Icterus bullockii	Bullock's oriole	Aves		
Icterus parisorum	Scott's oriole	Aves		
Carpodacus cassinii	Cassin's finch	Aves		
Carpodacus mexicanus	House finch	Aves		
Loxia curvirostra	Red crossbill	Aves		
Carduelis pinus	Pine siskin	Aves		
Carduelis psaltria	Lesser goldfinch	Aves		
Carduelis tristis	American goldfinch	Aves		
Coccothraustes vespertinus	Evening grosbeak	Aves		
Passer domesticus	House sparrow	Aves		
Antilocapra americana	Pronghorn	Mammalia		
Canis latrans	Coyote	Mammalia		
Urocyon cinereoargenteus	Gray fox	Mammalia		
Vulpes velox	Swift fox	Mammalia		Special concern
Castor canadensis	Beaver	Mammalia		
Cervus elaphus	Wapiti	Mammalia		
Odocoileus hemionus	Mule deer	Mammalia		
Odocoileus virginianus	White-tailed deer	Mammalia		
Erethizon dorsatum	Porcupine	Mammalia		
Felis concolor	Mountain lion	Mammalia		
Lynx rufus	Bobcat	Mammalia		
Pappogeomys castanops	Yellow-faced pocket gopher	Mammalia		
Thomomys bottae	Botta's pocket gopher	Mammalia		
Chaetodipus hispidus	Hispid pocket mouse	Mammalia		

Scientific Name	Common Name	Class	Federal Status	State Status
Dipodomys ordii	Ord's kangaroo rat	Mammalia		
Perognathus flavescens	Plains pocket mouse	Mammalia		
Perognathus flavus	Silky pocket mouse	Mammalia		
Lepus californicus	Black-tailed jack rabbit	Mammalia		
Sylvilagus audubonii	Desert cottontail	Mammalia		
Nyctinomops macrotis	Big free-tailed bat	Mammalia		
Tadarida brasiliensis	Brazilian free-tailed bat	Mammalia		
Mus musculus	House mouse	Mammalia		
Neotoma albigula	White-throated woodrat	Mammalia		
Neotoma floridana	Eastern woodrat	Mammalia		
Neotoma mexicana	Mexican woodrat	Mammalia		
Neotoma micropus	Southern plains woodrat	Mammalia		
Ondatra zibethicus	Muskrat	Mammalia		
Onychomys leucogaster	Northern grasshopper mouse	Mammalia		
Peromyscus boylii	Brush mouse	Mammalia		
Peromyscus difficilis	Rock mouse	Mammalia		
Peromyscus leucopus	White-footed mouse	Mammalia		
Peromyscus maniculatus	Deer mouse	Mammalia		
Peromyscus truei	Pinyon mouse	Mammalia		
Reithrodontomys megalotis	Western harvest mouse	Mammalia		
Reithrodontomys montanus	Plains harvest mouse	Mammalia		
Sigmodon hispidus	Hispid cotton rat	Mammalia		
Conepatus mesoleucus	Hog-nosed skunk	Mammalia		
Spilogale gracilis	Western spotted skunk	Mammalia		
Taxidea taxus	Badger	Mammalia		
Mephitis mephitis	Striped skunk	Mammalia		
Bassariscus astutus	Ringtail	Mammalia		
Procyon lotor	Raccoon	Mammalia		
Cynomys ludovicianus	Black-tailed prairie dog	Mammalia		Special concern
Spermophilus tridecemlineatus	Thirteen-lined ground squirrel	Mammalia		
Spermophilus variegatus	Rock squirrel	Mammalia		
Spermphilus spilosoma	Spotted ground squirrel	Mammalia		
Tamias quadrivittatus	Colorado chipmunk	Mammalia		
Notiosorex crawfordi	Desert shrew	Mammalia		
Antrozous pallidus	Pallid bat	Mammalia		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Eptesicus fuscus	Big brown bat	Mammalia		
Lasiurus cinereus	Hoary bat	Mammalia		
Myotis yumanensis	Yuma myotis	Mammalia		
Plecotus townsendii	Townsend's big-eared bat	Mammalia		

ATTACHMENT F.2.3

Arthropod Species Known to Occur at the PCMS

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Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)			
Order	**Family**	**Scientific Name**	**Common Name**
Orthoptera (grasshoppers, crickets, katydids)			
	Acrididae	*Acrolophitus hirtipes*	
		Aeoloplides turnbulli	
		Ageneotettix deorum	
		Amphitornus coloradus	
		Arphia conspersa	
		Arphia pseudonietana	
		Arphia simplex	
		Aulocara femoratum	
		Boopedon nubilium	
		Camnula pellucida	
		Ceuthophilus sp.	
		Chloeatis abdominalis	
		Choealtis conspersa	
		Chorthippus curtipennis	
		Chortophaga viridifasciata	
		Circotettix rabula	
		Cordillacris crenulata	
		Cordillacris occipitalis	
		Cycloptilum sp	
		Dactylotum bicolor	
		Derotmema haydeni	
		Encoptolophus costalis	
		Eritettix simplex	
		Eunemobius sp	
		Gomphocerinae sp.	
		Hadrotettix trifasciatus	
		Hesperotettix specious	
		Hesperotettix viridis	
		Hippiscus ocelote	
		Hippopedon capito	
		Hypochlora alba	
		Leprus cyaneus	
		Listroscelidinas sp.	
		Malanoplus borealis	
		Melanoplus angustipennis	

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
		Melanoplus borealis	
		Melanoplus bowditchi	
		Melanoplus confusus	
		Melanoplus discolor	
		Melanoplus dodgei	
		Melanoplus fasciatus	
		Melanoplus femurrubrum	
		Melanoplus flavidus	
		Melanoplus foedus	
		Melanoplus gladstoni	
		Melanoplus glaucipes	
		Melanoplus lakinus	
		Melanoplus occidentalis	
		Melanoplus packardii	
		Melanoplus ponderosus	
		Melanoplus regalis	
		Melanoplus sanguinipes	
		Melanoplus sp	
		Melanoplus splendidus	
		Melanoplus tristis	
		Melanoplus yarrowii	
		Mermiria bivittata	
		Mermiria picta	
		Mestobregma plattei	
		Microentrum sp.	
		Oedipodinae sp.	
		Opeia obscura	
		Orphulella speciosa	
		Pardalophora apiculata	
		Paropomala wyomingensis	
		Phlibostroma quadrimaculatum	
		Phoetaliotes nebrascensis	
		Pseudopomala brachyptera	
		Psoloessa delicatula	
		Psoloessa texana	
		Scudderia furcata	
		Spharagemon collare	

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
		Spharagemon equale	
		Stethophyma gracile	
		Syrbula montezuma	
		Tetrix ornata	
		Trachyrhachys kiowa	
		Trimerotropis magnifica	
		Trimerotropis oracilis	
		Trimerotropis pallidipennis	
		Trimerotropis sp	
		Xanthippus corallipes	
	Gryllidae	*Allonemobius fasciatus*	Striped Ground Cricket
		Gryllus pennsylvanicus	Fall Field Cricket
	Oedipodinae	*Encoptolophus costalis*	Dusky Grasshopper
	Romaleidae	*Brachystola magna*	Plains Lubber Grasshopper
	Tettigoniidae	*Scudderia frucata*	Fork-tailed Bush Katydid
Odonata (dragonflies and damselflies)			
	Calopterygidae		Broad-winged Damselflies
	Coenagrionidae		Pond Damselflies
	Cordulidae		Emeralds
	Gomphidae		Clubtail Dragonflies
	Libellulidae	*Libellula pulchella*	Twelve Spotted Skimmer
		Tramea lacerata	Black Saddlebags
Neuroptera			
	Chrysopidae		Lacewing
	Mantispidae		Mantis Fly

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
	Myrmeleontidae		Antlion
Coleoptera (beetles)			
	Anthicidae	*Notoxus* sp.	Ant-like Flower Beetle
	Buprestidae		Metallic Wood Boring Beetles
	Cantharidae	*Cantharis* sp.	Soldier Beetles
	Carabidae	*Agonum placidum*	
		Agonum extensicolle	
		Agonum cyclifer	
		Amara quenseli	
		Amara thoracica	
		Amblycheila cylindriformis	Great Plains Giant Tiger Beetle
		Badister obtusus	
		Brachinus phaeocerus	
		Calathus opaculus	
		Calosoma affine	
		Calosoma scrutator	
		Calosoma tricolor	
		Chlaenius sericeus sericeus	
		Chlaenius tomentosus tomentosus	
		Cicindela belfragei	Loamy-ground Tiger Beetle
		Cicindela formosa	Big Sand Tiger Beetle
		Cicindela pulchra	Beautiful Tiger Beetle
		Cicindela scutellaris scutelaris	Festive Tiger Beetle
		Cicindela nigrosoerulea nigrocoerulea	
		Cicindela punctulata punctualata	
		Cicindela obsoleta obsoleta	
		Cratacanthus dudius	
		Cyclotrachelus constrictus	
		Cyclotrachelus substriatus	

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
		Cymindis planipennis	
		Cymindis interior	
		Dicaelus laevipennis laevipennis	
		Diplocheila obtusa	
		Euryderus grossus	
		Galerita janus	
		Harpalus fraternus	
		Harpalus caliginosus	
		Harpalus paratus	
		Harpalus pensylvanicus	
		Harpalus amputatus	
		Harpalus paratus	
		Lebia viridis	
		Micrixys distincta	
		Pasimachus californicus	
		Pasimachus elongatus	
		Piosoma setosum	
		Poecilus cyanicolor	
		Poecilus lucublandus lucublandus	
		Poecilus scitulus	
		Pterostichus commutabilis	
		Rhadine dissecta sp.	
		Scarites subterraneus	
	Cerambycidae	*Poecilus lucublandus lucublandus*	Long-horned Wood-boring Beetles
		Oberea sp.	
	Chrysomelidae	*Prionus* sp.	Leaf Beetles
		Calligrapha sp.	
		Diabrotica sp.	
	Cleridae		Checkered Flower Beetles

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
	Coccinellidae	*Anatis lecontei*	
		Coccinella septempunctata	Seven-spotted Ladybeetle
		Hippodamia parenthesis	
		Hippodamia convergens	Convergent Ladybeetle
		Myzia interrupta	
	Curculiondiae		Weevils
	Dytiscidae		Predacious Diving Beetle
	Elateridae		Click Beetles
	Histeridae		Clown Beetles
	Lampyridae		Fireflies
	Meloidae	*Epicauta* sp.	Blister Beetles
	Nitidulidae	*Capophilus* sp.	Sap Beetles
	Scarabidae	*Aphodices* sp.	
		Canthon sp.	Dung Beetle
		Eurphoria inda	
		Melanocanthon sp.	Dung Beetle
	Sciritidae		Marsh Beetles
	Silphidae	*Nicrophorus* sp.	Carrion Beetles
		Silpha sp.	
	Staphylinidae	*Aleochara* sp.	Rove Beetles
	Tenebrionidae	*Diaperis* sp.	Darkling Beetles
		Eleodes sp.	
	Trogidae		Hide Beetles
Hymenoptera (bees, wasps, ants)			
	Apidae	*Apis mellifera*	Honeybee
		Augochlora pura	

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
		Bombus sp.	Bumblebee
	Braconidae		Braconid Wasps
	Formicidae		Ants
	Halictidae	*Halictus tripartitus*	Sweat Bees
		Agapostemon texanus	
	Ichneumonidae		Ichneumonid Wasps
	Megachilidae	*Megachile brevis*	Leafcutter or Mason Bees
		Megachile dakotensis	
	Mutilidae	*Dasymatina* sp.	Velvet Ant
	Pompilidae	*Pepsis* sp.	Spider Wasps
	Sphecidae		Thread-waisted Wasp
	Vespidae	*Polistes* sp.	Paper Wasp
		Vespula sp.	
Diptera (flies)			
	Asilidae	*Albibarbefferia bicolor*	Robber Flies
		Albibarbefferia leucocoma	
		Aridefferia prattii	
		Aridefferia subarida	
		Asilus auriannulatus	
		Atomosia melanopogon	
		Atomosia nuda	
		Atomosia puella	
		Laphystia varipes	
		Lasuopogon quadrivittatus	
		Leptogaster brevicornis	
		Leptogaster weslacensis	
		Ospriocerus abdominalis	
		Philonicus arizonensis	
		Philonicus limpidipennis	

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
		Proctacanthella exquisita	
		Psilocurus birdi	
		Stichopogon sp.2	
	Culicidae		Mosquitoes
	Muscidae	*Musca domestica*	House Flies
	Mydidae	*Mydas* sp.	Mydas Flies
Lepidoptera (butterflies and moths)			
	Arctiidae	*Grammia* sp.	Tiger Moths
		Hyproprea sp.	
	Geometridae		Geometer or Geometrid Moths
	Hesperiidae	*Hesperia pahaska*	Pahaska Skipper
		Hesperopsis alpheus	Saltbush Sootywing
		Pholisora catullus	Common Sootywing
		Pyrgus communis	Common Checkered Skipper
		Pyrgus scriptura	Small Checkered Skipper
	Lycaenidae	*Brephidium exile*	Western Pygmy Blue
		Callophrys gryneas	Juniper Hairstreak
		Euphilotes rita	Rita Blue
		Hemiargus isola	Reakirt's Blue
		Plebejus acmon	Acmon Blue
		Plebejus saepiolus	Greenish Blue
		Strymon melinus	Grey Hairstreak
	Noctuidae		Millers or Owlet Moths
	Nymphalidae	*Anaea andria*	Goatweed leafwing
		Cercyonis oetus	Small Wood Nymph
		Cercyonis pegala	Common Wood Nymph
		Danaus plexippus	Monarch
		Euptoieta claudia	Variegated Fritillary

Table F-1 Piñon Canyon Maneuver Site – 2007 Arthropod Species List. (This is the first year's data from a three-year project; species will be added to the list as they are identified.)

Order	Family	Scientific Name	Common Name
		Junonia coenia	Common Buckeye
		Limenitis archippus	Viceroy
		Nymphalis antiopa	Mourning Cloak
		Phyciodes campestris	Field Crescent
		Phyciodes mylitta	Mylitta Crescent
		Phyciodes picta	Painted Crescent
		Phyciodes tharos	Pearl Crescent
		Polygonia interrogationis	Question Mark
		Speyeria coronis	Coronis Fritillary
		Thessalia fulvia	Fulvia Checkerspot
		Vanessa atalanta	Red Admiral
		Vanessa cardui	Painted Lady
		Vanessa virginiensis	American Lady
	Papilionidae	*Papilio mulitcaudata*	Two-tailed Swallowtail
		Papilio polyxenes	Black Swallowtail
		Papilio rutulus	Western Tiger Swallowtail
	Pieridae	*Colias cesonia*	Southern Dogface
		Colias eurytheme	Orange Sulphur
		Colias philodice	Clouded Sulphur
		Eurema nicippe	Sleepy Orange
		Nathalis iole	Dainty Sulphur
		Pieris rapae	Cabbage White
		Pontia occidentalis	Western White
		Pontia pr\otodice	Checkered White
	Pyralidae		Pyralid Moths
	Sphingidae	*Hyles lineata*	White Lined Sphinx
		Proserpinus Juanita	

Interim Summary of Arthropod Species Collected at the U. S. Army Piñon Canyon Maneuver Site, 2007
http://www.fws.gov/policy/library/E7-8330.html

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ATTACHMENT F.3

Management Plan for Wintering Bald Eagles at Fort Carson and the Pinon Canyon Maneuver Site

Contents

Figures

Acronyms and Abbreviations

BGEPA	Bald and Golden Eagle Protection Act
CDOW	Colorado Division of Wildlife
DDT	dichlorodiphenyl tricholorethane
DECAM	Directorate of Environmental Compliance and Management
ESA	Endangered Species Act
FR	Federal Regulation
ft	feet
Guidelines	Draft National Bald Eagle Management Guidelines
kg	kilograms
km^2	square kilometers
lbs	pounds
m	meters
MBTA	Migratory Bird Treaty Act
mi^2	square miles
PCMS	Pinon Canyon Maneuver Site
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction

1.1 Purpose

The purpose of this Technical Memorandum is to provide a conservation assessment and conservation goals for wintering bald eagles on Fort Carson and the Pinon Canyon Maneuver Site (PCMS). Elements of the memorandum include threats to bald eagles on Fort Carson and the PCMS, and specific management actions to mitigate negative effects on the bald eagle.

1.2 Project Overview

This plan is organized into four parts.

Section 1.0 **Introduction:** A brief overview of the purpose of this Technical Memorandum.

Section 2.0 **Conservation Assessment:** Current knowledge on bald eagle population status, ecology, and habitat requirements on Fort Carson, the PCMS, and regionally, including known and potential threats to the bald eagle on the installations.

Section 3.0 **Conservation Goal:** Specific management prescriptions for the bald eagle on Fort Carson and the PCMS.

Section 4.0 **References:** References cited in the preparation of the plan.

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2.0 Conservation Assessment

2.1 Species Description

The bald eagle is a diurnal bird of prey. Adult bald eagles are readily identified by their white head and tail, dark brown body, and large yellow bill. Bald eagles weigh 3.6 to 6.4 kilograms (kg) (8 to 14 pounds [lbs]) and have wingspans of 1.7 to 2.4 meters (m) (5.5 to 8 feet [ft]). Northern bald eagles (Alaska and Canada) are significantly larger than their southern relatives, and females are larger than males. Juveniles are mottled brown and white and generally attain adult plumage by 5 years of age (U.S. Fish and Wildlife Service [USFWS], 2006a).

(Pictures from Birds of North America Online)

Juvenile Bald Eagle | Adult Bald Eagle

2.2 Species Distribution

2.2.1 General

The bald eagle is a North American species that has historically occurred throughout the contiguous United States and Alaska (USFWS, 2006a). Bald eagles nest in areas with forested shorelines or cliffs along aquatic habitats, including coastal areas, rivers, lakes, and reservoirs (Buehler, 2000). In winter, bald eagles may also occur in semi-deserts and grasslands, especially near prairie dog towns (Andrews and Righter, 1992).

2.2.2 Regional

Historically, the number of bald eagle pairs nesting in Colorado is unknown, but records indicate several mountain sites and one plains site. Bald eagles now nest across Colorado in large, mature cottonwoods or pines (Kingery et al., 1998). The Colorado population of bald eagles increases during the winter, and the bald eagle is a common local winter resident in western valleys, mountain parks, and on the eastern plains (Andrews and Righter, 1992).

2.2.3 Fort Carson

Most bald eagle records for Fort Carson are from the northern region (Figure F.3-1), most likely due to the presence of prairie dog colonies. Bald eagles do not nest on Fort Carson or within its region of influence, and no bald eagles have been seen on Fort Carson during the breeding season. Most records of bald eagles on Fort Carson are from October to March, with the majority of sightings from November to January (Bunn, 2006). Bald eagle density likely increases during the big game hunting season on Fort Carson as bald eagles scavenge viscera left by hunters (Directorate of Environmental Compliance and Management [DECAM], 2002).

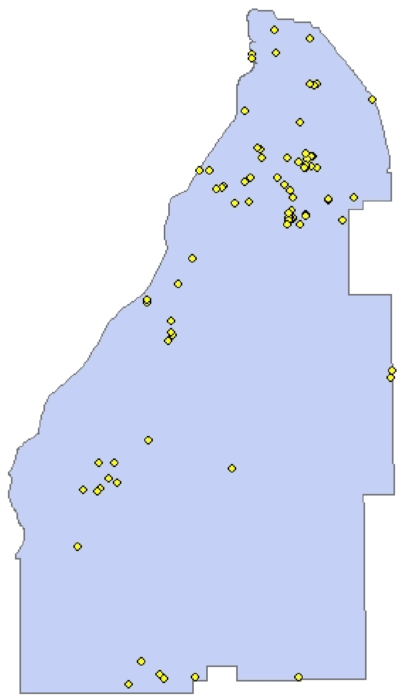

FIGURE F.3-1
Bald Eagle Sightings on Fort Carson

2.2.4 Pinon Canyon Maneuver Site

Bald eagles are winter residents and migrants on the PCMS, especially in the southwestern grassland area (Figure F.3-2). No evidence of active eyries has been found. As is the case at Fort Carson, bald eagle density probably increases during big game hunting season on the PCMS as bald eagles scavenge viscera left by hunters (DECAM, 2002). A bald eagle winter roost exists along County Road 54, off site of the PCMS (Klavetter, 2006).

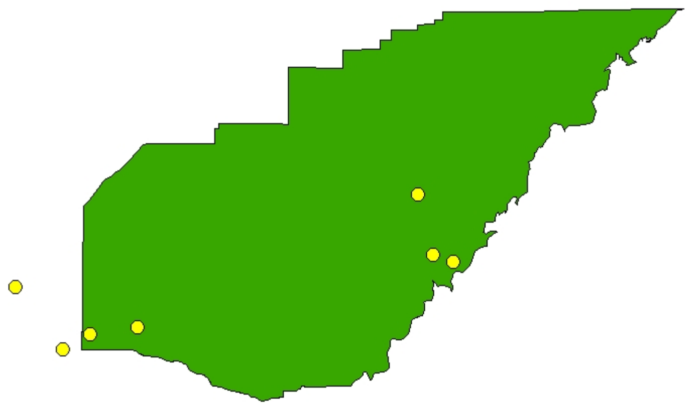

FIGURE F.3-2
Bald Eagle Sightings on the PCMS and Surrounding Area

2.3 Habitat Requirements

2.3.1 General

Bald eagles winter primarily in the temperate zone, generally below 500 m (1,640 ft) elevation. In Colorado, however, wintering areas may reach 2,500 m (8,200 ft) elevation. Bald eagle winter habitat is generally defined by food availability, presence of roost sites that provide protection from inclement weather, and absence of human disturbance. The majority of wintering bald eagles are associated with aquatic areas with some open water for foraging (Buehler, 2000). In some areas, however, bald eagles use habitats in winter with little or no open water if other food sources (e.g., small mammals or carrion) are readily available (NatureServe, 2006). Type of food consumed (avian, mammalian, or fish) and means of availability (live or carrion) vary greatly across wintering range. Winter perching habitat is characterized by the presence of tall trees located less than 50 m (164 ft) from foraging areas (Buehler, 2000).

Bald eagles have shown high site fidelity to wintering grounds (Buehler, 2000). In Colorado, 10 of 36 immatures and adults repeatedly returned to the same area to winter, and one individual wintered in the same area for 10 years (Harmata and Stahlecker, 1993).

Bald eagle winter ranges, especially those of non-breeding birds, can be very large (NatureServe, 2006). An immature bald eagle wintered in Arizona over an area of more than 40,000 square kilometers (km^2) (15,444 square miles [mi^2]) and spent the summer in the Northwest Territories on a summer range of more than 55,000 km^2 (21,235 mi^2) (Grubb et al., 1994). During February to April, the mean minimum winter home range of four immature bald eagles in Arizona averaged 400 km^2 (154 mi^2)(Grubb et al., 1989), and in Montana, adults and immatures had winter ranges from 102 to 3,925 km^2 (39 to 1,515 mi^2) (McClelland et al., 1996). Winter home ranges in Colorado averaged 311 km^2 (120 mi^2); ranges for mated birds were less than for unmated birds (128 km^2 and 546 km^2, respectively) (49 mi^2 and 211 mi^2, respectively) (Harmata, 1984).

2.3.2 Fort Carson and the PCMS

Due to large winter home ranges and various migration routes, wintering and migrating bald eagles may be found throughout Fort Carson and the PCMS. However, bald eagles are generally found near prairie dog towns on both installations. Prairie dogs, other small mammals, and animal remnants left by hunters provide food for bald eagles on Fort Carson and the PCMS.

2.4 Life History

2.4.1 Reproduction and Mortality

Bald eagle nest-building activity and egg-laying timing vary throughout the United States depending on latitude (Buehler, 2000). In the northern United States, including Colorado, bald eagles begin building nests between December and mid-March, and eggs are laid from February through April. Bald eagles lay from one to four eggs, with one or two eggs being most common. Only one egg is laid per day, and eggs are not always laid on successive days. Incubation begins after the first egg is laid, and hatching of young occurs on different days, resulting in chicks of unequal size occupying the same nest. Incubation typically lasts 33 to 35 days but can be as long as 45 days. Egg hatching and young rearing take place from March to June and by mid-May to August, the young are fledging. At 10 to 12 weeks after hatching, eaglets make their first flights, and they fledge within a few days after that first flight. After fledging, young birds usually remain in the vicinity of the nest for several weeks. Young are almost completely dependent on their parents for food until approximately 6 weeks later, when they disperse from the nesting territory. Overall, the national fledging rate is approximately one chick per nest per year (USFWS, 2006a).

Bald eagles exhibit high nest fidelity and nesting territories are often used year after year. Generally, nests are found near coastlines, rivers, lakes, or streams that support an adequate food supply. Nests are located in mature or old-growth trees, snags, cliffs, rock promontories, but rarely on the ground and, with increasing frequency, on human-made structures, including power poles and communication towers (USFWS, 2006a). In suitable forested areas, nest trees are generally the largest trees with accessible limbs capable of holding a nest that can weigh more than 455 kg (1,000 lbs) (USFWS, 2006a; Buehler, 2000). Nests are constructed from large sticks and may be lined with moss, grass, plant stalks, lichen, seaweed, or sod. Bald eagle nests are typically 1.2 to 1.8 m (4 to 6 ft) in diameter and 0.9 m (3 ft) deep (USFWS, 2006a). Nest sites generally include at least one perch with good visibility of the surrounding area (USFWS, 2006a; Buehler, 2000).

Humans represent the single greatest cause of bald eagle mortality, including mortality from direct human actions (shooting, trapping, poisoning) and mortality related to indirect human development activities (power lines and other structures). Environmental contaminants are also a significant source of mortality. These include ingestion of lead from waterfowl, deer, and other game species’ carcasses, and secondary poisoning through consumption of prey killed by pesticides or euthanasia (sodium pentobarbital). Bald eagles are also susceptible to motor vehicle-impact injuries while scavenging carcasses off highways (USFWS, 2006a; Buehler, 2000).

2.4.2 Movement and Behavior

Bald eagles have a complex pattern of migration that is dependent on age of the individual (immature or adult), location of breeding site (north versus south, interior versus coastal), severity of climate (especially during winter, but also possibly during summer), and year-round food availability. Adult bald eagles migrate as needed when food becomes unavailable. Bald eagles usually migrate alone but occasionally join other migrants. Concentrations of migrants may be found at communal feeding or roosting sites. Immature bald eagles migrate and move nomadically, presumably because they are not tied to a nest site (Buehler, 2000).

Bald eagles migrate widely over most of North America. Northward migration may be more rapid than the return trip south to wintering grounds because early arrival on breeding grounds provides advantages in competing for nest sites and mates. Migration southward may occur at a slower rate as birds respond to foraging opportunities along the way (Buehler, 2000).

2.4.3 Foraging and Diet

Bald eagles are opportunistic feeders, and fish make up most of their diet. Bald eagles also eat waterfowl, shorebirds/colonial water birds, small mammals, reptiles, amphibians, and carrion (USFWS, 2006a; Buehler, 2000). Bald eagles are visual hunters and usually locate their prey from a conspicuous perch or from soaring flight, then swoop down and strike. Large numbers of bald eagles often congregate in winter to feed on spawning salmon and other fish species or in areas below reservoirs (especially hydropower dams) where fish are abundant. In winter, bald eagles take birds from rafts of ducks on reservoirs and rivers, and congregate on melting ice sheets to scavenge dead fish. Bald eagles also eat roadkill and euthanized animal carcasses at landfills and feedlots. In addition, young eagles will often congregate to feed on easily acquired food such as carrion and fish found in abundance at the mouths of streams and shallow bays, and at landfills (USFWS, 2006a).

2.4.4 Population Status

The bald eagle has been extensively surveyed on breeding and wintering grounds throughout their range. In the 1980s, population estimates were from 70,000 to 80,000 birds, and populations in the 1990s undoubtedly increased (Buehler, 2000). In 1999, the entire bald eagle population was estimated to be around 100,000 individuals with the greatest numbers found in Alaska and British Columbia (Buehler, 2000).

In 1963, it was estimated that the lower 48 states had less than 500 pairs of nesting bald eagles, and USFWS-coordinated surveys in 1973-1974 estimated 1,000 pairs. In 2000, the USFWS recorded more than 6,471 occupied breeding areas. The 2001 estimate for breeding pairs in Colorado was 45 (USFWS, 2006b).

The estimated total wintering population of bald eagles in the continental United States was over 20,000 by 2000 (Buehler, 2000).

2.5 Species Status

The bald eagle was first listed under the Endangered Species Act (ESA) as endangered on March 11, 1967, (32 Federal Regulation [FR] 4001) and was downlisted to threatened in July 1995 (60 FR 35999 36010). Primary agents that contributed to listing the bald eagle are habitat loss and contaminants (USFWS, 2006b).

Due to population rebounds, the USFWS in 1999 proposed to remove the bald eagle from the threatened and endangered species list (64 FR 36454). The public comment period for the proposal to delist the bald eagle closed on June 19, 2006 (71 FR 8238). Banning dichlorodiphenyl tricholorethane (DDT) and other harmful organochlorines from use in the United States and promulgation of the ESA with the subsequent listing of the bald eagle were the two major actions contributing to the recovery of the bald eagle. Impacts from contaminants have also been reduced through elimination of lead shot for waterfowl hunting and restrictions on other harmful pesticides. Vigorous law enforcement efforts also added to the recovery by reducing the shooting of bald eagles (USFWS, 2006b).

Bald eagles are also protected by the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). Bald eagles are a Colorado state-listed threatened species.

2.6 Conservation Measures

The USFWS has developed and is implementing the Northern States Bald Eagle Recovery Plan, which includes Colorado (USFWS, 1983). The plan includes four basic elements:

- Determine current population and habitat status.
- Determine minimum population and habitat needed to achieve recovery.
- Protect, enhance, and increase bald eagle populations and habitats.
- Establish and implement a coordination system for information and communication.

In the event the bald eagle is removed from the Federal List of Endangered and Threatened Wildlife and Plants and does not have protection under the ESA, Draft National Bald Eagle Management Guidelines (Guidelines) have been established to promote the continued conservation of the bald eagle (USFWS, 2006a). The Guidelines are intended to:

- Publicize the provisions of the BGEPA that continue to protect bald eagles in order to reduce the possibility that people will violate the law.

- Advise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles.

- Encourage land management practices that benefit bald eagles and their habitat.

2.7 Conservation Issues on Fort Carson and the Pinon Canyon Maneuver Site

This section outlines potential natural and human-related threats to the bald eagle and its habitat on Fort Carson and the PCMS.

2.7.1 Natural Threats

Predators

Bald eagles will defend their nests against other avian species, especially ravens and other raptors. Bald eagle eggs, nestlings, and fledglings are the most vulnerable to predation. Black-billed magpies, gulls, ravens, crows, black bears, and raccoons have been reported to prey on eggs in nests. Black bears, raccoons, hawks, owls, crows, ravens, bobcats, and wolverines have been reported to kill nestlings, although there is little actual documentation. Fledglings on the ground are vulnerable to mammalian predators. Few non-human species are capable of or likely to prey on immature or adult bald eagles. Starving, injured, or diseased immatures and adults may be vulnerable to mammalian predation (Buehler, 2000).

Disease

Of 1,428 bald eagles examined during a 20-year period, only 2 percent died directly from disease. Diseases reported as leading to death included peritonitis, pneumonia, enteritis, septicemia, avian cholera, aspergillosis, hepatic necrosis, and myocardial infarction. Avian pox has been reported in a few cases, including one case involving mortality of two bald eagles (Buehler, 2000).

Parasites

Few data on parasites exist, and no parasites have been reported to cause death of an individual bald eagle. Parasites appear to be common on nestling bald eagles (Buehler, 2000).

Exposure

Although little mortality is attributed to exposure, extreme weather conditions that lead to food shortages may cause death. Bald eagles can tolerate extreme cold, wind, and snow as long as food is available (Buehler, 2000).

Black-Tailed Prairie Dog Plague Outbreaks

Black-tailed prairie dogs are an important food source for wintering bald eagles. If natural prairie dog plague outbreaks cause significant localized loss of prairie dog colonies, bald eagles may not use the area for foraging.

2.7.2 Human Threats

Bald eagles are sensitive to human disturbance, especially during the nesting season. During migration and winter, bald eagles often concentrate in large numbers, from hundreds to thousands of individuals, for feeding and sheltering. Bald eagles rely on established roost sites because of their proximity to sufficient food sources. Human activities near or within roost sites may prevent bald eagles from feeding or taking shelter, especially if other undisturbed or productive areas are not available. Feeding may be disrupted if there are disturbance activities in the flight path of important foraging areas. Activities that permanently alter bald eagle habitat may altogether eliminate factors essential for foraging bald eagles (USWFS, 2006a).

Military Training

There are no training restrictions or buffer zones at Fort Carson and the PCMS associated with the management of the bald eagle. Military training occurs in many forms throughout areas in which bald eagles have been found on Fort Carson and the PCMS. The most likely military training to affect bald eagles would be training that may cause prairie dog populations to decline on Fort Carson and the PCMS.

Military Training Effects on Prairie Dogs

Military training activities within prairie dog colonies, including mine plows, large-caliber weapon firing, construction of trench obstacles, live small-arms-caliber munitions, equipment drops, and offroad vehicles, would have a direct impact on prairie dogs. Except in the smallest colonies, damage associated with this type of training would not be substantial. These activities would have a short-term adverse effect on prairie dogs and a negligible effect on the long-term viability of a colony.

Non-Military Activities

Infrastructure Construction

Construction of infrastructure, especially on Fort Carson, could have the greatest impact on existing colonies of black-tailed prairie dogs on the installations. Prairie dog burrowing activities near infrastructure may lead to human/wildlife conflicts (i.e., gnawing of electrical wiring causing malfunctions in equipment), and in these cases, prairie dogs may be controlled according to practices outlined in the *Biological Assessment and Management Plan for the Black-Tailed Prairie Dog on Fort Carson and the Pinon Canyon Maneuver Site* (DECAM, 2004). Loss of prairie dog populations could result in bald eagles foraging outside of the installations.

Recreation

Hunting is permitted on both Fort Carson and the PCMS. The Colorado Division of Wildlife (CDOW) sets hunting seasons, but Fort Carson and the PCMS may place additional restrictions if warranted. There is a permanent moratorium on all black-tailed prairie dog hunting on both installations. Bald eagles scavenge animal remains left by hunters, and hunting most likely increases the availability of food for bald eagles on the installations. Therefore, hunting restrictions are not warranted.

Pest Control

The *Biological Assessment and Management Plan for the Black-Tailed Prairie Dog on Fort Carson and the Pinon Canyon Maneuver Site* outlines approved prairie dog population-control methods. Lethal control of prairie dogs occurs on Fort Carson at sites where prairie dogs present a public health threat, threaten the safety of sanctioned Army activities, damage or threaten to damage Army property, or where their presence is incompatible with current land-use practices or management goals. No prairie dogs have ever been poisoned on the

PCMS, but lethal removal of prairie dogs could be employed on the PCMS in the future under the circumstances outlined above for Fort Carson (DECAM, 2004).

Aluminum phosphide (trade name Phostoxin) is the chemical agent used to control prairie dogs. Phostoxin use is restricted to times when soil temperatures are greater than 55 degrees Fahrenheit for 72 hours and acceptable soil moisture is present. Under proper conditions, Phostoxin combines with moisture in the soil to emit carbon dioxide. Phostoxin is lethal to all other wildlife species and is not used on sites where burrowing owls or mountain plovers are present (DECAM, 2004).

Bald eagles are susceptible to secondary poisoning in prairie dog colonies. The prairie dog is an important food source for bald eagles on Fort Carson and the PCMS, especially in winter. The application of any pesticide must consider the risk of secondary poisoning to bald eagles.

Power Lines

Bald eagles are susceptible to electrocution by power lines and power poles, as demonstrated by the electrocution deaths of golden eagles along Route 1 and Route 8 on Fort Carson (DECAM, 2002). Eagle electrocutions on power lines have been documented in several states, especially in the west. Problem lines are those with wires so close together that an eagle is apt to simultaneously touch two wires while attempting to land on a power pole. The problem seems to be most severe in terrestrial habitats where few suitable natural hunting perches are available (USFWS, 1983).

3.0 Conservation Goal

3.1 Goal

The goal of bald eagle management on Fort Carson and the PCMS is to protect and enhance bald eagle populations in accordance with the ESA, BGEPA, and MBTA. The primary conservation objective is to protect wintering bald eagles while on Fort Carson and the PCMS. Described below are specific management recommendations to protect bald eagles on Fort Carson and the PCMS.

3.1.1 Manage for Sustainable Black-Tailed Prairie Dog Populations

Restrict aboveground poisoning of black-tailed prairie dogs, especially in winter. Restricted use of pesticides would reduce the potential for ingestion of contaminated prey that could result in the death of bald eagles. By coordination, exclusion devices, and use of pesticides that are not poisonous or available to raptors, ensure that pest management programs do not inadvertently affect bald eagles on Fort Carson and the PCMS (DECAM, 2002). Black-tailed prairie dog recreational shooting is banned on Fort Carson and the PCMS, which may reduce the added risk of lead poisoning to eagles from scavenging prairie dog carcasses from hunters.

3.1.2 Implement Measures to Prevent Bald Eagles from Being Electrocuted on Towers, Poles, and Power Lines

Reduce accidental power line electrocution of bald eagles through identification of lines currently causing electrocution, modification of existing problem lines, and construction of new lines in accordance with recommended standards (USFWS, 1983). Recommendations for reducing impacts of power lines on raptors can be found in *Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996*, by Edison Electric Institute and Raptor Research Foundation.

Power lines will be inventoried to identify existing problem lines that should be modified. The DECAM will continue to monitor incidental take by electrocutions and will provide recommendations to the Directorate of Public Works regarding power lines that are known to kill raptors. Implementation of this objective includes gathering data on raptor electrocutions on the installations to identify raptor-killing lines and investigating methods to reduce the number of electrocutions on the installations (DECAM, 2002). The DECAM will provide technical assistance to ensure that wire/pole modifications to power lines do not accidentally electrocute bald eagles (or other large raptors). The DECAM will also notify the USFWS in the event of any bald eagle electrocution on Fort Carson or the PCMS.

In 2002, an independent survey by San Isabel Electric Company (Beth Dillion) was conducted for the potential for electrocution sites on all power lines within the PCMS. No locations were found on site that did not meet current guidelines/standards to avoid raptor electrocution (Klavetter, 2006).

3.1.3 Follow Applicable USFWS Guidelines for Protecting Bald Eagles

The USFWS describes management practices that land owners and planners can use to benefit bald eagles. Many of the recommendations are designed to protect bald eagle habitat and ensure against illegal take under the BGEPA (USFWS, 2006a). These recommendations include:

- Protect and preserve communal roost sites, potential nest sites, and important foraging areas. Retain mature trees and old-growth stands wherever possible, particularly within one-half mile of water.
- Avoid potentially disruptive activities and development in the eagles' direct flight path between their nest sites, roost sites, and important foraging areas.
- Locate long-term and permanent water-dependent facilities away from important eagle foraging areas.
- Avoid recreational and commercial boating and fishing near eagle foraging areas during peak feeding times (usually early to mid-morning and late afternoon), except where eagles have demonstrated tolerance to such activity.
- Do not use explosives within one-half mile (or within 1 mile in open areas) of communal roosts when eagles are congregating, without prior coordination with the USFWS and CDOW.
- Locate aircraft corridors no closer than 1,000 feet vertical or horizontal distance from communal roost sites.
- Only use pesticides, herbicides, fertilizers, and other chemicals in accordance with federal and state laws and labeled instructions for their use.
- Identify and monitor contaminants associated with hazardous waste sites (legal or illegal) and permitted releases, especially within watersheds where eagles have shown poor reproduction or where bio-accumulating contaminants have been documented. These factors present a risk of contamination to eagles and their food sources.
- Where feasible, site wind turbines, communication towers, and high-voltage transmission power lines away from bald eagle communal roost sites to avoid collisions. Bury utility lines along forested shorelines and roadways in new development projects.
- Employ industry-accepted measures to prevent birds from being electrocuted on towers and poles.
- Immediately cover carcasses of euthanized animals at landfills to protect eagles from being poisoned.
- Do not intentionally feed bald eagles. Artificially feeding bald eagles can disrupt their essential behavioral patterns and put them at increased risk from power lines, collisions with windows and cars, and other mortality factors.
- Avoid excessive groundwater pumping and river diversion that can lead to destruction of nest trees, roosts, and foraging areas.

- Use an approved non-toxic shot when hunting waterfowl. Eagles can be poisoned by elevated levels of lead after feeding on fish and waterfowl that have ingested lead shot or carrion killed with lead shot.

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APPENDIX G

CULTURAL RESOURCES SUPPORTING DOCUMENTATION

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Provided by

Fort Carson Directorate of
Environmental Compliance and Management,
Cultural Resources Program

ATTACHMENT G.1

Prehistoric and Historic Cultural Sequences at Fort Carson

PREHISTORIC AND HISTORIC CULTURAL SEQUENCES FOR FORT CARSON

Prehistoric Cultural Sequence

Three general stages of prehistory have been delineated for southeastern Colorado: the Paleoindian, Archaic, and Late Prehistoric. An earlier stage, the Pre-Clovis, has been proposed, but direct evidence of this stage in the region is lacking. The Paleoindian, Archaic, and Late Prehistoric stages in southeastern Colorado are each subdivided into three periods. These periods represent specific changes or innovations in the material culture of prehistoric peoples that suggest broader changes in environmental conditions and/or political and socio-economic structure. These periods span from approximately 11,500 B.P. to 225 B.P.

The following description of the prehistoric cultural chronology is taken from the cultural synthesis for Fort Carson provided in Zier et al. (1997), and the southeastern Colorado overviews found in Piper et al. (2006) and Zier and Kalasz (1999).

Pre-Clovis

The most noteworthy and generally widely accepted Pre-Clovis site is Monte Verde (Dillehay 1989; Meltzer et al. 1997) in southern Chile. In North America, a Pre-Clovis stage has been proposed by some archeologists based on the early radiocarbon dates found at sites like Cactus Hill site in southeastern Virginia (Adovasio 2002), Topper site in South Carolina (Goodyear 2002), and Meadowcroft rockshelter in Pennsylvania (Adovasio and Carlisle 1988).

Some sites in Colorado have Pre-Clovis age materials; however, radiocarbon dates at these locations have yet to be definitively associated with actual human activity (Zier and Kalasz 1999:75). Two northeastern Colorado sites, Dutton and Selby, produced bones of extinct megafauna that exhibit spiral fracturing and flake scars suggesting human modification. At the Lamb Spring site southwest of Denver, a possible Pre-Clovis component contained the remains of 23 mammoths, some of which appeared to have been left in piles, and bone flakes possibly resulting from the production of bone tools. Dates from the Dutton, Selby, and Lamb Spring sites range from 13,140 B.P. to 11,710 B.P.

Paleoindian 11,500-7,800 B.P.

The Paleoindian (11,500-7,800 B.P.) represents the earliest stage of cultural evolution in the archeological record of southeastern Colorado. This stage in southeastern Colorado is commonly divided into three periods based on diagnostic projectile points.

Clovis Period (11,500-10,950 B.P.)

The Clovis Period (11,500-10,950 B.P.), the earliest Paleoindian manifestation, has been delineated based on findings of large, fluted lanceolate spear points and prismatic blades, blade cores, and blade tools (Collins and Kay 1999:45-71). The latter were most likely used as knives, scrapers, and core/choppers. These characteristic artifacts have been found in association with the remains of mammoth, horse, and other Pleistocene fauna suggesting economies were hunting-focused. Clovis sites in eastern Colorado include the Dent, Dutton, and Lamb Spring sites. The Drake cache in northeastern Colorado contained 13 large Clovis points and may represent a human interment (Frison 1991).

Other Clovis sites within the region include the Domebo site in southwestern Oklahoma and the Blackwater Draw site in east-central New Mexico. The Hahn site represents the only site of this age in southeastern Colorado (McDonald 1992), though surface Clovis points have been reported near Aguilar (Bair 1975:8), in Black Mesa State Park in the northwestern Oklahoma panhandle, and at several locations in western Kansas (Anderson 1990). Campbell (1969:360) identified a Clovis point in northern Las Animas County.

Folsom Period (10,950-10,250 B.P.)

The Folsom Period (10,950-10,250 B.P.) has been delineated based on fluted points found in association with extinct *Bison bison antiquitus*, as well as pronghorn, hare, wolf, fox, coyote, and turtle. The period coincided with early Holocene warming that saw the extinction of many large Pleistocene mammals. Besides fluted points, other Folsom period tools included knives, gravers, spokeshaves, scrapers, cores, drills, burin-like implements, choppers, abrading stones, awls, beads, and needles (Zier and Kalasz 1999:86-87). There is some evidence for the processing of vegetal products and for the grinding of pigments (Anderson 1990). Folsom sites in the region include the “type” site in northeastern New Mexico (35 miles south of the PCMS), the Lindenmeier, Fowler-Parrish, Powars, and Johnson sites in north-central Colorado (Zier and Kalasz 1999:85), and the Stewart’s Cattle Guard, Zapata, and Linger sites in the San Luis Valley (Dawson and Stanford 1975; Jodry and Stanford 1992).

Though no Folsom sites have been reported in southeastern Colorado, surface projectile points have been reported in the Canon City area, Red Top Ranch, the Flank Field Storage Area, the Cimarron River basin (Zier and Kalasz 1999:87), near Fowler (Lotrich 1938), and on the Chaquaqua Plateau (Anderson 1975). Three Folsom point fragments have been recovered from PCMS sites, but two appear to have been brought there by later occupants. The other is of a local material and was broken during the fluting process (Owens and Loendorf 2005:581).

Plano Period (10,250-7,800 B.P.)

The Plano Period (10,250-7,800 B.P.) comprises several complexes characterized by different flake styles of lanceolate projectile points. Complexes include Midland, Agate Basin, Hell Gap, Alberta, Cody, Frederick, and Lusk (Gunnerson 1987; Wiesend and Frison (1998); Zier and Kalasz 1999:91-92). These complexes are thought to reflect a cultural continuum with adaptive modifications resulting in tool variability. An increasingly complex lifestyle is indicated by the presence of more varied tool kits, including a variety of stone and bone tools (Knell 1999). The presence of milling stones indicates a greater emphasis on processing plants. A great variety of kill, processing, and camp sites also occur, some with evidence suggestive of religious practices (Anderson 1990).

Evidence of Plano occupation in southeastern Colorado is plentiful; recorded sites of note include Olsen-Chubbock (Wheat 1972) and Runberg (Black 1986). On Fort Carson, two Cody complex projectile points and two unidentified Plano projectile points fragments have been recorded as surface finds. On the PCMS, Hell Gap points are quite common and have been found on eight sites and as isolates twice. Recently, PCMS archaeologists (Owens and Swan 2006) identified an Agate Basin site with four diagnostic projectile points and highly patinated debitage and chipped-stone tools.

<u>Archaic 7,800-1,850 B.P.</u>

The beginning of the Archaic Stage (7,800-1,850 B.P.) marks another turning point in the natural environment with the onset of the Altithermal climatic episode, a prolonged early Holocene period of general warming and drying in western North America (Benedict 1979). The Archaic Stage represents a shift from economies geared toward big game hunting to more generalized hunting and gathering. More importance was placed on wild plant foods like *Chenoams*, and the procurement of game became more diversified, with large and small mammals like rabbits and gophers represented (Piper et al. 1996). Ground stone implements became common and are the predominant artifact class at many Archaic sites. Lithic tool assemblages exhibit more variability, and many artifacts reflect specialized local adaptation (Zier and Kalasz 1999).

Based on changes in projectile point morphology, the Archaic stage has been divided into Early, Middle, and Late periods. Archaic projectile points are nearly all stemmed and are not as delicately flaked as those of the earlier Paleoindian stage. Generally, Archaic complexes in the region have been poorly defined (Anderson 1990; Zier and Kalasz 1999:100).

Early Archaic Period (7,800-5,000 B.P.)

The Early Archaic Period (7,800-5,000 B.P.) reflects human adaptations to a hotter and drier climate. In response to this drastic climate change, southeastern Colorado may have become partially depopulated (Owens and Loendorf 2005:661), with some groups possibly relocating to the relatively cooler and wetter foothill and mountain regions (Benedict 1979; Brunswig 1992; Feiler 1994:16).

Early Archaic projectile points in eastern Colorado tend to be large, with either corner-notching or shallow side-notching (Zier and Kalasz 1999:105). Tool kits have not been thoroughly described, though Cassels (1997:95) indicates that expedient ground stone first appears regularly at this time.

In southeastern Colorado, Early Archaic projectile points have been reported from nine sites in the Apishapa highlands and from one site in the John Martin Reservoir area (Zier and Kalasz 1999:102-104). On Fort Carson, a component of the Gooseberry Shelter site has been radiocarbon-dated to the Early Archaic (Kalasz et al. 1993). No Early Archaic archeological sites have been found at Pinon Canyon and only a few projectile point isolates have been identified (Owens and Loendorf 2005). The lack of Early Archaic remains results from either a cultural hiatus, brought on by drought, or poor site preservation resulting from natural geologic processes (Zier et al 1989:15).

Middle Archaic Period (5,000-3,000 B.P.)

The Middle Archaic Period (5,000-3,000 B.P.) witnessed a widespread reversion to more mesic climatic conditions following the Altithermal event. Middle Archaic sites indicate broad-spectrum adaptations by hunter-gatherers to plains, basin/valley, foothills, and montane environments (Gunnerson 1987:31-36). Sites display evidence of diverse resource procurement. Remains of large and small mammals, birds, reptiles, and shellfish occur, as do seeds of numerous wild plants (Zier and Kalasz 1999:121). Hearths are common and spaced-stone circles also appear. Characteristic projectile points of this period include large, basally concave or indented points such as McKean, Duncan, Hanna, and Mallory types (Gunnerson 1987:31-32). Other artifacts include formalized manos and grinding slabs, bifaces, scrapers, drills, spokeshaves, bone awls, and hammerstones (Anderson 1990).

In southeastern Colorado, one Middle Archaic site, Draper Cave in Custer County, has been excavated revealing mixed levels of Duncan, McKean, and Hanna projectile points. On Fort Carson, components of the Recon John Shelter site, the Gooseberry Shelter, and the Two Deer Shelter have been radiocarbon-dated to the Middle Archaic (Zier and Kalsaz 1999:115). Though isolated Middle archaic projectile points are quite common, only one PCMS site can be attributed to the McKean Complex (Piper et al. 2006:3-4). Middle Archaic age rock art, in the form of Pecked Curvilinear and Pecked Rectilinear elements, is quite common on the PCMS.

Late Archaic Period (3,000-1,850 B.P.)

The Late Archaic Period (3,500-1,800 B.P.) saw the continued specialization in subsistence practices, and maize probably first spread into the region at this time (Zier and Kalasz 1999:137). Evidence of communal bison procurement is abundant for this period and suggests the development of complex intergroup cooperation in conjunction with population growth (Piper et al. 2006:3-6). In southeastern Colorado, Late Archaic sites are much more common than Middle Archaic sites. Diagnostic projectile points of the period include basal corner-notched types like Ellis, Garza, Marcos, Shumla, Williams, Palmillas, Ensor, Edgewood, and Yarbrough (Anderson 1990).

On Fort Carson, Late Archaic components have been discovered at many locations, including a number with Middle Archaic components, such as the Recon John Shelter, the Gooseberry Shelter , and the Two Deer Shelter (Zier and Kalasz 1999:128-129). Pinon Canyon contains many surface sites of this time period; those excavated indicate that communal plant collecting and processing were dominant activities (Piper et al. 2006:3-6 – 3-7). In the area around Pinon Canyon, Late Archaic remains are plentiful, especially in the canyons (Campbell 1969; Hand and Jepson 1996; Reed and Horn 1995).

Late Prehistoric 1,850-225 B.P.

The Late Prehistoric Stage (1,850-225 BP) observed important changes in subsistence patterns, artifact complexes, and demographics on the southern Plains. The beginning of the stage coincides with innovations like the bow and arrow, ceramics, and permanent or semi-permanent houses (Piper et al. 2006:3-7). The use of cultigens reached a significant level during this time, though few pollen or macrobotanical samples attest to this change in southeastern Colorado. Recently, however, excavations along the Purgatoire River have produced significant maize pollen (Scott-Cummings and Varney 2002) at the Developmental Period/Diversification Period boundary.

The final centuries of the Late Prehistoric Stage reflect the effects of European incursions, including both direct intrusions by Europeans and diffusion and spread of material goods of European origin by indigenous groups (Secoy 1953; Zier and Kalasz 1999).

Developmental Period (1,850-900 B.P.)

The Developmental Period (1,850-900 B.P.) corresponds with what has traditionally been referred to by archeologists as the Plains Woodland Period (Winter 1988) or the Early Ceramic Period (Eighmy 1984). At this time, cordmarked and plain pottery, small corner-notched arrow points (Scallorn, Reed, Bonham, Alba, Washita, Fresno, Chaquaqua types), circular slab masonry architecture and some agriculture first appeared.

Ground stone tools are more common than chipped stone in this period. This suggests that vegetal materials, possibly including maize, and other cultigens probably constituted larger portions of the human diet (Piper et al. 2006:3-8). Faunal remains from excavated sites indicate that animals like deer and antelope were exploited, as well as small animals like cottontail rabbits and prairie dogs (Zier and Kalasz 1999:178). Aquatic species like fish, frogs, and fresh water mussels were also consumed (Sanders 1983; Zier and Kalasz 1999:178).

Developmental Period sites are much more numerous in the region than those of earlier periods. It has been noted that this increase in the number of recorded sites could be the result of improved site visibility due to the presence of architectural features (Zier et al. 1997). Observed site types include circular masonry architecture, rock shelters, brush and hide shelters with circular rock foundations, and open camps (Zier and Kalasz 1999:174-175)

Diversification Period (900-500 B.P.)

The Diversification Period (900-500 B.P.), also termed the Middle Ceramic (Eighmy 1984), marks the local variant of the Plains Village tradition. It is subdivided into the Sopris (900 to 750 B.P.) and Apishapa Phases (900 to 500 B.P.) in southeastern Colorado. The Sopris occurs in the area around Trinidad, Colorado, and relates to the Pueblo Indian occupation of New Mexico. Sites of this phase have never been found at the PCMS or Fort Carson and will receive little discussion here.

Based on the appearance of “fortified” sites on areas of high terrain, and massive architectural features, Withers (1954) proposed the concept of the Apishapa focus. More recently, Lintz (1984) proposed the concept of the Upper Canark regional variant for cultures of Plains Village age that occur along the western margin of the southern and central Plains. Within the Upper Canark regional variant, he recognized the Antelope Creek Phase of the Texas and Oklahoma Panhandles and northeastern New Mexico, and the Apishapa Phase of southeastern Colorado. Lintz’s dates for the Upper Carnark regional variant were approximately 900-500 B.P. (Zier et al. 1997).

There is little doubt that subsistence practices during the Diversification Period were geared more toward horticulture than those of the Developmental Period. However, floral and faunal evidence from Diversification sites still indicates that hunting and gathering predominated and that horticulture was supplemental. The degree to which architectural developments are reflective of permanent habitation is also uncertain. Where surface architecture is common (particularly along the canyons of the upper Arkansas River drainage basin), it is difficult to envision permanent habitation and a horticultural subsistence base, due to the marked absence of substantial middens (Zier et al. 1997).

Cultigens have been recovered from excavations on Diversification Period sites. Maize has been recovered from many rockshelters in the region including Medina Rockshelter, Pyeatt Rockshelter, Upper Plum Canyon Rockshelter, Gimmie Shelter, and Trinchera Cave (Zier and Kalasz 1999:217). Maize pollen has been recovered from open architectural sites along the major rivers of southeast Colorado (Gardner 2005; Gunnerson 1989). At Umbart Cave in the upper Arkansas River drainage basin, Campbell (1969:180) recovered beans in subsurface context. The presence of cultigens in the drainage basins of the Arkansas River indicates that horticulture was being practiced, or that these peoples were actively trading with the horticulturists of the Antelope Creek Phase.

Deer and antelope remains are common on Apishapa Phase sites, but bison bones are rarely encountered. Communal hunting of ungulates is portrayed in rock art of this time period with human figures portrayed herding or chasing quadrupeds (Piper et al. 2006:3-10).

Technologically, the most distinctive lithic characteristic of the period is the small triangular projectile point, either unnotched Fresno or side-notched Washita. Ceramics are also varied, but generally consist of cord-marked, globular, or conoidal jars. Bone artifacts are common and include awls, fleshers, wrenches, and beads. Ground stone includes manos, metates, and shaft abraders (Zier et al. 1997).

Many Diversification Period sites are found on the Army controlled lands in Colorado. The canyon settings of the PCMS exhibit defensive sites on every isolated high ridge point surrounded by a steep slope. At the Sorenson Site or Jason's Pillar, for example, Apishapa village sites were found on isolated canyon edges where their occupants could monitor the movement of adversaries during what was likely a raid or siege warfare event.

Protohistoric Period (500-225 B.P.)

The Protohistoric Period (500-225 B.P) extends from roughly 1450 A.D. to 1725 A.D. The earliest European incursions into the region occurred during the first half of the sixteenth century, and the material cultures of indigenous populations were altered significantly over the course of the ensuing three centuries. Three principal indigenous groups entered southeastern Colorado during this period. In chronological order of appearance, they are the Apache, Comanche, and Cheyenne-Arapaho (Zier et al. 1997). In addition, southeastern Colorado was on the margin of Ute territory throughout protohistoric times.

The Protohistoric Period marks the start of the Plains Nomad Tradition (Gunnerson 1969, 1984). Material remains include metal artifacts, micaceous pottery, Pueblo pottery, chipped glass artifacts, and side-notched points. Most sites from this period are tipi encampments found along canyon heads though some earth ovens have been found (Winter 1988:77-78). Spanish expeditions onto the southern Plains reported groups of nomadic bison hunters that also subsisted on corn, other large and small game, native plant seeds, greens and tubers, mussels and fish.

In eastern Colorado, the Dismal River Aspect has been proposed for the remains recovered for the time period between A.D. 1675 and A.D. 1725. The Dismal River Aspect has been associated with Plains Apachean peoples (Anderson 1990; Gunnerson 1960) based on the previously mentioned Spanish accounts. Recently, Gulley (2000:7) has called into question the validity of these accounts and has determined that sites attributed to Dismal River actually represent a local manifestation of a Plains life way, rather than a definitive Apachean presence.

Tipi rings sites are common throughout the southern Plains, but only a few of them can be attributed to the Protohistoric. Sites on the Carrizo Ranches near the Colorado/New Mexico border have tipi rings and diagnostic pottery (Kingsbury and Gabel 1983). Protohistoric ceramics have also been found at two sites on the PCMS (Loendorf and Kuehn 1991).

Historic Cultural Sequence

Within southern Colorado, the initial European contact occurred mid 16th century. The Late Prehistoric aboriginal way of life probably changed little until the Spanish began settling in the region. Following Zier and Kalasz (1999), the transition between the Protohistoric to the Historic begins around A.D. 1725. Though there is a paucity of ethnographic and historical data for the region, records document aboriginal/European contact beginning with Fray Marcos DeNiza's expedition of 1539.

Archaeologically, the recognition of Historic Indian sites in the region has been rare (Church 2002; Stoffle et al. 1984). Because of this, only the European cultural history will be discussed. The following description of the historic cultural chronology is largely taken from Clark (2003), Mehls and Carter (1984), Jones et al. (1998), Zier and Kalasz (1999), and Zier et al. (1997), though other, less known sources are also consulted.

Spanish Period (A.D. 1540 – A.D. 1822)

Initial European exploration into southeastern Colorado was associated with Spanish colonialism. In 1539, Viceroy Medoza sent Fray Marcos DeNiza to investigate the "Seven Cities of Cibola" described by Cabeza DeVaca (Carson 1998:5). In 1540, Francisco Coronado led another large expedition in search of the Seven Cities as far north as south-central Kansas. Though neither of these expeditions actually crossed into Colorado, the entire region became part of the territory claimed by Spain in the New World (Mehls and Carter II-1; Zier et al.. 1997).

Through the late 16th century, there were other Spanish expeditions into the southern Plains. In 1598, Don Juan Onate sent Vincente de Zaldivar into southern Colorado and the Juan de Archuleta made the first documented trip into Colorado around 1664 when retrieving Taos Indians from El Cuartelejo (Freidman 1988; Mehls and Carter II-1-3). The Purgatoire River is said to have received its name because Spanish soldiers had died here and did not receive last rites. Perhaps members of the Bonilla and Humana expedition of 1594 (Taylor 1963) were the servicemen mentioned in this account. The river's Spanish name, "Rio de las Animas", means river of souls, to which was later added "Perdidas en Purgatorio," or lost in Purgatory. Records indicate that Gutierez de Humana killed Captain Fransisco Leyva de Bonilla along the Arkansas River in Kansas, however, while retuning to Pecos Pueblo the rest of the group was attacked by Indians and most of the Spanish Soldiers were killed (Murray 1979). The majority of scholars

(Friedman 1989; Thomas 1924) confirm that the Humana expedition went into Kansas and not Colorado, but a skeleton in Spanish armor found in a canyon near La Junta (Jeancon 1925) and chain mail found in the area (Church and Cowen 2003) collaborate nicely with the legend.

The migration of the Utes and Comanches was part of a broader pattern of rapidly shifting tribal territories, a pattern which had begun before the Spaniards reached the region and continued into the late-nineteenth century (Kenner 1969). The Uto-Aztecan speaking Ute Indians may have been the first historic tribe to enter Colorado when they migrated southeastward from the Great Basin (Zier et al. 1997). Following herds of bison, and because of ameliorating climatic conditions, Apaches entered the area from the north by the beginning of the 16th century (Piper et al. 2006). Other Athabaskans, Navajos, migrated to extreme southern Colorado and northern New Mexico at this time (Zier et al.. 1997). The Navajos and Apaches conducted both trade and warfare with the older pueblo groups further to the south. By the 1660s, the Apaches had become a mounted military threat to the Pueblos and the Spanish in what Secoy (1953) calls the Post-Horse-Pre-gun pattern. The Utes also had horses in the 1700s and they too began to raid New Mexico villages.

The first documentation of mounted Indians with armor occurred around the time of the 1680 Pueblo Revolt (Secoy 1953). The revolt had little direct impact north of New Mexico, though Spanish exploration into the area ceased as both soldiers and settlers retreated into Mexico (Mehls and Carter 1984). Within a few years, the Spanish regained control of the Rio Grande area and exploration into territories to the north resumed.

In the 1700s, French traders operating on the northern Plains and along the Mississippi River began to trade goods and arms to the various Indian groups including members of the Pawnee family and the Comanche (Secoy 1953). These enemies of the Apache pushed back across the southern Plains, and along with the Ute's who had guns at this time, established military dominance. This is because the semi-sedentary Apache were tied to crops on a seasonal basis and their more mobile, and better equipped, adversaries could pattern their locations and dominate calvary warfare.

In 1704, the Comanches began to raid Spanish settlements in New Mexico and used the Purgatoire River area as a staging point for their trips (Stoffle et al. 1984). Competition between Comanches and Utes for the upper Arkansas River basin eventually led to general warfare between those former allies, with the remaining Apaches allied with the Utes (Zier et al. 1997).

The Spanish military pattern at this time was one of infantry and calvary and expeditions into the southern Plains a show of force. To control the Indians of the southern Plains, and to assess French influence in the area, Spanish leaders dispatched a party lead by Antonio de Valverde in 1717 and Pedro de Villasur in 1729 (Mehls and Carter 1984; Murray 1979). On the Platte River of Nebraska, Villasur's party was attacked by the Pawnee and was the last Spanish expedition across eastern Colorado until 1779.

The French Canadian brothers, Paul and Peter Mallet, are credited with the first expedition up the Arkansas and Purgatory River valleys while traveling to Santa Fe in 1739 to establish a trade route (Taylor 1959). On the journey, they apparently found stones bearing Spanish inscriptions on the banks of the Arkansas River (Folmer 1939). Although their exact route is not known, they may have followed the prehistoric Indian trade route, which would later become known as the Santa Fe Trail (Church and Cowen 2003).

In the 1770s, Comanche and Apache raiding parties terrorized the edge of the Spanish frontier. To combat these attacks, Governor Juan Bautista de Anza led an army of 600 solders, militiamen, and Indian allies against the Comanche (Murray 1979). They ambushed a large Comanche camp on the north side of the Wet Mountains in south central Colorado, then traveled south to near the present town of Rye where routed another Comanche force led by Cuerno Verde (Stoffle et al. 1984).

This Spanish victory initiated lasting peace with the Comanche in 1786. This new alliance led not only to the demise of the Apache on the Plains, but began the *Comanchero* period (1786 to 1860) where the Spanish, New Mexicans, and Comanche came together for trading on the southern plains (Kenner 1969). At the same time, New Mexican buffalo hunters known as *ciboleros*, hunted throughout the region (Carrillo 1990).

The French threat to the Spanish in the southern Plains disappeared in 1763. Napoleon, in the early 1800s, needed money to support the French Empire elsewhere, and came to an agreement with Spain to return the former French colony of Louisiana to France (Murray 1979). In 1803, in one of the greatest land deals of its time, France sold the recently secured Louisiana to the United States (Ubbelohde et al. 2001). The boundaries of the Louisiana, largely disputed by Spain, but claimed by the United States included the land extending west from the Mississippi River to the Rocky Mountains and the Rio Grande. It was not until 1819 that the Adams-Onis Treaty would established the Arkansas River as the northern boundary of Spanish New Mexico (Stout 2002; Zier et al. 1997).

President Jefferson did not waste any time in procuring federal funding for scientific expeditions to explore the natural resources, and to gain knowledge of the Indians, and the transportation routes of this uncharted territory. One of the first explorations, the renowned Lewis and Clark Expedition (1803-1806), explored the area along the Missouri River and the Northwest region. Two later expeditions that followed are directly associated with the Fort Carson area. The expedition of Captain Zebulon Pike (1806) explored the geography, natural history, and topography of the lands in the southwest portion of the newly acquired territory, leading Pike up the Arkansas River Valley into Colorado. The entourage of twenty-two men split into two groups, one to seek the headwaters of the Red River, and the other along the Arkansas River. During this expedition Pike would observe the mountain peak that bears his name today. Pike and three other men continued northwest in an attempt to climb the peak looming on the horizon, an attempt that proved unsuccessful. This venture possibly led him to the area of Little Fountain Creek, and on his return journey to the mouth of Fountain Creek the group possibly went by way of Turkey Creek. A winter camp described by Pike believed to have been located east of Colorado Highway 115 between Turkey Creek and Little Turkey Creek within the Fort Carson area has not been archaeologically verified (Zier et al. 1997).

After the official boundaries of Louisiana were established, Long's expedition (1820) would explore the western mountains in search of the source of the Platte River, returning by way of the

Arkansas and Red Rivers. Three of the men in Long's expedition would be the first Americans to climb what Long referred to as James' Peak, but would forever be referred to by the public as Pike's Peak (Ubbelohde et al. 2001). Long's expedition skirted the eastern boundary of Fort Carson (Stout 2002; Zier et al. 1997).

Fur trappers and traders were among the first Euro-Americans to venture forth in this unknown land, exploring the region in the process of economic enterprise. Trading and trapping networks had been in place by the early 19th century, and while private parties of New Mexico traders were encouraged by Spanish authorities to travel north and east to trade with the Indians, American traders were not always welcomed to trade in Santa Fe. When American traders did venture to Santa Fe, the Spaniards confiscated their goods and detained them, some for as long as a decade. James Purcell explained to the captured Pike in 1807 that after coming from Missouri and traveling up the South Platte to South Park he and two French-American traders turned southward to trade their furs in Santa Fe. Upon arriving there, Spanish authorities appropriated their goods, and did not allow them to leave (Stout 2002; Zier et al. 1997).

The Missouri Fur Company, in 1809-1812, did not intend to have its trappers detained in New Mexico and sent parties of trappers into the Rocky Mountains. Jean Baptiste Champlain led one party up the South Platte River bringing news back to St. Louis of a thriving beaver population and Arapaho Indians eager to trade. He returned to the South Platte area in 1811, and his party of trappers dispersed into different areas where they learned of the hostilities of the northern Plains Indians towards Americans resulting from British incitement during the War of 1812 (Weber 1971). In 1821, the Mexicans overthrew the Spanish during the Mexican Revolution.

<u>Mexican Period (A.D. 1822 – A.D. 1848)</u>

The Mexican Period coincides with much of the early American presence in the Colorado territory. In the spring of 1821, Spain granted Mexico independence as addressed in General Agustin de Iturbide's publication of the *Plan of Iguala*. While the news of independence spreads quickly through Mexico, it was not until September that Santa Fe learned of freedom from Spanish rule. New Mexico officials quickly endorsed independence, with no show of opposition. After the long imposed monopoly on the price of merchandise shipped to New Mexico by Chihuahua merchants, Santa Fe was eager to reverse Spanish policy against transactions with foreign merchants. Aware of the advantages that trading with the United States could bring, New Mexico eagerly sought the business of American traders from the northern frontier (Weber 1971).

Upon learning of the new opportunities in Mexico, William Becknell, who had set out in 1821 from Missouri to trade with the Comanches, traveled on to Santa Fe. His route across the plains and over Raton Pass became the Mountain Branch of the Santa Fe Trail (Taylor 1971). The Santa Fe Trail provided a trade route that linked Independence, Missouri with Santa Fe, New Mexico (Stout 2002; Zier et al. 1997). The Mountain Branch of the Santa Fe Trail more or less runs along State Highway 350 and the Timpas Creek drainage on the south side of Pinon Canyon. Shortly thereafter, many other traders made their way to sell merchandise to the New Mexico market. Establishment of a viable fur trade in the region brought about exploration of previous sections of unknown territory, thus expanding geographical knowledge of the mountain west (Alexander et al. 1982).

As the door opened for trade in New Mexico, the price of furs was rising in the United States, which brought with it a renewed interest in the fur trade. American fur traders ventured into New Mexico to hunt the plentiful beaver found in the streams of the Pecos and Rio Grande Rivers. In 1823, Mexican soldiers warned trappers of Baird and Company working the drainage of the Colorado River Basin that there were laws against foreigners trapping beavers in Mexican waters. When officials in Mexico City learned in 1824 that an American trapping network had developed in New Mexico, they ordered the government to prevent trapping of furs by foreigners in Mexican territory. American trappers, however, continued to trap New Mexico's waters by obtaining licenses granted to them in the names of Mexican citizens by Governors Baca and Narbona, provided a group of Mexicans joins the trappers to learn the fur trade. Due to pressures from Mexico City in 1826, Narbona revoked licenses and confiscated furs. American trappers did not easily give up the rich trapping areas in New Mexico, and many found ways around the law like smuggling furs by alternative routes, or by obtaining Mexican citizenship. Many American trappers, however, moved on, as early as 1827, into the Rocky Mountains to work the mountain streams for beaver. The "golden era of beaver trapping" dates between 1828 and 1833. The demand for beaver fur fell from favor in the early 1830s, replaced by the demand for the hide of the American bison, which lasted close to three decades (Weber 1971).

The success of the fur trade brought about the construction of many trading posts inside the United States territory north of New Mexico. Entrepreneurs such as William and Charles Bent and John Gantt established trading posts along the Upper Arkansas River between 1821 and 1835 (Lecompte 1964; Alexander et al. 1982). The most successful trading post, and strongest competitor of Taos, was Bent's Fort, established in the early 1830s by the Bent, St. Vrain and Company on the north side of the Arkansas River (Weber 1971). The location of the fort increased usage of the Mountain Branch of the Santa Fe Trail, and encouraged initial attempts of the first permanent settlements in the region (Stout 2002; Zier et al. 1997).

As the fur trade waned in the late 1830s, many trading posts continued to serve as supply stops along established trails and trade routes (Alexander et al. 1982). Agricultural settlement of the region coincided in conjunction with fur trading activities. Small farming communities settled at Pueblo and other locations along the Arkansas River and its north-flowing tributaries in the 1830s and 1840s. Corn and other produce of these farms found a ready market at the fur trading posts, and most farms were located close to at least one of the various segments of the Santa Fe and Taos Trails (Zier et al. 1997). As the fur trade became less lucrative many fur traders gave up their roaming lives and some with Spanish or Indian wives settled down to farm (Hafen and Hafen 1943). Food demands of Bent's Fort encouraged Mexican traders (*comancheros*) in 1839 to establish the first Mexican settlement, Fort El Pueblo, five miles upstream of Bent's Fort (Carrillo 1990; Stout 2002; Zier et al. 1997), where they raised grain, vegetables, horses and mules (Hafen and Hafen 1943). Around 1842, trappers and mountaineers started a settlement at the site of present day Pueblo where they farmed and traded with the Indians. A similar settlement started about the same time near the mouth of Hardscrabble Creek, near present day Florence (Hafen and Hafen 1943).

Sites associated with the fur trade are lacking within the boundaries of Fort Carson Military Reservation. The absence of well-traveled waterways or an overland route necessary for the existence of a fur trading post indicates little promise that anything other than ephemeral interactions with the area existed. Archival evidence does not indicate the existence of fur trading posts in the area. One site, 5PE64, was erroneously identified as an 1820s-1830s "Bent's Stockade" by amateur historian C. W. Hurd in 1960. Archival, architectural and archaeological evidence indicated the site is the remains of a small ranch established in the late 1860s or early 1870s (Hurd 1960; Socha and Posner 1975:45-52; Zier and Kalasz 1985: 42-45, 74-48; Zier 1987; Zier et al. 1997). Review of archival sources or physical contexts fail to indicate establishment of a fur trading post near the location of site 5PE64 or anywhere else within Fort Carson. A number of streams run through the Fort Carson area to include, Fountain Creek, Little Fountain Creek, Little Turkey Creek, Red Creek, Sand Creek, and Turkey Creek (Zier et al. 1987). While trappers probably worked the streams throughout Fort Carson, their temporary campsites most likely have been lost through natural processes or latter human interaction with the land (Stout 2002; Zier et al. 1997).

The Arkansas River was the international boundary of the Louisiana Territory from 1819 to 1848. To promote settlement in Mexico's northern frontier, the Mexican government issued a series of land grants between 1833 and 1843 to individuals for the development of towns and natural resources (Hafen and Hafen 1943; Abbott et al. 1982). Mexico established three large land grants in 1843. The Sangre de Cristo Grant, a million acre tract in present Costilla County extended into New Mexico. The Nolan Grant encompassed an area south of Pueblo, and the Virgil and St. Vrain Grant, extended east of Pueblo to the Purgatory River and south of Trinidad. Prior to 1843, individuals received from Mexico the Maxwell Grant, south of Trinidad into New Mexico, and the Tierra Amarilla Grant, southwest of the San Juan Mountains (Hafen and Hafen 1943).

Before the establishment of any permanent Mexican settlements, the land grants transferred to the United States in 1848 after the war with Mexico. The treaty between the United States and Mexico honored the land and property rights of the individuals who held the Sangre de Cristo, Maxwell, and Tierra Amarilla grants. Congress reduced the size of the Nolan, and the Virgil and St. Vrain Grants, and did not ratify the Conejos Grant. The Navajo and Ute thwarted earlier attempts (1833 and early 1840s) to settle the Conejos Grant (Abbott et al. 1982). Hispanic *pobladores* migrated from northern New Mexico to develop towns within the Sange de Cristo Grant along the Costilla River (1849), and San Luis (1851), San Pedro (1852), and San Acacio (1853) and the Culebra River. Humble farmers raised families, tilled the soil with crude wooden plows, dug irrigation ditches, and raised crops of wheat, corn, and beans (Hafen and Hafen 1943). These small Hispanic communities were the first permanent agricultural settlements in Colorado (Hafen and Hafen 1943; Carrillo 1990; Stout 2002; Zier et al. 1997). By 1860, more than 2,000 emigrants had settled in the area establishing at least forty irrigation ditches (Abbott et al. 1982).

American Frontier (A.D. 1849 - A.D. 1858)

The Mexican War officially ended in 1848, with the Treaty of Guadalupe Hidalgo. The United States annexed the Mexico territory from Texas to the Pacific Ocean, from the Rio Grande to the forty-second parallel, the present American Southwest, including the area of Colorado south of the Arkansas River (Ubbelohde et al. 2001). The postwar period brought several significant changes resulting in permanent occupation of the region. American population in Colorado increased as a direct result of gold and silver mining and emigrants seeking fortunes through mineral prospecting in California, or settling on farms or ranches in Utah and Oregon (Stout 2002; Zier et al. 1997). While wagon wheels continued to furrow deeply along the Santa Fe Trail, the flow of emigrants heading to Oregon, California, and Utah (1840 – 1850), the rush to gold fields and cattle drive routes contributed to the emergence of formal communication and transportation systems, linking frontier posts and villages. Frontier building increased hostilities between emigrants and the indigenous tribes eventually resulting in systematic removal of the Indians as early as the 1860s (Stout 2002; Zier et al. 1997).

Enthusiastic reports brought back by Lewis and Clark in 1806 of the fertile valleys of Oregon, and the Fremont expeditions (1842, 1843 and 1844) returning with maps of the major trails over the mountains to Oregon and California territories, encouraged many emigrants to head west. The Fremont expedition of 1842 employed the seasoned frontiersman Kit Carson as their guide to survey the area between the Missouri River and South Pass for passable routes and sites for the development of military posts (Ubbelohde et al. 2001). Bent's Fort established in the 1830s continue to serve as a portal from which many expeditions and emigrants began their journey into the western frontier.

Originally, emigrants made the journey west in search of land to establish farms and ranches. The discovery of gold in 1848 on a ranch belonging to John Sutter in California altered the purpose and demographics of those traveling west changed. By 1849, the gold rush brought many seekers of fortune over the Great American Desert and the Rocky Mountains (Ubbelohde et al. 2001). In 1846, Mormons in search of a heavenly fortune sought a "homeland" to practice their beliefs began their trek west establishing their haven in the Great Salt Lake Basin of Utah. In 1846, near Pueblo, a temporary settlement was set up for sick and disabled soldiers of the "Mormon Battalion" who had enlisted in the United States army during the war with Mexico to spend the winter. They left their log cabins and church in the spring of 1847 and traveled northward to the Oregon Trail with their final destination Salt Lake City, Utah (Stout 2002; Zier et al. 1997).

While Fort Carson is not located along the most frequently traveled Oregon Trail that took emigrants through central Wyoming, or the Overland Trail through northeastern Colorado and southern Wyoming, important "feeder" trails of the Oregon Trail did traverse through the immediate Fort Carson area (Zier et al. 1997). A number of exploration parties traveled along the Fountain Creek route: George Ruxton (1847), the Sumner Kansas Territory Survey (1857) and the Hayden Geological Survey (1873). The Cherokee Trail may have originated as early as 1849 with the Evans party of 124 gold prospectors, including 15 Cherokee Indians, on their way to the gold fields north of Denver. The trail followed along Fountain and Jimmy Camp Creeks to the headwaters of the South Platte drainage, then north to Denver. The trail became a frequently used thoroughfare after 1858, as news spread quickly through the Kansas and Missouri frontiers of the discovery of gold in the Pikes Peak area. Following the path of the gold prospectors, came freight wagons with needed supplies to outfit and feed those seeking their fortunes (Stout 2002; Zier et al. 1997).

Eastern Colorado, from 1854-1855, was part of the Kansas and Nebraska Territories, a region largely unsettled by Euro-Americans, with no established civil government (Sprague 1976;

Alexander et al. 1982). Scattered Euroamerican settlements emerged in the Arkansas Valley during the early 1850s. Early settlers included "Uncle Dick" Wooten, Joseph Doyle, and Charles Autobees. Communication between the United States and its new territories was a necessity; thus in1850 the U.S. government established the first mail contract between Independence, Missouri and Santa Fe, New Mexico. Settlement, along with the appearance of smallpox, increased tensions between Native Americans and emigrants (Stout 2002; Zier et al. 1997). Indian hostilities often caused abandonment of early settlements and ranches before the decade of the 1850s closed, and prior to the 1858 Colorado gold rush (Hafen and Hafen 1943).

Indian populations adapted to the limited presence of American traders and fur trappers along the South Platte and Arkansas River drainages, but became more agitated as Americans began to extensively travel through and settle in the Colorado Territory. The Treaty of Fort Laramie established in 1851 between the United States government and nine Plains tribes allowed Americans the right to build forts and roads within the tribal territories. The tribal territories agreed upon in the treaty set aside eastern Colorado from the Arkansas River to the North Platte River in Wyoming for the Cheyenne and Arapahoe. The central Rockies and the western slope was the land of the Ute, who resisted the gradual emigration of Hispanic American groups from New Mexico into the San Luis Valley. The U.S. Army erected Fort Massachusetts in 1852 to protect the settlers from Indian hostilities (Sprague 1976; Alexander et al. 1982). On Christmas Day in 1854, the Muache Ute and their Jicarilla Apache allies attacked the trading post at Pueblo, killing most of the residents (Carrillo 1990).

