Draft
Environmental Impact Statement for Implementation of 2005 Base Realignment and Closure (BRAC) Recommendations and Related Army Actions at Fort Belvoir, Virginia

prepared by

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DRAFT ENVIRONMENTAL IMPACT STATEMENT

IMPLEMENTATION OF 2005 BASE REALIGNMENT AND CLOSURE (BRAC) RECOMMENDATIONS AND RELATED ARMY ACTIONS AT FORT BELVOIR, VIRGINIA

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DRAFT ENVIRONMENTAL IMPACT STATEMENT

***TITLE OF PROPOSED ACTION*:** Implementation of Base Realignment and Closure (BRAC) Recommendations and Related Army Actions at Fort Belvoir, Virginia

***LEAD AGENCIES*:** Department of the Army

***AFFECTED JURISDICTIONS*:** Fairfax County, Virginia

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ABSTRACT: This Draft Environmental Impact Statement (EIS) considers the proposed implementation of the BRAC recommendations at Fort Belvoir, Virginia. The Draft EIS identifies, evaluates, and documents the effects of facility construction, maintenance, management, and renovation on the environment and economic and social conditions at Fort Belvoir that would result from the implementation of the realignment actions mandated by the BRAC Commission. A no action alternative is also evaluated.

REVIEW COMMENT DEADLINE: The Draft EIS is available for review and comment for 60 days. A Notice of Availability (NOA) of the document was published in the *Federal Register* by the U.S. Environmental Protection Agency. Publication of the NOA began the 60-day review and comment period. Copies of the Draft EIS can be obtained by contacting Mr. Patrick McLaughlin, Fort Belvoir Directorate of Public Works Environmental and Natural Resources Division, Building 1442, 9430 Jackson Loop, Fort Belvoir, Virginia, 22060-5116 (or by e-mail at environmental@belvoir.army.mil). Copies have also been provided to the libraries listed in Section 7 of the Draft EIS. Comments on the Draft EIS should be submitted to the above-noted individuals.

DRAFT ENVIRONMENTAL IMPACT STATEMENT ORGANIZATION

This Draft Environmental Impact Statement addresses the proposed action to implement the BRAC recommendations and related Army actions at Fort Belvoir, Virginia. It has been developed in accordance with the National Environmental Policy Act and implementing regulations issued by the Council on Environmental Quality (Title 40 *Code of Federal Regulations* [CFR] 1500–1508) and the Army (32 CFR 651). Its purpose is to inform decision-makers and the public of the likely environmental and socioeconomic consequences of the proposed action and alternatives.

An ***EXECUTIVE SUMMARY*** briefly describes the proposed action, environmental and socioeconomic consequences, and mitigation measures.

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SECTION 1.0: ***PURPOSE, NEED, AND SCOPE*** summarize the purpose of and need for the proposed action and describes the scope of the environmental impact analysis process.

SECTION 2.0: ***PROPOSED ACTION*** describes the proposed action to implement the BRAC Commission's recommendations at Fort Belvoir.

SECTION 3.0: ***ALTERNATIVES*** examines alternatives to implementing the proposed action.

SECTION 4.0: ***AFFECTED ENVIRONMENT AND CONSEQUENCES*** describes the existing environmental and socioeconomic settings at Fort Belvoir and identifies potential effects of implementing the proposed action.

SECTION 5.0: ***CUMULATIVE EFFECTS*** identifies potential effects of past, present, and reasonably foreseeable future actions in addition to implementing the proposed action.

SECTION 6.0: ***LIST OF PREPARERS*** identifies the preparers of the document.

SECTION 7.0: ***DISTRIBUTION LIST*** indicates recipients of this Draft Environmental Impact Statement.

SECTION 8.0: ***REFERENCES*** provides bibliographical information for cited sources.

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This environmental impact statement (EIS) evaluates the potential environmental and socioeconomic impacts of two proposals at Fort Belvoir: update of the land use plan of the post's real property master plan (RPMP) and implementation of base realignment.

Fort Belvoir established its RPMP in 1993 and amended it in 2002. In light of substantial changes at the post because of base realignment, the land use plan needs to be updated.

On September 8, 2005, the Defense Base Closure and Realignment Commission (BRAC Commission) recommended numerous realignment and closure actions for domestic military installations. On November 9, 2005, the recommendations became law and now must be implemented as provided for in the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), as amended. The BRAC Commission's recommendations will generate a net increase of 22,000 people in the workforce on Fort Belvoir.

ES.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTIONS

The purpose of the proposed action with respect to the land use plan is to obtain a revised land use plan for allocation of functions and facilities at the post. Fort Belvoir requires a revised land use plan that will enable sound use of physical and natural resources at the post with respect to both current and future land use requirements.

The purpose of the proposed action with respect to BRAC is to realign functions as directed by the BRAC Commission's recommendations for Fort Belvoir. The need for the proposed action is to advance the goals of transformation by improving military capabilities and thereby enhancing military value. The Army must carry out the BRAC recommendations at Fort Belvoir to achieve these improvements and to comply with BRAC law.

ES.3 SCOPE

This EIS identifies, documents, and evaluates environmental effects of land use plan revision and realignment activities at Fort Belvoir in accordance with the National Environmental Policy Act of 1969 (NEPA) and implementing regulations issued by the President's Council on Environmental Quality (CEQ) and the Army.[1] The purpose of the EIS is to inform decision makers and the public of the likely environmental consequences of the proposed action and alternatives.

ES.4 PROPOSED ACTION DETAILS

The Army proposes to update Fort Belvoir's land use plan and to implement the BRAC Commission's recommendations. The BRAC realignment actions would involve constructing

[1] *Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, Title 40 of the *Code of Federal Regulations* (CFR) Parts 1500–1508, and *Environmental Analysis of Army Actions*, 32 CFR Part 651.

and renovating facilities and, consistent with the BRAC law, relocating units, agencies, and activities to the post by September 2011.

BRAC realignment would result in a net increase in workforce of approximately 22,000 personnel at Fort Belvoir. The increase in personnel and facilities requires an updated land use plan. Siting of new facilities for the base realignment action would then comport with the updated land use plan.

ES.4.1 Land Use Plan Update

The EIS pertains to the initial step of the RPMP update process–to revise the land use plan, which must happen before the Army can begin siting facilities for BRAC implementation.

Fort Belvoir developed its current master plan in 1993 to reflect the post's transition from primarily a troop support and training mission to its role as an administrative center providing support to multiple organizations in the National Capital Region (NCR). The 1993 Long Range Component (LRC) identified Fort Belvoir's role as "the major administrative and logistics center for the Northern Virginia portion" of the Military District of Washington (MDW). The Engineer Proving Ground (EPG) was not included in the 1993 plan. The 1993 Real Property Master Plan was amended in 2002 upon the adoption of a Regional Community Support Center Subarea Development Plan. The plan amendment designated a portion of the Lower North Post area as the Regional Community Support Center.

The proposed land use plan includes EPG in planning for future development. It also uses fewer, but broader, land use designations that are more flexible than the 1993 plan. The designations are Airfields, Community, Industrial, Professional/ Institutional, Residential, Training, and Troop. Principal features and elements of the proposed land use plan include the following:

- *Professional/Institutional.* The Administration & Education and Research & Development land use categories used in the 1993 land use plan would change to Professional/Institutional. The proposed land use plan increases the amount of land designated for Professional/Institutional by more than 800 acres.
- *Residential.* The proposed land use plan would increase the land area dedicated to family housing on both the North and South Posts.
- *Open Space.* Much of the area designated as Environmentally Sensitive in the 1993 land use plan would be redesignated as Community. This category also includes safety clearances, security areas, water areas, wetlands, conservation areas, resource protection areas (RPAs), forest stands, and former training areas. Environmentally constrained land areas would continue to have all regulatory protections in place.
- *South Post Golf Course.* The proposed land use plan would change the land use designation of most of the South Post golf course from Outdoor Recreation to Professional/Institutional.
- *Supply, Storage, and Maintenance.* The proposed land use plan would enable the Army to demolish outdated and inefficient warehouses; relocate most of the Supply, Storage, and Maintenance operations in the 1400 Area to the 700/1100 Areas; and redevelop the eastern portion of the 1400 Area east of Gunston Road for Professional/Institutional uses.

- *Unaccompanied Personnel Housing*. The proposed land use plan would convert North Post areas designated for Troop uses to Professional/Institutional. A new Troop land use area would be provided on South Post, west of Gunston Road.
- *Army Community Hospital.* The proposed land use plan would enable a new hospital to be sited on the South Post golf course in the southwest quadrant of the intersection of Route 1 and Belvoir Road. The present hospital site would be designated for Community uses.

The proposed land use plan has been developed to achieve compliance with force protection requirements for military facilities as set forth in Department of Defense (DoD) Unified Facilities Criteria 4-010-01, *Antiterrorism Standards for Buildings* (2003). A key effect of the standards is the requirement that buffer zones around buildings and roads be reserved as force protection standoff areas. The buffer zones affect the amount of land needed for any one facility and also dictate the facility's relationship to other facilities.

ES.4.2 Base Realignment

Accommodation of personnel being realigned to Fort Belvoir must take into account the needs of six major groups slated for realignment by the BRAC Commission. The six groups and the number of personnel (staff and contractors) to be realigned are as follows:

- Washington Headquarters Services (WHS)—9,263 personnel
- National Geospatial-Intelligence Agency (NGA) —8,500 personnel
- Army Lease—2,720 personnel
- U.S. Medical Command (MEDCOM) —2,069 personnel
- Program Executive Office, Enterprise Info Systems (PEO EIS) —480 personnel
- Missile Defense Agency, HQ Command Center (MDA) —292 personnel

These six groups total 23,324 personnel. The personnel being realigned from Fort Belvoir to other installations result in a net increase at Fort Belvoir of approximately 22,000 personnel. Realignments from Fort Belvoir include the relocation of Army Materiel Command Headquarters and U.S. Army Security Assistance Command to Redstone Arsenal, Alabama; Prime Power School to Fort Leonard Wood, Missouri; U.S. Army Criminal Investigation Division Headquarters to Marine Corps Base, Quantico, Virginia; Soldiers Magazine to Fort Meade, Maryland; Biomedical Science and Technology programs of the Defense Threat Reduction Agency to Aberdeen Proving Ground, Maryland; Defense Threat Reduction Agency conventional armaments research to Eglin Air Force Base, Florida; and Information Systems, Research, Development and Acquisition to Aberdeen Proving Ground, Maryland. Evaluation of environmental impacts associated with these realignments will be performed by the receiving locations.