Increased traffic along the Santa Fe Trail and the establishment of the cattle drive routes in the new territory created further problems with Native American populations. In June 1860, the War Department ordered construction of a military fort at Big Timbers (known as Fort Lyon after the Civil War). Nevertheless, the situation between settlers and Native Americans continued to degenerate. In 1861, under pressure from the U.S. Government and white settlers, the Cheyenne and Arapahoe surrendered in the Treaty of Fort Wise the bulk of their land, which included the heart of their hunting lands at the base of the mountains. While most of the Cheyenne peace chiefs, lead by White Antelope and Black Kettle, supported the agreement, many of the young men and members of the warrior society claimed they had not agreed to the cessation of their land. The amount of game necessary to support the tribes was not plentiful enough on the fraction of the land north of the Arkansas allotted to the tribes. Stealing livestock from farms and ranches became a way to supplement the lack of game (Abbott et al. 1982).

In the spring of 1864, Cheyenne and Arapahoe Indians began raiding isolated ranches, running off horses, and antagonizing detachments of cavalry primed for action after a long winter (Abbott et al. 1982). A Cheyenne party attacked and burned the Iron Spring stage station along the Santa Fe Trail, and, in June, the brutally murdered the Hungate family on their ranch thirty miles from Denver. Reprisals by the military led to a series of events that culminated in the Sand Creek Massacre on 29 November1864. Cheyenne came to Sand Creek to witness the aftermath of the massacre. Incited by what they saw, the Cheyenne joined by Arapaho and Sioux gathered a force of thousands in early 1865, and initiated two attacks on the freight station of Julesburg killing forty whites, and blockading Denver (Abbott et al. 1982). William Bent associated through marriage with a Cheyenne woman and his trade relationship with the Cheyenne from the 1830s – 1840s, helped open negotiations for a new treaty in late 1865. However, intensive raiding of settlers continued into 1867. A major military campaign occurred in the winter of 1868-1869, resulting in the Treaty of Medicine Lodge, where most of the Southern Cheyenne and Arapaho agreed to relocate to a reservation in Oklahoma (Abbott et al. 1982; Carrillo 1990; Stout 2002; Zier et al. 1997).

Colorado Territory

The formation of the Colorado Territory coincided with the onset of the Civil War in 1861. Geographically the newly established territory included portions of western Kansas and Nebraska, eastern Utah, and northern New Mexico (Alexander et al. 1982). However, due to political infighting, the prospect of attaining actual statehood was less and less attractive to many Coloradans. From 1868 to the approach of the presidential election of 1876, Colorado statehood was a dead issue. Then, with the national elections fast approaching, President Grant promised Colorado statehood in return for three Republican electoral votes. The proclamation was issued on August 1, 1876, and that fall Hayes defeated Tilden by a one-vote margin (Cowen, personal communication).

By 1860, the population of Colorado had expanded to almost 35,000, with 82.4% of the working force employed in mineral extraction (Arrington 1963; Schulze 1977; Alexander et al. 1982). The first detailed census (1860) for the Fort Carson vicinity reported 737 individuals living within the area of Canon City, down the north side of Fountain Creek, and up Fountain Creek to Colorado City. Demographics of this population consist of 614 men, 122 females, and one Negro (Alexander et al. 1982). The Colorado Territory gold rush was short lived with the primary gold deposits in the Leadville district depleted by 1863, and the mining industry entered a depressed phase lasting through the 1860s. By the 1870s, the work force employed in the mining industry had dropped to 12.5%, a dramatic change from the 82.4% indicated in the 1860s census (Arrington 1963; Alexander et al. 1982). Most prospectors eventually left, some turned to agriculture, and some stayed on to bolster new communities such as Boulder, Central City, and Fort Collins (Stout 2002; Zier et al. 1997). With new mining discoveries in the 1870s and development of railroad transportation Denver effectively doubled its size by 1872; by 1874 Denver's population reached 20,000 (Carrillo 1990; Stout 2002; Zier et al. 1997).

Settlement and Development of the Fort Carson Area

Fort Carson does not include locations of known outstanding events in the history of the region or the nation, but areas within and adjacent to the military reservation are directly associated with important historical themes and eras. Principal historical themes are homestead/ranch settlement and hardrock mining, but the area has also seen Spanish military and trading expeditions, placer gold prospecting, exploration expedition, overland emigration, United States military expeditions of the Mexican, Civil, and Indian wars, open range ranching and trail herding, railroad construction, and stagecoach communications. The following overview is intended to be a general background statement about the themes, events and eras of the Fort Carson region, with specific references to threshold events of themes and eras and to events within or adjacent to Fort Carson associated with the themes. Of no less importance is the direct association of Fort Carson Military Reservation itself with the United States' role in World War II as well as its association with the Korean and Vietnam wars (Zier et al. 1997).

The overview necessarily addresses a broad regional context, as well as the more particular context of the present Fort Carson Military Reservation. The regional context is part of southeastern Colorado bounded on the south by the Arkansas River, on the east by the Kansas-Colorado border, on the north by the headwaters of the Platte River system, and on the west by the Front Range of the Rocky Mountains.

Historic sites predating the 1860s have not been located within Fort Carson proper (Zier and Kalasz 1985). The climate in the Fort Carson area is semiarid to arid and unsuitable for settlement on the subsistence scale. Settlement within the present boundaries of Fort Carson was sparse due to the lack of water and the difficulty of travel. The area surrounding Fort Carson would greatly expand as a result of gold rush of 1859, bringing with it population and economic fluctuations, and as readily assessable minerals were depleted, resulted in a substantial decline in settlement of the area. The demand for fresh meat in mining camps played a role in the development of the Colorado cattle industry. The cattle industry developed gradually in the Fort Carson area beginning in 1860. The Civil War, depletion of readily accessible minerals, the difficulty in transportation and the transportation of goods, and growing conflicts between settlers and native tribes tempered growth between the mid-to late-1860s. With the cessation of Indian hostilities in 1868, development of better transportation alternatives and communication mechanisms, settlement gradually increased within the region surrounding Fort Carson and within its boundaries. Resurgence in population and community development resulted from the mining industry in Leadville in the 1870s and discovery of large gold deposits in Cripple Creek in the 1890s.

The discovery of gold in 1858 in the mountains near present day Denver and in Leadville (1859) would bring approximately 100,000 gold-seekers to Colorado in 1859, where they spread like wild fire up the South Platte into the upper reaches of the Arkansas River drainage to pan for gold. Not all emigrants came to seek fortune by panning for gold, but rather they took advantage of the needs of those who did. Thousands of would-be miners eventually stayed and became ranchers and farmers (Zier et al. 1997). Towns and villages emerged out of the wilderness in the late 1850s. A few communities developed to serve as supply points and agricultural centers near the present boundaries of Fort Carson: Fountain City (Pueblo), Canon City, El Dorado, and Colorado City. Canon City and Colorado City were located along the foot of the mountains on trails that lead to the gold mines in South Park and along the Blue River. Attributes of these two cities—the scenery, fresh mountain air, and fertile soil near streams—made settling in the area favorable. Regional farms could supply fresher food for mining towns then supply trains departing from the Missouri River. Thus, farms sprung up along the branches of the Arkansas, especially in Huerfano and Fountain Creek, offering fresh radishes, lettuce, onions, and peas for sale in the Denver market (Hafen and Hafen 1943).

Colorado City received its name because it was located along the natural gateway leading to upper branches of the Colorado River. By 1860, the population of Colorado City had reached 1,000; many were merchants and forwarders (Griswold 1958). In a marketing campaign in May 1860, Colorado City advertised free access to the South Park Mines, abundant agricultural resources, medicinal springs, and inspiring views of the Garden of the Gods. From 1861 to 1862, Colorado City briefly held the distinction as capitol of the Colorado Territory. The first publication of the Canon City newspaper on September 8, 1860, included references to an operating shingle mill and steam saw mill, discovery of an oil spring, and announced that subscriptions were being taken up to begin a new church. By November, the population was 800, with forty businesses established (Hafen and Hafen 1943). The growth of Colorado City and Canon City would go through a period of decline as the mining industry entered a depressed phase in 1863. By the end of the decade, Colorado City was virtually deserted (Hafen and Hafen 1943; Griswold 1958; Alexander et al. 1982).

The cattle industry in Colorado Territory developed as a direct result of the 1859 gold rush. Prior to the gold rush, ranches were located at widely scattered locations in the Arkansas River Valley, most close to the Santa Fe Trail. Former New Mexico citizens who trailed cattle herds northward in search of grassy pastures along major rivers operated many of the ranches. Cattle were brought in from Missouri or Kansas, rather than from Texas or New Mexico (Zier et al. 1997). In 1860, the cattle industry found its official beginnings in Colorado when the Lovell and Reed Cattle Company brought Texas longhorn cattle to the lower Turkey Creek area near Pueblo. Over the summer, cattle grazed, until sold in small packs to resident ranchers or for butchering. Many small ranches, established as early as1860, continued to grow, and their success encouraged the establishment of others between 1869 and 1872. The home ranch or ranch headquarters often was located on a stream with at least semi-permanent water, and the cattle would graze the adjacent public domain land (Stout 2002; Zier et al. 1997).

True to the old pattern, most ranches continued to be located close to established trails. Settlement near present day Fort Carson began in 1860. The first settlement along Fountain Creek started when J.P. Robinson, Johnson Sanders, and Oliver Locks brought their families to the area and established small ranches. Several families, along with J.B. Bates, settled along Monument Creek, northeast of present day Fort Carson. Lewis Conley operated a gristmill on lower Beaver Creek, southwest of Fort Carson. William T. Holt established a cattle and sheep ranch on Horse Creek, east of Fort Carson, where he eventually ran 1,200 cattle, 1,000 horses, and 125,000 sheep. D. M. Holden settled with his family in the Bijou Basin east of present-day Colorado Springs. By 1878, the Holden ranch was running 2,700 sheep and 1,500 cattle. Sparseness of water and lack of transportation routes would delay settlement within the Fort Carson area until the late 1860s (Sandoz 1958; Whittemore 1967; Zier et al. 1997).

Agricultural settlement in the area between Fountain Creek and Beaver Creek was limited almost entirely to raising stock because of the rough and arid landscape and the lack of surface water. The term "settlement" does not accurately apply to occupation and use of the area until at least 1880. Scattered and usually isolated ranches were established throughout the Fort Carson area in the early 1870s, but most of the southern and eastern portions of the area were hinterland ranges for ranches headquartered along Fountain, Beaver, Red and lower Turkey Creeks. Virtually all of the territory remained unfenced range, and therefore used as common range by the ranchers (Zier et al. 1997).

Just outside the boundaries of Fort Carson, J.L. White and H.S. Clark secured CE patents in 1868. C.B. Wells (1867), P.D. Miller (1868), and J.W. Love (1869) held land patents located within the first terrace of the Fountain Creek flood plain (Schweigert 1997). By 1872, ranches were located along the length of Turkey Creek (Bullen 1939; *Canon City Daily Record* 5/8/1962; Whittemore 1967). In the 1870s, sheep were a dominant livestock in the area. One of the earliest and most successful sheep ranchers within the Fort Carson area was David Degraff who settled near Fountain Creek in 1871. Reported to have run about 6,000 sheep at one time, Degraff switched to raising shorthorn cattle in 1887. The Skinner and Tabor Ranch started a sheep operation in 1878, with its headquarters at the Skinner railroad siding just northeast of Fort Carson (Osgood 1970; Zier et al. 1997). W.A. Cuthell operated a large sheep ranch in 1878 near Cheyenne Valley, located in the original Fort Carson cantonment area. W.D. Corley purchased the ranch and operated as a Hereford cattle ranch until purchased by the Army (Alexander et al. 1982; Zier et al. 1997).

The Charter Oak Ranch/Brown Ranch operated in the general vicinity of the present Fort Carson Rod and Gun Club. Charter Oak ranch was founded prior to 1886 with the original name of Brown Ranch (Alexander et al. 1982). C.S. Haynes, owner of the Haynes Cattle Company, changed the name to Charter Oak. Haynes filed a land entry in Sec. 10, T16S/R66W in 1885, later canceled. The Mary Helen Ranch, named by owner Charles Carson in the 1930s, was from part of the Old Charter Oak property (Alexander et al. 1982). Latter the Engle Land and Cattle Company owned the ranch. Both ranches produced Hereford Cattle (Whittemore 1967; Zier et al. 1997).

In 1866, Charles Goodnight and Oliver Loving established the Goodnight-Loving Trail, to bring cheap Texas beef to the mining camps of the Front Range. The trail extended from the Pecos River in Texas to Trinidad, Pueblo, Colorado City, and Denver. Goodnight and Loving brought 2,000 Texas longhorns into Colorado in 1867, and started a ranch on Apishapa Creek. Colorado’s cattle industry was growing, with an estimated 147,000 cattle in 1867. As early as 1868, El Paso County stockgrowers held meetings to discuss concerns that Texas cattle traveling through the region could transport tick fever and other diseases that would endanger Colorado herds, and possibly affect the efforts of selective breeding to improve range stock (Stout 2002; Zier et al. 1997). Petitions passed against the importation of Texas cattle, and armed men soon turned back Texas herds entering the Colorado Range, causing the search for ranges and slaughterhouses further north that welcomed Texas longhorns (Osgood 1970; Stout 2002; Zier et al. 1997).

The route of trail drives probably changed somewhat depending upon the time of year and condition of the grass and streams. Some Texas herds possibly trailed through Fountain Creek on a trail reportedly used in the 1870s and 1880s until fencing and railroad construction made the overland cattle drive unprofitable and unnecessary. After the Union Pacific Railroad was built through Wyoming in 1868-1869 a vast opportunity for ranching opened up on the Central and Northern Plains, and primary cattle drives moved eastward away from the Fort Carson area (Zier et al. 1997).

Attack by Indians was not the only violence settlers and ranchers faced in eking out a living on the frontier. The Arkansas Valley Claim Club was organized by ranchers in 1860 “to protect life and property”, and to arbitrate range rights. In April 1863, a band of horse rustlers disturbing the peace in the southeastern section of the newly formed Colorado territory, were stopped by a shoot-out near an outcrop called “Crows Roost” on Squirrel Creek, east of Fort Carson. That same year, the Espinosa brothers, Vivian and Filipe, committed a series of robberies and murders in a rampage leading from Hardscrabble Creek to South Park, then southward to the Fort Garland area. Near upper Beaver Creek, the brothers killed Henry Harkings on March 19, 1863. Harkings was buried in Deadman Canyon, outside the present northwest boundary of Fort Carson (Little 1996; Whittaker 1917; Whittemore 1976; Zier et al. 1997).

In the spring of 1876 most of the cattlemen on Turkey Creek, Red Creek, and Little Fountain Creek formed the Turkey Creek Stock Association in order to handle their stock more effectively and economically. The constitution of the Association required ranchers to contribute one herder for each six hundred head of cattle on the range and to pay assessments for the cost of roundup proportional to the number of cattle. During the first summer, the Association herders spent about five months on a roundup that apparently extended from the Arkansas River northward to the Arkansas-South Platte divide. The *Pueblo Chieftain* (November 7, 1877) reported completion of the annual roundup. The principal beef sellers were J.W. Booth, Mrs. A.D. Hamlin, John Palmer, Rich Toof (whose home ranch was near the mouth of Beaver Creek), Ed Van Erder, Frank Price, Mr. Barnardsdale, Mr. Redman, and Jeff and Mass Steel. By 1878, the Turkey Creek Stock Association had 35 members whom cumulatively owned about 8,000 head of cattle. The roundup of that year consisted of fourteen herders under the direction of ranch foreman, John Palmer. Organized at the Steel Ranch on Fountain Creek the roundup took place on May 18 (*Pueblo Chieftain* 4/8/1877, 5/5/1878, 5/14/1878; Zier et al. 1997).

In the fall of 1877, field cattle buyers began to visit the ranches of the study region to buy stock directly from the ranchers. Individual ranchers responded by rounding up their market-ready steers. The *Pueblo Chieftain* (11/25/1877) reported that several ranchers were having a tough time extracting their stock from Wild Mountain, a densely wooded mountain between Beaver Creek and Red Creek. The newspaper reported in the same article that J.W. Booth, John Allen, Charles Hobson, and the Myers brothers sold steers to one of the buyers (Zier et al. 1997).

With the arrival of railroad service, ranchers shipped most of their stock by rail from Colorado Springs, Fountain, or Pueblo. However, the high cost of shipping led several members of the association to drive herds of cattle overland to Kansas City. The last trail drive from the Fort Carson area probably occurred in the early 1880s (Osgood 1970; Stout 2002; Zier et al. 1997).

Stagecoach lines were one of the first modes of transportation to provide passenger and mail service to supply stations and gold camps. The Leavenworth and Pike's Peak Express Company, already operating under a federal contract to deliver supplies to army units in Utah Territory, provided daily passenger service between Kansas and the Cherry Creek settlements for a fare per person of $100 to $125 one way. In 1860, after reorganization, the name changed to the Central Overland, California and Pike's Peak Express Company (COC&PP), and besides running passenger service, the COC&PP also ran the Pony Express across western America until 1861. Ben Holladay's Overland Mail and Express Company took over the COC&PP in 1861, and the Wells, Fargo & Company took over the line five years later. Stagecoach and mail service between Denver and Santa Fe in the 1860s was irregular. The line apparently ran "…from Denver…through Russellville, Jimmy's Camp, the Fountaine and Jenk's Ranch; then" left "over the hill to the Arkansas near the mouth of the Huerfano…"(Burnett and Burnett 1965; Zier et al. 1997).

Several stage stations were located near the eastern boundary of Fort Carson. The Widefield Stage Station was about two miles south of the present junction of Colorado Highway 83 and U.S. 85. The Fountain Stage Station was on the southern edge of the present city limits of Fountain, on the north bank of Jimmy Camp Creek. The Little Buttes Stage Station was in Section 33, T16S/R65W, at a ranch operated by Mr. Lincoln and Mathias Lock. A “Map of the Colorado Territory Embracing the Central Gold Region” (1886) shows a community/stage station (?) of El Paso, perhaps three miles north of the Pueblo-El Paso County boundary. The map locates Wood Valley about four miles south of the boundary. Piñon possibly had a stage station on the west bank of Fountain Creek in Section 31, T18S/R65W, and east of the southeast corner of Fort Carson (Bullen 1939; Ebert 1866; Long 1947; Township Map of El Paso County 1913; Whittemore 1967; Zier et al.1997).

Congress appropriated $1 million to subsidize daily transcontinental mail service, either by main line or extension routes in 1861. Denver was interested in establishing a direct east-west route, but after investigation development of a pass over the mountains proved too difficult to maneuver. Daily service to the gold camps came by way of a tri-weekly branch from Julesburg, off the Oregon Trail (Ubbelohde et al. 2001). Weibling received a mail contract in 1862 to provide regular mail service from Denver to Pueblo. Jacobs took over the mail contract and extended the service to Trinidad. The Barlow, Sanderson and Company established a stage line in 1861 from Independence, Missouri to Santa Fe, and took over the Jacobs’ line, known as the Denver & Santa Fe Stage Line in 1869. A branch telegraph line extended from Julesburg to Denver in 1863. By 1868, the telegraph line ran from Denver to Santa Fe by way of Colorado City, Pueblo, and Trinidad (Burnett and Burnett 1965; Clausen 1963; Hafen 1948; Ubbelohde et al. 2001, Zier et al. 1997). Colorado Territory would not gain transportation service by rail until 1870.

In the 1870s, sporadic new gold and silver strikes were discovered in the mountains west of the region nearest the Fort Carson area. The Union Pacific Railroad completed its mainline through Cheyenne, Wyoming in 1868, and the transcontinental link by 1869. When Coloradans learned the Union Pacific would not be extending a line to Denver, citizens with financial backing built the Denver Pacific Railroad in 1870, with a line extending from Denver to Cheyenne, where it connected with the transcontinental line of the Union Pacific. The Kansas Pacific Railroad completed its line from St. Louis to Denver that same year. As these two railroad lines reached completion, W.A.H. Loveland began building the Colorado Central Railroad, which extended out of Denver to Golden and on to the mines on Clear Creek. By 1871, the Denver and Rio Grande Railroad (DRG), directed by General William Palmer, began building a line southward, reaching Colorado Springs on October 21, 1871. The DRG extended its line south, east of Fountain Creek reaching Pueblo on June 15, 1872, eliminating the stage line along that route. The Canon City Railroad, a line financed by the DRG to gain access to the coal fields, extended up the Arkansas River to Coal Creek, several miles east of Canon City.

The growing industry at Cañon City, the failure of railroads to reach Cañon City until 1877, and the settlement along Beaver Creek resulted in a demand for overland passenger and freight service between Colorado Springs and Cañon City. When the railroad did not provide service to Canon City in the early 1870s, Bob Spotswood and William McClelland constructed a wagon road in

1873 from Beaver Creek northward to Colorado Springs, over much of the route later known as Lytle Road. The Granite-Colorado City Stage began carrying passengers and freight over the road. One source reported that at least one hundred people used this route per day. The exact route of the stageline/wagon road is not known, but it probably conformed in large measure to a road or trail shown on an 1862 map of Colorado territory (Campbell 1972:59; Case 1862; Zier et al. 1997). As in many other cases, the stage service was probably preceded for some time by mounted mail service on the route. Two sub-post offices were set up along the route. Sun View, the home of Bob Womack on the Little Fountain served as one sub-post office, and the other at the John Lytle homestead on Turkey Creek. Thus the area took on another title of recognition as "the Lytle" area (*Cañon City Daily Record* 5/8/1962; Zier et al. 1997).

Other archival sources identify two stage stations farther to the southwest on Beaver Creek. The little community of Hatten, also called Upper Beaver Creek, was served at an unknown date and for an unknown period. Hatten area settlers grew vegetables and fruit for the mining camps and began providing cheaper imported foodstuffs. Farther south, near the confluence of Red Creek and Beaver Creek, the community of Glendale was established about 1873 as a station on the stage line. John McClure, a merchant in Cañon City, built a large hotel "of pale stone from near-by quarries" on the east bank of Beaver Creek, above the junction with Red Creek, called the McClure House. Large barns and corrals that held a thousand mules and horses for exchange teams were located below the hotel where the road forded the creek. During the years when mining along the Upper Arkansas brought an enormous amount of traffic through the area, D. S. Coffman, then proprietor of the hotel served more than a hundred passengers a day. In addition, "the spacious, well-furnished rooms made it a popular spot for local weddings, dances, and occasional gospel meetings. It was frequented by Indians and Cowhands as well as more cultured ladies" (Fremont County historian Rosemae Campbell 1972). Campbell may have exaggerated the importance and the business of the stage stop to a considerable extent.

Glendale remained a bustling stage station and settlement center until railroads reached Leadville and removed both the need for transportation to the Upper Arkansas from Colorado Springs and some of the market for agricultural products grown around Glendale. The stagecoach was discontinued in the late 1870s; archival sources give the date of demise of the community as 1896 and 1909 (Alexander et al. 1982). A flood on June 5, 1921 destroyed everything at Glendale except the stone hotel (Campbell 1972). Glendale was apparently located in Section 35, T18S/R68W, about a half-mile to the west of the Fort Carson Military Reservation. Hatten was well outside the reservation boundary (Zier et al. 1997).

In 1876, the Atchison, Topeka, and Santa Fe Railroad (ATSF) completed a line up the Arkansas River to Pueblo eliminating the need for the Southern Overland Stage. In response to the ATSF, the Denver and Rio Grande Western Railroad (D&RGW) extended its track from Pueblo south to the Purgatoire River. By 1878, the two companies were in competition for access to Raton Pass. "Uncle Dick" Wooten disliked the D&RGW, which worked favorably for the ATSF to received access in 1878 to Raton Pass via Wooten's former toll route. The ATSF reached Trinidad on September 1, 1878. The Pueblo and Arkansas Valley Railroad, a subsidiary of ATSF, built a track between Granada and Pueblo in 1877, and continued construction to Cañon City and the Royal Gorge, and the 1873 the Granite-Colorado City Stage route was abandoned shortly thereafter (Stout 2002; Zier et al. 1997). Additional rail access to the Fort Carson area was established when the Denver and New Orleans Railroad (know later as the Denver, Texas and Fort Worth Railroad, a subsidiary of the Chicago, Burlington, and Quincy) built a line from Denver to Trinidad in 1881. The Missouri Pacific reached Pueblo from the east in 1887. That same year the ATSF built a line from Pueblo to Denver by way of Colorado Springs. The last major rail link to the region occurred in 1888 when the Chicago, Rock Island, and Pacific Railroad reached Colorado Springs via Limon (Ormes 1976; Sprague 1980; Zier et al. 1997).

During the late nineteenth century Euroamerican interests came to control and dominate southeast Colorado. Several factors contributed to the intensive settlement of the plains in the area by the early twentieth century, including the passage of the Enlarged Homestead Act of 1909 and the Stock Raising Act of 1916. Methods of dryland farming also improved, and new wheat strains better adapted to arid environments were introduced. World War I was a major factor in the spread of dryland agriculture in the region, as the United States became an important exporter of wheat and corn to Europe. This period resulted in significant changes for southeastern Colorado, rivaling the gold rush era in terms of demographic effects (Carrillo 1990; Stout 2002).

Rail connections, coal, oil, and available water greatly influenced the growth of Pueblo and Florence. The discovery of oil, sometime in 1859 or 1860, became the lifeblood of Florence and Canon City where several small extraction and refining enterprises operated. Florence Well Field, established in 1881 with the development of the first deep well, holds the distinction as the second oldest oil field in the United States. In 1885, Florence opened a refinery with the capacity to refine 100 barrels daily, and other refineries were built. The Florence Well Field reached a peak in crude oil production in 1892, with 824,000 barrels extracted. By1892 there were 75 producing wells, but gradually production declined and new exploration was halted by 1923 (Little and McFall 1972; *Pueblo Star-Journal and Sunday Chieftain*, 8/31/1975; Riches 1978; Scamehorn 1978; Zier et al. 1997).

Major ore milling and smelting industries developed in Pueblo and Florence. Pueblo built the first smelting industry in 1878 and was devoted to extracting gold and silver. Large deposits of iron ore discovered at Orient and Calument in 1880-1881, and ore hauled from many sources in Colorado, resulted in the founding of the Colorado Coal and Iron Company in Pueblo. Six smelting furnaces, each with the capacity of 40 tons were operating by 1881. Meyer Gugenheim and his sons built the Philadelphia Smelter in Pueblo in 1888, one of the smelting bases that would contribute to the eventual world domination of the smelting industry by the Gugenheims (Bullen 1939; *Pueblo Star-Journal and Sunday Chieftain*, 4/5/1959; Zier et al. 1997). Three railroads built from the plains into the mountains included lines from Colorado Springs to Florence. The Florence and Cripple Creek Railroad built in 1894 brought low-grade ores directly to the reduction mills, causing Florence to develop into a milling and smelting center in its own right. When in 1901 the Colorado Springs and Cripple Creek District Railroad, the “short line”, reached the mines, Florence gradually declined as a reduction center. The last mill closed in 1910 (Scamehorn 1978; Zier et al. 1997).

The railroad stimulated the growth in the Pike’s Peak Region and in areas on the Front Range. The mining industry in the 1870s also significantly affected the area surrounding Fort Carson, resulting in the establishment of several towns and rural railroad stations. Colorado Springs, originally Fountain Colony, established by General William Jackson Palmer in 1871 near the nearly abandoned town of Colorado City, was located on the new Denver and Rio Grande Western route from Denver to Pueblo. By 1879, the population of Colorado Springs had grown to about 5,000 people, and included members of Fountain Colony, a Quaker agricultural colony within the environs of the township (Lavender 1968). Recreation and tourism greatly influenced the early development of Colorado Springs, however the 1890 gold strikes in Cripple Creek expanded economic and societal development as it became an important ore-smelting center (Zier et al. 1997).

When the Denver and Rio Grande Railroad built its mainline south of Colorado Springs through the mouth of Jimmy Camp Creek in 1872, the town/siding of Fountain was probably established. Various sources seem to confuse the Fountain community with Fountain City, a precursor to Pueblo established in 1859, and Fountain Colony at Colorado Springs. Early settlement around Fountain relied on irrigation, and the community became a farming and stock shipping center. In 1888, the town had a population of around 200 persons, but in that year a runaway train struck rail cars filled with naphtha and blasting powder in the Fountain switchyard destroying most of the town. The town was rebuilt and remains a small farming center (Fountain, Colorado Historical Survey Report n.d.). Other towns established along the railroad included Kelker, Wideland, and Wigwam (Carrillo 1990; Stout 2002; Zier et al. 1997).

Robert Womack's famous gold strike in 1890 resulted in a second Pikes Peak gold rush. By 1900, more than 450 mines developed yielding an estimated $125,000,000 in gold extracted. The Cripple Creek Mining District is listed on the National Register (Scamehorn 1978; Zier et al. 1997). Gold strikes at Cripple Creek encouraged prospectors to examine streams of the Fort Carson area. During the 1890s, local farmers and ranchers joined prospectors mining for gold in Beaver Creek. Placer workings on Red Creek and Turkey Creek were extensive enough to encourage William A. Williamson to plat the town of Red Creek, near the head of Red Creek in 1893. The first day of the sale, June 22, 1893, fifteen lots sold, with arrangements to construct a two-story hotel made a week later. Settlement at Red Creek, directly west of the present Camp Red Devil, appears to have been temporary at best. Several claims established between 1916 and 1919 were located about a mile from Turkey Creek, west of Fort Carson. Occasional prospecting on Turkey Creek may have continued until Fort Carson was established (Stout 2002; Zier et al. 1997).

Beginning in the late 1860s, as manufacturing, commercial and governmental structures established in developing towns, so did the desire for substantial buildings to house these enterprises. Stone and brick, to face prominent buildings, came into demand (Carrillo et al. 1991; Van Hook 1933; Zier et al. 1997). In the early 1870s, the Denver and Rio Grande Railroad extended a line from Pueblo to the mountains, offering a way to ship stone from quarries established between Pueblo and Beaver Creek to Denver. Pueblo developed into an ore-smelting center in the late 1870s, leading to the successful development of the iron and the steel industry. By 1874, Denver and Pueblo were vying for the distinction of being the state capital, with Denver winning the title in 1881. In 1881, the firm of Mather and Geist built eight new calcine furnaces and four new blast furnaces in Pueblo. The Standard Fire and Brick Company of Pueblo organized in 1890, and by 1901 occupied a 21-acre track of land west of Fountain Creek. The plant employed 650 workers, and in a 24-hour day production capabilities numbered nearly one-quarter of a million bricks, consisting of 75,000 firebricks, 75,000 paving bricks, and 50,000 pressed bricks. By the turn of the century, Pueblo was reducing ore from areas outside Colorado, to include Arizona, New Mexico, Mexico, Montana, and Utah and shipping products to St. Louis, Chicago, and Pittsburg. The steel industry employed 3,000 workers, and produced steel for markets ranging from California to Missouri (Van Hook 1933; Carrillo et al. 1991).

Large-scale, sustained quarrying and other extraction developed in 1898 when the Colorado Portland Cement Company began mining and manufacturing cement, 23 miles west of Pueblo on the Arkansas River. The towns of Portland and Cement developed. By 1908, the Colorado Portland Cement Company joined operations with an affiliated firm, the Portland Company. After 1910, the Ideal Cement Company built a ten-million-dollar cement plant at Portland. From 1915 to 1927, the Ideal Cement Company ran a small railroad from Portland about twenty miles northeastward to a limestone quarry on Beaver Creek (Campbell 1972; Ormes 1976; Zier et al. 1997).

In the early 1900s, Robert K. Potter, owner of a lumber business in Cripple Creek in the 1890s, became interested in quarrying building stone deposits in the Turkey Creek region of Booth Gulch. His ranch was located just south of the area that developed into the small stone quarrying and clay mining town of Stone City (1912) eventually purchased by Fort Carson in the 1960s. Porter established quarries in Booth Gulch in 1908. Clay mining had already begun in Booth Gulch in 1906, when J. Wands, owner of the Pueblo Clay Products Company, developed three clay mines to extract exposed Red Creek anticline clay deposits. Nevertheless, Potter was instrumental in establishing a railroad line into the area. Prior to the development of the rail line, wagons hauled stone to Pueblo.

Development of stone and clay industries at Booth Gulch remained limited by distance and difficulty of transporting materials to Pueblo. In 1908, the Kansas-Colorado Railway planned to build an electric railway line from Cañon City to Dodge City, Kansas, with a 25-mile extension from northwest Pueblo to the Turkey Creek region. R. K. Potter, owner of the Turkey Creek Stone Company, and a principle supporter of the plan, held groundbreaking ceremonies on his Turkey Creek Ranch on July 31, 1908 (*Pueblo Chieftain*, July 31, 1908). Management problems and financial setbacks prevented construction of the line, until the company reorganized in 1910, and constructed 21 miles of railroad grade from Pueblo to Booth Gulch. An ambitious plan was to extend the railroad a few miles east of Turkey Creek following Lytle Road to the north, eventually ending in Cripple Creek. Only limited grading had begun on this segment and discontinued in favor of a route that afforded better grades and a more adequate water supply for the locomotives (McKenzie 1972; Ormes 1975; Zier et al. 1987). Additional financial difficulties sent the railroad into receivership until reorganization in April 1911 as the Colorado Kansas Railway. Construction of the Pueblo/Booth Gulch railroad resumed with 14.8 miles of rail completed by the end of the year. By late May/early June 1912, with the addition of eight miles of rail following the west bank of Turkey Creek, the goal to provide rail service to the Booth Gulch quarries had been reached (Carrillo et al. 1991; McKenzie 1972; Ormes 1975; Wilkins 1974; Zier et al. 1987). The Booth Gulch line was 22.2 miles long and had 1.8 miles of sidings. An estimated five hundred Pueblo residents boarded inaugural excursion trains on June 12, 1912, to travel to the mining area (Carrillo et al. 1991; McKenzie 1972; Ormes 1976:17; *Pueblo Chieftain* 6/13/1912).

Several large quarries opened after the railroad reached the area. A quarry about three miles from the nominal rail terminus at Stone City produced a fine white sandstone which was used to build the massive Pueblo County courthouse in 1918 (McKenzie 1972; see also Carrillo 1991: Figures 14, 15). Adjacent to the quarry was a large stone working yard with a railroad track running through it. A large overhead crane was used to move blocks of stone to a finishing plant and then to flatbed railroad cars for shipment (Carrillo et al. 1991: Figures 16, 17). McKenzie's description, confirmed by archaeological survey, indicates that this quarry complex was to the southeast of Stone City, and portions of a spur rail grade are visible, which served various quarries in that area (Carrillo et al. 1991). Builders began switching to reinforced concrete as a major building material after World War I, to the detriment of the natural stone industry. The Turkey Creek Stone, Clay & Gypsum Company ceased quarrying sandstone at its large pit in 1930, but the company maintained an office in Stone City and probably continued to mine other products through 1934 (Carrillo et al. 1991; *Colorado State Business Directory* 1922-1935; McKenzie 1972).

The Colorado Kansas Railway consistently operated at a loss; in 1930, it went into receivership. The line sold under foreclosure in 1932 and a corporation called the Colorado Railroad purchased it in 1938. Throughout its existence, the line operated with second-hand equipment; in 1917, the rolling stock consisted of one 30-year-old locomotive, one passenger car, ten flatcars, and one service car (Carrillo et al. 1991: Figure 9). When the original locomotive was no longer operable in 1938, a locomotive leased from the Denver and Rio Grande Western Railroad replaced it. The leased locomotive proved too heavy for the deteriorated condition of the grade and track, and in 1940, replaced with a gasoline-electric locomotive (Carrillo et al. 1991: Figure 10). The line continued to operate, usually at a loss, until 1957 when a flash flood washed out several bridges on the line. The management of the Colorado Railroad then determined that the haulage potential of the line was not sufficient to justify repair of the bridges and grade, and the tracks removed in 1958 (Carrillo et al. 1991; McKenzie 1972; Wilkins 1974:265).

Clay mining proved to be a much more durable industry at Booth Gulch than was quarrying of building stone. The primary means of mining clay was driving drift tunnels into the slopes and excavating the clay seams found between solid sandstone and limestone roofs and floors. In later years, the mining of clay evolved in Stone City with the quarrying of limestone and sandstone as seams of clay were exposed. Accounts of pre-1912 mining are lacking, but it is likely wagons carried the clay to Pueblo for processing and firing. The *Pueblo Chieftain* reported in June 1912 that a large brick plant would be installed to kiln the eight kinds of clay being mined. This brick plant was probably built; a brick manufacturer, J. E. McCusker, was listed as a resident of the town in 1913 and 1914. However, a brickyard also was operated in Pueblo in association with the Booth Gulch mines, and no archaeological evidence of a brick plant at Stone City has been found. The Booth Gulch clay deposits were first mined by Wands' Colorado Clay Company and the Turkey Creek Stone, Clay & Gypsum Company. Other companies that also mined these deposits in were the Pueblo Quarries Incorporated, the Standard Fire Brick Company, and the Diamond Fire Brick Company (*Colorado State Business Directory* 1913, 1914; Carrillo et al. 1991; McKenzie 1972; *Pueblo Chieftain* 6/3/1912; Vanderbilt 1947).

Archival sources do not indicate that clay mining was done anywhere other than at Stone City. A number of materials mined in Stone City were gannister (a pure form of silica), limestone, flint fire clay, sandstone, plastic clay, calcite, roof tile clay, vitrifying clay, gypsum, glass sand, and gypsite (McKenzie 1972). Calcine kilns, which heated raw materials to make them friable and pure of unwanted organic material, operated at Stone City at least from 1924 to 1930, with H.R. Colby serving as superintendent. Pueblo Clay Products Company built and operated the calcine kilns, and possibly promoted Colby to general manager of the firm's Stone City complex. In 1930 or 1931, Colby became manager of the Pueblo Clay Products Company, presumably in Pueblo, and thereafter the manager of the calcine kilns no longer appears in the business directories (Carrillo et al. 1991; *Colorado State Business Directory* 1924-1931). Very limited, part-year mining of clay in the area, by the Colorado Clay Company, continues to the present day. Clay is now hauled by truck (Carrillo et al. 1991; McKenzie 1972; Wilkins 1974).

Mining is represented at Fort Carson by one recorded site, Stone City (5PE793), located within and at the extreme southern end of the reservation in the vicinity of lower Booth Gulch and the southernmost reaches of Booth Mountain. The site was heavily impacted by intentional demolition by the Army and impacted further during training exercises. In 1988 and 1989 the site of Stone City and associated industrial complex was extensively documented using a combination of aerial photography and photogrammetric mapping, surface inventory and recording, and archival research (Carrillo et al. 1991). In addition to Stone City, the study area encompassed two previously recorded sites (5PE319 and 5PE230) and one newly recorded site (5PE1126). Ultimately, 123 features were recorded and include quarries and related features, mines and related features, railroad grade and associated features, residences, and miscellaneous features. Two of the features, a calcine kiln and culvert, were assessed as NRHP-eligible. Feature 1 at site 5PE319 is a largely intact calcine kiln that dates to the earlier years of quarrying in the Stone City area. Feature 19 at site 5PE793 is one of nine culverts associated with the Colorado-Kansas Railroad bed or related rail spurs. Spanning an ephemeral drainage above Stone City proper, it exhibits a vaulted configuration and is constructed of mortared sandstone blocks.

The vitality of the small community of Stone City was entirely tied to the fortunes of the nearby mines. The Turkey Creek Stone, Clay & Gypsum Company (Figure 5) filed the official plat of Stone City on December 24, 1912. The town was located in the W1/2 of the E1/2 of the SW1/4, Section 26, T18S/R67W. It consisted of five blocks of 34 lots each and one block containing 17 lots; each lot was 25 by 120 feet. The original plat indicated that portions of four blocks would be included in the right-of-way of the Colorado-Kansas Railway. Four of the five avenues and one of the two streets on the plat were named after officials of the Turkey Creek Stone, Clay & Gypsum Company: McCorkle, Potter, Crews, Harvey, and Candow. West Street and Hillside Avenue were geographical truths. An addition to the plat, of unknown date, indicates a "Water Main" extending along the east edge of the north half of the town and ending in a "City Water Supply."

As may be expected, the commercial focus of the town was the railroad depot, which was a small wood frame structure with a gabled roof and a simple board platform facing the tracks to the north. The depot also housed the general merchandise store operated by J. W. Heath from 1912 to 1915. The depot building eventually moved to Penrose presently stands at the corner of Broadway and Grand (Carrillo et al. 1991: Figures 12, 13). C. M. Jasper and Mrs. E. V. Jasper operated a general merchandise store from 1916 to 1921, followed by Roscoe E. Sutton in 1923, J. O. Southwell in 1924, and L. B. Keigley from 1925 to 1937. By 1939, Clyde Wands sold groceries in association with his auto service station. In 1950, James W. Mayfield operated the Stone City Grocery. The locations of the grocery/general stores are not known; the store may have remained in the depot for sometime after 1915 (Carrillo et al. 1991).

The post office, established at Stone City in 1912, was usually associated with the grocery or general stores. In 1920 through 1921, Mrs. William Candow ran a large hotel, built in 1920, followed by Dumbeck & Dodge in 1922. After 1922, the hotel listing disappears from the business directories. One source indicated the building was dismantled and the stone was used in construction of a building in Pueblo (Staton 1959). For varying lengths of time, the town also had resident blacksmiths, an automobile stage to Pueblo, a chiropractor, a constable and justice of the peace, and two ranch owners. A resident principal served a combined grade and high school at least as early as 1922. The school building burned in December of 1939 and was replaced with a two-room school built as a Works Progress Administration project in the summer of 1940 (Carrillo et al. 1991; *Pueblo Chieftain* 4/4/1940, 4/25/1940).

The population of Stone City appears to have been rather static; an estimated 100 persons lived there in 1912, 100 in 1914, 150 in 1917, 175 in 1929, 125 in 1935, and 100 in 1950 (*Colorado State Business Directory*; *Pueblo Chieftain* 6/13/1912). The post office was closed on June 30, 1957, serving only seven families with mailboxes at Stone City, and some boxes serving ranch families who did not live in the town (*Pueblo Star-Journal* and *Sunday Chieftain* 6/12/1957). Photographs taken at an unknown date show small one-and-a-half story wood frame cottages surrounded by lawns and trees. Some persons may have continued to live in Stone City until the U. S. Army purchased the area in 1965 when the Fort Carson Military Reservation expanded. The Army subsequently bulldozed the Stone City structures and only the trees, foundation remnants of structures, and widely scattered refuse are now visible (Carrillo et al. 1991; Zier et al. 1997).

Other smaller stone quarries and clay mines are known to exist inside the Fort Carson Military Reservation. Records of mineral entries on public lands indicate that several claims were filed in the period 1915-1919 in areas removed from stream courses, which probably means the claims were filed to reserve mining rights to stone or clay. The historical and engineering significance of the small mines and prospects is probably much less than that of the Stone City complex (Zier et al. 1997).

Unlike other areas of the Plains, the Fort Carson area did not have distinct homestead settlement periods. Sizable ranches prior to the 1940s involved a combination of purchasing land claims and filing claims on available land. Generally, later homesteaders, often limited to marginal land, characteristically claimed land under laws requiring a period of residence and improvement. Between 1865 and 1965, 1,735 land entries were filed in the immediate Fort Carson area. The number of entries rose dramatically from the 1860s to the end of the 1880s. After a quieter decade of the 1890s, land entries jumped to a peak during 1900-1909. Homesteading remained strong in the 1910s and 1920s, with a large drop off in the 1930s (Stout 2002; Zier et al. 1997).

Sixty percent of all land entries occurred between 1900 and 1929. This corresponds with the prime homestead period on the Plains when the government encouraged the establishment of family farms and dryland agriculture. Laws that encouraged dryland farming and the system's inappropriateness are demonstrated in the number of failing land entries. Of land claims filed in the 1870s, only 11 percent failed. Thereafter percentages rose with 15 percent in the 1880s, 25 percent in the 1890s, 42 percent in the 1900s, 68 percent in the 1910s, 40 percent in the 1920s, and 91 percent in the 1930s (Stout 2002; Zier et al. 1997).

The period 1900 to 1920 was the prime homestead period for the dryland areas of the High Plains, and therefore a high number of land entries for the Fort Carson area are not surprising. The high volume of land entries in the 1920s, when climate and the economy of the region made any agricultural existence difficult, may be attributable to inertia from the preceding decades and/or attempts by previous claimants to obtain sufficient land to make a living. Despite the facts that the land was open for settlement in the 1860s and railroads penetrated the area in the 1870s, 60% of all land entries in the area were made between 1900 and 1929 (Zier et al. 1997).

The inappropriateness of dryland farming and the laws, which encourage it, are demonstrated in the ratios of the number of land entries to the number of entries that failed to reach patent. Of land claims filed in the decade of the 1880s, 27% (3 of 11) failed to reach patent because the claims were canceled or relinquished. The number is not statistically reliable because of the small universe and because the actions of a single settler could determine the entire ratio. During the 1870s only 11% of land claims failed. Thereafter the ration of failures rose steadily: 15% in the 1880s, 24% in the 1890s, 42% in the 1900s, 68% in the 1910s, a mere 40% in the 1920s, and 91% in the 1930s (Zier et al. 1997).

Availability of water was a key factor in success of settlement. The first known irrigation system in the area was in place in 1863. A General Land Office survey plat (1863) shows "Murray, Cooper, Miller and Stubbs Ditch" east of Fountain Creek in T15S/R66W. About the same date Lincoln and Lock filed water right claims and began irrigating hay meadows near Fountain, and several settlers began irrigating fields on Beaver Creek near what later became Glendale (Little 1966; Whittemore 1967). A number of applications were made for rights-of-way for irrigation ditches and reservoirs within the Fort Carson area in the period 1865 to 1965 (Centennial Archaeology, Inc. 1997). Only one filing for a ditch appears in the Federal land records; it was entered in 1911 and relinquished in 1924. The ditch was planned to run through 23 legal sections in townships T17S/R66W, T18S/R66W, T18S/R67W, T18S/R68W, and T?S/R67W. Considering the long period the rights were in force, this ditch undoubtedly served a number of settlers. One other ditch was filed with Pueblo County officials, rather than with the General Land Office. Oscar P. Harpel filed a plat for the Harpel Turkey Creek Ditch on December 26, 1895. Other small ditches may also have been filed with county officials (Zier et al. 1997).

Harpel filed rights to a reservoir location in Section 19, T18S/R66W in 1903, but this entry was canceled in 1910. Applications were also filed for reservoir sites in Section 3, T17S/R66W in 1906; Section 34, T17S/R66W in 1913 (proof of construction filed 1923); and Sections 29 and 32, T18S/R67W in 1909 (relinquished 1929). The largest reservoir project was the construction of a dam on Turkey Creek, which resulted in the present Teller Reservoir in Section 30 and 31, T18S/R66W. The General Land Office reserved the general site as a potential reservoir area in 1891, and in 1894 R. K. Potter and Red Rock Reservoir, Inc. filed an application for rights to build a reservoir in Sections 19, 20, 29, 30, and 31 of this township. That claim was canceled in 1915 (Zier et al. 1997).

In the meantime, much of the land came to private patent, which would not necessarily negate the rights of other persons to build and maintain a reservoir there. R. K. Potter and associated companies obtained special warranty deeds and other deeds for some of the property beginning in 1910. The progression of companies interested in the project appears to have been Turkey

Creek Reservoir Company (1910), Turkey Creek Irrigation Company (1914), Meadow Investment Company (1921), Pueblo Meadow Land Company (1923), and Red Rock Reservoir, Inc. (1923). In 1924 Frederick J. Muench of Stone City filed a plat with the Pueblo County Clerk for the Hood Rock Reservoir in Section 30, T18S/R66W. Muench's plan included two dams, one 90 feet high and one 20 feet high on Turkey Creek, and a diversion ditch below the second and lower dam. The development would also be known as the Turkey Creek Dam (Pueblo County Clerk and Recorder, Plat of Hood Rock Reservoir). Muench's project appears to have been slightly south of the Red Rock Reservoir project. The present dam was apparently built shortly thereafter (Zier et al. 1997).

The ribbon of settlement on Beaver Creek began to expand onto the mesa to the west about 1900. In 1907 Florence merchant J. Q. MacDonald convinced Spencer Penrose and other Colorado Springs investors to develop large-scale fruit growing businesses on the mesa. The Beaver Creek Land and Irrigation Company bought out settlers on Beaver Creek to obtain water rights, and they build an extensive series of irrigation ditches to the west of Beaver Creek. The company platted Beaver Park agricultural subdivision on November 1, 1907, and in June of 1908 the Fremont Townsite Company superimposed the townsite of Penrose over parts of Beaver Park. To provide access and transportation to the 18,000-acre development, Penrose and other investors built the Beaver, Penrose and Northern Railroad in 1909. The line ran from Penrose Townsite to Beaver Station on the Denver and Rio Grande Railroad at the mouth of the Beaver Creek. The Beaver, Penrose and Northern ran only until 1919; in its last years it operated with a Cadillac flange-wheeled auto car as its locomotive power (Campbell 1972; *Cañon City Daily Record* 5/8/1962; Zier et al. 1997).

The introduction of refrigerated railroad cars after World War I caused a decline in the demand for Beaver Creek fruits. Heavy rains in the spring of 1921 caused the Shaeffer Dam on Beaver Creek to collapse; a wall of water sped down Beaver Creek and eventually down the Arkansas River to devastate the valley and a large area of Pueblo. The Shaeffer Dam was a chief source of irrigation water for Beaver Park, and in the following years the farmers turned to other kinds of produce. The Shaeffer Dam was rebuilt and other reservoirs were constructed, but the drought and economic difficulties of the Great Depression brought a general decline to the community. The Penrose Canning Factory and an alcohol distillery each lasted only two years in Penrose (Campbell 1972; Zier et al. 1997).

Very little information has been found about the architecture of the settlements in the Fort Carson area. The area had abundant sources of building stone and most foundations and retaining walls found in the area to date were constructed of mortared and dry-laid sandstone. Timber suitable for building purposes, particularly for cribbed log construction, generally did not exist in the area but was available to the west and north. Some of the larger structures built in the 1860s and 1870s probably were built of imported logs, and many of the smaller structures were undoubtedly built of native piñon pine and juniper logs. Remains of a log structure have been found in site 5FN496 in the southwestern part of the reservation. William Ninehouse, a settler on Beaver Creek, constructed his dwelling, barns, and granary by anchoring cedar poles in a vertical rock face, placing cedar poles as rafters, and then covering the roof with a poured concrete slab (Campbell 1972). Similar construction is indicated in the physical remains of a settlement site (5EP150) recorded in Fort Carson (Zier et al. 1997).

Piñon and juniper poles were also sunk vertically into the ground in close order to form corrals. The pole enclosures offered increased shelter to livestock, were cheap to build and did not cause injury to livestock as pole-and-wire fences often did. This kind of corral was particularly appropriate for horses and mules, which were prone to wire-related injuries. One such corral was built and used by a grading crew during construction of the railroad from Pueblo to Stone City in 1910 (Carrillo et al. 1991: Figure 7). The "stockade" at the supposed Bent trading post on Turkey Creek (site 5PE64) may simply be a corral built after 1873 (Zier 1987; Zier and Kalasz 1985; Zier et al. 1997).

By the early 1870s sawmills were producing milled lumber on upper Beaver Creek and in the area called "The Pinery" near Colorado Springs. Milled lumber could also be obtained at the railroad sidings along Fountain Creek on the east edge of the Fort Carson area. Most settlement structures were probably simple wood frame buildings, but some true sod, adobe brick, and mortared stone masonry buildings are known to have been constructed in the region in the early settlement period (Alexander et al. 1982; Freed and Barber 1977; Whittemore 1967). Mounding of clay material around some foundations in the Fort Carson Military Reservation indicates either that superstructures were partially composed of earthen materials (or insulated with stacked sod) or, more likely, the roofs were covered with earth or sod (Zier et al. 1997).

Ethnic reflections in settlement architecture are apparently rare in the region, other than the ephemeral association of adobe with Mexican Americans. Regional urban stylistic preferences during the period 1865 to 1920 tended toward "Western Victorian" forms and decorations, but rural structures in the region were characteristically utilitarian in design with little if any ornamentation (Freed and Barber 1977; Naeve 1972). A notable exception to this pattern was Spencer Penrose's Turkey Creek Farm. Shortly after Penrose bought the farm in 1912, he hired the Colorado Springs firm of MacLaren & Thomas, Architects to design a showcase house, garage, stable, hay shed, and large cow barn to be built on the site. Several buildings already existed on the site at that time, and the new structures eclipsed the old buildings in size. The house was designed in Spanish Revival Style, as was Penrose's sprawling mansion called El Pomar in Colorado Springs. The house featured curved Baroque gables, round-arched windows and doors, columns, balustrades, and wrought iron railings. Like the mansion in town, the house looked out on wide lawns and fine shrubbery. The house still stands today (Zier et al. 1997).

The most famous ranch located within Fort Carson (SW Section 34, T16S/R67W), is the Turkey Creek Ranch. The ranch is eligible for inclusion as a historic district in the National Register of Historic Places's, because of its association with Spencer Penrose and the development of ranching in the area. Supposedly established in the late 19th century by Frank Cross (Alexander et al. 1982; Socha and Posner 1972), it seems as though Cross never owned the property. H.H. Jacobs started the ranch in 1883, followed by 10 other owners before Spencer Penrose bought the ranch in 1912. Penrose reregistered the property in 1916 as the Turkey Creek Farm. The ranch saw much development under Penrose with many structures that contribute to the historic district because of architectural significance. The U.S. Army purchased the ranch in 1965, and its use has changed over the years. Today it is the Turkey Creek Recreation Area (Zier et al. 1997).

Nearly all of the historic period sites recorded to date in the Fort Carson Military Reservation are related to the settlement theme. Most of the sites consist of remains of stone or concrete foundations, depressions, and scatters of domestic and agricultural artifacts. The only known intact standing structures related to settlement remaining in Fort Carson include Turkey Creek Ranch, one building in the Fort Carson cantonment area, and possibly several buildings at the Fort Carson Rod and Gun Club and at Camp Red Devil (Schweigert 1987; Barnes 1991). Site 5FN290 contains portions of buildings probably moved from within Fort Carson to just west of the reservation boundary. All but a very few of the recorded settlement sites appear to have had stock raising as the primary economic base; the remainder appear to have had a partial fruit-raising economic base. Other features associated with settlement within the reservation are occasional graves, windmills, dams, irrigation ditches, stock watering tanks, artifact scatters, and rock faces with historic graffiti (Zier et al. 1997).

Historic Development of Fort Carson

The modern history of the Fort Carson region began in 1940 when a group of Colorado Springs business and community leaders started lobbying for a military installation near their city in hopes of reviving a sagging economy (Barnes 1992; Jepson 1990; McCarthy and McCullough 2003; Zier 1987). The Pikes Peak region possessed many features suited to military training, including miles of prairie for large-scale training maneuvers and a mild climate permitting year-round training (Barnes 1992; Connor and Schneck 1996; Connor et al. 1999; Jepson 1990; Stout 2002).

World War II, 1942-1945

Construction of Camp Carson

The U.S. Army announced plans in January 1942 to establish a military installation on approximately 60,000 acres of rangeland between Colorado Springs and Pueblo. The installation received the name Camp Carson after Army Brigadier General Christopher “Kit” Carson, famed nineteenth century frontiersman and Indian agent. The installation would encompass 5,533 acres donated by the city of Colorado Springs, 29,676 acres purchased from private owners, 262 acres acquired from the Department of the Interior, and 24,577 acres leased from the State of Colorado (Barnes 1992; Connor and Schneck 1996; Connor et al. 1999; Stout 2002; Zier 2004).

In mid-January of 1942, specifications for construction of the camp were completed and the bidding process opened. Colorado Springs Constructors, Incorporated, “The Big Five”, a team of five construction firms, won the contract with the bid of $30,054,390; signed February 1942 (Public Affairs Office undated). Companies organized under the “Big Five” included Edward H. Honnen Construction Company, Colorado Springs; Peter Kiewit, Omaha, Nebraska; Condon-Cunningham Construction Company, Omaha; Thomas Bate and Sons, Denver, Colorado, and the C.F. Lytle Company, Sioux City, Iowa. The concept of a group of contractors organized together under one large company to reduce liability risks was not entirely new; the first successful implementation was during construction of Boulder Dam. Within the framework of the package contract, each company was responsible for only the percentage it agreed to perform. Honnen, a native of Colorado, became the contractor/sponsor of the project. His experience included work on Army installations at Cheyenne, Wyoming, Rock Island Arsenal in Illinois, and Peterson Field east of Colorado Springs (Connor et al. 1999; Stout 2002; Zier 2004).
Thousands of men and women, laboring around the clock, participated in construction. A force of contractors and skilled laborers were initially coordinated through union rosters nationwide.

At the peak of construction, when the unions could not provide enough skilled labor, recruitment of additional laborers from the general work force was necessary. During peak construction, the project employed close to 11,500 workers. Construction of the camp proceeded quickly. In less than a month's time after the January announcement of the establishment of Camp Carson, the first building was completed. Crews finished a large segment in a two-week period, causing the need for a Kiewit representative from the firm's home office to visit the construction site to verify the achievement.

The design layout of Camp Carson conformed to the contour of the land, thus avoiding unnecessary grading, and accounts for the banana shape of the post. Series 800 building plans, first introduced in 1941, was the architectural type used for most of the buildings constructed on Camp Carson. Dissatisfaction of design and amount of materials necessary to construct this type of architecture led to its discontinuation in October 1942. Assembly-line construction, making the headlines around the United States, was the method used at Camp Carson, as well as elsewhere. The first-floor level of a building and its foundation was staked by a transit crew, followed by a foundation crew, who drilled holes with an auger (6-minutes for each) to set in wood or concrete support piers. Framing crews consisted of two crews; construction of floors done by one crew, while the other erected walls. Prefabrication methods helped to speed construction, and as building sites were leveled pre-cut lumber arrived. A sawmill located near the railroad cut lumber planks to size, which were then shipped to Camp Carson on a specially constructed railroad spur. The D&RGW laid a spur connecting the warehouse district with Kelker, Colorado. When ever possible, procurement of construction materials was local, and when necessary shipped in from out-of-state. Plumbing and electrical crews were subcontracted, and quickly became drawn in with the assembly-line concept of construction. As the tempo of construction increased, the Mountain States Telephone and Telegraph Company joined in the activity, hurrying to keep pace with the demand for communication (Barnes 1992; Conner and Schneck 1996; Connor et al. 1999; Friedman 1986; Jepson 1990; Stout 2002; Zier 2004).

Completed six weeks before the deadline, the Army took possession of the first segment of two-story, wood-frame buildings on June 2, 1942. When the installation's facilities were complete, they provided for 35,173 enlisted men, 1,818 officers, and 592 nurses. Most buildings were of mobilization type construction, *i.e.* buildings assembled as a component in the effort to place human and material resources in a state of readiness for war. Shortly before the contract expired, the Army negotiated additional construction of a prisoner of war internment camp, barns for 3,310 horses and mules, and 374 additional buildings to house 5,000 more enlisted men and 200 officers, raising the total cost of construction to approximately $41 million. The extended date for completion was November 4; the skill and expertise brought to the project by the five companies working under Colorado Springs Construction enabled completion by the deadline. In doing so, the government received a refund of nearly $2.5 million in accordance with the "renegotiation" clause of the contract (Barnes 1991; Conner and Schneck 1996; Connor et al. 1999; Friedman 1986; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

Training and Mobilization

During World War II, four infantry divisions prepared for combat at Camp Carson. The camp's peak troop strength occurred in late 1943 with approximately 43,000 military personnel. In June 1942, the 89th Infantry Division, from Jefferson Barracks, Missouri, reactivated at Fort Carson on

July 14, and deployed in 1944. Following deployment to the European theater in January 1945, the division gained the nickname "Rolling W" while making assault crossings of the Moselle and Rhine rivers and advancing 350 miles into Germany. Created by the War Department in 1943, the 71st Infantry Division met the need for a small strike force capable of fighting in rough terrain. Activated at Camp Carson as the 71st Light Division in July 1943, the unit was designated the 71st Infantry Division on May 26, 1944, and transferred to Europe in February 1945. The 104th Infantry Division, activated in August 1943 at Camp Adair, Oregon, transferred to Camp Carson on March 11, 1944. The "Timberwolves" deployed to France in September 1944 and fought through Northern Europe from Antwerp to the Rhine River (Barnes 1991; Conner and Schneck 1996; Connor et al. 1999; Friedman 1986; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

Mountain and Cold Weather Training at Camp Hale

In 1942, Camp Hale constructed west of Pikes Peak near Leadville, Colorado, operated as a sub-installation of Camp Carson during the war. The Mountain Training Command, activated at Camp Carson on September 2, 1942, moved to Camp Hale in November. An increased need for troops trained in the art of mountain warfare led to the formation of the 10th Mountain Division. Activated at Camp Hale, Colorado, in July 1943, the 10th Mountain was the Army's only specifically trained mountain division. Trained by Norwegian General Dagfin Dahl, the 10th Mountain Division deployed to the mountains of Northern Italy and proved instrumental in defeating the Axis powers in the Italian campaigns (Barnes 1992; Connor and Schneck 1996; Friedman 1986; Jepson 1990; McCarthy and McCullough 2003; Stout 2002).

Prisoner-of-War Camp

In 1942, the U.S. War Department established a prisoner-of-war (POW) camp on Camp Carson, one of 511 installations throughout the United States to detain Axis prisoners of war. Colorado was the location of more than 30 POW camps, and many served as small temporary branch camps under the jurisdiction of Camp Carson. The location of Fort Carson, not in close proximity of any crucial war industries afforded maximum security; the temperate climate of the area ensured construction costs and maintenance would be minimal (Connor et al. 1999; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004) .

Fort Carson's prisoner-of-war (POW) camp opened on January 1, 1943. Original camp facilities were minimal, and meant to accommodate 3,000 enlisted men and 32 officer POWs.
In January 1943, a wildfire hit Camp Carson, and swept through the POW camp destroying twenty-three buildings. In all, the fire caused over $1 million in damage (Barnes 1992; Jepson 1990; Connor and Schneck 1996; Connor et al. 1999; Stout 2002).

The initial group of 368 Italian prisoners arrived at Camp Carson in May 1943, and soon moved to another camp outside Colorado. During their short internment, the Italian POWs built a camp theater for their production of "Romeo and Juliet." Shortly after the Italian POWs moved, German POWs arrived. Camp Carson POWs participated in athletic events, musical performances and plays. A POW library was established, a wide variety of educational classes organized, and religious services held. A POW post exchange was set-up, and prisoners published a weekly German-language newspaper. The demands of war caused a work force shortage in Colorado, which POWs help to alleviate by doing general farm work and aiding in logging operations. Prisoners earned $0.80 a day, but the wages could range from $0.60 to $1.20 throughout the period of internment.

One of the largest prisoner repositories in the U.S., Camp Carson housed nearly 10,000 German prisoners, during one period from 1943 – 1946 (Connor et al. 1999; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

During the war, Fort Carson incarcerated nearly 9,000 German, Italian, and some Japanese prisoners of war. In 1945, near the end of the war, Fort Carson housed an additional 5,000 prisoners in barracks located east of Pershing Field. Repatriation of all POWs to their respective homelands occurred by July 21, 1946.

Archival research (1990) and archaeological investigations of 1989 and 1990 determined that there was little intact evidence of the Camp Carson Prisoner-of-War camp. Archaeological testing (1995) determined that there were no subsurface remains (Barnes 1992; Jepson 1990; Connor and Schneck 1996; Connor et al. 1999; Stout 2002).

Carson Hospital Center/Old Hospital Complex

In 1942, the Carson Hospital Center, the largest of nine medical centers built in the nation during World War II, opened to provide immediate medical care for Camp Carson's soldiers. The Center had a 2,000-bed capacity with 11 square miles of floor space. The combined general and convalescent hospitals cared for more than 30,000 patients over the course of the war. The staff consisted of three Women's Army Corps (WAC) hospital companies, 2,000 civilians, and hundreds of doctors, nurses, and medical corpsmen. The Carson Hospital Center was also a major training center for nurses. The Army Nurse Training Center trained more than 3,000 nurses between October 1943 and the end of the war. When the war ended the Carson Hospital Center was inactivated, and a temporary separation center was established. The 400-bed center continued treating patients scheduled for release before May 31, 1946. About 9,000 soldiers from installations in a four-state area processed for discharge through the center (Barnes 1992; Connor and Schneck 1996; McCarthy and McCullough 2003; Stout 2002).

The Old Hospital Complex at Fort Carson was determined as an eligible property for inclusion in the National Register in 1991. The complex, constructed of semi-permanent buildings, followed the Department of the Army's Series 800 plans. A 1991 Memorandum of Agreement (MOA) and a 2002 amended MOA with the Colorado State Historic Preservation Office, allowed for disposal of all complex buildings except Buildings #6237 and #6236. In 1995, a Historic Architectural Building Survey was completed on 59 buildings in the complex and Colorado site forms completed, with both the interior and exterior of buildings inventoried and evaluated. Literature research and review of the Directorate of Public Works real property forms were completed and an historic context written. The 2002 MOA provides for adaptive reuse of Building #6237 and Building #6236. The exterior of Building #6236 has been restored to historic standards, and the Directorate of Environmental Compliance and Management currently occupies the building. Plans for Building #6237 involve restoring its interior and exterior to historic standards to accommodate additional office space for Fort Carson personnel. Management includes establishing a buffer zone around Buildings #6237 and #6236 to maintain existing line-of-sight features (Napier and McCarthy 2000; Clapper 2000; Stout 2002).

Cold War, 1946-1989

By 1946, with activities greatly reduced, it appeared that Camp Carson would close. The military strength at the camp had dropped to around 600, not including 320 patients at the hospital. In April, an announcement made by the War Department verified that the camp would remain open. In late April and May, troop strength increased when the 38th Regimental Combat Team and the 611th Field Artillery Battalion transferred to Camp Carson. To facilitate the families of enlisted men, the Army converted a large block of two-story barracks into NCO apartments for families of enlisted men.

A fire that started in the Broadmoor area on January 17, 1950, and driven by 50 mile-per-hour winds soon spread over the post. It would be the worst fire to strike the post in its history. In an attempt to stop the fire, post engineer bulldozers cut a firebreak across the northern part of the post. The unceasing winds blew the fire where there were no men and equipment available to extinguish or control its velocity, causing the destruction of more than 33 buildings. Civilian volunteers and fire fighting equipment from the surrounding town was not able to come to the camp's aid until mid-morning. Families evacuated from the NCO housing area went to Pueblo. By noon, when the fire still blazed, it appeared total destruction was the fate of the entire camp. Wind velocity dropped by dusk, allowing firefighters finally to extinguish the fire by midnight. Six people lost their lives in the fire, and 92 buildings destroyed resulting in $3 million in damage (Barnes 1992; Stout 2002).

In 1950, at the onset of the Korean War, activities at Camp Carson increased. Many Reserve and National Guard units called into active duty began to arrive. The 196th Regiment Combat Team from the South Dakota National Guard, the largest unit, arrived in September. The camp also served as duty station for more than 20 engineer and artillery battalions and several miscellaneous companies and detachments. To process returning veterans, Activated in July 1951, the Camp Carson Separation Center prepared to process returning Korean War veterans. More than 100,000 soldiers were processed by the end of 1953 (Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002).

As the nation emerged from war to peace in the early 1950s, Camp Carson continued to serve as duty station for approximately 25,000 troops. The future of the camp was uncertain, and the lack of approval for new construction did not indicate positive prospects. Colorado Springs was just beginning to recover from an economic recession, when an announcement indicated that Camp Carson would become a fort. The designation of the post as Fort Cason officially occurred on August 27, 1954. This distinction from camp to fort did not necessarily ensure a secure future for the post. Congress approved approximately $3.5 million for the construction of new barracks and officer quarters. Fort Carson was authorized $13 million for construction of 1,000 sets of family quarters, and a NCO mess hall. By the mid-1950s, cuts made to the Department of Defense's budget affected Fort Carson. Units of the 9th Infantry Division, stationed on Fort Carson, were inactivated. Efficiency experts argued that Fort Carson was too remote from main transportation arteries and population centers to be economically viable as an Army post. By 1960, the 2nd United States Army Missile Command (Medium) was the only major unit stationed at Fort Carson (Barnes 1992; Connor and Schneck 1996; Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

In response to the Berlin Crisis of 1961 and the Cuban Missile Crisis of 1962, two more divisions activated at Fort Carson. The 5th Infantry Division (Mechanized), formally reactivated at Fort Carson on February 19, 1962, was the first division to be organized under the "ROAD" (Reorganization Objectives Army Division) concept. Training a mechanized division triggered the need for more land. In 1965, Fort Carson acquired 24,577 acres of state land by trading it for federal land located at the Lowry Bombing Range east of Denver. In 1965 and 1966, the Army acquired a total of 78,741 acres of land south of Fort Carson's original reservation at a cost of approximately $3.5 million. These additions brought Fort Carson to its current size of 138,523 acres (Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002).

Fort Carson opened Camp Red Devil, the first year-round training area for soldiers in a field environment on March 7, 1966 (Barnes 1992). Training for Southeast Asia was also a priority at Fort Carson. By the end of 1966, Fort Carson deployed 9,000 soldiers to Vietnam, with another 9,000 deployed in 1967, and 6,000 in 1968. Activities at Fort Carson had risen to a higher level near the end of 1968 than at any time since World War II. In October 1965, the military strength was 9,658 and by March 1967 had more than doubled with 24,735 troops. In March 1965, civilian strength was 1,337 and had increased to 2,445 in July 1967. The economic impact of Fort Carson on the Colorado Springs region rose from approximately $55 million in 1964 to $100 million in 1967. By January 1973, the economic impact was over $340 million (McCarthy and McCullough 2003; Stout 2002).

Force reductions in Vietnam, 1 November 1970, deployed the 4th Infantry Division back to the United States and to Fort Carson, replacing the 5th Infantry Division. In its new western home, the 4th Infantry Division was reorganized as a mechanized infantry division (Stout 2002). Fort Carson would become an initial test site for The Modern Volunteer Army concept in January 1971. The 18-month field test aimed to create an environment conducive for an all-volunteer Army, with plans to incorporate the best field test experiences in future Army budgets (McCarthy and McCullough 2003; Stout 2002).

The need for additional land for Army training received considerable emphasis during 1974. The Army was considering the Pinon Canyon area southeast of Pueblo, Colorado, for land acquisition by the late 1970s. Purchase of 245,000 acres in the Pinon Canyon area, 100 air miles southeast of Fort Carson, was made in September 1983 at an approximate cost of $26 million. Relocation of eleven landowners and school bond relief cost an additional $2 million. The Pinon Canyon Maneuver Site opened for training in the summer of 1985 (Connor and Schneck 1996; Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002). In 1986, the Evans Army Community Hospital was dedicated continuing Fort Carson's long tradition of providing medical care to U.S. citizens and soldiers (McCarthy and McCullough 2003).

Post Cold War, 1990-Present

Changes in troop units assigned to Fort Carson in the 1990s reflect the evolving role of defending the United States. The 43rd Corps Support Group, supported the 4th Division and III Corps and was deployed to Saudi Arabia in October 1990 and served in Operations Desert Shield and Desert Storm until April 1991. The 43rd sent units to Somalia in December 1992 for Operation Restore Hope, and redesigned as Area Support Group. In 1992, the 10th Special

Forces Group (Airborne) arrived at Fort Carson. In 1995, a number of brigades and troop units were inactivated, reassigned or re-flagged. The 4th Infantry Division headquarters, one maneuver brigade (1st Brigade), and support units at Fort Carson were inactivated. One brigade of the 3rd Brigade Combat Team was reassigned to the 2nd Armored Division, Fort Hood, Texas, but remained at Fort Carson. The 2nd Armored Division at Fort Hood was re-flagged as the 4th Infantry Division, and the 3rd Armored Cavalry Regiment was relocated to Fort Carson from Fort Bliss, Texas. The latest major unit change is the formation of the 7th Infantry Division at Fort Carson in 1999 (Stout 2002; McCarthy and McCullough 2003; Zier 2004).

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FORT CARSON

THE MOUNTAIN POST

1980 MEMORANDUM OF AGREEMENT REGARDING FORT CARSON MILITARY RESERVATION

Advisory
Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

MEMORANDUM OF AGREEMENT

WHEREAS, the Department of the Army, Headquarters Fort Carson and Headquarters 4th Infantry Division (Army), propose to continue training at the Fort Carson (Installation); and,

WHEREAS, the Army proposes to acquire additional training land within Southeastern Colorado (for the purposes of this Agreement the term "Fort Carson" includes the existing installation as well as any additional lands that may be acquired); and,

WHEREAS, the Army, in consultation with the Colorado State Historic Preservation Officer (SHPO), has determined that these undertakings as proposed may have an adverse effect upon cultural properties included in or eligible for the National Register of Historic Places; and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320), Section 2(b) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment," the Army has requested the comments of the Advisory Council on Historic Preservation (Council) in accordance with the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800); and,

WHEREAS, representatives of the Council, the Army and the Colorado SHPO have consulted and reviewed the undertakings as proposed; and,

NOW, THEREFORE, it is mutually agreed that the implementation of the undertakings, in accordance with the following stipulations, will avoid, minimize, or mitigate adverse effects on cultural properties.

Stipulations

The Army will ensure that the following stipulations are carried out at Fort Carson (Installation).

I. All survey, evaluations, data recovery, monitoring of land disturbing activities, or rehabilitation work performed in accordance with this Agreement will be conducted under the direct supervision of a person who meets at a minimum the appropriate professional qualifications set forth in 36 CFR Part 1210, Appendix C and who has professional experience relevant to Southeastern Colorado.

II. The Army will ensure compliance with the Archeological Resources Protection Act of 1979 and will advise all contract and Army personnel and resident dependents against illegal collection of cultural materials and of the penalties for such collection imposed by the Act.

III. Copies of all scopes of work, reports, plans, or other products generated under this Agreement will be provided to the Colorado SHPO for review and comment.

IV. Copies of any final technical reports will be furnished to the Council and to Interagency Archeological Services (Heritage Conservation and Recreation Service, Department of the Interior, Washington, D.C. 20243), for possible submission to the National Technical Information Service (NTIS). Any precise locational data should appear in a separate appendix and may be withheld from NTIS publication pursuant to Section 11 of the General Authorities Act of 1970, as amended (P. L. 94-458).

V. An Historic Preservation Program for the Installation will be developed and implemented in consultation with the Colorado SHPO and, as appropriate, historical architects, archeologists, or other historic preservation specialists. The Historic Preservation Program will be included as an element of the Installation Master Plan and will be used to guide installation and training exercise planning. In order to promote consistency in the treatment of cultural properties on the Installation, the Historic Preservation Program will be responsive to Army Technical Manuals TM5-801-1, TM5-801-2, and Technical Note No. 78-17, dated September 15, 1978, until it is superceded by Army Technical Manual TM5-801-3 (presently in draft form).

A. The Historic Preservation Program must include, but need not be limited to, the following elements:

1. A cultural property overview and archeological research design (or designs) that identifies the types of cutural properties that are expected to be found on the installation; that sets forth the research topics to be addressed; and that establishes survey and other investigation strategies for the identification and evaluation of such properties.

2. A strategy for completing the cultural property survey required by Section 2(a) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment." This strategy will include:

a. assignment of all installation land into land-use categories based on intensity of military use or land disturbing activities, such as planned construction and new training areas;

b. survey priorities based on the land-use categories;

c. time table for completion of the survey; and,

d. staffing and funding programs.

3. An Installation procedure to be followed in determining historic and cultural properties eligible for inclusion in the National Register of Historic Places, which is consistent with 36 CFR 1204.

4. An Installation procedure for reviewing actions to determine effects (36 CFR Sec. 800.3) on National Register or eligible properties.

5. An Installation procedure for the preservation of affected National Register or eligible properties. This procedure will include, but need not be limited to, the following:

a. an assessment of alternatives that would avoid project effects by project design, relocation or physical means such as signing, fencing or patrolling,

b. an assessment of alternatives designed to mitigate any adverse effects, where it is not prudent and feasible to avoid effects.

c. a process for selecting an appropriate alternative course of action (avoidance or mitigation) that includes consultation with the Colorado SHPO. The Council will be afforded an opportunity to comment where agreement cannot be reached with the Colorado SHPO and the Army, the affected property is of national significance (recognized as a National Landmark, National Historic Site, National Historic Monument, or National Historic Trail), or beyond its historic or scientific value is known to have historic or cultural significance to a community, ethnic, or social group that would be impaired by its disturbance.

d. standards and guidelines for archeological data recovery that take into account 36 CFR Part 1210 and the Council's "Recommendations for Archeological Data Recovery" (Part III of Guidelines-attached).

e. a procedure to be followed, if after meeting all the responsibilities for identification of National Register or eligible properties, the Army finds or is notified after the undertaking has begun that the undertaking will affect a previously unidentified National Register or eligible property. This procedure should permit delay of the undertaking, consultation with the Colorado SHPO and compliance with Section 800.7 of the Council's regulations.

6. Provision for curation of all specimens, field notes, photographs, negatives, and processed data in a manner that makes them available for future study at an appropriately equipped institution that meets the standards set forth in 36 CFR Sec. 1210.4 and that makes these data available to other parties for research or other appropriate purposes. Specimens may be disposed-of permanently only with the written concurrence of the Secretary of the Interior and the Colorado SHPO.

7. Provision for routine maintenance of all National Register or eligible properties consistent with Army Technical Manual TM5-801-1.

8. Provision for periodic review and refinement of the Historic Preservation Program in consultation with the Colorado SHPO.

B. After the Historic Preservation Program has been developed, it will be submitted to the Council and the Colorado SHPO for review. If, after 30 days, neither has provided written objections, the program may be implemented. Once approved, should the Historic Preservation Program be modified, the Council and the Colorado SHPO will be afforded an opportunity to provide written objections within 30 days of receipt of the modified program. Should the Council or the Colorado SHPO object to the proposed Historic Preservation Program, or any modifications thereof, the Army, Colorado SHPO, and the Council will consult to resolve the objections.

VI. Within 180 days after ratification of this Agreement, the Army will submit a draft of the Historic Preservation Program to the Council and the Colorado SHPO.

VII. Until the Historic Preservation Program is implemented and during any period in which objections between the Army and SHPO remains unresolved, the Army will follow the procedure set forth in 36 CFR Part 800.

VIII. If any of the signatories to this Agreement determine that the terms of the Agreement cannot be met or believes a change is necessary, that signatory shall immediately request the consulting parties to consider an amendment or addendum to the Agreement. Such an amendment or addendum shall be executed in the same manner as the original Agreement.

Robert Garvey Nov. 17 1980

Executive Director (date)
Advisory Council on Historic Preservation

Bernard D. Friend 26 NOV 8
BERNARD D. FRIEND (date)
Colonel, MPC
Deputy Post Commander
Fort Carson, U.S. Army

Arthur C. Townsend 12.9.80
Colorado State Historic (date)
Preservation Officer

Richard H. Jenrette 12-15-80
Chairman (date)
Advisory Council on Historic Preservation

CULTURAL RESOURCES LAWS, REGULATIONS, AND EXECUTIVE ORDERS

The Cultural Resources Management Program at the US Army Environmental Center offers a variety of resources to help support military readiness and quality of life for our soldiers.

An archeological project is not complete simply because the artifacts are out of the ground and a final report has been submitted. The materials recovered from archeological inventories, evaluations and data recovery projects must be appropriately curated for the benefit of future scientists, educators, and museum specialists.