Concurrent with the relocations directed by the BRAC Commission, the Army proposes to implement five discretionary moves–relocations not necessitated by BRAC Commission recommendations–of units, agencies, and activities to Fort Belvoir. The 146 personnel involved in these discretionary moves would directly support units, agencies, or activities realigned to Fort Belvoir by the BRAC Commission or join similar activities already assigned to the post.

Under the Preferred Alternative, accommodating BRAC requirements would involve siting of the incoming organizations as follows.

- NGA and WHS would be on the eastern portion of EPG.
- Army lease units, agencies, and activities would be on South Post at sites on Gunston Road and Belvoir Road.
- The new Army community hospital would be on the South Post Golf Course.
- PEO EIS and MDA would be on South Post at sites on Gunston Road and Belvoir Road.

Construction and renovation of facilities to support additional personnel at Fort Belvoir would entail 20 separate projects totaling about 6.2 million square feet of built space and about 7 million square feet of parking structures.

ES.4.3 Schedule

Implementation of the various aspects of the proposed actions would occur until approximately the end of Fiscal Year 2011. Actions with respect to the land use plan revision would begin upon issuance of the Record of Decision (ROD) and continue until further revision of the master plan. Construction and renovation of facilities in support of base realignment and other requirements of Fort Belvoir would begin in Fiscal Year 2007 and continue through Fiscal Year 2011.

ES.5 ALTERNATIVES

Section 2.2 of the EIS presents the Army's preferred land use plan. This EIS also considers three other land use plans, referred to as the Town Center, City Center, and Satellite Campuses Alternatives.

ES.5.1 Town Center Alternative

Under the Town Center Alternative, the majority of new facilities to accommodate base realignment would be sited between J.J. Kingman Road on North Post and 12th Street on South Post. Developed areas bounded by 16th and 21st Streets and Gunston Road and Belvoir Road would be available for future redevelopment. The EPG, Davison Army Airfield, and the North Post golf course would remain available for future development after 2011. For land use planning, several land parcels affected by the Town Center strategy would be redesignated for Professional/Institutional or Community uses. Accommodation of BRAC realignments under this alternative would result in the following major sitings:

- NGA and associated parking structures would be sited in the area bounded by Route 1, Belvoir Road, 9th Street, and Gunston Road.
- WHS and associated parking structures would be sited in the area bounded by Route 1, Belvoir Road, 9th Street, and Gunston Road and in the adjacent area north of Route 1 that is bounded by Constitution Drive, Route 1, and Gunston, Abbott, and Beauregard Roads.
- Army Lease activities and associated parking structures would be sited on North Post, in the southern half of the area bounded by Woodlawn, Abbott, Gunston, and J.J. Kingman Roads.
- MEDCOM and MDA and associated parking structures would be sited in the area that is bounded by Constitution Drive, Route 1, and Gunston, Abbott, and Beauregard Roads.

- PEO EIS and associated parking structures would be sited on North Post, in the southern half of the area bounded by Woodlawn, Abbott, Gunston, and J.J. Kingman Roads.

ES.5.2 City Center Alternative

Under the City Center Alternative, all new facilities to accommodate base realignment would be sited on EPG and a nearby 70-acre parcel occupied by the General Services Administration (GSA), known as the *GSA Parcel*. The North and South Posts at Fort Belvoir would remain available for future development. Accommodation of BRAC realignments under this alternative would result in the following major sitings:

- NGA, Army Lease, MEDCOM, PEO EIS, and MDA and associated parking structures would be sited at EPG.
- Portions of Army Lease would be sited in existing facilities along the east side of Gunston Road between Route 1 and 9th Street, and in the northwest quadrant of the intersection of Belvoir Road and 21st Street. Units, agencies, and activities that could not be assigned to the existing facilities would occupy EPG.
- WHS would be sited at the GSA Parcel on Loisdale Road.

Army adoption of the City Center Alternative would require measures not inherent in other alternatives. The Army would expect GSA to vacate its facilities, demolish all existing structures, conduct any environmental corrective action required under hazardous waste laws, and transfer administrative control of the property to the Army. These actions would have to occur within a time frame that would provide the Army sufficient time to construct facilities for WHS use.

ES.5.3 Satellite Campuses Alternative

Under the Satellite Campuses Alternative, new facilities to accommodate base realignment would be sited on Davison Army Airfield, North Post golf course, and North Post and South Post (from Kingman Road to 12th Street). Accommodation of BRAC realignments under this alternative would result in the following major sitings:

- NGA and associated parking structures would be sited at Davison Army Airfield.
- WHS and MDA and associated parking structures would be sited in the North Port area that is bounded by Constitution Drive, Route 1, and Gunston, Abbott, and Beauregard Roads.
- Army Lease would be sited in existing facilities along the east side of Gunston Road between Route 1 and 9th Street, and in the southwest quadrant of the intersection of Belvoir Road and 21st Street in renovated facilities.
- MEDCOM and associated parking structures would be sited on the southern portion of the North Post golf course.
- PEO EIS and associated parking structures would be sited on North Post, in the southern half of the area bounded by Woodlawn, Abbott, Gunston, and J.J. Kingman Roads.

ES.5.4 Preferred Alternative

Consideration of the Town Center, City Center, and Satellite Campuses conceptual development strategies resulted in a determination that any single strategy was inadequate to meet Fort Belvoir's base realignment needs. The Army reached this determination on the basis of giving high priority to traffic-related issues and development density; specifically, use of EPG for all base realignment units, agencies, and activities would have resulted in development densities that might not be supportable because of traffic congestion. In light of these circumstances, the Army identified another alternative for land use, referred to as the Preferred Alternative Land Use Plan. That alternative is presented in Section 2.2.2 of the EIS (and ES.4.2, above).

ES.5.5 Alternatives for BRAC Implementation

The Defense Base Closure and Realignment Act requires implementation of base realignment actions by no later than September 15, 2011, 6 years following the President's sending the BRAC Commission's recommendation to Congress. Because those recommendations became law effective November 9, 2005, the Army is required to implement them in accordance with their terms.

The implementation of base realignment at Fort Belvoir essentially centers on what facilities must be provided, where those facilities would be sited, and which personnel would be assigned to new or renovated facilities. The determinations on these matters are, in large part, guided by the post's land use plan, which identifies areas appropriate for Professional/Institutional purposes. The EIS examines four land use plan alternatives that serve as the surrogate for alternative means of accommodating the units, agencies, and activities being relocated.

ES.5.6 No Action Alternative

Inclusion of the No Action Alternative is prescribed by the CEQ regulations and serves as the benchmark against which federal actions can be evaluated. No action assumes that the Army would continue its mission at Fort Belvoir as it existed in November 2005, with no units relocating from other locations and no new facilities being constructed. Because the BRAC Commission's recommendations now have the force of law, continuation of the November 2005 Fort Belvoir mission is not possible. Although the No Action Alternative is not possible to implement without further congressional action, it serves as a baseline alternative against which other alternatives can be evaluated.

ES.6 ENVIRONMENTAL CONSEQUENCES

ES.6.1 Land Use

Preferred Alternative. Long-term minor beneficial effects would be expected upon adoption of the Preferred Alternative land use plan. Long-term minor beneficial and minor adverse effects would be expected upon implementation of BRAC.

Town Center Alternative. Long-term minor beneficial effects would be expected upon adoption of the Town Center Alternative land use plan. Long-term minor beneficial and minor adverse effects would be expected upon implementation of BRAC.

City Center Alternative. Long-term minor beneficial effects would be expected upon adoption of the City Center Alternative land use plan. Long-term minor adverse effects would be expected upon implementation of BRAC.

Satellite Campuses Alternative. Long-term minor beneficial and minor adverse effects would be expected upon adoption of the Satellite Campuses Alternative land use plan. Long-term significant adverse effects would be expected upon implementation of BRAC.

ES.6.2 Transportation

The BRAC action would be expected to have significant effects on the transportation system, regardless of the land use alternative selected. The effects of each alternative would vary because of the siting of each of the agencies affected by the BRAC action. For example, the Preferred Alternative land use plan concentrates most of the new development onto EPG, with some increases to South Post. The Town Center Alternative's land use plan places all development on the Main Post on either side of U.S. Route 1. Thus, the effects on the transportation system caused by the new developments would vary by location. For example the Preferred Alternative would affect the Fairfax County Parkway adjacent to EPG greater than the Town Center Alternative because of the locations of the various agencies. The Town Center Alternative has the greatest effect along U.S. Route 1 because more development is concentrated in that segment of the Main Post.

From a regional perspective, the alternatives are very similar. Overall, regional travel patterns would be expected to be identical, with any differences showing up only on a localized scale, depending upon the specific siting of individual BRAC elements within the immediate Fort Belvoir area. For all the alternatives, the significant transportation effects would be limited to the entrance points and the immediately adjacent transportation facilities. These significant effects would disappear into the regional traffic flow within 3 to 5 miles of Fort Belvoir. While the alternatives differ somewhat in terms of the detailed extent and location of these effects, on a regional basis, beyond the 3- to 5-mile range, the effects become negligible for all alternatives.

The alternatives placing all BRAC-related development within the Main Post area have greater effects than those that disperse the activities between the Main Post and the EPG site. The most significant of these larger effects relates to the added traffic on the segment of the Fairfax County Parkway between I-95 and U.S. Route 1. Mitigation to address this issue is likely to require a Fairfax County Parkway cross-section in this area of eight lanes, including a two-lane reversible high-occupancy vehicles (HOV) facility.

The City Center Alternative would also require additional mitigation because of the significant effect on the Franconia-Springfield Parkway by including the GSA Parcel into the BRAC planning regime. That site is relatively landlocked and would require additional access beyond what currently exists off Loisdale Road. This mitigation would include the construction of new access from the Franconia-Springfield Parkway, which would have significant costs and adverse effects on existing traffic. The Satellite Campuses Alternative is most similar to that of the Town Center Alternative, as the development is centered on Main Post and Davison Airfield. Slight differences in localized impacts exist due to the use of Davison Airfield.

An additional consideration for the Preferred Alternative is the fact that the needed transportation improvements can largely be constructed without interfering with existing traffic because the EPG site is largely undeveloped and the major access-related project would be constructing the

new segment of the Fairfax County Parkway. Constructing this segment could be accomplished with minimal effect on existing traffic. Each of the other alternatives involves more highway projects that would need to be constructed within active traffic zones.

Any significant traffic effects as a result of the BRAC action should be mitigated with transportation improvements, such that the negative effects become minor or negligible. Any development would always have some effects on the transportation system; however, the state and local agencies require, for development they can control, that the developer mitigate those effects with some improvements to the transportation system. The level of mitigation depends on the alternative selected.

The region's transportation system is already strained under existing traffic volumes (2006 conditions), and it will continue to be constrained under the No Action Alternative (2011), even with the transportation improvements proposed by Federal Highway Administration (FHWA), Virginia Department of Transportation (VDOT), and Fairfax County in their transportation improvement programs. The 2011 conditions, which represent the opening year of BRAC, were assessed and compared to the 2011 No Action Alternative to determine the level of effects caused by the development in each land use alternative. Through the analyses of the four alternative land use plans, a series of transportation improvements have been identified to mitigate the effects of each of the proposed alternatives. These improvements would be needed to maintain the transportation system's operational performance at an acceptable level of service and delay.

Order-of-magnitude costs for the mitigation actions are estimated to be as follows:

- Preferred Alternative, $458 million
- Town Center, $732 million
- City Center, $471 million
- Satellite Campuses, $742 million

For the Preferred and City Center Alternatives, the ability of transit to contribute to the mitigation is greater than for the other alternatives because these alternatives use sites that are closer to the regional rail network. Their locations make it easier to achieve the targeted 5 to 10 percent transit mode share goals.

ES.6.3 Air Quality

Short-term and long-term minor adverse effects would be expected from implementing BRAC under any of the four alternatives. Minor increases in emissions would conform to the state implementation plan (SIP); would not be expected to contribute to a violation of any federal, state, or local air regulations; and would not introduce localized carbon monoxide concentrations greater than the National Ambient Air Quality Standards (NAAQS).

Regionally, the alternatives are very similar. Each would constitute approximately the same amount of both construction and operating emissions within the region for all years. A Draft General Conformity Determination was prepared and demonstrates that the emissions associated with each of the alternatives conform to the purpose and intent of the applicable SIP. Therefore, by definition, they do not:

- Interfere with the region's ability to timely attain the NAAQS

- Cause or contribute to any new violations of an NAAQS
- Increase the frequency or severity of any existing violation of any NAAQS
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones

For all the alternatives, both construction and operating permits for the new sources of air emission would be required. EPG and the GSA Parcel are noncontiguous with respect to the Main Post; therefore, they meet the requirements of separate facilities. Exceedence of the major source thresholds would be anticipated with the implementation of the City Center and Town Center Alternatives. For these alternatives, a Nonattainment New Source Review permit would be required, and emission offsets at a ratio of 1:1.15 would have to be located and obtained for all stationary sources that fell under this permit.

For all the alternatives, implementing the BRAC action would decrease both the number of vehicles and the total vehicle miles traveled (VMT) within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily due to a net reduction of approximately 1,700 personnel from the region. These are personnel leaving Fort Belvoir to areas outside the NCR. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality. Increases in localized traffic near the installation, however, would result in minor increase in traffic congestion and subsequent long-term minor increases in localized carbon monoxide concentrations at nearby intersections. For all the alternatives, these minor increases would not be expected to contribute to a violation of the carbon monoxide NAAQS. The traffic changes would not be expected to cause significant long-term increases of other criteria pollutants.

ES.6.4 Noise

Short-term and long-term minor adverse effects would be expected for all development alternatives. Minor increases in noise would not be expected to contribute to a violation of any federal, state, or local regulations or introduce areas of incompatible land use due to noise.

Each development alternative would require construction activities at the Main Post, EPG, or the GSA Parcel. Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet. With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction sites. The zone of relatively high construction noise typically extends to distances of 400 to 800 feet from the site of major equipment operations. Locations more than 1,000 feet from construction sites seldom experience noteworthy levels of construction noise. Given the temporary nature of proposed construction activities and the limited amount of noise that construction equipment would generate, this effect would be considered minor.

Noise levels for noise-sensitive receptors (NSR) adjacent to the main traffic routes near the Main Post, EPG, and the GSA Parcel would not exceed the noise-abatement criterion (67 A-weighted decibels) for residential land uses.

ES.6.5 Topography, Geology, and Soils

Topography. Long-term minor effects would be expected upon implementation of any of the four alternatives. While the degree of impact on topography would be greater under the Town

Center and Satellite Campuses Alternatives, the overall effect would still be insignificant on the landscape level.

Geology. Negligible effects would be expected upon implementing any of the BRAC alternatives and other facilities projects within the Main Post and EPG. The geology of the area would remain unchanged, although small portions of the bedrock underlying the area could be affected by construction activities. Such effects would be inconsequential and extremely localized on a geologic scale.

Soils. Short-term and long-term minor effects to soils' productivity would be expected under all the BRAC alternatives resulting from construction activities and the installation of impervious surfaces. These effects would be minor when considered on the landscape level. Soils covering many areas within the Main Post and EPG that are amenable to construction have already been subject to previous construction and land-clearing activities; therefore, not all soils within the project area are in their undisturbed state and at maximum productivity. With the acres of disturbance being the simplest measure to compare alternatives, the Preferred Alternative and City Center Alternative land use plans would affect 353 and 298 acres of soils, respectively, concentrated primarily in EPG. The Satellite Campuses Alternative would result in the greatest extent of disturbance (471 acres), with disturbances occurring primarily in the North Post. The Town Center Alternative land use plan would affect 330 acres on the North Post and South Post. Land use categories developed in consideration of environmental constraints would confine most construction activities to areas that are most conducive to development, thereby excluding or limiting effects to highly erodible or otherwise unsuitable soils, such as those with steep slopes (drainages) or high water tables.

ES.6.6 Water Resources

Short-term and long-term minor adverse effects would be expected, regardless of the land use plan and BRAC implementation alternative selected. The effects would occur at the watershed scale, with localized effects that could be more pronounced during the implementation of proposed changes. Each alternative would have varying effects due to the siting of each of the agencies affected by the BRAC action. For example, the Preferred Alternative's land use plan concentrates most of the new development onto EPG with some increases to South Post. The Town Center Alternative's land use plan places all development on Main Post, on either side of Route 1. Thus, the effects on water resources caused by the new developments would vary to some degree by location.

Effects on water resources resulting from the BRAC action would relate to the potential for increases in storm water runoff, associated physical effects, and associated pollutants from land disturbance activities. These effects would be expected to occur during construction activities and their associated land disturbance as well as for a longer term as a result of increased impervious surfaces because of development. The number of acres of increased high- and medium-intensity development would be greatest under the Satellite Campuses Alternative (447 acres) as compared with increases of about 348 acres under the Preferred Alternative, about 316 acres under the Town Center Alternative, and about 259 acres under the City Center Alternative. Correspondingly, the amount of land area expected to be converted from pervious to impervious surface is greatest under the Satellite Campuses Alternative (207 acres), as compared with increases of about 183 acres under the Preferred Alternative, about 142 acres under the Town Center Alternative, and about 131 acres under the City Center Alternative. Similarly, the Satellite Campuses Alternative would be expected to result in the greatest disturbance to Chesapeake Bay

RPAs (40 acres) and floodplain (3 acres), as compared with 14 acres of disturbed RPAs and 3 acres disturbed floodplain under the Preferred and City Center Alternatives, and 18 acres of disturbed RPAs and no disturbed floodplain under the Town Center Alternative.

The greatest potential expected increases in total nitrogen and total phosphorous pollutant loading to surface waters would be expected to occur under the Preferred Alternative and the City Center Alternative, with five subwatersheds expected to increase their loads by more than 10 percent. This compares with an expected increase of more than 10 percent in only one subwatershed under both the Town Center Alternative and the Satellite Campuses Alternative.

ES.6.7 Biological Resources

Long-term moderate and minor adverse effects would be expected by implementing any of the four land use plans and by implementing BRAC. These effects would pertain to vegetation; wildlife; and endangered, threatened, and sensitive species.

- *Main Post*. The primary areas of biological resources concentration on the Main Post are the Southwest Area, land bordering the shores of the South Post, and the Special Natural Areas (SNA). All the alternatives would reduce vegetated areas on the post by a substantial amount and could indirectly affect vegetative communities and wildlife through habitat fragmentation and isolation and increased occurrences of invasive species, which would result in a loss of ecological integrity.

- *EPG*. Natural habitat on EPG has been re-establishing itself since the 1970s, when intensive training activities on EPG ceased. West of Accotink Creek, development has been minimal, and east of Accotink Creek, the developed areas have not been used intensively in recent years. Natural aspects of the area east of Accotink Creek—such as woody growth and the use of undisturbed open areas by breeding birds—have increased. The Preferred and City Center Alternatives have the greatest adverse effects on the biological resources on EPG because they have more project development in EPG, while the Town Center and Satellite Campuses Alternatives have less development occurring on EPG.