Statutes:

- Abandoned Shipwreck Act of 1987 (43 USC 2101-2106)
- Archeological Resources Protection Act of 1979 (16 USC 470aa-470mm)
- American Indian Religious Freedom Act of 1978, as amended (42 USC 1996-1996a)
- Archeological and Historic Preservation Act of 1974 (16 USC 469-469c)
- National Environmental Policy Act of 1969 (42 USC 4321-4370c)
- National Historic Preservation Act of 1966, as amended (16 USC 470-470w)
- Historic Sites, Buildings and Antiquities Act of 1935 (16 USC 461-467)
- Antiquities Act of 1906 (16 USC 431-433; 34 Stat 225)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001-3013)

Federal Regulations and Guidelines:

- Advisory Council on Historic Preservation: Protection of Historic Properties (36 CFR 800)
- Council on Environmental Quality: Regulations Implementing the National Environmental Policy Act (40 CFR 1500-1508)
- Department of Defense: American Indian and Alaska Native Policy
- Department of Defense Guidelines for the Curation of Archeological Soil Samples
- Protection of Archeological Resources (32 CFR 229)
- Department of the Interior: Native American Graves Protection and Repatriation Act Regulations (43 CFR 10)
- Department of the Interior: Curation of Federally-owned and Administered Archeological Collections (36 CFR 79)
- Department of the Interior: Determinations of Eligibility for Inclusion in the National Register of Historic Places (36 CFR 63)
- Department of the Interior: National Historic Landmarks Program (36 CFR 65)
- Department of the Interior: National Register of Historic Places (36 CFR 60)
- Department of the Interior: Preservation of American Antiquities (43 CFR 3)
- Department of the Interior: Protection of Archeological Resources (43 CFR 7)
- Secretary of the Interior's Standards and Guidelines for Federal Agency Historic Preservation Programs Pursuant to the National Historic Preservation Act
- Secretary of the Interior's Professional Qualification Standards (48 FR 22716, 1983)

- Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation
- Secretary of the Interior's Standards for Architectural and Engineering Documentation: HABS/HAER Standards
- Secretary of the Interior's Standards for Rehabilitation
- Secretary of the Interior's Illustrated Guidelines for Rehabilitating Historic Buildings
- Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR 68)

Executive Orders:

- EO 11593 Protection and Enhancement of the Cultural Environment
- EO 13006 Locating Federal Facilities in Historic Properties in our Nation's Central Cities
- EO 13007 Indian Sacred Sites
- EO 13175 Consultion and Coordination with Indian Tribal Governments
- EO 13287 Preserve America

DoD and Army Regulations and Policy:

- Army Regulation 200-4: Cultural Resources Management
- DA Pamphlet 200-4: Cultural Resources Management
- Environmental Assessment for AR 200-4 —83.5kb DOC
- Department of Defense: American Indian and Alaska Native Policy
- Department of Defense: American Indian and Alaska Native Policy Memo

Authors, First	Authors, Other	Publication Title	Type of Document	Publication Date
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		Fort Carson Diary 1942 - 1958.		1942-1958
Hurd, C.		*Five Apishapa Focus Sites in the Arkansas Valley* (5PE64).	Unpublished M.A. Thesis	1960
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Withers, A.		*An Archaeological Survey of Northwestern Pueblo County, Red Creek, Turkey Creek, Beaver Creek, Avery Ranch Site (5PE56).*	Manuscript	1964
Ireland, S.		*Five Apishapa Focus Sites in the Arkansas Valley, Colorado, Avery Ranch Site (5PE56).*	Report	1968
Watts, H.		*The Archaeology of the Avery Ranch Site on Turkey Creek & The Avery Ranch Site (5PE56).*	Unpublished M.A. Thesis	1971 & 1975

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Martin, Curtis W.		*Settlement Survey of the Fort Carson Military Reservation.*	Manuscript	1978
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Alexander, Robert K	John D. Hartley, Carol Rolen	*Preliminary Report on 1982 Field Investigations at Fort Carson, Colorado. 2 volumes.*	Report	1982
Burns, George R.	William R. Killam	*Cultural Resource Inventory of Tank Gunnery Range Fan Number 145, Fort Carson Military Reservation, Colorado.*	Report	1983
Zier, Christian J.		*Preliminary Report of an Archaeological Survey of the Red Creek Parcel, Fort Carson Military Reservation, Colorado.*	Report	1983
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Stoffle, Richard W.	Henry F. Dobyns, Michael J. Evans, and Omer C. Stewart	*Toyavita Piavuhuru Koroin Canyon of Mother Earth: Ethnohistory and Native American Religious Concerns in the Fort Carson-Pinon Canyon Maneuver Area.*	Report	1984

Zier, Christian J.		*An Archaeological Inventory of the Red Creek Parcel on the Fort Carson Military Reservation, Colorado.*	Report	1984
Hoffman, J. Michael		*Human Skeletal Remains from 5EP773: The Red Creek Site, Fort Carson, Colorado.*	Report	1985
Zier, Christian J.	Stephen M. Kalasz	*Archaeological Survey and Test Excavations in the Multi-Purpose Range Complex Area, Fort Carson Military Reservation, Colorado.*	Report	1985
Brodnicki, E.		*Cultural Resources Reconnaissance Study of Wild Horse Canyon Gravel Extraction Site.*	Report	1986
Butler, William B.	Stephen A. Chomko, J. Michael Hoffman	*The Red Creek Burial, El Paso county, Colorado.*	Article	1986
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Grant, Marcus P	Christian J. Zier	*An Archaeological Inventory of Selected Sample Transects of the Fort Carson Military Reservation, Colorado.*	Report	1987
Jepson, Daniel A.		*Archaeological Survey of Thirty-three Soil Conservation Structures on the Fort Carson Military Reservation, Colorado.*	Report	1987
Schweigert, Kurt P.		*A Selected Standing Structures Survey of the Fort Carson Military Reservation, Colorado.*	Report	1987
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Butler, William B.		*Cultural Resource Survey of Ten Soil Conservation Structures and the Gale Irrigation Ditch, Fort Carson Military Reservation, El Paso and Pueblo Counties, Colorado.*	Report	1990
Jepson, Daniel A.		*Historical and Archaeological Perspectives on the World War II Prisoner of War Camp at Fort Carson, Colorado.*	Report	1990
Kalasz, Stephen M.		*Archaeological Survey and Test Excavation in the Turkey Canyon Area, Fort Carson Military Reservation, Pueblo and El Paso Counties, Colorado (Appendix A).*	Report	1990

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Chidley, Mike	DECAM	Range 155 Survey and Mitigation.	Report Pending	2005
Moody, Terry	Pamela Cowen	Restoration Plan for Building 6237, Old Hospital Complex Historic District, Fort Carson, Colorado.	Plan	2007
Anderson, Cody		*Gilligan's Island Site 5FN1592: An Archaic to Late Prehistoric Stage Site on FCMR, Fremont County, Colorado.*	Thesis	2008

Provided by

Fort Carson Directorate of
Environmental Compliance and Management,
Cultural Resources Program

ATTACHMENT G.4

Comprehensive Agreement

COMPREHENSIVE AGREEMENT

Regarding Tribal Access, Privacy and Information Sharing, and Inadvertent Discovery and Intentional Excavation of Native American Human Remains and Cultural Items Culturally Affiliated with the

Apache Tribe of Oklahoma
Cheyenne and Arapaho Tribes of Oklahoma
Comanche Nation of Oklahoma
Kiowa Tribe of Oklahoma
Northern Arapaho Tribe
Northern Cheyenne Tribe
Oglala Sioux Tribe of the Pine Ridge Reservation
Shoshone Tribe (Eastern Band)
Southern Ute Indian Tribe
Ute Mountain Ute Tribe

Within Federal Lands Owned or Controlled by Fort Carson, Colorado

COMPREHENSIVE AGREEMENT

Regarding Tribal Access, Privacy and Information Sharing, and Inadvertent Discovery and Intentional Excavation of Native American Human Remains and Cultural Items Culturally Affiliated with the Following Indian Tribes:

Apache Tribe of Oklahoma
Cheyenne and Arapaho Tribes of Oklahoma
Comanche Nation of Oklahoma
Kiowa Tribe of Oklahoma
Northern Arapaho Tribe
Northern Cheyenne Tribe
Oglala Sioux Tribe of the Pine Ridge Reservation
Shoshone Tribe (Eastern Band)
Southern Ute Indian Tribe
Ute Mountain Ute Tribe

Within Federal Lands Owned or Controlled by Fort Carson, Colorado

Whereas, Fort Carson has need to engage in ongoing activities that may result in the inadvertent discovery or intentional excavation of human remains and/or cultural items culturally affiliated with the aforementioned Federally Recognized Tribes (Tribes); and

Whereas, Fort Carson, in consultation with the Federally Recognized Tribes, is responsible for identification, protection, and disposition of human remains and cultural items on lands it administers pursuant to the Native American Graves Protection and Repatriation Act of 1990 [25 U.S.C. 3001-3013] (NAGPRA) and 43 CFR 10; and

Whereas, appropriate treatment of Native American human remains and cultural items that may be affiliated with the Tribes requires respect for the cultural traditions of tribal members; and

Whereas, the Tribes represented by the signatories hereto were aboriginal occupants of lands now administered by Fort Carson and, based on cultural and/or aboriginal affiliation, do hereby claim and assert the right of possession and control of human remains and associated funerary objects on these lands in accordance with Section 3a(2)(B) of NAGPRA; and

Whereas, Section 11 of NAGPRA and 43 CFR 10.5(f) specifically encourage the development of comprehensive agreements between federal agencies and federally recognized tribal governments to ensure the appropriate treatment of Native American human remains and cultural items;

NOW, THEREFORE, Fort Carson and the identified Tribes agree that the following procedures will be followed for tribal notification and consultation and for the treatment and disposition of all Native American human remains and cultural items that are inadvertently discovered or excavated on lands administered by Fort Carson.

Definitions

For the purposes of this agreement, the following definitions apply:

- *Cultural affiliation* means "that there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian Tribe or Native Hawaiian organization and an identifiable earlier group. Cultural affiliation is established when the preponderance of the evidence, based on geographical, kinship, biological, archeological linguistic, folklore, oral tradition, historical evidence, or other information or expert opinion, reasonably leads to such a conclusion" [43 C.F.R. 10.2(e)].
- *Cultural items* means, collectively, human remains, associated and unassociated funerary objects, sacred objects, and objects of cultural patrimony [25 U.S.C. 3001].
- *Federally recognized tribe* means any tribe, band, nation, or other organized Indian group or community of Indians which is recognized as eligible for special programs and services provided by the United States to Indians because of their status as Indians. Such acknowledged or *federally recognized* Indian tribes exist as unique political entities in a government-to-government relationship with the United States.
- *Funerary objects* mean "items that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed intentionally at the time of death or later with or near individual human remains." [43 C.F.R. 10.2(d)(2)]. *Associated funerary objects* are "those funerary objects for which the human remains with which they were placed intentionally are also in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(i)]. *Unassociated funerary objects* are "those funerary objects for which the human remains with which they were placed intentionally are nor in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(ii)].
- *Human remains* means the "physical remains of a human body, including but not limited to bones, teeth, hair, ashes, or mummified or otherwise preserved soft tissues, of a person of Native American ancestry. For the purposes of determining cultural affiliation, human remains incorporated into a funerary object, sacred object, or object of cultural patrimony, as defined below, must be considered as part of that item" [43 CFR 10.2(d)(1)].
- *Inadvertent discovery* means "the unanticipated encounter or detection of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(d)" of NAGPRA [43 C.F.R. 10.2(g)(4)].
- *Intentional excavation* means "the planned archeological removal of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(c)" of NAGPRA [43 C.F.R. 10.2(g)(3)].
- *NAGPRA SOP* is the *Fort Carson NAGPRA Standard Operating Procedures*, appended to this agreement.
- *Objects of cultural patrimony* means "items having ongoing historical, traditional, or cultural importance central to the Indian Tribe or Native Hawaiian organization itself, rather than property owned by an individual tribal or organization member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal or organization member. Such objects must have been considered inalienable by the culturally affiliated Indian Tribe or Native Hawaiian organization at the time the object was separated from the group" [43 C.F.R. 10.2(d)(4)].
- *Sacred objects* means "items that are specific ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents. While many items, from ancient pottery sherds to arrowheads, might be imbued with sacredness in the eyes of an individual, these regulations are specifically limited to objects that were devoted to a traditional Native American religious ceremony or ritual and which have religious significance or function in the continued observance or renewal of such ceremony" [43 C.F.R. 10.2(d)(3)].

Article I: Inadvertent Discovery of Human Remains

A. In the event of an inadvertent discovery of human remains or cultural items on lands administered by Fort Carson, Fort Carson will follow the procedures outlined in the NAGPRA Standard Operating Procedures (SOP - Appendix A).

B. All inadvertently discovered human remains that are not associated with a crime scene shall be analyzed *in situ* by means of non-destructive analysis to potentially determine cultural affiliation. Non-destructive analysis shall consist of direct physical measurement of the material, preceded, if necessary, by cleaning with a non-corrosive solution that does not damage or alter the material or object. Fragments or samples of the material shall not be taken. A qualified professional physical anthropologist or archeologist shall conduct such analysis. Other methods of analysis shall be conducted only upon consultation with the Tribes.

C. All inadvertently discovered cultural items associated with human remains shall be analyzed *in situ* and shall not be removed from their context. Other methods of analysis shall be conducted only upon consultation with the Tribes.

D. In the event that lineal descendants and cultural affiliation cannot be determined based on preliminary analysis, the signatory Tribes to this agreement, based on aboriginal occupation and use of Fort Carson lands, shall hereby claim joint ownership of the human remains and/or cultural items. Other notified Tribes not party to this agreement will have sixty (60) days within which to claim ownership.

E. The Tribes claiming ownership shall, among themselves, determine which Tribe will act as the lead in the disposition of the human remains and/or cultural items depending upon the particular circumstances of the case. If a lead cannot be determined, Fort Carson will follow the dispute resolution procedures outlined in the NAGPRA SOP (Section 6.0), and the matter may be put before the NAGPRA Review Committee.

Article II: Archeological or Other Investigation That May Result in the Discovery of Human Remains or Cultural Items

A. If Fort Carson proposes to undertake an archeological investigation or other activity that has a high probability to result in the discovery of Native American human remains, NAGPRA points-of-contact for the consulting Tribes shall be notified. Fort Carson shall consult with the Tribes (allowing for a thirty (30)-day period for response from the Tribes) to ensure that the scope of work for the investigation or activity addresses the concerns of the Tribes.

B. High probability for the discovery of Native American human remains or burial items will be determined by the Fort Carson Cultural Resources Manager based on whether the scope of work for the planned investigation or activity indicates that excavation is proposed in areas in which Native American cultural resources are likely to occur.

C. In the event of the discovery of human remains or cultural items during a planned investigation, all activity within a 30 meter radius of the remains shall stop, and the Fort Carson CRM will follow the procedures for consultation outlined in the NAGPRA SOP.

D. Analysis to determine cultural affiliation will be conducted *in situ* as stipulated in Article I of this agreement.

E. In the event that lineal descendants and cultural affiliation cannot be determined based on preliminary analysis, the signatory Tribes to this agreement, based on aboriginal occupation and use of Fort Carson lands, shall hereby claim joint ownership of the human remains and/or cultural items. Other notified Tribes not party to this agreement will have sixty (60) days within which to claim ownership.

F. The Tribes claiming ownership shall, among themselves, determine which Tribe will act as the lead in the disposition of the human remains and/or cultural items depending upon the particular circumstances of the case. If a lead cannot be determined, Fort Carson will follow the dispute resolution procedures outlined in the NAGPRA SOP (Section 6.0), and the matter may be put before the NAGPRA Review Committee.

Article III: Access

A. In accordance with the American Indian Religious Freedom act of 1978, as amended, it is the policy of Fort Carson to accommodate requests by the Tribes for access to Fort Carson and the Pinon Canyon Maneuver Site to carry out their traditional and accustomed beliefs and practices when such access will not interfere with the military mission.

B. Tribes interested in visiting for ceremonial or other purposes shall submit a written request to the CRM at least forty-five (45) days in advance of their visit. Requests may be made via mail or e-mail. The CRM may be contacted at:

Department of Army
Directorate of Environmental Compliance and Management
ATTN: Pamela Cowen, Cultural Resources Manager
1638 Elwell St. – Bldg. 6236
Fort Carson, CO 80913-4356
pamela.cowen@carson.army.mil

C. Requests must come from the federally recognized tribal government, either via the tribal chairperson, a NAGPRA representative, or an authorized cultural or spiritual representative.

D. Depending on the circumstances, visitors may need to be escorted on site by Fort Carson personnel.

E. Tribal use of plants or other natural resources under the stewardship of Fort Carson for ceremonial or traditional purposes must be coordinated with the CRM and approved by the Director, DECAM.

Article IV: Privacy and Information Sharing

A. Fort Carson shall not provide details of any discovered human remains or cultural items to any media, agency, organization or individual, public or private, with the exception of other federally recognized tribes that may express interest. If it is determined that other parties need to be informed, information may be released upon the approval of all consulting parties.

B. Fort Carson shall not provide details of traditional cultural properties, sacred sites, or other resources of cultural significance to the Tribes to any outside media, agency, organization or individual, public or private, with the exception of Colorado State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP). If it is determined that other parties need to be informed, information may be released upon the approval of all consulting parties.

C. Both the Tribes and Fort Carson shall comply with the confidentiality provisions of the Archeological Resources Protection Act (ARPA) in 16 U.S.C. 470hh.

D. The Tribes may contact the Fort Carson CRM at any time to request information on cultural resources management activities.

E. Per Section 106 of the National Historic Preservation Act of 1966, as amended, the Tribes will be included in review of Fort Carson undertakings with potential to affect historic properties of cultural significance to the Tribes.

F. Subject to any applicable laws to the contrary, the Tribes may obtain copies of any Fort Carson cultural resources reports of investigations upon request, provided that requests do not exceed the photocopying capacity of the program.

Article V: Terms of the Agreement

A. This agreement shall become binding upon a party when it is signed by an authorized representative of that party. Each party warrants that it has the requisite authority to execute, deliver, and consummate the stipulations this agreement.

B. Any party may terminate its participation in this agreement by providing thirty (30) days written notice to the other parties.

C. This agreement shall remain in effect so long as Fort Carson and at least one Tribe remain as participants under it.

D. Any party to this agreement may propose in writing that it be amended, whereupon the parties will consult to consider such an amendment.

Anti-Deficiency Act Statement

All commitments made under this agreement are subject to the availability of funds. Nothing in this agreement will be construed as limiting or affecting the legal authorities of the U.S. Army or the Tribes as binding upon the parties to assume or expend funds in excess of available appropriations.

Signatures:

16Nov04

THOMAS L. WARREN — Date
Director
Environmental Compliance and Management
Fort Carson, Colorado

16Nov04

MICHAEL RESTY JR. — Date
COL, CM
Garrison Commander
Fort Carson, Colorado

6-6-05

~~ALONZO CHALEPAH~~ — Date
Chairman
Apache Tribe of Oklahoma

GILBERT BRADY — Date
NAGPRA Representative
Northern Cheyenne Tribe

11-16-04

JOE BIG MEDICINE — Date
Southern Cheyenne NAGPRA Representative
Cheyenne and Arapaho Tribes of Oklahoma

5/18/05

ALVIN SLOW BEAR — Date
NAGPRA Representative
Oglala Sioux Tribe of the Pine Ridge Reservation

William Lee Pedro 11-16-04

WILLIAM LEE PEDRO — Date
Southern Arapaho NAGPRA Representative
Cheyenne and Arapaho Tribes of Oklahoma

DELPHINE CLAIR — Date
NAGPRA Representative
Shoshone Tribe (Eastern Band)

6-7-05

WALLACE COFFEY — Date
Chairman
Comanche Nation of Oklahoma

Neil Buck Cloud 5-6-05

NEIL BUCK CLOUD — Date
NAGPRA Coordinator
Southern Ute Indian Tribe

Billy Evans Horse 16Nov04

BILLY EVANS HORSE — Date
Chairman
Kiowa Tribe of Oklahoma

NAGPRA Rep

Robert J. Goggles 11-16-04

ROBERT J. GOGGLES — Date
NAGPRA Representative
Northern Arapaho Tribe

TERRY KNIGHT SR. — Date
NAGPRA Representative
Ute Mountain Ute Tribe

FORT CARSON

NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT (NAGPRA) STANDARD OPERATING PROCEDURES (SOP)

1.0 INTRODUCTION

a. Fort Carson is engaged in continuing archeological survey and evaluation of cultural resources on Fort Carson and the Pinon Canyon Maneuver Site (PCMS).

1) Approximately 55% of installation lands have been surveyed (as of October 2002).
2) A total of 5,616 archeological sites have been identified on Fort Carson and the PCMS.
3) A total of 861 sites have been determined eligible for inclusion in the National Register of Historic Places.
4) Prehistoric sites number 4,258; historic sites number 890. A total of 468 are multi-component, *i.e.* have both prehistoric and historic components.

b. Models of site location probability indicate that the lands remaining to be surveyed are likely to contain additional sites and National Register eligible properties. The studies conducted to date indicate that human burials are rare but do occur on Fort Carson administered lands.

c. This SOP is an integral feature of the Fort Carson *Integrated Cultural Resources Management Plan, 2002-2006* (ICRMP), an internal planning document guiding cultural resources management on Fort Carson and the PCMS. This SOP supercedes the interim NAGPRA SOP in Section 6.4 of the ICRMP.

d. Appended to these procedures are:

1) Appendix A: a list of applicable legislation, executive orders, and Presidential memoranda.
2) Appendix B: a template for notification of the Garrison Commander and Indian Tribes.
3) Appendix C: a list of official tribal contacts.

2.0 DEFINITIONS: Reference: Native American Graves Protection and Repatriation Act 25 U.S.C. 3001, Sec. 2, unless indicated otherwise.

- *Burial site* means "any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which as a part of the death rite or ceremony of a culture, individual human remains are deposited, and includes rock cairns or pyres which do not fall within the ordinary definition of grave site" [43 C.F.R. 10.2(d)(2)].
- *Cultural affiliation* means "that there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian Tribe or Native Hawaiian organization and an identifiable earlier group. Cultural affiliation is established when the preponderance of the evidence, based on geographical, kinship, biological, archeological linguistic, folklore, oral tradition, historical evidence, or other information or expert opinion, reasonably leads to such a conclusion" [43 C.F.R. 10.2(e)].
- *Cultural objects* specifically refers to associated funerary objects, sacred objects, and objects of cultural patrimony.
- *Funerary objects* means "items that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed intentionally at the time of death or later with or near individual human remains." [43 C.F.R. 10.2(d)(2)]. *Associated funerary objects* are "those funerary objects for which the human remains with which they were placed intentionally are also in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(i)]. *Unassociated funerary objects* are "those funerary objects for which the human remains

with which they were placed intentionally are nor in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(ii)].

- *Human remains* means the "physical remains of a human body, including but not limited to bones, teeth, hair, ashes, or mummified or otherwise preserved soft tissues, of a person of Native American ancestry. For the purposes of determining cultural affiliation, human remains incorporated into a funerary object, sacred object, or object of cultural patrimony, as defined below, must be considered as part of that item" [43 CFR 10.2(d)(1)].
- *Inadvertent discovery* means "the unanticipated encounter or detection of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(d)" of NAGPRA [43 C.F.R. 10.2(g)(4)].
- *Indian Tribe* means "any tribe, band, nation, or other organized group or community of Indians, including any Alaska Native village or corporation as defined in or established by the Alaska Native Claims Settlement Act [43 U.S.C. 1601 et seq.], which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians" [43 C.F.R. 10.2(b)(2)].
- *Intentional excavation* means "the planned archeological removal of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(c)" of NAGPRA [43 C.F.R. 10.2(g)(3)].
- *Objects of cultural patrimony* means "items having ongoing historical, traditional, or cultural importance central to the Indian Tribe or Native Hawaiian organization itself, rather than property owned by an individual tribal or organization member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal or organization member. Such objects must have been considered inalienable by the culturally affiliated Indian Tribe or Native Hawaiian organization at the time the object was separated from the group" [43 C.F.R. 10.2(d)(4)].
- *Sacred objects* means "items that are specific ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents. While many items, from ancient pottery sherds to arrowheads, might be imbued with sacredness in the eyes of an individual, these regulations are specifically limited to objects that were devoted to a traditional Native American religious ceremony or ritual and which have religious significance or function in the continued observance or renewal of such ceremony" [43 C.F.R. 10.2(d)(3)].
- *Tribal contacts* means the Indian Tribes listed in Appendix C.

3.0 POLICY

a. The Garrison Commander will ensure compliance with the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) [25 U.S.C. 3001-3013, 43 C.F.R. 10]. The Garrison Commander-appointed Cultural Resources Manager (CRM) (Directorate of Environmental Compliance and Management, DECAM) will coordinate with the Staff Judge Advocate (SJA), Criminal Investigation Division (CID), Provost Marshal's Office (PMO), Directorate of Planning, Training and Mobilization (DPTM), and Master Planning (Directorate of Public Works, DPW) to ensure that the CRM is:

1) incorporated in the planning of training and construction in order to assess the potential for the discovery of Native American burials and archeological sites, and
2) identified as the point-of-contact to be notified immediately if a Native American burial or archeological site is inadvertently discovered on installation property.

4.0 PROCEDURES: Reference: NAGPRA 25 U.S.C. 3002 Sec. 3(d), 43 C.F.R. 10.

4.1 Contingency 1: Inadvertent Discovery of Native American Human Remains and Associated Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony
4.1.1. Discovery, Preliminary Assessment, Protection, and Verification

a. Upon discovery of known or suspected human remains or cultural objects on Fort Carson administered lands, all activity within a 30 meter radius of the remains shall stop, no material shall be moved or removed, the area shall be secured, and the Director DECAM ((719) 526-2022) and the CRM ((719) 526-3806) shall be notified immediately. Dig permits and contracts for archeological investigations or construction on installation lands include the requirement to notify the CRM immediately upon discovery of human remains or cultural objects.

b. When notified of the possible discovery of human remains or cultural objects, the CRM will visit the site within twenty-four (24) hours of the notification of discovery. The CRM will make an initial determination whether the remains or objects meet the criteria defined in NAGPRA.

c. If upon examination the remains appear to be human and associated with a crime scene, the CRM will ensure that the Provost Marshal's Office (PMO) and the Criminal Investigation Division (CID) are notified. The CID will assume custody of the area.

d. If upon examination the remains are identified as non-human, the CRM will determine if archeological contexts are present that need to be evaluated pursuant to Section 106 of the National Historic Preservation Act [16 U.S.C. 470-470w].

e. If the remains are determined to be non-Native American (e.g. Caucasian, African American, or Asian American) and not associated with a crime, then NAGPRA will not apply and requirements of this SOP will be complete.

f. If the remains are determined to be Native American and not associated with a crime, the CRM will prepare a preliminary report outlining the circumstances of the discovery, description of the site and/or context of the remains, a description of the remains and objects, and an evaluation of their antiquity and significance.

1) The human remains and cultural objects will be evaluated *in situ* and only descriptive analysis will be permitted at this time.
2) The CRM may consult with a qualified physical or forensic anthropologist if necessary.
3) The site will be protected by temporary fencing and signing as "Off Limits." Stabilization or covering may be employed if necessary.

g. If preliminary assessment is inconclusive, the CRM will assume Native American affiliation and proceed as described below.

4.1.2 Notification of the Responsible Federal Agency Official (Garrison Commander) [43 C.F.R. 10.4]

a. Upon confirmation of the discovery of Native American human remains and cultural objects, the CRM will immediately notify the Garrison Commander or his/her official designee by the most expeditious means. This notification will be followed within 48 hours by a Memorandum of Notification, a written notification that summarizes the results of the field evaluation and a plan to deal with the consultation tasks and disposition of the discovered objects. A template for the Memorandum of Notification is provided as Appendix B.

b. No later than 48 hours after receipt of the Memorandum of Notification from the CRM, the Garrison Commander or his/her official designee will forward to the CRM confirmation that he/she has received the notification.

4.1.3 Notification of Native American Tribes

a. Within three (3) working days after receipt of confirmation from the Garrison Commander of receipt of the Memorandum of Notification, the CRM shall notify culturally affiliated Indian Tribes of the discovery. Notification will be by telephone and by forwarding a notification packet by certified mail. The notification packet will include:

1) the Memorandum of Notification, this time signed by the Garrison Commander;
2) the report of the preliminary analysis of cultural affiliation; and
3) a proposed time and place for consultation and which other Indian Tribes are being notified.

b. The notification packet shall be sent to the tribal chairpersons and a copy furnished to the designated tribal NAGPRA coordinators.

c. Decisions on which Indian Tribes to notify will be based on information in the Native American contacts list appended to this SOP [Appendix C].

4.1.4 Native American Consultation

a. After the notification packet has been sent to the Tribes or review, the CRM will continue to consult with the Tribes. Representatives of Indian Tribes may decide to visit the site.

b. The Garrison Commander will notify the Installation Management Agency Northwest Region (IMA NWR), POC Rick Sharp, regarding the details of the case.

Determining Custody

c. An Indian Tribe that wishes to make a claim of ownership of human remains or cultural objects must be able to demonstrate an affiliation by a preponderance of evidence according to the criteria for the priority of custody specified in 25 U.S.C. 3002, Sec.3(a) and 43 C.F.R. 10.6.

d. Priority of ownership or control of Native American human remains and cultural objects is: [For details, see 25 U.S.C. 3002, Sec. 3(a)(1)-(2), 43 C.F.R. 10.6]

1) Lineal descendants, as determined pursuant to 43 C.F.R. 10.14(b).
2) Indian Tribe land owner.
3) Culturally affiliated Indian Tribe, as determined pursuant to 43 C.F.R. 10.14.
4) Indian Tribe recognized as the aboriginal owners of the land by a final judgment of the Indian Claims Commission or the United States Court of Claims.
5) Indian Tribe aboriginally occupying the land.
6) Indian Tribe with the strongest demonstrated cultural relationship.
7) Unclaimed.

e. If a single, legitimate claimant cannot be identified, signatories to the NAGPRA Comprehensive Agreements will claim custody of the human remains or cultural objects as allowed for in the agreements. Consultation will continue to consider treatment and disposition.

Plan of Action

f. Consultation must result in a written plan of action in accordance with 43 C.F.R. 10.5(e) between the appropriate Indian Tribes and the Garrison Commander.

1) Development, review, and signature of the plan of action will follow Army protocol specified in AR 200-4 (paragraph 3-3).
2) The CRM may prepare the written plan of action.
3) The Garrison Commander or his/her official designee will approve and sign the plan of action.
4) Copies of the written plan of action will be provided to the consulting Indian Tribes.

g. Information to be gained during the consultation that should be included in the plan of action include the following.

1) Kinds of material to be considered as cultural objects pursuant to 43 C.F.R. 10.2(b).
2) Specific information used to determine custody pursuant to 43 C.F. R. 10.6.
3) Treatment, care, and handling of human remains and cultural objects.
4) Archeological recording of the human remains and cultural objects.
5) Kinds of analysis for identification of human remains and cultural objects.
6) Kind(s) of traditional treatment(s) to be afforded the human remains or cultural objects.
7) Nature of the reports to be prepared.
8) Disposition of human remains and cultural objects in accordance with 43 C.F.R. 10.6.
9) Steps to be followed to contact Indian Tribe officials if there is a future inadvertent discovery or before any intentional excavation of human remains or cultural objects.

h. If no agreement can be reached, refer to dispute resolution in Section 6.0 of this SOP.

1) Unclaimed Native American human remains and cultural objects shall be treated in accordance with the regulations developed by the NAGPRA Review Committee.

4.1.5 Treatment and Disposition of Native American Human Remains, Associated Funerary Objects, Sacred Objects, and Objects of Cultural Patrimony

a. The treatment and disposition of Native American human remains and cultural objects recovered from Fort Carson administered lands will follow the plan of action developed through consultation with Indian Tribes (see above).

b. If the human remains or cultural objects have been removed from their context, they will be maintained in a safe and secure manner agreeable to the consulting parties as required by 43 C.F.R. 10.6(c) and 10.15 until the plan of action is implemented.

Publishing Notice

c. Following 43 C.F.R. 10.6(c), prior to the disposition of human remains and cultural objects to the lineal descendants or the apparent most closely affiliated Indian Tribe/s, the Garrison Commander or his/her official designee must publish notices of the proposed disposition in a newspaper of general circulation in the area in which the human remains and cultural objects were discovered and in which the lineal descendants or affiliated Indian Tribe/s currently reside.

1) The notice must provide information as to the nature and affiliation of the human remains, funerary objects, sacred objects, or objects of cultural patrimony and solicit further claims to custody.
2) The consulting Indian Tribes may review the content of the notice before its publication.
3) Privileged information should not be included in the notice.
4) The notices must be published twice, at least a week apart. A copy of the notice and information on when and in what newspaper/s the notice was published must be sent to the Departmental Consulting Archeologist, Department of the Interior.

Disposition

d. Per 43 C.F.R. 10.6(c), the disposition of human remains and cultural objects must not take place until at least thirty days after the publication of the second notice to allow time for any additional claimants to come forward.

e. If, during the period of publication, additional claimants come forward and the Garrison Commander or his/her designee is unable to determine which claimant is entitled to custody, proceed to Section 6.0, *Dispute Resolution*, of this SOP.

f. Fort Carson will provide an opportunity for appropriate tribal religious ceremony or ceremonies pursuant to the American Indian Religious Freedom Act (AIRFA) [42 U.S.C. 1996-1996a] and E.O. 13007 for burial site restoration and/or re-internment.

4.1.6 Resumption of Activity [43 C.F.R. 10.4(d)(2)]

a. The activity that resulted in the inadvertent discovery of Native American human remains or cultural objects may resume thirty (30) days after certification by the Commanding of the receipt of the Memorandum of Notification, if otherwise lawful.

b. Activity may resume before that time if there is a written plan of action approved by consulting parties that outlines steps for stabilization and protection of the site with no removal of human remains and cultural objects, excavation or removal of the human remains or cultural objects in accordance with 43 C.F.R. 10.3, or their disposition to lineal descendants or Indian Tribe/s with priority of custody as defined in 25 U.S.C. 3002, Sec. 3(a) and 43 C.F.R. 10.6.

4.2 Contingency 2: Intentional Archeological Excavation That May Result in the Discovery of Native American Human Remains, Associated Funerary Objects, Sacred Objects, and Objects of Cultural Patrimony

a. Archeological excavations or other investigations that have a high potential to result in the discovery or removal of Native American human remains, associated funerary objects, sacred objects, or objects of cultural patrimony are permitted only after:

1) Issuance of a permit pursuant to the Archaeological Resources Protection Act [16 U.S.C. 470aa-470ll], if applicable, and
2) Consultation with potential culturally affiliated Indian Tribes to establish provisions for the identification, treatment, and disposition of Native American human remains and cultural objects and meet the requirements of 43 C.F.R. 10.5., and
3) For sites determined eligible for the National Register of Historic Places, compliance with Section 106 of the National Historic Preservation Act [16 U.S.C. 470-470w].

b. Before issuing any approvals or permits for excavations that may result in the discovery of Native American human remains or cultural objects, the CRM must provide written notification signed by the Garrison Commander or his designee to the Indian Tribes listed in Appendix C.

c. The notice to the Indian Tribes of planned excavations must describe the planned activity, its general location, the basis for the determination that human remains and cultural objects may be encountered during excavation, and the basis for the determination of likely custody pursuant to 43 C.F.R. 10.6.

d. If no response is received in fifteen (15) days from a written notification, a follow-up telephone call will be made by the CRM.

e. The CRM will then consult with the Tribes to ensure that the scope of work for the investigation or activity addresses the concerns of the Tribes.

f. In the event of the discovery of human remains or cultural items during the excavation, the CRM will follow the procedures set forth in Section 4.1 of this SOP.

5.0 TIME CONFLICTS

On those occasions when Fort Carson or the Indian Tribe(s) are unable to meet their commitments pertaining to time schedules for any activity specified herein, the party that is unable to meet the schedule will notify the other party as soon as physically possible to reschedule the activities to the mutual satisfaction of both parties. Emergency actions will be coordinated by telephone or FAX.

6.0 DISPUTE RESOLUTION

a. All disputes regarding the cultural affiliation of discovered human remains and/or cultural objects shall be resolved in accordance with Sections 3 and 7(e) of NAGPRA and the implementing regulations 43 C.F.R. 10.

b. Should any interested Indian Tribe make a conflicting claim of cultural affiliation or dispute the methods of treatment or disposition of human remains and/or cultural objects as delineated herein, the Garrison Commander will notify the Installation Management Agency Northwest Region, POC Rick Sharp, and the Army Environmental Center (AEC).

c. Fort Carson will continue consultation with the disputing parties, suggest that the disputing parties seek resolution among themselves, and, if the disputing parties concur, go before the NAGPRA Review Committee which is given the authority under 25 U.S.C 3006, Sec. 8(c)(4) and 43 C.F.R. 10.16 and 10.17 to make recommendations on the resolution of disputes.

d. If, upon receipt of the recommendations of the Review Committee, the most appropriate claimant still cannot be determined, Fort Carson shall retain the disputed remains or cultural objects until the question of custody is resolved, as stated in 43 C.F.R. 10.15(a)(2).

7.0 ADDITIONAL PARTIES

a. Interested Indian Tribes claiming lineal descent or cultural affiliation may join these procedures at any time should they express a desire to do so.

b. In accordance with 43 C.F.R. 10.15 (a)(1), if an interested party fails to make a written claim prior to the time human remains and cultural objects are duly repatriated or disposed of to a claimant in accordance with 43 C.F.R. 10, the interested party is deemed to have irrevocably waived any right to claim such items pursuant to these regulations.

APPENDIX A to NAGPRA SOP

MANDATES

FEDERAL STATUTES
American Indian Religious Freedom Act of 1978, as amended, 42 U.S.C. 1996-1996a
Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa-470ll
Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001-3013
National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321-4370c
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470w

FEDERAL REGULATIONS

32 C.F.R. 229	Protection of Archeological Resources
36 C.F.R. 60	National Register of Historic Places
36 C.F.R. 63	Determinations of Eligibility for Inclusion in the National Register of Historic Places
36 C.F.R. 78	Waiver of Federal Agency Responsibility under Section 110 of the National Historic Preservation Act
36 C.F.R. 800	Protection of Historic Properties
40 C.F.R. 1500-1508	Regulations Implementing the National Environmental Policy Act
43 C.F.R. 7	Protection of Archaeological Resources
43 C.F.R. 10	Native American Graves Protection and Repatriation Act Regulations

EXECUTIVE ORDERS

E.O. 11593	Protection and Enhancement of the Cultural Environment
E.O. 13007	Indian Sacred Sites
E.O. 13175	Consultation and Coordination with Indian Tribal Governments, November 6, 2000

ARMY REGULATIONS
Army Regulation (AR) 200-4, Cultural Resources Management, 1 October 1998
Army Pamphlet 200-4, Cultural Resources Management, 1 October 1998

APPENDIX B to NAGPRA SOP

TEMPLATE FOR
MEMORANDUM OF NOTIFICATION OF THE GARRISON COMMANDER

1. PURPOSE:

a. To notify the Garrison Commander that Native American human remains and/or cultural objects have been inadvertently discovered on Fort Carson or the PCMS.

b. Recommend an action plan that implements requirements of the Native American Graves Protection and Repatriation Act (NAGPRA) [25 U.S.C. 3001-3013, 43 C.F.R. 10], outlined in the NAGPRA Standard Operating Procedures.

c. Request certification of this notification by the Garrison Commander to be forwarded directly to the CRM.

2. SITUATION:

a. Describe circumstances of discovery: by whom, where, and how were Native American human remains and/or cultural objects discovered on the installation.

b. Describe discovered items: condition and contents of the burial, including any grave goods; the primary and secondary context of the remains and any artifacts, including site location described according to standard Fort Carson archeological practice; probable antiquity and significance of the remains and/or cultural objects.

3. ACTION PLAN

a. Continue to protect the site.

b. Mention that the CRM must receive confirmation of receipt of the Memorandum of Notification within forty-eight (48) hours.

c. Notify the Indian Tribes listed in Appendix C of the discovery by telephone and written report within three working days after receipt of confirmation from the Garrison Commander.

d. Inform each notified Indian Tribe of the names of the other Indian Tribes being consulted.

e. Consult with the Indian Tribes regarding the cultural affiliation, treatment, and disposition of the remains and/or objects.

f. Document the decisions made as a result of consultation in a written plan of action or as specified in Section 4.1 of this SOP.

g. Carry out treatment and disposition of remains and/or objects as agreed upon in consultations according to the process outlined in Section 4.1 of this SOP.

APPENDIX C to NAGPRA SOP

TRIBAL CONTACTS

Apache Tribe of Oklahoma
Mr. Alonzo Chalepah, Chairman
Apache Tribe of Oklahoma
P.O. Box 1220
Anadarko, OK 73005
(405) 247-9493 fax-2686

Cheyenne and Arapaho Tribes of Oklahoma
Mr. Robert Tabor, Chairman
Cheyenne and Arapaho Tribes of Oklahoma
P.O. Box 38
Concho, OK 73022
(405) 262-0345 fax - 422-1184

Mr. Joe Big Medicine, Southern Cheyenne NAGPRA Representative
620 South Wengle Ave.
Watonga, OK 73772
(580) 623-5052

Mr. Lee Pedro, Southern Arapaho NAGPRA Representative
P.O. Box 41
Concho, OK 73022
(405) 422-1725

Mr. Alonzo Sankey, Southern Arapaho NAGPRA Representative
P.O. Box 836
Canton, OK 73724
(580) 886-2984

Mr. Gordon L. Yellowman, Sr., Southern Cheyenne NAGPRA Representative
(405) 262-4794 *205 fax - 4865

Comanche Nation of Oklahoma
Mr. Wallace Coffey, Chairman
Comanche Nation of Oklahoma
P.O. Box 908
Lawton, OK 73502
(580) 492-3751 fax - 3796

Office of Environmental Programs
Comanche Nation of Oklahoma
P.O. Box 908
Lawton, OK 73502
(580) 492-3754
fax – (580) 492-3733
cnoep@tds.net

Jicarilla Apache Nation
Levi Pasata, President
Jicarilla Apache Nation
P.O. Box 507
Dulce, NM 87528
(505) 759-3242 fax - 3005

Lorene Willis
NAGPRA Coordinator
Jicarilla Culture Center
P.O. Box 507
Dulce, NM 87528
(505) 759-1343 fax – 1342
mlorene@juno.com

Kiowa Tribe of Oklahoma
Mr. Billy Evans Horse, Chairman
Kiowa Tribe of Oklahoma
P.O. Box 369
Carnegie, OK 73015
(580) 654-2300 fax - 2188

(Rev.) George Daingkau, NAGPRA Representative
Kiowa Tribe of Oklahoma
P.O. Box 369
Carnegie, OK 73015
(580) 654-2300 fax - 2188
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Northern Arapaho Tribe
Mr. Anthony A. Addison, Sr., Chairman
Northern Arapaho Business Council
P.O. Box 396
Fort Washakie, WY 82514
(307) 332-6120 *835 fax - 3055

Mr. Robert J. (Bobby Joe) Goggles
Northern Arapaho NAGPRA Coordinator
Box 54 Star Route
Arapahoe, WY 82510
work - (888) 822-5940
fax – (307) 857 - 5932
home – (307) 332-9175

Northern Cheyenne Tribe
Ms. Geri Small, President
Northern Cheyenne Tribe
P.O. Box 128
Lame Deer, MT 59043
(406) 477-6284 fax - 6210

Gilbert Brady, NAGPRA Representative (Northern Cheyenne Culture Commission)
(406) 477-6035

Oglala Sioux Tribe of the Pine Ridge Reservation
Mr. John Yellow Bird Steele, President
Oglala Sioux Tribe of the Pine Ridge Reservation
P.O. Box H
Pine Ridge, SD 57770
(605) 867-5821 fax - 1788

Vance Blacksmith, NAGPRA Coordinator

Shoshone Tribe (Eastern Band)
Mr. Ivan Posey, Chairman
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514

Mr. Delpine Clair and Mr. Haman Wise, NAGRPA Representatives
Shoshone Tribe
P.O. Box 538
Fort Washakie, WY 82514
(307) 332-5832 fax – 2074

Southern Ute Indian Tribe
Mr. Howard Richards, Sr., Chairperson
Southern Ute Indian Tribe
P.O. Box 737
Ignacio, CO 81137
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Mr. Neil Cloud, NAGPRA Coordinator
Southern Ute Indian Tribe
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Ute Mountain Ute
Mr. Harold Cuthair, Acting Chair
Ute Mountain Ute Tribe
General Delivery
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Mr. Terry Knight Sr., NAGPRA Representative
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APPENDIX H

SOCIOECONOMICS ECONOMIC IMPACT FORECAST SYSTEM

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H. Socioeconomics Economic Impact Forecast System

H.1. Analysis of Socioeconomic Effects For Grow the Army (GTA) at Fort Carson

H.1.1. Introduction

The socioeconomic analysis requirements of NEPA have been established over the years through successful early NEPA litigation ("McDowell vs Schlesinger", US District Court, Western District of Missouri, Western Division, No. 75-CV-234-W-4 [June 19, 1975] and "Breckinridge vs Schlesinger", US District Court, Eastern District of Kentucky, No. 75-100 [October 31,1975]), as well as the practical need for communication and collaboration with affected communities. The social and economic effects of BRAC actions are especially relevant and important, as these issues are often the source of community concerns and subsequent controversies.

H.1.2. The Economic Impact Forecast System (EIFS) and the Hierarchical Approach.

H.1.2.1. The Model

The EIFS (Huppertz, Claire E.; Bloomquist, Kim M.; Barbehenn, Jacinda M.; EIFS 5.0 Economic Impact Forecast System, User's Reference Manual; USACERL Technical Report TA-94/03; July 1994.) has been a mainstay of Army NEPA practice since its initial development and implementation in the mid-70s. EIFS provides a mechanism to estimate impacts, and ascertain the "significance" of projected impacts, using the RTV technique. This analysis and determination can be readily documented, and if significance thresholds are not exceeded, the analysis can be completed. EIFS was designed to address NEPA applications, providing a "two-tier" approach to the process; (1) a simple and quick aggregate model (sufficient to ascertain the overall magnitude of impacts) and (2) a more detailed, sophisticated I-O model to further analyze impacts that appear significant, in NEPA terms, and worthy of additional expenditures and analyses. This "two-tier" approach is consistent with the two common levels of NEPA analysis, the EA and the EIS. EIFS has facilitated efficient and effective completion of such analyses for approximately 3 decades.

Complete documentation of the model, its development, and applicable theoretical underpinnings is available in numerous publications:

- Huppertz, Claire E.; Bloomquist, Kim M.; Barbehenn, Jacinda M.; EIFS 5.0 Economic Impact Forecast System, User's Reference Manual; USACERL Technical Report TA-94/03; July 1994.
- Isard, W., Methods of Regional Analysis, MIT Press, 1960.
- Isard, W. and Langford,T., Regional Input-Output Study: Recollections, Reflections, and Diverse Notes on the Philadelphia Experience, MIT Press, 1971.
- Isserman, A., "The Location Quotient Approach to Estimating Regional Economic Impacts", AIP Journal, January, 1977, pp. 33-41.
- Isserman, A., "Estimating Export Activity in a Regional Economy: A Theoretical and Empirical Analysis of Alternative Methods", International Regional science Review, Vol. 5, 1980, pp. 155-184.
- Leigh, R., " The Use of Location Quotients in Urban Economic Base Studies", Land Economics, Vol 46, May, 1970, pp 202-205.
- Mathur, V.K. and Rosen, H.S. , "Regional Employment Multiplier: A new Approach", Land Economics, Vol 50, 1974, pp 93-96.
- Mayer, W. and Pleeter, S., "A Theoretical Justification for the Use of Location Quotients", Regional Science and Urban Economics, Vol 5, 1975, pp 343-355.
- Robinson, D.P., Hamilton, J.W., Webster, R.D., and Olson, M.J., Economic Impact Forecast System (EIFS) II: User's Manual, Updated Edition, Technical Report N-69/ADA144950, U.S. Army Construction Engineering Research Lab (USACERL), 1984.

- Robinson, D.P. and Webster,R.D., Enhancements to the Economic Impact Forecast System (EIFS), Technical Report N-175/ADA142652, USACERL, April, 1984.
- Rogers, Claudia and Webster, Ron, "Qualitative Answers to Quantitative Questions", Impact Assessment, IAIA, Vol.12, No.1, 1999.
- Thompson, W., A Preface to Urban Economics, Johns Hopkins Press, 1965.
- Tiebout, C., The Community Economic Base, New York Committee for Economic Development,1962.
- USACERL, " Methods for Evaluating the Significance of Impacts: The RTV and FSI Profiles"; USACERL EIFS Tutorial; July 1987.
- U.S. Army, Department of the Army, DA Pamphlet 200-2, "Economic Impact Forecast System-User Instructions", 1980.
- U.S. Army, "Base Realignment and Closure "How-To" Manual for Compliance with the National Environmental Policy Act", revised and published as official Department of Army Guidance, 1995.
- U.S. Army, Army Regulation 5-20, "Commercial Activities"
- U.S. Army, Department of the Army, DA Pamphlet 200-2, "Economic Impact Forecast System-User Instructions", 1980
- Webster, R.D.and Shannon, E.; The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts; USACERL Technical Report TR N-49/ADA055561; 1978.
- Webster, R.D., Hamilton, J.W., and Robinson, D.P., "The Two-Tier Concept for Economic Analysis: Introduction and User Instructions", USACERL Technical Report N-127/ADA118855.

These efforts reflect development of a tool for specific NEPA application, following the successful NEPA litigation referenced in the Introduction. As EIFS has been used for Army NEPA analyses, the results of EIFS analyses have been reviewed by stakeholder (affected community) representatives, and, as a result of BRAC application, twice reviewed by the GAO. During such reviews, the analyses and resultant decisions were upheld, and EIFS was lauded as a uniform (non-arbitrary and non-capricious) approach to such requirements. Drawing from a national, uniform database, and using a common, systematic approach, EIFS allowing the improved comparison of project alternatives (the heart of NEPA analysis), and provides comparable analyses across the U.S.

H.1.2.2. NEPA Process Improvement

Since NEPA was implemented, it has been commonly criticized as expensive and time-consuming. While these criticisms have been often justified, the President's CEQ has actively promoted NEPA process improvements; first in the publication of the CEQ NEPA regulations (CEQ, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Reprint, 40 CFR Parts 1500-1508, Executive Office of the President, Council on Environmental Quality, 1992.), and, more recently, through a NEPA anniversary introspective (CEQ, The National Environmental Policy Act: A Study of its Effectiveness After Twenty-five Years, Executive Office of the President, Council on Environmental Quality, January, 1997.) and the formal CEQ NEPA Task Force (CEQ, The NEPA Task Force Report to the Council on Environmental Quality: Modernizing NEPA Implementation; September, 2003.). All three CEQ initiatives call for more "focus" on NEPA documents, eliminating the analyses of minor or unimportant issues, and focusing, instead, on those issues that should be part of an informed agency decision. The use of EIFS, and the "two-tier" approach is consistent with these CEQ recommendations.

H.1.2.3. Determining Significance

While EIFS was being developed, communities began to question the rationale for determining the significance of socioeconomic impacts. USACERL was directed to develop a defensible procedure for such a determination, resulting in the Rational Threshold Value (RTV) technique (Webster, R.D.; and Shannon, E.; The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts; USACERL Technical Report TR N-49/ADA055561; 1978). This technique relies on the yearly BEA time series data on employment, income, and population to evaluate historical trends with in a subject community (region); and uses those trends to measure the "resilience" of the local community to change, or its ability to accommodate such change. This approach has worked well when communicating with affected communities. The combined use of RTV with the EIFS model meet the two pronged approach for significance determinations, intensity and context (CEQ, 1992)

The initial EIFS implementation (USACERL, 1975) included the analysis of numerous variables: business volume, personal income, employment, government revenues and expenditures, income and employment distribution, local housing impacts, regional economic stability, school system impacts, government bond obligations, population, welfare and dependency, social control, and aesthetic considerations. Selection of these variables was based on the predictive capability of forecasting techniques and data availability. Over some 30 years of practice, pragmatism and sufficiency led to the use of sales volume, employment, personal income, and population as indicators of impacts (as a "first tier" approximation of effects). These effects can also be readily evaluated (and significance determined) using the BEA time series data. Population, important in its own right, is also a valuable indicator of other factors (e.g., impact on local government revenues and expenditures, housing, local school systems, and the change in welfare and dependency), as impacts on such variables are driven, to a large extent, by a population change.

Using BEA time series data is used to analyze the four variables for the ROI, the RTV model produces thresholds for assessing the magnitude of impacts. The RTV technique is simple, starting with a straight line between the first year of record and the last year of record for that variable, establishing the average rate of change over time. Then, each yearly deviation from that growth rate is calculated and converted to a percentage. The largest historical changes (both increase and decrease) are used to define significance thresholds. The following figure illustrates the RTV concept:

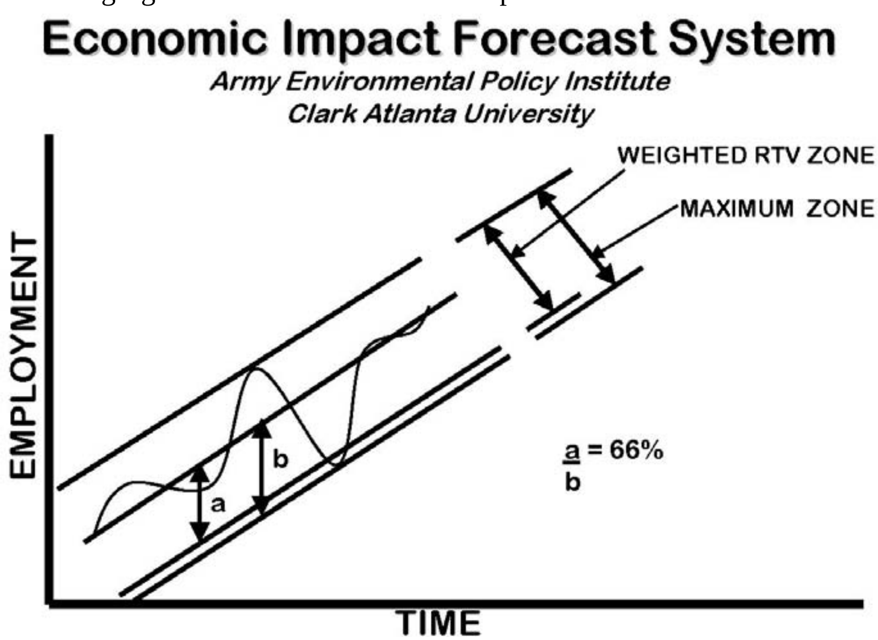


Figure H-1 Visual Depiction of the RTV Technique

A "factor of safety" is applied to negative thresholds, as shown in the figure, to produce a conservative analysis; while 100 percent of the maximum positive thresholds is used; as indicated in Table H-1.

	Increase	Decrease
Total sales volume	100 percent	75 percent
Total employment	100 percent	66 percent
Personal income	100 percent	66 percent
Total population	100 percent	50 percent

The maximum positive historical fluctuation is used because of the positive connotations generally associated with economic growth. While economic growth can produce unacceptable impacts and the "smart growth" concept is increasingly favored, the effects of reductions and closures are usually much more controversial. These adjustments, while arbitrary, are sensible. The negative sales volume threshold is adjusted by 75 percent, as sales volume impacts can be absorbed by such factors as the manipulation of inventory, new equipment, etc; and the impacts on individual workers or proprietors is indirect, if at all. Changes in employment and income, however, are impacts that immediately affect individuals; thus they are adjusted by 66 percent. Population is extremely important, as an indicator of other social issues, and is thus adjusted by 50 percent.

To adjust dollar amounts for inflation (to create "constant dollars" prior to calculations), the CPI is used for appropriate years, and all dollar values are adjusted to 1987 equivalents.

The main strength of the RTV approach stems from its reliance on data for each individual ROI. This approach addressed previous criticism of more simple approaches that applied arbitrary criteria to all communities. This approach establishes unique criteria, representative of local community patterns, and, while a community may not completely agree, a common frame of reference is established. Critics of the RTV technique have questioned the arbitrary selection of the maximum allowable deviations to indicate impact significance, but the process has proven workable over the years.

H.1.2.4. The Application of EIFS to the Proposed Action

To effect these analyses, the inputs to the EIFS model must be estimated. The normal EIFS inputs include:

- Number of affected (moving) civilians and their salaries
- Number of affected (moving) military employees and their salaries
- Percentage of affected military employees living on-post
- Changes in local procurement, contracting, and purchases
- Definition of the multi-county region of influence (ROI)

In the case of the proposed GTA actions at Fort Carson, the EIFS analyses are completed for (1) the Proposed Alternative (the ORCA site) or Alternative 2 (Tent City) and (2) Alternative 1 (TA Bravo). These analyses (two scenarios) are completed for each fiscal year (FY09-FY12). These socioeconomic effects are estimated using a ROI consisting of El Paso, Fremont, and Pueblo counties in Colorado. Only minor civilian changes are anticipated, but are included in the EIFS analyses. The estimated military salary ($37,000) is determined from a detailed analysis of IBCT grade structure, using the same salary for the CAB component. Civilian salaries are estimated at 50,000. Construction estimates are combined for MCA and range construction program plans, allocating expenditures (by FY) over the estimated periods of construction.

These input values were as follows:

Prop Alt 1 and Alt 2	FY09	FY10	FY11	FY12
Increase in military		161	3621	191
Increase in civilians			16	
Construction expenditures	$107.4M	$269.3M	$128.8M	$19.7M
Alt 1				
Increase in military		161	3621	191
Increase in civilians			16	
Construction expenditures	$83.5M	$199.5M	$102.9M	$19.7M

The estimated inputs were used to produce EIFS reports (model results) for changes in total business volume, employment, income, and population. These are best shown as percentages (of the activity in the total ROI), and can be compared to the RTVs for that variable in that ROI. The following EIFS documentation is provided for both scenarios for each fiscal year (The detailed RTV analyses are shown in the first EIFS output); detailing the inputs, documenting projected changes, and evaluating the potential significance of the predicted change, based on the RTV technique:

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternative 2 for FY 09

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$107,400,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$57,189,530	
Sales Volume - Induced	$101,225,500	
Sales Volume - Total	$158,415,000	0.62%
Income - Direct	$11,922,920	
Income - Induced	$21,103,570	

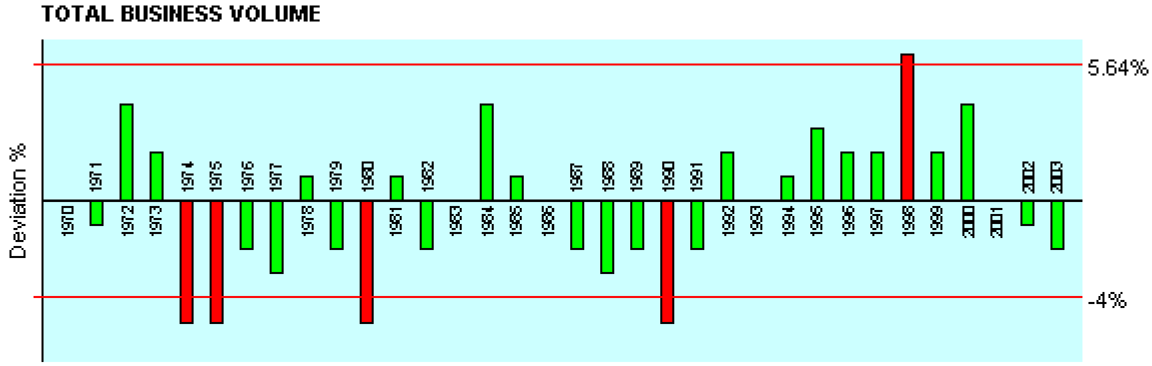
Income - Total	$33,026,480	0.22%
Employment - Direct	380	
Employment - Induced	672	
Employment - Total	1052	0.27%
Local Population	0	
Local Off-base Population	0	0%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

RTV DETAILED

SALES VOLUME

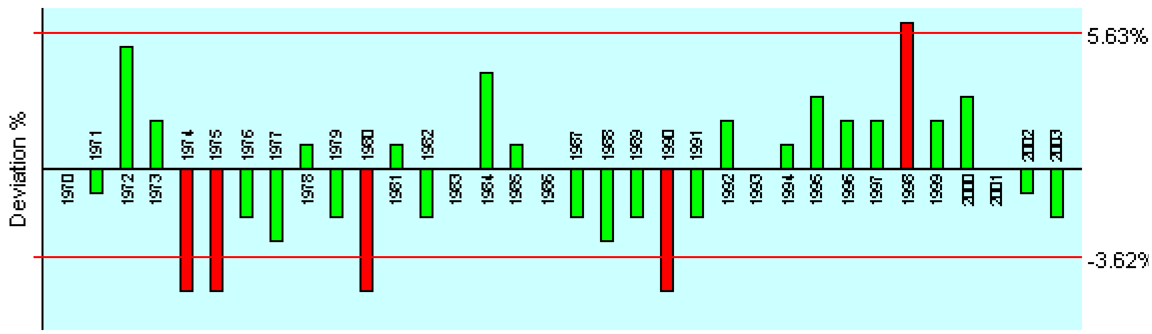


Year	Value	Adj_Value	Change	Deviation	% Deviation
1969	2363070	12429748	0	-934960	0
1970	2685242	13372505	942757	7797	0.06
1971	2976060	14195806	823301	-111659	-0.79
1972	3426442	15830162	1634356	699396	4.42
1973	3943390	17153746	1323584	388624	2.27
1974	4397648	17194804	41057	-893903	-5.2
1975	4794118	17210884	16080	-918880	-5.34
1976	5238588	17811199	600316	-334644	-1.88
1977	5708070	18208743	397544	-537416	-2.95
1978	6509472	19268037	1059294	124334	0.65
1979	7474228	19881446	613409	-321551	-1.62
1980	8482164	19848264	-33183	-968143	-4.88
1981	9846214	20972436	1124172	189212	0.9
1982	10702396	21404792	432356	-502604	-2.35
1983	11520376	22349529	944737	9777	0.04
1984	13092704	24352429	2002900	1067940	4.39
1985	14256596	25661873	1309443	374483	1.46
1986	15126812	26623189	961316	26356	0.1
1987	15915066	27055612	432423	-502537	-1.86
1988	16746320	27296502	240889	-694071	-2.54
1989	17769370	27720217	423716	-511244	-1.84
1990	18333156	27316402	-403815	-1338775	-4.9

1991	19419060	27575065	258663	-676297	-2.45
1992	20993114	28970497	1395432	460472	1.59
1993	22216856	29770587	800090	-134870	-0.45
1994	23959042	31146755	1376168	441208	1.42
1995	26135008	33191460	2044706	1109746	3.34
1996	28182416	34664372	1472912	537952	1.55
1997	30137754	36165305	1500933	565973	1.56
1998	33039476	39316976	3151672	2216712	5.64
1999	35557594	41246809	1929833	994873	2.41
2000	39031928	43715759	2468950	1533990	3.51
2001	40904790	44586221	870462	-64498	-0.14
2002	41977940	44916396	330175	-604785	-1.35
2003	43003188	45153347	236952	-698008	-1.55

INCOME

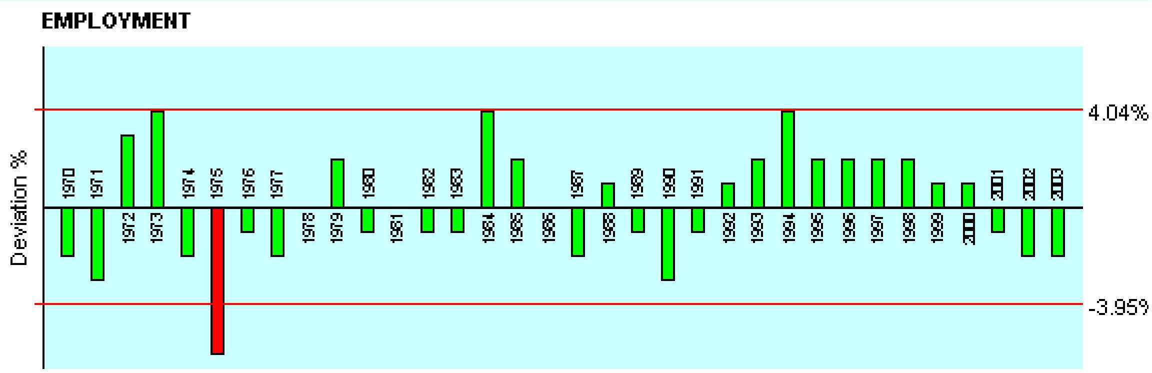
PERSONAL INCOME



Year	Value	Adj_Value	Change	Deviation	% Deviation
1969	1188908	6253656	0	-465948	0
1970	1348723	6716641	462984	-2964	-0.04
1971	1493302	7123051	406410	-59538	-0.84
1972	1720810	7950142	827092	361144	4.54
1973	1983142	8626668	676525	210577	2.44
1974	2206155	8626066	-602	-466550	-5.41
1975	2407721	8643718	17652	-448296	-5.19
1976	2631543	8947246	303528	-162420	-1.82
1977	2863802	9135528	188282	-277666	-3.04
1978	3262735	9657696	522167	56219	0.58
1979	3742079	9953930	296235	-169713	-1.7
1980	4248027	9940383	-13547	-479495	-4.82
1981	4930629	10502240	561857	95909	0.91
1982	5357920	10715840	213600	-252348	-2.35
1983	5768372	11190642	474802	8854	0.08
1984	6553819	12190103	999462	533514	4.38
1985	7132834	12839101	648998	183050	1.43
1986	7568997	13321435	482334	16386	0.12
1987	7968124	13545811	224376	-241572	-1.78
1988	8382614	13663661	117850	-348098	-2.55
1989	8892960	13873018	209357	-256591	-1.85

1990	9176789	13673416	-199602	-665550	-4.87
1991	9714439	13794503	121088	-344860	-2.5
1992	10504802	14496627	702123	236175	1.63
1993	11116836	14896560	399933	-66015	-0.44
1994	11977634	15570924	674364	208416	1.34
1995	13061771	16588449	1017525	551577	3.33
1996	14085368	17325003	736553	270605	1.56
1997	15064877	18077852	752850	286902	1.59
1998	16513456	19651013	1573160	1107212	5.63
1999	17772765	20616407	965395	499447	2.42
2000	19502458	21842753	1226346	760398	3.48
2001	20443716	22283650	440897	-25051	-0.11
2002	20969505	22437370	153720	-312228	-1.39
2003	21487457	22561830	124460	-341488	-1.51

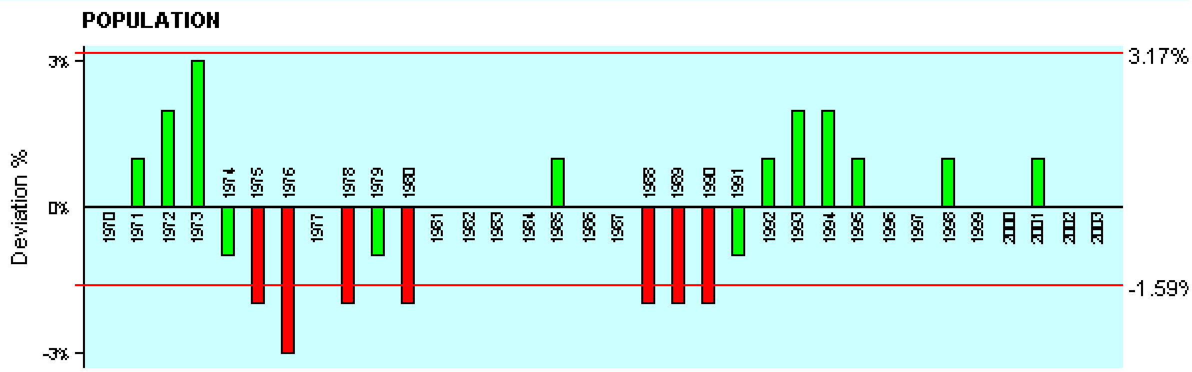
EMPLOYMENT



Year	Value	Change	Deviation	% Deviation
1969	164237	0	-7582	0
1970	168720	4483	-3099	-1.84
1971	170442	1722	-5860	-3.44
1972	183927	13485	5903	3.21
1973	199140	15213	7631	3.83
1974	201795	2655	-4927	-2.44
1975	197713	-4082	-11664	-5.9
1976	202334	4621	-2961	-1.46
1977	206628	4294	-3288	-1.59
1978	214876	8248	666	0.31
1979	226848	11972	4390	1.94
1980	231333	4485	-3097	-1.34
1981	238611	7278	-304	-0.13
1982	242897	4286	-3296	-1.36
1983	248214	5317	-2265	-0.91
1984	266565	18351	10769	4.04
1985	279060	12495	4913	1.76

1986	285229	6169	-1413	-0.5
1987	288096	2867	-4715	-1.64
1988	297442	9346	1764	0.59
1989	301542	4100	-3482	-1.15
1990	300957	-585	-8167	-2.71
1991	306396	5439	-2143	-0.7
1992	315867	9471	1889	0.6
1993	328471	12604	5022	1.53
1994	348621	20150	12568	3.61
1995	361817	13196	5614	1.55
1996	377479	15662	8080	2.14
1997	392208	14729	7147	1.82
1998	406666	14458	6876	1.69
1999	417138	10472	2890	0.69
2000	428918	11780	4198	0.98
2001	431583	2665	-4917	-1.14
2002	429395	-2188	-9770	-2.28
2003	429608	213	-7369	-1.72

POPULATION



Year	Value	Change	Deviation	% Deviation
1969	367959	0	-10757	0
1970	378845	10886	129	0.03
1971	393892	15047	4290	1.09
1972	414727	20835	10078	2.43
1973	439424	24697	13940	3.17
1974	444616	5192	-5565	-1.25
1975	447054	2438	-8319	-1.86
1976	443715	-3339	-14096	-3.18
1977	452406	8691	-2066	-0.46
1978	456115	3709	-7048	-1.55
1979	463710	7595	-3162	-0.68

1980	466859	3149	-7608	-1.63
1981	476858	9999	-758	-0.16
1982	487475	10617	-140	-0.03
1983	500324	12849	2092	0.42
1984	509889	9565	-1192	-0.23
1985	525817	15928	5171	0.98
1986	538814	12997	2240	0.42
1987	551940	13126	2369	0.43
1988	552476	536	-10221	-1.85
1989	553642	1166	-9591	-1.73
1990	552879	-763	-11520	-2.08
1991	560222	7343	-3414	-0.61
1992	579579	19357	8600	1.48
1993	599848	20269	9512	1.59
1994	624880	25032	14275	2.28
1995	641861	16981	6224	0.97
1996	653738	11877	1120	0.17
1997	665551	11813	1056	0.16
1998	680778	15227	4470	0.66
1999	694883	14105	3348	0.48
2000	707505	12622	1865	0.26
2001	725482	17977	7220	1
2002	736745	11263	506	0.07
2003	744453	7708	-3049	-0.41

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternative 2 for FY 10

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$269,340,000
Change In Civilian Employment	0

Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	161
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$145,319,900	
Sales Volume - Induced	$257,216,200	
Sales Volume - Total	$402,536,200	1.57%
Income - Direct	$35,857,550	
Income - Induced	$53,624,650	
Income - Total	$89,482,190	0.59%
Employment - Direct	1126	
Employment - Induced	1708	
Employment - Total	2834	0.72%
Local Population	401	
Local Off-base Population	200	0.06%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternative 2 for FY 11

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$128,870,000
Change In Civilian Employment	16
Average Income of Affected Civilian	$50,000
Percent Expected to Relocate	100
Change In Military Employment	3621
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$111,863,300	
Sales Volume - Induced	$197,998,000	
Sales Volume - Total	$309,861,300	1.21%
Income - Direct	$149,083,400	
Income - Induced	$41,278,780	
Income - Total	$190,362,200	1.26%
Employment - Direct	4380	
Employment - Induced	1315	
Employment - Total	5695	1.45%
Local Population	9056	
Local Off-base Population	4548	1.36%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternatives 1&2 for FY 12

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$19,700,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	191
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77
Sales Volume - Direct	$12,742,680
Sales Volume - Induced	$22,554,540

Sales Volume - Total	$35,297,220	0.14%
Income - Direct	$9,253,979	
Income - Induced	$4,702,188	
Income - Total	$13,956,170	0.09%
Employment - Direct	276	
Employment - Induced	150	
Employment - Total	425	0.11%
Local Population	476	
Local Off-base Population	238	0.07%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Alternative 1 for FY 09

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$83,500,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$44,463,000	
Sales Volume - Induced	$78,699,500	
Sales Volume - Total	$123,162,500	0.48%
Income - Direct	$9,269,681	
Income - Induced	$16,407,340	
Income - Total	$25,677,020	0.17%
Employment - Direct	295	
Employment - Induced	523	

Employment - Total	818	0.21%
Local Population	0	
Local Off-base Population	0	0%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Alternative 1 for FY 10

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$199,540,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	161
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$108,152,000	
Sales Volume - Induced	$191,429,100	
Sales Volume - Total	$299,581,200	1.17%
Income - Direct	$28,108,760	
Income - Induced	$39,909,290	
Income - Total	$68,018,060	0.45%
Employment - Direct	879	
Employment - Induced	1271	
Employment - Total	2150	0.55%
Local Population	401	
Local Off-base Population	200	0.06%

RTV SUMMARY

	Sales Volume	Income	Employment	Population

Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Alternative 1 for FY 11

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$102,870,000
Change In Civilian Employment	16
Average Income of Affected Civilian	$50,000
Percent Expected to Relocate	100
Change In Military Employment	3621
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$98,018,510	
Sales Volume - Induced	$173,492,800	
Sales Volume - Total	$271,511,300	1.06%
Income - Direct	$146,197,000	
Income - Induced	$36,169,910	
Income - Total	$182,366,900	1.21%
Employment - Direct	4288	
Employment - Induced	1152	
Employment - Total	5440	1.39%
Local Population	9056	
Local Off-base Population	4548	1.36%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

H.1.3. Summary of Results

The EIFS analyses indicated that the proposed action will produce no major socioeconomic effects in the ROI (community). The projected changes compare the appropriate RTVs as follows:

Proposed Alt/Alt 2	FY09	FY10	FY11	FY12	RTV
Business volume	0.62%	1.57%	1.21%	0.14%	5.64%
Income	0.22%	0.59%	1.26%	0.09%	5.63%
Employment	0.27%	0.72%	1.45%	0.11%	4.04%
Population	0.0%	0.06%	1.36%	0.07%	3.17%

Alt 1	FY09	FY10	FY11	FY12	RTV
Business volume	0.48%	1.17%	1.06%	0.14%	5.64%
Income	0.17%	0.45%	1.21%	0.09%	5.63%
Employment	0.21%	0.55%	1.39%	0.11%	4.04%
Population	0.0%	0.06%	1.36%	0.07%	3.17%

This significance determination is "conservative"--well within any errors produced through assumed EIFS input values. While these inputs could be refined, the results of the analysis (final determination) will certainly remain unchanged.

The potential stationing of a CAB at Fort Carson cannot be currently analyzed as the amount and timing of construction expenditures and employee relocations cannot currently be defined.

H.2. Analysis of Socioeconomic Effects at PCMS

H.2.1. Introduction

The socioeconomic analysis requirements of NEPA have been established over the years through successful early NEPA litigation ("McDowell vs Schlesinger", US District Court, Western District of Missouri, Western Division, No. 75-CV-234-W-4 (June 19,1975) and "Breckinridge vs Schlesinger", US District Court, Eastern District of Kentucky, No. 75-100 (October 31,1975)), as well as the practical need for communication and collaboration with affected communities. The social and economic effects of BRAC actions are especially relevant and important, as these issues are often the source of community concerns and subsequent controversies.

H.2.2. The Economic Impact Forecast System (EIFS) and the Hierarchical Approach.

H.2.2.1. The Model

The EIFS (Huppertz, Claire E.; Bloomquist, Kim M.; Barbehenn, Jacinda M.; EIFS 5.0 Economic Impact Forecast System, User's Reference Manual; USACERL Technical Report TA-94/03; July 1994.) has been a mainstay of Army NEPA practice since its initial development and implementation in the mid-70s. EIFS provides a mechanism to estimate impacts, and ascertain the "significance" of projected impacts, using the RTV technique. This analysis and determination can be readily documented, and if significance thresholds are not exceeded, the analysis can be completed. EIFS was designed to address NEPA applications, providing a "two-tier" approach to the process; (1) a simple and quick aggregate model (sufficient to ascertain the overall magnitude of impacts) and (2) a more detailed, sophisticated I-O model to further analyze impacts that appear significant, in NEPA terms, and worthy of additional expenditures and analyses. This "two-tier" approach is consistent with the two common levels of NEPA analysis, the EA and the EIS. EIFS has facilitated efficient and effective completion of such analyses for approximately 3 decades.

Complete documentation of the model, its development, and applicable theoretical underpinnings is available in numerous publications:

- Huppertz, Claire E.; Bloomquist, Kim M.; Barbehenn, Jacinda M.; EIFS 5.0 Economic Impact Forecast System, User's Reference Manual; USACERL Technical Report TA-94/03; July 1994.
- Isard, W., Methods of Regional Analysis, MIT Press, 1960.
- Isard, W. and Langford,T., Regional Input-Output Study: Recollections, Reflections, and Diverse Notes on the Philadelphia Experience, MIT Press, 1971.
- Isserman, A., "The Location Quotient Approach to Estimating Regional Economic Impacts", AIP Journal, January, 1977, pp. 33-41.
- Isserman, A., "Estimating Export Activity in a Regional Economy: A Theoretical and Empirical Analysis of Alternative Methods", International Regional science Review, Vol. 5, 1980, pp. 155-184.
- Leigh, R., " The Use of Location Quotients in Urban Economic Base Studies", Land Economics, Vol 46, May, 1970, pp 202-205.
- Mathur, V.K. and Rosen, H.S. , "Regional Employment Multiplier: A new Approach", Land Economics, Vol 50, 1974, pp 93-96.
- Mayer, W. and Pleeter, S., "A Theoretical Justification for the Use of Location Quotients", Regional Science and Urban Economics, Vol 5, 1975, pp 343-355.
- Robinson, D.P., Hamilton, J.W., Webster, R.D., and Olson, M.J., Economic Impact Forecast System (EIFS) II: User's Manual, Updated Edition, Technical Report N-69/ADA144950, U.S. Army Construction Engineering Research Lab (USACERL), 1984.
- Robinson, D.P. and Webster,R.D., Enhancements to the Economic Impact Forecast System (EIFS), Technical Report N-175/ADA142652, USACERL, April, 1984.
- Rogers, Claudia and Webster, Ron, "Qualitative Answers to Quantitative Questions", Impact Assessment, IAIA, Vol.12, No.1, 1999.
- Thompson, W., A Preface to Urban Economics, Johns Hopkins Press, 1965.
- Tiebout, C., The Community Economic Base, New York Committee for Economic Development,1962.

- USACERL, " Methods for Evaluating the Significance of Impacts: The RTV and FSI Profiles”; USACERL EIFS Tutorial; July 1987.
- U.S. Army, Department of the Army, DA Pamphlet 200-2, “Economic Impact Forecast System-User Instructions”, 1980.
- U.S. Army, “Base Realignment and Closure “How-To” Manual for Compliance with the National Environmental Policy Act”, revised and published as official Department of Army Guidance, 1995.
- U.S. Army, Army Regulation 5-20, "Commercial Activities"
- U.S. Army, Department of the Army, DA Pamphlet 200-2, “Economic Impact Forecast System-User Instructions”, 1980
- Webster, R.D.and Shannon, E.; The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts; USACERL Technical Report TR N-49/ADA055561; 1978.
- Webster, R.D., Hamilton, J.W., and Robinson, D.P., "The Two-Tier Concept for Economic Analysis: Introduction and User Instructions", USACERL Technical Report N-127/ADA118855.

These efforts reflect development of a tool for specific NEPA application, following the successful NEPA litigation referenced in the Introduction. As EIFS has been used for Army NEPA analyses, the results of EIFS analyses have been reviewed by stakeholder (affected community) representatives, and, as a result of BRAC application, twice reviewed by the GAO. During such reviews, the analyses and resultant decisions were upheld, and EIFS was lauded as a uniform (non-arbitrary and non-capricious) approach to such requirements. Drawing from a national, uniform database, and using a common, systematic approach, EIFS allowing the improved comparison of project alternatives (the heart of NEPA analysis), and provides comparable analyses across the U.S.

H.2.2.2. NEPA Process Improvement

Since NEPA was implemented, it has been commonly criticized as expensive and time-consuming. While these criticisms have been often justified, the President's CEQ has actively promoted NEPA process improvements; first in the publication of the CEQ NEPA regulations (CEQ, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Reprint, 40 CFR Parts 1500-1508, Executive Office of the President, Council on Environmental Quality, 1992.), and, more recently, through a NEPA anniversary introspective (CEQ, The National Environmental Policy Act: A Study of its Effectiveness After Twenty-five Years, Executive Office of the President, Council on Environmental Quality, January, 1997.) and the formal CEQ NEPA Task Force (CEQ, The NEPA Task Force Report to the Council on Environmental Quality: Modernizing NEPA Implementation; September, 2003.). All three CEQ initiatives call for more "focus" on NEPA documents, eliminating the analyses of minor or unimportant issues, and focusing, instead, on those issues that should be part of an informed agency decision. The use of EIFS, and the "two-tier" approach is consistent with these CEQ recommendations.

H.2.2.3. Determining Significance

While EIFS was being developed, communities began to question the rationale for determining the significance of socioeconomic impacts. USACERL was directed to develop a defensible procedure for such a determination, resulting in the Rational Threshold Value (RTV) technique (Webster, R.D.; and Shannon, E.; The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts; USACERL Technical Report TR N-49/ADA055561; 1978). This technique relies on the yearly BEA time series data on employment, income, and population to evaluate historical trends with in a subject community (region); and uses those trends to measure the "resilience" of the local community to change, or its ability to accommodate such change. This approach has worked well when communicating with affected communities. The combined use of RTV with the EIFS model meet the two pronged approach for significance determinations, intensity and context (CEQ, 1992)

The initial EIFS implementation (USACERL, 1975) included the analysis of numerous variables: business volume, personal income, employment, government revenues and expenditures, income and employment distribution, local housing impacts, regional economic stability, school system impacts, government bond obligations, population, welfare and dependency, social control, and aesthetic considerations. Selection of these variables was based on the predictive capability of forecasting techniques and data availability. Over some 30 years of practice, pragmatism and sufficiency led to the use of sales volume, employment, personal income, and population as indicators of impacts (as a "first tier" approximation of effects). These effects can also be readily evaluated (and significance determined) using the BEA time series data. Population, important in its own right, is also a valuable indicator of other factors (e.g., impact on local government revenues and expenditures, housing, local school systems, and the change in welfare and dependency), as impacts on such variables are driven, to a large extent, by a population change.

Using BEA time series data is used to analyze the four variables for the ROI, the RTV model produces thresholds for assessing the magnitude of impacts. The RTV technique is simple, starting with a straight line between the first year of record and the last year of record for that variable, establishing the average rate of change over time. Then, each yearly deviation from that growth rate is calculated and converted to a percentage. The largest historical changes (both increase and decrease) are used to define significance thresholds. The following figure illustrates the RTV concept:

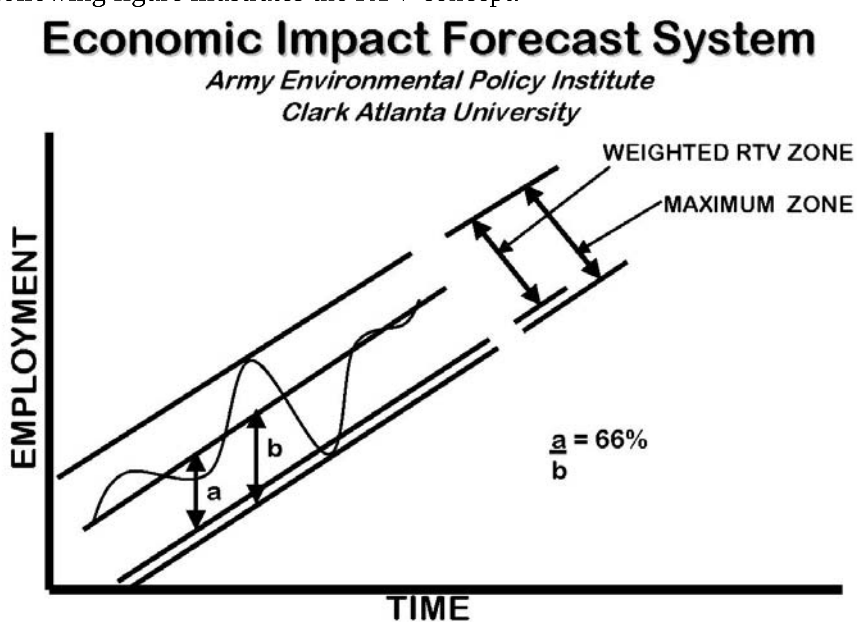


Figure H-1 Visual Depiction of the RTV Technique

A "factor of safety" is applied to negative thresholds, as shown in the figure, to produce a conservative analysis; while 100 percent of the maximum positive thresholds is used; as indicated in Table H-1.

	Increase	Decrease
Total sales volume	100 percent	75 percent
Total employment	100 percent	66 percent
Personal income	100 percent	66 percent
Total population	100 percent	50 percent

The maximum positive historical fluctuation is used because of the positive connotations generally associated with economic growth. While economic growth can produce unacceptable impacts and the "smart growth" concept is increasingly favored, the effects of reductions and closures are usually much more controversial. These adjustments, while arbitrary, are sensible. The negative sales volume threshold is adjusted by 75 percent, as sales volume impacts can be absorbed by such factors as the manipulation of inventory, new equipment, etc; and the impacts on individual workers or proprietors is indirect, if at all. Changes in employment and income, however, are impacts that immediately affect individuals; thus they are adjusted by 66 percent. Population is extremely important, as an indicator of other social issues, and is thus adjusted by 50 percent.

To adjust dollar amounts for inflation (to create "constant dollars" prior to calculations), the CPI is used for appropriate years, and all dollar values are adjusted to 1987 equivalents.

The main strength of the RTV approach stems from its reliance on data for each individual ROI. This approach addressed previous criticism of more simple approaches that applied arbitrary criteria to all communities. This approach establishes unique criteria, representative of local community patterns, and, while a community may not completely agree, a common frame of reference is established. Critics of the RTV technique have questioned the arbitrary selection of the maximum allowable deviations to indicate impact significance, but the process has proven workable over the years.

H.2.2.4. The Application of EIFS to the Proposed Action

To effect these analyses, the inputs to the EIFS model must be estimated. The normal EIFS inputs include:

Number of affected (moving) civilians and their salaries
Number of affected (moving) military employees and their salaries
Percentage of affected military employees living on-post
Changes in local procurement, contracting, and purchases
Definition of the multi-county region of influence (ROI)

For the Piñon Canyon analyses, an increase in approximately 87 civilian employees is estimated by Email from Robert Ford on 14 November, 2008). The average civilian salary of $50,000 is used to facilitate the analysis. The ROI for Piñon Canyon consists of Huerfano, Las Animas, and Otero counties in Colorado.

The estimated inputs were used to produce the EIFS reports (model results) for changes in total business volume, employment, income, and population. These analyses are detailed, along with the community RTVs, in the following pages.

EIFS REPORT

PROJECT NAME

Pinyon Canyon GTA

STUDY AREA

08055 Huerfano, CO
08071 Las Animas, CO
08089 Otero, CO

FORECAST INPUT

Change In Local Expenditures	$0
Change In Civilian Employment	87
Average Income of Affected Civilian	$50,000
Percent Expected to Relocate	100
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

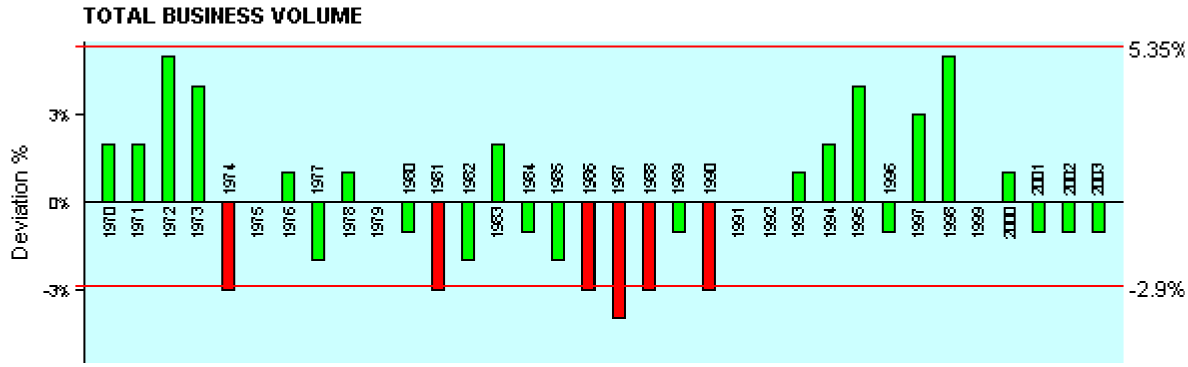
Multiplier	1.66	
Sales Volume - Direct	$2,914,500	
Sales Volume - Induced	$1,923,570	
Sales Volume - Total	$4,838,070	0.53%
Income - Direct	$4,350,000	
Income - Induced	$377,732	
Income - Total	$4,727,732	0.63%
Employment - Direct	109	
Employment - Induced	14	
Employment - Total	123	0.58%
Local Population	217	
Local Off-base Population	217	0.5%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.35 %	5.16 %	5.38 %	2.3 %
Negative RTV	-2.9 %	-3.33 %	-3.28 %	-1.3 %

RTV DETAILED

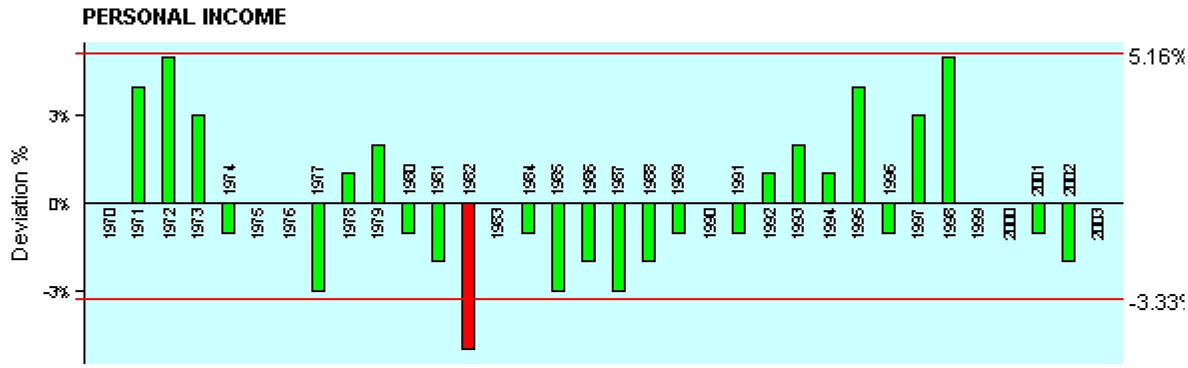
SALES VOLUME



Year	Value	Adj_Value	Change	Deviation	% Deviation
1969	219452	1154318	0	-23404	0
1970	240698	1198676	44359	20955	1.75
1971	260952	1244741	46065	22661	1.82
1972	289996	1339782	95040	71636	5.35
1973	326130	1418666	78884	55480	3.91
1974	359080	1404003	-14663	-38067	-2.71
1975	397802	1428109	24106	702	0.05
1976	431832	1468229	40120	16716	1.14
1977	456434	1456024	-12204	-35608	-2.45
1978	505916	1497511	41487	18083	1.21
1979	573002	1524185	26674	3270	0.21
1980	651888	1525418	1233	-22171	-1.45
1981	709126	1510438	-14980	-38384	-2.54
1982	751700	1503400	-7038	-30442	-2.02
1983	800354	1552687	49287	25883	1.67
1984	835198	1553468	782	-22622	-1.46
1985	862010	1551618	-1850	-25254	-1.63
1986	865582	1523424	-28194	-51598	-3.39
1987	876026	1489244	-34180	-57584	-3.87
1988	903370	1472493	-16751	-40155	-2.73
1989	949300	1480908	8415	-14989	-1.01
1990	984378	1466723	-14185	-37589	-2.56
1991	1045046	1483965	17242	-6162	-0.42
1992	1096828	1513623	29657	6253	0.41
1993	1162582	1557860	44237	20833	1.34

1994	1246156	1620003	62143	38739	2.39
1995	1352468	1717634	97632	74228	4.32
1996	1396710	1717953	319	-23085	-1.34
1997	1494136	1792963	75010	51606	2.88
1998	1607064	1912406	119443	96039	5.02
1999	1663308	1929437	17031	-6373	-0.33
2000	1756224	1966971	37534	14130	0.72
2001	1802854	1965111	-1860	-25264	-1.29
2002	1843614	1972667	7556	-15848	-0.8
2003	1879468	1973441	774	-22630	-1.15

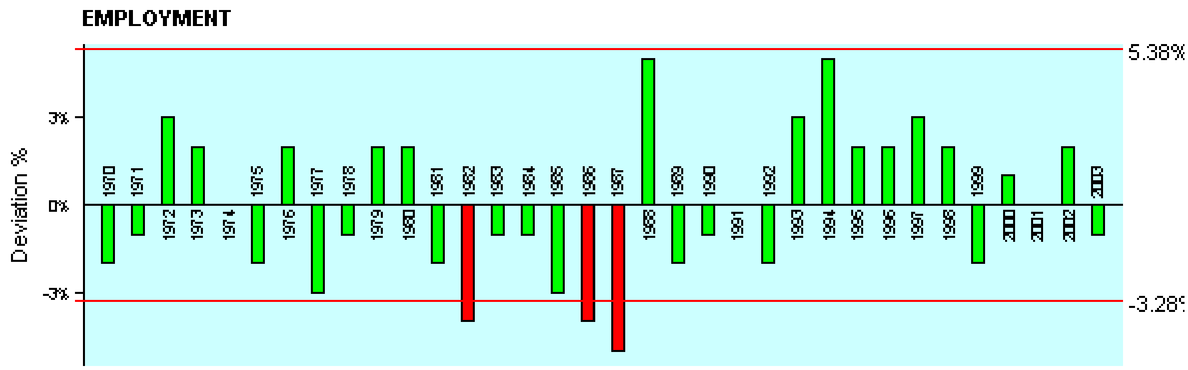
INCOME



Year	Value	Adj_Value	Change	Deviation	% Deviation
1969	117896	620133	0	-10559	0
1970	126539	630164	10031	-528	-0.08
1971	139671	666231	36066	25507	3.83
1972	154465	713628	47398	36839	5.16
1973	171478	745929	32301	21742	2.91
1974	191115	747260	1330	-9229	-1.23
1975	210106	754281	7021	-3538	-0.47
1976	225660	767244	12963	2404	0.31
1977	236155	753334	-13910	-24469	-3.25
1978	261277	773380	20045	9486	1.23
1979	301106	800942	27562	17003	2.12
1980	343209	803109	2167	-8392	-1.04
1981	374607	797913	-5196	-15755	-1.97
1982	385086	770172	-27741	-38300	-4.97
1983	404149	784049	13877	3318	0.42
1984	422550	785943	1894	-8665	-1.1
1985	431665	776997	-8946	-19505	-2.51

1986	437368	769768	-7229	-17788	-2.31
1987	445677	757651	-12117	-22676	-2.99
1988	460320	750322	-7329	-17888	-2.38
1989	485103	756761	6439	-4120	-0.54
1990	512978	764337	7577	-2982	-0.39
1991	539032	765425	1088	-9471	-1.24
1992	568952	785154	19728	9169	1.17
1993	603369	808514	23361	12802	1.58
1994	633319	823315	14800	4241	0.52
1995	681972	866104	42790	32231	3.72
1996	703119	864836	-1268	-11827	-1.37
1997	753044	903653	38816	28257	3.13
1998	807613	961059	57407	46848	4.87
1999	841294	975901	14842	4283	0.44
2000	882559	988466	12565	2006	0.2
2001	909370	991213	2747	-7812	-0.79
2002	914244	978241	-12972	-23531	-2.41
2003	942586	989715	11474	915	0.09

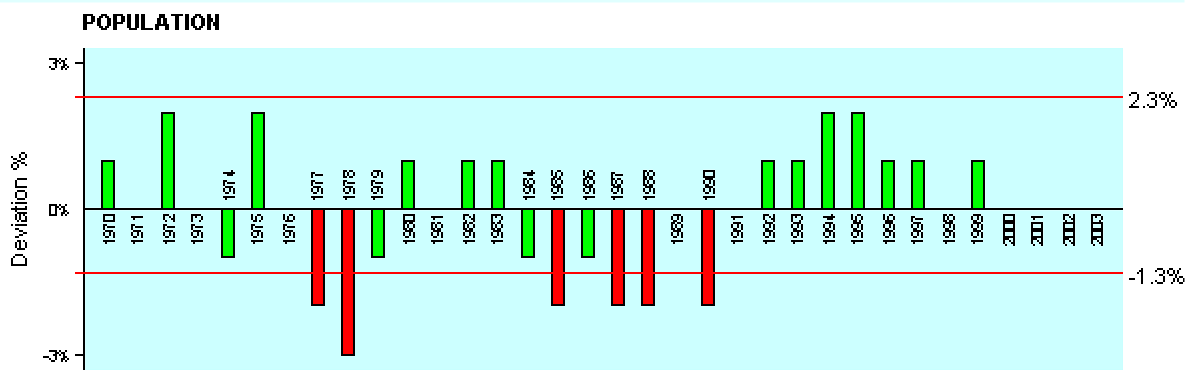
EMPLOYMENT



Year	Value	Change	Deviation	% Deviation
1969	16489	0	-167	0
1970	16324	-165	-332	-2.03
1971	16250	-74	-241	-1.48
1972	16977	727	560	3.3
1973	17517	540	373	2.13
1974	17616	99	-68	-0.39
1975	17475	-141	-308	-1.76
1976	17977	502	335	1.86
1977	17692	-285	-452	-2.55

1978	17662	-30	-197	-1.12
1979	18147	485	318	1.75
1980	18733	586	419	2.24
1981	18495	-238	-405	-2.19
1982	17979	-516	-683	-3.8
1983	17890	-89	-256	-1.43
1984	17886	-4	-171	-0.96
1985	17511	-375	-542	-3.1
1986	16992	-519	-686	-4.04
1987	16357	-635	-802	-4.9
1988	17464	1107	940	5.38
1989	17329	-135	-302	-1.74
1990	17368	39	-128	-0.74
1991	17515	147	-20	-0.11
1992	17303	-212	-379	-2.19
1993	17986	683	516	2.87
1994	19167	1181	1014	5.29
1995	19789	622	455	2.3
1996	20287	498	331	1.63
1997	21113	826	659	3.12
1998	21741	628	461	2.12
1999	21455	-286	-453	-2.11
2000	21799	344	177	0.81
2001	21872	73	-94	-0.43
2002	22382	510	343	1.53
2003	22327	-55	-222	-0.99

POPULATION



Year	Value	Change	Deviation	% Deviation
1969	45607	0	71	0

1970	45782	175	246	0.54
1971	45596	-186	-115	-0.25
1972	46269	673	744	1.61
1973	46089	-180	-109	-0.24
1974	45704	-385	-314	-0.69
1975	46607	903	974	2.09
1976	46460	-147	-76	-0.16
1977	45629	-831	-760	-1.67
1978	44405	-1224	-1153	-2.6
1979	43728	-677	-606	-1.39
1980	43949	221	292	0.66
1981	44026	77	148	0.34
1982	44187	161	232	0.53
1983	44340	153	224	0.51
1984	43665	-675	-604	-1.38
1985	42936	-729	-658	-1.53
1986	42419	-517	-446	-1.05
1987	41668	-751	-680	-1.63
1988	40828	-840	-769	-1.88
1989	40607	-221	-150	-0.37
1990	39872	-735	-664	-1.67
1991	39725	-147	-76	-0.19
1992	39876	151	222	0.56
1993	40349	473	544	1.35
1994	41061	712	783	1.91
1995	41957	896	967	2.3
1996	42475	518	589	1.39
1997	42951	476	547	1.27
1998	43064	113	184	0.43
1999	43341	277	348	0.8
2000	43374	33	104	0.24
2001	43114	-260	-189	-0.44
2002	43182	68	139	0.32
2003	43136	-46	25	0.06

H.2.3. Summary of Results

The EIFS analyses indicates that the proposed actions will produce no major socioeconomic effects in the ROI (community). The projected changes compare the appropriate RTVs as follows:

Variable	% Change	RTV
Business (Sales) Volume	0.53	5.35
Personal Income	0.63	5.16
Employment	0.58	5.38
Population	0.50	2.30

The economic effects of GTA at Piñon Canyon appears to be not significant. The significance determination is "conservative"--well within any errors produced through assumed EIFS input values. While these inputs could be refined, the results of the analysis (final determination) will certainly remain unchanged. The socioeconomic effects will not be significant.

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APPENDIX I
PUBLIC COMMENTS AND RESPONSES ON THE FORT CARSON GTA EIS

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I. Public Comments and Responses on the Fort Carson GTA EIS

I.1. Introduction

This appendix contains the comments submitted to the Army on the Draft GTA EIS and presents the Army's responses to those comments. The Army prepared the DEIS in accordance with the CEQ regulations for implementing the NEPA (Title 40 of the CFR 1500-1508) and the Army's NEPA-implementing regulations (32 CFR 651). These procedures and regulations provide for a period of public comment on a DEIS prior to the publication of a FEIS.

The NOA of the GTA DEIS was published in the Federal Register on October 10, 2008. The NOA provided for a 45-day public comment period (from October 10 to November 24, 2008), which is in accordance with NEPA regulations [40 CFR 1506.10(c)].

The Army held three public meetings to receive comments on the GTA DEIS. Meetings were held in Trinidad, La Junta, and Colorado Springs on October 27, 28, and 29, 2008, respectively. All comments that were received have been considered in preparing the GTA FEIS.

Section I.2 presents a set of Master Responses to issues that were raised frequently by numerous commentors both at public meetings and in comment letters. Section I.3 includes copies of the public meeting transcripts, individual comment letters, and the agency responses. No comments were received from elected officials. They are organized in the following order:

- Transcripts (T);
- Federal Agencies (FA);
- Individuals (I);
- Local Community Organizations or Interest Groups (LC);
- Local/Regional Agencies (LRA); and
- State Agencies (SA).

The comment documents are organized alphabetically by commentor type and each is assigned a unique document number. Transcripts from the Fort Carson GTA EIS public review meetings were assigned one number but contain the full text of comments and responses for each of the speakers at the meeting.

Responses for each document are presented following the original comment letter and are presented numerically according to the multiple comments within each document. One document may contain multiple comments. Each comment is assigned a sub-number that follows numerically from the beginning to the end of the document. Responses to the individual comments identified within each document are presented at the conclusion of each comment document.

Per Question 29A of the CEQ's Forty Most Asked Questions Concerning National Environmental Policy Act Regulations (46 Fed. Reg. 18026) and CEQ Regulation 1503.4, Fort Carson is not required to issue a lengthy reiteration of its methodology for any portion of an EIS if the only comment addressing the methodology is a simple complaint that the EIS methodology is inadequate. Agencies must respond to comments that are specific in their criticism of agency methodology.

For example, if a comment on an EIS stated that an agency's air quality dispersion analysis or methodology was inadequate, and the agency had included a discussion of that analysis in the EIS, little if anything needs be added in response to such a comment; however, if the comment stated that the dispersion analysis was inadequate because of its use of a certain computational technique, or that a dispersion analysis was inadequately explained because computational techniques were not included or referenced, then the agency would have to respond in a substantive and meaningful way to such a comment.

Although potential expansion of PCMS was not within the scope of this EIS, Fort Carson recognized the importance of this issue to the public and provided Master Responses to comments concerning it. Otherwise, comments that were not substantive or that addressed issues outside the scope of this EIS were noted and included in the administrative record, but no specific response was given.

I.2. Master Responses to Comments

To aid decision makers and the reviewing public, Master Responses have been developed to address the comments made on the GTA DEIS. The intent of the Master Responses is to provide background and concise responses on each of the commonly raised issues to support the more specific responses included in the "Response to Individual Comments" (Section I.3). These Master Responses supplement, but do not replace, specific responses to the individual comments submitted and are not intended to address every issue raised in individual letters.

Master Responses to the following issues are presented in this section of the GTA FEIS:

- Potential Expansion of the PCMS (Master Response 1);
- Segmentation (Master Response 2);
- Alternatives Considered (Master Response 3);
- Section 106 Consultation (Master Response 4); and
- Use of the 2002-2006 ICRMP and Implementation of the AAP (Master Response 5).

Many of the Master Responses are linked and, therefore, must be considered as a group to gain the full context of the Army's responses to the substantive and common issues raised. For example, many people commented on segmentation, the alternatives, and PCMS expansion in ways that interrelate, particularly in the context of the issue of possible future expansion of the PCMS.

I.2.1. Master Response 1 – Expansion of the PCMS

I.2.1.1. Summary of Comments

The Army received many comments on the potential acquisition of land around the PCMS stating that the Army is moving forward with expanding the boundaries of the PCMS and that expansion should have been evaluated in some context in the GTA DEIS, including as part of the Proposed Action or as an action subject to cumulative analysis. Commentors state that existing Army documents discuss potential expansion and that these documents demonstrate the need to include expansion as an alternative or as part of the GTA Proposed Action.

I.2.1.2. Army's Response

The Army recognizes that many people and agencies in southeastern Colorado and elsewhere are concerned about the Army's potential expansion of the PCMS. The written and oral comments received regarding expansion are testament to the importance of this issue to members of the community, particularly those who live in the proximity of possible PCMS expansion. As discussed throughout these Master Responses and in the individual comment responses, the Army understands the public's historical and future concerns about possible land expansion for the PCMS.

In responding to the many comments on this issue, it is important to explain and provide an update on the Army's major land acquisition conceptual planning activities and decisions, as well as to explain why expansion is not being studied in this EIS.

I.2.1.3. Update on Major Land Acquisition Conceptual Planning and Decisions

Several DoD decisions are discussed below in the context of how these decisions affect this EIS. The issues are 1) Fort Carson preliminary planning, 2) status of potential expansion, and 3) the processes to initiate an expansion EIS.

Fort Carson Preliminary Planning. It is important to understand the process and context for the lengthy preliminary planning that is necessary to obtain approval to develop a proposed action and alternatives for land acquisition and issue a NOI for an EIS. The Army is a hierarchical organization that requires chain-of-command approval before any major action can be initiated. Land acquisition is a process that begins locally with planning at the installation and requires Headquarters, Department of the Army approval and review by officials in the DoD. There are guidelines and approval requirements outlined by DoD for major land acquisitions. These additional requirements and restrictions on major land acquisitions further delay the development of a Proposed Action or alternatives.

The Fort Carson staff has prepared numerous documents as preliminary planning for potential expansion of PCMS. (As reflected in many comments, these documents have been released to members of the public either through Freedom of Information Act requests or through the litigation process). These documents were prepared for the purposes of determining the feasibility of expanding the PCMS, and provide to Headquarters Department of Army the general ways in which to optimize future use of the PCMS for meeting its mission training requirements. The preliminary nature of this initial planning is reflected in the changes in the contemplated expansion area which has varied from approximately 7 million acres to as few as 100,000 acres between 2003 and 2008.

This preliminary planning does not comprise a binding commitment to purchase lands adjacent to the PCMS. None of the preliminary planning documents commits any resources to implementation. No Army decision to proceed with expansion has been made as yet based on these preliminary documents

A major land acquisition requires many steps before the actual acquisition process may begin. These steps include substantial pre-planning, like the work Fort Carson has done, to support conceptual approval at Headquarters Department of the Army; development and refinement of a specific proposed action and alternatives to the action; completion of substantial environmental baseline studies; preparation and public review of an EIS; completion of Real Estate Planning Report; congressional approval and funding; and landowner negotiations. The Army has completed only the first step, which is planning to support the conceptual approval to begin more detailed study of potential expansion of the PCMS.

Status of the Potential Expansion. In 1990, the Deputy Secretary of Defense imposed a moratorium on the acquisition of land by the military departments. Under this policy, any land acquisition involving more than 1,000 acres or costing more than $1.0 million requires the prior approval of the OSD. This moratorium was reaffirmed on November 17, 2002, and the OSD delegated approval to the Under Secretary of Defense (Acquisition, Technology, and Logistics) [USD (AT&L)]. DoD Instruction 4165.71 (January 6, 2005) incorporates this policy into DoD regulation and provides that such land acquisitions require approval of the USD (AT&L) for any public announcement; request for proposals; NOI to perform environmental analysis; request for legislation or budget line item; press release; or other official notice.

Congress has passed several measures related to expansion in response to considerable public concern. As part of the 2007 National Defense Authorization Act (NDAA), which was enacted in October 2006, Congress required the Army to submit a report containing an analysis of any potential expansion of the PCMS. The Army submitted that report in early December 2006.

In February 2007, the USD (AT&L) approved a waiver request to allow the Army to "begin the Real Estate Planning Report and the Environmental Impact Study including the Environmental Baseline Study" for acquisition of approximately 418,000 acres of land around the PCMS (Reference No. 262).

In December 2007, the 2008 Military Construction Appropriation Act was enacted. It contained a provision that prohibited the Army from using MILCON funds to support land expansion at the PCMS.
In January 2008, as part of the 2008 NDAA, Congress required the Army to submit another report concerning expansion of the PCMS. The Army submitted that report in July 2008 (Reference No. 263). Part of this law also required the Comptroller General to review the report. On January 13, 2009, the Government Accountability Office (GAO) 2007 released a report containing that review (Reference No. 284). The Army is currently considering the recommendations in the report. The 2008 NDAA also required that the Army solicit public comments concerning the final GAO report for at least 90 days and then submit to Congress a written summary of comments received.

The 2009 Military Construction Appropriation Act, enacted in September 2008, contains the same prohibition against use of MILCON funds to support land expansion at the PCMS that was in the 2008 Act.

In light of the public and Congressional concerns, the Army has been re-assessing the potential expansion of the PCMS. For example, in its 2008 report to Congress, the Army said,

> Although, the Army has revalidated their doctrinally based requirement for at least 418,577 additional acres of training land, the U.S. Army is proposing to expand PCMS by obtaining approximately 100,000 acres adjacent to the existing 235,000 acre site. While this expansion will not address the full training land requirement at Fort Carson, it will provide an enhanced training capability for the Soldiers stationed at Fort Carson and will have a less significant impact on the communities surrounding PCMS.

Regardless of the final Army position on a potential expansion, Congress will have to approve and fund any such expansion. Under 10 U.S.C. Section 2664, the Army may not acquire land owned by private persons unless the acquisition is expressly authorized by law. As stated in Army Regulation 405-10 (Acquisition of Real Property and Interests Therein), "While the Federal Government has the inherent power to acquire land for its constitutional purposes, this power can be exercised only at the discretion of Congress. No land will be purchased in the name of the United States except under a law authorizing such purchase."

Processes to Initiate an Expansion EIS. As stated above, in February of 2007, the USD (AT&L) approved the Army's request for a waiver to the land acquisition moratorium. This approval meant only that potential expansion could be further analyzed under NEPA. The Army has already committed to completing an EIS if it is decided that PCMS expansion should be further evaluated. As discussed in Section 1.1 of the 2007 PCMS Transformation EIS, "[t]he Army is assessing the potential need for expanding the PCMS….Should a decision be made to expand the PCMS, it would be evaluated through a separate NEPA process." Section 2.1.6 of this EIS discusses potential expansion as it pertains to the stationing of GTA units at Fort Carson.

According to the Army's implementing regulations for NEPA outlining the steps the Army must follow in the EIS process (32 CFR 651.45), the process begins with the NOI. The NOI "shall clearly state the Proposed Action and alternatives, and state why the action may have unknown and/or significant environmental impacts" [32 CFR 651.45(2)]. At this early stage of the planning process for an expansion EIS, neither the description of the Proposed Action nor the alternatives to expansion have been defined; therefore, the Proposed Action and alternatives cannot be "clearly stated" as required for issuance of an NOI.

As discussed above, the preliminary studies conducted by Fort Carson focused on the need for expansion—not the Army's decision to proceed with expansion or even the definition of the Proposed Action for expansion. The Army has "determined conceptually that the purchase of private lands and the transfer of public lands in areas surrounding and contiguous to the PCMS provided the best option for increased training" (Reference No. 262).

The Army has specifically recognized that land acquisition "will take years," and the Army "is approaching the effort with a detailed campaign plan that methodically addresses the process" (Reference No. 264). In the preliminary feasibility reports, the Army acknowledged that "[s]ubsequent acquisition will focus on acquiring contiguous parcels or portions of parcels based on available funding, willingness of sellers, and the ability of the land to assimilate and use the new land for training as quickly as possible" (Reference No. 264). The Army clearly is focusing on a process for defining whether expansion is needed and, if so, what the overall planning process will be for moving forward to define and evaluate a Proposed Action for expansion (e.g., if, how, when, and where expansion might occur).

The NEPA process of developing a Proposed Action and initial set of alternatives for land acquisition has not been initiated. As stated above, the Army's initial reviews of the potential need for expanding the PCMS are preliminary activities conducted to evaluate the potential for such a Proposed Action—they do not constitute a commitment to such a course of action nor do they provide the level of detail needed to define a Proposed Action for an EIS. The USD (AT&L) approval of the Army's waiver request to consider land acquisition identified the need for an EIS to assess the impacts of expansion. Neither a Proposed Action nor a set of reasonable and feasible alternatives has been developed, and they will likely not be developed before Congress has assessed the GAO review of the Army's latest NDAA report concerning potential expansion and its other concerns are satisfied.

I.2.1.4. Expansion is Not Part of the Proposed Action in this EIS

As summarized in Section 2.1.6 of this EIS, as quoted below, the Proposed Action incorporates modifications to training requirements in ways that best meet training needs (see Section 2.2.4 for more detail) and can be implemented as a stand-alone action (i.e., troop stationing, training, and construction) that does not require expanding PCMS's boundaries. That is, land acquisition is not necessary or proposed to implement the Proposed Action in this EIS.

2.1.6 Relationship Between Army Growth and the Potential for Future Expansion of Pinon Canyon Maneuver Site:

> GTA decisions, including the assignment of the IBCT to Fort Carson, were made in light of the overall Army training land shortfall on all installations and on the premise that receiving installations would be limited to their existing lands to accommodate these additional units. The GTA PEIS states:
>
> This analysis examines installations in their current boundaries. It does not consider possible expansion of land holdings at installations. The process of land acquisition for Federal Agencies is a long one, requiring multiple approvals, a series of environmental and real estate planning studies, and funding of appropriations. Because of these uncertainties, there are no installation expansion actions that are included in the scope of this analysis.
>
> The Army's position is that the present Fort Carson and PCMS marginally provide sufficient land to train assigned Soldiers and units adequately, including the IBCT and CAB being studied in this EIS, for current missions. As stated in the 2007 Transformation EIS, however, even with just the assignment of the baseline units and

which are designed to address the multiple contingencies that its forces may face, both now and in the future, not just current missions. With the addition of the new units at Fort Carson, the Army would have to introduce more work-arounds and deviate further from doctrinal training standards, which would have associated costs and implications. These could include greater environmental impacts, less time for Soldiers with their Families at home station, increased expenses, and sub-optimal training.

Thus, the Proposed Action is a stand-alone action within the rules set out in CEQ regulation 40 C.F.R. 1508.25. That is, the contemplated expansion of PCMS is not a connected action to the Proposed Action because the Proposed Action will not automatically trigger expansion, the Proposed Action can proceed without expansion, and the Proposed Action and expansion are not interdependent parts of a larger action.

The need to implement the GTA ROD stationing decisions expeditiously is similar to the situation the Army faced in the 2007 Transformation EIS. In that document, the Army stated:

> Because of the immediate need for implementing the transformation actions,expansion is neither a reasonable component of the [proposed action] nor a reasonable and feasible alternative to it. . . . The transformation . . . can be implemented as a stand-alone action . . . that does not require expanding the PCMS boundaries. That is, land acquisition is not necessary or proposed to implement the [proposed action].

After due consideration in the GTA PEIS, and as stated in the GTA ROD, the Army determined that a new IBCT and other units were to be stationed at Fort Carson. A main justification for creation of the new GTA units was to provide relief to existing forces from the demands of the current operational tempo, particularly short turn-around times between deployments. Thus, implementation of the decisions recorded in the GTA ROD, including the Proposed Action, must occur quickly. In contrast, any potential expansion of PCMS will have to await a longer period of consideration and execution.

Whether, when, where, to what extent, and how PCMS expansion may occur are, at present, not determined. This uncertainty results largely from the considerable community and political concern that has been expressed about this issue, including several legislative measures at both the state and federal level. In light of this uncertainty, the Army has not yet been able to formulate either a proposed action or a set of reasonable alternatives for potential expansion. Both of these are required before the Army may publish a NOI to start the EIS process. Thus, potential PCMS expansion simply has not arisen to the level of a “proposal” within the meaning of NEPA and is not ripe for NEPA analysis.

For all of the reasons discussed above, potential PCMS expansion is not analyzed in this EIS. The Army is not trying to avoid the environmental impact scrutiny required by NEPA. If and when PCMS expansion arises to the level of a proposal that is ripe for NEPA analysis, it will be the subject of separate NEPA analysis with all required opportunities for public participation. Should that point be reached, the analysis would consider the cumulative effects of the Proposed Action in combination with the effects of potential expansion.

I.2.1.5. Expansion is Not an Alternative to the Proposed Action in this EIS

As discussed in Chapter 2.0 of this EIS and also in the ROD for the GTA PEIS, the Army has a need to rebalance its forces and increase its numbers to better match force capabilities with mission requirements, balance troop deployments with training at home station to sustain force readiness, and preserve Soldier and Family quality of life. None of these elements of need would be addressed by expansion of PCMS. Further, the stationing decisions in the ROD, including those related to Fort Carson, were based on utilization of existing installations and training areas. Thus, the Proposed Action in this EIS is independent of and may be accomplished without expansion of PCMS. As a result, expansion is not a reasonable alternative to the Proposed Action.

In addition, the elements of need as described above reflect critical requirements the satisfaction of which is overdue. The Army's need for additional Soldiers and the facilities to support them must be satisfied as soon as possible. Expanding the PCMS is a complex issue requiring focused analysis and adequate public forums for considering alternatives. Developing the Proposed Action and alternatives for a separate EIS, describing and characterizing lands for potential expansion, and evaluating the impacts of expansion will likely be a lengthy process to ensure that analysis is thorough and that public input is considered and addressed. Because of the immediate need for implementing the GTA actions, expansion is not a reasonable and feasible alternative to the Proposed Action in this EIS.

I.2.1.6. Cumulative Analysis of the Separate GTA and Expansion Actions

Some comments noted that expansion should be evaluated in this EIS as a reasonably foreseeable future action with the potential to contribute to cumulative environmental impacts. Chapter 5 of the EIS is a comprehensive cumulative impacts analysis. As discussed above in this Master Response, land acquisition for expansion is a future action that could occur, but the determination of if, how, when, and where such an expansion could occur is contingent on numerous studies, processes, and public discussions that are likely to require several years of consideration.

For the purposes of the cumulative analysis in this EIS, the expansion action is at such a preliminary stage (i.e., no Proposed Action has been developed, no NOI to prepare an EIS has been published in the Federal Register, no EIS has been initiated) that effective cumulative analysis of such an action is not reasonable or feasible. Specifically, a Proposed Action has not yet been defined; and without defining a Proposed Action for expansion, it would be too early to speculate on what the impacts of expansion would be or how they might contribute to cumulative impacts when combined with the Proposed Action. If and when appropriate, the Army has indicated that it will prepare an EIS for expansion. As part of any expansion EIS, the transformation and GTA related activities at the PCMS will be evaluated as cumulative impacts in that EIS; however, the definition of a proposed action for expansion is so preliminary as to exclude meaningful analysis.

I.2.1.7. Public Concerns

Numerous commentors have stated that the Army has not listened to their position that potential expansion of PCMS should be analyzed in this EIS. To the contrary, the Army has not only heard these comments but also understands the basis for them. Within the Transformation EISs and this EIS, we have stated as clearly as possible the reasons why NEPA analysis of expansion is not yet appropriate or even possible. We recognize that the Army's decision does not agree with the position of the commentors; however, the Army's decision has been made after carefully considering the comments and with all due respect to the genuine concerns of the commentors. The public comments have been acknowledged and recorded and will be considered in any expansion EIS.

I.2.2. Master Response 2 – Segmentation

I.2.2.1. Summary of Comments

Comments were received stating that expansion should have been studied in this EIS because it is a connected action to the Proposed Action. Put another way, the commentors' position was that failing to include expansion constituted improper segmentation under NEPA rules.

Commentors cite Army planning documents, public statements, and media reports that document the Army's desire to expand the PCMS and argue that the expansion of the PCMS is a major federal action that needs to be considered as part of the GTA Proposed Action or as an alternative in the EIS. Others state that the Army is segmenting future expansion from this EIS and "inducing" the need for future expansion of the PCMS.

I.2.2.2. Army's Response

As stated in the Master Response, "Expansion of the PCMS," the Proposed Action does not include land acquisition and does not commit the Army to a future action of expansion. The implementation of the Proposed Action can be accomplished whether or not the Army expands PCMS in the future. It is not known at this time if or when or how expansion may occur.

As also stated in Master Response 1, the Proposed Action and the initial set of alternatives for expansion have not been developed. Not enough detail on the nature, location, extent, and amount of such expansion or an analysis of the feasibility of potential training lands has been identified. Therefore, it is premature to evaluate expansion impacts because of the lack of information. Because a Proposed Action for expansion has not been defined and many steps are necessary for expansion to occur, the action is still speculative and cannot be reasonably evaluated in this EIS. As stated in Master Response 1, expansion is not part of the Proposed Action, is not a reasonable alternative to the Proposed Action, and is not a reasonably foreseeable action that can be evaluated in this EIS.

The Army recognizes that expansion is a critical issue for local residents. The actions being evaluated in this EIS are separate from any possible future action to expand the PCMS. Implementing the Proposed Action does not preclude or otherwise affect any alternatives to potential expansion.

I.2.3. Master Comment 3 – Number of Alternatives Considered

I.2.3.1. Summary of Comments

Commentors stated generally that the Army did not consider a reasonable range of alternatives in this EIS and specifically that alternate stationing locations and training sites should have been considered.

I.2.3.2. Army's Response

The CEQ regulations implementing NEPA require that agencies preparing EISs shall adopt procedures to ensure that decisions are made in accordance with the policies and purposes of NEPA. For alternatives, the regulations require that "the alternatives considered by the decision maker are encompassed by the range of alternatives discussed in the relevant environmental documents and that the decision maker consider the alternatives described in the environmental impact statement" [40 CFR 1505.1(e)]. Furthermore, the CEQ regulations require that agencies assess in an EIS "all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" (40 CFR 1502.14).

The CEQ's NEPA regulations do not, however, prescribe a specific number of alternatives determined to be a reasonable range of alternatives. In Question 2 of the CEQ's "40 Frequently Asked Questions," the

CEQ clarifies that "[w]hat constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts in each case."

As stated in Section 2.1.2 of this EIS, for many aspects of stationing there are no true alternatives. For example, increased number of Soldiers and Families, the need for new facilities, and the need for training are all necessary elements or results of stationing actions.

As stated in Section 1.1 of this EIS, the decision to station the IBCT and other units at Fort Carson was analyzed in the 2007 PEIS and was one of the implementing stationing actions announced in the December 2007 ROD. As a result, alternative stationing locations have been analyzed previously and are not within the scope of this EIS. The focus of this EIS is simply to study the effects of implementing the decision to station GTA units at Fort Carson.

As stated in Section 2.5 of this EIS, the GTA ROD decision was based on the training resources at Fort Carson and PCMS. Training at locations other than Fort Carson and PCMS would essentially constitute re-examining the GTA ROD stationing decision. Furthermore, the supplementation of training at Fort Carson and PCMS with training at other DoD installations or facilities was determined not to be sufficient or practical. Other training areas are already being used at maximum capacity or are too distant.

I.2.4. Master Response 4 – Section 106 Consultation

I.2.4.1. Summary of Comments

The Army received several comments and questions related to how Fort Carson meets the statutory responsibilities of Section 106 of the NHPA in the identification of historic properties potentially affected by the activities analyzed in the DEIS.

I.2.4.2. Army's Response

Since discussions began related to the potential for expansion of PCMS, Fort Carson acknowledges that the COSHPO, other recently identified consulting and interested parties, and the general public have raised questions and concerns about historic property protection, management, and Section 106 consultation procedures as outlined in the regulations implementing the NHPA (NHPA, 36 CFR 800). Additionally, misunderstandings and conflicting interpretations of the use of the NEPA process for compliance with Section 106 have occurred. It is Fort Carson's intention to work with all interested parties within the scope of 36 CFR 800 to foster stronger working relationships and ensure continued compliance with our statutory and regulatory responsibilities. As such, on December 10, 2008, Fort Carson entered into further consultation with the COSHPO and the ACHP regarding the undertaking analyzed in this DEIS. The FEIS has been revised to reflect that Section 106 consultation will continue until all issues and concerns have been resolved in accordance with 36 CFR 800. As regards Section 106 compliance for future undertakings identified on Fort Carson and PCMS, the Installation will work with the COSHPO and ACHP to determine a path forward until the AAP have been certified by the ACHP for Fort Carson/PCMS and are officially implemented as described in Master Response 5.

I.2.5. Master Response 5 – Use of the 2002-2006 Integrated Cultural Resources Management Plan and Implementation of the AAP

I.2.5.1. Summary of Comments

Comments were received related to the use and function of management plans and other planning documents in Fort Carson's Cultural Resources Management Program, including statements in general that Fort Carson's ICRMP is not up-to-date. Many of these comments also addressed the implementation of the AAP and how they will function within overall program management.

I.2.5.2. Army Response

Fort Carson began the process of updating the 2002-2006 ICRMP during FY 2006 and FY 2007. Due to the complexities involved at that time with current and projected cultural resources workload and increases in numbers of Soldiers, training schedules, and construction activities for Fort Carson and PCMS, in July 2007 the Garrison Commander made the decision to implement the AAP at Fort Carson/PCMS. Fort Carson began discussions in this regard with consulting parties in August 2007.

Background Information on the AAP. The NHPA allows an agency to develop procedures to implement Section 106 and substitute them for subpart B as long as they are consistent with Section 106 regulations (36 CFR 800.14(a)). The AAP were developed for this purpose. The ACHP approved the AAP in 2001, and the Army published the final AAP in the *Federal Register* (67 *FR* 10138-10165) on March 6, 2002. Since this original publication, the Army has undergone internal reorganization that required the AAP to be revised. In November 2003, the ACHP approved an amendment allowing the ACHP chairman to make technical or administrative changes to these procedures provided that they do not alter the role of consulting parties. An amended AAP was subsequently published in the ***Federal Register*** (69 ***FR*** 20576-20588) on April 16, 2004.

The AAP are designed to establish a proactive planning and management-based approach to historic preservation and Section 106 compliance to substitute for the formal case-by-case review process prescribed in 36 CFR 800(B). Installations that follow the AAP will prepare a HPC of the ICRMP in consultation with the SHPO, Tribal Historic Preservation Officers, Indian tribes, and other stakeholders.

An HPC addresses standard operating procedures for the identification, evaluation, assessment of effects, treatment, and management of historic properties, including those of traditional religious and cultural importance to federally recognized Indian tribes or Native Hawaiian organizations. An HPC also includes standard operating procedures for annual review and monitoring of installation undertakings with consulting parties to include the SHPO/THPO, federally recognized Indian tribes, and Native Hawaiian organizations.

ACHP certifies installations that have completed the HPC and have met the certification criteria. Upon certification, the installation is free to implement its actions in accordance with the HPC for five years without further SHPO, THPO or ACHP project-by-project review. The AAP provide a process for amendments and recertification of the HPC. Furthermore, the procedures include provisions for ACHP review of Army programs and installation compliance and for ACHP assistance in improving Army program efficiency. Once completed and certified, the HPC serves as an ICRMP for resources management purposes and as a Programmatic Agreement with all consulting parties for compliance with Section 106. Further details on the AAP can also be found on the U.S. Army Historic Preservation website at www.achp.gov/army.html.

Status of AAP Implementation at Fort Carson/PCMS. Initial meetings regarding the development of the Fort Carson/PCMS HPC began in August 2007, in partnership with the following consulting and interested parties: COSHPO, ACHP, CCPA, Colorado National Trust for Historic Preservation, all Native American Tribes with a cultural affiliation with Fort Carson/PCMS lands, and representatives from Las Animas, Otero, and Huerfano counties. Fort Carson received no response from El Paso, Pueblo, and Fremont County officials.

Fort Carson began preparation of a draft HPC, which was intended for consulting parties' review no later than June 2008. Fort Carson was unable to meet this deadline due to the increased, and immediate, cultural resource management workload caused by twelve different wildland fire events affecting approximately 80,000 acres that took place between April and July 2008, on both Fort Carson and PCMS. An Assistant Cultural Resources Manager/Historic Preservation Specialist has been added to the Fort

Carson staff in an effort to facilitate completion of the draft HPC. It is anticipated that Fort Carson will submit an outline/draft HPC to consulting parties by early 2009, with a consultation meeting to follow.

The management and standard operating procedures detailed in the 2002-2006 ICRMP will remain in force until superseded by ACHP certification of the AAP, and Fort Carson will continue to work with the COSHPO and ACHP on a case-by-case basis for Section 106 consultation.

I.3. Responses to Individual Comments

Table I.3-1 provides a listing of the commentors and their assigned identification numbers. The remainder of this volume provides scanned images of the comment documents and the Army's individual responses to the comments. This section begins with the transcripts of the public hearings for the Draft EIS (October 27, 2008, in Trinidad, Colorado, October 28, 2008, in La Junta, Colorado, and October 29, 2008, in Colorado Springs, Colorado) and continues with the comment documents received by the Army.

Table I.3-1 Commentor Index

Commentor Number	Commentor
Public Meeting Transcripts	
T1	Doug Holdread
T2	Levi Montoya
T3	Abel Benavidez
T4	Kennie Gyurman
T5	Mack Louden
T6	Kimmi Walter
T7	Tony Bernal
T8	Justin Clark
T9	James Herrell
T10	Lane Simmons
T11	Beverly Babb
T12	Kennie Gyurman
T13	Rebecca Goodwin
T14	Lon Robertson
T15	Byron Blotz
T16	Bill Sulzman
T17	Mark Lewis
Federal Agencies	
FA1	U.S. Department of the Interior (Robert F. Stewart)
FA2	U.S. Environmental Protection Agency (Greg Davis)
FA3	U.S. Environmental Protection Agency (Larry Svoboda)
Individuals	
I1	Floyd Beard
I2	Donna Bonetti
I3	Pamela Casteel
I4	Chris M. Eddy
I5	Doug Holdread
I6	Lori Holdread
I7	Larada Horner
I8	Cliff Johnston
I9	Diane Thomas Lincoln

Table I.3-1 Commentor Index (continued)	
Commentor Number	**Commentor**
I10	Linda Mahoney
I11	Juliette Mondot
I12	Cathy Mullins
I13	Julia Portmore
I14	Jane L. Quartiero
I15	Annette Roberts
I16	Tim Roberts
I17	Lon Robertson
I18	Bill Sulzman
I19	Michael Ome Untiedt
I20	Gary and Jennie Yocam
Local Community Organizations or Interest Groups	
LC1	Colorado Council of Professional Archaeologists (Lucy Hackett Bambrey)
LC2	Colorado Legal Services (Larry R. Daves)
LC3	Comanche Nation (Jimmy Arterberry)
LC4	Southern Colorado Environmental Council (Paula Ozzello)
LC5	Southern Colorado Environmental Council (Paula Ozzello and Kathy Hill)
LC6	Not 1 More Acre! and Grassland Trust (Stephen D. Harris)
Local/Regional Agencies	
LRA1	City of Trinidad (Brad Parker)
State Agencies	
SA1	Colorado Division of Wildlife (Sabrina Schnelker)

GROW THE ARMY

FORT CARSON STATIONING DECISION EIS

Public comment heard at

Trinidad, Colorado

27 October 2008

ROBERT FORD, Presiding

Mark Clinard, CSR

Court Reporter • (719) 784-3813 • 217 County Road 119 • Florence, Colorado 81226

Commentor T1 – Doug Holdread

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(27 October 2008; 7:22 p.m.)

MR. FORD: Our first speaker is Doug Holdread.

MR. HOLDREAD: First, thank you for not imposing the two-minute limitation. I only have one page here, but I don't know if I could cover it in two minutes.

I want to speak to two issues that I think are concerns regarding the draft EIS for Grow The Army. One is the problem of the alternatives. The other is the issue of what is called inducement, which is a principle, I believe, in NEPA law or perhaps precedents, of using one EIS to force a future EIS.

T1-1

First of all, with the issue of alternatives in this document, there is a kind of presupposition that I have seen repeated that once stationing decisions are made, that that eliminates from the decision-making power of our legislature the examination of alternative stationings, of alternative assignments of troops. The assumption is that they are coming to Fort Carson; they are going to be trained at Pinon Canyon; that it is not negotiable; that it is already decided.

My understanding of NEPA is that part of its purpose is to provide our decision-makers, our elected officials, our representatives who decide what we are going to do with our money, and what we are going to do

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Commentor T1 – Doug Holdread

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T1-1 (cont'd)

with our land, with options, alternative scenarios; if not to make a decision in favor of all of those alternatives, at least to have those alternative scenarios, for comparison purposes in all kinds of ways -- expense considerations, military expediencies -- there are all sorts of reasons why our legislators, doing our business for us in Washington, need to have the ability to look at alternatives.

T1-2

The other thing that concerns me, obviously, every time we have one of these EISs -- which are unrelated to the expansion of Pinon Canyon -- there is an increased training burden placed upon Pinon Canyon. I think that has some real implications.

T1-3

We are talking here about potentially 6,500 additional solders at Fort Carson, who would train at Pinon Canyon. The document says that -- I would say artfully says, that the Pinon Canyon maneuver site is marginally adequate. I think that is a very perhaps clever turn of phrase.

T1-4

The reason for this Grow The Army decision, I believe, is to induce or force the expansion of Pinon Canyon, not because of military necessity, but because of something that I think is really just beginning to be understood by the public; that it is a pretty grandiose Department of Defense dream scheme to transform

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T1-4 (cont'd)

southeastern Colorado into what would be the world's largest live-fire training range. According to the Army's own documents, an expanded Pinon Canyon would, and I quote, "serve as a joint and combined Department of Defense training facility for all US forces and Allied forces." So this GTA, the Grow The Army proposal, is really one piece of a much larger master plan, not simply to train Fort Carson troops, but it is to train US troops and international forces with remotely-controlled robotic weapon systems. It is a big deal.

The truth is that the Defense Department has enough training land: 25 million acres of the US, and even more in locations around the world. They have so much land that they can't keep track of it all. Section 366 of the 2003 Bob Stump Authorization Act requires of the DOD -- Congress really ordered the Department of Defense to provide an accounting of all of their lands, including a list of training ranges that are underutilized. That was 2003.

Every year since then, according to the Government Accountability Office, the Department of Defense has failed to produce that inventory and accounting of the 25 million acres that they have already, just telling Congress it is too big a job, that

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Commentor T1 – Doug Holdread

they can't figure it out, they can't do it.

It is kind of hard for us, just ordinary people, to grasp the training requirements of these different-sized units, ranges of weapons, all of that kind of thing. But the last EIS we looked at, the transformation EIS, did express this in a way we did understand. In that document -- I was looking for it in the Grow The Army EIS, because I found it helpful -- they calculated it in terms of training weeks. In other words, if used at its maximum potential capacity, how many weeks of training will it take to train the troops that are stationed at Fort Carson. The transformation EIS came up with the number of 77.5 training weeks per year.

T1-5

It doesn't take a military expert to figure out in a 52-week year, 77.5 weeks of training is tough. In fact, the document itself says -- this is a quote, "This training load is not possible and becomes more unrealistic when factoring in conflicts attributable to live-fire operations and necessary land duress to sustain the training lands." This is from the transformation EIS. This training load is not possible.

So, what is going on here?

It also doesn't take a military expert to see that Pinon Canyon is being -- the situation is being

Commentor T1 – Doug Holdread; Commentor T2 – Levi Montoya

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T1-5 (cont'd)

stacked with a training burden that is impossible, and it appears to many of us that this is intended to create a necessity. Not to respond to a need, but to create an artificial need, an artificial necessity to expand Pinon Canyon.

There is a name for this. Under the National Environmental Policy Act, NEPA, using one EIS to force an action under another EIS is called inducement. It is illegal. Using the transformation EIS and the Grow The Army EIS to force the expansion of Pinon Canyon is inducement, and it is against the law.

MR. FORD: Thank you.

Now Levi Montoya.

MR. MONTOYA: I am Levi Montoya, M-O-N-T-O-Y-A. I am with the USDA, Natural Resources Conservation Services. I have a few comments in regard to natural resources.

T2-1

The comment is that with the number of additional soldiers, equipment, the possibility of that adverse effect on the environment. That land is going to be disturbed and to recover that land in a quick period to ensure we don't have any adverse effects is a concern.

One of the concerns we have in that area is the infestation of noxious weeds. That area, the

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surrounding area, has been inventoried and we do have weeds on the state noxious weed list: African rue and spotted knapweed are species found there.

T2-2

One of the concerns is the amount of vehicles coming in from all over the world. Are these vehicles being quarantined and cleaned properly without the transportation of weeds from all over the world?

Our noxious weeds are not native here. Are those vehicles being cleaned of weeds coming onto the facility and then going off of the facility? That is a concern from the Natural Resource Conservation Service and we feel that needs to be addressed. That is what I have for you.

MR. FORD: Thank you.

Abel Benavidez, please, followed by Kennie Gyurman.

T3-1

MR. BENAVIDEZ: Some of this has been rehashed. I couldn't find it in the draft EIS. Guys, I am going to remind you, or get an ad in the Chieftain and in the Gazette, that I would be uncomfortable as hell having five combat brigades stationed eight miles from downtown Colorado Springs. I would not want them in Model. That is where I live. I would be very uneasy about that.

Another thing folks, they are talking about

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T3-2
water. Colorado Springs is raiding southeastern Colorado for water. They want to put a conduit all the way to Colorado Springs. They are going to burn up.

The Army is going to use some of that water. I know the guys need to take a shower, and wash things down.

T3-3
And then we go down to Pinon Canyon, and like Doug talked about, you can almost draw a flow chart: We go down there with all of these brigades; we tear up all this land. Where are we going next? Well, we got this 100,000 acres where we are going to scare these people off, give them $200 an acre and run them off. They do that, and then they come up with some other dream and grab another 100,000 acres.

So Doug touched on so many things it is hard for me to really expand on those. But thank you for listening to me. I know you have listened to the same song and dance from me, but I believe that quite strongly.

MR. FORD: Mr. Gyurman now, followed by Mack Louden.

MR. GYURMAN: My name is Kennie Gyurman, G-Y-U-R-M-A-N. I live about three miles west of the western boundary of the present site.

T4-1
I object to the additional troops being

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T4-1 (cont'd)

trained down here for the additional damage it will inflict on the area there. But I guess what I -- you

T4-2

guys got that this concerns growing of forces. You seemed to forgot that part of that ought to be growing the forces and growing the acreage of the Pinon Canyon. Because it is all involved, it is all the same thing. You generate more of a need for the Pinon Canyon down here with this. And in your eyes, that makes it okay to acquire the additional land.

I know you keep saying this has nothing to do with the expansion, but we know better. We haven't believed you people for four or five years now.

Back in 2005, I started asking around, because

T4-3

I started to get rumors of this. I was assured by people, people tonight right here, to go on like I was going on, do whatever I wanted to do with my place, because there was no money for it, nothing in the works.

Well, it took a court action, Freedom of Information Act, or using that act, to get your analysis of alternative study, Pinon Canyon maneuver site. This is what you have in mind for down there. This come out May 6, 2004, according to your document. This is your document.

So, all of this time we have been told, No, it is not in the works, it hasn't been approved. I don't

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T4-3 (cont'd)

know what you people consider to be telling the truth, but that is not the truth in my eyes.

There is such a thing as honesty. You people should have been honest with the people down here. You want credibility. I have not seen one thing that you people have done since 1983 that would warrant us to believe anything you said.

T4-4

I am almost done. This is your document here. We can look forward to 6,914,328 acres in the southeastern part of Colorado being taken. These are your figures. A total of 17,263 people displaced.

This has been in your thoughts since 2004. We have been fighting it since probably 2006. And we are going to continue to fight it.

Thank you.

MR. FORD: Mr. Mack Louden, followed by Kimmi Walter.

MR. LOUDEN: I am Mack Louden, L-O-U-D-E-N.

I tell you, I hate being here tonight. I would rather be home watching the World Series, but it dictates that we have to come every so often to save our land.

T5-1

Grow the forces. How are we going to grow the forces? We can't even get the number of people that they want in the military now. Are we going to go back

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T5-1 (cont'd)

to the draft, or have a mercenary army?

People, don't be misled by anything you hear: The Pentagon is coming for you.

The build-out of the present foot-in-the-door 25 years ago is vital to the contractors' plans -- I mean the Pentagon's plans. They need to build out barracks, motor pools, golf courses, to make a case for 6.9 million acres for Allied and domestic forces to

T5-2

train on. 17,000 people will be displaced. I think that is a low number, but we will take them at their word. 17,000 people. Our land and our lives have now been refined down to a number. Your family history is now a statistic.

T5-3

People, don't relish in the fact that they are going to take one million acres of public lands along with five million acres of private land. My guess is the one million acres will be transferred somewhere else so there would be no cost to public lands. Rest assured, people, if the Pentagon gets the one million acres, it will in fact tear up the whole region, financially, ecologically, and culturally.

T5-4

The Pentagon will probably deny the maps that were produced as being outdated or obsolete, which is what they told us two years ago when we produced them the first time. You would think that if those were

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outdated maps that in two years they could have updated their records.

Pentagon, I am asking you to divulge all of your plans, and if you are so inept that you have no plan, we need new leadership at the Pentagon.

T5-5

Make no mistake, in spite of the spin that you hear from the Pentagon, they want your land and they are coming after it.

MR. FORD: Kimmi Walter.

MS. WALTER: Good evening. My name is Kimmie Walter, W-A-L-T-E-R.

I am the reporter for the Hoehne FFA. Members of the Hoehne FFA are here tonight in continued

T6-1

opposition of any expansion of Pinon Canyon. By stationing more troops at Fort Carson, the Army has more opportunity to request more land for training. The Army continues to try and station more troops at Fort Carson

T6-2

to justify expansion of Pinon Canyon. Their proposed expansion will have a negative impact on our schools and our community.

T6-3

We the Hoehne FFA oppose any attempt to take away those things we dearly love. My family's ranch borders Pinon Canyon. I have lived on that ranch all my life. It has had a very positive impact on my life. I, as well as my family and other Hoehne FFA members, would

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T6-3 (cont'd)

like to continue our way of life in the future. Until this problem goes away, the Hoehne FFA members will do whatever we can do to fight this expansion.

Thank you.

MR. FORD: Is there anybody else to use the open mic? Go ahead, sir.

MR. BERNAL: I am Tony Bernal, B-E-R-N-A-L.

I am retired military. I am not against the military. I spent many years in the military. I am a disabled veteran.

T7-1

What bothers me, we are so worried about eliminating species. What about us as a species? Where are we going to go? People always been ranchers, what are they going to do? That is the only question I got.

T7-2

We are so concerned about eliminating species, worried about taking care of people in other countries and their land. What about our freedom, our property? We fight for our land. We fight for our property. The same as we would for our land as for our country. It is the same thing, as far as I am concerned.

In Spanish there is a word, "mi patria." My land, my property, my country. It is the same basic word. It just makes it a bit rough for somebody to spend all that time in the military to have this kind of BS imposed on us. That is all I have.

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MR. FORD: Thank you.

Is there anyone else to make a comment using the open mic? If not, that will conclude the open mic session for this evening. But we will be here until 8:30 if you wish to speak with the court reporter, one-on-one. We will be here until 8:30. If you would like to write your comments down, however you like.

We appreciate your time coming out tonight. We know the World Series is on, but this is pretty important.

Thank you.

(The meeting adjourned at 7:35 p.m.)

(Following adjournment, Mr. Justin Clark dictated the following comment for the record:)

MR. CLARK: This is titled "Army/Department of Defense Lies, Cheats, and Steals."

Since when did we the people, for the people, become we the government, for the government?

The DOD has long ago became too big for their own britches, just like the IRS, Internal Revenue Service. For those of you who have never heard of them, or what I am trying to relate to, see Readers Digest article, "The Man Who Beat The IRS," in the July of 1994 edition.

Now it is time for southeastern Colorado

Commentor T8 – Justin Clark

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residents and every single citizen of the United States to do the same thing with the DOD, Department of Defense. Southeastern Colorado will cease to exist if we do not stop the Army's proposed expansion now. The land, our environment, cannot and will not withstand any further burnings or damage to the land and animals by our unconcerned DOD.

T8-1

We need an unbiased environmental group to come in and assess the damage that has been done on the existing Pinon Canyon maneuver site, such as a group of environmentalists from Australia, or Canada, or anywhere but from here. Which we know the Army/DOD will never allow, due to the honest negative report that will come from it.

T8-2

Not one single US Colorado citizen has to give up their land to the DOD. We the people of the United States run this country still. Not the Army, or the Department of Defense with their elementary school tactics to get their way. The time has come to put our government into action and stop the proposed expansion now, and force the DOD to utilize their other viable options as stated in the Trinidad Times Independent article titled "Eminent Domain Language Out of Bill." Tuesday, September 23, 2008 edition.

T8-3

This country was, and still is, based on

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freedom, and if this is allowed to go forward, then we need to change our name to the Un-united Soviet States of America, or the Now Dire Straits of America.

T8-4

The situation is due to the greediness of our government officials and the DOD's continued and non-stop plans to expand the Pinon Canyon maneuver site.

(End of comment.)

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CERTIFICATE

I, Mark E. Clinard, CSR and Notary Public, certify that the foregoing is a true transcript of testimony given and proceedings had.

I further certify that I am not related to any party herein, nor their counsel, and have no interest in the result of this proceeding.

Mark E. Clinard, CSR/Notary
217 County Rd 119
Florence, Colorado 81226
Commission Exp: 9/29/2010

NOTARY PUBLIC
MARK E. CLINARD
STATE OF COLORADO

Responses

Response to T1-1
Please refer to Master Response 3.

Response to T1-2
The environmental impacts of increased training at PCMS are evaluated in Chapter 4 of this EIS.

Response to T1-3
Comment noted and will be included in the Administrative Record.

Response to T1-4
Please refer to Master Responses 1 and 2.

Response to T1-5
Please refer to Master Responses 1 and 2.

Response to T2-1
The impacts to soils of PCMS are discussed in Section 4.5 of this EIS. The Army has several mitigation measures to address land recovery which are included in new Chapter 6.

Response to T2-2
The Fort Carson Invasive Plants Management Plan proscribes activities that prevent the spread of noxious weeds. The Army thoroughly cleans its vehicles and equipment prior to shipment from one location to another as part of the extensive list of procedures that must be completed to deploy and redeploy military equipment. Vehicles undergo a rigorous inspection process prior to entering/re-entering the US.

Section 4.7.2.1.2 refers to the Fort Carson Invasive Plants Management Plan.

Response to T3-1
Comment noted and will be included in the Administrative Record.

Response to T3-2
Comment noted and will be included in the Administrative Record.

Response to T3-3
Comment noted and will be included in the Administrative Record.

Response to T4-1
Comment noted and will be included in the Administrative Record.

Response to T4-2
Please refer to Master Responses 1 and 2.

Response to T4-3
Please refer to Master Response 1.

Response to T4-4
Please refer to Master Response 1.

Response to T5-1
Recruiting and retention efforts are outside of the scope of this EIS.

Responses

Response to T5-2
Please refer to Master Response 1.

Response to T5-3
Please refer to Master Response 1.

Response to T5-4
Please refer to Master Response 1.

Response to T5-5
Please refer to Master Response 1.

Response to T6-1
Please refer to Master Responses 1 and 2.

Response to T6-2
Please refer to Master Response 1.

Response to T6-3
Please refer to Master Response 1.

Response to T7-1
Comment noted and will be included in the Administrative Record.

Response to T7-2
Comment noted and will be included in the Administrative Record.

Response to T8-1
Please refer to Master Response 1.

Response to T8-2
Comment noted and will be included in the Administrative Record.

Response to T8-3
Please refer to Master Response 1.

Response to T8-4
Please refer to Master Response 1.

GROW THE ARMY

FORT CARSON STATIONING DECISION EIS

Public comment heard at

La Junta, Colorado

28 October 2008

ROBERT FORD, Presiding

Mark Clinard, CSR

Court Reporter • (719) 784-3813 • 217 County Road 119 • Florence, Colorado 81226

Commentor T9 – James Herrell

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(28 October 2008; 7:20 p.m.)

MR. FORD: Mr. James Herrell, please, followed by Lane Simmons.

MR. HERRELL: My name is James Herrell, H-E-R-R-E-L-L.

I have been looking at footprints a significant part of my scientific life.

In the small but proud percent of Amerindian blood that runs through my veins, I feel a sense of deja vu. Promises like we have seen were probably given to some of our ancestors all the way to the Pacific ocean. So here we are again.

The Army orchestrated this effort in response to the Environmental Policy Act of 1969 to some degree. This law does not require full disclosure of the intent.

T9-1

Presentation mentioned nothing about significant land acquisition. But you know that the law doesn't ban full disclosure. The conclusion we must draw is that the Pentagon has made a conscious choice not to tell the loyal, patriotic people of southeast Colorado about their plans to take staggering amounts of land.

I read in the Pueblo Chieftain that this plan we discovered is silly. Silly, it says.

Let me tell you that this silly plan is evidence in a federal court now. So the US Army is

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creating silly documents now presented in the federal court. I can't wait for the judge to read that quote.

I am a plaintiff in the lawsuit. Thank goodness for the Freedom of Information Act. We got this document unredacted.

Some major expense seems to take place in this world as we attempt to ferret out the truth, and that is not done with a highlighter. It is done with a Sharpie.

The grow the contractors -- I mean Grow The Army agenda is subject to scrutiny. While not able to meet recent quotas, what force are we growing? Is the draft imminent, or are we going to contract this out to somebody else?

Willing sellers? The point is that there are no willing buyers. There is no doubt that the Army wants the land. My daughter wants a pony.

No, from the American taxpayer, means no.

We would like to thank Representative Musgrave, and Representative Salazar, and Senator Salazar for their efforts on our behalf. A bit of firmer stance could have shut this stuff off. Let's all be more encouraging to our elected officials.

T9-1 (cont'd)

To not speak of a desire to acquire hundreds of thousand of acres of generational ranch land, our heritage, and our way of life is not only criminal, but

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Commentor T9 – James Harrell; Commentor T10 – Lane Simmons

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T9-1 (cont'd)

it is an insult to all of us.

Whether this DEIS is build up, build out, let's don't kid ourselves. If that much infrastructure begins to evolve, what is next?

Gee whiz, I think this may be next. This Analysis of Alternatives Study of Pinon Canyon Maneuver Site, Colorado, this silly document, that we had to use the Freedom of Information Act to acquire.

I am going to ask you guys to use this stealth technology on al Quaeda, not on the loyal citizens of southeastern Colorado.

God bless America, and thank you very much.

MR. FORD: Thank you, Mr. Herrell.

Lane Simmons, please.

MR. SIMMONS: I am Lane, L-A-N-E, Simmons, S-I-M-M-O-N-S.

I do have a few questions, actually. I would like to preface that with some comments. I understand

T10-1

that it is your position that this EIS is not related to the purchase of the Phase 1A area, which is south of the current maneuver site, which is between 80,000 and 100,000 acres, which is actually the first phase of the seven million acres expansion. I was actually misled. I thought it was 5.5 million acres, but apparently in the paper it is 7 million acres. The 5.5 was probably

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T10-1 (cont'd)

not adequate enough.

T10-2

I am also well-aware that the expansion of Pinon Canyon, as well as the troops coming to Fort Carson, are in large part driven primarily by interests in Colorado Springs and El Paso County. This has a lot less to do with the management of our troops and their safety and a lot more to do with the economic health of the city to the north.

T10-3

In a nutshell, I am just worried these additional troops are nothing more than a way to justify the future expansion of Pinon Canyon.

T10-4

Looking through the EIS it becomes apparent that there is some concern. The EIS does state there is adequate land on existing Pinon Canyon and Fort Carson to train these troops. The EIS does say that. But there is carefully written language in the EIS document that allows room for a future expansion, primarily by talking about future missions, that there may be inadequate area to train for future missions.

It seems that somebody has gone to great lengths in this document to leave themselves a lot of wiggle room in the future to say I told you so: I am training for a future mission that I didn't anticipate back in 2008, so we need to expand Pinon Canyon.

T10-5

If Fort Carson is concerned that their land is

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T10-5 (cont'd)

going to be too tight to train for future missions on the current Pinon Canyon, current Fort Carson, why bring more troops? To me, that is a blatant disregard for their safety. In the event that a future mission requires more land than you presently have, that needs to be addressed now, so that is something that you should be honest about. The way this EIS is written, it looks to me like a blank check for a future land acquisition in this area.

The Army already mentions in the EIS that they are having trouble meeting training standards.

T10-6

Actually, I have questions in regard to those training standards as well. So I understand that it takes fewer troops to control more acres of land, but by that logic pretty soon we will need land the size of the entire state of Colorado to train on.

That is all I have. Thank you for your time. I appreciate it.

MR. FORD: Thank you, Mr. Simmons.

Ms. Beverly Babb, please.

MS. BABB: My name is Beverly Babb, B-A-B-B. Lots of Bs. I live at 1120 West Twelfth, La Junta, Colorado.

There are 700,000 head of cattle that are sent to market from the Arkansas Valley every year. That

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Commentor T11 – Beverly Babb

means your hamburger, steaks, and roasts. Ranches in the area the Army wants is the area where a lot of your food comes from. Beef, beans, tomatoes, onions, melons, et cetera.

T11-1

Along with the Army wanting to take our land, Aurora is taking our water. Now, we have to put this together. They want to bring additional brigades to this area. You also have more troops and civilians to plan on. Where is the water going to come from to support all this expansion? Every city in Colorado right now is looking at the question of water.

We would pay more for groceries and chase the generations of ranchers into the city and you can have the land for the Army. Not a very pleasant idea.

Subtract green lawns, community swimming pools, and reduce our showers to maybe three times a week. Then we will have more water for the Army troops at Fort Carson and Pinon Canyon.

But let's talk about soil.

T11-2

Our soil in this beautiful desert area is fragile and moves easily with extremely strong winds. And our winds are good now here. Our winds are why we have all of those windmills, and more planned. This fall during a five-minute time frame we literally could not see the house across the street. Dan and Dawn

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T11-2 (cont'd)

Johnson could not see our house across the street. Not even the outline. And that is in town. Envision tearing up this soil for miles and miles of roads, ten thousand soldiers driving armament over that land, and I can tell you that the topsoil is going to take to the air in a dust storm the likes of which we have never seen, even in the '30s.

Gauge our winds over a year's time, take soil samples, and depth of soil samples. And look at the history of this area. There is a book, "The Worst Hard Times." For those of you who have read it, you know what it is going to be. The dust from Colorado blew to Washington, DC, during the '30s.

We have the good common sense to understand that this is not the location that the Army needs.

T11-3

Now, this information is from your Appendix A of Major Army Land Holdings. You have two million acres of land at White Sands Missile Range in New Mexico, and only 707 personnel, which is four persons to the acre. That is a lot of room. In fact, it is actually the size of the big island of Hawaii.

Then you have one million acres at the Yuma Proving Ground in Arizona, with 350 staff. Again, that is four people to the acre.

Dugway Proving Ground in Utah has

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T11-3 (cont'd)

798,855 acres, and a permanent staff of 60.

All three of these sites are already operational and would not cost additional tax dollars, nor would you have to purchase land from unwilling ranchers and totally demolish the lifestyle of generations of people and the economy of the entire southeastern part of the state.

My sincere belief is that you have already three strong appropriate locations elsewhere, and we would like for you to exercise one of those options.

Thank you very much.

MR. FORD: Thank you, Ms. Babb.

Kennie Gyurman.

MR. GYURMAN: My name is Kennie Gyurman, K-E-N-N-I-E, G-Y-U-R-M-A-N.

Last night in Trinidad, I mentioned the report. I think most everyone has seen it. They kept it secret. It took a court order to get it.

I was reading an article in the Pueblo Chieftain. Their requests were referred to the Pentagon where an Army spokesman dismissed the 2004 Fort Carson report as silly.

T12-1

So I thought about that a bit. I wanted to be danged sure that I knew what silly meant. So I got out my dictionary and I looked: "Silly implies ridiculous

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T12-1 (cont'd)

or irrational behavior that seems to demonstrate a lack of common sense and good judgment."

That fits your plan perfectly.

MR. FORD: Thank you, Mr. Gyurman.

Rebecca Goodwin.

MS. GOODWIN: My name is Rebecca Goodwin. G-O-O-D-W-I-N.

According to the Directorate of Environmental Compliance & Management Strategic Plan, Fiscal Years 2001-2005, the overall strategic goal of the 2002-2006 Integrated Cultural Resource Management Plan for Fort Carson and PCMS is to conserve and protect cultural resources, consistent with the military mission, for present and future generations.

Among the objectives set forth in the ICRMP are to implement a cultural landscape planning approach to cultural resources management that recognizes the complexity of the human cultural interaction with the natural terrain through time; to inventory and evaluate cultural resources for eligibility to the National Register of Historic Places; to provide guidelines for the preservation, stabilization, rehabilitation, repair, and maintenance of historic properties.

T13-1

The total estimated budget for ICRMP implementation at Fort Carson and the PCMS during

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T13-1 (cont'd)

2002-2006 was $8,018,000, yet the concept of a cultural landscape planning approach has consistently been avoided by the Army.

T13-2

In addition, historic sites which had been deemed ineligible for the National Register by consultants hired by Fort Carson and PCMS were targeted to be reevaluated during the 2002-2006 time period. Yet during tours given to the state historic preservation officer, Colorado Preservation Institute, and the National Trust for Historic Preservation in late 2007, it was the consensus that some sites deemed ineligible clearly were eligible, but Army cultural resource personnel stated that they still had needed to re-evaluate the sites.

T13-3

Army Regulation 200-4, Cultural Resources Management, outlines responsibilities with regard to cultural resources legislation for Army installations, major commands, and supporting organizations. Specific responsibilities of the cultural resources management program are to develop, approve, and maintain an Integrated Cultural Resources Management Plan, or ICRMP. The ICRMP for Fort Carson/PCMS expired in 2006, and although they elected in July 2007 to develop the AAP for Section 106 compliance, consulting parties have had no contact from Army personnel since February of 2008.

Also, to inventory and evaluate cultural

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T13-4

resources. Yet 25 years after the establishment of the PCMS a significant percentage of the resources has yet to be inventoried.

To protect and maintain eligible and listed National Register properties and promote their preservation, rehabilitation, and adaptive reuse. But

T13-5

National Register-eligible sites, including Brown's Sheep Camp, have been fenced and neglected, with dry forage and tumbleweeds being allowed to accumulate, increasing fire risk. In addition, neglect and lack of maintenance have contributed to the overall deterioration of this significant property.

T13-6

Another requirement is to integrate preservation requirements with planning and management activities of the military mission, and importantly, to cooperate with federal, state, and local agencies, Native American tribal organizations, and the public in cultural resources management. Unfortunately, the Army has chosen not to comply with this legal requirement either, as demonstrated by the following:

Their failure to submit to the SHPO required information concerning Section 106 compliance regarding the use of Red Rocks Ranch, Sharps Ranch, and the Big Canyon complex;

The Army's statement that Section 106

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T13-6 (cont'd)

procedures would take place only when a project has the potential to adversely affect cultural resources, which, in the words of the SHPO, and I quote, "is in direct opposition to the expectation of the SHPO that consultation is required on any project that has the potential to affect -- not adversely -- to affect historic properties." In the words of the Advisory Council for Historic Preservation, and I quote, "The issue is not whether there are specific properties or sites that might be affected, but is it the type of activity that might affect sites."

In other words, if there may be the potential for adverse effects, there must be a finding of adverse effect, which requires consultation and notification of the advisory council.

T13-7

In addition, the Army has responded to the SHPO's repeated requests for Section 106 consultation with only perfunctory responses.

T13-8

This pattern appears to be continuing. In recent months a series of communication towers have been erected on the PCMS. These towers are clearly visible from the Santa Fe Trail Historic & Scenic Byway and have altered the cultural landscape. But it appears that the Army has neither considered the adverse effects to the viewscape of this nationally significant historic and

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T13-8 (cont'd)

cultural site, nor undertaken Section 106 consultation, which is required at any time the potential for adverse effect exists.

It is our understanding that the FCC requires that all towers must have a public notification and review process, which also has not happened.

T13-9

The DEIS states that since the Bridger Fire, Fort Carson cultural resource personnel have begun individual site assessment work, which is projected to be completed in November 2008. Which I assume means it should be finished in the next several days. It also states that assessment and recovery efforts and PhaseI/II archaeological inventory work will take five to seven years to complete, and that the work is scheduled to start in the spring of 2009.

T13-10

Yet, once again, it is reported that the SHPO officer has had no communication with Fort Carson concerning the fire and damage to archaeological and historic sites.

Based upon past actions and the continuation of this pattern, we have significant, warranted

T13-11

concerns. This DEIS addresses substantial increased troop training at the PCMS. In light of statements in this DEIS that an IBCT is projected to conduct maneuver training in the more ruggedly contoured areas of PCMS to the northern and western portions of the training site,

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T13-11 (cont'd)

and in the eastern canyon areas where numerous historic and archaeological sites are located, combined with statements that, quote, "installation managers are projected to have limited options in managing maneuver and live-fire training activities at the PCMS," the question must then be asked: If the Army has enough information to make findings of impact in the DEIS, why hasn't Section 106 compliance consultation been initiated, since it is obvious that increased troop activity has potential for adverse effects?

T13-12

It appears that once again a course of action has been predetermined and this DEIS and these public meetings are only an attempt to appear to adhere to the laws and regulations which govern all federal agencies in this country.

Thank you.

MR. FORD: Thank you, Ms. Goodwin.

Mr. Lon Robertson, please.

MR. ROBERTSON: I am Lon, L-O-N, Robertson, R-O-B-E-R-T-S-O-N.

T14-1

As Jim mentioned, and others, the process and procedure of the DEIS is somewhat in question. This part of the National Environmental Policy Act applies to the Army's contractors and subcontractors. They and other agencies have become adept at following the letter

Commentor T14 – Lon Robertson

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T14-1 (cont'd)

of the law, but masters at ignoring the intent of the NEPA process. This is evidenced by there not being any actual consideration and true involvement of citizens as would be expected.

Citizen participation. In order to have citizen participation you must have a democratic foundation, and have a decisive influence on the outcome of the decision-making process. Our participation in these meetings will not have any direct influence on the outcome or the proposed action.

They say that all substantive and relevant comments will be addressed in the final EIS. That is the limit as to how they will respond to our comments tonight, specifically with this EIS. The NEPA compliance process and comment period only delivers an appearance of democratic participation. It is nothing but a spectacle, that serves as a check box activity required of the Army. We should, and will, however, make comments that have legal standing in future actions such as lawsuits that may need be considered. But we are not fooling ourself about this specific process today and what the actual comment period means.

So how do we make a difference? We get involved by protecting our lands, our lives, our heritage, and our future by continually effecting change

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at the grass-roots level; by taking comments to our elected leaders, and getting others involved to do the same. We have representatives of our elected leaders here tonight. We have Dwight from Sen. Salazar's office; we have County Commissioner Kevin Carney, and commissioner hopeful Keith Goodwin, and other elected officials here. I see the city manager from Fowler.

These are the people we need to take the message to. These are the people who helped us in getting where we are.

We have succeeded in getting over 90 percent of cities, towns, counties, schools, state legislatures, and the US Congress to oppose the unnecessary project called the PCMS expansion. Keeping this in the public eye will bring to the forefront the basic rights and privileges that we are trying to protect. We have the ability to continually influence decision-making for implementing or changing laws, and we have to continue to use that ability to the fullest extent possible.