Overall, the City Center Alternative would have the greatest adverse effect on the biological resources of Fort Belvoir, followed by the Preferred Alternative. The Town Center and Satellite Campuses Alternatives would have the least impact on biological resources.

ES.6.8 Cultural Resources

Long-term minor and beneficial effects would be expected upon adoption of the any of the four alternative land use plans. Minor adverse effects, including direct and indirect physical effects and direct visual effects and noise, would occur to both archaeological sites and historic resources under each of the alternatives. The nature of the effects is the same from one alternative to the next. Mitigation measures common to all the alternatives would avoid or reduce the adverse effects. Specific comparison of the land use alternatives at an impact-by-impact level is not possible until certain planned studies have been completed in the areas proposed for development.

Long-term minor adverse effects would occur upon implementation of any of the four alternatives for implementing BRAC. These effects would occur with respect to archaeological sites and historic resources, with the nature of the effects being the same between alternatives and the same

mitigation measures being applied to avoid or reduce the effects. Assessment of specific adverse effects to historic properties from the proposed BRAC projects depends on the exact location of the proposed projects and the specific design details of the projects. These details include such things as building materials, construction footprint, height of buildings, and building design. Many of these project details cannot be determined until Fort Belvoir initiates the project design process. Until these details are developed, the exact nature and extent of adverse effects cannot be determined. For each of the alternatives, a broad assessment of potential effects was based on general locations and characteristics of the proposed projects, as compared with information on historic property locations.

A simple tally of the number of proposed projects under each alternative that would result in adverse effects shows that the Preferred Alternative has 10 such projects, Town Center Alternative has 11, City Center Alternative has 7, and Satellite Campuses Alternative has 13. This tally alone, however, does not provide information on the number of resources affected by each project or the type or extent of effects.

ES.6.9 Socioeconomics

The BRAC action would have minor beneficial economic effects, regardless of the land use alternative selected. The BRAC action, in general, would have the same economic effects under each alternative from construction expenditures and the increase of Fort Belvoir personnel. Estimated construction expenditures would be similar under each alternative, with variations among the alternatives for demolition and infrastructure. The construction and renovation expenditures would result in beneficial increases in region of influence (ROI) business sales volume, income, and employment. Although the proposed action's expenditures would be quite substantial, Fort Belvoir is in such an economically large and robust region that the magnitude of the expenditures relative to the regional demographic and economic forces would be considered minor. Because construction projects are, by nature, temporary, the economic stimulus from construction of the proposed BRAC and associated facilities would diminish over time as the projects reach completion in 2011.

The social effects of the BRAC action would range from short-term minor adverse to long-term significant adverse and long-term minor beneficial effects, regardless of the land use alternative selected. The siting of the BRAC facilities on Fort Belvoir would vary with each land use alternative; however, the effects on sociological resources from BRAC implementation and the effect on population and demand for housing and public services would be similar. On-post facilities would be inadequate to accommodate the incoming BRAC workforce. Additional police, fire, medical, shopping, and morale, welfare, and recreation (MWR) sponsored programs and facilities would be needed. If facilities were not improved, levels of service would decrease. The ability to provide proper service and meet customer demands would degrade because of continued use of inadequate facilities, continued fragmentation of services, and increased demand from the additional population. Long-term significant adverse effects would be expected on MWR sponsored programs, such as Soldier and family support and recreational facilities and activities, because Fort Belvoir's MWR would not have sufficient funds, facilities, or staff to support required MWR programs. Additional Fort Belvoir actions (BRAC and non-BRAC) plan for the construction and staffing of on-post facilities such as a new hospital, new emergency services center, child development centers, pool (water park), relocated/new sports fields, physical fitness centers, and Family Travel Camp area. These new or expanded facilities would be designed to adequately serve the incoming BRAC population, resulting in long-term beneficial effects. However, MWR's ability to build and operate these new recreational facilities depends

on their available nonappropriated funds (NAF), which would be significantly reduced by BRAC actions.

From a regional perspective, the social effects of the BRAC action would have short- and long-term minor adverse effects on regional services. The BRAC Commission's recommendations would generate a net increase of 22,000 people in the workforce on Fort Belvoir. Most of these personnel already reside within a one-hour drive to Fort Belvoir. It is probable that some of the affected personnel would change their home residence within the ROI to improve their commute to Fort Belvoir, in particular moving to areas along the Northern Virginia I-95 corridor including Fairfax County, Prince William County, and Stafford County, and the city of Fredericksburg. This would increase the population in these jurisdictions and the demand for services such as police, fire, and medical care; schools; social services; and shopping facilities. In the short-term, services would be expected to decrease as population increased. Expansion of services would be necessary to maintain levels of service. However, the population increases because of the BRAC action would be minor relative to projected regional population growth. In addition, population changes would occur over a number of years. The BRAC action would not be fully implemented until 2011. Over time, services (police, fire, medical, schools, social services) would adapt to the demands of the increased population base, funded by new tax revenues. The number and type of shopping and service businesses and community support morale, welfare, and recreation facilities and services would be expected to increase with demand as they would be market driven.

ES.6.10 Aesthetics and Visual Resources

The BRAC actions would be expected to have a minor to moderate impact on the aesthetic and visual resources of Fort Belvoir. There would be some difference in the effects the four alternatives have on aesthetics, with the City Center having the least impact and the other three alternatives having similar slightly larger impacts.

Throughout its history and development, Fort Belvoir has strived to take advantage of the natural topography and vegetation of the area. For this reason, it has been able to preserve a relatively high amount of aesthetic value. Potential effects on the installation's aesthetic value depend on how proposed actions affect those signature areas of the installation having high aesthetic integrity. These areas include the traditional buildings of Fort Belvoir and the landscaping that takes advantage of natural features and mature hardwoods, which are found primarily on South Post and, to a lesser extent, on North Post; the undisturbed areas of Fort Belvoir found in the Southwest Area; the wildlife corridors on North Post and western EPG; the golf courses on North and South Post; and the many vistas of the Potomac. The four proposed alternatives differ slightly on how they affect these areas.

The City Center Alternative, which concentrates the majority of its actions on eastern EPG and the GSA Parcel, would have the fewest aesthetic effects because of the lack of major construction on either North or South Post. The eastern portion of EPG, especially the area inside of Heller Loop, has low aesthetic value because of training and testing activities that have occurred there over the years. This area also contains several abandoned structures that have progressed to an advanced state of dilapidation. Both the City Center Alternative and, to a lesser extent, the Preferred Alternative make use of this area. The Preferred, Town Center, and Satellite Campuses Alternatives all have a greater impact because of having developments on or near aesthetically sensitive areas of Main Post. The Preferred and Town Center Alternatives would have more effects as a result of the hospital campus being sited on the South Post golf course. The Town Center Alternative also would situate a large amount of development on North Post above U.S.

Route 1. Similarly, the Satellite Campuses Alternative places new structures in this area north of U.S. Route 1. Although it does not impact the South Post golf course, it would site buildings on the North Post golf course. Despite their slight differences, none of the proposed alternatives would have a significant effect on aesthetics and visual resources of the installation.

ES.6.11 Utilities

Long-term minor adverse and beneficial effects would be expected upon adopting any of the four alternative land use plans and implementing BRAC.

Different alternatives for implementing the BRAC action would have varying effects on existing utility systems, extent of upgrades, additions required to utility infrastructure, associated cost investment to implement the additions and time frame required to plan and implement them. In addition, the alternatives grade differently with respect to availability of additional capacity, on- and off-site improvements required, redundancy available for ensuring reliability of service and provision of centralized service.

Under the Preferred Alternative, most of the development would be centralized around EPG where existing utility services on EPG are close to nonexistent. However, the site is in close proximity to most utility systems. The BRAC action would require expansion to the publicly owned infrastructure as well as to some of the utility owned infrastructure.

For potable water and sanitary sewer, existing on-site utilities on EPG are currently largely inadequate to support the level of proposed development. New infrastructure would be needed on EPG for all on-site utility systems. However, the proposed BRAC facilities at EPG would require little if any improvements to off-site facilities, except for electricity and natural gas. Providing the required level of electricity at EPG would require substantial improvements to the existing off-site infrastructure. In addition, extending natural gas to EPG would require off-site improvements to existing infrastructure.

Consideration should also be given to the capacity constraints of the local utility network. Fort Belvoir purchases treatment capacity for potable water and sanitary sewer services from public utilities and currently is using only a portion of purchased capacity. However, the BRAC action demands would most likely consume all the purchased treatment capacity for both systems. There is adequate local capacity to provide natural gas for the proposed development at EPG, but some on- and off-post infrastructure improvements would be required. Providing electricity to meet the needs of BRAC tenants moving to EPG would require substantial on- and off-site upgrades, time, and investment.

Redundancy is a fundamental principal in the design of all utility systems. Unified facilities criteria (UFC) recommend certain reliability and redundancy strategies designed to minimize outages from all systems; strategies include multiple feeds, looped water systems, and quick disconnects at buildings. Mission-critical activities such as NGA could have power fed from independent Dominion transmission circuits with automatic switching in addition to standby generators to support life-support and critical-data functions. It would be imperative to identify and quantify the redundancy requirements of each tenant as soon as possible because these requirements would have substantial cost effects to the utility infrastructure. Redundancy ratings for the different alternatives are comparable with one another for most utility services.

The City Center and Satellite Campuses Alternatives would be ranked the lowest in terms of providing centralized service. The centralized service provision ratings for the Preferred Alternative and the Town Center Alternative are comparable because most facilities would be concentrated on either EPG or the South Post, respectively, under these two alternatives.

Municipal solid waste and construction and demolition debris collection and disposal are comparable for all the alternatives. The sites are in close proximity to one another. As such, their impact on available landfill capacity also would be similar for all considered alternatives.