We have to be fully transparent in our efforts and continue to work to demonstrate the lack of transparency being displayed by the Army and its contractors. T14-2 We owe it to the country and our children to publicize the attempts by the Army deceive, to falsely justify, or otherwise promote an agenda that has

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T14-2 (cont'd)

nothing to do with protecting our country.

T14-3

Specific elements of the DEIS. There is a concerted effort in the DEIS to justify the rationale of the DEIS as being totally apart and separate from the proposed expansion. We submit it is a segmentation of the larger plan to take over southeastern Colorado. Realization of the Army's true intent is evidenced in the complete 2004 Analysis of Alternatives document referenced here several times already, denying there was ever any real consideration for taking over southeast Colorado.

It is obvious to us that the basic purpose and intent of the Grow the Army in Colorado is implicated in and surrounds the proposed actual taking of almost seven million acres, along with the displacement of at least 20,000 people.

If you read the population list from that specific report, it references specific counties, from Phase 1A through Phase 5, over an 18-year take-over period.

Las Animas County would lose 2,690,944 acres. It would also lose 4,500 people.

Otero County would lose 730,063 acres, and 4,300 people.

Baca County would be completely obliterated:

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T14-3 (cont'd)

All 2,304,281 acres, and all of its 4,517 people.

Bent County would lose 566,240 acres, and 1,931 people.

Prowers County would lose 622,800 acres and 1,949 people.

If that does not make a direct hit on southeast Colorado and completely obliterate us. I don't know what else they could think.

T14-4

Specifically regarding Section 4.9.2 and 3 of the DEIS. This section references a report required by Sens. Salazar and Allard to justify PCMS expansion. It is odd that this PCMS-specific document did reference it, even though they reference it saying it doesn't have anything to do with the expansion.

Mitigation measures are suggested in this section that reference the Army's response to the National Defense Authorization Act, Section 2831. Pinon Canyon Expansion Opposition thus submits their formal response to that Army report as a document to be included in this EIS, and as a portion of this public comment. This particular comment response for the National Defense Authorization Act is submitted on behalf of the board of directors of the Pinon Canyon Expansion Opposition.

And that's it.

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Commentor T15 – Byron Blotz

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MR. FORD: Thank you, Mr. Robertson.

Is there anyone else to make a comment at the open mic?

MR. BLOTZ: My name is Byron Blotz, B-L-O-T-Z.

When you were going over the list a while ago, you hit water and jumped immediately to the biologicals. When you came to utilities, you mentioned water and jumped away from it right away.

T15-1

You say tonight, there are about seven or six thousand new troops coming to Fort Carson. How many more people for each troop or family do you bring in, move into the area to service, hospitals, schools, whatever, for those troops? Now, I have heard as many as 30,000 troops for Fort Carson.

Colorado Springs does not have enough water to take care of your needs of that many people. They say a ballpark figure is it takes one acre foot of water for each family. One acre foot of water does not mean going through the meter at the house, but city parks, schools, hospitals, service stations, all that sort of thing, car washes, to reach the acre foot of water.

To dry up the farmland, you would be allowed to take consumptive use of our irrigation water. The consumptive use runs around 22 inches of water per acre. So you could get less than two feet, two cubic feet of

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T15-1 (cont'd)

water, or acre feet of water, per share of water, per acre of farmland. Now, if you bring in that many people, you have the potential of drying up the entire Arkansas Valley irrigated section.

I never heard anybody discuss drying up all the irrigated land as well as ranch land, and you skipped over it like a whistle in the wind. So I would like to know how many troops you are going to bring, and where are you going to get that water? Because people have to have water to live. And if you take it off the farms, you are not just taking off the acres of the ranch land they are using, but losing the whole economic value of this valley.

That is about all. Thank you.

MR. FORD: Is there anyone else?

If not, that concludes the open mic session for this evening. We will be here until 8:30. Our court reporter will be here if you would like to talk to him and leave a comment.

You can leave comments on the comment cards and other access that we gave you this evening. We appreciate your time this evening and have a safe trip home.

(The meeting adjourned at 7:55 p.m.)

MARK CLINARD, CSR
(719) 784-3813

CERTIFICATE

I, Mark E. Clinard, CSR and Notary Public, certify that the foregoing is a true transcript of testimony given and proceedings had.

I further certify that I am not related to any party herein, nor their counsel, and have no interest in the result of this proceeding.

Mark E. Clinard, CSR/Notary
217 County Rd 119
Florence, Colorado 81226
Commission Exp: 9/29/2010

NOTARY PUBLIC
MARK E. CLINARD
STATE OF COLORADO

Responses

Response to T9-1
Please refer to Master Response 1.

Response to T10-1
Please refer to Master Response 1.

Response to T10-2
Comment noted and will be included in the Administrative Record.

Response to T10-3
Please refer to Master Response 1.

Response to T10-4
Please refer to Master Response 1.

Response to T10-5
As stated in Master Response 1, the stationing of additional troops and their training can be conducted to meet current mission requirements. This can be done without jeopardizing the safety of Soldiers stationed at Fort Carson. Please refer to Master Response 1.

Response to T10-6
Comment noted and will be included in the Administrative Record.

Response to T11-1
See revised Section 4.11.1.1.1 of this EIS.

Response to T11-2
Please refer to Section 4.5.2 for the discussion of soil impacts in this EIS.

Response to T11-3
The Army included the analysis of other stationing locations for GTA units as part of the 2007 PEIS. Decisions made as part of that EIS process selected the best locations to station GTA units in looking at a variety of factors to support GTA stationing. Please refer to Master Response 1 and the Programmatic EIS and Record of Decision for Army Growth and Force Structure Realignment for additional details regarding installation stationing locations.

Response to T12-1
Comment noted and will be included in the Administrative Record.

Response to T13-1
The Fort Carson Cultural Resources Program incorporates cultural landscape analysis as part of every evaluation and/or adverse effect determination. Please see Section 5.2.1.4.7 of this EIS. Consideration of cultural landscapes is embedded within the National Register eligibility evaluation criteria established in 36 CFR Part 63 with which Fort Carson complies, as well as in the various Research Domains used by cultural resources personnel during the historic property identification and evaluation process.

Response to T13-2
Conducting historic property re-evaluations is one of Fort Carson’s Cultural Resources Program’s Best Management Practices. Re-evaluation projects occur routinely and are standard within the Program. All sites that have been determined as National Register-eligible, to include those that need to be re-evaluated, are treated and protected as eligible.

Responses

Response to T13-3
Army Regulation 200-4 was superseded by Army Regulation 200-1 in 2007. The status of the implementation of the Army Alternate Procedures for Fort Carson was discussed at the agency and public scoping meetings for this EIS in May 2008. All subsequent inquiries regarding this subject have been answered and addressed by the Fort Carson CRM.

Response to T13-4
As detailed in Section 4.8 of this EIS, a majority of the PCMS (80 percent) has been inventoried for cultural resources, with over 5000 sites identified to date.

Response to T13-5
Historic properties on PCMS that have been determined National Register-eligible are maintained in accordance with applicable law and regulation. Brown's Sheep Camp was included in the HABS evaluation/mitigation project conducted in 1989 for 7 of the historic ranch sites on the PCMS.

Response to T13-6
In accordance with Army Regulation 200-1, the Army is required to comply with all applicable cultural resource laws and regulations. Fort Carson continues to work with the COSHPO, ACHP, tribes, and other interested parties to comply with Section 106.

Response to T13-7
Fort Carson has received no such comment from the COSHPO.

Response to T13-8
The construction of communication towers is not part of the Proposed Action in this EIS.

Response to T13-9
Text has been revised in this EIS to reflect progress in completing individual site assessment work (refer to Section 4.8.1).

Response to T13-10
Mr. Edward Nichols, the newly-appointed COSHPO, was fully briefed on the cultural resources efforts regarding both the PCMS and Fort Carson wildland fires in a meeting with Fort Carson's Commanding General on July 9, 2008.

Response to T13-11
As stated in Sections 3.8 and 4.8 of this EIS, for both Fort Carson and the PCMS, when specific undertakings related to military training activities are identified in the future, Section 106 consultation will be initiated.

Response to T13-12
The Army has followed NEPA requirements. The decision will be made and stated in the ROD after the completion of the FEIS. Comments from public meetings have been considered as part of this process.

Response to T14-1
The Army has considered and responded to all substantive and relevant comments received in response to the DEIS, as is required under the NEPA process. Please refer to Master Response 1.

Responses

Response to T14-2
Comment noted and will be included in the Administrative Record.

Response to T14-3
Please refer to Master Responses 1 and 2.

Response to T14-4
The first paragraph of text in Section 4.9.2.3 of this EIS explains that the mitigation measures stated in the report concerning potential expansion "also apply to the Army's intentions to contribute to the economy of southeast Colorado whether PCMS expands or not."

Response to T15-1
For the potential impact on potable water supplies, see Section 3.11.2.1.1 of this EIS for Fort Carson and revised Section 4.11.1.1.2 for PCMS.

GROW THE ARMY

FORT CARSON STATIONING DECISION EIS

Public comment heard at

Colorado Springs, Colorado

29 October 2008

ROBERT FORD, Presiding

Mark Clinard, CSR

Court Reporter • (719) 784-3813 • 217 County Road 119 • Florence, Colorado 81226

Commentor T16 – Bill Sulzman

GTA/EIS -- Colorado Springs CO -- 10/29/2008

Page 2

(29 October 2008; 7:22 p.m.)

MR. FORD: Our first comment will come from Bill Sulzman.

MR. SULZMAN: I am Bill Sulzman, S-U-L-Z-M-A-N.

T16-1

I want to primarily comment on the subject that even though the document takes great pains to say that expansion at Fort Carson can be talked about without talking about Pinon Canyon, I don't think that is true.

I will work my way through one paragraph which I would say almost rises to the level of satire. It is so full of weasel words and holes, it is like Swiss cheese. I will real it and comment as I go through it.

T16-2

It is Page 2-5: "The Army's position is that the present facilities at Fort Carson and PCMS marginally provide sufficient land to train assigned soldiers and units adequately, including IBCT and CAB being studied in this EIS for current missions."

A couple of words in there jump out at me. Certainly if something is marginally sufficient, it is also marginally insufficient. That is just kind of using a definition that you would get out of a dictionary. So reading the rest of the paragraph tells you which way that would tilt. Which way really is this

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(719) 784-3813

Commentor T16 – Bill Sulzman

T16-2 (cont'd)

statement tilting? Is it towards marginally adequate, or marginally inadequate?

T16-3

Picking up again with the quote as stated in the 2007 Fort Carson transformation EIS: "However, even with just the assignment of the baseline units and soldiers, it will be necessary for the Army to deviate from its doctrinal training standards."

Doctrinal training standards as applied to PCMS have come up with acreages ranging from the one we just found out, which is about 6.9 million acres in 2004, and the land use requirement in 2005 said an additional 1.1 million acres. It took a long time to get the blanks filled in on those documents, but we finally got them. That is what the people looking at the doctrinal requirements in fairly recent time have defined as how much land there ought to be down at Pinon Canyon.

T16-4

Then, continue on. The rest of that sentence -- I will read it: "It will be necessary for the Army to deviate from the doctrinal training standards which are designed to address the multiple contingencies that its forces may face both now and in the future, not just current missions."

There is a strong hint in there that there are future missions that are note being foreseen in this

Commentor T16 – Bill Sulzman

GTA/EIS -- Colorado Springs CO -- 10/29/2008

Page 4

T16-4 (cont'd)

document.

T16-5

"With the addition of the new units at Fort Carson, the Army would have to introduce more work-arounds and deviate further" -- remember that up above it said that, based on what is in the pipeline, there will be deviation from doctrinal standards. Now they say, "This addition of one or both of these units will deviate further from doctrinal training." So we are way out there now. It is like a second red flag going up here -- "which would have associated costs and implications."

The last paragraph has another of these loaded

T16-6

phrases: "These could include greater environmental impacts."

I don't know why they put "could" in there, because when you add in the accumulation of the new standards that went in in January of 2008, plus elsewhere in this document seeing some cumulative impacts estimated seven percent, eight percent, thirteen percent -- and even those are estimates. So it is not "could." That phrase should be "will."

T16-7

Also, it is my understanding that environmental impacts are not measured quite as hard as they used to be; there are no more after-action reviews being required for assessing this. So that would also

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Commentor T16 – Bill Sulzman

GTA/EIS -- Colorado Springs CO -- 10/29/2008

Page 5

T16-7 (cont'd)

raise concern for me.

T16-8

So after the environmental impacts, "It will also take less time for soldiers with families at home station, increased expenses, and suboptimal training."

We have now come back again to one of these red flags that would make that statement about marginally sufficient sound way more like insufficient.

Who wants to have a place that gives suboptimal training?

Then, the next paragraph goes on with this language that you can read a couple of different ways. They say again that expansion here doesn't automatically

T16-9

cause expansion down there. Here is a sentence: "That is the contemplated expansion at PCMS" -- which I think has gone a little beyond contemplated; although we have had various forms of that contemplation: 6.9 million in 2004, and 1.1 million acres in 2005. Right now a 418,000 acres proposed expansion has been whittled down to 100,000 acres. It says here, "because the proposed expansion will not automatically trigger expansion"; that "the proposed action can proceed without expansion"; and "the proposed action and expansion are not interdependent parts of a larger action."

That almost has to be said, because Fort Carson and PCMS expansion, especially the latter,

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Commentor T16 – Bill Sulzman

GTA/EIS -- Colorado Springs CO -- 10/29/2008

Page 6

T16-9 (cont'd)

is the subject of a moratorium right now. There can be no funds appropriated for expansion. So you have to say that as many times as you can in a document that screams to high heaven that you are really talking about an inevitability of coming back later, flipping those words right around and going with inadequate, inadequate, et cetera, et cetera, using some of the same data that is in here, where you get into expanded use, doctrinal standards, et cetera.

So I do think that paragraph is satire; that any reasonable person reading that would see way more between the lines than on the paper.

Another couple of random thoughts -- I didn't read it all, but I read a lot of it.

T16-10

I learned that the Army at Fort Carson sometimes trains in the Pike National Forest. I had not heard that before. It would be nice to have a map and some delineation of how much, and where that is done, and when.

There is another sentence in here which I found almost comical -- anyway, it relates to the

T16-11

increased -- they do say there will be a lot of increased use of the Pinon Canyon maneuver site. But it obviously does not rise to the level of needing to expand it, supposedly.

T16-12

There is the use of the word "mitigation" all

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Commentor T16 – Bill Sulzman; Commentor T17 – Mark Lewis

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Page 7

T16-12 (cont'd)

the time: If you have a bad problem, you mitigate it and the problem goes away.

T16-13

Anyway, there is a phrase in here where it talks about there could be possibly -- it is a double qualifier -- could be possibly some increased purchase and use of services in the Pinon Canyon area. But it is so modified that it is pretty much meaningless: Could be possibly. They use two subjunctives in the same sentence.

T16-10 (cont'd)

Those are all the remarks I have. I would like an answer to the question, Where does Fort Carson train in the Pike National Forest? I didn't know that.

Thank you.

MR. FORD: Thank you, Mr. Sulzman.

Now, Mr. Mark Lewis.

MR. LEWIS: I am Mark Lewis. M-A-R-K, L-E-W-I-S.

T17-1

I prepared a DVD about the new map that was released from the lawsuit. So we will see if that plays. Otherwise, you have to listen to me.

MR. WARNER: Can you leave the DVD with us?

MR. LEWIS: I can. You can enter it in the record and play it for anyone you want. I brought you a copy.

MR. WARNER: That would work.

MARK CLINARD, CSR
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Commentor T17 – Mark Lewis

T17-1 (cont'd)

(DVD shown as Mr. Lewis commented.)

MR. LEWIS: This is a satellite map of the area, with an overlay from the new map, which is the old map, the denied map. The now official map.

This overlay, I think, makes the statement that this is not a NIMBY issue, not a not-in-my-backyard issue; not I live in Colorado Springs, so what the hell do I care. This is a state issue, and I think it is a very much national issue, because the only way to remove 17,263 people from this land would be eminent domain.

That is all I have to say.

That is all yours.

MR. FORD: Thank you, Mr. Lewis.

Is there anyone else who would like to use the mic this evening?

If not, that would conclude the open mic session for tonight. We still have the court reporter here who will take comments off line, if you wish to give them. Other than that, I wish the rest of you a safe trip home. The Fort Carson folks will be here until around 8:30. Have a good night.

(The meeting adjourned at 7:35 p.m.)

Commentor T17 – Mark Lewis

A CD was provided along with Mark Lewis' comment called "New Map." If you would like a copy of the CD, contact the Fort Carson Garrison Public Affairs Officer at (phone) 719-526-1269, (fax) 719-526-1705, or (email) carsdecamnepa@conus.army.mil.

CERTIFICATE

I, Mark E. Clinard, CSR and Notary Public, certify that the foregoing is a true transcript of testimony given and proceedings had.

I further certify that I am not related to any party herein, nor their counsel, and have no interest in the result of this proceeding.

Mark E. Clinard, CSR/Notary
217 County Rd 119
Florence, Colorado 81226
Commission Exp: 9/29/2010

NOTARY PUBLIC
MARK E. CLINARD
STATE OF COLORADO

Responses

Response to T16-1
Please refer to Master Response 1.

Response to T16-2
The comment accurately quotes from Section 2.1.6 of this EIS. This EIS attempts to steer a neutral course between the possible descriptions of sufficiency of training lands.

Response to T16-3
Comment noted and will be included in the Administrative Record.

Response to T16-4
Comment noted and will be included in the Administrative Record.

Response to T16-5
Comment noted and will be included in the Administrative Record.

Response to T16-6
Comment noted and will be included in the Administrative Record.

Response to T16-7
Comment noted and will be included in the Administrative Record.

Response to T16-8
Comment noted and will be included in the Administrative Record.

Response to T16-9
Please refer to Master Response 1.

Response to T16-10
Training is limited to high altitude training. National Forest System (NFS) lands of the Pike/San Isabel National Forests have been used to provide the U.S. Army (Army) and Fort Carson locations related to mountain/high altitude training of helicopter pilots and instructors since about 1978 and is operated under a Special Use Permit. An Environmental Assessment was accomplished in 2007 (Use of National Forest System Lands for Mountain/High Altitude Military Helicopter Training, October 2007) in cooperation with the Forest Service for reissuance of the Special Use Permit. There are no flights or operations conducted in the vicinity of federally-designated Wilderness Areas and adheres to environmental and safety laws and regulations that are in place for this type of activity.

Response to T16-11
Please refer to Master Response 1.

Response to T16-12
As used in the governing regulations, “mitigation” involves either wholly eliminating adverse impacts or reducing them.

Response to T16-13
Comment noted and will be included in the Administrative Record.

Response to T17-1
Comment noted and will be included in the Administrative Record.

Commentor FA1 – U.S. Department of the Interior (Robert F. Stewart)

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Denver Federal Center, Building 56, Room 1003
Post Office Box 25007 (D-108)
Denver, Colorado 80225-0007

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November 21, 2008

9043.1
ER 08/1058

Ms. Deb Owings, NEPA Coordinator
1638 Elwell Street, Building 6236
Fort Carson, Colorado 80913–4000

Dear Sir or Madam:

The Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for Grow the Army Actions, Fort Carson, CO and offers the following comments:

Fish and Wildlife Resources

1) In general, additional information on site specific actions may need to be provided to determine if Endangered Species Act section 7 consultation is appropriate.

FA1-1

a) Specifically, Table 4.7-1 identifies the black-footed ferret as a species that may occur in Las Animas and Otero counties. The DEIS states that the black-footed ferret (Mustela nigripes)is not known to occur in the Pinon Canyon Maneuver site, but does not provide additional information, such as field survey information, to support this conclusion. If there are actions that would affect 80 acres or more of black-tailed prairie dog populations, surveys for the black-footed ferret should be conducted.

FA1-2

b) Table 4.7-1 identifies the Mexican spotted owl (Strix occidentalis lucida)as a species that may occur in Las Animas and Otero counties. The DEIS states that the Mexican spotted owl is not known to occur in Pinon Canyon Maneuver Site, but has the potential to occur there. The U.S. Fish and Wildlife Service (USFWS) knows that some Mexican spotted owl surveys were conducted in the general area awhile ago but does not know the locations or dates. If there are actions that could affect the narrow canyons of the Purgatoire River, then the USFWS should be involved in further discussions.

FA1-3

c) Table 4.7-1 identifies the New Mexico jumping mouse (Zapus hudsonius luteus)as a species that occurs in Las Animas and Otero counties. The DEIS states that field trappings occurred in 2008 but were not conclusive due to the drought and wildfires, and

Commentor FA1 – U.S. Department of the Interior (Robert F. Stewart)

Ms. Deb Owings 2

FA1-3 (cont'd)

that surveys will likely continue in 2009. The final EIS should include additional information on the trapping efforts, locations, and the results from the 2009 survey season. Training activities that impact riparian vegetation would be of concern to the New Mexico jumping mouse if this species were present in the Pinon Canyon Maneuver Site.

FA1-4

2) The USFWS is also concerned about potential impacts to birds protected by the Migratory Bird Treaty Act (MBTA). Under the MBTA, it is unlawful, unless permitted by regulations, to pursue, hunt, take, capture, kill or attempt to take, capture, or kill any migratory bird, egg, or active nest. The MBTA does not require intent to be proven and there is no incidental take provision. Regarding the proposed action, activities that would be of greatest concern are those that result in the vehicular traffic in previously undisturbed areas, such as native grasslands, during the nesting season. Although the provisions of MBTA are applicable year-round, most migratory bird nesting activity in eastern Colorado occurs during the period of April 1 to August 15. Therefore, if ground-disturbing activities could avoid this nesting period to the extent possible, impacts to migratory birds should be greatly minimized. If ground-disturbing activities are planned during the primary nesting season or at any other time that may result in the take of nesting migratory birds, the Service recommends that a qualified biologist conduct a field survey of the affected habitats to determine the absence or presence of nesting migratory birds. Project activities should avoid impacts to active nests to the extent possible. It is further recommended that the results of field surveys for nesting birds, along with information regarding the qualifications of the biologist(s) performing the surveys, be thoroughly documented and that such documentation be maintained on file for potential review by the Service (if requested). The USFWS's Colorado Field Office (303 236-4773) should be contacted for further guidance if a field survey identifies the existence of one or more active bird nests that cannot be avoided by the planned activities. Adherence to these guidelines will help avoid the unnecessary take of migratory birds.

FA1-5

3) Please confirm that the conservation measures identified in the Fort Carson INRMP are still in place and have not changed. Confirmation should be sent to: Susan Linner, Colorado Field Supervisor, USFWS/ES/Colorado Field Office, P.O. Box 25486, DFC (MS 65412), Denver, Colorado 80225-0486.

Sincerely,

Robert F. Stewart

Robert F. Stewart
Regional Environmental Officer

Responses

Response to FA1-1
Table 4.7-1 in Section 4.7.1.3.1 of this EIS is based on current and historic records that indicate that these counties were within the known historic range of the black-footed ferret and that it likely occurred here at sometime in the past. Trained biologists have been on staff annually, but no observations have ever been made of the species since the acquisition of the property. Some intriguing possibilities came about in 1983 when PCMS staff documented a jaw bone belonging to the family ***mustelidea*** below a golden eagle nest. This bone was sent to experts for identification, but it could not be verified to ***mustela nigripes*** or ***m. putorius***. Although the analysis was inconclusive and the last reported observations in 1971 were said to be “unreliable at best” by the Colorado Division of Wildlife, PCMS staff invested resources to survey 24 black-tailed prairie dog colonies on and adjacent to the PCMS. Increased training at PCMS is expected to positively impact prairie dog populations, due to the increased disturbance as it has in the past.

Response to FA1-2
In December 1995, wintering Mexican Spotted Owls were discovered on Fort Carson. During the ensuing dialog with the US Fish and Wildlife Service, the idea was raised that there maybe a possibility of this species inhabiting the PCMS. Although it was agreed that the habitat on the PCMS does not meet all of the owls known requirements (i.e., elevation, height/width ratios, dense mature trees in the canyon bottoms, etc…), the distance to the closest known Mexican Owl territory may be too far for dispersal, and the accepted historic range of the species does not encompass the PCMS, it was decided to maintain the Installation’s proactive stance toward the protection of the natural resources and proceed with a nocturnal breeding owl survey to verify whether or not the species could be present on the PCMS. Those surveys were initiated with coordination of the USFWS and although they were not carried to completion (not done for three consecutive years) the results of no detections were shared in a report required by the issued permit. The current proposal would not have much impact to the dismounted training areas encompassing the habitats that have some potential for occupancy.

Response to FA1-3
Table 4.7-1 in Section 4.7.1.3.1 of this EIS states that the New Mexico meadow jumping mouse has had documented occurrences in Las Animas County only. When it learned that this species was proposed for listing, and after careful consideration, PCMS staff concluded that it was highly unlikely that this mouse occurred on PCMS. The few known occurrences were in the Dorothy James State Wildlife Area. Although the State Wildlife Area is in the same watershed, it is a long distance from PCMS and at a much higher elevation. A site visit determined that this Wildlife Area was considerably different than the habitats that exist on the PCMS. Also, the basic life requirements commonly cited in the literature don’t match habitat on the PCMS, and previous small mammal data collection surveys (over 10,000 night trap collections) conducted at PCMS did not document the species. In 2008, surveys of possible habitat were again initiated, although there was little likelihood of discovering this species. Efforts were suspended due to the reassignment of staff to help suppress numerous wildland fires. These efforts are expected to resume in 2009, but the results are not anticipated before publication of the final EIS.

Responses

Response to FA1-4

On December 2, 2002, the President signed the 2003 National Defense Authorization Act (Authorization Act). that provides an exemption for the Armed Forces for the incidental taking of migratory birds during military readiness activities. In passing the Authorization Act, Congress itself determined that allowing incidental take of migratory birds as a result of military readiness activities is consistent with the MBTA and the treaties. With this language, Congress clearly expressed its intention that the Armed Forces give appropriate consideration to the protection of migratory birds when planning and executing military readiness activities, but not at the expense of diminishing the effectiveness of such activities. If any of the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, then they must confer and cooperate with the Service to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects. As discussed in Section 3.7.2.2.2 of this EIS, Fort Carson has been proactive in its efforts to preserve and protect its migratory birds and will continue to coordinate with the USFWS and the CODOW as necessary. On-site Wildlife Biologists monitor and survey areas for any nesting birds prior to initiation of any project and will continue to employ efforts to protect and preserve them.

Response to FA1-5

Fort Carson still adheres to the conservation measures identified in the 2007-2011 INRMP. Confirmation will be accomplished.

Commentor FA2 – U.S. Environmental Protection Agency (Greg Davis)

Gregory Davis/EPR/R8/USEPA/US wrote on 12/24/2008 02:03:50 PM:

> Here is the comment. I hope this makes sense. Let me know what you need
> in addition.

FA2-1

> Section 438 of the Energy Independence and Security Act requires that
> sponsors of new developments at Federal Facilities with a footprint
> exceeding 5,000 square feet "shall use site planning, design,
> construction, and maintenance strategies for the property to maintain or
> restore, to the maximum extent technically feasible, the predevelopment
> hydrology of the property with regard to the temperature, rate, volume,
> and duration of flow." This requirement is also included in Fort
> Carson's proposed Municipal Separate Storm Sewer System (MS4) permit for
> sites equal to or greater than one acre. To ensure that this design
> standard can be met, Requests for Proposal (RFP) will need to be reviewed
> by Fort Carson strormwater program staff using the process outlined in
> the Fort Carson Stormwater Management Plan (SWMP). In addition, a

FA2-2

> general budget will need to be included in all requests for project
> funding (Department of Defense Form 1391) to ensure that financing is
> provided for post-construction controls.
>
> Note: There is no specific line item for post-construction controls in
> the Form 1391 but the costs can be included in other areas (e.g., site
> work, stormwater control)
>
> SEC. 438. STORM WATER RUNOFF REQUIREMENTS FOR FEDERAL DEVELOPMENT PROJECTS.
> The sponsor of any development or redevelopment project involving a
> Federal facility with a footprint that exceeds 5,000 square feet shall
> use site planning, design, construction, and maintenance strategies for
> the property to maintain or restore, to the maximum extent technically
> feasible, the predevelopment hydrology of the property with regard to the
> temperature, rate, volume, and duration of flow.

Commentor FA2 – U.S. Environmental Protection Agency (Greg Davis)

> ____
> Greg Davis
> EPA Region 8 Storm Water Coordinator
> Mailcode: 8P-W-WW
> 1595 Wynkoop Street
> Denver, CO 80202-1129
>
> Phone: 303-312-6314
> http://www.epa.gov/region8/stormwater
>
> Send me an E-mail if you would like to receive updates related to
> storm water permits, BMPs, and NPDES regulations.

Responses

Response to FA2-1
Fort Carson concurs with the comment. The Stormwater Management Plan for Fort Carson has been updated and finalized.

Response to FA2-2
A cost estimate for stormwater management has been provided to the Fort Carson Master Planning division, Directorate of Public Works, for inclusion in the 1391s, to meet the legal requirement for proper stormwater management and has been included in the Mitigation section of this EIS.

Commentor FA3 – U.S. Environmental Protection Agency (Larry Svoboda)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Ref: EPR-N

Rob Ford
GTA EIS Project Manager
1638 Elwell St.
Building 6236
Fort Carson, CO 80913

Subject: Draft Environmental Impact Statement for Fort Carson Grow the Army Stationing Decisions, CEQ # 20080409

Dear Mr. Ford:

The Environmental Protection Agency (EPA) Region 8 has reviewed the Fort Carson Grow the Army Stationing Decisions Draft Environmental Impact Statement (DEIS). Our review was done in accordance with our authorities under the National Environmental Policy Act (NEPA), 42 U.S.C. 4231, and Section 309 of the Clean Air Act. The U.S. Department of The Army (Army) proposes to station additional troops at Fort Carson in the State of Colorado. On 19 December 2007, the Army signed its transformational Record of Decision (ROD) documenting its decision to proceed with a campaign to grow both the Active and Reserve components of the Army by 74,200 soldiers by standing up several new Brigade Combat Teams (BCTs), and Combat Support and Combat Service Support (CS/CSS) units. In a connected action, Fort Carson would meet a new requirement to host one of the new Infantry BCTs and their supporting CS/CSS personnel. In addition, this DEIS identified a reasonably foreseeable future action for Fort Carson to receive a Combat Aviation Brigade (CAB) since it is destined to become an Army Division Command with five BCTs in the garrison. Fort Carson is bordered on the east by State Highway 115 and on the west by Interstate 25 and is located directly south of the City of Colorado Springs, Colorado.

The EPA appreciates the significant efforts of the Army in preparing this DEIS, and we want to offer our comments and recommendations concerning alternatives, environmental impact analysis, and proposed mitigation measures. Our main concerns are outlined below. Specifically, the FEIS should include:

Commentor FA3 – U.S. Environmental Protection Agency (Larry Svoboda)

FA3-1
- A clearer description in the preferred alternative of what specific construction activities will be occurring at Fort Carson and where. This would serve two specific needs in the FEIS. The first would be to evaluate the specific impacts of these facilities (construction impacts and their long-term operational impacts) and the second would be in developing mitigation for expected impacts.

FA3-2
- A more quantitative approach in identifying short and long term impacts that would occur on and off the base in the implementation of the preferred alternative.

FA3-3
- A clearer description of what and how mitigation will occur to offset environmental impacts identified in the DEIS.

FA3-4
- A more detailed explanation in the FEIS of the coordination that is occurring between natural resource management agencies and state and local transportation agencies, and an explanation of the outcome of these meetings.

Based on the procedures EPA uses to evaluate the adequacy of the information and the potential environmental impacts of the proposed action and alternatives in an EIS, EPA rates this DEIS as LO-1 (Lack of Objection). An "LO" signifies that EPA's review of the DEIS has not found environmental impacts that have not been either avoided or mitigated in order to provide adequate protection for the environment. A copy of EPA's rating criteria is attached.

We appreciate the opportunity to provide comments at this stage of the project. If you have any questions or would like to discuss our comments, please contact me (303 312-6004) or James Hanley (303 312-6725) of my staff.

Sincerely,

Larry Svoboda
Director, NEPA Program
Ecosystems Protection and Remediation

Enclosures: EPA's Rating System Criteria

2

Commentor FA3 – U.S. Environmental Protection Agency (Larry Svoboda)

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements

Definitions and Follow-Up Action*

Environmental Impact of the Action

LO - - Lack of Objections: The Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC - - Environmental Concerns: The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO - - Environmental Objections: The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU - - Environmentally Unsatisfactory: The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 - - Adequate: EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 - - Insufficient Information: The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new, reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 - - Inadequate: EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

Responses

Response to FA3-1
Chapter 2 and Appendix B of this EIS describe construction activities at Fort Carson that would be accomplished under the Proposed Action and alternatives. Chapter 3 of this EIS evaluates the impacts of these facilities at Fort Carson, and new Chapter 6 has been added to this EIS to address mitigation measures.

Response to FA3-2
Additional quantitative data has been added to air quality in Sections 4.3 and 5.2, and water resources in Sections 3.6, 4.6 and 5.2 of this EIS.

Response to FA3-3
New Chapter 6 has been added to this EIS to address mitigation measures.

Response to FA3-4
See revised Section 5.2.1.4.6 of this EIS for natural resource management agency coordination efforts and outcome, and Section 5.2.1.4.9 for transportation agency coordination efforts and outcomes.

Commentor I1 – Floyd Beard

From: Floyd Beard
Sent: Tuesday, November 18, 2008 6:21 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

Dear legislators and Army Administration,

The entire Pinion Canyon Expansion proposal needs stopped immediately and permanently. Every level of our society has opposed this expansion from the private landowners to whom the Army wants to take their land away in a hostile maneuver, to thousand of individuals and business people who have knowledge of this atrocity and oppose it in any form, to legislators and law makers at the local, regional, State, and Federal levels who have opposed this at every turn.

The Army has not been forth coming regarding this issue from the very start, including the take over of private property and the promises made as far back as the 1980's when the Pinion Canyon Maneuver site was established by forcefully taking private land and homes away from the American citizens that the U.S. Army is supposed to protect. If this type of land grab was proposed by the United States Army any where else in the world; the taking away of private citizen's homes and land with some that had been in their families for generations; if this were to happen any where else it would be viewed as a very hostile maneuver against a nation and it's people. Even the UN would be up in arms about such a proposal.
I1-1 Yet this proposal, with it's display of a total lack of respect for a people and a region within our own Nation's borders, decried at every level of society, government and law making, is set forth by our own Army, and this same Army persists as if unfazed.

Legislation currently says NO SPENDING . . . , yet the Army simply models that this does not mean them, they can do as they wish, they do not have to follow any rules, even the laws passed overwhelmingly by our own Federal Government! Is the administration of our military, especially the U.S. Army, truly and absolutely out of control?

There is nothing in the reports that even remotely suggests that this is a proper solution to the needs of the Army, or any other branch of the military, for training, or any other needs. There are many suggestions that this is not needed at all, but is instead the arrogant vision of a few without consideration to alternatives or to the ramifications to the private citizens of the United States of America.

Protect the American citizens of South Eastern Colorado! Protect the people, their land, their homes, their livelihoods, and the wonderful heritage of South Eastern Colorado! Permanently stop the Pinion Canyon Expansion.

Sincerely,

Floyd and Valerie Beard

Commentor I1 – Floyd Beard

50416 County Road 22, Ramah, CO 80832

719-541-4880 febeard@yahoo.com

Former land owners of SE Colorado, still currently connected and involved with Southeastern Colorado through our family.

Family members of current land owners in South East Colorado

Fighting for our own children's lands and their rights to continue a way of life on their multi generational ranch

Fighting for the rights and heritage of our own grand children to live in a free country in South Eastern Colorado and have the choice to continue to live and work on their multi generational ranch.

Responses

Response to I1-1
Please refer to Master Response 1.

Commentor I2 – Donna Bonetti

From: Donna Bonetti
Sent: Tuesday, November 18, 2008 2:39 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I2-1 In the 90's the military closed many bases. If the defense dept needs more land for training, they should consider reopening some of these and cancel any plans to expand into Pinon Canyon. The way of the future should be diplomacy and we should be ending the current wars and focusing on troop reduction. Expanding into Pinon Canyon is an unnecessary waste of good farm land and existing communities.

Responses

Response to I2-1
Please refer to Master Response 1.

Commentor I3 – Pamela Casteel

From: Pamela Casteel
Sent: Friday, November 21, 2008 3:18 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I live in Colorado Springs, not far from Fort Carson but a couple of hundred miles from the Piñon Canyon region. I recently made the long ride to Kim, home of many of southeastern Colorado's earliest ranchers and farmers, to see for myself this vast private land that the Army wants to own despite the fact that it's not for sale.

I don't have what it takes to be a rancher or a farmer, and I'm not related to one. But I care deeply about Colorado, its heritage, and the rights of its people. That's why I attended the Fort Carson GTA EIS Public Meeting in Colorado Springs on October 29, 2008. I didn't like what I heard, or more to the point, what I didn't hear concerning the "Fort Carson Grow the Army Stationing Decisions."

I3-1

The public turnout was poor because most people in the city don't have a clue about the Army's potential takeover of 6 million acres of privately owned agricultural land and another 1 million acres of national forest. The displacement of more than 17,000 people in five counties isn't big news in Colorado Springs, even though it would destroy the Piñon Canyon region's economy and ravage the state's prehistoric history and Old West heritage. Ask the Environmental Protection Agency about the Department of Defense's infamous record of disregard for environmental consequences. Does the Army really care that large-scale, live-fire maneuvers would destroy an ecosystem that landowners have preserved for hundreds of years? The U.S. military might rationalizes its destruction of irreplaceable wilderness on the premise of national security. But, at the cost of citizens' security and the right to feel safe in their homes and on their land?

"Our land, our lives," isn't just a slogan, it's a cry for help that every Coloradoan, indeed, every American wanting to protect his or her property rights should heed. Seizing millions of acres that will be annihilated with bullets, bombs, and tanks, and forcing people from their homes and livelihoods is a crime against all of us.

Responses

Response to I3-1
Please refer to Master Response 1.

Commentor I4 – Chris M. Eddy

From: Chris M. Eddy
Sent: Wednesday, November 19, 2008 12:21 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I4-1 How long do we have to continue this stupidity? As a US Navy veteran I fully understand how the military operates and all these studies are just another waste of Americans tax dollars. This is just the latest ploy to benefit the community of Colorado Springs at the expense of the lower arkansas valley. I pray for the souls of all of the politicians who have a say in these decisions because one day you will meet your maker and will have to ansewer for the wrong doing that you have done to others. This could very well be the greatest wrong doing if it is allowed to happen. It won't just be the land that is affected but thousands of hard working patriotic AMERICAN citizens who have continually sent their sons and daughters to fight in wars to support this great nation. Don't allow this to happen and ruin southeastern colorado. God bless your souls and guide each and every one of you in the decision to not allow this expansion to happen. If we the people loose this battle we might as well fight a war right here on our on soil because if this is allowed to happen it goes against the very beliefs this once great nation was founded on.

Responses

Response to I4-1
Please refer to Master Response 1.

Commentor I5 – Doug Holdread

Doug Holdread
1221 Alta Street
Trinidad, CO 81082

October 28, 2008

PCMS NEPA Coordinator
Directorate of Environmental Compliance and Management
1638 Elwell Street
Building 6236
Fort Carson, CO 80913-4000

I have numerous concerns with the Grow The Army DEIS. I also have a number of questions about specific issues that I hope you will be able to clarify for me. My concerns and questions are related to the following areas:

I5-1
- *The EIS represents the segmentation of a larger foreseeable project.*

I5-2
- *The failure of the EIS to include any alternatives other than "Proposed Alternative" and "No Action Alternative" is an inadequate examination of alternatives.*

I5-3
- *The EIS fails to adequately address the cumulative effects of present and foreseeable future actions.*

I5-4
- *The dependence of the EIS upon the mandates of other actions and programs which are not included or adequately described within the document makes an informed public evaluation of the merits of the proposed action impossible.*

I5-5
- *The EIS makes improper and inadequate determinations of populations which must be considered in regard to Environment Justice.*

I5-6
- *Issues related to Air Pollution, Soil Erosion and Sedimentation are not adequately addressed in the EIS.*

I5-7
- *The issue of potable water supplies is not adequately addressed in the EIS.*

I5-8
- *The impact on transportation corridors is not adequately addressed in the EIS.*

I5-9
- *The impact upon recreational uses of the PCMS is not adequately addressed in the EIS.*

I5-10
It is difficult for many of us who have lived in this area for decades and have observed the low levels of use by the Army of Pinon Canyon to understand why the support facilities specified in the EIS had not been necessary in association with training activities conducted at PCMS in the past.

I5-11
I am also concerned, based upon our previous experience, with the credibility and value of the whole EIS process. The original EIS which established the Pinon Canyon Maneuver Site in the early '80s was poorly done. It didn't even conclude with a Record of Decision which would have given us an understanding of why the decision was taken.

I5-12
It seems that we are being railroaded. The complete absence of an analysis of alternative locations in the GTO DEIS is offensive and makes us feel that the whole process is a sham. The reason for this appears to be that the GTA is an imperative which precludes the examination of alternatives. But how are decision-makers supposed to make a responsible evaluation of the merits of your proposal without an analysis of alternative locations?

Commentor I5 – Doug Holdread

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I5-13 This land represents the cultural heritage and history of our region as well as the entire western United States in significant ways. We are deeply concerned with increased training requirements that procedures be employed to protect archeological, paleontological and other cultural resources as they are discovered and disturbed during training at PCMS?

I5-14 And it is not just general cultural and historic assets that are at risk. It becomes very personal when peoples birth places, wedding sites and burial grounds are involved. numerous historic and family cemeteries exist within the current and possible future PCMS. What measures will be taken to protect and preserve them? Will families be able to visit these grave sites in the future?

It's a sad day for America when good, hardworking, patriotic American ranchers have to defend their homes and their way of life against an invasion by its own Army. That's what this proposed Transformation is about.

SEGMENTATION and INDUCEMENT

I5-15 I am concerned that this DEIS has segmented a larger proposal, treating the proposed action within this DEIS as if independent from planned future actions, including plans to expand the Pinon Canyon Maneuver Site. I believe that this segmentation is contrary to the intent of NEPA. I believe that this DEIS attempts to avoid an honest examination of the full scope of Army planning for the PCMS by splitting the project into smaller projects. I am concerned that by excluding known subsequent phases and associated project components from this GTO DEIS, decision makers may not be provided with all necessary information to make a fully informed determination about the proposed action. I am afraid that the segmentation of this project may cause it to appear to be unrealistically acceptable to the reviewing agencies and the public.

All known phases of the future planned expansion of PCMS should be considered in the determination of the significance of the Grow the Army actions proposed in this DEIS. While future phases of the PCMS may be uncertain as to precise design or timing, their environmental significance should nonetheless be examined as part of this action by considering the potential effects of total PCMS build-out.

I5-16 I believe that segmentation is occurring in the Grow the Army DEIS for the following factors:

- ***Purpose****: There is a common purpose between the Transformation, Grow the Army and the Expansion; namely the increased training burden imposed upon Pinon Canyon Maneuver Site. .*
- ***Time:*** *The three actions; Transformation, Grow the Amy and Expansion are being considered at the same time. Even as this DEIS is being reviewed, the Department of Defense has submitted a congressional required justification of their expansion plans.*
- ***Location****: There a common geographic location for Transformation, Grow the Army and the Expansion.*

Commentor I5 – Doug Holdread

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I5-16 (cont'd)

- ***Impacts***: *The three actions; Transformation, Grow the Army and Expansion, share a common impact that if reviewed as one project by decision makers will result in a significantly more adverse impact than if reviewed in segments.*
- ***Ownership:*** *These three different segmented aspects of PCMS development are being undertaken by the same lead agency, the Department of the Army. There is good reason to assume a comprehensive awareness to assume the existence of, and relationship between the two projects.*
- ***Planning:*** *The Grow the Army DEIS is obviously a segmented component of an identifiable overall plan. This initial phase fits into the development of subsequent phases and the approval of this phase or will prejudice the objective consideration of alternatives in subsequent phases.*
- ***Utility:*** *The GTO DEIS and the Expansion represent interrelated phases of one project and should be considered functionally dependent on each other.*
- ***Inducement:*** *The approval of this segmented Grow the Army action will commit the Army to Expansion and induce legislative decision makers in relationship to future expansion legislation.*

I5-17

Question: Do the commonality of purpose, proximity of timing, coincidence of location and area of impact, existence of preliminary planning, complimentary purpose and probable inducement that would be generated by the Grow the Army action indicate that this DEIS is a segmented part of a larger project?

I5-18

Numerous documents including Fort Carson Sustainability Plan, the Land Use Requirements Study, 12 April 2005, (LURS), and The Ananysis of Alternatives, 12 April 2005, and 6 May 2006, (http://www.carson.army.mil/rusag/pinon_canyon.html) suggest the Transformation EIS extists within a larger context of foreseeable related actions at Pinon Canyon Maneuver Site.

I5-19

Section 2.3.4.1 of the Pinon Canyon Transformation EIS includes table 2-2 which outlines the total number of training weeks under rotations for unites assigned to train at PCMS. This table indicates that training requirements by far exceed the capacity of PCMS. On page 2-24 the statement is made that, "This training load not possible and becomes more unrealistic when factoring in conflicts attributable to the live-fire operations and necessary land rest to sustain the training lands." The Grow the Army programs adds to this impossible training load an additional IBCT and other units, making the training load at PCMS even more unrealistic suggesting that this DEIS is designed as an inducement, to force the expansion of the site.

I5-20

This Grow the Army Proposal would add an additional 6500 soldiers to Fort Carson that would have to trained at Pinon Canyon. The DEIS artfully states the current PCMS is "marginally adequate." It appears that the Transformation and Grow the Army stationing decisions is to force expansion of Pinon Canyon, not because of an actual "military necessity" but because of a Department of Defense plan to transform the southeastern corner of Colorado into the world's largest live-fire training range. According to the Army's Analysis of Alternatives document such an expanded PCMS would be created, not simply in order to meet the training needs of Fort Carson, but would serve as "a Joint and Combined Department of Defense training facility for all U.S. forces and allied forces." In other words, this GTA proposal is one piece of a master plan; not just to train Fort Carson troops, not just to train U.S. troops, but to train international forces with remotely controlled robotic weapons systems.

Commentor I5 – Doug Holdread

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I5-21 The Department of Defense has enough training ranges; 25 million acres in the U.S. and even more around the world. In Section 366 of the Bob Stump reauthorization act, Congress required that the DOD provide an accounting of all their lands and which training ranges are underutilized. According to the Government Accountability Office, Year after year the DOD has failed to produce such an inventory.

I5-22 It is difficult for a lay person to evaluate the technical calculations of training land requirements for different sized unites from platoons to various kinds of brigades to Objective Force Units of Action. But he Transformation EIS expresses it in a way that we can all understand. The translation of training requirements in that document, expressed as in terms of "training weeks" is more discernable to the general public. That document indicates that even before the additional stationing of 6500 troops under GTA, it would take 77.5 weeks a year to train the troops. The document states the obvious, "This training load not possible and becomes more unrealistic when factoring in conflicts attributable to the live-fire operations and necessary land rest to sustain the training lands." It doesn't take a military expert to understand that there are only 52 weeks in year. And it doesn't take a military expert to understand that before the DOD tries to move more private property into federal ownership, it should complete an inventory of the 25 million acres that it already has, as Congress has required. And it doesn't take an expert to figure out that Department of Defense is piling up an impossible training burden upon PCMS in order to make it seem like they HAVE TO expand the site.

I5-23 *Question: Given the capacity at PCMS, How many training weeks would it take to train all of the units assigned to Fort Carson under Transformation and Grow the Army?*

I5-24 Under the National Environmental Policy Act, using one EIS to force an action under another EIS is called inducement. Using the Transformation EIS and the Grow the Army EIS to force the expansion of Pinon Canyon is just such an inducement.

Question: Why should the Grow the Army EIS not be viewed as an inducement to expansion?

I5-25 *Question: Does the impossibility of training Fort Carson troops to doctrinal standards at the current Fort Carson/Pinon Canyon suggest that this Grow the Army DEIS is being considered within the context of a foreseeable future expansion and is therefore a segmented aspect of a larger project?*

I5-26 *Question: Since this Grow the Army DEIS tiers from analysis within the Transformation Programmatic EIS, are the transformation activities discussed in the PEIS reasonably foreseeable? Are the elements and phases of the GTO DEIS properly understood as the out-built elements of the Transomation PEIS? Should they be addressed in one comprehensive EIS? Should the EIS address other anticipated and foreseeable future projects as well as the cumulative impacts generated by planned projects such as the expansion of PCMS?*

Commentor I5 – Doug Holdread

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CONSIDERATION OF ALTERNATIVES

I5-27

NEPA describes the Alternatives section of the EIS as the "heart of the EIS." Does the limitation of this EIS to only the "Proposed Action" and the "No Action Alternative" render it "heartless?" It sets up a false dilemma for the public and decision makes. NEPA requires a range of alternatives. It does not require that alternatives necessarily even be within the capacity of the applicant in order to be considered. The alternatives are for the benefit of legislative and administrative levels of decision makers who may have discretionary authorities beyond that of the Department of the Army and Department of Defense. The fact that other alternatives were "not approved" should not render such alternatives "unreasonable" and there for disqualified from consideration. The EIS is itself a step in the process leading to approval? The fact that an alternative has not been approved should not eliminate it from consideration as an alternative? No level of authority may appropriately disapprove or eliminate alternatives from consideration in the EIS since the inclusion of alternatives is necessary for an adequate evaluation of the proposed action by decision makers.

I5-28

A broad range of alternatives are supposed to be included in the EIS "so that reviewers may evaluate their comparative merits." (40 C.F.R. 1502.2(d)). It also must explain how each alternative will or will not achieve the policies of NEPA. The existence of a viable but unexamined alternative renders the EIS inadequate. (Mumma, 956 F.2d).

The only discussion of alternatives is the precise location of buildings at Fort Carson. This is inadequate.

I5-29

Question: Does the limitation of the GTA DEIS to only the "Proposed Action" and the "No Action Alternative" satisfy NEPA requirement that a "range of alternatives" are discussed and are rigorously explored and objectively evaluated?

I5-30

Question: Since the purpose of this DEIS is to present alternatives to decision makers above the Department of the Army, in the Legislative and Executive branches, shouldn't alternatives be examined even though they are not considered acceptable by the Department of the Army?. As long as alternatives are within their power of legislators, shouldn't they be examined in the DEIS?

I5-31

Question: Shouldn't alternatives that are within the purview of the decision-makers within the Legislative and Executive branches of government, for whom the EIS is being prepared have the benefit of "a range of alternatives?"

I5-32

Question: Why has a cooperative use of training lands at Fort Bliss been ruled out as an alternative?

I5-33

Question: By what authority may alternatives be disapproved and eliminated from consideration in the DEIS?

I5-34

Question: Does the severe limitation of alternatives to either the "proposed action" or the "no action alternative" substitute a "range of alternatives" with a "false dilemma" and too severe limitation upon public and legislative consideration?

Commentor I5 – Doug Holdread

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I5-35 Question: Was consideration given to the inter-service, cooperative use of Fort Bliss/White Sands, (4,642,309 acres), Yuma Proving Grounds/Bob Stump Training Range/Berry M. Goldwater Range, (3,856,379 acres), Nellis Training Range/Floyd Edsall Training Center, (3,100,000 acres) and Dugway Proving Grounds/Utah Test and Training Range, (2,475,093 acres) as alternative? Why were these alternative not objectively evaluated in the EIS? (Section 1502.14)

I5-36 Question: Do the two alternative included in the EIS provide the wide range of reasonable alternatives intended by NEPA and CEQA for the consideration of decision makers?

I5-37 Question: Not mentioned in the DEIS are locations such as Fort Bliss/White Sands, (4,642,309 acres), Yuma Proving Grounds/Bob Stump Training Range/Berry M. Goldwater Range, (3,856,379 acres), Nellis Training Range/Floyd Edsall Training Center, (3,100,000 acres) and Dugway Proving Grounds/Utah Test and Training Range, (2,475,093 acres). Could any of these locations satisfy the training needs of Fort Carson and therefore be considered as alternatives?

I5-38 Question: Is the Army plan to convert to BCT an irreversible absolute which disallows the consideration of all alternatives? Is it beyond the purview of congressional oversight? If not, should congress have the benefit of a comparative analysis of a broad range of alternatives?

I5-39 Question: Does the Garrison Commander, in consultation have authority to modify the training schedule at PCMS in the interest of sustainability? If so, does this authority suggest the possibility of reasonable alternatives that should be examined within the EIS?

CUMULATIVE EFFECTS

I5-40 Past, present and future cumulative effects of activities within the Purgatoire River drainage have not been adequately addressed in the EIS, Particularly regarding the effects of coal mining and methane gas development upstream from PCMS upon erosion and sedimentation. These activities are currently occurring and are expected to increase within the foreseeable future. Also within the foreseeable future are the increased training land requirements associated with Objective Force doctrinal distances and the projected need to further increase the training capacity of PCMS.

Question: Should the cumulative effects of reasonably foreseeable actions such as the expansion of PCMS be evaluated and addressed in the EIS?

I5-41 Question: 3.13.2 of the EIS states that, "All planned future actions at the PCMS are considered as part of this EIS." And that future changes are "not considered reasonably foreseeable." Given the numerous references to planned expansion of PCMSin the range of 100 sq km, to 150 sq km, in Army planning documents such as the 2002 Sustainability Plan, LURS and Analysis of Alternatives, should the future expansion of PCMS be regarded as reasonably foreseeable?

I5-42 Question: Section 1.2.3 states that Transformation to Army Module Force necessitates, "larger maneuver training areas." If the transformation to AMF is being treated as an imperative which precludes the examination of alternatives, then it is reasonable to assume that these necessary actions represent "foreseeable future actions" and therefore must be considered in one EIS, or at least considered as reasonably foreseeable future actions which can be expected to contribute to cumulative impacts.

Commentor I5 – Doug Holdread

I5-43 *Question: Should the cumulative effects upon sedimentation in the Purgatory of such past, present and reasonably foreseeable actions within the Purgatory River basin as coal mining and methane gas extraction be evaluated and addressed in the EIS?*

I5-44 *Question: Should the impacts of the current and future actions, including the possible displacement of ranchers living in close proximity to PCMS constitute "cumulative effects" upon human communities under NEPA?*

I5-45 *Question: Are cumulative impacts restricted to impacts resulting from actions in the areas adjacent to the PCMS or should they also include actions upstream within the Purgatory River Basin, such as methane extraction and coal mining?*

I5-46 *Question: Do the calculations of necessary training lands sited in the EIS reflect current Army training strategy and doctrine? Will training requirements for Objective Force UA outlined in TC 25-1 require much larger training areas? Are there foreseeable increased training land requirements surpassing that which is available at PCMS?*

I5-47 *Question: Should the DEIS view Grow the Army in a larger context of future expansion and include consideration of anticipated future expansion activities in the EIS.*

I5-48 *Question: According to TC 25-1, under AMF, each Objective Force UA will require much larger training areas than current doctrine. It is my understanding that each UA/BCT includes , 35 platoons, 11 Companies, 3 maneuver battalions and 1 BCT. Under the BRAC legislation there will be 5 BCT/UAs stationed at Ft. Carson who will need to conduct maneuver training at PCMS. In addition one Infantry BCT has been repositioned from Korea to Fort Carson, along with national guard, reserves, special forces and non-manuever units like engineers and field artillery. With the additional brigades proposed in the GTO DEIS, what is the cumulative amount of training area that will be required for all of the foreseeable training responsibilities to be undertaken by Fort Carson/PCMS under current doctrine? What is the anticipated training land requirement for Fort Carson to train all of the above in accordance with Objective Force UA doctrinal distances?*

I5-49 *Question: Does the failure of the current EIS to consider future foreseeable actions and associated impacts render it inadequate? Is this inadequacy sufficient basis for disapproving the project?*

ENVIRONMENTAL JUSTICE

I5-50 Section 3.9.1.6 of the DEIS identifies populations subject to environmental justice determinations in El Paso and Fremont Counties, but does not properly consider the realities of economic conditions in Las Animas County. Minority and low-income populations are significant and should be reevaluated.

I5-51 *Question: Does the 41.7% Hispanic population of Las Animas County, compared with 27.7% in adjacent areas and 17.1 % for the state of Colorado constitute "meaningfully greater than the minority population percentage in the general population?" Should this*

Commentor I5 – Doug Holdread

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I5-51 (cont'd) *population be identified and addressed as low-income populations according to EO 12898?*

I5-52 *Question: Does the 27.6% poverty rate among Hispanics in Las Animas County constitute a "community" within the intent of EO 12898?*

I5-53 *Question: Does the per capita income in Las Animas County of $16,829, when compared with per capita income in the State of Colorado indicate a relatively low income community which should be considered under EO 12898?*

EROSION AND SEDIMENTATION

I5-54 I am particularly concerned with the possible impact that the GTA Action might have upon the Purgatory River. The river has been determined to be eligible as a Wild and Scenic River and any increased levels of sediment in the river might jeopardize such designation.

I5-55 *Question: Which of the erosion control measures of the Section 404 permit No. 2002-00707, have been implemented? Which have yet to be implemented? What have been the impacts of implementation?*

I5-56 *Question: What monitoring regime is in place for streamflow gauges on the Purgatoire River and tributaries?* I5-57 *What relationship does data from these gauges indicate between training activities and sediment levels in the Purgatoire River?*

I5-58 *Question: Has monitoring of the Purgatory River been done, and if so what has this monitoring indicated about the relationship between training activities and sediment levels in the Purgatoire River.*

I5-59 *Question: What is the anticipated past, present and future cumulative impact of training activity at PCMS in combination with other past, present and future coal mining and methane extraction activity upstream within the Purgatoire River basin upon sedimentation levels in the Purgatoire River?*

I5-60 *Question: How with current and foreseeable future actions by the Army at PCMS affect the future designation of the Purgatoire River's potential National Wild and Scenic River designation?*

I5-61 *Question: With increased training at PCMS, what measures will be implemented to ensure against fecal contamination of the Purgatoire River?*

I5-62 *Question: What system of latrines and/or portable toilets will be employed to ensure against fecal contamination? How many portable toilets will be necessary to meet the needs of the proposed increased training schedule? How will they be distributed throughout the training site during maneuver activities?*

I5-63 *Question: What impact will the proposed increased training schedule have upon the City of Trinidad's water supply and delivery systems?*

Commentor I5 – Doug Holdread

- Page 9

October 28, 2008

I5-64 *Question: In what ways does the Integrated Training Area Management Program address the issues of increased turbidity and sedimentation within the PCMS and the Pugratoire River?*

I5-65 *Question: What specific requirements of the Integrated Natural Resources Management Plan contribute to the sustainability of the Purgatoire River?*

I5-66 *Question: What are the responsibilities of the Watershed Team? In what ways will this team contribute to the mitigation of erosion damage at the PCMS?*

POTABLE WATER

I5-67 Concerns already exist about the ability of the City of Trinidad and Las Animas County to meet their potential needs. I am concerned that the water needs for a potential expansion at Pinon Canyon given the anticipated increase in the number of soldiers and the number of rotations occurring at the facility

I5-68 *Question: Section 3.11.1.1 indicates that PCMS currently purchases up to 500,000 gallons of water from the City of Trinidad? Will that amount increase under the proposed*
I5-69 *action? How much does the Army pay for this water?*

WILDLIFE

I5-70 The presence of diverse wildlife populations in Southeastern Colorado are a valuable asset. I am concerned with the adverse impact upon wildlife populations inside of, and surrounding the PCMS

I5-71 *Question: What mitigation measures will be employed to protect the bald eagles on the PCMS?*

I5-72 *Question: What measure will be implemented to mitigate the disruption and destruction of burrowing mammals and birds?*

TRANSPORTATION

I5-73 Highways 160 and 350 represent the only east-west transportation corridors in our region. Minutes from the Fort Carson, SUSTAINABILITY MANAGEMENT REVIEW Meeting Minutes held on 12 December 2005 state that "Major routes that were open to traffic might have to be closed to nonessential traffic." The potential for suspension of, and/or major disruptions to the free access of these vital transportation corridors is of great concern.

I5-74 *Question: How will local traffic by residents in the area surrounding PCMS during intensified training schedules be accommodated? Will travel on 160 and 350 be disrupted by training activity at PCMS?*

I5-75 *Question: How would additional training impact roadways? How many total days annually would highways 160 and 350 experience increased traffic from all training related activities at PCMS?*

Commentor I5 – Doug Holdread

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PUBLIC ACCESS

I5-76 One of my personal areas of concern is the possible loss of access to the wonderful canyon country within and adjacent to PCMS. This is the best country in world for hiking and praying as far as I am concerned.

Question: How will recreational use of PCMS by the public and access to Forest Service property through PCMS be impacted by actions outlined in the EIS?

Sincerely,

Douglas D. Holdread Jr.

Douglas D. Holdread Jr.
1221 Alta Street
Trinidad, Co 81082

Responses

Response to I5-1
Please refer to Master Response 2.

Response to I5-2
Please refer to Master Response 3.

Response to I5-3
Comment noted and will be included in the Administrative Record.

Response to I5-4
Comment noted and will be included in the Administrative Record.

Response to I5-5
Comment noted and will be included in the Administrative Record.

Response to I5-6
Comment noted and will be included in the Administrative Record.

Response to I5-7
Comment noted and will be included in the Administrative Record.

Response to I5-8
Comment noted and will be included in the Administrative Record.

Response to I5-9
Comment noted and will be included in the Administrative Record.

Response to I5-10
This EIS proposed no new facilities at PCMS.

Response to I5-11
Comment noted and will be included in the Administrative Record.

Response to I5-12
Please refer to Master Response 3.

Response to I5-13
Please refer to Cultural Resources, Section 4.8 of this EIS, which discusses cultural resource management of PCMS**.**

Response to I5-14
There are no known family cemeteries within the current boundaries of the PCMS. The Army is aware of two burial locations adjacent to PCMS. The Simpson cemetery is located just outside the cantonment area. The fence around this cemetery site has been arranged so that family members may visit the cemetery without needing special consent, permission, or arrangements for access. The second site is a Hispanic grave site located on land previously under the Army's management at the PCMS. This area is now administered by the USFS and is accessible to the public. As to other cemeteries that might be acquired as part of an expansion of PCMS, this is out of the scope of this EIS. Please refer to Master Response 1.

Responses

Response to I5-15
Please refer to Master Responses 1 and 2.

Response to I5-16
Please refer to Master Response 2.

Response to I5-17
Please refer to Master Response 2.

Response to I5-18
Please refer to Master Response 1. Please note that transformation is not within the scope of this EIS.

Response to I5-19
Both the Transformation and this EIS acknowledge that the training lands at Fort Carson and PCMS are not sufficient to meet doctrinal requirements. However, both documents recognize that the installation will employ training work-arounds which will allow units to obtain training readiness levels necessary to deploy for current operational requirements. Grow the Army decisions made by the Army recognized that virtually no Army installation has the ability to meet doctrinal training requirements of their units, but that Fort Carson was postured to best meet the training, mission, and quality of life requirements of the new BCT.

Response to I5-20
Please refer to Master Response 2.

Response to I5-21
This comment is out of the scope of this EIS. Comment noted and will be included in the Administrative Record.

Response to I5-22
Please refer to Master Response 1.

Response to I5-23
There are several major factors which drive the training use of PCMS. Some of these factors include the ongoing missions and operational deployments of units, the frequency and length of deployments, the spacing of unit rest/reset and ready cycles, the critical tasks commanders choose to train based on current mission factors, and the availability of Combat Training Centers to support maneuver training. There is no simple straight line relationship between stationing and training weeks of utilization required at PCMS. That being said, given that there will be five BCTs stationed at Fort Carson along with Special Forces and other combat support units, the stationing of GTA units could be reasonably estimated to result in approximately a 20 percent increase in the frequency of training. Assuming that there would be five BCTs at Fort Carson and that none are deployed, the requirements for brigade and battalion training at PCMS total approximately 54 weeks per year. Obviously, this training load requires the Army to continue the work-arounds described in Section 2.2.4 of this EIS.

Response to I5-24
Please refer to Master Responses 1 and 2.

Response to I5-25
Please refer to Master Responses 1 and 2.

Responses

Response to I5-26
Neither this EIS nor the Army's Programmatic EIS for Army Growth and Force Structure Realignment tier from the Army's Programmatic EIS for Transformation. Please refer to Master Responses 1 and 2.

Response to I5-27
Please refer to Master Response 3.

Response to I5-28
Please refer to Master Response 3.

Response to I5-29
Please refer to Master Response 3.

Response to I5-30
Please refer to Master Response 3.

Response to I5-31
Please refer to Master Response 3.

Response to I5-32
Please see Section 2.5.1 of this EIS.

Response to I5-33
The Army, as the lead federal agency, is responsible for articulating the purpose and need for action and determining a range of alternatives to meet the purpose and need.

Response to I5-34
Please refer to Master Response 3.

Response to I5-35
Please see Section 2.5.1 of this EIS.

Response to I5-36
Please refer to Master Response 3.

Response to I5-37
It should be noted that many of the installations cited in the comment were considered in the PEIS, and Fort Bliss/White Sands is receiving multiple brigade combat teams and other combat support units as part of GTA decisions. With regard to training Soldiers stationed at Fort Carson at these other locations please see Section 2.5.1 of this EIS.

Response to I5-38
This comment relates to transformation, which is outside of the scope of this EIS.

Response to I5-39
Please refer to Master Response 3.

Responses

Response to I5-40
The commentor suggests the potential for coal bed methane and other oil and gas development upstream from Trinidad as activities that could, in combination with the Army's activities at the PCMS, cumulatively affect the Purgatoire River. The comment specifically mentions the sedimentation of the Purgatoire River from upstream coal bed methane and other oil and gas development projects as a specific concern. This activity was considered but determined not to be an action or actions that could contribute to cumulative water quality impacts because the dam that forms Trinidad Lake, located on the Purgatoire River approximately 4 miles upstream of Trinidad, Colorado, effectively traps sediment and prevents interaction of sedimentation (and water quality concerns) upstream of Trinidad where these oil and gas activities are occurring and downstream of the dam where the Army actions at the existing PCMS are proposed. With regard to future impacts all future mining or exploration activities would be subject to all applicable local, state, and federal laws and regulations.

Response to I5-41
Please refer to Master Response 1.

Response to I5-42
There is no Section 1.2.3 in this EIS. Comment noted and will be included in the Administrative Record.

Response to I5-43
Chapter 5 of this EIS evaluates and addresses all cumulative effects considered relevant. With regard to future impacts all future mining or exploration activities would be subject to all applicable local, state, and federal laws and regulations. Please see response to Comment I5-40.

Response to I5-44
The Proposed Action will not result in displacement of ranchers. Also refer to Master Response 1.

Response to I5-45
Chapter 5 of this EIS evaluates and addresses all cumulative effects considered relevant. With regard to future impacts all future mining or exploration activities would be subject to all applicable local, state, and federal laws and regulations. Please see response to Comment I5-40.

Response to I5-46
This comment references information in the 2007 Transformation EIS.

Response to I5-47
Please refer to Master Responses 1 and 2.

Response to I5-48
As cited in the 2007 Report to Congress prior to the implementation of GTA stationing, the units assigned to Fort Carson had a doctrinal requirement of approximately 738,000 acres of training land. Following the implementation of GTA stationing decisions, that doctrinal requirements have been revised to 112,000 acres for an IBCT and 170,000 acres for a HBCT. Therefore, the total requirement for Fort Carson, with the additional GTA units, has changed to approximately 810,000 acres.

Responses

Response to I5-49
See Chapter 5 of this EIS, in which cumulative impacts, including reasonably foreseeable future actions and associated impacts, are discussed in detail.

Response to I5-50
Please see Chapter 4, Section 4.9, Socioeconomics. Chapter 3 of this EIS specifically addresses Fort Carson's Affected Environment and Environmental Consequences. Therefore, and as stated by the commentor, Section 3.9.1.6 only discusses Environmental Justice issues as they pertain to the Fort Carson ROI. Chapter 4 addresses PCMS's Affected Environment and Environmental Consequences. Section 4.9.1.6 specifically addresses Environmental Justice issues in Las Animas, Huerfano and Otero Counties.

Response to I5-51
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations requires "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations." As part of the Army's Proposed Action, no construction would occur at PCMS. As stated in Section 4.9.1.6 of this EIS, none of the Census Tracts surrounding PCMS meet the 20 percent definition of a poverty area. The Hispanic and low-income populations of Las Animas County will not be disproportionately impacted, and should be no more or less likely to benefit economically than other groups in the three-county region. Little or no long-term economic effects, either beneficial or adverse, are expected.

Response to I5-52
Please see response to Comment I5-51.

Response to I5-53
Please see response to Comment I5-51.

Response to I5-54
A section of approximately 16 miles of the Purgatoire River flowing through Picket Wire Canyonlands on the Comanche National Grassland (downstream of the PCMS) which has the potential to be considered for designation as a Wild and Scenic River. Identification of a river for study does not trigger any protection under the Wild and Scenic Rivers Act of 1968, which is a designation made by congressional action. Such designation is made for free-flowing rivers characterized by water quality and outstandingly remarkable values. The DEIS did consider potential effects to the Purgatoire River from training at the PCMS under both the No Action and Proposed Action scenarios. As noted in Section 4.6 of this EIS, the mitigation measures that the Army has implemented to control erosion and pollutants from leaving the PCMS and entering the Purgatoire River have been effective. These measures would continue to be implemented under the Proposed Action. The concern about the Purgatoire section has been updated in Chapter 5, Section 5.2.2.2.5 of this EIS.

Responses

Response to I5-55
Most of the activities listed in the Clean Water Act, Sec 404, Regional Permit #2002-00707 have been implemented including erosion control impoundments (to include those defined as "stock water impoundments" which is a State Engineers Office definition based on size rather than use), bank-sloping, check dams, rock armor, hardened crossings, culverts, erosion control terraces, water diversions, and water turnouts. These activities are all designed to curtail erosion process and/or sediment transport. The only method that was not utilized that was listed on the permit is bridge construction because that method was determined to be unnecessary at this time. These activities, together with plant material applications, are the principle techniques used by the Army to control sediment loading at the PCMS. The USGS (Stevens et al 2008) has determined that sediment production from PCMS tributaries into the Purgatoire River does not exceed normal background sediment contributions.

The Section 404 permit recognizes that these erosion control activities have impacts that are "substantially similar in nature and cause only minimal individual and cumulative environmental impacts." By complying with the terms and conditions of the permit, the Army ensures minimal effects to wetlands and is in full compliance with the regulatory requirements of Section 404 of the CWA. See Section 4.6.1.1.2 for updated discussion.

Response to I5-56
Please see revised Section 4.6.1.2.3 of this EIS.

Response to I5-57
According to the findings of the USGS, the largest correlate to sedimentation of the waters of the Purgatoire River is the number of large storm events received in the in the vicinity of PCMS, not the frequency of use of PCMS by the military. Please see revised Section 4.6.1.2.3 of this EIS.

Response to I5-58
Please see Section 4.6.1.2.3 of this EIS.

Response to I5-59
The commentor suggests the potential for coal bed methane and other oil and gas development upstream from Trinidad as activities that could, in combination with the Army's activities at the PCMS, cumulatively affect the Purgatoire River. The comment specifically mentions the sedimentation of the Purgatoire River from upstream coal bed methane and other oil and gas development projects as a specific concern. This activity was considered but determined not to be an action or actions that could contribute to cumulative water quality impacts because the dam that forms Trinidad Lake, located on the Purgatoire River approximately 4 miles upstream of Trinidad, Colorado, effectively traps sediment and prevents interaction of sedimentation (and water quality concerns) upstream of Trinidad where these oil and gas activities are occurring and downstream of the dam where the Army actions at the existing PCMS are proposed.

With regard to future impacts all future mining or exploration activities would be subject to all applicable local, state, and federal laws and regulations.

Response to I5-60
The Army does not anticipate any actions that may affect the future designation to the Purgatoire River.

Responses

Response to I5-61
Section 4.11 of this EIS has been updated to include that increased wastewater flows would be addressed through the completed upgrade to the treatment/oxidation ponds, the scheduled installation of a new septic system in the cantonment, more frequent servicing of all septic systems, and additional portable toilets for areas outside the cantonment which are serviced regularly in accordance with applicable laws and regulations. These measures are in place to avoid fecal contamination (resulting from human waste generated at the PCMS) of the Purgatoire River and its tributaries.

Response to I5-62
Section 4.11 of this EIS has been updated to include that wastewater treatment in the cantonment generally consists of evaporative, nondischarging treatment/oxidation ponds. A portion of the cantonment uses septic tanks, and all areas outside the cantonment area utilize septic systems (or portable toilets). Portable toilets are used during training exercises and are distributed based on training locations and requirements. The number of portable toilets is typically one for every ten to fifteen people, and several are often grouped together in appropriate locations to support the training exercises. Up to 1,500 portable toilets may be used to support a training exercise (which would be the same under both the No Action alternative or the Proposed Action). Portable toilets are rented from local suppliers who are responsible to deliver and maintain them during training exercises. Periodic cleaning and servicing of the portable toilets is performed by the contracted vendor.

Response to I5-63
Since historical use has been well less than half the contract maximum amounts for purchase of water, the contract maximum is considered to be sufficient to satisfy the increases in training at PCMS anticipated under the Proposed Action. In negotiating this maximum amount, the City of Trinidad had the opportunity to consider this potential demand in relation to its overall water supply and the demands of other customers. In times of shortages, the City has the authority to limit water usage and has exercised that authority in the past. The Army has no special exemption from any such limitations. The Army funded both the original water line to PCMS and much of the cost of repairs to that line in 2007 after it had failed prematurely. Those repairs will eliminate the substantial leakage waste that had occurred in the past few years. Please refer to Section 4.11.1.1.2 of this EIS, which has been revised to include this information.

Response to I5-64
Please see Section 4.5.1.4 of this EIS for erosion management measures and Section 4.6.1.2.3 for information on water quality. Also see new Chapter 6 of this EIS for possible mitigation measures.

Response to I5-65
See Section 4.6.1 of this EIS.

Response to I5-66
See Section 4.6.1 of this EIS.

Response to I5-67
Please see revised Section 4.11.1.1.2 of this EIS for a discussion of water use at PCMS by GTA units. With regard to expansion, please refer to Master Response 1.

Response to I5-68
The comment refers to the 2007 PCMS Transformation EIS. Please see revised Section 4.11.1.1.2 of this EIS for current information.

Responses

Response to I5-69
Rates for the water purchased from the City of Trinidad are set by the City and have varied over the term of the contract. The Army receives no preferential treatment from the City with regard to these rates.

Response to I5-70
Section 4.7 of this EIS includes discussion of wildlife populations in and around PCMS.

Response to I5-71
See Appendix F, Attachment F.3, and new Chapter 6 of this EIS, which includes mitigation measures for the protection of bald eagles.

Response to I5-72
The Proposed Action is projected to have fewer impacts to burrowing wildlife than other alternatives. The INRMP cited in new Chapter 6 includes management activities and mitigation measures for burrowing mammals and birds.

Response to I5-73
The Army does not anticipate the required suspension or closure of Highway 160 or 350 to support the stationing of GTA units.

Response to I5-74
Please see response to Comment I5-73 and Section 4.10.2 of this EIS.

Response to I5-75
Section 4.10.1.2.2 of this EIS states traffic from training activities at PCMS, including the numbers of additional vehicles during IBCT rotations, which would be the highest volume. The annual total of days that US 160 and 350 would experience increases in volume cannot be stated because of the variability in training schedules. Please see Section 4.10.2.1 for conclusions as to anticipated traffic increases.

Response to I5-76
Effects on recreational use of PCMS by the public were described in the 2007 PCMS Transformation EIS, which is the baseline condition for this EIS. As stated in Section 4.2.2.1 of this EIS, no changes are anticipated as a result of the Proposed Action.

Access to USFS property through the PCMS is not allowed presently, and that would not change.

Commentor I6 – Lori Holdread

Fort Carson
GTA EIS PUBLIC MEETING

**Environmental Impact Statement for the
Fort Carson Grow the Army Stationing Decisions**

PUBLIC MEETING COMMENT FORM

Monday, October 27, 2008 • Trinidad, Colorado

(Please print clearly)

Must be postmarked, e-mailed, or faxed on or before November 24, 2008.

I6-1 The people and communities & legislatures of SE Colorado have spoken against illegal segmentation of EIS statements for the NEPA requirements. "Grow the Army" implies "expand PCMS" and the people oppose any expansion or the expenditure of funds for pre-expansion infra-structure building.

I would like to receive a copy of:

DRAFT Fort Carson GTA EIS ☑ **Hard Copy** OR ☐ **CD/Summary**

FINAL Fort Carson GTA EIS ☑ **Hard Copy** OR ☐ **CD/Summary**

Name: Lori Holdread
Address: 1221 Alta St.
Trinidad, CO. 81082

Comment forms may be mailed to:
NEPA Coordinator
1638 Elwell Street, Building 6236, Fort Carson, Colorado 80913-4000
Tel: (719) 526-0912 or (719) 526-4666
Fax: (719) 526-1705
E-mail: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil

Fort Carson GTA EIS Public Meeting • October 27, 2008

Responses

Response to I6-1
Please refer to Master Responses 1 and 2.

Commentor I7 – Larada Horner

From: Larada Horner
Sent: Tuesday, November 18, 2008 2:43 PM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I7-1

Please stop bothering the good people of southeastern Colorado that make their honest living by ranching -- this Army attack on good peaceful people must stop.

My family and most others there do not want to sell their ranches -- how many times do we have to tell you that?

Stop the harassment, the reports, the slow psychological warfare that you are using and let these people getting back to living their lives without the stress of wondering if their homes will be taken away.

Larada Horner

Responses

Response to I7-1
Please refer to Master Response 1.

Commentor I8 – Cliff Johnston

From: Cliff Johnston
Sent: Monday, November 24, 2008 12:17 PM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I8-1 The Army's intent to turn southern Colorado into the world's largest military training area has been exposed by the Freedom of Information Act. It is apparent to a fourth grader that the broken promises, ignored Congressional mandate, and latest "grow the Army scheme" are just steps toward this goal. While denying the "big map" the Army continues to follow the schedule it lays out. As a taxpayer and landowner I am outraged by this arrogance.

Responses

Response to I8-1
Please refer to Master Response 1.

Commentor I9 – Diane Thomas Lincoln

From: Diane Thomas Lincoln
Sent: Wednesday, November 19, 2008 2:00 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

Pinon Canyon and the areas which surround the Colorado and Kansas

I9-1 National Grasslands appear to most as barren, useless, and yet beautiful land just idly residing with cattle, coyote and barbed wire. Yet these lands sit above the largest deposit of water in the Ogallala Acquifer that extends from Texas to Canada which provides water for huge areas of farm and cattle production and is the last largest body of water left in the Great Plains producing drinking water all the way to my house in Wichita, Kansas. Throughout the High Plains and western states of America the evidence of massive water depletion and ruination of land can be witnessed visibly in the far too many mining, oil, fossil fuel, gravel and road projects which have sprung up ruining and threatening the once abundant landscapes America has so valued. The Pentagon/Army take over of vast areas of federal and private lands for nefarious purposes and their intent to capture more land and resources for these activities has secondary consequences including the pollution of ground water for dumping radioactive and nuclear waste materials nto the soil which then leeches into the Acquifer. This makes the relatively invisible activities of the Pentagon-Army not only my personal business but everyone else who calls the High Plains and western states HOME.

I9-2 Besides poisoning the land and water the Expansion Project is a farce and empowers and enriches groups like independent military contractor Blackwater who should be in prison rather than hoping to continue their massive buildup of bases and military practice zones for their transparent activities, often outside the law, and providing nothing for the military, farmers, ranchers, or others who have made these lands their stewardship for hundreds of years. Supporting this insanity and waste of resources in a time of diminishing resources shows the stupidity and corruption of the military branches of government who continue to vandalize all Americans while claiming to protect us. Pinon Canyon expansion is anti-American and in my view, should be exposed and condemned.

Nothing so exposes the "bridge to nowhere" as does this Expansion project and the many like it outside the control of Congress and the Senate.

Responses

Response to I9-1
Comment noted and will be included in the Administrative Record.

Response to I9-2
Please refer to Master Response 1.

Commentor I10 – Linda Mahoney

From: Linda Mahoney
Sent: Friday, November 21, 2008 3:58 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I10-1 Please reconsider adding the additional troops to Fort Carson. When our economy is in turmoil it makes no sense to proceed with actions that are not necessary. We also need to let the new Administration decide where we need to strengthen our military and when this should occur. We should not rely on the decisions of a failed Administration that has shown a complete disregard for logic.

I10-2 An unnessary war, an economy on the brink of a depression and poor responses during emergencies gives me absolutely no confidence in their plans for Fort Carson or the Pinon Canyon Maneuver Site Expansion.

Thank you for considering my comments.

Sincerely,

Linda Mahoney

Responses

Response to I10-1
Please refer to Master Response 3.

Response to I10-2
Please refer to Master Response 1.

Commentor I11 – Juliette Mondot

From: Juliette Mondot
Sent: Sunday, November 23, 2008 12:20 PM
To: PCEOC@hughes.net
Subject: Copy of my Comment regarding Grow the Forces DEIS

November 23, 2008

Dear Fort Carson and U. S. Army,

I11-1 Your newest DEIS is substantial, reflecting massive amounts of research, hours and work. Fort Carson is getting better at this process. A thorough discovery process reveals hitherto unknown and vital information. I praise the effort.

But the fundamental reason for the EIS process is the result of Congressional requirements instigated by "experts" in distance places making choices to close and relocate military personnel. Too often these choices do not adequately consider the welfare of the affected people - not the soldiers, not their families and not the neighbors. That is why setting up processes of communication among military families and with the surrounding communities and public schools is imperative. Do I see a process of communication proposed in this 900-page fact gathering report? None - other than the EIS process itself. Environment is not just physical. It is also the people in communities that have to live with the DOD's choices. We PCMS neighbors have asked for years to have a communication process beyond the EIS public hearings and a Fort Carson telephone number answering during business hours.

I11-2 Who can we call when the helicopters are overhead shaking our homes at 1 am? I hope Fort Carson opens two way lines of communications with its neighbors in substantial and institutionalized ways. This IS your homeland. Why doesn't Fort Carson

Commentor I11 – Juliette Mondot

I11-2 (cont'd)

act more like a good neighbor instead of a mini empire ruled from afar?

I11-3

This DEIS for expanding Fort Carson claims no changed land use or significant impact on PCMS. That conclusion defies common sense. It contradicts the Army's recent report about needing Piñon Canyon for training. At least Army spokespeople are no longer calling us PCMS neighbors "unpatriotic" for trying to save OUR prairie homeland, ranches, communities and schools. This EIS claims no need to take our land, so I hope you won't try to use Fort Carson expansion against us in the future.

Sincerely,

Juliette Mondot

Landowner 4 miles from PCMS Gate

718 W Washington Ave

Trinidad, CO 81082

juliettemondot@yahoo.com

Responses

Response to I11-1
Comment noted and will be included in the Administrative Record.

Response to I11-2
The Fort Carson Public Affairs Office (719) 526-3420 will receive all noise complaint calls. There is an after hours number (719) 526-5500 where an on-call Public Affairs Office representative can be reached.

Response to I11-3
Please refer to Master Response 1.

Commentor I12 – Cathy Mullins

From: Cathy Mullins
Sent: Monday, November 24, 2008 10:13 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

"Grow the Army" DEIS Statement

I12-1

In response to your "grow the army" DEIS statement...I say BUNK to you and all of the people involved in this "comedy of errors". Your report was supposed to answer questions that have been asked repeatedly for over 3 years by the landowners and County, State and Federal lawmakers.
As far as I can determine, you have NO answers and you CANNOT justify the expansion of PCMS/Warfighters Center ! What would the people of Colorado Springs do if you came to them and said we need your land for training the new troops ? Their land and homes would be destroyed because you have to train the troops. I am sure they would not take it sitting down.

Your "spin doctors" are on high alert trying to sway people into your way of thinking. It is NOT going to work on the good people of Southern Colorado. We are tired of this mess in our faces, but we will never give up our fight.

We are going through some very tough times in this country. I think you need to tighten your belts just like the rest of us have and utilize what you already have. The spending for the military is completely out of control, but hopefully with this new administration coming in, they will put you in the corner for a "time out" !!!

NO EXPANSION OR NO MONEY FOR EXPANSION !!!!

STOP THIS MADNESS !!!!!

Cathy Mullins

Responses

Response to I12-1
Please refer to Master Response 1.

Commentor I13 – Julia Portmore

From: Julia Portmore
Sent: Tuesday, November 18, 2008 10:10 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I13-1 You must be joking! An additional 6000 troops with their families will overwhelm the area around Fort Carson, and the state as well, with the need for additional infrastructure and services. This anouncement, coupled

I13-2 with the Army's desire to expand it's facilities into Pinon Canyon, is one of the most hairbrained schemes I've heard lately, and appears to be related to the current administration's desire to make unpopular changes before its term in office expires. Let's put all this on hold until the new President and his team make their decisions regarding the future needs of Fort Carson and the military!

Responses

Response to I13-1
Please see Chapters 3, 5, and new Chapter 6 of this EIS.

Response to I13-2
Please refer to Master Response 3.

Commentor I14 – Jane L. Quartiero

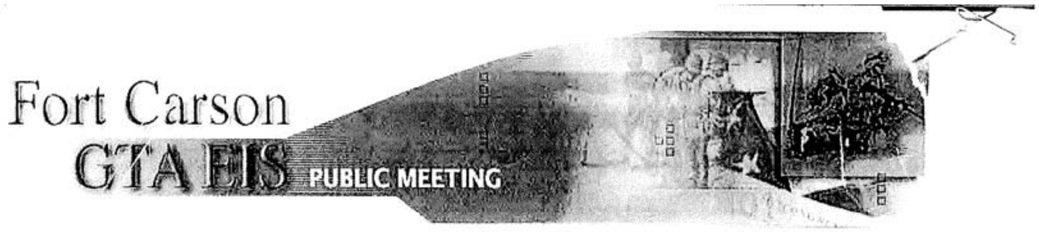
From: JANE L QUARTIERO [mailto:janieq1155@wildblue.net]
Sent: Friday, November 21, 2008 4:05 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I14-1 I find this to be another ploy to force people off their land, homes and future. The Army does not need more land. They need to use what they already have. It's very ironic that our government spends billions of dollars to help other nations keep their lands from other invading nations. Here in the United States of America, our national leaders and those who carry out their agenda think nothing of taking from us. The people who have given so much to their country. Our families have suffered with our own losses in battles and wars to serve in our military and to protect our rights as citizens of this country. We need to protect all we have worked for. Back door policies and lies that the Army has been utilizing to take our lands has got to stop.

Responses

Response to I14-1
Please refer to Master Response 1.

Commentor I15 – Annette Roberts



Environmental Impact Statement for the
Fort Carson Grow the Army Stationing Decisions

PUBLIC MEETING COMMENT FORM

Monday, October 27, 2008 • Trinidad, Colorado

(Please print clearly)

Must be postmarked, e-mailed, or faxed on or before November 24, 2008.

The GTA DEIS is an attempt to force the expansion
I15-1 because of the increased use projected for PCMS. Also
using one EIS to force another EIS is being used, its Called
Inducement and it's illegal.' Issues related to air pollution,
I15-2 Water quality, Soil Erosion & Sedimenation are not adequately
addressed in the EIS. Also the impact on recreational uses of the PCMS
I15-3 are not adequately addressed in the EIS.

I would like to receive a copy of:

DRAFT Fort Carson GTA EIS	☐ **Hard Copy**	OR	☐ **CD/Summary**	
FINAL Fort Carson GTA EIS	☐ **Hard Copy**	OR	☐ **CD/Summary**	

Name: Annette Roberts

Address: 45515 C.R. 90
Walsenburg, Co 81089

Comment forms may be mailed to:
NEPA Coordinator
1638 Elwell Street, Building 6236, Fort Carson, Colorado 80913-4000
Tel: (719) 526-0912 or (719) 526-4666
Fax: (719) 526-1705
E-mail: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil

Fort Carson GTA EIS Public Meeting • October 27, 2008

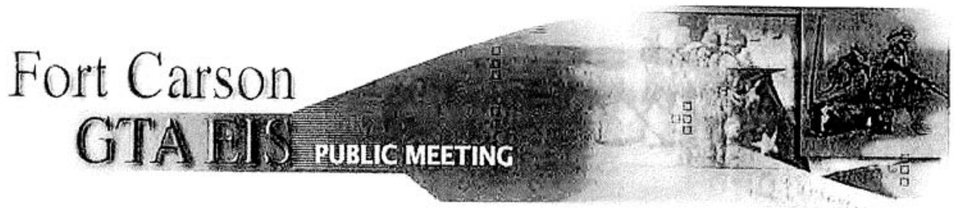
Responses

Response to I15-1
Please refer to Master Responses 1 and 2.

Response to I15-2
Comment noted and will be included in the Administrative Record.

Response to I15-3
Effects on recreation use of PCMS by the public were described in the 2007 PCMS Transformation EIS, which is the baseline condition for this EIS. As stated in Section 4.2.2.1 of this EIS, no changes are anticipated as a result of the Proposed Action.

Commentor I16 – Tim Roberts



Environmental Impact Statement for the
Fort Carson Grow the Army Stationing Decisions

PUBLIC MEETING COMMENT FORM

Monday, October 27, 2008 • Trinidad, Colorado

(Please print clearly)

Must be postmarked, e-mailed, or faxed on or before November 24, 2008.

I16-1 I don't think the GTA DEIS is a good idea because I think it will cause alot more problems for Colorado Springs. I16-2 I think it is another part of a bigger plan to Expand Pinon Canyon. I16-3 I don't think it is a good idea to have that much of the US military in one area. I16-4 I think it will put a real strain on Colorado Springs water supply. I16-5 I think it should be at a base some where else.

I would like to receive a copy of:

DRAFT Fort Carson GTA EIS	☐ **Hard Copy**	OR	☐ **CD/Summary**
FINAL Fort Carson GTA EIS	☐ **Hard Copy**	OR	☐ **CD/Summary**

Name: Tim Roberts

Address: 45515 Rd 90
Walsenburg, CO 81089

Comment forms may be mailed to:
NEPA Coordinator
1638 Elwell Street, Building 6236, Fort Carson, Colorado 80913-4000
Tel: (719) 526-0912 or (719) 526-4666
Fax: (719) 526-1705
E-mail: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil

Fort Carson GTA EIS Public Meeting • October 27, 2008

Responses

Response to I16-1
Comment noted and will be included in the Administrative Record.

Response to I16-2
Please refer to Master Response 2.

Response to I16-3
Comment noted and will be included in the Administrative Record.

Response to I16-4
Discussion of water demand is presented in Section 3.11 of this EIS.

Response to I16-5
Please refer to Master Response 3.

Commentor I17 – Lon Robertson

November 24, 2008

PCMS NEPA Coordinator
Directorate of Environmental Compliance and Management
1638 Elwell Street
Building 6236
Fort Carson, CO 80913-4000

My comments relative to concerns and issues with the GTA DEIS as compiled by Potomac-Hudson Engineering and presented by Fort Carson's Directorate of Environmental Compliance and Management.

Underlying problems with this DEIS include:

- **The DEIS represents the segmentation of a larger foreseeable project.**

I believe that segmentation is occurring in the Grow the Army DEIS for the following factors:

Purpose: There is a common purpose between the Transformation, Grow the Army and the Expansion of PCMS; namely the increased training burden imposed upon Pinon Canyon Maneuver Site. .

Time: The three actions; Transformation, Grow the Arny and Expansion of PCMS are being considered at the same time. Even as this DEIS is being reviewed, the Department of Defense has submitted a congressional required justification of their expansion plans.

Location: There a common geographic locations for Transformation, Grow the Army and the Expansion of PCMS.

I17-1 **Impacts**: The three actions; Transformation, Grow the Army and PCMS Expansion, share a common impact that if reviewed as one project by decision makers will result in a significantly more adverse impact than if reviewed in segments.

Ownership: These three different segmented aspects of PCMS development are being undertaken by the same lead agency, the Department of the Army. There is good reason to assume a comprehensive awareness to assume the existence of, and relationship between the three projects.

Planning: The Grow the Army DEIS is obviously a segmented component of an identifiable overall plan. This initial phase fits into the development of subsequent phases and the approval of this phase or will prejudice the objective consideration of alternatives in subsequent phases.

Utility: The GTA DEIS and the proposed PCMS Expansion represent interrelated phases of one project and should be considered functionally dependent on each other.

Inducement: The approval of this segmented Grow the Army action will commit the Army to Expansion and induce legislative decision makers in relationship to future expansion legislation.

Commentor I17 – Lon Robertson

● Page 2 November 24, 2008

Other considerations specific to this DEIS:

- I17-2 The failure of the DEIS to include any alternatives other than "Proposed Alternative" and "No Action Alternative" is an inadequate examination of alternatives.
- I17-3 The DEIS fails to adequately address the cumulative effects of present and foreseeable future actions.
- I17-4 The dependence of the DEIS upon the mandates of other actions and programs which are not included or adequately described within the document makes an informed public evaluation of the merits of the proposed action impossible.
- I17-5 The DEIS makes improper and inadequate determinations of populations which must be considered in regard to Environment Justice.
- I17-6 Issues related to Air Pollution, Soil Erosion and Sedimentation are not adequately addressed in the DEIS.
- I17-7 The issue of potable water supplies is not adequately addressed in the DEIS.

I17-8 Concern also surrounds the EIS process as conducted by Fort Carson and its contractors. It is suggested that public input will somehow be considered as part of the decision making process yet that is precluded and thus excluded by the fact that the decision to implement a project has been made prior to any EIS process being formally conducted.

I would challenge Fort Carson, its contractors, or any other federal government agency to prove that any EIS conducted as a requirement of NEPA has obtained public input that actually changed the outcome of a proposed action in and of itself. It appears that the process itself has no actual intrinsic value other than as a check off to verify it was done.

I17-9 The complete absence of an analysis of alternative locations in the GTA DEIS is offensive and makes us feel that the whole process is a sham. The reason for this appears to be that the GTA is an imperative which precludes the examination of alternatives. Decision-makers are not being given a reasonable opportunity to make a responsible evaluation of the merits of a proposal without an analysis of alternative locations.

I17-10 This land in and around PCMS represents the cultural heritage and history of our region as well as the entire western United States in significant ways. We are deeply concerned with increased training requirements that procedures be employed to protect archeological, paleontological and other cultural resources as they are discovered and disturbed during training at PCMS.

And it is not just general cultural and historic assets that are at risk. It becomes very personal when peoples birth places, wedding sites and burial grounds are involved.

I17-11 Numerous documents including Fort Carson Sustainability Plan, the Land Use Requirements Study, 12 April 2005, (LURS), and The Analysis of Alternatives, 12 April 2005, and 6 May 2006, (http://www.carson.army.mil/rusag/pinon_canyon.html) suggest the Transformation

Commentor I17 – Lon Robertson

● Page 3 November 24, 2008

I17-11 (cont'd)

DEIS exists within a larger context of foreseeable related actions at Pinon Canyon Maneuver Site.

I17-12

Section 2.3.4.1 of the Pinon Canyon Transformation EIS includes table 2-2 which outlines the total number of training weeks under rotations for unites assigned to train at PCMS. This table indicates that training requirements by far exceed the capacity of PCMS. On page 2-24 the statement is made that, "This training load not possible and becomes more unrealistic when factoring in conflicts attributable to the live-fire operations and necessary land rest to sustain the training lands." The Grow the Army programs adds to this impossible training load an additional IBCT and other units, making the training load at PCMS even more unrealistic suggesting that this DEIS is designed as an inducement, to force the expansion of the site.

I17-13

The limitation of this DEIS to only the "Proposed Action" and the "No Action Alternative" render it fatally flawed as a useful and complete document. It sets up a false dilemma for the public and decision makers. NEPA requires a range of alternatives. It does not require that alternatives necessarily even be within the capacity of the applicant in order to be considered. The alternatives are for the benefit of legislative and administrative levels of decision makers who may have discretionary authorities beyond that of the Department of the Army and Department of Defense. The fact that other alternatives were "not approved" should not render such alternatives "unreasonable" and there for disqualified from consideration.

The fact that an alternative has not been approved should not eliminate it from consideration as an alternative. No level of authority may appropriately disapprove or eliminate alternatives from consideration in the DEIS since the inclusion of alternatives is necessary for an adequate evaluation of the proposed action by decision makers.

A broad range of alternatives are supposed to be included in the DEIS "so that reviewers may evaluate their comparative merits." (40 C.F.R. 1502.2(d)). It also must explain how each alternative will or will not achieve the policies of NEPA. The existence of a viable but unexamined alternative renders the DEIS inadequate. (Mumma, 956 F.2d).

The only discussion of alternatives is the precise location of buildings at Fort Carson. This is inadequate.

I17-14

Past, present and future cumulative effects of activities within the Purgatoire River drainage have not been adequately addressed in the DEIS. These activities are currently occurring and are expected to increase within the foreseeable future. Also within the foreseeable future are the increased training land requirements associated with Objective Force doctrinal distances and the projected need to further increase the training capacity of PCMS.

I17-15

Section 3.9.1.6 of the DEIS identifies populations subject to environmental justice determinations in El Paso and Fremont Counties, but does not properly consider the realities of economic conditions in Las Animas County. Minority and low-income populations are significant and should be reevaluated.

I17-16

The 41.7% Hispanic population of Las Animas County, compared with 27.7% in adjacent areas and 17.1 % for the state of Colorado constitute "meaningfully greater than the minority population percentage in the general population". This population is not identified and addressed as low-income populations according to EO 12898 and thus inadequate considerations are given in the DEIS.

Commentor I17 – Lon Robertson

● Page 4 November 24, 2008

I17-17 The 27.6% poverty rate among Hispanics in Las Animas County constitutes a "community" within the intent of EO 12898 yet is not addressed.

I17-18 The per capita income in Las Animas County of $16,829, when compared with per capita income in the State of Colorado indicate a relatively low income community which is not considered as required under EO 12898.

I17-19 I am also concerned with the possible impact that the GTA Action might have upon the Purgatory River. The river has been determined to be eligible as a Wild and Scenic River and any increased levels of sediment in the river might jeopardize such designation.

I17-20 Concerns already exist about the ability of the City of Trinidad and Las Animas County to meet the potential water needs of PCMS. I am concerned that the water needs for a potential expansion at Pinon Canyon are not adequately considered given the anticipated increase in the number of soldiers and the number of rotations occurring at the facility

I17-21 Highways 160 and 350 represent the only east-west transportation corridors in our region. Minutes from the Fort Carson, SUSTAINABILITY MANAGEMENT REVIEW Meeting Minutes held on 12 December 2005 state that "Major routes that were open to traffic might have to be closed to nonessential traffic." The potential for suspension of, and/or major disruptions to the free access of these vital transportation corridors is of great concern and is not addressed in the DEIS.

Please accept and document this as my submission for comment as allowed under NEPA.

Signed,

Lon Robertson
18159 CR 169
Branson, CO 81027

cc: Senator Ken Salazar
Senator elect Mark Udall
Congressman John Salazar
Congressman elect Betsy Markey
Colorado State Senators and Representatives

Responses

Response to I17-1
Please see response to Comment I5-1.

Response to I17-2
Please see response to Comment I5-2.

Response to I17-3
Please see response to Comment I5-3.

Response to I17-4
Please see response to Comment I5-4.

Response to I17-5
Please see response to Comment I5-5.

Response to I17-6
Please see response to Comment I5-6.

Response to I17-7
Please see response to Comment I5-7.

Response to I17-8
Comment noted and will be included in the Administrative Record.

Response to I17-9
Please see response to Comment I5-12.

Response to I17-10
Please see response to Comment I5-13.

Response to I17-11
Please see response to Comment I5-18.

Response to I17-12
Please see response to Comment I5-19.

Response to I17-13
Please refer to Master Response 3.

Response to I17-14
All present and future activities would be subject to all applicable local, state, and federal laws and regulations.

Response to I17-15
Please see the response to Comment I5-51.

Response to I17-16
Please see response to Comment I5-51.

Response to I17-17
Please see response to Comment I5-52.

Responses

Response to I17-18
Please see response to Comment I5-53.

Response to I17-19
Please see response to Comment I5-54.

Response to I17-16
Please see response to Comment I5-67.

Response to I17-17
Please see response to Comment I5-73.

Commentor I18 – Bill Sulzman

October 31, 2008

I18-1
I want to summarize briefly the comments I made at the public meeting at the Crowne Plaza hotel on October 29, 2008. It is my contention that the Draft EIS is invalid in the area of describing the inter connection of Fort Carson expansion and possible future expansion of PCMS. The paragraph which begins at line 8 on page 2-5 makes a clear argument for expansion of PCMS after an opening sentence which declares the opposite.

I18-2
The rest of the document provides a mountain of evidence that the **Grow the Army** expansion of Fort Carson will lead to forceful arguments for expansion of PCMS if and when the temporary moratorium on expansion is ever lifted. The most concise summary of the prospective increases is found on page 3-114 beginning at line 11. Here we find a description of several of the multipliers on PCMS use. The IBCT unit would bring an 8.6 per cent increase in land use and 20 percent in live fire exercises. The CAB would add another 7 percent to land use and 6 per cent to live fire exercises. Then we have another multiplier which is not quantified, the 2008 decision "to conduct training exercises for battalion-and brigade size units primarily at PCMS to help alleviate overcrowding at Fort Carson" How much will this add?

I18-3
Any reasonable person would conclude that when one adds this altogether it is a compelling argument for PCMS expansion as everyone from Keith Eastin to General Mark Graham have been saying for months. .

As I stated in my presentation at the hearing no amount of dodgy language can disguise this fact.

Bill Sulzman

Responses

Response to I18-1
Please refer to Master Response 1.

Response to I18-2
Both battalions and brigades have historically conducted a vast majority of their maneuver training at PCMS so it is not clear whether or to what extent the formal announcement of such a policy, as was announced in 2008, will actually result in any increase in training at PCMS. Variables such as frequency and duration of deployments have a far larger effect on frequency of use of PCMS for battalion and brigade maneuver training than a policy decision which formalizes how PCMS was already being used.

Response to I18-3
Comment noted and will be included in the Administrative Record.

Commentor I19 – Michael Ome Untiedt

From: Michael Ome Untiedt
Sent: Tuesday, November 18, 2008 9:17 AM
To: pceoc@hughes.net
Subject: Comment on October'08 Ft Carson PCMS GTA DEIS

I19-1

It is shocking to see our federal government seek to first isolate and then take away a great cultural and natural resource such as the Pinon Canyon area. We don't have a great many areas of such rich biological and historical diversity out on the Great Plains, the Pinon Canyon area is the exception.

It is also not surprising to me that so many "outsider" bureacrats feel enpowered to make decisions such as the expansion of Pinon Canyon Tank Maneuver Site. They live hundreds if not thousands of miles from the lands affected by their decisions, hence they can sleep easily at night. They don't have to live with the immorality of their decisions, life goes on for them. It is my hope a "new change" is coming to Washington, and the arrogant insensitive ways of past bureaucrats will be put to rest.

I was born and raised down in the country I speak about. To lose a treasure such as the Canyon Country is a tragedy and a travesty. Furthermore, to see the US Army, Department of Defense and El Paso County officials circumvent the will of the people and Congress, is an assault on the Constitution and American way of life. Their actions are immoral, illegal, and anti-American. They must be stopped.

Responses

Response to I19-1
Please refer to Master Response 1.

Commentor I20 – Gary and Jennie Yocam

Fort Carson GTA EIS PUBLIC MEETING

Environmental Impact Statement for the
Fort Carson Grow the Army Stationing Decisions

PUBLIC MEETING COMMENT FORM

Tuesday, October 28, 2008 • La Junta, Colorado

(Please print clearly)

Must be postmarked, e-mailed, or faxed on or before November 24, 2008.

I20-1 You really don't care what we think. The meetings are for publicity only and the comments aren't considered.

I would like to receive a copy of:

DRAFT Fort Carson GTA EIS ☐ **Hard Copy** OR ☐ **CD/Summary**

FINAL Fort Carson GTA EIS ☐ **Hard Copy** OR ☐ **CD/Summary**

Name:

Address:

Comment forms may be mailed to:
NEPA Coordinator
1638 Elwell Street, Building 6236, Fort Carson, Colorado 80913-4000
Tel: (719) 526-0912 or (719) 526-4666
Fax: (719) 526-1705
E-mail: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil

Fort Carson GTA EIS Public Meeting • October 28, 2008

Responses

Response to I20-1
The Army does consider all comments relevant to the Proposed Action and Alternatives. Please refer to Master Response 1.

Commentor LC1 – Colorado Council of Professional Archaeologists (Lucy Hackett Bambrey)

COLORADO COUNCIL OF PROFESSIONAL ARCHÆOLOGISTS

November 23, 2008

Re: Comments on the *Draft Environmental Impact Statement for Fort Carson Grow the Army Stationing Decisions*

Dear Sirs/Madams:

The Colorado Council of Professional Archaeologists (CCPA) is pleased to submit these comments on the *Draft Environmental Impact Statement for Fort Carson Grow the Army Stationing Decisions* prepared by Fort Carson and the U.S. Army Environmental Command. CCPA has been given consulting party status for National Environmental Policy Act (NEPA) documentation and National Historic Preservation Act (NHPA) Section 106 compliance by Fort Carson IMCOM.

LC1-1 We present some general comments followed by specific comments. We consider these to be substantive comments that need to be addressed in the final EIS.

<u>General Comments</u>

LC1-2 Information given out at public scoping for this DEIS appears to have been misleading. At the public scoping meetings for this DEIS held May 21, 2008 in Colorado Springs, the Army moderator refused to provide additional information on or allow discussion of Pinõn Canyon Maneuver Site (PCMS), stating that the "Grow the Army" DEIS was focused solely on Fort Carson facilities. However, the DEIS addresses the existing PCMS facilities.

LC1-3 It is unclear whether the 2007 EIS(s) or this 2008 DEIS is truly in compliance with Section 106. The 2007 programmatic FEIS discussed development of various resource management plans and agreements intended to avoid or mitigate adverse effects of implementation of the various proposals. However, apparently Section 106 compliance is still being done on a case-by-case basis with little overall guidance. Page 3-140 states that the Army Alternate Procedures (AAP) were approved by the Advisory Council on Historic Preservation (ACHP) in 2001; we understand that only the *concept* of using the AAP was approved; not the AAP itself. Please add a Federal Register or other citation for the 2001 approval if the statement is true. The DEIS also indicates the AAP was later revised (2004), and is again undergoing revision while the DEIS is underway. It is our understanding that the Army is still working on the Fort Carson AAP (due out in 2009).

1

Commentor LC1 – Colorado Council of Professional Archaeologists (Lucy Hackett Bambrey)

LC1-4 The status of the historic properties component of the AAP is unknown; the ICRMP was developed for 2002-2006 (soon to be at least three years out of date); and the Programmatic Agreement with the SHPO and ACHP (1980) is so outdated as to be useless. Thus the document bases Section 106 compliance on use of existing management practices, and does not really provide an analysis of effects to resources.

LC1-5 No representatives of the State Historic Preservation Officer (SHPO)/Colorado Historical Society or the ACHP were present at agency meetings held on May 19, 2008. LC1-6 Have drafts of the above resource management plans been reviewed by consulting parties and what are their comments? It seems that plans that are not yet final, or that have not undergone appropriate agency review and comment are being referenced for this DEIS as if they have been approved approved. LC1-7 In addition, this DEIS tiers off of an environmental document that is, we believe, still under litigation.

LC1-8 Integrated Training Area Management (ITAM) programs are being used at Fort Carson; is this true for PCMS? Internet sources indicate that the Fort Carson ITAM program is only partially supported by the Regional Support Center because, as of November 15, 2008, Fort Carson apparently is in the process of hiring appropriate GIS specialists. LC1-9 Do the Integrated Natural Resource Management Plan (INRMP), ITAM program, and plans for managing fire consider effects on cultural resources? LC1-10 Has the ITAM program been expanded to include PCMS and what mechanisms are available for feedback and program modification (adaptive) based on resource conditions there? LC1-11 What active programs are underway to ensure that the additional units proposed for training at PCMS will not further degrade natural and cultural resources?

LC1-12 The document states that a 2008 decision was made to conduct training for battalion and brigade-size units at PCMS. Battalion and brigade level training at PCMS would involve larger numbers of troops. Increased personnel, equipment and training programs as proposed in this DEIS could contribute to damage of vulnerable resources, especially if troop increases occur before field surveys are completed. Was this decision covered within one of the previous EISs?

LC1-13 What is the status of survey of unsurveyed lands, especially those proposed for unmounted use at PCMS? Dismounted training, particularly in the canyon areas, could have adverse effects on cultural sites from inappropriate uses such as artifact collecting, camping, ground disturbance, and other activities.

Specific Comments

LC1-14 On page 1-4 "Adequate facilities do not currently exist at Fort Carson and PCMS to accommodate the new units; therefore construction of facilities would be required." We infer this to statement mean there would be new construction at PCMS. Is this the case?

LC1-15 Based on the statements on page 1-6, the focus of the Army's sustainability program for Fort Carson is designed to "ensure training lands continue to be available to support the Army's mission." This focus is NOT on preservation of cultural or natural resources.

2

Commentor LC1 – Colorado Council of Professional Archaeologists (Lucy Hackett Bambrey)

LC1-16 Page 1-2. The planning for Fort Carson is based on a 1999 30-year projection of military needs. However, is this decade-old projection still valid given the rapid changes in modern warfare and technology?

LC1-17 The DEIS states that training elements of the Infantry Brigade Combat Teams (IBCT) and the Combat Aviation Brigade (CAB) would not change land use at PCMS. However, it is clear that the increased frequency and duration of training exercises and increased numbers of troops under this DEIS seriously heightens the potential for cultural resource damage. Although stationing of a new IBCT would not qualitatively change the types of maneuver training at PCMS (page 2-16), it would change the frequency of use by 20 to 25%, along with increases in the number of vehicles used, duration of training, and areas within PCMS locales used.

LC1-18 Page 2-28. The document states that under the No Action Alternative, force structure, assigned personnel, and equipment would be as they exist *after implementation of the transformation activities studied in the 2007 Fort Carson and PCMS EISs*. These transformation activities are not yet complete and will continue into the future. Is this truly a description of existing conditions?

LC1-19 Section 4.8.4.1 Archaeological Resources states that the Fort Carson CRM Program includes management of PCMS. In addition, the DEIS states that Section 106 compliance is conducted as training exercises are instituted. The fact that 80% of PCMS has been inventoried for cultural resources is admirable. However, this section also states that large-scale archaeological investigations have not been conducted since 2001. Because natural and human forces cause changes to cultural resources over time, by the time the Army's proposed action (or any alternative) is implemented, these surveys will most likely be outdated according to professional standards. Please resolve the inconsistencies.

LC1-20 Table 5-1. Army regulations implementing NEPA (36 CFR 651.16) state that "(a) NEPA analyses must assess cumulative effects, which are the impact on the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Actions by federal, non-federal agencies, and private parties must be considered (40 CFR 1508.7)." The Army is skirting the issue by not listing the potential expansion of PCMS in Table 5-1 as a reasonably foreseeable Army action. CCPA contends that enough details about the potential expansion have been made public by Fort Carson officials and by U.S. Army representatives, including the Assistant Secretary of the Army for Installations and Environment Keith Eastin on July 16, 2008.

LC1-21 Section 5.2.2.1 Potential Expansion of Piñon Canyon Maneuver Site states that the EIS does not include expansion of PCMS and that details of expansion are unknown. Therefore, the impact of expansion of PCMS is not included in the cumulative impacts analysis because it is not reasonably foreseeable. CCPA contends that enough details about the potential expansion have been made public by Fort Carson officials and by U.S. Army representatives such as the Assistant Secretary of the Army.

3

Commentor LC1 – Colorado Council of Professional Archaeologists (Lucy Hackett Bambrey)

LC1-22

Section 5.2.1.4.7 Cultural Resources. Please consider the cumulative impacts on cultural resources a result of potential impact of expansion of PCMS in southeast Colorado. Expansion is a reasonably foreseeable future action. Estimates of numbers and types of resources can be made based on recorded data for that area of the state. A Context for the Arkansas River Basin (Zier and Kalasz 1999) and Piper et al. 2006 can assist in projections.

LC1-23

Section 5.2.2.2.7 Cultural Resources. This section admits that the proposed action may result in direct or indirect loss of cultural resources during PCMS maneuver training rotations or wildfires that military training could generate. To use a blanket statement that development and use of various management plans would "mitigate" effects of implementing the proposal does not really allow quantification/ analysis of what would occur. What sort of feedback provisions are built into monitoring? What are the existing conditions and the triggers for adaptive management? How will agencies such as the SHPO, ACHP, and others know when adaptive management is being used to avoid cultural resource damage? Would adaptive management kick in only after damage has been observed?

LC1-24

Table 5-8 indicates that implementation of the proposed action would result in negligible adverse cumulative effects on cultural resources. CCPA strongly disagrees with this conclusion. First, nowhere in the DEIS is the threshold for negligible effects described. Generally, under NEPA, negligible effects are those impacts, either positive or negative, that are minimally observable on a resource. In other Army EISs, negligible effects are defined as those that would neither degrade nor improve current conditions.

LC1-25

The cumulative effects discussion fails to acknowledge that cultural and paleontological resources are non-renewable, irreplaceable resources that once damaged or destroyed cannot be replaced. Even with the very best protective measures, some cultural sites would still be affected by increased duration and frequency of training exercises at PCMS under the proposed action. Such destruction or damage is an adverse effect as described in 36 CFR 800.

For example, even if no National Register-eligible sites are directly or indirectly damaged by maneuvers, unauthorized artifact collecting and recreational use of sites by military personnel during training may remove or damage diagnostic artifacts that provide understanding of past use of the PCMS area, as well as the broader region. It is clear that ongoing and projected loss of cultural sites and resources will occur in the foreseeable future from continuing development along the Front Range, floods, fires, vegetation growth, insects, etc. Damage to or loss of sites reduces the number and type of resources available now and in the future for public education, enjoyment, and scientific research as well as diminishing the cultural heritage of affiliated tribes. When loss of resources from increased use of vehicles, weapons training, unmounted troop use and/or other training activities is combined with the past, ongoing, and future actions, adverse cumulative effects would occur, and these would not be negligible.

4

Commentor LC1 – Colorado Council of Professional Archaeologists (Lucy Hackett Bambrey)

The CCPA appreciates the opportunity to comment. We also look forward to the issuance of the final EIS.

Respectfully Submitted,

COLORADO COUNCIL OF PROFESSIONAL ARCHAEOLOGISTS

Lucy Hackett Bambrey

Lucy Hackett Bambrey
President
P.O. Box 40727
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Responses

Response to LC1-1
Comment noted and will be included in the Administrative Record.

Response to LC1-2
The moderator said, as does this EIS in Sections E.3, E.14, E.18, 2.2, and throughout Chapter 4 beginning with Section 4.1, and added to Sections 1.1 and 2.1.5, that the Proposed Action does not include any new construction at PCMS. The only new construction included in the Proposed Action would occur at Fort Carson.

Response to LC1-3
The text of Section 3.8.1.2 of this EIS has been clarified. See also Master Responses 4 and 5.

Response to LC1-4
Please refer to Master Responses 4 and 5.

Response to LC1-5
Comment noted and will be included in the Administrative Record.

Response to LC1-6
Before any cultural resources management plan is finalized and implemented, it is submitted to the appropriate consulting parties for review.

Response to LC1-7
This EIS tiers off the GTA PEIS, which is not under litigation.

Response to LC1-8
The ITAM program has always applied to PCMS. Description of ITAM efforts, including specific references to work at PCMS, is included in numerous places in Chapters 1, 2, and 4 of this EIS.

Response to LC1-9
Yes, these plans and programs do consider the effects on cultural resources. The CRM coordinates with the proponents of these plans and programs on their potential impacts on cultural resources.

Response to LC1-10
The ITAM program has always applied to PCMS. Description of ITAM efforts, including specific references to work at PCMS, is included in numerous places in Chapters 1, 2, and 4 of this EIS.

Response to LC1-11
Mitigation measures are covered in new Chapter 6 of this EIS.

Responses

Response to LC1-12
No, this decision was not covered in an EIS. The decision for apportioning the training resources of Fort Carson and PCMS was a routine management decision, comparable to deciding which firing range will be used by which units on a given day. It did not involve the introduction of any new type of training at either location. PCMS has always been the primary location for conducting battalion and brigade level maneuver training events. It is not clear whether or to what extent the policy will actually result in any increase in training at PCMS. The 2008 decision was consistent with this past practice. This type of decision is covered by categorical exclusion (b)(7) in Appendix B to the Army NEPA regulation at 32 CFR Part 651, "Deployment of military units on a … training basis where existing facilities are used for their intended purposes consistent with the scope and size of existing mission." Categorical exclusions do not require further NEPA review.

In contrast, when the Army has introduced new types of training at PCMS, it has conducted NEPA review, such as the EAs for the construction of the small arms and convoy live fire ranges.

Response to LC1-13
As detailed in Section 4.8 of this EIS, a majority of the PCMS (80 percent) has been inventoried for cultural resources and archaeological inventories are on-going to complete the survey of all un-surveyed land. Fort Carson acknowledges that an increase in military training has a corresponding increase in the potential for impacts to historic properties.

Before conducting training at PCMS, including dismounted, Soldiers receive briefings concerning their activities; e.g., all types of ground disturbance and/or movement or removal of natural or cultural resources are prohibited, no vehicle traffic of any kind, no digging, no fire building, no use of rocks or other building materials that may be present; all materials, natural and cultural, are to be left in place. Fort Carson has instituted comprehensive, and successful, education and awareness programs specifically geared to cultural resources.

Response to LC1-14
As stated in Sections E.3, E.18, 2.2, and throughout Chapter 4 of this EIS, and added to Sections 1.1 and 2.1.5 of this EIS, the Proposed Action does not include new construction at PCMS. The only new construction included in the Proposed Action would occur at Fort Carson.

Response to LC1-15
As stated in AR 200-1, the Army's mission includes compliance with all applicable environmental laws and regulations, including those that pertain to cultural and natural resources.

Response to LC1-16
This issue is beyond the scope of this EIS.

Response to LC1-17
As stated in Section 5.2.2.2.7 of this EIS, the Army acknowledges that an increase in military training has a corresponding increase in the potential for impacts to historic properties. However, it is anticipated that the cultural resource management program and policies will avoid significant adverse effects to cultural resources.

Responses

Response to LC1-18
The commentor is correct that the transformation activities have not yet been fully implemented. The No Action Alternative as described in Section 2.4 of this EIS is a hypothetical baseline to provide a benchmark to compare the magnitude of the environmental effects of the Proposed Action and the other alternatives.

Response to LC1-19
Once an area has been inventoried, and historic properties have been identified, evaluated, and documented, there are no federal, or state mandates to re-survey a previously inventoried area. However, as a proactive approach to resources management, conducting historic property re-evaluations is one of Fort Carson's Cultural Resources Program's Best Management Practices. Re-evaluation projects occur routinely and are standard within the Program. All sites that have been determined as National Register-eligible, to include those that need to be re-evaluated, are treated and protected as eligible. In addition, Fort Carson has a standard operating procedure in place that addresses the inadvertent discovery of cultural materials, whether these materials be in a previously surveyed area or discovered sub-surface due to ground-disturbing activities. Please see new Chapter 6 of this EIS.

Response to LC1-20
Please refer to Master Responses 1 and 2.

Response to LC1-21
Please refer to Master Responses 1 and 2.

Response to LC1-22
Please refer to Master Responses 1 and 2.

Response to LC1-23
The cultural resources management practices and program for PCMS are described in Section 4.8, new Chapter 6 of this EIS, and Master Responses 4 and 5. It is anticipated that the AAP, when completed and certified, will contain comprehensive information on the subject areas addressed in this comment. All identified consulting parties will have the opportunity to participate in the formulation of the HPC for the AAP.

Response to LC1-24
See updated Section 5.2.3, Table 5-8.

Response to LC1-25
The Army agrees that cultural and paleontological resources are non-renewable and irreplaceable. For this reason, Fort Carson cultural resources personnel work diligently with all units training at PCMS, before, during, and after training exercises to avoid impacts to historic properties.

The Army acknowledges that any activity has the potential to impact historic properties. As such, Fort Carson will continue the instituted comprehensive, and successful, education and awareness programs specifically geared to cultural resources as described in Section 4.8 and new Chapter 6 of this EIS, and Master Responses 4 and 5.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

24 November 2008

PCMS NEPA Coordinator
Directorate of Environmental Compliance and Management
1638 Elwell Street
Bldg 6236
Ft. Carson, CO 80913-4000

Re: Comments on the Draft Environmental Impact Statement for Fort Carson Grow the Army Stationing Decisions and finding that the actions will not have significant adverse environmental impacts at the Pinon Canyon Maneuver Site.

Thank you for the opportunity to comment on the Draft Environmental Impact Statement for the Fort Carson Grow the Army Stationing Decisions and the findings that the actions associated with the December 19, 2007 Record of Decision to proceed with the growth of the Active and Reserve components of the Army by 74,200 soldiers and the stationing of 6700 soldiers (3500 in an Infantry BCT, 400 in the CS/CSS units, and 2900 in the CAB) at Fort Carson will not have significant adverse environmental impacts at the PCMS. We submit these comments on behalf of the Cathy Mullins. Ms Mullins lives directly North of the PCMS and is personally affected by the proposed actions.

The growth actions described in the Draft EIS will result in dramatic environmental impacts both at the Pinon Canyon Maneuver Site and on the residents and communities of Southeast Colorado. We have a number of concerns with the substance of the analysis
LC2-1 conducted to date and with the process followed by the Department of the Army and Fort Carson officials.

In September 2003 Fort Carson officials prepared a plan for an expansion of the Pinon Canyon Maneuver Site through a multi-phased acquisition of 6.9 million acres of land owned by private land owners and the U.S. Forest Service (Comanche National Grasslands). On May 4, 2004 Fort Carson officials adopted the plan as part of an analysis of alternatives study of the Pinon Canyon Maneuver Site concluding that the acquisition of the land was the preferred alternative and recommending that the PCMS begin an environmental analysis and prepare the real estate planning reports.

Fort Carson officials then recommended and the Department of the Army has adopted the expansion plan as part of the large scale land acquisitions process. In the 2008 National Defense Authorization Act, Section 2867, Report on the Pinon Canyon Maneuver Site, Colorado, Congress has directed the Secretary of the Army to submit to the congressional

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-1 (cont'd)

defense committees a report explaining the impact of the proposed expansion and how the expansion is justified.

Yet this Draft EIS does not include an analysis of the environmental impact of the expansion. Therefore the public is being excluded from contributing in a meaningful way to the information-gathering process mandated by Congress. The Draft EIS is fatally defective on its face by failing to properly assess alternatives such as the proposed expansion, the use of other training facilities, and failing to assess the use of a training schedule which takes into account present and future deployments. Moreover the Draft totally fails to assess the cumulative impacts of the assignment of additional soldiers as a result of the Grow the Army Stationing Decisions along with the transformation and expansion of the Pinon Canyon Maneuver Site.

LC2-2

1. **The Department of the Army has failed in its obligation to comply with NEPA to the fullest extent possible.**

The National Environmental Policy Act mandates that all federal agencies prepare a "detailed statement by the responsible official," for any proposed "major federal action significantly affecting the quality of the human environment". See 42 U.S.C. § 4332(2)(C).

Environmental impact statements may be prepared, and are sometimes required, for broad federal actions such as the adoption of new agency programs or regulations (Sec. 1508.18). Agencies shall prepare statements on broad actions so they are relevant to policy and are timed to coincide with meaningful points in agency planning and decision making. See 40 C.F.R. §1502.4(b).

LC2-3

The "responsible official" herein has contracted out to a private company the responsibility for preparing an environmental impact statement. We question whether the statute authorizes the delegation of this responsibility to a private contractor. Federal officials are ultimately responsible to the people for their actions and failures to act. Private contractors do not owe any such duty to the people. We therefore object to the failure of the responsible official to prepare the Draft EIS.

LC2-4

Under NEPA the Army is "not only permitted, but compelled, to take environmental values into account. Perhaps the greatest importance of NEPA is to require [all] agencies to consider environmental issues just as they consider other matters within their mandates." *Calvert Cliffs' Coordinating Committee v. Atomic Energy Commission, 449 F.2d 1109 (D.C. Cir. 1971), cert. denied, 404 U.S.942 (1972).*

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-4 (cont'd)

In this Circuit the Courts have made clear that NEPA establishes a process by which federal agencies "take a hard look at the environmental consequences" of a proposed agency action. *Pennaco Energy, Inc. v. United States DOI, 377 F.3d 1147, 1150 (10th Circuit 2004)* (further quotation omitted); see *Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350, 109 S. Ct. 1835 (1989).*

LC2-5

LC2-6

LC2-7

The private contractor has determined erroneously that the actions associated with the Grow the Army Stationing Decisions will not have significant adverse environmental and/or socioeconomic impacts at the PCMS but admitted that the potential for adverse environmental impacts exists. Importantly the Congress has required the Army to answer questions and provide information concerning the environmental impact of the proposed expansion. Therefore the stationing of additional soldiers, along with the transformation activities and the proposed expansion constitute major federal actions "significantly affecting the quality of the human environment" triggering compliance with NEPA and should have been discussed in this Draft EIS.

LC2-8

That the actions associated with the stationing of additional soldiers has the potential for significantly affecting the quality of human life is irrefutable. The Draft EIS for the transformation lists the following possible adverse impacts of the increased training activities at the PCMS at page ES-5 of the Draft EIS:

> Nearly all of the vegetated areas and wildlife habitat on the Maneuver Training Area (most of the land area, excluding canyons and cantonment area) at PCMS could be disturbed during training exercises. Less mobile and burrowing wildlife could be directly affected by training exercises. Recreational use of the PCMS for hunting could become more limited because of conflicts with increased training activity. Air quality impacts could result from increased convoy traffic, construction of facilities, operation of additional combustion equipment, maneuver training, and prescribed burns. Archeological or paleontological resources could be encountered and inadvertently destroyed during training activities. Training activities could adversely affect soils and make them more prone to wind and water erosion.

We are convinced that vegetated areas and wildlife habitat *will* be destroyed during training exercises. Less mobile and burrowing wildlife *will* be directly affected by vehicular traffic and training exercises. Recreational use of the PCMS for hunting *will* be more limited because of conflicts with training exercises. Air quality *will* suffer from increased vehicular traffic, construction of facilities, operation of additional combustion equipment, maneuver training, and prescribed burns. Archeological resources *will* be encountered and destroyed during training activities. Training activities and prescribed burns *will* adversely affect the soils and make them more prone to wind and water erosion.

Given the adverse environmental impacts from the additional training activities and adverse impacts we know will flow from the activities: the Army had a duty to comply fully with NEPA and tragically has failed to fulfill its duty to the people.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

2. **The Army has failed to discuss all reasonable alternatives as required by NEPA.**

NEPA requires that the Draft EIS include a discussion of "alternatives to the proposed action." 42 U.S.C. § 4332(2)(C)(iii); see also 40 C.F.R. § 1502.14(a) (requiring agencies to "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated"); *Utahns for Better Transp. v. U.S. Dept. of Transp., 305 F.3d 1152, 1166(10th Cir. 2002).*

"The consideration of alternatives to a proposed action is 'the heart of the environmental impact statement.'" *Lee v. U.S. Air Force, 354 F. 3d 1229, 1238 (10th Cir. 2003)* (quoting 40 C.F.R. § 1502.14). In deciding whether an agency has adequately considered reasonable alternatives, "courts look closely at the objectives identified in an EIS's purposes and needs statement." *Citizens' Comm. to Save Our Canyons v. U.S. Forest Serv., 297 F.3d 1012,1031 (10th Cir. 2002).*

LC2-9

The Draft EIS states that the purpose of the proposed action is to implement the Fort Carson portions of the 2007 Record of Decision for the 2007 Programmatic EIS for Army Growth and Force Structure Realignment and the possible stationing of CAB at Fort Carson. Fort Carson Implementation will result in the deployment of 6700 additional troops to Ft. Carson and increase the use of the PCMS for training activities

It is therefore abundantly clear in the purposes and needs section of the Draft EIS that the Army should have considered and analyzed all reasonable alternatives for satisfying the increased training responsibilities imposed on Ft. Carson by the stationing of additional soldiers at Fort Carson. Yet the Draft EIS deliberately excludes from consideration the expansion of the PCMS even though the Department of the Army has recommended an expansion and Congress has required the Pentagon to provide information concerning the environmental and socioeconomic effects of an expansion. Moreover the Draft EIS totally fails to consider the alternatives of training the additional troops on other military facilities not requiring the taking of private or public lands.

Herein the alternatives analysis of the Draft EIS is deficient for three reasons. It inappropriately fails to assess the environmental and other impacts of an expansion. It arbitrarily eliminated alternatives such as training the additional troops on other available lands. It did not discuss varying the training schedules to

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

take into consideration the fact that the PCMS is not presently used for large training exercises because of the war in Iraq.

An agency may not as the Army has done "define [a] project so narrowly that it forecloses a reasonable consideration of alternatives." *Davis v. Mineta, 302 F. 3d 1104, 1119 (10th Cir. 2002)* cited in *Fuel Safe Washington v. Federal Energy Regulatory Commission, 389 F. 3d 1313, 1324 (10th Cir. 2004)*.

In the discussion of scope of the analysis, the Draft EIS at page 1-6 states:

This EIS incorporates the analysis of the 2007 GTA PEIS and the 2007 Fort Carson and PCMS Final Transformation EISs, by reference, and provides the baseline conditions of the No Action Alternative. <u>The scope of the EIS does not include potential land acquisition for expansion of the PCMS</u>. (emphasis added)

At paragraph 2.1.6 the Army explains the relationship between the Grow the Army and the potential for future expansion of the Pinon Canyon Maneuver Site as follows:

LC2-9 (cont'd)

GTA decisions, including the assignment of the IBCT to Fort Carson, were made in light of the overall Army training land shortfall on all installations and on the premise that receiving installations woiuld be limited to their existing lands to accommodate these additional units. The GTA PEIS states:

> This analysis examines installations in their current boundaries. It does not consider possible expansion of land holdings at installations. The process of land acquisition for Federal Agencies is a long one, requiring multiple approvals, a series of environmental and real estate planning studies, and funding of appropriations. Because of these uncertainties, there are no installation expansion actions that are included in this scope of analysis.

The Army's position is that the present facilities at Fort Carson and PCMS marginally provide sufficient land to train assigned soldiers and units adequately, including the IBCT and CAB being studied in this EIS, for *current* missions.

In other words the Army has made the decision not to include consideration of the proposed expansion in flagrant violation of NEPA. The decision was made to restrict alternatives and to not consider other reasonable alternatives with no public input whatsoever. The Army totally misconstrues the NEPA process. The purpose of the process is to aid in the development of informed decisions. The NEPA process includes public input because Congress requires that the public be involved '[b]efore taking "major Federal actions significantly affecting the quality of the human environment," agencies take that "hard look" at potential environmental impacts by means on an environmental impact statement ("EIS").' *Fuel Safe Washington v. Federal Energy Regulatory Commission at 1324.*

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-9 (cont'd)

The procedural duties imposed by NEPA are not discretionary. Section 102 of NEPA mandates a careful and informed decision making process and creates judicially enforceable duties. The Army is required to assess the direct, indirect, and cumulative environmental and socioeconomic effects of implementing the Grow the Army stationing decisions at the PCMS under its own NEPA implementing regulations. See 32 CFR 651.

LC2-10

3. The Draft EIS does not adequately consider the use of alternative training facilities.

LC2-11

Congress has specifically required a detailed report from Fort Carson information concerning what alternatives have been considered that do not require expanding the PCMS in the 2007 Defense Authorization Act. Moreover 40 CFR § 1502.14(a) requires the agency to "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated."

LC2-12

LC2-13

At paragraph 2.5.1 of the Draft Fort Carson EIS the Army dismissed a consideration of training sites other that Fort Carson and the PCMS because that analysis "would essentially constitute re-examining the GTA ROD stationing decision…" The failure of the Army to consider at an earlier stage of the decision-making process reasonable alternative training facilities to the PCMS should not automatically authorize a violation of the NEPA regulations in this Draft EIS.

LC2-14

The Draft EIS does not even mention training alternatives such as the inter-service, cooperative use of Fort Bliss/White Sands (4,642,309 acres), Yuma Proving Grounds/Bob Stump Training Range/Berry M. Goldwater Range (3,856,379 acres), and Dugway Proving Grounds/Utah Test and Training Range (2,475,093 acres). Yet these facilities are owned by the federal government, are much larger than the PCMS and have the terrain needed for training troops. Are these three sites heavily scheduled? Why do these sites not have the capacity to support Ft. Carson's training needs? What would be the cost and time involved in conducting training at these sites?

LC2-15

4. The Draft EIS does not consider the alternative of varying the training schedule to take into consideration operational deployments.

The PCMS has not been used except for limited training exercises this past three years. Presently Fort Carson soldiers continue to be deployed overseas and the Army does not have a firm timetable for when the deployments will cease. The media reports that the Army is making plans for soldiers to remain in Iraq for at least three more years. Therefore it makes sense that the Draft EIS should have considered seriously the impact of continued deployments overseas.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

5. The Draft EIS fails to evaluate cumulative impacts.

In *Fritiofson v. Alexander, 772 F. 2d 1225 (5th Cir. 1985)*, the Court was faced with a challenge to an Army Corps' decision to prepare an environmental assessment on a § 404 permit to fill wetlands for a development on Galveston Island. Additional development affecting the wetlands was being planned, but those plans were not yet pending before the Corps. The Corps prepared an environmental assessment instead of an EIS because the individual project would not have significant effects. The Court remanded for an EIS.

The Court noted scooping regulations require connected, cumulative, and similar actions to be considered together in the same EIS. When proposals are functionally or economically related, those proposals must be considered in one EIS. "If proceeding with one project will, because of functional or economic dependence, foreclose options or irretrievably commit resources to future projects, the environmental consequences of the projects should be evaluated together."

LC2-16 With respect to cumulative impacts, the Court noted that the regulations require analysis of direct, indirect and cumulative impacts and held that the impacts were not limited to those from actual proposals, but must also include impacts from actions which are merely being contemplated so long as they were reasonably foreseeable and not speculative.

The cumulative impact analysis must identify:

(1) the area in which the effects of the proposed project will be felt;
(2) the impacts that are expected in that area from the proposed project;
(3) other past, present, and reasonably foreseeable actions that have or are expected to have impacts in the area;
(4) the impacts or expected impacts from these other actions; and
(5) the overall impact that can be expected if the individual impacts are allowed to accumulate.

The expansion alternative should have been analyzed under these regulations. The sustainability study issued by Fort Carson in 2002 and the Land Use Requirements Study issued in 2005 discuss the need for expansion of the PCMS. The Department of the Army has already recommended expansion and requested a waiver of the Defense Department prohibition on purchasing land. Congress has already begun deliberations on the proposal. NEPA mandates that the decisionmakers be provided the environmental and socioeconomic information required to make informed decisions. This Draft EIS wholly fails to comply with the mandate of NEPA by failing to analyze the impact of an expansion.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

PLAN COMPONENT CONCERNS

1. Introduction

LC2-17 The additional training will introduce new elements to the visual landscape. The Draft EIS fail to take into consideration the very fragile nature of this ecosystem. This area was devastated during the great dust storms of the depression. The Comanche Grasslands were formed as a pilot project to stabilize the soil and conserve the topsoil of this region. Both construction and increased training activities will destroy vegetation and disturb the soil and raise the very real prospect of generating a new Dust Bowl throughout Southeast Colorado. The Draft EIS fails to address this issue.

2. Land Use

LC2-18 The PCMS contains a significant number of historic archeological properties and paleontological resources. The Army in the area already surveyed has recorded 5,113 archeological sites and projects that another 2040 sites will be discovered in unsurveyed areas. Most of these sites are prehistoric. Damage or destruction of any of these sites should not be permitted. Therefore the Army should not use any of the "Dismounted Training Areas" or "Restricted Areas" for any exercises or military activities whatsoever.

LC2-19 The Draft fails to note many important cultural and historic properties of this area. The Mountain Branch of the Santa Fe Trail passes through a small segment of the PCMS and parallels State Highway 350 along the Timpass Creek drainage. See Johnson and Carrillo 1987. Picketwire Canyonlands is located East of the PCMS and includes important recreational and tourism sites such as the dinosaur tracks and numerous petrographs. The Spanish Peaks are located West of the PCMS.

LC2-20 The stationing decisions and increased training activities on the PCMS will severely restrict the availability of public hunting opportunities in Southeast Colorado and adversely impact opportunities for hunting in this area. The PCMS is the largest contiguous parcel of public land available for hunting in this area. Potential limitations on hunting will severely restrict hunting opportunities.

LC2-21 Finally the increase in dust and noise due to construction activities and new training activities will adversely affect residents living near the PCMS and will discourage future residential development in this area.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-22

3. Air Quality

The additional training activities will in all likelihood result in emissions which violate the Clean Air Act. The level of training activities alone will result in substantial increases in vehicle exhaust and fugitive dust. The PCMS is located adjacent to Comanche National Grasslands and Picketwire Canyonlands and contains numerous archeological properties eligible for inclusion in the National Register of Historic Sites.

The prescribed burning activities, use of smoke grenades and fog-oil, and live fire exercises will generate inhalable particulate matter in excess of Clear Air Act standards affecting both the troops and adjacent residents.

As was demonstrated during the transformation hearing process the landscape is so fragile that even colonies of prairie dogs generate visible plumes of dust. Therefore it is preposterous to state that battalion - sized tank training exercises will not result in visibility impacts at the Picket Wire Canyonlands-Dinosaur Tracks, Spanish Peaks or Picture Canyon Historic District.

LC2-23

4. Sound

The Draft EIS fails to take into consideration the impact of noise resulting from the increase in training on non-human animal life in the PCMS and surrounding area. Transformation activities will generate noise while the troops are moving in convoys on very narrow two lane roads, while troops are operating tanks, support vehicles, aircraft and construction equipment. The increases in noise level will be destructive of native wildlife habitat and will disturb neighbors such as Cathy Mullins who lives less than five miles from the PCMS.

The live fire exercises will include both small-caliber and large-caliber weapons and will generate noise extending outside the boundaries of the site. This noise will certainly discourage residential development on lands near the PCMS and will preclude ranchers from grazing cattle near the PCMS.

LC2-24

5. Geology and Soils

The PCMS is located within the Raton Basin along the western margin of the Great Plains Physiographic Province. The Army admitted in the Transformation Draft EIS that this Province may be seismically active. From living in this area we know it is seismically active. The Army admits that faults in the area could have a low-to-moderate potential to cause damaging earthquakes. The Colorado Geological Survey estimates that

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

several thousand faults within the state have not been extensively mapped or studied-several thousand. Therefore it is not possible to predict the timing or location of potentially dangerous earthquakes within the PCMS.

We also know that the soil types commonly occurring on the PCMS are "characterized by moderate to severe soil erodability, landslides and unstable clay formation movement ". See Paragraph 3.5.1.2. Transformation Draft EIS. We also know that the proposed higher use of the PCMS for training will result in increased bare soil, reduced plant cover and a reduction in the variety of plant life. In a study of the military effects of training on the grasslands at Ft. Riley, Kansas researchers concluded as follows:

> High military training use was associated with increased bare soil, reduced total plant cover, and compositional shifts in plant communities. Reduced cover of perennial, matrix-forming grasses and native species, and increased cover of annuals and introduced species were also associated with high training activity.

LC2-24 (cont'd)

The researchers noted that training activities at Ft. Riley were strongly associated with plant community characteristics and with the amount of bare soil. Cover of bare soil increased with military use reaching over 35% on several areas. See Quist et al "Military Training Effects on Terrestrial and Aquatic Communities on a Grassland Military Installation" *Ecological Applications*, 13(2), 2003 pp. 432-442.

The fragility of the soil and plant life is not merely of academic concern to residents of this area. Long-term residents, during the Draft EIS hearings, made several comments concerning their experiences during dust bowl period in expressing their opposition to the transformation and possible expansion of the PCMS. The soil structure is so fragile that even planned burnings result in loss of topsoil due to wind and water erosion. The scope of training described in the Draft EIS will have the inevitable effect of stripping the soil of any cover and will result in devastating soil erosion and dust storms.

The damage from tank maneuvers and the use of live fire in the hand grenade range will permanently destroy the soil structure. It will not be possible to mitigate the damage. If mitigation of other damage is possible, what personnel and how many will actually be assigned to restore the vegetation and what steps will be taken to restore vegetated cover to bare soil?

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

6. Water Resources

LC2-25

The training activities described in the Draft EIS create the potential for substantial violations of the Clean Water Act and the National Pollutant Discharge Elimination System requirements.

LC2-26

The Army admits that the increased number of vehicles crossing dry ranges could modify drainage structures through erosion or compaction and could modify the drainages resulting in increased erosion with indirect impacts on water quality. The Army also admits that increased training frequency, particularly during wet weather when the soils are more susceptible to damage and increased erosion could lead to adverse impacts to water and air quality. Increased training would also increase the use of fuels, solvents and other hazardous and toxic substances with adverse impacts to both surface water quality and aquifer water quality. The live fire exercises will result in increased contamination of the groundwater, soil and air with lead and pose a direct threat to the healthy growth of children, wildlife and livestock in Southeast Colorado.

LC2-27

Mitigation and remediation are not spelled out in the Draft EIS in any detail and must therefore be assumed to not exist as to these disastrous impacts.

LC2-28

Finally the Army admits that floodplains have not been mapped at the PCMS even though it borders on the Purgatoire River and various creeks and drainages of the Purgatoire are on the PCMS. This area is prone to flash floods during the same period of much of the planned training exercises.

7. Biological Resources

LC2-29

This section as pointed out during the hearings fails to make any reference or list any invertebrates known to occur at the PCMS. The Draft EIS fails to even mention the results of the Ft. Riley study concerning the short and long term adverse impacts of military training on vegetation. This section notes that the bald eagle is both federally and state listed and is known to be a winter resident and migrant at the PCMS (Table 3-11). Bald eagles are likely to feed on rabbits, prairie dogs, squirrels and carrion (Andrews and Righter 1992). The failure to address the impact on the destruction of small mammals and their habitat as a result of training activities will likely lead to violations of the Bald and Golden Eagle Protection Act.

LC2-30

We anticipate that Forest Guardians will file an exhaustive comment dealing directly with deficiencies in the biological resources section of the draft and we adopt and incorporate their comment as our own.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

8. Cultural Resources

LC2-31 The Purgatoire River and its tributaries have served as habitat for humans for over 10,000 years. The PCMS and the surrounding area have a rich and largely unreported repository of archeological and paleontological resources. The cultural resources alone present a powerful argument against continued military use much less the transformation or expansion of the PCMS.

LC2-32 The Army essentially admits that since the taking of lands by eminent domain in the early 1980s it has systematically looted the PCMS and stored the results of archeological investigations at a warehouse located at Ft. Carson. Las Animas and Otero County residents and visitors are thereby deprived of an opportunity to become familiar with their own history except by examining the content of crates at Ft. Carson.

LC2-33 Surveyed areas of the PCMS contain 5,113 archeological sites of which 488 have been determined to be eligible for inclusion in the National Register of Historic Places. The PCMS also contains 68,864 acres of unsurveyed property with the prospect of identifying 2,040 additional archeological sites, 406 potentially eligible for inclusion in the National Register.

LC2-34 13 deposits containing paleontological resources have been documented at the PCMS. Four of these were determined to be of high paleontological significance.

LC2-35 The Army admits that areas known to contain properties eligible for inclusion in the National Register and areas not yet surveyed for cultural resources would be used for dismounted training exercises. Any use of these areas for training purposes raises the threat of inadvertent or even intentional destruction of important cultural resources and should not be permitted.

LC2-36 The Army claims to have entered into agreements with various Native-American tribes concerning compliance with the Native American Graves Protection and Repatriation Act of 1990 but does not include an executed copy of the agreement in the appendix. LC2-37 The Army apparently does not recognize the cultural significance of the Spanish, Mexican or early American settlement of this area other than through its efforts to document and preserve archeological properties.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-38

9. Socioeconomics

The Army has intentionally minimized the potential socioeconomic impact of the increased training activities by failing to evaluate the long term impact of the proposed expansion of PCMS. The adverse impacts on residents and ranchers in Las Animas and Otero Counties of the stationing and transformation decisions and the proposed expansion are severe. Investments in capital improvements have stopped because of uncertainty and the failure of Ft. Carson and Army officials to honestly disclose their plans to the affected communities.

The emotional and mental health of residents and ranching families has been negatively impacted by the actions of the Army in threatening to destroy historic communities. Many of the people affected by the stationing and transformation decisions and proposed expansion have lived in this area for generations and are now threatened with forced removal. How can one take away the soul and heart of those affected without causing irreparable injury? The Army expects these families to rear children to serve in the military of this country, perhaps to serve in Iraq or Afghanistan, in wars not understood and sometimes in wars the majority of the American people do not accept as legitimate. But that same Army refuses to be forthright and open about matters vitally affecting the lives of these same people.

LC2-39

10. Transportation

The increased training and transformation activities will create congestion problems on I-25 near Ft. Carson and Pueblo. Military convoys on U.S. 350 could essentially shut down traffic 30-60 days a year unless passing lanes are constructed between Trinidad and the gate to the PCMS.

11. Utilities

LC2-40

The utility infrastructure of PCMS does not comply with the Clean Water Act. The PCMS purchases treated potable water from the City of Trinidad. The water is stored in a large tank and distributed through underground water lines. However the Army does not know the location of the water supply or the distribution lines. See ¶ 3.11.1.1.Transformation Draft EIS.

LC2-41

Furthermore the water supply line from Trinidad has deteriorated and is leaking. Additionally the Cantonment area contains an evaporative treatment/oxidation pond designed for continuous use by a brigade-sized unit.

LC2-42

The wastewater ponds do not have a discharge permit even though stormwater generated in the Cantonment is directed to the ponds and

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-42 (cont'd)

allowed to run directly off site. Furthermore the septic tank for the Headquarters Building is not large enough to meet existing treatment design. See ¶ 3.11.1.2. Transformation Draft EIS

LC2-43

A high pressure gas line runs through the PCMS from southwest to northeast. Hopefully the Army has plans showing the exact location of this line since the Army plans to expand the operation of tanks as part of the transformation. However the Army admits that information concerning the utilities infrastructure is limited. See ¶ 3.11.1. Transformation Draft EIS. The Army also does not know where existing buried telephone lines are located. See ¶ 3.11.1.4. Transformation Draft EIS

LC2-44

Since the location of various utility pipelines is not known, it is very likely that construction activities as well as planned military maneuvers could damage the existing utility infrastructure. Construction and operation of new facilities will also result in an increase in wastewater and stormwater. Existing facilities are not adequate and new sewer mains must be constructed.

LC2-45

12. Hazardous and Toxic Substances

PCMS does not have a hazardous waste plan but should given the increase in personnel and training exercises contemplated by the increased training and transformation activities. Hazardous materials used at the PCMS include gasoline, diesel fuel, oil and lubricants used during routine maintenance; pesticides, chemical agents; and explosive and pyrotechnic devices used during military exercises.

LC2-46

Training activities will result in leachable lead and will most likely pollute the air, surface water, groundwater, and soil. Live-fire will most likely result in unexploded ordinance thus generating another special hazardous waste. These wastes will constitute a hazard on site and offsite. The leachable lead can be carried by wind and water runoff as well as by groundwater migration offsite thereby endangering the health of wildlife and humans in this area.

LC2-47

The prospect that lead-based soils would need to be remediated in the future is very distressing. What plans does the Army have once vegetation is destroyed by training exercises to keep lead-contaminated soil from being dispersed as dust during what will surely be inevitable dust storms?

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

13. Cumulative Effects

LC2-48

The Draft EIS fails to evaluate any of the effects of an expansion although the Department of the Army has recommended an expansion and the proposal is before Congress.

14. Mitigation Issues

LC2-49

As urged herein the potential adverse environmental impacts of the transformation activities are severe. The promises of mitigation are empty, shallow and incomplete. The Army promised in 1983 that it only needed 218,000 acres to fulfill its mission and there would never be any live fire exercises at the PCMS. The Army cannot be trusted. It is simply engaged in a word game. This Draft EIS is a charade to cover an elaborate land grab.

15. Unavoidable Adverse Environmental Impacts

LC2-50

The training activities described in the Draft EIS will significantly reduce hunting opportunities in Southeast Colorado and there are no equivalent hunting opportunities available in this area.

LC2-51

Facility construction activities will permanently destroy vegetative cover and result in increased stormwater runoff.

LC2-52

Nearly all vegetative areas and terrestrial habitats of the PCMS will be disturbed. Much of the vegetative cover and terrestrial habitats will be destroyed.

Wildlife will be affected by the loss of habitat, and by increased human and vehicular activity, by noise and by pollution from the exercises. Many less mobile and burrowing animals will be killed during training exercises.

LC2-53

Unidentified archeological and paleontological resources will be destroyed during construction and training exercises. Other identified archeological and paleontological resources will be defaced, disturbed and inadvertently destroyed during permitted training exercises on surveyed sites.

LC2-54

Air quality will be affected during construction and training exercises and the concentrate levels will exceed applicable air quality standards.

LC2-55

Movement of tracked and wheeled vehicles and the use of land for bivouac sites will adversely affect soils and make the soils prone to wind and water erosion.

Commentor LC2 – Colorado Legal Services (Larry R. Daves)

LC2-55 (cont'd)

The soil will be swept away by the wind and floods after the vegetation is destroyed by construction and training activities.

Irreplaceable cultural resources will be lost forever and a critical connection with our history will be irretrievably cut.

16. Conclusion

LC2-56

The increased training and transformation activities described in the Draft EISs are not suitable for this area. The grasslands and the wildlife of this area are too sensitive. The cultural treasures are too precious to be wasted or destroyed. Our farmers and ranchers are far better stewards of the land than the Army. The nation needs agricultural production more than the Army needs this land.

Respectfully Submitted,

/Larry R. Daves, Reg #33637

Larry R. Daves
Colorado Legal Services
P.O. Box 1026
La Junta, CO 81050
Email: ldaves @pcisys.net

Responses

Response to LC2-1
Please refer to Master Responses 1, 2, and 3.

Response to LC2-2
The Army believes that this EIS complies with NEPA.

Response to LC2-3
The Army has used contractors to assist in the preparation of both the draft and final EISs. However, these documents have been reviewed and approved by Army officials, and the determinations in them are those of the Army.

Response to LC2-4
The Army believes that this EIS complies with NEPA.

Response to LC2-5
The Army has used contractors to assist in the preparation of both the draft and final EISs. However, these documents have been reviewed and approved by Army officials, and the determinations in them are those of the Army.

Response to LC2-6
Comment noted and will be included in the Administrative Record.

Response to LC2-7
Please refer to Master Responses 1 and 2.

Response to LC2-8
To the extent that the comment refers to the DEIS for PCMS Transformation, it is beyond the scope of this EIS. Otherwise, the Army believes that this EIS complies with NEPA and has adequately covered the issues mentioned in Chapter 4 of this EIS.

Hunting opportunities will likely change due to increased training from the Proposed Action. However, changes have occurred in the past and, through communication and coordination with regulatory agencies, PCMS has remained available for public hunting. It is anticipated that changes due to this Proposed Action can be negotiated in this same manner to keep the quality of hunting high on the PCMS. Section 4.2.2.1 of this EIS has been updated to include additional information on hunting.

Response to LC2-9
Please refer to Master Responses 1, 2, and 3.

Response to LC2-10
Please refer to Master Response 3.

Response to LC2-11
The reporting requirements in the 2007 and 2008 NDAAs were not under NEPA and, thus, are beyond the scope of this EIS.

Response to LC2-12
Comment noted and will be included in the Administrative Record.

Responses

Response to LC2-13
The PEIS and ROD did consider other locations, including their training areas, for stationing of GTA units. The Army believes the PEIS complied with NEPA requirements and that this EIS is a proper "tiering" document from the PEIS.

Response to LC2-14
Please refer to Master Response 3.

Response to LC2-15
We cannot predict the timing or nature of deployments in the future, and, thus, to properly study the potential effects of the Proposed Action, as stated in Section 1.3, the analysis in this EIS was based on the assumption that all units would be present at Fort Carson at the same time. If and as deployments occur, it is anticipated that the effects at PCMS would be temporarily reduced for the period of those deployments.

Response to LC2-16
Cumulative effects are analyzed in Chapter 5.

Please refer to Master Responses 1 and 2.

Response to LC2-17
With regard to impacts on visibility, additional information has been added to Section 4.3 and Appendix C of this EIS. Soil disturbance is analyzed in Section 4.5 of this EIS.

Response to LC2-18
Limitations and restrictions on training areas as described in Chapter 4 of this EIS are considered sufficient for protecting cultural resources in those areas.

Response to LC2-19
Comment noted and will be included in the Administrative Record.

Response to LC2-20
Hunting opportunities will likely change due to increased training from the Proposed Action. However, changes have occurred in the past and, through communication and coordination with regulatory agencies, PCMS has remained available for public hunting. It is anticipated that changes due to this Proposed Action can be negotiated in this same manner to keep the quality of hunting high on the PCMS. Section 4.2.2.1 of this EIS has been updated to include additional information on hunting.

Response to LC2-21
The Proposed Action does not include any construction at PCMS. Impacts of dust and noise from training activities are analyzed in Sections 4.3 and 4.4, respectively, of this EIS.

Response to LC2-22
Air quality issues are analyzed in Section 4.3 of this EIS and analysis does not predict any violation of the CAA. Under AR 200-1, the Army is required to comply with all applicable environmental laws and regulations.

Responses

Response to LC2-23
Noise impacts to wildlife are discussed throughout Section 4.7.

In Sections 4.4.1.1 and 4.4.2.1, the Army recognizes that small-caliber (.50 caliber and below) weapons use at PCMS may potentially increase. However, this would not change existing noise contour models as there is a restriction on use of munitions exceeding .50 calibers. The noise models included in this EIS in Appendix D account for all weapon systems authorized and employed at PCMS. Noise Zone II (pk15 (met)) contours for the small arms ranges encroach less than 1.25 kilometers on adjacent PCMS properties located due East of Tyrone. This is the only location where noise contours exceed Noise Zone I levels and encroach beyond PCMS boundaries for small arms fire. According to USACHPPM, Noise Zone I is usually acceptable for all types of land uses.

Response to LC2-24
Comment noted and will be included in the Administrative Record.

The impacts of increased soil erosion and loss of vegetation are discussed extensively in Section 4.5.2.1 of this EIS.

Response to LC2-25
The analysis does not predict violations of the CWA or NPDES requirements. Under AR 200-1, the Army is required to comply with all applicable environmental laws and regulations.

Response to LC2-26
Comment noted and will be included in the Administrative Record.

Response to LC2-27
Mitigation has been added in new Chapter 6 of this EIS.

Response to LC2-28
Comment noted and will be included in the Administrative Record.

Response to LC2-29
Invertebrates at PCMS are described in Section 4.7.1.2.5 and additional information has been added to Appendix F of this EIS.

Adverse impacts of the Proposed Action and Alternatives on vegetation are discussed extensively throughout this EIS, specifically in Sections 3.5.2, 3.7.2, 4.5.2, and 4.7.2.

Impacts to small mammals are discussed in Sections 3.7.2 and 4.7.2 of this EIS. Fort Carson adheres to the ***Bald Eagle Management Plan for Wintering Bald Eagles at Fort Carson and the PCMS*** (Appendix E) to minimize impacts to Bald Eagles.

Response to LC2-30
Comment noted and will be included in the Administrative Record.

Response to LC2-31
Comment noted and will be included in the Administrative Record.

Response to LC2-32
Comment noted and will be included in the Administrative Record.

Responses

Response to LC2-33
Comment noted and will be included in the Administrative Record.

Response to LC2-34
Comment noted and will be included in the Administrative Record.

Response to LC2-35
As part of the Proposed Action, the Army would continue to conduct dismounted maneuver training in unsurveyed areas in accordance with longstanding cultural resource management practices and policies. To date, no significant impacts have resulted from dismounted training.

Response to LC2-36
The signature page for the agreement was inadvertently deleted in publication of the DEIS. It is included in the FEIS. See revised Appendix G.

Response to LC2-37
Comment noted and will be included in the Administrative Record.

Response to LC2-38
Please refer to Master Response 1.

Response to LC2-39
Analysis in this EIS does not support the conclusions stated in the comment. Transportation issues, including use of I-25 and US 350, are addressed in Section 4.10 of this EIS.

Response to LC2-40
In accordance with Army Regulation 200-1, the Army is required to comply with all applicable Safe Drinking Water Act (SDWA) and CWA requirements. The Army is aware of the general locations of the water supply and distribution lines on PCMS, but exact locations are not known. However, utility locates can be performed as necessary to determine specific locations and perform maintenance or modifications as necessary.

Response to LC2-41
The Army repaired the water supply line from Trinidad in 2007. See Section 4.11.1.1 of this EIS.

Response to LC2-42
The evaporative treatment oxidation ponds function only to accumulate and treat wastewater from cantonment area septic tanks and limited amounts of stormwater runoff from the bulk fuel facility and rail yard area. Portable toilets are used by units to support all training activities at PCMS. Local contractors provide a daily pump and return service. Sewage from the portable toilets is disposed of off-site in coordination with local POTWs. In reference to wastewater ponds discharge permitting, the ponds are considered Domestic Wastewater Treatment Works under Colorado Water Quality Control Commission Regulation 22. Accordingly, a completed site application (#3715), in accordance with the regulation, was made to the CDPHE Pueblo District Office in August and September of 2005 and was approved in November 2005. The lagoons are not regulated as an Individual Sewage Disposal System under 5 CCR 1003-6 or Las Animas-Huerfano Counties District Health Department regulations. In regard to the Headquarters Building septic tank, the Army upgraded to a 2,000-gallon septic system in 2006.

Responses

Response to LC2-43
The location of the gas line is well known and marked on maps. None of the increased maneuver training activities would affect it. Although the exact locations of utility lines are not known, that is not an uncommon situation. These lines may be located as needed.

Response to LC2-44
As stated in Sections E.3, E.18, 2.2, and throughout Chapter 4 of this EIS, and added to Sections 1.1 and 2.1.5 of this EIS, the Proposed Action does not include new construction at PCMS. The only new construction included in the Proposed Action would occur at Fort Carson.

Existing facilities are sufficient to support the Proposed Action.

Response to LC2-45
Hazardous wastes are generated infrequently and in small quantities at PCMS. Hazardous materials and wastes at PCMS are currently managed in accordance with Section 4.12.1 of this EIS. As previously identified as well as suggested by the commentor, the development and implementation of a hazardous waste plan is a proposed mitigation measure per new Chapter 6. A hazardous waste management plan is a component of the Integrated Solid Waste Management Plan.

Response to LC2-46
Live-fire activities would potentially generate small amounts of small arms ammunition UXO (.50 cal and below) at PCMS. Prior to returning to home station, units are required to recover spent round casings or non-firing ammunition before leaving ranges. Most of the casings and ammunition are recovered through this process and turned-in to Fort Carson. Some potential exists for small quantities of round casings to be missed and left behind during range clearing activities. Many, however, are recovered through subsequent range clearing iterations. These types of ammunition pose little risk as are not comprised of high explosives.

With regards to leaching of lead from Army ranges, Section 4.12 of this EIS has been updated to include new information.

Response to LC2-47
Vegetation maintenance, on a regular basis, can keep lead on the range and prevent wind or water from transporting lead away from ranges. Also use of wind breaks at the margins of ranges has been used effectively. The Army also has a brand new wear tolerant vegetation manual indicating various types of grasses appropriate for military training lands associated with arid northern climates (Palazzo et al., in progress). As part of the Proposed Action, installation staff will continue to implement ITAM and re-vegetation programs following maneuver and live fire training activities at PCMS to reduce the ability of lead to migrate from firing ranges. Re-vegetation will occur with grasses and vegetation that will stand up to small arms range use and also minimize the impact of range fires.

Response to LC2-48
Please refer to Master Response 1.

Response to LC2-49
This EIS concerns implementation of the stationing of GTA units and a possible CAB, not transformation. With regard to expansion, please refer to Master Response 1.

Responses

Response to LC2-50
Hunting opportunities will likely change due to increased training from the Proposed Action. However, changes have occurred in the past and, through communication and coordination with regulatory agencies, PCMS has remained available for public hunting. It is anticipated that changes due to this Proposed Action can be negotiated in this same manner to keep the quality of hunting high on the PCMS. Section 4.2.2.1 of this EIS has been updated to include additional information on hunting.

Response to LC2-51
As stated in Sections E.3, E.18, 2.2, and throughout Chapter 4 of this EIS, and added to Sections 1.1 and 2.1.5 of this EIS, the Proposed Action does not include new construction at PCMS. The only new construction included in the Proposed Action would occur at Fort Carson.

Response to LC2-52
See the analyses in Sections 4.5 and 4.7 of this EIS.

Response to LC2-53
Effects on archeological and paleontological resources are analyzed in Section 4.8 of this EIS.

Response to LC2-54
Effects on air quality are analyzed in Section 4.3 of this EIS.

Response to LC2-55
Effects on soil are analyzed in Section 4.5 of this EIS.

Response to LC2-56
Comment noted and will be included in the Administrative Record.

Commentor LC3 – Comanche Nation (Jimmy Arterberry)

From: Jimmy Arterberry
Sent: Wednesday, November 19, 2008 9:26 AM
To: Cowen, Pamela K CIV USA IMCOM
Subject: RE: Historic Properties Identification for GTA DEIS (UNCLASSIFIED)

Good morning Pam,

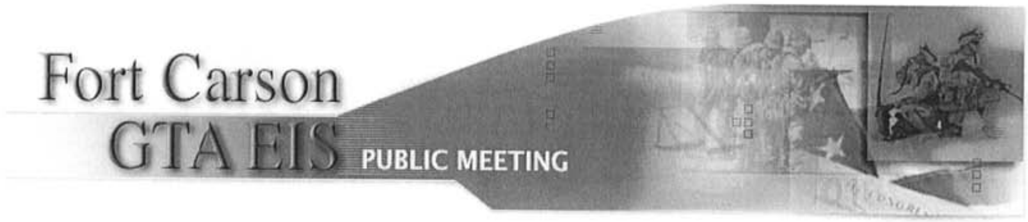
LC3-1 I must commend you on your promptness and commitment to providing us with access to sites/information requests. Your office has demonstrated a willingness over the years, to work with the Comanche Nation in protecting our histories. We look forward to continuing the work with your office. In regards to the DEIS for Fort Carson Grow the Army Stationing Decisions, the Comanche Nation Office of Historic Preservation comments are as follows; Since the proposed action will not involve expansion at PCMS, and will follow federal mandates of consultation as issues arise, the Comanche Nation Office of Historic Preservation has no current issue. Thank you.