ES.6.12 Hazardous Substances and Hazardous Materials

Long-term minor adverse effects would be anticipated for each alternative with respect to the construction and operations activities associated with a development project of this size. The construction activities would involve managing, storing, and generating hazardous substances and hazardous materials. In addition, long-term minor adverse effects would be anticipated with the addition of tenants would result in the additional managing, storing, and generating hazardous substances and hazardous materials.

Although not part of the proposed action, the predevelopment preparations requirements would have a long-term beneficial effect as the unexploded ordnance (UXO) and hazardous materials release sites are investigated and remediated, which would be beneficial to both human health and the environment. The most costly alternative for corrective action predevelopment activities would be the Satellite Campuses Alternative, largely due to the project sites being located in former training ranges with costly UXO clearance and removal. The least expensive would be the Preferred Alternative. In addition, corrective action for the Preferred Alternative could be completed on a faster track than the other alternatives. The estimates for the Town Center and Satellite Campuses Alternatives do not include costs of finding and obtaining swing space for current tenants to be relocated into while the program redevelops the Main Post. The costs and logistical requirement to execute these alternatives would also be substantial.

ES.6.13 Unavoidable Adverse Environmental Impacts

Implementing the Preferred Alternative would result in a variety of adverse environmental effects, as detailed in Sections 4.2 through 4.13. Some of the effects could be minimized, avoided, or compensated for through mitigation, but others would be unavoidable. The principal unavoidable adverse effects on the environment are the following.

- *Biological Resources.* Unavoidable loss of approximately 113 acres of natural habitat, including several stands of mature oak trees, to accommodate incoming BRAC actions in a manner that would best serve the military mission at Fort Belvoir.
- *Utilities.* Unavoidable generation of about 8,410 tons of construction and demolition debris from the proposed action, which would be disposed of in various landfill sites in the area.

ES.7 CUMULATIVE EFFECTS

In addition to the 20 projects identified in Section 2.2.2, the Army foresees there being another 32 projects at the installation. These 32 *non-BRAC* projects range from small scale projects involving only renovations of existing buildings to large projects involving the construction of

new sizeable structures. Chief among this latter category would be proposals such as the National Museum of the U.S. Army and associated Museum Support Center, the expansion of the Information Dominance Center, and a potential Army Reserve complex. Additional numerous smaller projects would occur on-post as new facilities or, in several instances, as renovations of existing facilities. Each of these projects would undergo or have already undergone their own NEPA compliance. The Army has identified 187 off-post, non-Army projects planned within 3 miles of Fort Belvoir. While many of these are small in scale and would have only a negligible effect on the environment as a whole, 20 projects are at least 25 acres in size. The following summarize principal conclusions with respect to potential cumulative impacts.

- *Land Use.* Negligible cumulative effects on land use would be expected from implementing non-BRAC projects at Fort Belvoir. In general, the on-post cumulative projects would be compatible with existing land use or those associated with the proposed alternatives for BRAC actions. Negligible adverse and beneficial long-term effects on land use would be expected with respect to off-post development. Cumulative effects to land use upon implementation of the Fairfax County Comprehensive Plan over the next 5 years would be negligible if all approved/programmed roadway improvements are realized.

- *Transportation.* On-post facilities projects, taken together, would be expected to have negligible effects on Fort Belvoir area traffic. Impacts on the transportation network associated with off-post projects would be mitigated through roadway improvements by the developers. The largest contributor to future impacts would be the proposed National Museum of the U.S. Army. This could be sited at either the North Post golf course or along Route 1, east of Pence Gate. At either location, additional road improvements would be required. To quantify the effects of the museum on the transportation system, trip generation and mode split would need to be developed for site traffic.

- *Air Quality.* The proposed cumulative projects would have minimal long-term adverse effects on the region's air quality. Other construction and development projects would occur within the National Capital Region (NCR), and each of the projects would produce some measurable amounts of air pollutants. The effects of all past, present, and reasonably foreseeable projects in the region and associated emissions are taken into account during the development of the State Implementation Plan (SIP). This includes all on- and off-post projects including National Museum of the U.S. Army. Estimated emissions generated by all the alternatives would conform to the SIP. Therefore, by definition, the net effects of the BRAC action at Fort Belvoir in addition to all other collectively identified cumulative projects would not contribute to significant adverse cumulative air quality effects.

- *Noise.* No long-term cumulative effects on noise would be expected. Implementing any of the alternatives would have negligible ongoing or cumulative effects on the noise environment because of construction or changes in traffic in or around the site. The construction activities associated with the BRAC alternatives would be temporary in nature, and the current noise environment would return after the projects' completion.

- *Geology and Soils.* Past, present, and reasonably foreseeable projects proposed for Fort Belvoir and the immediate vicinity could result in localized changes to topography and minimal effects on geology. Soils in the area would undergo short- and long-term to permanent impacts depending on the nature of the disturbance. Overall, the topography

of Fort Belvoir and the surrounding area would not change as a result of any of the BRAC-related projects in concert with previous or reasonably foreseeable actions. Soils throughout the EPG project area would undergo short- and long-term adverse cumulative effects. Urban and Cut and Fill soils have already been affected by development so in cases of redevelopment the impact to these soil types has already occurred. With native soils the effects related to construction would generally be minor and generally limited to the areas directly disturbed by those activities. The Museum of the U.S. Army, its Support Center, and the Fairfax County Parkway extension would all result in the permanent loss of the soil resource directly under the impervious surfaces. However, portions of these projects would occur on soils previously affected (Urban soils) and impacts to native soils would be localized. Off-post past, present and reasonably foreseeable projects would have similar types of impacts as those described for on-post projects, except over a broader scale. None of the projects considered in the cumulative impacts analysis are likely to contribute to a significant cumulative impact in terms of topography or geology. Likewise, assuming that regulatory requirements are followed, the soil resource should experience localized effects that would be both short- and long-term.

- *Water Resources.* Long-term minor adverse effects on water resources would be expected due to cumulative actions. Various other on-post and off-post proposed development projects in the vicinity of Fort Belvoir would potentially increase storm water runoff from paved surfaces and nonpoint source pollutants (e.g., sediment, nutrients, petroleum hydrocarbons) in the area. A cumulative effects analysis was conducted using Generalized Watershed Loading Model to estimate potential changes in average annual flow volume and pollutant loads as a result of the change in impervious surface area in each watershed. The model results indicate that increases in flow volume and nutrient loadings are not expected to be significant at the watershed scale. Appropriate required storm water management designs would be expected to minimize the adverse effects of increased storm water and nonpoint source pollutants, and additional measures that permit infiltration are recommended for implementation on a watershed basis to limit cumulative effects to waterbodies within these watersheds and receiving waters downstream.

- *Biological Resources.* Long-term moderate adverse cumulative effects would be expected. Cumulative natural resource effects of the proposed on-post non-BRAC projects such as the Army Museum would generally affect the central area of the North Post, the North Post golf course, and the South Post similarly under all the alternatives. On other areas of the Main Post, cumulative projects would have a similar level of effect under the Preferred Alternative and all other alternatives. Proposed on-post non-BRAC projects and off-post non-army projects would further diminish the availability of forest and field habitats on and off the installation, and increase the possibility of occurrences of invasive species, edge effects on habitats, and habitat fragmentation under the Preferred Alternative and all other alternatives.

- *Cultural Resources.* Long-term minor adverse and beneficial effects on cultural resources would be expected. Adverse visual effects on national, state, and county registered historic properties both on- and off-post would occur under each of the alternatives. These effects would be in addition to other modern developments that have already visually affected those properties. Increasing urbanization in the surrounding cities and counties, as exhibited by past and proposed future projects surrounding Fort

Belvoir and proposed developments on Fort Belvoir, would likely contribute to more visual effects on these historic properties. Although the adverse visual effects from the individual BRAC projects would be mitigated to a minor level of significance, the additional visual effects from the BRAC projects, when added to existing and future visual effects would have long-term minor adverse cumulative effects to these historic properties.

- *Socioeconomics (Economic Development).* Short- and long-term beneficial and adverse cumulative effects would be expected. The past action of the establishment and continued operation of Fort Belvoir continues to have positive effects on the local economy. The proposed realignment action would add to these beneficial economic effects by generating employment, income, and business sales in the ROI from construction and operation of the proposed new facilities. There are numerous other projects (in progress or planned for the future) on Fort Belvoir and in the ROI that could have short- and long-term effects on the local economy. On-post projects include (but are not limited to) the National Museum of the U.S. Army, Museum Support Center, a physical fitness center in the Troop Cantonment Area and on EPG, a South Post fitness facility, modernization of the marina, expansion of the Main Post library, a shoppette on the South Post, a Soldier Support Center, an addition to the MP Station, and replacement of the South Post Fire Station. Projects in the ROI include, but are not limited to, ongoing development of the Lorton Town Center, housing development in Laurel Hill and Lorton, reconstruction of the I-95/I-395/I-495 interchange, improvements to Route 1, plus numerous other residential and commercial developments and transportation projects. These proposed projects would have short- and long-term beneficial economic effects in terms of employment, income generation, and business sales. There would be short-term beneficial effects from the construction projects and long-term beneficial effects from the continued operation, maintenance, and use of the facilities, businesses, and houses. The backfilling of office space vacated by the agencies moving to Fort Belvoir could create a change in regional employment. Adverse cumulative effects would occur because of the overlapping time frames for construction activities of the Proposed Action and ongoing and future projects, with the adverse effects resulting from possible construction labor and material shortages.

- *Socioeconomics (Sociological Environment).* Long-term beneficial and adverse effects would be expected on police, fire, and medical services, schools, housing, family support and social services, shops, services, and recreation. Long-term beneficial effects would occur on on-post police and fire services and medical services. Adverse effects could occur to off-post police, fire, and social services based on population projections that indicate continued population growth for the ROI. Long-term adverse effects would be expected to occur on off-post schools. Long-term beneficial and significant adverse effects would be expected with respect to family support, shops, services, and recreation. Fort Belvoir's increased population would increase demand for shopping, service, and recreational facilities. Long-term significant adverse effects on Fort Belvoir's MWR recreation program would occur from the construction of the Army Museum and Museum Support Center. If the museum would be constructed on the North Post golf course site, Fort Belvoir would lose a portion of this golf course, in addition to the South Post golf course as the hospital is sited there under the Preferred Alternative. Fort Belvoir could lose about 60 percent of its golf course fairways, which would result in significant losses to the MWR NAF from lost revenue and undepreciated fixed assets.