Jimmy Arterberry, THPO
Comanche Nation
P.O. Box 908
Lawton, Oklahoma 73502
(580) 353-0404
(580) 353-0407 fax

Responses

Response to LC3-1
Thank you. Comment noted and will be included in the Administrative Record.

Commentor LC4 – Southern Colorado Environmental Council (Paula Ozzello)



Environmental Impact Statement for the Fort Carson Grow the Army Stationing Decisions

PUBLIC MEETING COMMENT FORM

Monday, October 27, 2008 • Trinidad, Colorado

(Please print clearly)

Must be postmarked, e-mailed, or faxed on or before November 24, 2008.

LC4-1 would like the issue of live fire at PCMS on aquifer water addressed in your statement?

I would like to receive a copy of:

DRAFT Fort Carson GTA EIS ☒ **Hard Copy** OR ☐ **CD/Summary**

FINAL Fort Carson GTA EIS ☒ **Hard Copy** OR ☐ **CD/Summary**

Name: PAOLA OZZello

Address: SO COLORADO Environment Council
618 E Godding Ave
Trinidad Co 81082

Comment forms may be mailed to:
NEPA Coordinator
1638 Elwell Street, Building 6236, Fort Carson, Colorado 80913-4000
Tel: (719) 526-0912 or (719) 526-4666
Fax: (719) 526-1705
E-mail: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil

Fort Carson GTA EIS Public Meeting • October 27, 2008

Responses

Response to LC4-1

The specific impacts of live fire activities on aquifer water quality is discussed in the Environmental Assessment for Construction and Operation of Live Fire, Maneuver Range, Piñon Canyon Maneuver Site, Colorado, 2005. Marginal increases in use of ranges designated for live fire are not projected to impact aquifers. Please see Section 4.6.2.1 of this EIS, which has been updated.

Commentor LC5 – Southern Colorado Environmental Council (Paula Ozzello and Kathy Hill)

SOUTHERN COLORADO ENVIRONMENTAL COUNCIL
618 East Godding Avenue
Trinidad, Colorado 81082

Paula Ozzello
Co-Chairperson
719 859 4048

Kathy Hill
Co-Chairperson
719 846 8504

RESPONSE TO DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR PINON CANYON EXPANSION AND PRESENT PINON CANYON MANEUVER SITE

LC5-1 First and foremost, we the Southern Colorado ENVIRONMENTAL Council are opposed to any expansion of PCMS. We respect our men and women of the armed forces and honor their service to our country. We also strive to protect our people, land, water and wildlife.

LC5-2 Our concern concerning the environmental impact statement for "Fort Carson Grow the Army Stationing" decisions report released in October of 2008 is that since the 1980's, the covenants made at that time between the army and residents of Las Animas County have been broken or never realized . Covenants included and effect the balance of our harmonious ecological system; economical issues, no live-fire, culture, historical sites and the scars to the emotional physic of residents for generations to come.

LC5-3 To address the issues of the Army wanting to expand 100,000 acres at this time: in "Area A" and "Area B" there are unwilling landowners who will not sell their property and live under the fear of EMINENT DOMAIN BEING USED BY THE ARMY EVERY DAY OF THEIR LIVES. A proper environmental impact statement for the expansion has not yet been done to truly reflect the negative and harmful impact to the harmony and co-existence of the maneuver site expansion and the residents of Las Animas, Huerfano, and Otero counties. The eco-system will not be able to survive with the expansion, the frequent use of PCMS and the live-fire element entering the picture.

LC5-4 Economically our region will not recover the loss of additional acquisition of farms and ranches. Presently, our natural gas fields have shut down and are not drilling new wells. Hundreds have been laid off and sub-contracts have been put on hold. Once again it is the agriculture residents carrying the burden of maintain our economy through this rough time. Should we lose this 100,000 acres of agriculture land the loss would be catastrophic to Las Animas County. $5,000,000 employment gains under the EXPANSION does not off set $20,887,000 annual value of production.

LC5-5 UNTIL A REAL STUDY IS DONE ON THE EFFECTS OF THE PROPOSED EXPANSION TO OUR COMMUNITIES THERE IS NO WAY WE CAN ACCEPT THE FINDINGS OF A DRAFT ENVIRONMENTAL IMPACT STATEMENT.

Commentor LC5 – Southern Colorado Environmental Council (Paula Ozzello and Kathy Hill)

LC5-5 (cont'd)

In relationship to the existing "Pinon Canyon Maneuver Site" which consists of 235,896 acres of which 220,000 are used for actual training, we are voicing the following concerns in response to the draft environmental impact statement.

LC5-6

The increased use of PCMS for training will definitely have a negative impact on the top soil and vegetation at PCMS. Noxious weed growth on the site is not under control. At the public hearing held in Trinidad on October 27, 2008 it was suggested that all vehicles entering PCMS should be decontaminated before leaving Fort Carson or other bases prior to being shipped to PCMS. THIS IS A MUST.

LC5-7

LC5-8

The damage to top soil will be great with the use of tanks, heavy equipment and other units listed in your study.

Vegetation and grasses original to the habit will also receive damage and possible extinction

LC5-9

WATER, SURFACE and GROUND: We found that this section is minimal in looking at the effects on our water, both surface and especially ground water. " THE DAKOTA AQUIFER" is the LIFE-LINE to eastern Las Animas County, southeastern Colorado counties and areas in the state of Kansas. At the meeting in Trinidad there was not an expert provided by the Army to address water issues. THERE IS A GREAT CONCERN OF THE EFFECT OF INCREASED TRAINING, CONTAMINATION ISSUES PERTAINING TO INCREASED LIVE-FIRE ACTIVITIES, CHEMICAL SPILLS AND THE STRESS ON THE AQUIFER AT PCMS. In your final statement, more study has to be done on the effects to our ground water.

LC5-10

WILDLIFE: Mammals, birds, fish, reptiles, amphibians, and invertebrates, all wildlife have a purpose in the eco-system in southeastern Colorado. With increased use of PCMS and the use of increased caliber of live-fire, our wildlife is at risk. Certain species are already endangered and risk extinction. Without the maintenance of a balanced habitat species will migrate to other regions or become non-existent southeastern Colorado. This would change the ecological order of things in our region.

LC5-11

LIVE-FIRE USE AT PCMS HAS BEEN INCREASED TO LARGER CALIBERS. WHICH LEADS US TO QUESTION WHAT THE NEGATIVE EFFECTS ON THE REGION WILL BE. This area is fragile to begin with and now the high risk of damage to our habitat that could take the local environment hundreds to thousands of years to recover. The eco-system will be tested in the near future if the Army is allowed to move forward with the expansion. There is grave concern for our land, water, wildlife, and most important 'OUR PEOPLE'.

In our work to protect and respect the environment, the test of our task is that people live and continue to thrive. THE VERY EXISTENCE OF OUR RANCHERS AND FARMERS IS WHAT OUR OPPOSITION IS ALL ABOUT, BECAUSE WITHOUT THEM WE ARE LESS A COMMUNITY, COUNTY AND A COUNTRY.

Commentor LC5 – Southern Colorado Environmental Council (Paula Ozzello and Kathy Hill)

LC5-12

Highways are also of great concern, as the damage being done to Highway 350 is beginning to show and the increased use will place all who travel at increased risk, making it impassable. Definite mitigation must be done immediately and not at the expense of the State but at the expense of the Army.

LC5-13

CULTURE ARTIFACTS : Presently are being housed at Fort Carson, under lock and key. We would like to see these returned and housed here in Las Animas County. THIS IS OUR HISTORY AND OUR HERITAGE – WHEN RETURNED WOULD BE PRESERVED AND GUARDIANSHIP NEVER QUESTIONED.

HISTORICAL RANCH SITES ON PCMS SHOULD BE MAINTAINED AND TAKEN CARE OF BY OUR LOCAL HISTORICAL SOCIETY, WITH THE ARMY'S FULL COOPERATION, PHYSICALLY AND FINANCIALLY.

LC5-14

SACRED LAND: THE ARMY MUST NEVER FORGET THAT THE LAND THAT PINON CANYON MANEUVER SITE SITS ON, IS SACRED TO MANY INDIAN TRIBES AND TO THE PEOPLE WHO HAVE LIVED IN THIS AREA FOR MANY GENERATIONS AND WHO HAVE PROTECTED AND PRESERVED IT EVERYDAY. SO PLEASE REMEMBER YOU ARE SHARING A LAND THAT HAS BLESSED SOUTHEASTERN COLORADO WITH AN ECO-SYSTEM THAT IS LIFE, " IN EVERY ESSENCE OF ITS EXISTENCE."

LC5-15

It represents everything you fight for and protect – our people, land, water, wildlife, culture and the very special gift of FREEDOM, which allows us the freedom to choose. WE THE RESIDENTS OF SOUTHEASTERN COLORADO CHOOSE TO OPPOSE THE EXPANSION OF PINON CANYON MANEUVER SITE. And after this election in November 2008, our President-elect has voiced that we the people DO HAVE A SAY in our government's decision and LOUD AND CLEAR we are saying NO TO THE EXPANSION. We accept the present PCMS AS IT IS and consider them a member of our community and will work with PCMS to maintain a healthy eco-system in Southeastern Colorado.

Paula Ozzello

Paula Ozzello
Co-chairperson

Kathy Hill

Kathy Hill
Co-chairperson

Responses

Response to LC5-1
Please refer to Master Response 1.

Response to LC5-2
We believe the comment refers to policy issues beyond the scope of this EIS. The comment mentions but does not identify “covenants” for which we cannot find documentation.

Response to LC5-3
Please refer to Master Responses 1 and 2.

Response to LC5-4
Please refer to Master Response 1.

Response to LC5-5
Please refer to Master Response 1.

Response to LC5-6
The Army agrees that additional training at PCMS will have some adverse impacts to soil and vegetation. Please see Sections 4.5, 4.7, and 5.2.2.2.4 through 5.2.2.2.6 of this EIS.

Response to LC5-7
Noxious weed management and the current condition of PCMS are addressed in Sections 3.7.1.1.1 and 4.7.1.1 of this EIS. As part of the Army’s Preventive Maintenance Checks and Services (PMCS) Program and standard operating procedures for deployment, vehicles are required to be washed immediately after returning from training activities. The Army employs dedicated noxious weed managers and support staff at both Fort Carson and PCMS.

Response to LC5-8
The Proposed Action does not involve the stationing of tracked armored vehicles or tanks. As stated, the Proposed Action includes the stationing of an IBCT, which is comprised of primarily wheeled vehicles. Please see Sections 4.5 and 4.7 of this EIS for discussion of impacts to soils and vegetation, respectively.

Response to LC5-9
Please see updated Section 4.6 of this EIS.

Response to LC5-10
Impacts to PCMS wildlife are covered in Section 4.7 of this EIS.

Response to LC5-11
The types of weapons allowed for live-fire use at PCMS have not been increased. Live fire is limited to .50 caliber and below, which are considered small-caliber. See Sections 4.12.1 and 5.2.2.2.1 of this EIS.

With regard to expansion, please refer to Master Response 1.

Response to LC5-12
Highway impacts are covered in Section 4.10.2 of this EIS. The Army does not feel that improvements to Highway 350 are necessary as a result of the Proposed Action.

Responses

Response to LC5-13
This comment concerns matters beyond the scope of this EIS. However, the Army has been and will continue to be willing to discuss partnering opportunities with regard to its historical collections and sites.

Response to LC5-14
Comment noted and will be included in the Administrative Record.

Response to LC5-15
Please refer to Master Response 1.

Commentor LC6 – Not 1 More Acre! and Grassland Trust (Stephen D. Harris)

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November 24, 2008

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Re: Draft Environmental Impact Statement for Grow the Army Actions at Fort Carson, Colorado

Dear Ms. Renn:

I submit these comments concerning the draft Environmental Impact Statement for Grow the Army Actions at Fort Carson, Colorado ("GTA DEIS") on behalf of Not 1 More Acre! and Purgatoire, Apishapa & Comanche Grassland Trust ("Grassland Trust").

Not 1 More Acre! is a Colorado non-profit corporation formed to promote ecological and economic health in southeastern Colorado. Not 1 More Acre! is actively working to protect and restore the Piñon Canyon Maneuver Site ("PCMS") and surrounding ecosystems, including private and public lands that would be affected by Army activities. Not 1 More Acre! strongly opposes any Grow the Army actions that would result in any expansion of the boundaries or size or increase the intensity of use of the PCMS. Not 1 More Acre! engages in education and advocacy activities, including but not limited to the submission of Freedom of Information Requests, preparation and submission of comment letters under the National Environmental Policy Act ("NEPA"), legislative action and environmental and social justice litigation.

LC6-1

Grassland Trust is a non-profit organization dedicated to educating people about healthy grasslands supporting flourishing and renewing communities of human, animal, plant, and soil life in southeastern Colorado and northern New Mexico. Grassland Trust works to inform social values and land ethics that foster ecological and economic health while preserving historical and geological values essential to human understanding and planetary well-being. Both Not 1 More Acre! and Grassland Trust are supported by broad and diverse national constituencies of concerned citizens who include ranchers, environmentalists, historians, proponents of sustainable agriculture, property rights groups, archaeologists, wildlife conservationists, educators and scientists.

Not 1 More Acre! submitted comments on the Draft Programmatic Environmental Impact Statement for Army Growth and Force Structure Realignment ("GTA PEIS") on October 8, 2007 and scoping comments for the GTA DEIS on or about May 21, 2008. *See,* Exhibits 1 & 2.

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I. The Natural and Cultural Heritage of Southeastern Colorado

The PCMS is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Colorado Springs. GTA DEIS at 2-4. PCMS is bounded by U.S. Highway 350 to the west, the Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. *Id.* The Spanish Peaks are located west of the PCMS. The PCMS includes a 1,600 acre cantonment area on US 350 that currently contains austere facilities to support training. *Id.*

The climate at PCMS is very dry with just 12" or 13" average annual precipitation per year, most of which falls as rain in short, high intensity storm events during the summer. *Id.* at 4-3. The PCMS is located in the Arkansas River basin and the Purgatoire River flows along the eastern border of the facility. *Id.* at 4-47. There are several small creeks and drainages located on the PCMS that drain into the Purgatoire and then into the Arkansas River. *Id.* Other surface flows enter the Arkansas River via the Big Arroyo drainage. *Id.* According to the GTA DEIS, drainage from the PCMS accounts for about 4% of the total flow in the Purgatoire River at the Rock Crossing USGS Station. *Id.* The Apishapa River is located to the west of the existing PCMS and flows into the Arkansas River near Fowler, Colorado.

The National Park Service compiles and maintains a Nationwide Rivers Inventory ("NRI"), a register of river segments that possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. The NRI identifies the Purgatoire River from Trinchera Creek to its confluence with the Arkansas River (a total of 117 miles) as possessing suitable characteristics for wild and scenic protection including deep and scenic red canyons, beautiful sandstone formations and exposed geologic processes, excellent fish and wildlife habitat, dinosaur tracks and bones, petroglyphs, and Indian paintings, dwellings, camps and artifacts.[1] Pursuant to an August 2, 1979 Presidential directive and related Council on Environmental Quality guidance, all federal agencies must seek to avoid or mitigate actions that would adversely affect any NRI segment. The PCMS and surrounding area also contains numerous playas, flat bottomed depressions that are periodically covered by water. GTA DEIS at 4-75. These playas are a major source of biological diversity and provide wetland habitat for waterfowl, shorebirds, and other wildlife.

The PCMS is located within the Raton Basin along the western margin of the Great Plains Physiographic Province, an area containing fragile soil types that are characterized by moderate to severe erodibility, landslides, and unstable clay formation movement attributable to variations in moisture content and temperature. *Id.* at 4-24 to 4-25. Tillage of soils to develop dryland farming in first few decades of the 20th century stripped vegetative cover from a percentage of the land, destroying soil structure and causing the devastating "Dust Bowl" of the 1930s. The Comanche National Grassland is the largest expanse of prairie set aside for restoration from that era. The Timpas Unit of the Comanche National Grassland borders the

[1] http://www.nps.gov/ncrc/programs/rtca/nri/states/co.html

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PCMS to the north, while the Carrizo Unit lies south of the existing military site. The grasslands surrounding the PCMS have experienced relatively low land use impacts since the 1940s.

The PCMS and southeastern Colorado contain outstandingly unique representations of Great Plains biodiversity. According to the GTA DEIS, 74% of the existing PCMS consists of grasslands and shrublands. *Id.* at 4-63. Western Short Grasslands is the second largest grassland ecoregion of North America, extending over portions of Nebraska, Wyoming, Texas, Oklahoma, Kansas, New Mexico, and much of eastern Colorado.[2] The grasslands of southeastern Colorado and northern New Mexico -- approximately 40% of the Western Short Grasslands -- are the last sweep of intact grasslands in the Western American Plains.

This grassland bioregion is distinguished by low rainfall, relatively long growing seasons, and warm temperatures. It is one of the most richly endowed bioregions in the United States with troves of biodiversity for species of butterflies, birds, and mammals, and once supported one of the most impressive migrations of a large ungulate species anywhere in the world – the American bison migration. Western Short Grasslands also contain the fastest declining bird populations on the continent, the endemic birds of the short grasslands of the Great Plains, which are increasingly dependent on the intact bioregions of southeastern Colorado and northern New Mexico. Globally, grasslands are rapidly gaining scientific recognition for the essential role they play in climate stability. Native grasslands play a critical role in storing carbon, by some measures even more so than forests.

The PCMS and surrounding lands are home to hundreds of wildlife species including elk, mule deer, pronghorn, coyote, swift fox, and the black tailed prairie dog, which is a keystone species upon which many other animals depend. GTA DEIS at 4-66. The area is used by nesting and migrating birds including the bald eagle, the golden eagle, the mountain plover, the burrowing owl, the ferruginous hawk and many ground nesting songbirds. *Id.* Southeastern Colorado is also the most biologically diverse region in the state for rare and common reptile species, including tiger salamanders, Texas horned lizards, the plains glossy snake, the plains milk snake, the longnose snake, the massasauga rattlesnake, the collared lizard, the checkered whiptail, the prairie rattlesnake, the bullfrog and the green toad.[3] Because scientific study of the PCMS and surrounding lands has been limited, it is known that there are many endemic species in the area that have not yet been described or classified.

The PCMS region is an archaeological hotspot of irreplaceable value, containing thousands of archaeological resources which document several thousand years of human prehistory. GTA DEIS at 3-137 to 3-138 & 4-85 to 4-86. Humans have occupied the Purgatoire River basin and its tributaries for over 10,000 years. *Id.* The PCMS area is a rich and largely unsurveyed repository of archaeological and historic resources, with a history spanning from the Paleoindian Period to the present day. *Id.* Predominately prehistoric rock art, considered a

[2] www.eoearth.org/article/Western_short_grasslands
[3] http://www.fs.fed.us/r2/nebraska/gpng/tes_projects/herpsurveyco.html

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"locus of sacred power and cultural significance," is also found throughout the area, mainly in the hogback formations and canyon areas.

The region contains important historic resources related to the Spanish, Basque, Mexican and early American settlement of the area. Historic sites include old stage route and station remnants, ranching complexes, homesteads and small mining operations. The PCMS contains a number of historic district-eligible homesteads including La Placita Hispanic Settlement, Cross Ranch, Bar VI Ranch, Mark Doyle Homestead, Red Rocks Ranch, Sharps Ranch, Crowder's Ranch & Big Canyon, Brown's Sheep Camp, Bent Stage Station, Lockwood Stage Station and Pinon Booster Station. 2007 PCMS Transformation EIS at 3-59. Red Rocks Ranch, Sharps Ranch and the Big Canyon Complex are used by Fort Carson base camps for field operations and as simulated Iraqi villages. *Id.* at 3-63. The Mountain Branch of the Santa Fe Trail passes through the south part of the PCMS and parallels State Highway 350 along the Timpas Creek drainage. GTA DEIS at Appendix F, Attachment F.1 at 11. There are also at least five Native American sites that are considered sacred, three Traditional Cultural Properties (TCPs) and "two areas of concern." *Id.* at 4-86.

The Purgatoire River Canyon, its tributaries and federal, state, county and private lands in the area contain an abundance of diverse paleontological resources that include trace plant, and invertebrate fossils from the Permian through Cretaceous geological periods (about 250-145.5 million years ago). 2007 PCMS Transformation EIS at 3-59. Although inventories have not been completed on the maneuver site, fourteen paleontological localities have already been identified, including four that "were determined to be of high paleontological significance" because of the diversity of plant and animal fossils, rare taxa and the amount of fossils in a stratigraphic unit (fossils located in rock layers). GTA DEIS at 4-86. The adjacent Picket Wire Canyonlands were taken away from the PCMS by Congress and transferred to the United States Forest Service "to conserve and protect the paleontological, archaeological, wildlife, vegetative, aquatic, and other natural resources of the area." Pub. L. No. 101-510, § 2825, 104 Stat. 1485 (Nov. 5, 1990). The Picket Wire Canyonlands contain a wealth of paleontological resources including the largest dinosaur tracksite in North America.

Today, approximately 44,000 people live and work in Las Animas, Huerfano and Otero counties. GTA DEIS at 4-89. The rural communities and economies surrounding the PCMS depend heavily on family ranching, farming and related small businesses. In Las Animas County alone there are approximately 567 working farms and ranches. *See,* Exhibit 3. Generational ranch families in the region continue ranching practices synchronous with the grassland ecosystems. This intact bioregion is by and large scientifically untouched.

II. The Piñon Canyon Maneuver Site

The Piñon Canyon Maneuver Site, an installation operated by the United States Department of the Army, is a roughly 238,000 acre maneuver training area that since 1985 has been primarily used by the Army to train units stationed at Fort Carson. GTA DEIS at 4-3. The

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PCMS is also used at times by other defense agencies, the Reserve Component, the National Guard, various state and local law enforcement agencies and multinational forces. *Id.* at 5-6. The Army originally acquired the PCMS in the early 1980s using the government's power of eminent domain to condemn privately owned property that had, in many cases, been owned by families for generations. The PCMS currently contains austere training facilities that are not capable of supporting large numbers of troops for extended periods of time. *Id.* at 5-32. The PCMS was not established as a sub-installation of Fort Carson; rather, the PCMS is a separate military installation of the Department of the Army. According to the DEIS, in 2008 Fort Carson "began a conceptual planning process to establish PCMS as a sub-installation, which may involve permanent assignment of support personnel to PCMS." *Id.* at 5-42.

The Army facilitated many scientific inventories at the PCMS in the 1980s and 1990s, but these projects diminished over time and virtually ceased after 2001. In the beginning, the Army imposed restrictions on maneuvers to protect natural processes and cultural heritage sites within the PCMS. In 1997, the Army prepared an Environmental Assessment ("1997 EA") for Training Area and Management Modifications that analyzed the impacts of making more of the site's lands available for mechanized training maneuvers. Exhibit 4. The 1997 EA effectively eliminated the spring (April, May, and June) and winter (December 1 to January 5) restrictions on off-road vehicular maneuvers, and also allowed for temporary use of a larger maneuver area at the base. *Id.* at 5.

In the NEPA process justifying the original acquisition of the PCMS, the Army promised area residents that neither live fire exercises nor future expansion would be permitted.[4] In response to a comment about the sort of training that would be conducted, the Army stated that "[n]o live firing would be conducted." Exhibit 6 at K-33, Response to Comment #61. The Army also represented that "commercial and private air traffic corridors . . . would preclude live firing" at the PCMS. *Id.* at K-34, Response to Comment #62. Comments expressed concern that the Army's "commitment for no live firing and estimated five month per year use level were empty promises that [the Army has] no intention of keeping." *Id.* at K-33 to K-34, Comment #62. The Army found "[t]he underlying trust . . . difficult to address" and advised the public to "wait and see." *Id.* On May 5, 2005, the Army secured approval for live fire exercises following completion of an Environmental Assessment and Finding of No Significant Impact, twenty years after promising local residents that live fire exercises would never be allowed. *See,* Exhibit 7.

From 1985 through 2001 the Army monitored training exercises at the PCMS and prepared reports known as After Action Reports ("AARs") that detail the extensive harm to the environment caused by training activities.[5] *See,* Exhibit 8. The current version of Fort Carson Regulation 350-4, adopted on January 4, 1999, governs training at the PCMS. Section 3-9(b) of

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[4] The Army reportedly promised Senator Hank Brown and Congressman Ray Kogovsek in 1983 that the PCMS would never increase in size. Exhibit 5.
[5] The first AAR evaluated a PCMS Training Rotation from July 29 to August 28, 1985. The last AAR evaluated a PCMS Training Rotation from April 5 to May 11, 2002.

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Fort Carson Regulation 350-4 provides that "[a]ll Fort Carson units training at PCMS will submit closing reports upon closing at PCMS and upon return to Fort Carson." Section 3-9(c) describes the required contents of AARs, which are "due 15 calendar days after exercise termination."

According to the Army, no AARs have been prepared since 2002, at least in part because no large maneuvers have taken place due to the number of troops who are deployed overseas fighting in the wars in Iraq and Afghanistan. *See,* GTA DEIS at 5-34 & Exhibit 9. However, a report submitted by the Army to Congress in response to the 2008 National Defense Authorization Act appears to indicate that the site is still used for small training exercises today. *See,* Exhibit 10. The failure to prepare AARs following these exercises appears to be a violation of Fort Carson's own reporting requirements. In addition, Fort Carson recently eliminated the Directorate of Environmental Compliance and Management, which was responsible for environmental management of the PCMS from 1985 until 2007. *See,* Exhibit 11. It is unclear whether there is any entity at Fort Carson that currently serves this function.

To our knowledge, Fort Carson, a base that has allowed urban-encroachment to increasingly compromise its mission, is the only Army installation that was evaluated in the Base Realignment and Closure 2005 ("BRAC 2005") and GTA processes that has produced well-developed plans to acquire additional training lands at a separate installation, and has been methodically moving forward those plans for the past five years without interruption and in contempt of a Congressional funding ban for any activity related to expansion at PCMS that first became law in 2007. Pub. L. No. 110-161, § 409, 121 Stat. 1844 (Dec. 26, 2007).[6]

LC6-2

III. Changing Army Doctrine

In order to fully understand the interdependent forces that are simultaneously driving the Proposed Action in the GTA DEIS, the 2007 PCMS Transformation EIS, and the PCMS land expansion project, it is necessary to review the history of an inter-related series of new military policies that the Army started to implement beginning in 1999. Some of the policies, such as the BRAC 2005 process,[7] the GTA initiative and Global Defense Posture Realignment ("GDPR"), dictate the movement ("alignment" or "realignment") of numbers of troops to specific military installations. By contrast, other new policies, such as "Transformation" and the "Army Modular Force" ("AMF"), fundamentally change the force structure and training requirements of the Army. All units of the Army are undergoing "Transformation" and conversion to AMF; only select installations are affected by BRAC 2005, GTA and GDPR alignment and realignment decisions. In order to aid the reader in comprehending the interrelationship among various dates in the discussion that follows, a timeline is included as Exhibit 13.

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[6] The funding ban was continued for another year by Congress in Pub. L. No. 110-329, § 127, 122 Stat. 3574 (Sept. 30, 2008).

[7] On September 16, 2005, based on Department of Defense recommendations, the Base Closure and Realignment Commission recommended that a brigade from Fort Hood be moved to Fort Carson along with other ancillary units. *See,* Exhibit 12.

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Following the lead of the Secretary of Defense, the Secretary of the Army announced on October 12, 1999 that the Army would henceforth be implementing the doctrine of "Transformation" throughout its ranks. GTA DEIS at 1-2. Transformation is a "dynamic" or changing doctrine that the Army is implementing over an estimated thirty-year period. The Army prepared a Programmatic EIS for Transformation ("Transformation PEIS") that became final in 2002, in which it was revealed that the core policy changes of Transformation are based on a series of seven adjectives, or "characteristics," that the Army seeks to achieve for the troops. *See,* Exhibit 14.

The broad purpose of Transformation is "identifying, planning for, and implementing changes to meet the security requirements needed for responding to 21st century threats and protecting national interests." Transformation PEIS at 2-1. The ultimate goal of Transformation is to transition from "Today's Army," also referred as the "Legacy Force," to the "Objective Force," to be achieved after a first phase transition to of the "Initial Force"[8] and a second phase transition to the "Interim Force."[9] According to the Transformation PEIS, "the Objective Force would have the characteristics of being more responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the entire spectrum of operations."

LC6-2 (cont'd)

According to the Transformation PEIS:

> Integration and synchronization of the Army's transformation efforts is guided by the Transformation Campaign Plan (TCP). The TCP is a "living" and continuously evolving internal "working" plan for synchronizing transformation activities. The TCP contains the level of detail required to synchronize efforts and to maximize the effectiveness and efficiency of those efforts. The TCP is also designed to allow maximum flexibility for innovation and initiative throughout the Army as the Army moves toward achieving the transformation objective.

Transformation PEIS at 2-5. However, the Army specifically retained the discretion to change those goals at any time in the name of Transformation. According to the 2007 PCMS Transformation EIS, the TCP:

> could be revised upon determination by senior leadership that specific tasks or responsibilities need to be reassigned from one major Army command to another. Alternatively, future events might lead to revised perspectives on the world situation that the Army confronts, resulting in identification of amended or new strategic requirements to be addressed. The basic feature of the TCP—the establishment of a framework for

[8] The Initial Force consisted of two brigades stationed at Fort Lewis in Georgia. Transformation PEIS at ES-3.
[9] The Interim Force consists of all the Army units that have been "transformed" after the Initial Force and before "transformation" of all Army forces into the "Objective Force." *Id.* at ES-2 to ES-3.

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> synchronization of planning for and execution of transformation to reach the goals expressed in the Army Vision—is not expected to change substantially, despite the "new" war on terrorism.

2007 PCMS Transformation EIS at 2-5 to 2-6.

LC6-2 (cont'd)

In the Transformation PEIS, the Army purported to analyze the environmental impacts of this vaguely defined "Transformation" on seven "activity groups" that together encompass every conceivable act that the Army might ever take in the future. According to the Transformation PEIS, the TCP will drive all acquisition of new weapons systems, construction, land acquisition,[10] deployments, stationing decisions,[11] and training.[12] As if this range of activities was not sufficiently all-encompassing, the architects of Transformation then created a catch all "activity group" for "institutional matters" defined as "the entire range of diverse day-to-day activities not otherwise specifically accounted for in the other six activity groups." Transformation PEIS at 2-7. According to the Transformation PEIS, institutional matters include:

> the Army's continuous examination and refinement of concepts, doctrine, and strategic plans for use of forces in joint service, interagency, and multinational operations. The activity group also extends to management actions that address sustainment of forces, personnel actions (recruiting, retention, and assignment), and budgeting. Finally, institutional matters include to the various programs and actions the Army implements in fulfilling its environmental stewardship role.

Id. at 2-8. In effect, "Transformation" is part of Army "Newspeak" invoked as authority justifying any conceivable project that the Army has already decided to pursue. During the past five years, the Army has increasingly used the term "Transformation" as a justification for every action that it seeks to undertake, to the point where today it is almost impossible to find a proposed military action that is not said to be a consequence of the Transformation of the Army. The public has limited ability to understand, let alone challenge, actions based upon these circular and self-fulfilling policies because the Army can now always tier its analysis of impacts

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[10] The Land Transaction "activity group" includes any acquisition of land and "the Army's maintenance of an adequate inventory of land." According to the PEIS, "acquisition involves gaining temporary or permanent control of property for Army use; in many instances, it results in lands being put to new or different uses." *Id.* at 2-7.
[11] The Stationing Activity Group "involves distribution of forces across Army installations in a manner that best supports achievement of the Army's mission. Stationing decisions are based on many factors, including Army force structure; availability of ranges and maneuver areas for training; and availability of support assets such as housing, schools, and other services for personnel and their families." *Id.*
[12] The Training Activity Group "involves achieving and maintaining readiness to perform assigned missions" and includes "all types of training activities that are needed by individuals and units to be ready to perform their missions." "The training activity group also addresses management of the Army's inventory of millions of acres of training ranges and maneuver areas." *Id.*

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to the impossibly broad goals approved in the Transformation PEIS and associated Record of Decision. In effect, the Army has created its own self-serving and fallacious syllogism:

> The troops must Transform.
> Project X is justified by Transformation.
> Hence, Project X must be implemented.

Our review suggests that there are just two specific changes to military doctrine based on Transformation that have a clear, uniform impact on the forces nationwide. First, AMF, the primary substantive training component of Transformation, is changing the size of fundamental units within the Army, with the open-ended goal of making the Army more responsive to changing conditions. The reorganization of the Army into a new unit type – the Brigade Combat Team – is well underway.

LC6-2 (cont'd)

Before Transformation, the larger Army units were organized into divisions and brigades. Brigades were considered "heavy" or "light" and typically included 1,500 to 4,000 troops, while divisions typically consisted of 10,000 to 20,000 soldiers commanded by a major general. After implementation of Transformation, most Army units will be organized into one of three "Brigade Combat Team ("BCT") types: Infantry BCTs, Heavy BCTs, and Stryker BCTs. Each BCT contains between 3,500 and 4,000 Soldiers organized into three battalions made up of roughly equal numbers of troops. GTA PEIS at § 1.4.3. According to the GTA PEIS, the rate of Transformation is accelerating. *Id.* at ES-I. All of the units stationed at Fort Carson have already converted to BCTs. GTA DEIS at 2-31 to 2-32.

Second, Transformation and the AMF have been used by the Army to justify significant changes in the land area required for maneuver training. When the Army refers to "doctrinal training standards," it is referring to the new, much larger land area requirements established for training BCTs in "force on force" exercises. Although the Army claims that the need for more land is in part based on the development of new, high tech weapons systems, remember that the Army reserved the discretion to change the focus of Transformation because doctrine is constantly evolving. Transformation can also be and is used to justify the new emphasis on counterinsurgency prompted by the military's experience in Iraq and Afghanistan.

On October 13, 2006, Fort Carson released a draft Transformation EIS for the PCMS that purported to analyze: (1) increased training related to the restationing of troops to Fort Carson under BRAC 2005 and GDPR; (2) new construction in the cantonment area at PCMS; and (3) new construction of ranges in the training areas at the PCMS. The final PCMS Transformation EIS was issued on June 20, 2007, and the Record of Decision ("PCMS Transformation ROD") was issued on August 2, 2007. Not 1 More Acre! is currently challenging the PCMS Transformation ROD in federal court. The 2007 PCMS Transformation EIS considered the environmental impacts of not only the realignment of troops authorized under BRAC 2005, but also changes based on AMF and Transformation. The 2007 PCMS Transformation EIS describes future weapons systems and other "technological changes [that] would enable BCTs to

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LC6-2 (cont'd)

operate on expanded battlefields and would require larger maneuver training areas to train effectively." 2007 PCMS Transformation EIS at 1-3. The 2007 PCMS Transformation EIS recognizes that "[o]ne of the most substantive results of the AMF initiative is the growing and evolving training requirement. Because changes to training requirements affect the land area required for training at the PCMS, these requirements are addressed separately in Section 1.2.4." *Id.* at 1-4. The 2007 PCMS Transformation EIS also relied on requirements outline in Training Circular (TC) 25-1 and 25-8. *Id.* at 2-15.

LC6-3

IV. Army Plans for PCMS Expansion

Make no mistake, the Army's land acquisition campaign for the PCMS is primarily driven by the increase in training requirements for the new force structure that arises out of Transformation. The Army formally adopted the new training land requirements in Training Circular (TC) 25-1 and 25-8, finalized on March 15, 2004 and in April 2005, respectively. Chapter 1 of TC 25-1 is titled "The Army Needs Maneuver Training Areas." TC 25-1 discusses conversion to the AMF and describes detailed formulas and models for assessing training land needs based on the concepts embodied in the Transformation PEIS. TC 25-1 at 3-4. TC 25-1 also introduced the Sustainable Range Program and the Army Range and Land Strategy. *Id.* at 3-3 to 3-4. TC 25-1 concludes with the warning that a "maneuver area that restricts doctrinal unit employment and does not reflect the potential battlefield will impair the unit's preparation for combat." *Id.* at 3-9.

In a power point presentation in March 2006, EIS Project Manager Mike Ackerman of the U.S. Army Environmental Center, who is listed as one of the preparers of and official contact for the GTA DEIS, explained that "[t]he ratio of current to future maneuver training [land] can probably best be expressed as a range of between 2.09 -4.18 or as a percentage increase from current to future training use of 209% to 418%." Exhibit 15. Not surprisingly, this substantial increase in training requirements has enabled the Army to claim that its training land shortfall will exceed 5.5 million acres. Exhibit 16 at 10. The Training Circulars that are driving the case for land expansion were not the subject of any public NEPA analysis, were adopted by the Army prior to initiation of BRAC 2005, and failed to disclose to the residents of southeastern Colorado that despite promises of no further expansion, the government was lining up its 'doctrines' to justify taking their lands and the last intact shortgrass steppe in the American Great Plains. The new training land requirements have the potential to become self-fulfilling prophecy; how can ordinary citizens fight a land expansion proposal that is based upon a "scientific" training land shortfall that was developed precisely to justify land expansion and without any public disclosure as required by NEPA?

In large part due to the efforts of citizens in the region, Not 1 More Acre! and Purgatoire, Apishapa & Comanche Grassland Trust, the Army has been delayed in its efforts to secure land expansion. However, the Army can patiently bide its time and put off well-developed plans for expansion, while at the very same time stationing more troops at Fort Carson than can be acceptably trained at the existing PCMS without causing irreparable environmental damage.

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Aware that its own warnings of peril would be used against it, the Army has now conveniently distinguished "doctrinal training standards" (or training to respond to any contingency) from Mission Essential Task List ("METL") training (training to respond to the conflicts currently facing the United States). GTA DEIS at 2-15. As a result, the Army can continue to push for land expansion to meet "doctrinal training standards" while grudgingly conceding in the GTA DEIS that the existing PCMS is "marginally adequate" for METL training. *Id.* at 2-5.

The public did not learn of the Army's ambitions for expansion at PCMS until in the first part of 2006, when a leaked Army map showing an acquisition area of nearly several million acres was presented at a meeting attended by Fort Carson and PCMS representatives in Las Animas County. Resistance from the people in southeastern Colorado was immediate and overwhelming. Since that time, Not 1 More Acre! and the Purgatoire, Apishapa & Comanche Grassland Trust have worked tirelessly to uncover the truth about the Army's expansion plans using the Freedom of Information Act. For the second year in a row, Not 1 More Acre! secured a funding prohibition for any action related to the expansion of the size or boundaries at PMCS and continues to demand full and complete disclosure and analysis of Fort Carson's options for dealing with its alleged training land shortfall before any changes at PCMS are implemented pursuant to Transformation.

LC6-3 (cont'd)

The first document produced by the Army that clearly defines the rationale and process is an Analysis of Alternatives Study dated May 6, 2004 ("2004 AAS").[13] *See,* Exhibit 16. The 2004 AAS states that the "Piñon Canyon Maneuver Site (PCMS) Revision to Section 7 for Fort Carson's Range and Training Land Program (RTLP) Development Plan, September 2003, identified the multi-phased acquisition of 6.9 million acres of land, currently owned by private land owners and the U.S. Forest Service (Comanche National Grasslands), as an option to the use of this land for large-scale, doctrinally sound Joint and Combined military training for units stationed at or deployed to Fort Carson and PCMS." *Id.* at 2. The 2004 AAS observes that "[a]t the present time, PCMS offers a maneuver area minimally capable of sustaining heavy (mechanized) BCT maneuvers over doctrinal distances." *Id.* at 4. The 2004 AAS also predicted that brigade sized units would be stationed at Fort Carson, all of which would "need to utilize an expanded PCMS for maneuver training." *Id.*

The 2004 AAS proceeds to analyze in fine detail the lands that could be acquired by the Army around the PCMS, and even includes a table showing that a total of 17,263 American citizens would be displaced by the expansion. *Id.* at 14. The report concludes:

> The purchase of the private land and the transfer of the U.S. Forest Service land parcels is the preferred alternative in addressing the issue that the units training at PCMS do so on an inadequate amount of available land, and that the required amounts are sure to drastically increase in the near

[13] The Analysis of Alternatives Study is one of the preliminary steps in the Army process for land acquisition. [cite?]

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> future. These parcels of land address the immediate need for land to meet doctrinal requirements, as well as providing the ability to train large-scale Joint and Combined maneuvers on a Department of Defense training facility for all U.S. forces and allied forces in the future.

Id. at 17 (emphasis supplied).

On December 22, 2004, the Army produced a document titled "Piñon Vision Operations Order 05-09." Exhibit 17. Piñon Vision is a detailed, 55-page campaign plan for implementing "the long-term expansion of Piñon Canyon Maneuver Site (PCMS) in order to obtain adequate training areas and ranges to support current and future Army and Joint force mobilization, mission rehearsal and training requirements." *Id.* at 2. The plan was produced with input from dozens of government officials at all levels of the Army and the Department of Defense, including Deputy Chief of Staff, U.S. Army Forces Command, Training and Environment; Department of the Army Management Office - Training Simulations; the Deputy Assistant Secretary of the Army for Installations & Housing; the Under Secretary of Defense for Acquisition, Technology & Logistics; Fort Carson: Directorate of Environmental Compliance and Management; Fort Carson Range Control; the Fort Carson Public Affairs Office; the Division Surgeon; the Division Engineer; the Army Environmental Center Public Affairs Office; the Fort Carson Garrison Commander; the Director of the Fort Carson Strategic Initiatives Group; the Fort Carson Directorate of Public Works; the Fort Carson Staff Judge Advocate; the Army Corps of Engineers; and many others. *See, e.g.*, Exhibit 17 at 12. Piñon Vision 05-09 declares that "a deliberate campaign plan must be methodically executed that meets all the federal, state and military regulatory and policy requirements. This plan will fulfill those requirements." *Id.* at 19. The Operations Order analyzes specific parcels of land to be acquired, timing of acquisition, construction of new facilities and proposed budgets.

LC6-3 (cont'd)

Based on Piñon Vision 05-09, the Army produced a Land Use Requirements Study ("LURS") on March 17, 2005, another step in the Army process for land acquisition. See, Exhibit 18. The March 2005 LURS identified a training land shortfall of just 418,577 acres. *Id.* at v. On April 12, 2005, the Army revised the 2004 AAS and the March 2005 LURS to reflect a training land shortfall of 1,142,838 acres. Exhibits 19 & 20. The higher figure was apparently based on the Army's intent at that time to acquire the minimum number of acres sufficient to support new increased training requirements and allow the lands to rest and recover following training use.[14] The 2005 AAS explains that "the advent of modularity has changed the doctrinal land requirements essential to train the combat and support formations of the Army." Exhibit 19 at 4. The 2005 AAS concludes that "[t]he demonstrated efficacy of using Fort Carson and Piñon Canyon as an integrated training facility will be multiplied by the acquisition of additional land

[14] The April 2005 LURS proclaims that "[t]he current PCMS facility cannot accommodate this major increase in maneuver training requirements. There is a shortfall of 1,142,838 acres at PCMS to meet the increased doctrinal maneuver and live fire training needs. This includes additional land beyond that required for training to sustain, repair and rehabilitate lands damaged by maneuver activity." Exhibit 20 at vi.

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sufficient to meet the training requirements of the Modular Force and, in all probability, the bulk of the requirements of the Future Joint Force." *Id.* at 19 (emphasis supplied).

The April 2005 LURS analysis "follows the guidelines established in Army Training Circular 25-1, *Training Land*, dated 15 March 2004. This study uses the Army Range and Training Land Program Requirements Model (ARRM) as the method for determining land use requirements at PCMS." Exhibit 20 at 3. The April 2005 LURS declares:

> In order to meet the demands of modularity and transformation and realize the true joint potential of Piñon Canyon, the Army will have to institute certain actions at Fort Carson and the Piñon Canyon Maneuver Site. These include acquiring additional maneuver land, the construction of live fire ranges, facilities, requisite infrastructure, and identifying the necessary personnel to support this emerging mission.

Id. at v & vi ("the transformation of the Army and the greatly increased capabilities of the modular force have combined to place a maneuver and live fire demand on the existing PCMS that can no longer be supported.")

LC6-3 (cont'd)

The April 2005 LURS assumes that brigades from Fort Hood and Korea will be permanently stationed at Fort Carson as part of the BRAC 2005 process, even though the Department of Defense's BRAC recommendations had not yet been submitted to the Base Closure and Realignment Commission ("BRAC Commission"). *Id.* at v. According to the April 2005 LURS:

> We anticipate the Army will form an additional BCT, and then move it to Fort Carson. This will mean that the installation will have 3 heavy BCTs, one light BCT, the 10th Special Forces Group, and the 43d Area Support Group. Based on discussions with higher headquarters, there is a strong likelihood that additional changes resulting in the establishment of a UEx headquarters with additional BCTs will take place over the next two years. This will result in an increase of approximately 7,000-10,000 Soldiers at Ft. Carson This increase will place a heavy demand on the existing maneuver training land and live fire facilities.

Id. The April 2005 LURS also warns that failing to expand PCMS will put the soldiers at risk and indicates that "[i]t is next to impossible for Fort Carson units to operate on the scale demanded by the COE within the current boundaries of the PCMS." *Id.* at 8. The April 2005 LURS asserts unequivocally that "[t]here is currently insufficient maneuver training land on Fort Carson proper to train these BCTs to doctrinal standards."[15] *Id.* at vi. The Army candidly

[15] The April 2005 LURS also states that "the maneuver area at PCMS is insufficient to realistically meet the doctrinal training needs of assigned units. This shortfall will only increase as existing units complete their transition

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explains that "[r]ecognizing that the acquisition of this land will take years, the Army is approaching the effort with a detailed campaign plan that methodically addresses the process." *Id.* at vii.

Subsequently, the Army revised the Pinon Vision Operations Plan and formally published it as Piñon Vision OPLAN 05-18 on January 12, 2006. Exhibit 21. Piñon Vision 05-18 was not authorized for release outside official channels but 50 copies were printed for distribution. *Id.* at 1. This new version of Piñon Vision is 124 pages and contains an expanded analysis of potential land acquisitions and an even more detailed campaign strategy. Piñon Vision 05-18 notes that "[t]he purpose of the campaign plan is to lay the foundation for a self-sustaining, coherent land acquisition effort that will weather the personnel turbulence, fluctuations in resources and shifting priorities inherent to military organizations while maintaining a steady azimuth resulting in access to greatly expanded training lands." *Id.* at 3. Piñon Vision 05-18 also recommended the hiring of a dedicated full-time employee specifically to work on the expansion project, titled the PCMS Outreach Coordinator, whose duties include coordinating with other Army offices "for land acquisition and environmental information strategies and communication plans" and implementing "the PCMS outreach program supporting public information efforts for PCMS expansion." *Id.* at 7-8. By April 2006 the Army had even hired a "PCMS Outreach Coordinator." *See,* Exhibit 22.

LC6-3 (cont'd)

On July 18, 2006, the Army submitted to the Department of Defense a Major Land Acquisition Proposal and request for a waiver from the land acquisition moratorium for up to 418,577 acres, yet another step toward gaining approval to proceed with land expansion. Exhibit 23. The Army presented a briefing in support of the land expansion proposal to Mr. Philip Grone, Defense Installations & Environment, on October 3, 2006, Exhibit 24. Not 1 More Acre!'s request for the final determination or outcome of the 2006 request for waiver has not been satisfied.

On October 17, 2006, four days following release of the draft 2007 PCMS Transformation EIS, the 2007 National Defense Authorization Act was signed into law including authorization for the acquisition of real property to expand PCMS thirty days following submittal of a report analyzing the potential expansion. Exhibit 25; Pub. L. No. 109-364, § 2827, 120 Stat. 2083 (Oct. 17, 2006) ("The Secretary of the Army may not carry out any acquisition of real property to expand the Pinon Canyon Maneuver Site until at least 30 days after the date on which the Secretary submits the report required under subsection (a)."). The authorization for the acquisition of expansion lands at PCMS and the report to Congress that would trigger the

to the more capable UA structure even if no further UAs are assigned to Ft. Carson." *Id.* at 17. Elsewhere, the April 2005 LURS explains that "the maneuver area at PCMS is insufficient to realistically meet the training needs of the modular Force at the brigade and regimental level. Training land requirements will drastically increase as the Army moves toward its Future Force. Analysis extrapolated from ATLAM calculations for the modular Force strongly suggests that the training land shortfall identified in this LURS applies to the Future Forces. While it is currently not possible to accurately calculate Future Force requirements, it is intuitively obvious that they will certainly exceed those of the current, modular force." *Id.* at 26.

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acquisition of land were requested by Senators Wayne Allard and Ken Salazar outside of the NEPA process and without public disclosure or Congressional exemption from NEPA. That NDAA Report was submitted by the Army to Congress during December 2006, ostensibly freeing the Army to move forward with real property acquisition. Exhibit 26. To Not 1 More Acre!'s knowledge, the authorization triggered by submission of the 2007 NDAA report has never been withdrawn. Again on the first day of the new session of Congress, January 4, 2007, Senator Wayne Allard introduced Senate Bill 135, "to authorize the secretary of the Army to acquire land for the purposes of expanding Pinon Canyon Maneuver Site." Exhibit 27. Senate Bill 135, co-sponsored by Senators Allard and Salazar, failed to be included in the 2008 NDAA.

On February 7, 2007, the Army submitted a new request for a waiver of the land acquisition moratorium, which was granted by the Department of Defense the following day.[16] Exhibit 28. Approval of the February 2007 waiver request occurred just over one week prior to the end of the public comment period on the draft 2007 PCMS Transformation EIS, which concluded on February 16, 2007. On May 3, 2007, Colorado enacted HB 07-1069 withdrawing consent to federal exercise exclusive jurisdiction over PCMS and claiming concurrent jurisdiction. Exhibit 29. Despite this clear expression of opposition from Colorado state government, the Army publicly released maps showing the area of interest for the proposed 418,000-acre land expansion during June and July, 2007. Exhibits 30 & 31. The area of interest identified on these maps closely match the first phases of the 6.9 million acre acquisition illustrated in the 2004 AAS, which included the same map that had been leaked to the ranchers in April 2006 but which the Army subsequently denied was authentic.

LC6-3 (cont'd)

On June 15, 2007, the House of Representatives passed a funding prohibition "for any action that is related to or promotes the expansion of the boundaries or size of the Pinon Canyon Manuever Site, Colorado" by a vote of 383 – 34. The amendment was subsequently approved by the Senate as well. Despite the legislative progress of the funding ban, Senator Salazar introduced an amendment ordering yet another report to Congress on PCMS expansion in September 2007. The first funding prohibition was signed into law on December 26, 2007. Pub. L. No. 110-161, § 409, 121 Stat. 1844 (Dec. 26, 2007). Senator Salazar's amendment requiring another report analyzing PCMS expansion became law in Pub. L. 110-181, § 2831, 122 Stat. 3 (Jan. 28, 2008).

On July 25, 2008, the Army submitted a report on PCMS expansion to Congress as required by Senator Salazar's amendment to the 2008 National Defense Authorization Act. Exhibit 10. In the report, the Army once again makes its strongest case for expansion, although its "proposal" is now limited to 100,000 acres, corresponding to the first phase of the Campaign Plan developed in 2004. *Id.* The 2008 NDAA Report was also accompanied by a "public relations" report prepared by consulting firm Booz Allen Hamilton under contract to the Army. Exhibit 32. As part of the Booz Allen Hamilton public relations offensive, polling agents

[16] The first request was made in July 2006 coterminous with the Transformation NEPA process. The determination of that request has not been revealed.

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LC6-3 (cont'd)

telephoned the residents of southeastern Colorado and convened focus groups in an effort designed to identify the most persuasive arguments in favor of expansion in contempt of a funding prohibition for any actions related to the expansion at Piñon Canyon. Notwithstanding these efforts, the funding prohibition was recently continued for another year by Congress on September 30, 2008. Pub. L. No. 110-329, § 127, 122 Stat. 3574 (Sept. 30, 2008).

It is notable that during this entire process, neither the Army nor the Department of Defense have ever voiced any misgivings or expressed any second thoughts about the expansion plans. The policy issue is never publicly disclosed nor presented as a question, such as: "Would it be in the public interest to expand the PCMS?" Instead, each and every Army analysis presents the need for expansion as a foregone conclusion, and sounds dire warnings about the national security perils associated with failing to expand.

V. The Proposed Action

The Proposed Action identified in the GTA EIS is an outgrowth of the January 2007 announcement by President George W. Bush that the Army would seek to "Grow the Forces" by some 75,000 additional active component troops. The President's announcement came just over a month prior to the close of the final public comment period for the draft 2007 PCMS Transformation EIS on February 16, 2007. In August 2007, the Army released the draft GTA PEIS to begin the process of identifying installations where the new troops would be stationed. Not 1 More Acre! submitted comments on the GTA PEIS. *See* Exhibit 1.

The final GTA PEIS was issued on October 26, 2007. The GTA PEIS considered seventeen installations as receiving bases, including Fort Carson. *Id.* at ES-II. According to the GTA PEIS, the seventeen installations chosen for analysis were all found to be "capable of supporting new stationing requirements of growth and realignment" with, among other things, "the capability to provide the necessary training infrastructure for new units." *Id.* at ES-IV. The PEIS claimed that land expansion was not contemplated and that receiving installations were sufficient based on their existing training lands. A programmatic Record of Decision for Army Growth and Force Structure Realignment ("GTA ROD") was issued on December 19, 2007.

The GTA ROD authorized the Army to add 30,000 troops in up to six new BCTs. GTA ROD at 12. The GTA initiative is unabashedly based on the doctrine of Transformation. *See, e.g.,* GTA PEIS at 1-2. According to the GTA DEIS, the purpose of the GTA initiative is to "implement realignments and associated activities between 2008 – 2012 to support Army's Modular Transformation and GPDR decisions." GTA DEIS at 1-1. The GTA ROD designated Fort Carson and PCMS to receive 4,877 new soldiers, including one retained BCT returning from Korea under GDPR (the 43rd Active Component (AC) BCT) and one new Infantry BCT ("IBCT"). GTA ROD at 22. The decision to retain the 43rd AC BCT was previously considered in both the BRAC 2005 process and the 2007 PCMS Transformation EIS.

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The Army published issued a Notice of Intent to prepare the GTA EIS on May 7, 2008 and held scoping hearings in Trinidad, La Junta and Colorado Springs from May 20 –22, 2008. Not 1 More Acre! submitted scoping comments objecting to the GTA EIS process. Exhibit 2. On October 10, 2008, the Army published a Notice of Availability of Draft EIS for Grow the Army Actions at Fort Carson. 73 Fed. Reg. 60246 (Oct. 10, 2008). The comment deadline is November 24, 2008; hence, these comments are timely.

The GTA DEIS describes the doctrine of Transformation as a justification for the Proposed Action. GTA DEIS at 1-1 to 1-2. The Proposed Action in the GTA DEIS will potentially increase the number of soldiers stationed at Fort Carson from 25,100 (organized into three Heavy BCTs and one IBCT) to 29,000 -- 31,800 in the 2008 to 2013 timeframe. *Id.* at 2-8. The Proposed Action includes the following elements that bear on impacts to the PCMS:

(1) The stationing of one IBCT (3900 soldiers) at Fort Carson. *Id.* at 2-8. The IBCT will be accompanied by equipment that includes two tracked vehicles, 930 medium to large cargo trucks, towed 115 mm artillery, 430 trailers, two unmanned aerial vehicles and other equipment. *Id.* at 2-32.

(2) The stationing of a Quartermaster Company and an Engineer Company at Fort Carson (400 Soldiers). *Id.* at 2-7.

(3) The potential Stationing of a Combat Aviation Brigade ("CAB") at Fort Carson (2800 soldiers). *Id.* at 2-8. A CAB consists of 116 helicopters accompanied by 700 tactical vehicles, with gunnery training at least twice per year. *Id.* at 2-9. The Army is considering other alternatives for the CAB, so the GTA DEIS reports that more NEPA analysis will be required before the CAB stationing will occur. *Id.* at 1-6.

Other new units at Fort Carson (including the 43rd AC BCT) were not analyzed as part of the Proposed Action because those units were analyzed in the 2007 PCMS Transformation EIS. *Id.* at 1-3.

LC6-4

Even though the Proposed Action does not authorize any additional construction at the PCMS, the increased training loads contemplated by the GTA DEIS will result in irreversible impacts to the uniquely important natural and cultural resources of southeastern Colorado. As depicted on Table 4.2-1, the vast majority of lands at the PCMS are open to some form of military training. *Id.* at 4-5. The Army recognizes four categories of training areas at the PCMS. *Id.* at 4-4. Dismounted training does not involve the use of vehicles. *Id.* at 4-4 to 4-5. Small arms live fire ranges are primarily used for weapons qualifications requirements. *Id.* at 4-4. Maneuver training areas, which comprise by far the majority of the training areas at the PCMS, are lands that the Army intends to use for mechanized and force-on-force training exercises. *Id.* The 2005 Environmental Assessment for Construction of a Live Fire Maneuver Range reported that 158,620 acres of the PCMS were open to mechanized use as of April 2005. Exhibit 7 at 21.

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LC6-4 (cont'd) Finally, restricted areas purport to "protect lands that support wildlife, ecosystems, soils, facilities, and cultural resources,"[17] although "varying degrees of training are allowed in restricted areas." *Id.* Figure 4.1-1 shows that very few acres are considered "off-limits" or "culturally restricted," although on a greater number of acres where there are "known occurrences of buried cultural resources, digging is not permitted." *Id.* **LC6-5** The GTA DEIS does not even disclose the number of acres now that fall within each of the different categories of training area.

LC6-6 According to the GTA DEIS, "[i]n 2008, a decision was made to conduct training exercises for battalion and brigade size units primarily at PCMS to help alleviate overcrowding at Fort Carson (i.e. mitigation for Fort Carson training impacts at the cost of increased training-related impacts at PCMS." *See, e.g.,* GTA DEIS at 2-13 & 3-114. The citation for this statement, Reference 83, indicates that the authority for this decision was a personal communication between Lieutenant Colonel T. Powell and the Fort Carson Assistant G-3 in June 2008. *Id.* at 6-5. The DEIS does not explain who made this decision, how the decision was documented or whether it was preceded by any environmental review as required by NEPA.[18] This is precisely the type of substantive policy decision that should have been subject to the NEPA process, and it is illegal for the Army to implement the decision without such environmental review.

LC6-7

VI. The GTA DEIS violates NEPA because it fails to consider impacts associated with the Army's proposed land expansion at PCMS.

NEPA is "our basic national charter for protection of the environment." 40 C.F.R. § 1500.1(a). NEPA declares a broad national commitment to protect and promote environmental quality and establishes a procedural framework for ensuring that potential environmental impacts caused by federal action are fully disclosed to the public and considered by federal agencies. 42 U.S.C. §§ 4331 *et seq.* NEPA emphasizes the importance of comprehensive environmental analysis to ensure that federal agencies carefully examine the environmental consequences of their actions before harm occurs. "The primary purpose of an environmental impact statement is to serve as an action-forcing device to insure that the policies and goals defined in [NEPA] are infused into the ongoing programs and actions of the Federal Government." 40 C.F.R. § 1502.1.

NEPA was enacted by Congress ensure that federal agencies thoroughly evaluate potential environmental impacts of and reasonable alternatives to proposed actions <u>before</u> making a commitment of federal resources. The analysis of environmental effects in an EIS must show a good-faith objectivity on the part of the agency. *Metcalf v. Daley,* 214 F.3d 1135, 1142

[17] All lands at the PCMS have the potential to support wildlife, ecosystems, soils, facilities, and cultural resources, in the absence of destructive military training use.
[18] The Army reports that increased use of range facilities at Fort Carson will interfere with maneuver use, in turn pushing "the need to PCMS to support all battalion and above exercises, significantly adding to costs, land management requirements and staffing levels." *Id.* at 3-10 to 3-11.

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(9th Cir. 2000) ("the comprehensive "hard look" mandated by Congress . . . must be taken objectively and in good faith, not as an exercise in form over substance, and not as a subterfuge designed to rationalize a decision already made."). Prior public statements by the Army suggest that preparation of the GTA DEIS was undertaken to justify a decision already made to expand the PCMS, in violation of NEPA.

NEPA requires an EIS to include an analysis of "the environmental impact of the proposed action," 42 U.S.C. § 4332(2)(C)(i), including ecological, aesthetic, historical, cultural, economic, social, and health impacts, whether direct, indirect, or cumulative, 40 C.F.R. § 1508.8. Council on Environmental Quality (CEQ) regulations require that "[p]roposals or parts of proposals ***which are related to each other closely enough to be, in effect, a single course of action*** shall be evaluated in a single impact statement." 40 C.F.R. § 1502.4(a) (emphasis supplied). Actions are considered "connected" if they: (a) automatically trigger other actions which may require environmental impact statements; (b) cannot or will not proceed unless other actions are taken previously or simultaneously; or (c) are interdependent parts of a larger action and depend on the larger action for their justification. 40 C.F.R. § 1508.25(a)(1). If proceeding with one project will, because of functional or economic dependence, foreclose options or irretrievably commit resources to future projects, the environmental consequences of the projects should be evaluated together. *Fritiofson v. Alexander,* 772 F. 2d 1225, 1241 n.10 (5th Cir. 1985).

LC6-7 (cont'd)

The Army's proposed land expansion at the PCMS is truly the 900 pound gorilla in the room that can no longer be ignored. It is fundamentally unfair for the Army to: (1) spend years developing detailed campaign plans in secret to justify the taking of private and public land; while at the same time (2) advocating for the stationing of thousands of new soldiers at Fort Carson, an increasingly urban-encroached base, pursuant to BRAC 2005, GPDR and GTA; and (3) developing new doctrinal training standards that it is impossible for even existing Fort Carson troops to meet at PCMS without further land expansion. The Army has consistently refused to publicly disclose or consider the impacts of its larger ambitions in the BRAC 2005 process, the 2007 PCMS Transformation EIS, and now the GTA DEIS process.

By artificially segmenting the PCMS expansion project into smaller pieces, the Army unfairly limits the scope of its analysis and thus circumvents NEPA's requirement that related proposals be addressed in a single environmental study. In effect, the military is irretrievably committing itself to future expansion of the PCMS by implementing the segmented actions authorized by the communications GTA DEIS. Without the proposed expansion, the training of ever more soldiers at the PCMS is a waste of federal resources and taxpayer dollars. Hence, the Proposed Action analyzed in the GTA DEIS serves to make the expansion more likely.

The Army insists that any interim decisions it makes regarding the amount and type of use to be authorized at the PCMS are wholly independent of the possibility of future land acquisition. The Army's EISs all recite a litany of legal terms of art that come from judicial interpretations of NEPA. According to the Army, the Proposed Action does not include expansion and can be accomplished without expansion. *See,* GTA DEIS at § 2.1.6. The Army

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argues that GTA is not "connected" to land expansion, not an "interdependent" part of a larger project that involves expansion, and even that the land expansion idea doesn't qualify as a "proposal" for purposes of NEPA. *Id.* at 2-5 and 2-6.

There is no question that the proposed expansion of the PCMS is sufficiently final to constitute a proposal for purposes of NEPA. *Kleppe v. Sierra Club*, 427 U.S. 390 (1976). The document submitted by the Army to the Department of Defense on July 18, 2006 and again in February 2007 seeking a waiver of the land acquisition moratorium was in fact titled "Major Land Acquisition Proposal." *See,* Exhibits 23 & 28 (emphasis supplied). In addition, the GTA DEIS analyzes the potential stationing of a Combat Aviation Brigade (CAB) at Fort Carson, even though the Army indicates that the final decision about stationing of the CAB will only be made after additional NEPA review in the future. How can the Army refuse to evaluate the impacts of expansion, which has been planned in detail for at least five years, while simultaneously evaluating the impacts of a speculative future idea like the stationing of the CAB? The Army is clearly playing games with words by arguing that the expansion project does not constitute a "proposal." The Army's coterminous preparation of the 2007 PCMS Transformation DEIS with its application for a waiver from the Department of Defense land acquisition moratorium in July 2006 (approval of which was mysteriously delayed until February 2007) makes it obvious that the expansion project was segmented from the Army's other plans for the PCMS and deliberated concealed from the public.

LC6-7 (cont'd)

The GTA DEIS asks the reader to believe that the Army made its stationing decision "on the premise that receiving installations would be limited to their existing lands to accommodate these additional units." GTA DEIS at 2-4. According to the GTA ROD, "Fort Carson's [training land] deficit is smaller than a majority of installations in the Army inventory." GTA ROD at 13-14. However, these statements are completely at odds with Fort Carson's urgent cries of alarm about the inadequacy of training lands at PCMS that have been expressed unequivocally for many years in expansion planning documents. The Army has consistently clamored for more land on the ground that Fort Carson is not capable of supporting more Soldiers in accordance with the demands of Transformation and AMF. Under these circumstances, the expansion cannot be fairly characterized as "speculative." The Army has structured its decision making process with respect to the PCMS such that expansion is a reasonably foreseeable action that is connected (or inseparably intertwined) with the number troops stationed at Fort Carson, and the military there has a statutory duty to take a hard look at its potential impacts in connection with the GTA DEIS and the 2007 PCMS Transformation EIS.

The Army is the enviable position of having both: (a) conducted the necessary planning for land expansion; and (b) received permission to proceed with land acquisition from the Department of Defense. In the face of stiff opposition now, the Army can wear down its opponents by subjecting them to multiple public processes that utterly ignore the central public policy debate concerning the PCMS, secure in the knowledge that its budget and resources far outstrip those of the citizens of southeastern Colorado and the grassroots taxpayers who support the efforts to preserve the last intact shortgrass steppe and her people from this travesty. The

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Army even assures us that the people of southeastern Colorado can look forward to participating in yet another NEPA process after the Army finally admits to the public, for real, that it does in fact intend to expand the PCMS (while continuing to deny any relationship between the full expansion project and the current proposal for 100,000 acres). GTA DEIS at E-3. This strategy is a clear attempt by the Army to circumvent the public involvement safeguards put into place by the Congress in the NEPA, all the while in contempt of a Congressional funding prohibition that prohibits ongoing pursuit of immersion site construction and boundary expansion at PCMS.

The contrast between the conclusions of all of the prior expansion planning documents and those contained in the GTA DEIS are stark and compelling. In every expansion study, the Army concludes that the land training shortfall at PCMS is dire and will compromise the safety of soldiers stationed at Fort Carson.[19] In order to justify the Proposed Action, the Army backtracks in the GTA DEIS:

> The Army's position is that the present facilities at fort Carson and PCMS marginally provide sufficient land to train assigned soldiers and units adequately, including the IBCT and CAB being studied in this EIS, for *current* missions. As stated in the Transformation EIS, however, even with just the assignment of the baseline units and soldiers, it will be necessary for the Army to deviate from its doctrinal training standards, which are designed to address the multiple contingencies that its forces may face, both now and in the future, not just current missions. With the addition of the new units at Fort Carson, the Army would have to introduce more work-arounds and deviate further from doctrinal training standards, which would have associated costs and implications. These could include greater environmental impacts, less time for soldiers with their families at home station, increased expenses, and suboptimal training.

GTA DEIS at 2-5 (emphasis in original). Thus, the Army now differentiates between doctrinal training standards, which are designed to prepare the troops for every possible contingency, and the Mission Essential Task List training standards, which are merely designed to prepare them for existing military conflicts. *Id.* at 2-14 & 2-15. The Army grudgingly concedes that the existing lands at the PCMS will barely suffice, and at the same time impliedly blames the residents of southeastern Colorado for causing the problems that they claim will be caused by opposition to land expansion.

Both in the 2007 PCMS Transformation EIS and the GTA DEIS, the Army uses the stationing of Soldiers at Fort Carson to justify other actions that do not follow automatically

[19] At various times, the Army has floated the idea of acquiring 6.9 million acres, 1.1 million acres, 418,577 acres and 100,000 acres. In fact, the three smaller acreage numbers simply represent phases in the detailed campaign plan laid out by Army leadership long ago.

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from the mere movement of troops. In section 2.1.3, the GTA DEIS reassures the reader that "implementing the Proposed Action will not alter the essential nature of Fort Carson or PCMS, which would remain as military installations on which Soldiers train, work and live, and on which there are facilities to support those activities." *Id.* at 2-1. It is true that if you station more soldiers at Fort Carson, then you need to provide housing for those soldiers at Fort Carson. It does not follow, however, that you need to make a fundamental shift in the way the PCMS is used, by turning it into a multipurpose combat training center that will house soldiers for long periods of time and become self-sufficient. It is impossible to separate the entrenched and detailed expansion plans for PCMS from ongoing planning designed to determine how PCMS will accommodate thousands of additional soldiers despite critical training land shortfalls claimed by the Army.

LC6-8

CEQ regulations provide that "[c]umulative impacts when viewed with other proposed actions should be discussed in the same impact statement." 40 C.F.R. § 1508.25(a)(2). The GTA DEIS fails to adequately disclose and consider the cumulative impacts of the proposed expansion on the environment, cultural resources and rural communities. The cumulative impacts that must be considered are not limited to those from past actions and present proposals, but also include impacts from actions that are merely being contemplated so long as they are reasonably foreseeable and not speculative. The cumulative impact analysis must identify any reasonably foreseeable actions that are expected to have impacts, describe the expected impacts, and discuss the overall impacts that can be expected if individual impacts are allowed to accumulate. As discussed above, the proposed expansion of the PCMS is a reasonably foreseeable action whose impacts should have been analyzed in the GTA DEIS.

Army protestations notwithstanding, the Army's plan for expanding the PCMS is not speculative or the product of unfocused brainstorming at the lowest level. The highest levels of the Army have coordinated a methodical, detailed campaign designed to overcome all obstacles that stand in the way of the expansion of the PCMS. The Army has deliberately developed doctrines and training requirements to be used in justifying the proposed land expansion to the public. The decision to move additional soldiers to Fort Carson is part of a deliberate plan to create conditions that will be used to justify expansion. NEPA requires that the public be involved in these kinds of public agency decisions at the earliest possible time. The Army cannot avoid the obligation to consider environmental impacts by first moving the soldiers to Fort Carson and building the necessary infrastructure, and then later demanding expansion as a consequence of these earlier actions. The Army is guilty of serial abuse of NEPA, concealing its true intent from the public while simultaneously moving ahead with overlapping EISs that are purposely designed to confuse opponents and ultimately wear down all resistance from the people.

NEPA is designed to ensure that federal agencies thoroughly evaluate potential environmental impacts of and reasonable alternatives to proposed actions <u>before</u> making a commitment of federal resources. Segmentation of the expansion proposal into smaller parts, or piece-mealing, prevents the government and the public from considering reasonable alternatives

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that could avoid the expansion altogether. If the Army implements the proposed actions analyzed in the 2007 PCMS Transformation EIS and the GTA DEIS, reasonable alternatives to the PCMS expansion will be foreclosed because the military will be reluctant to abandon its investment in favor of proposals that would train soldiers at Fort Carson proper or other training areas already owned by the military. For these reasons, the GTA DEIS violates NEPA. But considering the potential implications to the bioregion, homes, families, livelihoods and property of at least 17,263 Americans, the failure to consider these policy implications at the very earliest time that the Army starts implementing is detailed campaign plan is simply outrageous.

VII. The Army failed to analyze a range of reasonable alternatives in the GTA DEIS as required by NEPA.

NEPA requires federal agencies to consider alternatives to their proposed actions. 42 U.S.C. § 102(2)(c)(iii). The CEQ has described the alternatives requirements as the "heart" of the environmental impact statement. 40 C.F.R. § 1502.14. According to the CEQ, federal agencies must "rigorously explore and objectively evaluate all reasonable alternatives" and explain why any alternatives were eliminated. 40 C.F.R. § 1502.14(a). The purpose of the alternatives requirement is "to ensure that each agency decision maker has before him and takes into proper account all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and the cost-benefit analysis. Only in that fashion is it likely that the most intelligent, optimally beneficial decision will ultimately be made." *Calvert Cliffs Coordinating Comm'n, Inc. v. Atomic Energy Comm'n,* 449 F.2d 1109, 1114 (D.C. Cir. 1971).

LC6-9

As it relates to the PCMS, the GTA DEIS examines only two alternatives in detail: the Proposed Action and the No Action Alternative (which the military is required by law to consider under NEPA). GTA DEIS at Chapter 2. The only other alternatives considered concern the location of new support facilities to be constructed at Fort Carson proper. *Id.* at 2-28. The Army eliminated other alternatives from detailed analysis because "there are no true alternatives" to the stationing decisions analyzed in the GTA PEIS. *Id.* at 2-1. At a minimum, the Army should have considered in detail alternative means of meeting future training needs for troops stationed at Fort Carson through: (1) more efficient use of land at Fort Carson proper; and (2) transporting troops to other federal lands that contain less valuable ecological, archaeological and historical resources than the PCMS.

The Department of Defense manages 25 million acres of the approximately 650 million acres of federal land in the United States. The Army itself manages approximately 12 million acres of land, most of which is located in the western United States including roughly 137,000 acres at Fort Carson proper. Some of the largest Department of Defense landholdings in the western United States include Fort Bliss and the White Sands Missile Range in Texas and New Mexico (a combined total of 3,379,304 acres), the Yuma Proving Ground in Arizona (929,148 acres), Dugway Proving Ground in Utah (854,898 acres), and Fort Irwin in California (718,339 acres). Exhibit 16 at 9. These facilities are all owned by the federal government and much

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larger than the PCMS and have the terrain needed for training troops. The GTA DEIS fails to identify any specific training activities that cannot be accomplished on the millions of acres of land already owned by the military.

The GTA DEIS does not provide any information to allow the public to compare the potential impacts of increased training at the PCMS with the potential impacts of training elsewhere on Army lands, other federal lands or even privately-owned lands, as required by NEPA. The Army should have honestly considered the alternative of closing the PCMS and transporting troops to other locations such as these for training. Without a detailed analysis of the availability, capacity and cost of training at these sites, the public and agency officials are unable to make an informed decision with respect to the Proposed Action. The Army has offered no rational justification for refusing to compare the costs and benefits of the Proposed Action with those costs and benefits associated with other reasonable alternatives, such as closing the PCMS and either training soldiers at Fort Carson proper or transporting them to other Army bases. If there are legitimate reasons why those alternatives will not work, they should be fairly disclosed to the public and analyzed in the NEPA review process.

LC6-9 (cont'd)

The GTA DEIS at issue here is similar to the 2007 PCMS Transformation EIS and an EIS the Army recently issued for transformation of a Stryker Brigade Combat Team in Hawaii. *See 'Lio 'Ulaokalani Coalition,* 464 F.3d 1083 (9th Cir. 2006). In both cases, the Army defined the purpose and need narrowly in order to deliberately exclude other reasonable alternatives from consideration. The Proposed Action's broad purpose and need is not tied to a specific parcel of land, and thus training soldiers at locations other than the PCMS is a reasonable alternative. *Methow Valley Citizens Council v. Regional Forester,* 833 F.2d 810, 815 (9th Cir. 1987), *rev'd on other grounds,* 490 U.S. 332, *aff'd on remand,* 879 F.2d 705, 706 (9th Cir. 1989). "When the proposed action is an integral part of a coordinated plan to deal with a broad problem, the range of alternatives that must be evaluated is broadened." *City of Alexandria v. Slater,* 198 F.3d 862, 868 (D.C. Cir. 1999) (quoting *Natural Resources Defense Council v. Morton,* 458 F.2d 827, 835 (D.C. Cir. 1972)).

As noted earlier, the Army has not provided a rational justification for its decision to continue to use the PCMS for training purposes, which was never explained and forecloses alternatives that would have also been consistent with the stated purpose and need. The GTA DEIS fails to identify and analyze reasonable alternatives that could avoid or minimize adverse effects to significant biological and cultural resources at the PCMS, such as the alternative of using other federally-owned or managed lands. The Army's refusal to consider other reasonable alternatives violates NEPA and therefore the Army must withdraw the GTA DEIS.

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VIII. The DEIS fails to provide sufficient information about the anticipated use of PCMS to enable the public and agency officials to take a "hard look" at the potential environmental impacts, in violation of NEPA.

LC6-10

The GTA DEIS only examines the potential impacts of one new IBCT, an Engineer Company, a Quartermaster Company, and a CAB. All of the realignment decisions considered in the 2007 PCMS Transformation EIS are considered part of the baseline No Action Alternative in the GTA DEIS. GTA DEIS at 2-31. However, this approach fails to take into account the fact that Not 1 More Acre! is currently challenging the 2007 PCMS Transformation EIS in federal court. The Army has represented that it has taken no steps to implement the PCMS Transformation ROD by constructing the new facilities approved in that process. If the lawsuit is successful, the Army will not be permitted to proceed with construction of new facilities at the PCMS as authorized by the PCMS Transformation ROD, which will compromise the analysis of alternatives in the GTA DEIS. Under these circumstances, where a federal agency has two EISs pending at the same time that relate to the future operations of the same installation, and neither has been implemented (major federal action remains to occur), NEPA requires that all of the impacts from the pending actions be considered together in one process disclosed to the public. Changed circumstances have rendered the 2007 PCMS Transformation DEIS obsolete.

LC6-11

Pursuant to NEPA, all federal agencies are required to undertake thorough public review of the environmental consequences of all "major federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C). Congress intended that NEPA review would help "prevent or eliminate damage to the environment and biosphere by focusing government and public attention on the environmental effects of proposed agency action." *Marsh*, 490 U.S. at 371 & n.14 (1989) (citations and quotations omitted); *see also Robertson v. Methow Valley Citizen's Council*, 490 U.S. 332, 349 (1989). NEPA ensures that federal agencies elevate the consideration of the environmental effects of their proposed actions to the same level as other, more traditional, factors.

Preparation of an EIS serves two primary purposes: (1) "to inject environmental considerations into the federal agency's decision making process"; and (2) "to inform the public that the agency has considered environmental concerns in its decision making process." *Weinberger v. Catholic Action of Hawaii,* 454 U.S. 139, 143 (1981); *see also Sierra Club v. Hodel,* 848 F.2d 1068, 1088 (10th Cir. 1988). An EIS also enables critical evaluation of an agency's actions by those outside the agency. *Catron County Bd. Of Comm'rs v. U.S. Fish & Wildlife Serv.,* 75 F.3d 1429, 1434 (10th Cir. 1996); *Envtl. Defense Fund, Inc. v. Froehlke,* 473 F.2d 346, 351 (8th Cir. 1972). The EIS thus "helps insure the integrity of the process of decision," providing a basis for comparing the environmental problems raised by the proposed project with those in the alternatives. *Silva v. Lynn*, 482 F.2d 1282, 1285 (1st Cir. 1973). Federal agencies must comply with NEPA to the fullest extent possible. 42 U.S.C. § 4332.

NEPA requires an EIS to include an analysis of "the environmental impact of the proposed action," 42 U.S.C. § 4332(2)(C)(i), including ecological, aesthetic, historical, cultural,

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economic, social, and health impacts, whether direct, indirect, or cumulative, 40 C.F.R. § 1508.8. CEQ regulations implementing NEPA state that information included in NEPA documents "must be of high quality. Accurate scientific analysis ... [is] essential to implementing NEPA." 40 C.F.R. § 1500.1(b). In addition:

> Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analysis in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement.

40 C.F.R. § 1502.24. Where an agency has incomplete or no information on potential impacts, it must develop the information as part of the NEPA process. 40 C.F.R. § 1502.22. The CEQ regulations specify how an agency should proceed when faced with "incomplete or unavailable" information relating to its evaluation of "reasonably foreseeable significant adverse effects on the human environment." 40 C.F.R. § 1502.22. An agency "must obtain and include in the EIS information on 'reasonably foreseeable significant adverse impacts'" that are essential to a reasoned choice among alternatives "if the costs of obtaining such information are not exorbitant." *Holy Cross Wilderness Fund v. Madigan*, 960 F.2d 1515, 1523 (10th Cir. 1992). "If the costs of obtaining the information are exorbitant 'or the means to obtain it are not known' the agency must include within the EIS: (a) a statement that such information is incomplete or unavailable; (b) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (c) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and is within the rule of reason; and (d) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. *See, Lee v. U.S. Air Force*, 354 F.3d 1229, 1241 (10th Cir. 2004).

LC6-12

The GTA DEIS does not include sufficient detail about the nature of the actions to be undertaken at the PCMS or the environmental impacts of those actions to enable the public to meaningfully participate in the decision making process. The GTA DEIS is inadequate and precludes meaningful disclosure and analysis of impacts. Chief among the deficiencies is the GTA DEIS's failure to take a "hard look" at potential impacts to biological resources, physical resources and cultural resources. Impacts are often not disclosed, stated as obvious generalities without attempt at quantification or discussion, understated, or stated in a manner intended to mislead the public into believing they are insignificant. In fact, disclosure and discussion of the significance of the action's impacts on many resources are simply absent.

LC6-13

The GTA DEIS does not disclose and make use of the best available scientific information to analyze impacts. From 1985 until 2002, the Army kept detailed records of

LC6-14

environmental damages caused by military training, but none of this material was included within the analysis contained in the GTA DEIS. Information relevant to reasonably foreseeable

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LC6-15 adverse impacts that is critical to the decision makers arriving at a reasoned choice among alternatives is not included in the GTA DEIS. This includes data relative to ecological sustainability of maneuver activity. There is therefore no disclosure of how or why the decision makers will make a decision, i.e. no clear basis for choice among alternatives based upon impacts and their significance. LC6-16 In addition, mitigation is not discussed for many resources and the Army has therefore failed to adopt mitigation measures adequate to reduce the impacts.

LC6-17 Both the Transformation and the GTA EISs repeatedly remind the reader that the Army has no way to predict how the Proposed Action will be implemented over time. After all, "[t]he Army is in a constant state of flux (e.g. deployments, restationing, modularizing, converting, activating), and population changes are to be expected." *Id.* at 2-31. The GTA DEIS explains that force structure is constantly changing. *Id.* at 2-31. Timing of the project is contingent on numerous factors. *Id.* at 1-10. The GTA DEIS notes in several places that "[t]raining, as described in the 2007 PCMS Transformation EIS, is accomplished adaptively, based upon the commander's intent for the training exercise and/or the availability of limited training resources (maneuver area and firing range availability)." *Id.* at E-3, 3-112 & 4-75. If the Proposed Action authorized in the GTA DEIS can change at any time, what purpose does the NEPA analysis serve?

LC6-18 In multiple contexts, the GTA DEIS asks the reader to simply trust the Army to ensure that training will "occur throughout PCMS in accordance with the suitability of the land for different training activities and ability to sustain the land." *Id.* at 2-7 & 4-21 ("Army environmental and training staff will manage PCMS resources to meeting training, sustainability, and environmental goals to best meet the Army's training needs and sustainability of the land resource.") In the Army's view, all environmental concerns are moot because PCMS installation managers will "work together to ensure training requirements are balance with environmental sustainability." *Id.* at 2-14. The GTA DEIS offers empty promises over and over again that training will occur throughout PCMS in accordance with the suitability of the land for different training activities and ability to sustain the land, but the document lacks any concrete analysis or objective foundation for evaluating potential impacts.

LC6-19 Indeed, After Action Reports prepared by the Army from 1985 to 2002 demonstrate that the Army's environmental management programs and plans have consistently failed to ensure compliance with regulatory requirements and conservation of natural resources at PCMS. See, Exhibit 8. In 1985, the Army stated that "we did not adequately or satisfactorily comply with those "standards of training" which we have for years been expressing to the concerned citizenry of Colorado and the Congress of the United States." The AARs then go on to state that: "[i] we learned from this rotation to the PCMS that we cannot accomplish our required training in concert with those environmental stipulations which we have guaranteed to the public, then we should attempt to restate our priorities." As reported by the Army in the "Education and Awareness" sections of the AAR, the Army failed to educate Army personnel and to make them aware of maneuver restrictions. In addition, the Army reported "vandalism" and "numerous and significant violations of restricted area designations" by Army personnel.

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The AARs also reported that "[t]he cumulative impacts to the resources of the PCMS will continue to be evaluated and ***potentially mitigated*** with each future training rotation. If we can eliminate the continuance of ***unnecessary resource impacts*** which are ***totally destructive in nature***, then this management program should prove scientifically and functionally satisfactory" (emphasis supplied). For seventeen years, The Army failed to fulfill the management commitments published in the original 1982 PCMS EIS, and never did eliminate the "unnecessary" resource impacts which were "totally destructive in nature." The Army's PCMS management program has proved scientifically and functionally unsatisfactory. The Army did not adequately or satisfactorily comply with those "standards of training" which they have for years been expressing to the concerned citizenry of Colorado and the Congress of the United States.

In the GTA DEIS, just as in the 2007 PCMS Transformation EIS, the Army failed to disclose a true picture of the devastating and permanently destructive impacts that will occur from the year-round training, increased intensity of training, and the use of new technology and lethal weaponry upon the PCMS. Now the Army even fails to produce AARs to record unnecessary and destructive impacts. After implementation of the actions contemplated in the GTA DEIS and the 2007 PCMS Transformation EIS, the impacts of increased training and expansion at PCMS will be exponentially more destructive and fatal to the unique resources, wildlife, and people of southeastern Colorado.

LC6-20

The 2007 PCMS Transformation EIS reported that "[m]echanized training rotations at the PCMS have been scheduled, on average, approximately 12 to 16 weeks per year since the PCMS was established," allowing the land to rest and recover roughly eight months of the year. GTA DEIS at 2-11. The GTA DEIS reports that "PCMS has been used for military training exercises, on average, approximately four to six months per year, though it has been used much less frequently since 2001 because of the increase in operational deployments of Fort Carson's unit." *Id.* at 5-34.

According to the Army, "[l]and rest and rehabilitation are required in maneuver training areas to recover them from maneuver training activities." *Id.* at 4-4. However, experience has shown that conservation set asides and resting training lands after mechanized tank maneuvers are not an effective means of environmental restoration. The Comanche National Grasslands were protected in order to allow them to recover from the Dust Bowl, and yet these lands have still not recovered from the impacts decades later. Moreover, the GTA DEIS explains that the public cannot even rely on the Army to rest training lands after maneuver damage, presumably because the training demand will not permit the Army to keep any lands idle. The GTA DEIS notes that "[b]ecause the condition of training lands is highly variable, depending on the amount and type of training and the climactic conditions during training, the ITAM does not set specific ratios for land rest to sustain training lands. Instead, the ITAM program provides a process by which the post directorates work together to provide input regarding the training needs and the environmental condition of the training lands." *Id.* at 2-14.

LC6-21

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LC6-24

The practical progression of the analysis in the GTA DEIS is as follows: (1) Fort Carson will be home station to more Soldiers; (2) new training requirements are in effect under Transformation; (3) the new Soldiers at Fort Carson will train at PCMS; (4) PCMS will suffer greater impacts because there will be greater duration and frequency of training exercises and number of acres impacted; (5) the Army will protect the environment by continuing to follow its own management plans and cooperative agreements with alleged conservation organizations; and (6) any descriptions of actions in the GTA DEIS are subject to change at any time in the discretion of the Army.

LC6-25

IX. The Army's analysis of environmental impacts in the GTA DEIS is based on methods that are not scientifically valid.

The Proposed Action's primary impacts to the PCMS are related to the resulting increase in the frequency and duration of training exercises and number of acres impacted per exercise, as well as the severity of use that will occur due to the assignment of nearly 7,000 additional soldiers to Fort Carson. However, the GTA DEIS provides conflicting information about the increase in use that will occur as a result of the Proposed Action.

The GTA DEIS reports that the Proposed Action will result in a 27% increase in live fire training activities at Fort Carson, 20% of which would be attributable to the new IBCT and 6.5% to the CAB. *Id.* at 2-13. According to the GTA DEIS, most of this increase would be related to small arms and machine gun qualifications requirements. *Id.* The GTA DEIS also reports that the Proposed Action will result in a 20-25% increase in the frequency of maneuver training activities. *Id.* Elsewhere, the GTA DEIS reports that "[t]he addition of the IBCT as part of the Proposed Action is predicted to increase overall maneuver training impacts by 8.6 percent which accounts for the number and type of Soldiers involved. Live-fire requirements are anticipated to increase by approximately 20 percent. Maneuver training impacts would be predicted to increase by an additional 7 percent and live-fire would increase by approximately 6 percent." GTA DEIS at 3-114. In Chapter 4 of the GTA DEIS, the Army observes that "[t]he IBCT is projected to increase total maneuver training impacts at PCMS by approximately 8.6%, although the actual overall increase in maneuver training may be less after implementation of garrison training and land management controls." *Id.* at 4-37.

These percentages appear to be based on the Army's assertion that the Proposed Action will result in "an approximate 15 percent increase in the aggregate number of Maneuver Impact Miles (MIMs) at Fort Carson," 9% of which would be attributable to the new IBCT and 6.5% to the CAB. *Id.* Interestingly, the concept of "Maneuver Impact Miles" was not discussed at all in the draft or final 2007 PCMS Transformation EIS, which was issued less than a year and a half ago. It does not appear that the Army was using the MIM concept as a tool for evaluating environmental impacts at that time. In fact, the MIM metric does not appear to have ever been previously relied upon by the Army in connection with the PCMS, nor is the scientific basis for the calculation explained anywhere in the GTA DEIS.

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MIMs are mentioned in just three places in the 914-page GTA DEIS apart from the passage described in the prior paragraph. On page 3-74 and 3-75 of the GTA DEIS, the Army simply repeats the assertion that the Proposed Action will generate a 15% increase in MIMs with the same percentages assigned to the IBCT and the CAB. On page 4-41 of the GTA DEIS, the Army discloses that "MIMs calculations estimate an 8.6% increase in soil surface and vegetative disturbance impacts." Finally, the GTA DEIS recites that the Army would adaptively management maneuver training activities, but implementation of the Proposed Action could result in an approximate 15 percent increase in projected MIMs at Fort Carson." GTA DEIS at 5-23.

It appears that the 15% MIMs "calculation" is actually a "rule of thumb" statistic that the Army used in evaluating the increased impacts of the Proposed Action. According to the GTA DEIS:

> As a general guideline to projected impacts, the addition of one IBCT would increase overall quantifiable training impacts to land-based natural resources by approximately 9%, considering the type of unit and number of soldiers involved, while the CAB would add approximately 6%.

GTA DEIS at 4-76. The GTA DEIS does not explain any scientific method used to determine an exact percentage that describes the "overall quantifiable training impacts to land-based natural resources." Do these general guidelines purport to mean that the Army expects an across the board increase 9% increase in soil erosion, black-tailed prairie dog mortality, particulate emissions, and number of trees destroyed? The statistic is meaningless because there is no scientifically accepted means of assigning a fixed percentage of impacts across such a broad spectrum of disparate potential impacts. Using a "general guideline" to substitute for a detailed and searching analysis of individual potential environmental impacts is pseudoscience that violates the spirit and letter of NEPA because it deceives the public into assuming that the Army has accurately disclosed the potential environmental impacts of the Proposed Action.

X. The Proposed Action will irreversibly harm grasslands, wildlife, water resources, soils, air quality and cultural resources at the PCMS.

LC6-26

The southeastern Colorado ecosystem is unique, with a combination of canyonlands, forested mesas, grasslands and riparian systems that is found nowhere else on Earth. The ecoregion is one of the largest remaining intact shortgrass prairie and canyonland landscapes in the West. These ecosystems contain critical riparian systems that provide habitat for many diverse species of flora and fauna and cannot be replaced if destroyed. According to The Nature Conservancy, "the lands surrounding the Piñon Canyon Maneuver Site represent one of the largest blocks of native grasslands on the western High Plains."

LC6-27

In the more than twenty-five years that have passed since the PCMS was originally acquired, the military has failed to gather baseline information necessary to evaluate the potential

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impacts of the Proposed Action. There is no evidence that the Army has actually performed the appropriate level and types of information gathering necessary for comparative analysis. The draft 2007 PCMS Transformation EIS admitted that "because baseline data are not available for quantifying the extent (number of acres) and magnitude (severity) of training related impacts to vegetation and wildlife resources, it is not possible to quantitatively estimate impacts to habitat and wildlife population from implementation of the Proposed Action or what the magnitude or severity of those impacts would be compared to the no action alternative." 2007 PCMS Transformation DEIS at 3-54. When an agency has incomplete or no information about potential impacts, the agency is required to develop that information as part of the NEPA process. 40 C.F.R. § 1502.22. Thus, the military is required to gather information necessary to allow the public and agency decision makers to fairly assess potential impacts to native flora, fauna, and ecosystems in the area. Without this information, the public has no basis for assessing and understanding how and why decisions will be made with regard to consideration of impacts.

LC6-28

Insofar as the Army cannot provide a clear picture of what the Proposed Action will entail, because the Army "is in a constant state of flux" and future training decisions will be based on "the commander's intent" and availability of lands, the GTA DEIS violates NEPA because it does not provide the public with enough information about potential impacts to meaningfully evaluate or comment on the project. Indeed, the PCMS component of the Proposed Action is not actually a "project" per se, but rather simply a process of incorporating more people into the Army's existing operations at PCMS. In this regard, it is not surprising that the GTA DEIS provides little in the way of quantification or objective analysis of the impacts expected to occur as a result of the Proposed Action.

A. <u>Impacts to Vegetation and Wildlife</u>

LC6-29

The GTA DEIS admits that increased training will cause "disturbance" to plants and wildlife, but fails to adequately evaluate the irretrievable and irreversible harm to biological resources at the PCMS that will be caused by the Proposed Action. The Proposed Action will destroy critical grassland and ground habitat by compacting soils and damaging native vegetation. Mechanized maneuvers and live fire training exercises will increase mortality of wildlife populations. Those animals that are not directly killed by the military will suffer a decrease in reproductive success and harmful changes to migration patterns.

LC6-30

Unrestricted vehicle use on the PCMS will increase habitat fragmentation.

LC6-31

A review of After Action Reports prepared by the Army to document environmental damage caused by training maneuvers at PCMS shows that the GTA DEIS grossly understates potential environmental impacts. *See,* Exhibit 8. From 1985 to 2002, the AARs show that the training at PCMS caused unnecessary significant and permanent damage to vegetation and soils. This resulted in deterioration to the integrity of the training area, destruction of grass species that can remain bare after even twenty years of rest, acceleration of soil compaction and erosion, increased fugitive dust, damage and destruction of 200- and 300-year-old Pinon-Juniper

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vegetation, and damage and destruction to Pinon-Juniper vegetation that will require at least 150 years to rehabilitate. In the AARs the Army stated:

> Pinon-Juniper sites are the most fragile of all sites. The trees grow to maturity very slowly once a seedling is established and seedling establishment is very difficult at best. These sites should be utilized the least, not the most…Many trees were demolished, the vegetative understory obliterated and large ruts were left in areas which cannot sustain this type of use . . . .
>
> Pinon-Juniper areas were heavily utilized by numerous vehicles. Much of the areas were left with little or no understory vegetation and in many places the soil was very compacted. The fragile nature of this type of site must be emphasized. Pinon-Juniper sites normally have a very low production rate at best. The soils are extremely shallow and if erosion is accelerated, it does not take long before what little top soil exists to erode away.

LC6-32

See, Exhibit 8. Although the Army did not consistently report numbers of trees destroyed, a partial estimate of unnecessary tree damage and destruction reported in the AARs is depicted in the following table:

Year	Trees Damaged
1985	300 Pinon and Juniper Trees
1986	20-30 trees destroyed
1987	"large number" of Pinon and Juniper trees destroyed
1988	Destruction of Pinon and Juniper trees
1989	"considerable" unnecessary tree damage and destruction
1990	damage and destruction of Pinon-Juniper trees
1991	damage and destruction of Pinon-Juniper trees
1993	damage and destruction of Pinon-Juniper trees
1994	damage and destruction of Pinon-Juniper trees
1995	damage/destruction of 298 trees
1996	damage/destruction of trees

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1997	damage/destruction of trees
1998	unnecessary destruction of 36 trees
1999	unnecessary destruction of 208 trees
2000	unnecessary destruction of 133 mature trees and damage to 162 trees
2001	unnecessary destruction of 442 mature trees and damage to 884 trees
2002	unnecessary destruction of 289 trees and damage to 145 trees greater than 6 feet in height

From 1985 to 1989, the cost for damage to the trees and vegetative communities was not reported in the AARs. From 1989 to 2002, the reported damage to both the upper story (trees) and grassland vegetative communities shown by the Army in the AARs cost more than $1.6 million. The Army identified several other areas at PCMS with "excess" tree losses, but neither those trees nor trees lost in range fires caused by the Army were included in cost estimates or assessments. The AARs estimated that 3,500 acres of vegetation and soils were impacted by training maneuvers in 1987, 1,321 acres in 1995, 9,062 acres in 1996, 2,276 acres in 1997, 1,679 acres in 1998, 977 acres in 1999, 2,550 acres in 2000, 2,870 acres in 2001, and 1,937 acres in 2002.

In 1989, the Army reported "intrusions into restricted areas that became too numerous to compile . . . ." From 1990 to 2002, the AARs disclose "unauthorized utilization of off-limits areas within the PCMS" including for example "Soil Protection Areas," "Restricted Side Canyons," "Restricted Areas," "Research Plots," "Deferred Training Areas," "Dismounted Training Only Areas," "Private Property," and "Cultural Resource Sites." Various excuses offered for these entries into restricted areas included "stated command direction," "personal discretion," "use of outdated maps," and "a considered inability to effectively land navigate and/or comply with existing standards and management policies." From 1990 to 2002, the Army stated that "such utilization remains as inconsistent with established operational policies for long term utilization of the PCMS and existing congressional mandates."

LC6-33

Even though no federal threatened or endangered species have been discovered on the existing PCMS, the Army has never made a concentrated effort to inventory the wildlife and vegetation resources. There are sufficient acres of prairie dog colonies (700 to 1200 acres) on the PCMS to support a population of black-footed ferrets. Even though the prairie dog was removed from the US Fish & Wildlife Service's list of candidate species in 2004, many other grassland species depend on prairie dogs for prey, including the burrowing owl (a state listed threatened species), the golden eagle,[20] the bald eagle[21] and the swift fox. Most of the birds

[20] The footnote on page 3-124 of the GTA DEIS indicates that no studies of golden eagles have been undertaken, even though there are nesting golden eagles present on the PCMS. The GTA DEIS reports that surveys are

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found on the PCMS are ground nesting that breed in the spring and early summer. GTA DEIS at 3-121. The Army reports that only two to ten mountain plover nests are identified annually. The PCMS also contains an abundance of reptile life, including the triploid checkered whiptail, which has been designated as an Army Species of Risk. GTA DEIS at 3-101.

Once again, the AARs prepared by the Army tell a different story than the GTA DEIS. From 1985 to 2002, the Army reported vehicle-related mortality of coyote, mule deer, pronghorn, badger, prairie dogs, fledgling hawks, Swainson's hawks, sensitive species, swift fox and Texas horned lizards (which were both candidate species for listing under the federal Environmental Species Act at the time). During many rotations, however, the Army simply reported that "mortality related surveys for both small mammals and avifauna were considered as impractical and therefore not attempted." The AARs reveal the following impacts to raptors at the PCMS:

LC6-33 (cont'd)

* all transmitted raptors with home ranges in areas receiving high level of military activity showed some kind of extra-home range dispersal;
* some birds may habituate to the training while others may abandon the area;
* habitat alteration such as tree damage in the pinyon-juniper habitat near canyon rims may reduce the desirability of these areas as nesting sites;
* unnecessary maneuver damage to prairie vegetation and the existing drought may reduce the availability of rodents as prey and have an adverse impact on nesting and wintering raptors;
* habitat alteration in certain locations, particularly tree damage may have reduced the desirability of these areas as ferruginous hawk nesting sites;
* Swainson's Hawks remained actively involved in nesting activity throughout the course of one training rotation and training activities within the 150 meter restricted area adjacent to the nest site resulting in one nest being abandoned with subsequent death of two fledgling hawks; and

---

conducted to determine which areas should be closed during the breeding season for golden eagles, GTA DEIS at 3-128, but does not disclose the results of such surveys.

[21] The PCMS is wintering habitat for the bald eagle, according to the GTA PEIS. *Id.* at 3-136.

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* other impacts not documented, yet possible, included destruction of nest trees and alternation of prey density, vulnerability and distribution resulted from habitat alteration.

All of the above impacts are taken from the AARs prepared by the Army.

The AARs reveal that radio-collared coyotes that were not directly killed by Army exercises "exhibited changes in their home ranges as a result of the maneuvers," and warn that "continued alteration of prairie vegetation by maneuvers combined with drought conditions may result in a shift in coyote diets away from rodents," and "changing prey densities resulting from habitat alteration by training maneuvers may cause a shift in primary food selection to pronghorn and deer fawns." The impacts to pronghorn detailed in the AARs are significant, including

* radio-collared pronghorns shifted their home ranges in response to military exercises;

* fawns and does exhibited extensive movement patterns apparently in response to military maneuvers;

* these patterns could be detrimental to fawn survival as they rapidly expend weight and fat reserves required to sustain themselves during the winter;

* during maneuvers, pronghorn used pinyon-juniper breaks and canyon rims more than their preferred cholla grassland habitat;

* pronghorn do not appear to tolerate well the presence of tactical vehicles;

* pronghorn reacted strongly to overflights by fix-winged and rotary-winged aircraft;

* extremely high predation rates by coyotes on pronghorn fawns may be a result of training maneuvers and other factors;

* habitat alteration resulting from tracked vehicle disturbance may be decreasing small mammal prey with a corresponding shift in predation on fawns;

* damage to cholla stands has been documented during all training rotations to date;

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* the shift to a younger, immature stand is of concern since the fruits of mature cholla is a primary winter food of pronghorn; and

* since cholla is the primary winter food for pronghorn, this damage may also reduce herd size through reduced birth rate, increased winter mortalities and increased movements off the PCMS.

The Army also reported that "probable increased soil erosion rates as a result of maneuvers may increase the silt load in the Purgatoire River," "concentrations of dust which resulted from maneuvers may also increase this silt loading potential" and "could severely affect a unique aquatic ecosystem in the Purgatoire River system."

For avifauna, the Army reported that "vegetative response to areas previously damaged by training exercises has resulted in increased annual weeds and forbs," and "since many responses will probably result from habitat alteration and these changes result from accumulated impacts of many rotations over time, the ultimate response of various wildlife species may be unknown for many years." The AARs reveal that mule deer have also suffered extensive impacts as a result of military training as follows:

LC6-33 (cont'd)

* home ranges were altered in response to the activity;

* there is the potential for greater disturbance to the deer population if mechanized training extends further into the pinyon-juniper habitat and along canyon rims;

* unnecessary tree damage in the pinyon-juniper habitats may adversely affect the deer population;

* shifts in home ranges of mule deer whose home ranges encompass perimeter areas of pinon-juniper habitat in response to military disturbance in these areas would be expected;

* in addition to the direct disturbance to deer in perimeter areas, these areas also receive the greatest damage to the vegetation as a result of military training;

* the greatest potential for long term impacts to the population is habitat destruction which may not be apparent for years since this is a cumulative impact; and

* high fawn predation by coyotes remains a major concern.

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By 2001, the Army reported that "both mule deer and pronghorn antelope, which were observed to move in apparent response to this training rotation, did so at increased discernable distances (compared to previous rotations), and this response was considered to be the result of both increased vehicle density and OPTEMPO over previous training rotations. Of particular note was the response of various animals to the noted increase of vehicle trespass within the dismounted training areas of the side canyons and Soil Protection Area."

The AARs disclose that "a number of scattered spot fires destroyed trees, and fenceline breaks were reported," "the extremely dry conditions compounded the effects of military training on the prairie vegetation, particularly grasses," "concentrated tracked vehicle use of specific travel lands (e.g. trail paralleling the pipeline) resulted in damage to adjacent vegetation and increased dust which could result in erosional loss of topsoil," and "since many responses could result from habitat alteration and these changes result from accumulated impacts of many rotations over time, the ultimate response of various wildlife species may be unknown for many years." The Army reported that "in regard to the PCMS, habitat destruction is considered to be the crucial element to long term sustainment of current species diversity and numbers."

LC6-34

In order to ensure the continued availability of lands for training purposes, the Army proposes to provide mitigation for wildlife impacts, such as restrictions on training, observance of buffer zones, and compliance with management plans. GTA DEIS at E-10 & 3-133. However, there are few restricted or buffer zones on the PCMS where training is not permitted, and even those areas that are restricted are routinely entered by the troops anyway. At any rate, buffer zones will serve no purpose: fragmentation and destruction of pieces of the intact bioregion will result in area-wide erosion and devastation more intense than those of the Dust Bowl, which did not contain lethal chemicals and residues from weapons of modern war. Moreover, the Army in several places notes that the frequency, duration and amount of land used during training exercises will be decided at the discretion of the commander. The Army's praise for Fort Carson's environmental accomplishments is frankly not consistent with the extensive damages to biological resources reported in the AARs.

LC6-35

B. Impacts to Soils

The GTA DEIS reveals that the highly erodible soils at the PCMS will be heavily impacted by the Proposed Action, although the Army claims that those impacts will not rise to the significance threshold. Soil impacts are exacerbated by the extremely dry climate of southeastern Colorado, where rain is concentrated in flood events that occur primarily in the summertime. The Army estimates that the Proposed Action will cause an 8.6% increase is soil surface and vegetative disturbance impacts. GTA DEIS at 4-41. These impacts will include increased erosion, soil loss, soil compaction and rutting, loss of vegetative cover, increased fugitive dust emissions, and exposure to wind and rain.

LC6-36

Soils at the PCMS also contain some of the highest documented naturally occurring levels of selenium in the United States. GTA DEIS at 3-66. It was recently reported that high

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levels of radioactive uranium were detected in the soil at the PCMS. The Colorado Department of Public Health & Environment has asked the Army to investigate. Exhibit 33. However, impacts related to radioactive soil, air and water contamination are not discussed or analyzed anywhere in the GTA DEIS. Possible radioactive contamination is a critical issue that must be analyzed by the Army prior to any changes in land use at the PCMS, particularly in light of the potential health risks to Soldiers.

C. Impacts to Air Quality

LC6-37

Fugitive dust from travel on unpaved roads and maneuver training has been a problem in the past at the PCMS, and impacts will only increase under the Proposed Action. AARs prepared by the Army found that fugitive dust emissions during training exercises were as much as ten times greater than background levels.

LC6-38

Violations of national and state ambient air quality standards for airborne particulates have occurred routinely at the PCMS due to military training.

LC6-39

The GTA DEIS reports that training exercises (conveys and maneuvers) have the potential to emit 138 tons of PM_{10} annually, compared with just 44 tons for prescribed burning. See Table 4.3-3, GTA DEIS at 4-13. However, these emissions "were calculated assuming one IBCT training event per year," which is not consistent with the frequency of training events planned for the future.

LC6-40

Airborne fugitive dust will also be generated by rotor wash from the 116 helicopters that could be stationed at Fort Carson as part of the CAB. Nonetheless, the GTA DEIS concludes that any air quality impacts are "mitigatable" to a level that is less than significant. *Id.* at E-7. The Army's promised mitigation is hardly reliable, however, since the GTA DEIS also reports that the Army has designated all of its funding for dust palliatives to Fort Carson instead of PCMS. *Id.* at 4-13. The GTA DEIS also mentions that the Army obtains "state land disturbance permits" for activities that impact more than 25 acres or last for more than six months. *Id.* However, no additional detail about such permits was provided or analyzed in the GTA DEIS; in fact, there is no other mention of "state land disturbance permits" in the document.

LC6-41

Not surprisingly, the Army's analysis of air quality impacts in the GTA DEIS is contradicted by impacts reported in AARs following training exercises. In 1985, the Army reported that "fugitive dust emissions were increased significantly over background (pre-training) levels" and that "air monitoring facilities . . . continue to attract vehicular traffic within the 100 meter restricted radius." In 1986, the Army reported that "air quality as related to fugitive dust emissions were comparable to those of the first (August 85) rotation, in that significant increases in Total Suspended Particulate (TSP) concentrations were recorded at each of the four functional monitoring stations as compared to recorded pretraining "baseline" data. Although no respirable particulate (PM 10) information is available from previous training rotations, elevated concentrations are estimated to have occurred due to the large percentage of the PM 10 fraction observed in baseline data." The AARs also note that "[e]missions continue to be a concern on all access roads. Application of dust suppressants to these structures continues to remain uneconomically feasible. Therefore, minimal mitigation of fugitive dust emissions from these sources will remain somewhat consistent during future rotations."

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In 1987, the Army reported that "the average concentration of TSP [Total Suspended Particulates] during the non-rotational period of 1988 was 26.9 microgram/m3 (MGCM). On sampling days 30 October 1987 and 5 November 1987 the TSP concentration averaged 326 MGCM... Prior to 1978, any level over 260 MGCM constituted a violation. The U.S. environmental protection Agency (USEPA) dropped TSP as the indicator of fugitive dust compliance in mid-1987." "PM-10 (measure of respirable particulates) was adopted in 1987 by the US EPA as the indicator of fugitive dust. PM-10 concentrations during the non-rotational period of 1987 averaged 13.6 MGCM. On sampling days 30 October 1987 and 5 November 1987, the concentration averaged 93 MGCM... This represents an average increase of 700%. The highest value during the fall rotation was 120 MGCM. This value was 80% of the 150 MGCM which would have constituted a reportable violation." "Application of dust suppressants continues to remain considered as uneconomically feasible. Therefore, minimal mechanical mitigation options relative to fugitive dust emissions with the exception of training mission curtailment during these periods will remain consistent during future rotations."

In 1988, the Army reported that "air monitoring facilities continue to attract vehicular traffic within the 100 meter restricted radius..." In 1989, the Army reported that "air quality as related to fugitive dust emissions was significantly increased during this rotation," "violations of the National and Colorado State primary standards occurred," "total suspended particulates (all dust in the air) levels exceeded the 260 microgram per cubic meter standard," "the PM particulates, particle less than 10 microns in size which can enter the alveoli of the lungs, exceeded the 150 microgram per cubic meter standard," "there is a clear cut and significant increase in dust levels associated with military training maneuvers," extreme documented dust levels created constant air induction problems with internal combustion engines," and "health problems may also occur if respiratory protection is not used during dusty conditions."

LC6-42

In 1991, the Army reported that "routinely, there remains a clear and significant increase in dust levels associated with military training maneuvers (1100% for TSP and 275% for PM10 levels between training and non-training areas," "extreme documented dust levels may create air induction problems for internal combustion engines," and "health problems may also occur...if respiratory protection is not used during excessively dry and dusty conditions." In 1993, the Army reported that "both TSP and PM10 levels increased during training activities," dust levels in the utilized training area exceeded the ambient air quality standards for TSP at several locations or times," and "PM10 levels were NOT all below the proposed lower standard of 100mg/M3."

In 1994, the Army reported that "both TSP and PM10 levels increased during training activities," dust levels in the utilized training area exceeded the ambient air quality standards for TSP at several locations or times," and PM10 levels exceeded the existing ambient air quality standards . . . ." In 1995, the Army reported that "comparing training versus non-training periods, fugitive dust emissions were increased during this rotation due to both the general type of training accomplished (mechanized 'force on force' operations) and the generally dry nature

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of the training area," "one violation of the National and Colorado State primary air quality standards occurred during this rotation," "levels of total suspended particulates (all dust in the air) exceeded the 260 micrograms per cubic meter standard one time during this training rotation," obscurant utilization during a periods of high winds resulted in movement of the smoke plume some five (5) and ten (10) miles off of the PCMS…and over private property," and "both releases were in violation of existing training limitations and Colorado Department of Health and Environment (CDHE) Regulations."

LC6-43

In 1996, the Army reported that "comparing training versus non-training periods, fugitive dust emissions were increased during this rotation due to the type of training accomplished (mechanized 'force on force' operations, the generally dry nature of the training areas and the size and number of wildland fires which resulted," "one violation of the National and Colorado State primary air quality standards occurred during this rotation," "[elevated] levels of total suspended particulates (all dust in the air)…were noted…during this training rotation," "the PM10 particulates, particles less than 10 microns in micrograms per cubic meter standard only one time during this training rotation," and "this exceedance was documented…as a result of the 2400 acre (negligence caused) wildland fire which occurred . . . ."

From 1997 through 1999, the Army reported that "comparing training versus non-training periods, fugitive dust emissions were increased during this rotation due to the type of training accomplished (mechanized 'force on force' operations) and the generally dry nature of the training area." In 2000, the Army reported that "as compared to non-training periods, fugitive dust particulate emissions increased during this rotation as a result of mechanized force-on-force operations and the typical dry nature of the PCMS," and "emissions generated due to increased MSR utilization were significantly reduced by the application of 630,000 gallons of dust palliative," that in three cases, "generation of obscurant smoke was not curtailed/terminated timely enough to provide for attenuation of the plume within the boundaries of the PCMS."

In 2001, the Army reported that "as compared to non-training periods, fugitive dust particulate emissions increased during this rotation as a result of mechanized force-on-force operations and the typical dry nature of the PCMS," and "emissions generated due to increased MSR utilization were significantly reduced by the application of 320,000 gallons of dust palliative." In 2002, the Army reported that "as compared to non-training periods, fugitive dust particulate emissions significantly increased during this rotation as a result of mechanized force-on-force operations, administrative vehicle movement requirements and the atypically dry nature of the PCMS. Due to the dry windy conditions, air quality both on and off the PCMS was impacted during this training period."

LC6-44

The Army has suggested that leasing PCMS lands for grazing purposes may be possible, but overgrazing on public lands often occurs precisely because the lessee does not own fee simple title to the property and simply tries to maximize his or her own profits from the resource. Generational family ranching practices are highly sustainable for the grasslands because the ranchers care for the condition of the land and have decades of experience interacting holistically

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with the land. Removing these lands from agricultural production in any respect will harm the environment. No amount of environmental set asides or best management practices will offset the damages that military training exercises will cause to this intact bioregion, as documented in the Army's own After Action Reports.

LC6-45

D. Impacts to Water

The GTA DEIS minimizes the significance of impacts to water resources to the Purgatoire River hydrology. However, once again the AARs tell a different story. From 1985 to 2002, the Army reported that "cumulative impacts from areas of increased disturbance . . . could and did result in enhanced negative alternation of the vegetation and potentially to the future hydrology of the PCMS and surrounding lands." "Soil compaction and vegetation removal can affect the hydrology of the PCMS by decreasing soil infiltration and increasing runoff and sediment yield. These factors will decrease available soil moisture, lower water tables, increase gully incision, possibly fill or dry-out wetlands and increase sediment yield into adjacent arroyos." "These impacted areas, when considered cumulatively will act to increase sediment yield into the Purgatoire River. If disturbance such as this continues on a large scale, the potential impacts are very substantial… Once these effects are carried to the Purgatoire, downstream users may become more vocal (once again seek legal compensation) as to the impact of military training on their decreed use of water from the Purgatoire River."

LC6-46

Farmers, ranchers and residents of southeastern Colorado also depend on finite groundwater supplies for drinking water, stock watering and agricultural irrigation. The aquifers underlying the PCMS are under increasing pressure even absent military expansion. Declining groundwater levels in the Arkansas River Basin were stretched to the breaking point during the drought of 2002. In addition to the threat of contamination posed by mechanized training maneuvers, adverse impacts to groundwater recharge capacity provide justification for abandoning any plans for expansion of the PCMS. Direct, indirect and cumulative impacts to groundwater were not disclosed or analyzed in the GTA DEIS, in violation of NEPA.

E. Impacts to Cultural Resources

LC6-47

For purposes of cultural resource management, the Army divides the land at the PCMS into three categories: (1) lands that have been surveyed and contain no known protected archaeological or historic sites, where training is unrestricted; (2) sites that have not been surveyed, which are also open to dismounted training until surveys have been completed; and (3) lands that have been surveyed and do contain known archaeological or historic sites, which are open to dismounted training only until such time as the Army commander is satisfied that the resources can be protected. GTA DEIS at 3-151. The Army will only engage in consultation with the National Historic Preservation Alliance if the commander determines that resources cannot be protected during training. *Id.* However, even dismounted training can have severe impacts on cultural resources. Training at PCMS involves the establishment of temporary

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command operations bases, which may impact to twenty acres of land each for the duration of a training exercise. *Id.* at 4-76.

LC6-48

The DEIS reports that 80% of PCMS has been surveyed and 5216 archaeological sites discovered, up slightly from the numbers reported in the 2007 PCMS Transformation EIS. *Id.* at 4-86. Of those sites, 493 are eligible for listing on the National Register of Historic Places. The 2007 PCMS Transformation EIS disclosed that the PCMS contains 68,864 acres of unsurveyed land estimated to contain 2,040 archaeological sites, of which 406 were predicted to be potentially eligible for inclusion in the National Register. 2007 PCMS Transformation DEIS at 3-61.

No large scale archaeological investigations have been undertaken at the PCMS since 2001 due to Global War on Terrorism, although the Army is now surveying some 50,000 acres of land that burned in wildfires during the summer of 2008. *Id.* at 4-85 & 3-141. These surveys have already identified 315 sites eligible for listing on the National Register of Historic Places.

LC6-49

Id. at 4-85. This high number of sites eligible for federal protection casts doubt on the Army's 2007 prediction that only 406 additional would be found on lands that have not yet been surveyed. The GTA DEIS did not provide any estimate of the number of remaining eligible site will be identified. If only 80% of the PCMS has been surveyed, nearly 50,000 acres of land have

LC6-50

not yet been surveyed. On December 14, 2006, Not 1 More Acre! submitted a FOIA request to the Army seeking production of the "Integrated Cultural Resource Management Plan (IRMP) for Fort Carson and the Piñon Canyon Maneuver Site, 2002-2006 (2002)." The Army responded by indicating that Fort Carson was in the process of adopting a new IRMP, and agreed to provide this office with a copy as soon as it was approved. To date, the Army has not produced the revised IRMP, presumably indicating that no revised IRMP has been approved even though the former plan has outlived its expected useful life.

LC6-51

The Army has also identified fourteen paleontological localities on the PCMS, GTA DEIS at 4-86, including at least four which were determined to be of high paleontological significance based on the presence of rare taxa, the diversity of plant and animal fossils, and the abundance of fossils in a stratigraphic unit, GTA PEIS at 155. The GTA DEIS reports that the Army is currently negotiating a Memorandum of Agreement with USFS to manage these important resources. GTA DEIS at 4-86.

LC6-52

The negligible impacts to cultural resources described in the GTA DEIS are inconsistent with past impacts reported by the Army following military training exercises. From 1985 to 2002, the AARs show that the training damages caused to cultural resources, including archaeological sites, architectural sites, modern ranches with historic significance, rock art, and Native American ceremonial/religious sites, have been significant, destructive, and unnecessary. The reason typically offered in the AARs was that "soldiers were not adequately informed or were misinformed about the requirements to avoid standing structures, posted and restricted areas." In 1987, the Army stated that "the potential for significant future losses to both the cultural resource and the Command's credibility may result through continuation of these

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LC6-52 (cont'd)

unauthorized activities." From 1991 to 2002, the Army stated that "management efforts will continue which are designed to provide for legal compliance as well as site preservation where applicable." Unfortunately, in spite of Army rhetoric, vehicular intrusions into off-limits and restricted areas continued to cause unnecessary in each of the seventeen years for which AARs have been produced.

LC6-53

XI. Conclusion/Request for Relief

For the reasons stated in this letter, Not 1 More Acre! and Grassland Trust oppose the Proposed Action, and indeed, any action taken regarding the PCMS without full public disclosure and compliance with NEPA. The GTA DEIS is fundamentally flawed and violates the intent and plain language of NEPA in a myriad of respects. Therefore, the Army must withdraw the GTA DEIS and address these defects before proceeding with plans to alter the usage of or develop additional facilities at the PCMS.

Thank you for the opportunity to submit these comments, and please don't hesitate to contact me directly if you have any questions about my clients' positions.

Sincerely yours,

ALPERN MYERS STUART LLC

SDHarris

By: Stephen D. Harris

Exhibits Enclosed on CD w/Hard Copy

cc: Not 1 More Acre!
Grassland Trust

Commentor LC6 – Not 1 More Acre! and Grassland Trust (Stephen D. Harris)

The following documents were provided on CD along Steve Harris' comment letter dated November 24, 2008.

1. GTA PEIS Comment Letter (10-07)
2. GTA DEIS Scoping Letter (5-08)
3. Trinidad-Las Animas Counties Economic Development Resolution (06-07)
4. Environmental Assessment (5-97)
5. La Junta Tribune Article (4-06)
6. Final EIS for Training Land Acquisition (1982)
7. Environmental Assessment (5-05)
8. After Action Reports (1985-2002)
9. Affidavit (10-08)
10. FY08 NDAA Report (7-08)
11. Gazette Article re. DECAM (10-07)
12. BRAC Commission Report Volume 1 (9-05)
13. Timeline
14. PEIS for Army Transformation (2-02)
15. Ackerman Power Point (3-06)
16. Analysis of Alternatives Study (5-04)
17. Pinon Vision OPLAN 05-09 (12-04)
18. Land Use Requirements Study (3-05)
19. Analysis of Alternatives Study (4-05)
20. Land Use Requirements Study (4-05)
21. Pinon Vision OPLAN 05-18 (1-06)
22. Articles Quoting Karen Edge (2006)
23. Major Land Acquisition Proposal (7-06)
24. Power Point (10-06)
25. 2007 NDAA (10-06)
26. 2007 NDAA Report (12-06)
27. Senate Bill 135 (1-07)
28. DOD LAM Waiver Request (2-07)
29. HB 07-1069 (5-07)
30. Area of Interest Map (6-07)
31. Are of Interest Map (7-07)
32. Booz Allen Hamilton PR Report (7-08)
33. CDPHE Letter re. Uranium (6-08)

If you would like a copy of the CD, contact the Fort Carson Garrison Public Affairs Officer at (phone) 719-526-1269, (fax) 719-526-1705, or (email) carsdecamnepa@conus.army.mil.

Responses

Response to LC6-1
Please refer to Master Response 1.

Response to LC6-2
The scope of this EIS does not include transformation or its implementation. As for expansion, refer to Master Responses 1, 2, and 3.

Response to LC6-3
Please refer to Master Response 1.

Response to LC6-4
As required under NEPA, this EIS studies the impacts of increased training loads contemplated by this EIS. Please see Section 2.2.4 of this EIS.

In contrast to the comment's portrayal, the Army's position is that its land management program has resulted in more than satisfactory protection of the natural and cultural resources at PCMS as evidenced by factors discussed in Sections 4.7 and 4.8 of this EIS.

Response to LC6-5
Inclusion in this EIS of the acreages for the four types of training use within the PCMS training areas, as outlined in Section 4.2.1.3 of this EIS, was not considered relevant or useful as the Proposed Action would not affect those acreages. In response to the implied question in the comment, PCMS consists of approximately 235,000 acres. Due to natural landscape features and other land constraints, not all of this acreage is available for training at any given time, and the acreage may vary from time to time based on type and condition of the land and the type of training and the types of vehicles and equipment intended to be used. As stated in the 2005 Land Use Requirements study, acreage available for Maneuver Training is approximately 165,000; limited to Dismounted Training, approximately 37,000; Small arms Live-fire Ranges (with SDZs), approximately 13,000; and Restricted Areas, approximately 20,000 acres.

Response to LC6-6
The decision for apportioning the training resources of Fort Carson and PCMS was a routine management decision, comparable to deciding which firing range will be used by which units on a given day. It did not involve the introduction of any new type of training at either location. PCMS has always been the primary location for conducting battalion and brigade level maneuver training events. It is not clear whether or to what extent the policy will actually result in any increase in training at PCMS. The 2008 decision was consistent with this past practice. This type of decision is covered by categorical exclusion (b)(7) in Appendix B to the Army NEPA regulation at 32 CFR Part 651, "Deployment of military units on a … training basis where existing facilities are used for their intended purposes consistent with the scope and size of existing mission." Categorical exclusions do not require further NEPA review.

In contrast, when the Army has introduced new types of training at PCMS, it has conducted NEPA review, such as the EAs for the construction of the small arms and convoy live fire ranges.

Response to LC6-7
Please refer to Master Responses 1 and 2.

Responses

Response to LC6-8
Neither the Proposed Action nor any of the alternatives studied in this EIS includes any fundamental change in the way the PCMS is used. As to expansion, segmentation, and alternatives, refer to Master Responses 1, 2, and 3.

Response to LC6-9
Please refer to Master Response 3.

Response to LC6-10
The 2007 PCMS Transformation EIS was completed and a ROD issued. The Army recognizes that the EIS has been challenged in a lawsuit. However, the Army's position is that the EIS was properly completed, and, thus, that EIS remains as a proper baseline for this EIS. In 2007, the Army was not aware that Fort Carson would be selected for a GTA brigade, and therefore, the 2007 EIS could not have included the GTA brigade.

Response to LC6-11
Comment noted and will be included in the Administrative Record.

Response to LC6-12
The comments are too general in nature to permit a specific response. However, overall, the analysis in this EIS was accomplished in accordance with both the letter and intent of NEPA.

Response to LC6-13
The comment does not identify the scientific information to which it refers. The Army believes it did use and disclose the best available scientific information for this EIS.

Response to LC6-14
The data referred to are the After Action Reports (AARs) from 1985 to 2002 which collected environmental damage information with regard to specific training exercises. The information in these AARs was considered and used as each of them was written. Validated conclusions from these reports have been considered over the years as plans and procedures for managing training and natural resources at PCMS have been developed and updated. Thus, the data from these reports was involved generally and indirectly in the analysis in this EIS. However, the specific data from them was considered to be of limited use, and not appropriate as a specific reference for purposes of this EIS, primarily because this data is dated and largely related to equipment and tactics no longer used.

Response to LC6-15
Comment noted and will be included in the Administrative Record.

Response to LC6-16
See new Chapter 6 of this EIS for updated mitigation.

Response to LC6-17
As changes warrant additional NEPA analysis, it will be accomplished. This EIS serves as a baseline against which changes will be measured.

Responses

Response to LC6-18
The comment mischaracterizes Chapter 2 of this EIS. The adaptive management approach to stewardship of the training resources is explained and reflects a practical balance between accomplishment of the Army's mission and sustainment of the environment. This does not mean that environmental concerns are moot. Rather, it reflects a heightened awareness of those concerns.

Response to LC6-19
The comment takes the information from the AARs out of context and provides misleading conclusions based on that information. The AARs do not provide comprehensive information as to the long term effects or lack thereof from individual training exercises. In contrast to the comment's portrayal, the Army's position is that its land management program has resulted in more than satisfactory protection of the natural and cultural resources at PCMS as evidenced by factors discussed in Section 4.7.

The Army recognizes that the PCMS has a diverse wildlife population and other natural resources that are representative of much of SE Colorado. We also agree that PCMS is a valuable asset for the American public, one that we have an obligation to maintain properly. As a result, there have been extensive efforts to document, monitor, manage, sustain, and protect PCMS's natural resources. Due in part to those efforts, the ***Central Shortgrass Prairie Ecoregional Assessment Final Report November 2006*** determined the footprint of the PCMS to be of very high conservation value, with low vulnerability from current and future threats to those resources. The Army believes that this speaks volumes to the fact that the land use on the PCMS has not adversely impacted populations inside or on surrounding lands and that, under its management, the PCMS will continue to be a place that sustains that natural diversity so cherished in Colorado.

Response to LC6-20
Comment noted and will be included in the Administrative Record.

Response to LC6-21
The Army's land management and sustainment program does not consist solely of these two measures. See Sections 1.2.2, 2.2.4, and 3.13.1.1 of this EIS.

Response to LC6-22
Comment noted and will be included in the Administrative Record.

Response to LC6-23
The comment reflects an incomplete summary of Section 2.4.4 of this EIS, which relates the adaptive land management program used at PCMS. This section emphasizes the necessity of both sustaining the lands and accomplishing training objectives. A more pertinent portion of the section states, "Decisions on training activities would continue to balance current training needs and protection measures to maximize the training mission and the sustainability of training lands." Given the nature of the lands and the demands that training places on them, not allowing some idle periods would undoubtedly be incompatible with sustainment. Instead, as stated in Section 2.1.6, achieving sustainability will involve training "workarounds" and deviations from doctrinal training standards.

Responses

Response to LC6-24
The Army has several valued partners in the natural resources management of PCMS, none of which we would characterize as "alleged conservation organizations."

As changes warrant additional NEPA analysis, it will be accomplished.

Response to LC6-25
The Army, in collaboration with scientists from the Natural Resource Conservation Service (NRCS), the Construction and Engineering Research Laboratory, and US Army Environmental Command, developed the Maneuver Impact Mile (MIM) methodology in 1999 and have continued to refine this approach to reflect the best observational and scientific data available. A detailed description of the MIMs methodology is provided in ***Integrating Multi-criteria Analysis and GIS for Land Condition Assessment: Part I- Evaluation and Restoration of Military Training Areas*** (Mendoza et al. 2002). The MIMs methodology is a scientifically based methodology that has been uniquely developed for the Army to understand the increases in training load that will occur in association with unit stationing. The methodology incorporates the number of vehicles, vehicle weights, ground contact pressures, operational training requirements and other factors to best capture the training load associated with an Army unit and its vehicle fleet. This methodology allows for a comparative analysis of Army training loads and allows for an assessment of baseline training conditions compared to future projected training loads. The MIMs approach has been developed with the best scientific data and is used in conjunction with vegetation and soils monitoring programs to better understand and validate the installations assessment of predicted environmental impacts given the installations specific environmental conditions. (Reference No. 252)

The use of the MIMs methodology is widely accepted across the Army and has been used in numerous documents since its development. The presentation of MIMs in this EIS is intended to provide the public with the ability to better understand the increase in maneuver training loads that will occur in conjunction with Proposed Army stationing actions.

Response to LC6-26
In contrast to the comment's portrayal, the Army's position is that its land management program has resulted in more than satisfactory protection of the natural and cultural resources at PCMS as evidenced by factors discussed in Sections 4.7 and 4.8 of this EIS.

Response to LC6-27
The comment misstated the CEQ requirement in 40 CFR 1502.22. That section of the CEQ regulations recognizes that information may not be practically obtained, either for cost or other reasons, or it may be unavailable. The Army believes that it has complied with this section and used the best available information.

Responses

Response to LC6-28
The PCMS portion of the Proposed Action is implementation of the stationing of the IBCT and support units, and possibly the CAB. The comment is correct that this will entail incorporating more Soldiers and units into the Army's existing operations at PCMS. That is, a portion of the training for these Soldiers and units will occur at PCMS. As explained in both the Transformation EIS and in Section 2.2.4 of this EIS, while the types of training are known, the frequencies and timing of that training and the effects it may have cannot be predicted because they depend on unknown factors such as future mission requirements and weather conditions. As a result, the Army will rely on its adaptive land management practices to balance satisfaction of mission requirements with sustainment of the land, as explained in Section 2.2.4 of this EIS.

Response to LC6-29
This EIS recognizes that there will be impacts to plants and wildlife with the land use associated with military training just as there are various impacts with all types of land use. Please see Sections 3.7 and 4.7 of this EIS, respectively, for Fort Carson and PCMS. There is no USFWS designated critical habitat on PCMS. The Army has an ITAM program designed to prevent, monitor, and rehabilitate vegetation damage from training (as stated in Section 2.2.4). Training conducted at Fort Carson since the 1940's and at PCMS since the 1980's under Army management has not resulted in significant irretrievable or irreversible harm to biological resources at either location, and the comment provides no basis for concluding that such harm will result from the increased training involved in the Proposed Action.

Response to LC6-30
Vehicle use is not and, under the Proposed Action, will not be unrestricted on PCMS.

Response to LC6-31
The Army recognizes that training impacts include both potential removal of vegetation and compaction of soils which it monitors through the ITAM program. This EIS accurately captures these impacts. The comment relies on information from AARs which collected environmental damage information with regard to specific training exercises. The data from these AARs was considered but determined to be of limited use for purposes of this EIS primarily because it was dated and related to equipment and tactics no longer used. Further, an AAR is a tool to capture the impacts of a single training rotation and does not capture longer term impacts or trends in impacts to natural resources or corrective and management measures.

Responses

Response to LC6-32

Any land use by humans will have some impact to the environment. Some of the military training impacts at PCMS, not all of which are negative, have been documented in AARs and through various wildlife studies conducted in an effort to manage for those impacts. Many of the stated impacts happen in normal everyday activities such as "vehicle reported mortalities," and are not unique to Army installations. Studies looking at swift fox ecology documented 0.05 percent mortality rate from vehicle collision on the PCMS, while other research documented vehicle collision elsewhere showed a mortality rate of 12.5 percent.

The information from AARs that is cited in the comment must be kept in perspective. First, an AAR is a tool to capture the impacts of a single training rotation and does not capture longer term impacts or trends in impacts to natural resources or corrective and management measures.

Second, the numbers cited may appear significant in isolation. However, it should be kept in mind that these numbers reflect a very small percentage of the overall numbers for PCMS; e.g., the total acreage of PCMS is over 235,000.

Third, the Army recognizes that inadvertent intrusions have occurred in the past and will continue to occur in the future despite the Army's best efforts to prevent them. The significance of these intrusions must be kept in perspective. They have not in the past resulted in significant or long-term damage and are not anticipated to do so in the future.

Response to LC6-33

The comment relies on information from AARs which collected environmental damage information with regard to specific training exercises. The data from these AARs was considered to be of limited use for purposes of this EIS primarily because it was dated and related to equipment and tactics no longer used. Further, an AAR is a tool to capture the impacts of a single training rotation and does not capture longer term impacts or trends in impacts to natural resources or corrective and management measures.

Further, some of the stated changes in home ranges of various species are short term responses that can be seen in most populations that have some kind of disturbance. For example every year big games species are hunted. During the hunting season, deer, elk, sheep, moose, etc. change their behavior in an effort to avoid that disturbance. Once the hunting season is over, these animals return to pre-disturbance behavior and activities. The Army agrees that there are impacts, but the impacts historically have not caused, and are not expected to cause any long term/irretrievable damage, cause a species to become threatened or endangered, or cause significant impacts on adjacent lands.

Response to LC6-34

This comment again extrapolates generalized widespread and long-term consequences from the information in the AARs. An AAR is a tool to capture the impacts of a single training rotation and does not capture longer term impacts or trends in impacts to natural resources or corrective and management measures. After more than twenty years of Army training at PCMS, its current condition as described in Chapter 4 of this EIS does not reflect the dire conditions that the comment suggests. The Army attributes the generally good condition of PCMS to its management plans and practices and believes that those plans and practices will continue to result in sustainment of the natural resources at PCMS.

Responses

Response to LC6-35
The Army has accurately captured impacts to soils at Fort Carson and PCMS. These impacts are presented in Sections 3.5, 4.5 and are assessed as cumulatively significant in Chapter 5 of this EIS.

Response to LC6-36
Reports of elevated uranium, and resulting public concerns, stem from unsubstantiated allegations that an "independent environmental assessment" conducted in 2007 of the PCMS revealed the area is contaminated with high levels of uranium. As a proactive measure, the Army invited the U.S. Environmental Protection Agency (EPA) Region VIII to the PCMS to collect various media samples to provide information to the public regarding metal concentrations in soils, surface waters, and vegetation. From September 22-26, 2008, EPA personnel collected samples from soils, surface waters from seeps, ponds, wells, springs, the Purgatoire River, sediments, and opportunistic vascular plants throughout PCMS. Preliminary analytical results indicate no levels of uranium on or adjacent to the PCMS, other than those considered as naturally occurring. Laboratory analysis also included selenium. When compared to Colorado clean-up standards, the levels reported were much lower. The EPA's final analytical report is anticipated to be completed and publically available by 3rd Quarter FY 2009.

Additionally, a representative from the Nuclear Regulatory Commission (NRC) took readings of all areas sampled using a Ludlum Model 18 meter with SPA-3 probe (2 by 2 sodium iodide detector) and a Ludlum Model 19 micro Roentgen meter. At no time was there any indication the readings represented more than naturally occurring uranium.

The data from the EPA and NRC were in agreement with the Army's knowledge of the PMCS environment. Therefore, the GTA EIS did not discuss or analyze the potential health risks to Soldiers from exposure to uranium-contaminated media as there is no evidence that such contamination exists at the PCMS.

Please see Section 4.5.1.5 of this EIS for additional information on selenium.

Responses

Response to LC6-37

The comment does not include a citation or indicate the location of the fugitive dust monitors. Throughout the comment discussion, the cited AARs appear to address the air quality within PCMS, not offsite and there is no data associated with these AARs. Fort Carson does not dispute that fugitive dust increases during training activities and has proactively modeled proposed future training events using worst case scenarios (i.e., in terms of types of training and units, meteorological conditions, and duration/frequency of the training). Two near-field analyses were conducted using AERMOD and DUSTRAN. DUSTRAN is a dust dispersion modeling system specifically developed as a tool for military training facilities to assist in the planning and implementation of training maneuvers. DUSTRAN was used to model potential near-field particulate matter 24-hour average concentrations. A far-field analysis was also conducted using CALPUFF to identify potential Impacts to nearby Class I areas and sensitive Class II areas and ensure the analysis met the needs of the regulators. The results of these analyses are provided in the 2008 ***Air Quality Analysis Modeling Report for the Piñon Canyon Maneuver Site (PCMS)*** (Appendix C)***.*** The modeling indicates that predicted offsite pollutant concentrations do not exceed the National Ambient Air Quality Standards (NAAQS) or significantly impact visibility in Class I and sensitive Class II areas. This report uses the best available, current model for fugitive emissions and should be considered more accurate than anecdotal or outdated information contained in an AAR. See Section 4.3.3 and Appendix C of this EIS for updated discussion.

Response to LC6-38

The comment does not document the assertion made, and current Fort Carson staff are not aware of this past occurrence of "routine violations". The comment appears to address the air quality within PCMS, and not offsite. Fort Carson believes this is an overstatement, as the regional air quality around PCMS has remained designated as an attainment area for all criteria pollutants (i.e., has not violated national and state AAQS). The CHPPM (formerly known as the US Army Environmental Hygiene Agency) conducted monitoring in three separate phases during the 1980s (***Final Report: Ambient Air Quality Assessment No. 43-21-0260-89, Pinon Canyon Maneuver Site Fort Carson, Colorado October 1983 – September 1986***). The ambient air monitors were located within the PCMS boundaries, scattered around various training areas. Phase 1 established baseline pollutant concentrations at PCMS; Phase 2 defined pollutant levels during various construction activities and the initial training rotation; and Phase 3 covered the period during which numerous large scale training exercises were conducted at PCMS.

The cited report states that "Onsite monitoring (Phase 1 and 2) confirmed…TSP attainment status for the PCMS. Phase 3 monitoring showed isolated exceedances of the TSP NAAQS during large scale training exercises at the PCMS" (page 30). The conclusions discussed on pages 37-38 of the report state that "b. Baseline ambient concentrations of air pollutants at the PCMS were well below currently existing air quality standards; c. Ambient monitoring data indicated no measurable air quality impacts associated with construction activities at the PCMS; d. Ambient TSP levels increased significantly during the various training rotations, causing both primary and secondary TSP 24-hour NAAQS to be exceeded on several occasions; e. Ambient PM_{10} levels also increased significantly during the various training rotations; however measured concentrations did not exceed the PM_{10} NAAQS; No significant increases in ambient Pb, SO_4, or NO_3 levels were observed during any of the training rotations."

As stated previously, the 2008 ***Air Quality Analysis Modeling Report for the PCMS*** indicates that predicted offsite pollutant concentrations do not exceed the NAAQS or CAAQS.

Responses

Response to LC6-39

Table 4.3-3 of the GTA EIS references the Calendar Year 2006 potential to emit for PCMS activities to provide a baseline. The calendar year 2006 PTE was calculated assuming one IBCT training event per year. This assumption accounted for the less frequent and smaller training activities that took place in 2006. The potential increase in the magnitude and frequency of future training events associated with the Proposed Action is accounted for in the modeling report. The calculated and modeled emissions at both Fort Carson and PCMS are significantly higher than 138 tons per year of PM_{10}. (Refer to Appendices A and B of the ***Air Quality Analysis Modeling Report for US Army Garrison (USAG) Fort Carson, Colorado*** and Appendix A of the ***Air Quality Analysis Modeling Report for the Piñon Canyon Maneuver Site***). The fugitive dust emissions at Fort Carson were calculated based on six Battalion-level training exercises per year, four heavy and two light. (Refer to Section 3.1.4 of the ***Air Quality Analysis Modeling Report for USAG Fort Carson, Colorado***, Appendix C). The fugitive dust emissions at PCMS were calculated based on five Brigade-level training exercises and fifteen Battalion-level training exercises per year. (Refer to Section 3.1.1 of the ***Air Quality Analysis Modeling Report for the PCMS***, Appendix C).

Response to LC6-40

Fort Carson has found dust palliatives (that is, magnesium chloride) to be of limited use at PCMS and will be researching alternatives in terms of effectiveness and cost. To obtain a worst case analysis, the ***Air Quality Analysis Modeling Report for the PCMS*** (Appendix C) does not include any emission reductions from the use of dust palliatives at PCMS. The only emission reductions accounted for in the PCMS calculations were for the application of gravel on the wheeled-vehicle convoy routes and designated speed limits in certain areas. The current chemical used as a dust palliative is expensive, so due to economical restrictions they are applied to the most heavily trafficked tank trails on Fort Carson (and at PCMS subject to available funds), such as those that parallel the installation boundary. Based on training activities and environmental conditions, if training activities rely on helicopters landing downrange during dusty conditions, then dust suppression would be requested (either water or chemical palliative depending on the training duration as it takes time/funds to obtain the chemicals); alternatively, based on a pre-site training report or AAR, the training activity location could be revised to another less dusty location. Also, safety is a critical aspect of training activities, and although brown out conditions may provide a realistic desert training environment, it is not conducive to safe training. Please refer to Section 4.3.2.2 of this EIS, which has been updated to include additional information.

Land disturbance permits are for construction purposes only, and since the Proposed Action at PCMS does not include any, no additional analysis was required. These permits (for both State and El Paso County, depending on the project duration) will be obtained for Fort Carson on an as needed-basis, prior to the land disturbance.

Responses

Response to LC6-41
Excerpted out of context, the 1988 sentence does not make any sense. These quotations are twenty years old or more. Fort Carson is not aware of public complaints during/after training events at PCMS or what PM monitors in the surrounding communities have seen a spike in PM in the last twenty years. Based on the ***Colorado 2006 Air Quality Data – Report***, this EIS states at Section 4.3.2.2 that APCD has conducted only particulate and meteorology monitoring in the Eastern Plains Counties (those east of the I-25 corridor), which “do not have the pollution sources that can generate health impacting concentrations of the criteria pollutants”. The majority of monitoring for particulates in this region (including the nearby city of Trinidad), as well in Walsenburg in the Southern Front Range, has been discontinued after a review of the data showed that levels were well below the standard and declining.

A NAAQS violation results in the re-designation of an area; however, an exceedance of the NAAQS does not always mean a violation has occurred. The NAAQS is based on an averaging time (i.e., the 24-hour standard for PM_{10} is the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ that cannot be exceeded more than once per year on average over a three year period.) The results from the model demonstrate that future training activities would not exceed the NAAQS or CAAQS.

Dust is indeed recognized as an issue by the Army on many levels: for Soldiers conducting the training due to health issues, the increased potential for vehicular accidents, the increased maintenance issues for vehicles, and environmental concerns/regulatory air issues. Personal protective equipment is encouraged for Soldiers to use during training based on the situation.

Response to LC6-42
It is indisputable that fugitive dust levels increase during training activities. Since this significant exceedance event in the mid-1990s in which smoke and obscurants were transported across the PCMS boundary a considerable distance (during a period of unanticipated, high Chinook winds that came through the valley), the procedures for conducting smoke and obscurant training have changed and now comply with a regulation change. This regulation was developed over three years during which time Fort Carson worked closely with CDPHE and EPA Region VIII. Exceptional events associated with regional natural phenomenon (e.g., large wind/dust storm) are not included in NAQQS violation determinations as they are natural and uncontrollable events. Similarly, that large wind was an uncontrollable event. Nonetheless, current training procedures have been developed to prevent such an event from recurring. Now the way training is conducted, the unit obtains current real-time meteorological conditions prior to and during training and is in constant communication with leaders. In the event of high winds, units will suspend smoke and obscurants training.

Response to LC6-43
After approximately the late-1990s when the monitoring network was no longer funded, the AARs are of an anecdotal nature and not substantiated with any monitoring data, either on or off post.

Responses

Response to LC6-44
Leasing PCMS lands for grazing is not a part of the Proposed Action or a reasonably foreseeable requiring study as a cumulative effect in this EIS. As the commentor says, it has been suggested as a possibility in association with numerous other suggestions associated with the potential expansion of PCMS. For example, Section 2.3.1 of the 2008 NDAA Report to Congress concerning potential expansion discussed allowing grazing when PCMS is not being used for military purposes. Although Section 2.3.1 said that grazing would be considered during the analysis process, it stated several reasons why allowing grazing was not desirable and offered alternatives. Expansion, as discussed in Master Response 1, is not part of this EIS.

Response to LC6-45
The conclusions of this EIS find that cumulative soil erosion impacts of GTA combined with transformation of other activities are significant. However, impacts to the sediment loading of surface waters are not anticipated to be significant as is summarized in Section 5.2.2.2.5 of this EIS. The Purgatoire River is being monitored by the State of Colorado with a view toward establishing TMDLs.

Response to LC6-46
Section 4.6.1.3.1 of this EIS has been updated to include additional information. The Dakota Sandstone and Purgatoire Formation make up the Dakota-Purgatoire aquifer, which underlies PCMS and provides the principal groundwater source for this area. The Dakota-Purgatoire aquifer is predominately confined at PCMS, except for outcrop areas that are typically located along major tributaries to the Purgatoire River. The aquifer ranges from 185 to 320 feet in thickness and resides at approximate depths of 225 to 425 feet below the surface in upland areas. Recharge of this aquifer primarily occurs in areas approximately 60 miles west of PCMS. Recharge on PCMS occurs through precipitation and subsurface inflow from neighboring aquifers. However, PCMS resides in a very semi-arid climate and therefore only a small percentage of this precipitation may reach the aquifer. Groundwater movement in the northeastern corner of PCMS is toward the northeast, while groundwater movement throughout the remainder of the installation is toward the east and southeast. (Reference No. 200).

Based on the above clarification, recharge ability at PCMS itself is in trace amounts at best. Therefore, it is highly unlikely that maneuver training conducted at this facility will result in adverse impacts to groundwater recharge capacity or contamination of groundwater.

With regard to expansion, please refer Master Response 1.

Response to LC6-47
Fort Carson cultural resources personnel enter into consultation with the COSHPO when an activity has the potential to adversely effect an archaeological site or historic property. As stated in new Chapter 6 of this EIS, before conducting training at PCMS, including dismounted, Soldiers receive briefings concerning their activities; e.g., all types of ground disturbance and/or movement or removal of natural or cultural resources are prohibited, no vehicle traffic of any kind, no digging, no fire building, no use of rocks or other building materials that may be present; all materials, natural and cultural, are to be left in place. Fort Carson has instituted comprehensive, and successful, education and awareness programs specifically geared to cultural resources. Additionally, both natural and cultural resources personnel coordinate with military trainers and planners prior to exercises and construction of temporary operations facilities to ensure that training does not occur on land that could impact archaeological sites or historic properties.

Responses

Response to LC6-48
The wildland fire events at the PCMS occurred on both surveyed and unsurveyed land. The 315 sites under investigation within burned areas represent sites from previously surveyed land that have been identified, evaluated, and determined National Register-eligible. As such, they are included in the 493 sites discussed in this EIS.

Response to LC6-49
The PCMS Transformation EIS actually predicted that 2,040 sites would be identified on the as-yet unsurveyed lands, of which 406 would be determined to be eligible for inclusion in the National Register.

Response to LC6-50
Please refer to Master Responses 4 and 5.

Response to LC6-51
Comment noted and will be included in the Administrative Record.

Response to LC6-52
This comment again extrapolates generalized widespread and long-term consequences from the information in the AARs. An AAR is a tool to capture the impacts of a single training rotation and does not capture longer term impacts or trends in impacts to natural resources or corrective and management measures. After more than twenty years of Army training at PCMS, its current condition as described in Chapter 4 of this EIS does not reflect the dire conditions that the comment suggests. The Army attributes the generally good condition of PCMS to its management plans and practices and believes that those plans and practices will continue to result in sustainment of the natural resources at PCMS.

Response to LC6-53
The Army believes this EIS meets NEPA requirements and will serve as a proper basis for a ROD.

Commentor LRA1 – City of Trinidad (Brad Parker)

From: Brad Parker
Sent: Monday, November 17, 2008 3:08 PM
To: CARSON USAG NEPA
Subject: Fort Carson EIS

Hi, my name is Brad Parker and I am the Assistant City Planner for Trinidad, Colorado. The City of Trinidad has the following comments regarding the EIS statement prepared for the Draft Fort Carson Grow the Army Station Decisions.

LRA1-1

* Section 4.11.1.1.2 states that "The Army and the City of Trinidad have a contract for the supply of potable water to PCMS, which allows for the delivery of up to approximately 2,700,000 cubic feet (20,200,000 gallons) annually. In fiscal year 2006, the Army purchased approximately double the contract-allowed amount from the City of Trinidad. The difference between the contracted water supply amount and the purchased amount is attributed to the deteriorated water supply line." This line was repaired in 2007 at the expense of the Army.
Utilities Superintendent Jim Fernandez has advised that the contract agreed upon with the Army has no limit on the amount of water that the Army and PCMS can use. Therefore, a correction will need to be made on the EIS reflecting this.

LRA1-2

* Utilities Superintendent Jim Fernandez also advises that Section 4.11.1.3.1, Regional Setting has several errors in association with gas lines running on PCMS. The EIS states that "Colorado Interstate Gas (CIG), a subsidiary of El Paso Corporation, owns and operates a 10-inch diameter, high-pressure gas main that runs through the PCMS from southwest to northeast." This should read two (2) 10-inch diameter high pressure gas mains. In the same section the EIS states that "The City of Trinidad owns an existing 10-inch diameter, low pressure, odorized natural gas main that is operated by El Paso Gas."
Jim Fernandez has stated that no such gas line owned by the City of Trinidad is located on PCMS.

Please advise if you have any questions.

Commentor LC7 – City of Trinidad (Brad Parker)

Thank you,

Brad Parker

Assistant City Planner

City of Trinidad

135 N. Animas

Phone # (719)846-9843 X136

Cell Phone # (719) 680-3749

Fax # (719)846-4140

Responses

Response to LRA1-1
The contract with the City of Trinidad still contains the limits stated in Section 4.11.1.1.2 of this EIS. In 2003, in recognition of the fact that the Army had to pay a substantial sum to have the City of Trinidad repair the water line to PCMS, which had failed prematurely, the City agreed to modify upward the daily and annual maximum consumptions under the contract 'at the request of the Army.' No such modification has yet been made.

Response to LRA1-2
Section 4.11.1.3.1 of this EIS has been updated to accurately reflect the current conditions.

Commentor SA1 – Colorado Division of Wildlife (Sabrina Schnelker)

November 16th, 2008

Fort Carson NEPA Coordinator
1638 Elwell Street, Building 6236
Fort Carson, CO 80913-4000

Re: Draft Environmental Impact Statement (DEIS) for Fort Carson Grow the Army Stationing Decisions

Dear Fort Carson NEPA Coordinator:

The Division of Wildlife (DOW) has reviewed the DEIS for Fort Carson located in southern El Paso County. DOW staff is familiar with the site and offers the following comments for your consideration.

SA1-1

The DOW prefers that the Operational Readiness Training Center (ORTC) area be the alternative chosen for the development. Of the alternatives presented, the ORTC site would have the least amount of impact on wildlife species and habitat. We agree that development within prairie dog or burrowing owl habitat should be discouraged~~s~~, as this would fragment Fort Carson's 7000+ acres of suitable grassland habitat. We have also reviewed your updated species occurrence list, and see no missing species of interest.

SA1-2

Standing trees and snags are present on the sites slated for development. These trees may be currently occupied or historic nest sites. Please take care to avoid removal of trees with occupied nests. An active nest is any nest that is frequented or occupied by a raptor during the breeding season or which has been active in any of the five previous breeding seasons. Many raptors use alternate nests in various years; therefore, a nest may be active even if it is not occupied in a given year. The following site recommendations from the DOW should be followed regarding raptors:

SA1-3

BALD EAGLE
Nest Site: No surface occupancy (beyond that which historically occurred in the area; see 'Definitions' below) within ¼ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile radius of active nests from October 15 through July 31. This closure is more extensive than the National Bald Eagle Management Guidelines (USFWS 2007) due to the generally open habitat used by Colorado's nesting bald eagles.
Winter Night Roost: No human encroachment from November 15 through March 15 within ¼ mile radius of an active winter night roost if there is no direct line of sight between the roost and the encroachment activities. No human encroachment from November 15 through March 15 within ½ mile radius of an active winter night roost if there is a direct line of sight between the roost and the encroachment activities. If periodic visits are required within the buffer zone after development, activity should be

Commentor SA1 – Colorado Division of Wildlife (Sabrina Schnelker)

SA1-3 (cont'd)

restricted to the period between 1000 and 1400 hours from November 15 to March 15.
Hunting Perch: Diurnal hunting perches associated with important foraging areas should also be protected from human encroachment. Preferred perches may be at varying distances from human encroachment and buffer areas will vary. Consult the DOW for recommendations for specific hunting perches.

GOLDEN EAGLE
Nest site: No surface occupancy (beyond what has occurred historically) within 1/4 mile of active nest sites. Seasonal restriction to human encroachment within ½ mile of active nest sites between December 15 and July 15.

FERRUGINOUS HAWK
Nest site: No surface occupancy (beyond what has occurred historically) within ½ mile of active nest sites. Seasonal restriction to human encroachment within ½ mile of active nest sites between February 1 and July 15. This species is especially prone to nest abandonment during incubation if disturbed.

NORTHERN GOSHAWK
Nest Site: No surface occupancy (beyond what has occurred historically) within ½ mile of active nest sites. Seasonal restriction to human encroachment within ½ mile of active nest sites between March 1 and September 15.

PRAIRIE FALCON
Nest Site: No surface occupancy (beyond what has occurred historically) within ½ mile of active nest sites. Seasonal restriction to human encroachment within ½ mile of active nest sites between March 15 and July 15.

RED-TAILED HAWK
Nest Site: No surface occupancy (beyond what has occurred historically) within 1/3 mile of active nest sites. Seasonal restriction to human encroachment within 1/3 mile of active nest sites between February 15 and July 15. Some birds have adapted to urbanization and will tolerate human habitation to within 200 yards of a nest. Development that encroaches in rural areas is likely to cause abandonment.

SWAINSON'S HAWK
Nest Site: No surface occupancy (beyond what has occurred historically) within 1/4 mile of active nest sites. Seasonal restriction to human encroachment within 1/4 mile of active nest sites between April 1 and July 15. Some birds have adapted to urbanization and will tolerate human

Commentor SA1 – Colorado Division of Wildlife (Sabrina Schnelker)

habitation to within 100 yards of a nest.

PEREGRINE FALCON
Nest Site: No surface occupancy (beyond that which historically occurred in the area) within ½ mile radius of active nests. Seasonal restriction to human encroachment within ½ mile of the nest cliff(s) from March 15 to July 31. Due to propensity to relocate nest sites, sometimes up to ½ mile along cliff faces, it is more appropriate to designate 'Nesting Areas' that encompass the cliff system and a ½ mile buffer around the cliff complex.

BURROWING OWL
Nest Site: No human encroachment within 150 feet of the nest site from March 15 through October 31. Although Burrowing Owls may not be actively nesting during this entire period, they may be present at burrows up to a month before egg laying and several months after young have fledged. Therefore, it is recommended that efforts to eradicate prairie dogs or destroy abandoned towns not occur between March 15 and October 31 when owls may be present. Because nesting Burrowing Owls may not be easily visible, it is recommended that targeted surveys be implemented to determine if burrows are occupied. More detailed recommendations are available in a document entitled "Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls" which is available from the DOW.

SA1-3 (cont'd)

DEFINITIONS
Surface occupancy: Any physical object that is intended to remain on the landscape permanently or for a significant amount of time. Examples include houses, oil and gas wells, tanks, wind turbines, roads, tracks, etc.

Human encroachment: Any activity that brings humans in the area. Examples include facilities maintenance, boating, trail access (e.g., hiking, biking), etc.

SA1-4

The DOW is concerned about the construction of new power lines and how they will impact the avian species in the area. Through the Migratory Bird Treaty Act and the Eagle Protection Act, the U.S. Fish and Wildlife Service in cooperation with the Edison Electric Institute has developed Best Management Practices to minimize impacts to avian species. The DOW recommends that both the "Suggested Practices for Raptor Protection on Power Lines, the State of the Art in 1996" and the "Avian Protection Plan (APP) Guidelines" document published in 2005, be consulted for proper design considerations to minimize raptor electrocution. These documents are available at the Edison Electric Institute web site at www.eei.org.

Commentor SA1 – Colorado Division of Wildlife (Sabrina Schnelker)

SA1-5 The DOW recommends the development and implementation of a noxious weed control plan for the site. All disturbed soils should be monitored for noxious weeds and noxious weeds should be actively controlled until native plant revegetation and reclamation is achieved.

The following is a list of general recommendations that the DOW would like to be taken into consideration with this development in order to avoid nuisance conflicts with wildlife.

SA1-6 The DOW recommends using bear resistant trash containers. Bears, skunks, and raccoons are attracted to garbage and do become habituated.

SA1-7 Fences, other than those serving to protect landscaped trees and shrubs, should be designed so as not to impair wildlife movements. Ornamental fences with sharp vertical points or projections extending beyond the top rail should be strongly discouraged. Wildlife friendly design recommendations can be provided upon request.

SA1-8 When landscaping near buildings, it is strongly recommended that native vegetation be used ~~in which~~that wildlife are less likely to be attracted to. Non-native vegetation can overrun native vegetation and can become problematic. For more specific information on native vegetation, consult the local Natural Resources Conservation Service (NRCS) office. Planting of trees and shrubs that are attractive to ungulates should incorporate the use of materials that will prevent access and damage (fencing, tree guards, trunk guards, etc.).

SA1-9 It is unclear in the DEIS document to what extent increased training or dismounted troops will impact wildlife resources. With respect to big game hunting, the Division wishes to maintain communication with your office as these proposals could impact that recreational activity to some degree. As you know, the Division is in the process of approving the recent issue paper submitted by DECAM to shorten existing big game seasons. We hope this will allow a more predictable schedule for the hunting public, and recommend monitoring future army developments that might impact this activity.

Thank you for the opportunity to comment on this DEIS for Fort Carson. If you have any questions or require additional information please contact District Wildlife Manager Sabrina Schnelker at 719-227-5231 or via e-mail Sabrina.schnelker@state.co.us.

Responses

Response to SA1-1
The Army has selected the ORTC site as its preferred alternative for implementing the Proposed Action. Thank you for your input.

Response to SA1-2
Fort Carson and PCMS wildlife biologists monitor all known raptor nests. Part of the installation's regular practice is to avoid disturbance of nesting birds and tree removal. If tree removal is unavoidable, the on-site wildlife biologist inspects the trees for active nests prior to removal.

All trees are surveyed for nests and other wildlife. Moreover we recommend all trees approved for removal, be removed prior to migratory bird nesting season to reduce any potential Migratory Bird Treaty Act conflicts. Fort Carson Wildlife Office maintains records of known historic nest sites. This knowledge of trees with historical nesting records will be taken into consideration along with the urban forester's recommendations and the needs of the construction to make the necessary final decision. If a decision to remove or transplant trees is made, the associated activities will be done during the time of the season as to not impact nesting birds.

We have required the proponent for construction to mitigate trees in three ways to prevent what we call a possible significant impact to Fort Carson's Urban Forest.

Response to SA1-3
Generally, the types of training activities and the locations for that training under the Proposed Action, even those for the CAB, have been conducted at Fort Carson in the past. Fort Carson employs similar BMPs for protection of raptors, but some differ due to the nature of military training. Raptor protective measures are included in the INRMP (which is coordinated with and signed by the USFWS and DOW) and Fort Carson's Bald Eagle Management Plan (see Section 3.7 and Appendix F of this EIS). Fort Carson will make every effort to implement the DOW recommendations whenever possible. Installation biologists will continue to work with DOW to provide the best protection of raptors and other species possible.

Response to SA1-4
Fort Carson is working toward achieving all underground power distribution, as funding becomes available. All new construction of utility lines is planned as underground, and when currently existing power lines are planned for upgrades, they are replaced with underground distribution whenever feasible.

Response to SA1-5
Fort Carson employs integrated weed management strategies to prevent and control noxious weeds. As stated in Sections 3.7.1.1 and 4.7.1.1 of this EIS, the 2008-2012 Invasive Plant Management Plan describes the goals, strategies and prioritization of noxious weed control efforts at Fort Carson and PCMS. Fort Carson's approach involves biological, chemical, cultural and physical/mechanical control techniques. The Invasive Species Management Plan contains measures that pertain to construction sites.

Response to SA1-6
The garrison strives to keep the cantonment clean and eliminate the potential for trash to be available to wildlife. Examples of efforts already enacted to do so are locking mechanisms on refuse containers, regular educational articles in the post's papers regarding nuisance animal issues, and regular removal of refuse. See new Chapter 6 of this EIS for mitigation measures.

Responses

Response to SA1-7
Fort Carson concurs with your comment and will implement recommendations as funding is available.

Response to SA1-8
Standard practice for rehabilitating areas disturbed from construction and/or training has been to replant those areas with mixes of appropriate native plant species determined by a range conservationist. This will continue to be standard practice along with monitoring effectiveness of the reseeding. As is common in disturbed areas, even after reseeding, unwanted pioneer species (some of which are on state and county noxious weed lists) can become established. If this happens there are initiatives in place to be implemented through the pest management program to control such problems (i.e., self help programs and noxious weed management plan).

Response to SA1-9
Fort Carson will continue to coordinate on this issue with the CDOW. Additional information regarding hunting has been added to Section 4.2 of this EIS.