Overall, the loss of these MWR programs and facilities would reduce the quality of life for Soldiers, retirees, and their families.

- *Aesthetic and Visual Resources.* Minor adverse and beneficial effects on aesthetic and visual resources would be expected. The proposed on-post project with the largest cumulative aesthetic effect, the National Museum of the U.S. Army, has two possible sites: the North Post golf course and the Pence Gate site on the eastern side of South Post. Each site placement would have a moderate effect on aesthetics because of the size of the proposed structures, although the golf course siting would have more of an effect because of the high aesthetic integrity of the current land use. Other major changes would occur along Abbott Road on the North Post, the northeast portion of North Post, and in the Southwest Area. The building of the Operations Security Evaluation Group Training Facility on the Southwest Area would have a moderate effect on the area because of the current forested conditions of the area, although it would be relatively secluded. The proposed Woodlawn Road replacement would have a moderate effect because of the high aesthetic integrity of the land it would pass through. Short-term adverse effects resulting from construction activities from cumulative projects would be expected to be similar to that of the Preferred Alternative. In general, the smaller buildings and additions would have a negligible adverse aesthetic change once construction is complete. The larger structures would have a more noticeable effect because of their size. Despite the large number of proposed off-post cumulative projects, there would not be a significant amount of aesthetic effects. The off-post portion of Fairfax County in the vicinity of Fort Belvoir, as a whole, has a large amount of development, which includes large areas of residential and commercial development along I-95 and Route 1. The existing development makes the addition of these cumulative projects result in a minor effect on the aesthetic integrity of this portion of Fairfax County.

- *Utilities.* Short- and long-term minor adverse cumulative effects would be expected. Implementing the Preferred Alternative would result in short-term disconnections and reconnections of all buried and aboveground utility systems during the construction phase on- and off-post as required. Activities resulting from the BRAC action and other on- and off-post development projects such as office buildings, shops, and housing complexes would result in additional building space requiring utility services, thus resulting in a cumulative increase in demand on the existing utility infrastructure. This would require existing private and public providers of utility services in the area to increase the quantity of utility services provided to meet the demand from users directly and indirectly associated with Fort Belvoir and its surroundings. These entities must review and revise the existing short- and long-term projections for providing adequate and reliable utility services for the area in the future. The Energy Policy Act of 2005 (Public Law 109-58—August 8, 2005) stipulates that energy consumption per gross square foot of the Federal Buildings in fiscal years 2006 through 20015 be reduced in comparison to the base year of 2003. The percentage reduction required in 2006 is 2 percent from the baseline consumption and 20 percent in 2015. This required reduction will mitigate some of the cumulative effects of the above on- and off-post construction. The Preferred Alternative, together with on-post construction and renovation projects planned in the near term at Fort Belvoir and off-post projects would generate additional quantities of construction and demolition debris (CDD) and result in cumulative reduction of the lifespans of local area landfill sites.

- *Hazardous Substances and Hazardous Materials.* Short- and long-term minor adverse cumulative effects would be expected. Short-term cumulative effects would be expected from the increased use of petroleum during construction. Construction would adhere to federal guidelines to minimize the risk of spills. Minor long-term adverse effects would be expected from the increase in generation of hazardous and solid waste generated as more people would work at Fort Belvoir and the surrounding area.

ES.8 MITIGATION SUMMARY

Mitigation measures for the four alternatives for implementing BRAC would be expected to reduce, avoid, or compensate for most adverse impacts. Mitigation does not include legal, regulatory, or policy-driven environmental protections and best management practices (BMPs) required to comply with federal and state laws, or Army and Fort Belvoir policies. These are already part of the Proposed Action. Only those resource areas for which mitigation has been determined to be appropriate are discussed below.

ES.8.1 Transportation

Mitigation for impacts to the transportation system could occur with respect to off-post transportation improvements and mass transit expansion. Also, the Army could designate a Transportation Demand Management Coordinator.

Traffic and Transportation. The EIS examines several transportation improvements for each of the BRAC action alternatives. The following summarizes these improvements (shown in comparative format at Table 4.3-41.

- *Preferred Alternative.* Fourteen actions, costing an estimated $458 million, are identified.

- *Town Center Alternative.* Fifteen actions, costing an estimated $732 million, are identified.

- *City Center Alternative.* Fourteen actions, costing an estimated $471 million, are identified.

- *Satellite Campuses Alternative.* Fifteen actions, costing an estimated $742 million, are identified.

Mass Transit. Bus service of a high enough quality to realize a 5 to 10 percent mode share for transit could complement the road network mitigation actions and help to reduce congestion and limit vehicle delays. The EIS identifies five basic bus service areas, then proposes and examines general routes and service concepts to achieve 5 or 10 percent mode share. For all the alternatives, a 5 percent mode split would reduce by 360 the number of vehicles entering the post during peak hour. A 10 percent mode split would reduce by 725 the number of vehicles entering the post during peak hour.

Transportation Demand Management Coordinator (TDMC). To help alleviate traffic congestion, the Army could appoint a TDMC. The TDMC would be knowledgeable of principles, practices, and methods of transportation demand management. These would include, but not be limited to, employee rideshare and commute programs; current regional programs

regarding air quality and transportation; employer trip reduction requirements; marketing, promotion, and event planning practices; and parking management practices. The TDMC's principal function would be to develop and manage a transportation management plan focused on measures to reduce the number of single-occupancy vehicles. Appointing a TDMC before fiscal year 2009 would allow development of transportation program initiatives before BRAC relocation of personnel.

ES.8.2 Air Quality

Mitigation with respect to air quality would be required with the implementation of the City Center Alternative. Under the nonattainment new source review permitting requirements, oxides of nitrogen emission offsets at a ratio of 1:1.15 would have to be located and obtained for all stationary sources sited on EPG. Emission offsets are generally unavailable in this region and could be extremely expensive if they could be obtained at all.

ES.8.3 Water Resources

Depending on the alternative selected for implementation of BRAC, up to nine subwatersheds at the post would be expected to have increases of more than 10 percent in 1-year or 10-year storm event peak discharges. A potential mitigation measure would be to develop a storm water drainage system master plan study. This study would identify current deficiencies (e.g. capacity problems, outfall problems, stream bank erosion) and determine infrastructure needs to meet BRAC requirements and long-term growth.

ES.8.4 Other Resources

No specific mitigation measures are identified for affected resources. In general, actions with respect to affected resources are protected by a variety of BMPs that preserve and conserve the resources. For example, a permit would be required under the Virginia Pollutant Discharge Elimination System program for a construction project disturbing at least 2,500 square feet; as part of the permit process, the Army would have to prepare a soil erosion and sediment control plan and storm water pollution prevention plan to guide sedimentation reduction during the construction process. BMPs typically are an inherent part of project design and implementation, and their funding is included in general project costs.

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SECTION 1.0
PURPOSE, NEED, AND SCOPE

1.1 INTRODUCTION

This environmental impact statement (EIS) evaluates the potential environmental and socioeconomic impacts of two proposals at Fort Belvoir: update of the land use plan of the post's real property master plan (RPMP), and implementation of base realignment.

Fort Belvoir established its RPMP in 1993 and amended it in 2002. In light of substantial changes at the post that would occur due to the proposed base realignment activities, the land use plan needs to be updated.

On September 8, 2005, the Defense Base Closure and Realignment Commission (*BRAC Commission*) recommended numerous realignment and closure actions for domestic military installations. President Bush concurred with the 2005 BRAC Commission's report and sent it to Congress on September 15, 2005. On November 9, 2005, the recommendations became law and now must be implemented as provided for in the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), as amended. Consistent with the law, the BRAC actions at Fort Belvoir must be initiated by no later than September 15, 2007, and completed by no later than September 15, 2011. The BRAC Commission's recommendations will generate a net increase of 22,000 people in the workforce on Fort Belvoir.

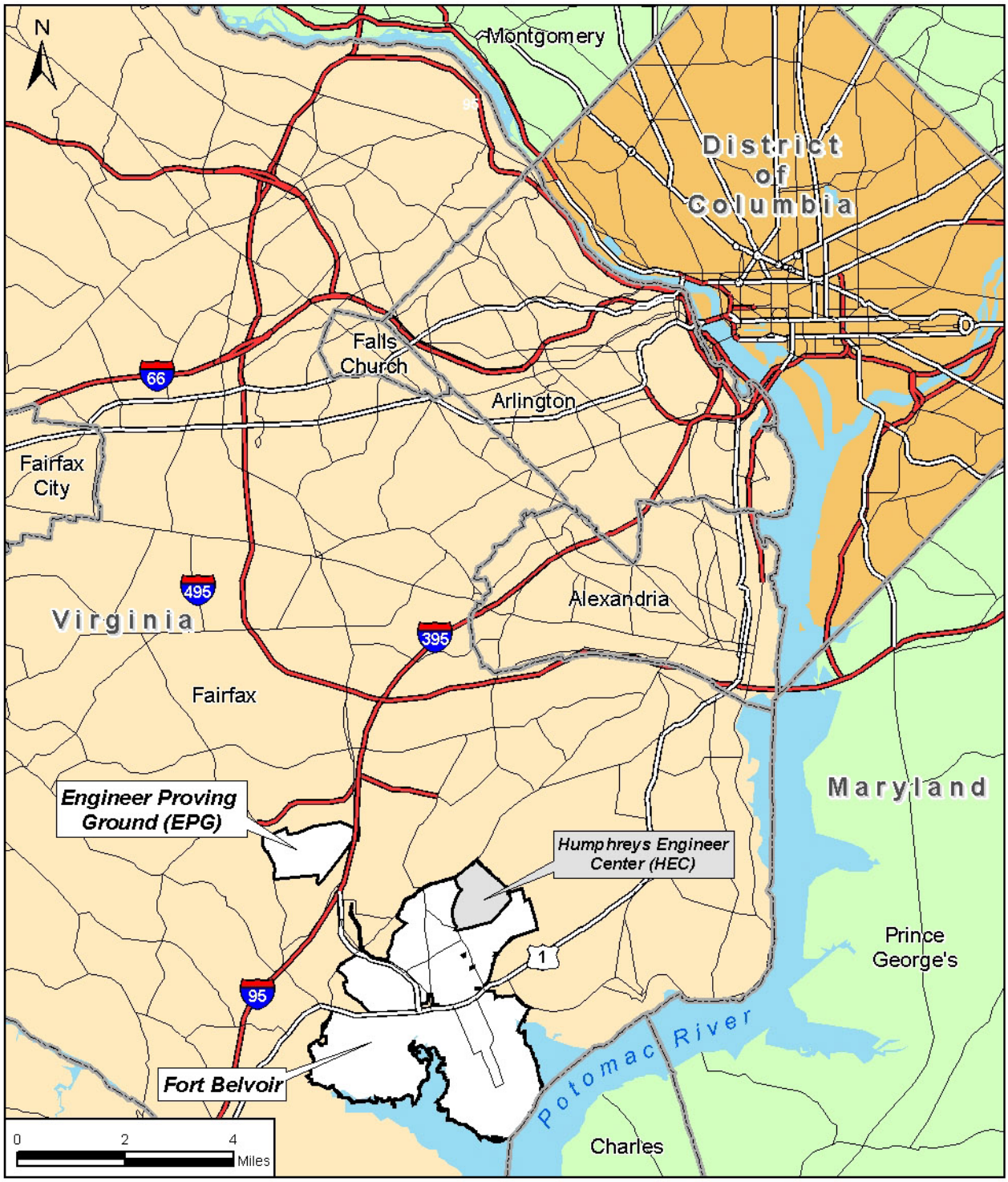
Fort Belvoir is located approximately 15 miles south of Washington, DC (Figure 1-1). The installation is the host for one major command headquarters (Army Materiel Command), two Direct Reporting Unit headquarters (U.S. Army Intelligence and Security Command and U.S. Army Criminal Investigation Command), and more than 100 other elements of the Army, Department of Defense (DoD), and Intelligence Community, including the Defense Logistics Agency headquarters, Army Management Staff College, Defense Acquisition University, and the National Geospatial-Intelligence Agency College.

1.2 PURPOSE AND NEED

The proposed actions are to provide an updated land use plan and to implement the BRAC Commission's recommendations pertaining to Fort Belvoir. The following identifies the purpose of and need for the Army's two proposals.

Land use plan update. The purpose of the proposed action with respect to the land use plan is to obtain a revised land use plan for allocation of functions and facilities at the post. Fort Belvoir requires a revised land use plan that will enable sound use of physical and natural resources at the post with respect to both current and future land use requirements. Master planning is required by Army Regulation (AR) 210-20, *Real Property Master Planning for Army Installations*.

BRAC implementation. The purpose of the proposed action with respect to BRAC is to realign functions as directed by the BRAC Commission's recommendations for Fort Belvoir. The need for the proposed action is to advance the goals of transformation by improving military capabilities and thereby enhancing military value. The following discusses major initiatives that contribute to and underlie the Army's need for the proposed action.



LEGEND

- Installation Boundary
- HEC Boundary
- County Boundary
- Interstate Highway
- US Highway

Source: Fort Belvoir GIS, 2006.

Installation Location

Fort Belvoir, Virginia

Figure 1-1

- *Base Realignment and Closure.* In previous rounds of BRAC, the explicit goal was to save money and downsize the military. In the 2005 BRAC round, DoD sought to reorganize its installation infrastructure to support its forces most efficiently, increase operational readiness, facilitate new ways of doing business, and improve force protection. Thus, BRAC represents more than cost savings. It supports advancing the goals of transformation, improving military capabilities, and enhancing the military value of its installations. The Army must carry out the BRAC recommendations at Fort Belvoir to achieve these improvements and to comply with BRAC law.
- *Installation Sustainability.* On October 1, 2004, the Secretary of the Army and the Chief of Staff issued *The Army Strategy for the Environment*. This strategy 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.

1.3 SCOPE

This EIS identifies, documents, and evaluates environmental effects of land use plan update and realignment activities at Fort Belvoir in accordance with the National Environmental Policy Act of 1969 (NEPA) and implementing regulations issued by the President's Council on Environmental Quality (CEQ) and the Army.[1] The purpose of the EIS is to inform decisionmakers and the public of the likely environmental consequences of the proposed action and alternatives. The range of actions, alternatives, and impacts considered in this EIS are intertwined with the requirements for BRAC analysis. As further described in the EIS, the scope pertains to the geographic areas potentially affected by the realignment activities at Fort Belvoir as well as the area of potential environmental effects, which varies by resource.

The Defense Base Closure and Realignment Act of 1990 ("BRAC Law") specifies that NEPA does not apply to actions of the President, the Commission, or the Department of Defense, except "(i) during the process of property disposal, and (ii) during the process of relocating functions from a military installation being closed or realigned to another military installation after the receiving installation has been selected but before the functions are relocated" (Sec. 2905(c)(2)(A), Public Law 101-510, as amended). The law further specifies that in applying the provisions of NEPA to the process, the Secretary of Defense and the secretaries of the military departments concerned do not have to consider "(i) the need for closing or realigning the military installation which has been recommended for closure or realignment by the Commission, (ii) the need for transferring functions to any military installation which has been selected as the receiving installation, or (iii) military installations alternative to those recommended or selected" (Sec. 2905(c)(2)(B)). The Commission's deliberation and decision, as well as the need for closing or realigning a military installation, are exempt from NEPA. Accordingly, this EIS does not address the need for realignment.

Army policy calls for the environmental analysis to be proportionate to the nature and scope of the action, the complexity and level of anticipated effects on important resources, and the

[1] *Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, Title 40 of the Code of Federal Regulations (CFR) Parts 1500–1508, and *Environmental Analysis of Army Actions*, 32 CFR Part 651.

capacity of Army decisions to influence those effects in a productive, meaningful way from the standpoint of environmental quality.[2] The environmental analysis for this EIS is commensurate with the planning horizon and diverse array of actions associated with realignment at Fort Belvoir. The project site for the Army's proposed actions includes Fort Belvoir's Main Post (7,836 acres) and the Engineer Proving Ground (EPG) (807 acres).[3] Figure 1-2 provides a site map of Fort Belvoir. The region of influence (ROI) for each of the environmental and socioeconomic resource areas discussed in this EIS varies, depending on their nature and relationship to the project site. The transportation and socioeconomics resource areas have the largest ROIs, as shown in Figure 1-3.

The land use plan proposed in this EIS represents the first step in Fort Belvoir's ongoing efforts to revise its RPMP. Work on the revision is expected to take approximately 2 years, with completion of the effort projected to occur in 2008. The BRAC statutory deadline constrains the Army to complete environmental analysis of construction requirements not later than in mid-2007 in order to allow sufficient time for planning, design, construction, commissioning, and occupancy of facilities required for units, agencies, and activities relocating to Fort Belvoir. The schedule for BRAC requirements renders the RPMP completion not ripe for consideration in this EIS. Accordingly, the Army will perform separate environmental impacts analysis for the remainder of its RPMP revision.

Analysis of environmental impacts of the proposed action extends from the present to 2015. This timeframe captures reasonably foreseeable actions that might contribute to cumulative impacts associated with the proposed actions. Impacts beyond 2015 are not evaluated because their occurrence is too uncertain and their prediction would be speculative.

1.4 PUBLIC INVOLVEMENT

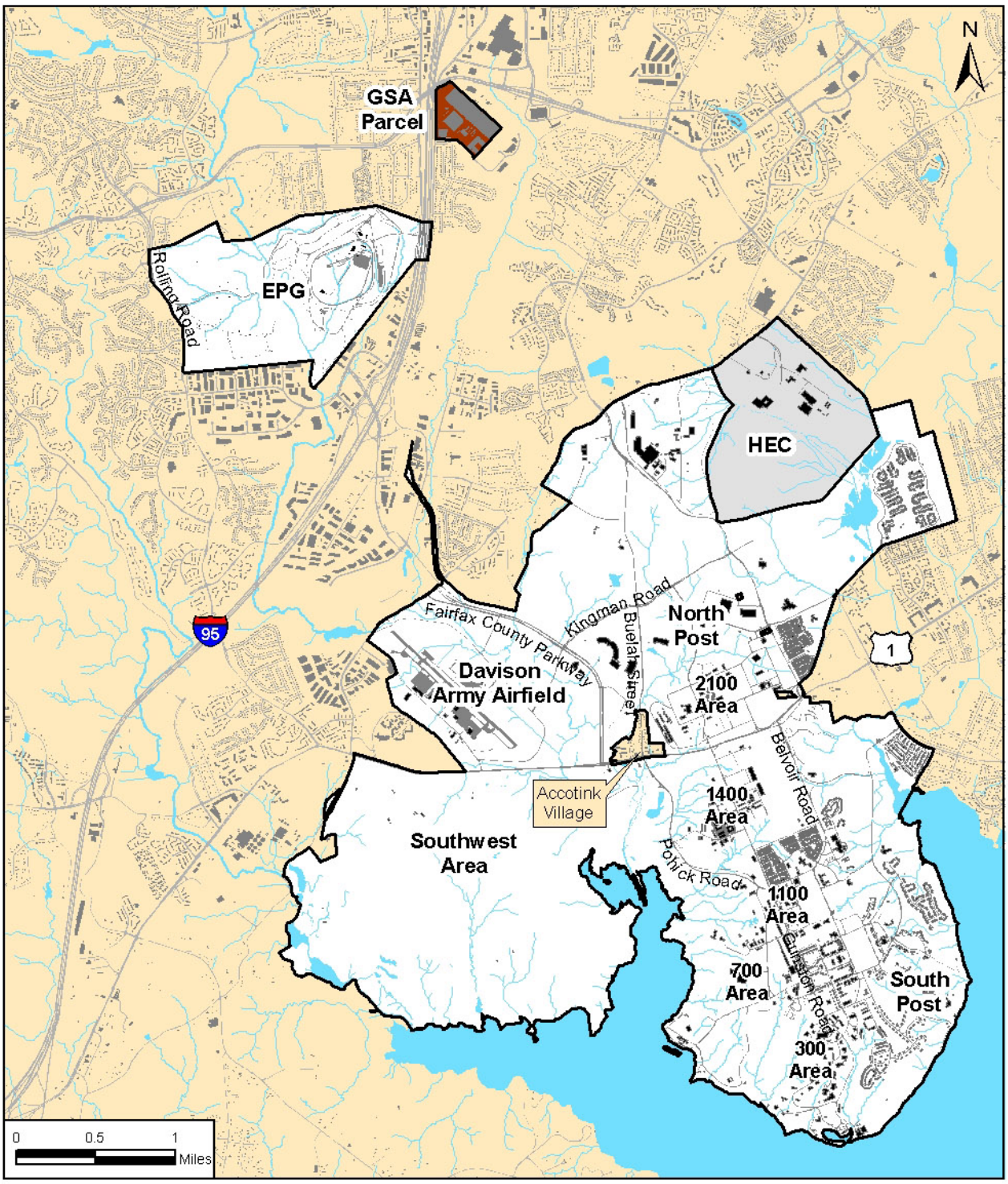
1.4.1 NEPA Public Involvement Process

The evaluation of potential environmental effects of federal actions is open to the public. Public participation in the NEPA process promotes both open communications between the public and the Army and better decisionmaking. All persons and organizations that have a potential interest in the proposed action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate in the NEPA environmental analysis process.

Public participation opportunities with respect to the proposed action are guided by CEQ regulations and Army regulation. The regulations provide for five major aspects of public participation available in conjunction with preparation of this EIS: (1) notice of intent (NOI), (2) scoping, (3) 60-day public review of the draft EIS, (4) public hearing on the draft EIS, and (5) 30-day publication of the final EIS prior to issuance of the record of decision. In addition to these steps, a public information meeting was held following the scoping meeting and prior to the public hearing on the draft EIS. Each of these steps in the process provides for public involvement and is briefly discussed below. Throughout this process, the public may obtain information on the status and progress of the proposed action and the EIS through Fort Belvoir's Directorate of Public Affairs Office (PAO) by calling 703-805-5001.

[2] 32 CFR 651.5

[3] Congress has authorized the Army to convey 170 acres of the EPG to Fairfax County, Virginia for the Fairfax County Parkway and another 11.45 acres to the Commonwealth of Virginia, a parcel for which the Army previously granted an easement related to construction of Interstate 95 (Section 2836, National Defense Authorization Act for Fiscal Year 2002, Pub. L. 107-107).



LEGEND

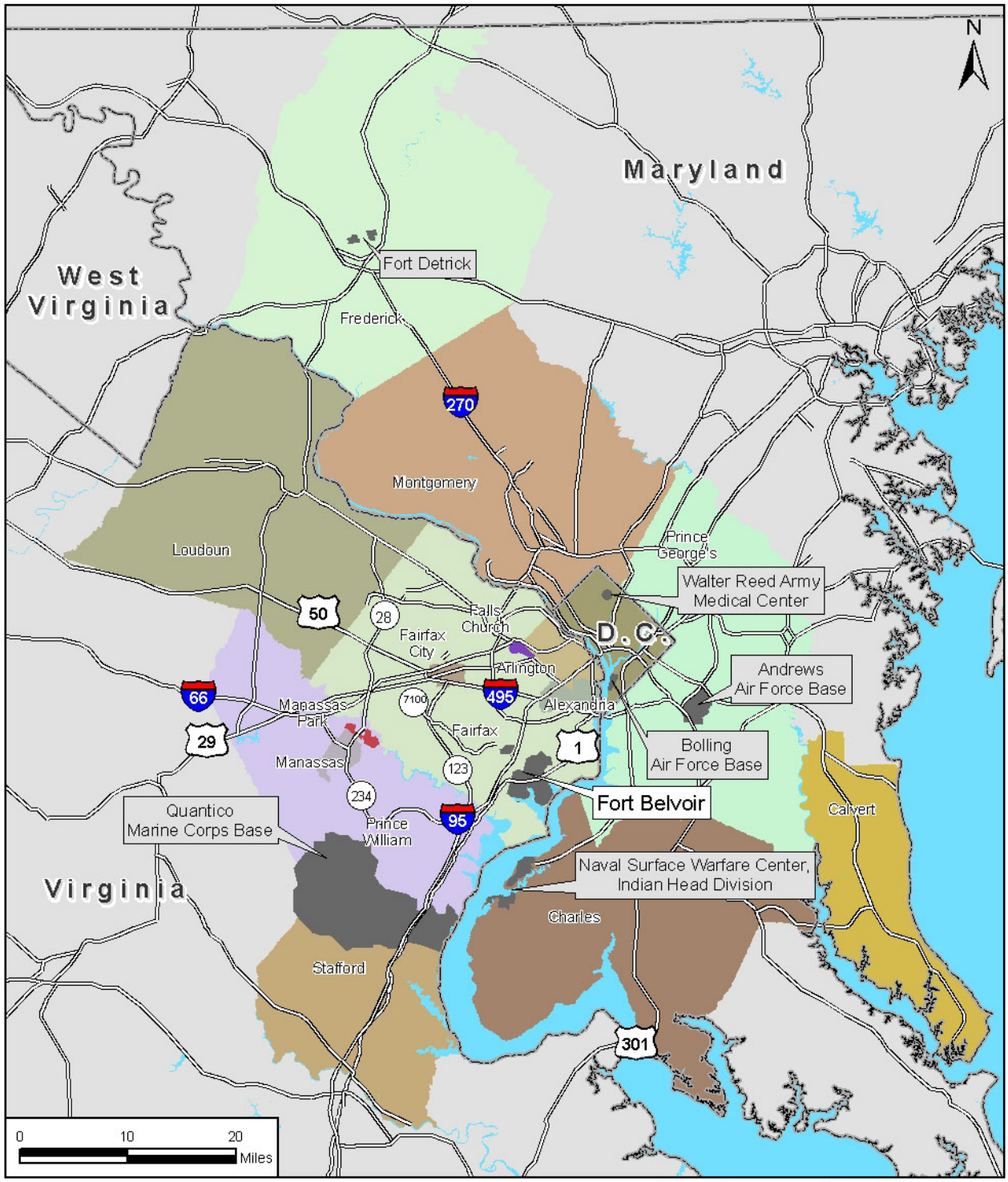
- Installation Property
- GSA Parcel
- HEC (Area not included within the scope of this EIS)

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Site Map

Fort Belvoir, Virginia

Figure 1-2



Region of Influence

Fort Belvoir, Virginia

Figure 1-3

Additionally, interested persons seeking more information about the BRAC NEPA process for Fort Belvoir may visit the Web site http://www.belvoirbrac-eis.net.

1.4.2 Notice of Intent

The NOI informing the public of the preparation of an EIS is the first formal step in the NEPA public involvement process. The notice is published in the *Federal Register* before the start of the scoping process by the agency proposing the action. The NOI includes a description of the proposed action and gives the name and address of an agency contact person. The NOI declaring the Army's intent to prepare an EIS for realignment of Fort Belvoir was published in the *Federal Register* on November 23, 2005. The NOI is provided in Appendix A.

1.4.3 Scoping Process

The purpose of scoping is to solicit public comment on issues or concerns that should be addressed in the EIS. Public comments are solicited through mailings, media advertisements, and both agency and public scoping meetings. While informal comments are welcome at any time throughout the process, the scoping period and the scoping meeting provide formal opportunities for public participation in and comment on the environmental impact analysis process.

The Army held a public scoping meeting on June 7, 2006, at the Hilton Springfield Hotel on Loisdale Road in Springfield, Virginia, from 7:00 pm to 9:30 pm. More than 100 members of the public, including representatives from agencies and the press, attended the public scoping meeting. The Army provided public notice of the meeting in the *Washington Post* on May 28, 2006; *Mount Vernon Gazette* on May 25 and June 1, 2006; *Springfield Times* on June 1, 2006; and *Fort Belvoir News* on June 1, 2006. Using a mailing list compiled by Fort Belvoir, agency and public scoping letters were mailed on May 17, 2006, to about 190 individuals, organizations, tribes, and federal, state, and local agencies to inform them of the proposed action, solicit their input concerning issues that should be addressed in the EIS, and invite them to attend the public scoping meeting. Recipients of the mailing were invited to send written comments to the Fort Belvoir Directorate of Public Works (DPW) no later than July 2, 2006, or to submit written or oral comments at the public scoping meeting.

In addition to the public scoping meeting, the Army reserved a time to meet with agency officials to discuss the scope of the EIS. This meeting was conducted on June 7, before the public scoping meeting, at the Hilton Springfield Hotel at 1:30 pm. About 30 people representing approximately 15 federal, state, and local agencies attended the meeting.

Agency coordination letters and responses and the Scope of Statement scoping report are provided in Appendix B.

The following comments provided by the public and agencies are within the scope of the EIS:[4]

[4] Some comments urged a particular outcome concerning the proposed action, while others were redundant or dealt with matters deemed out of scope. All comments are contained in the *Scope of Statement Report*, available through http://www.belvoirbrac-eis.net.

Socioeconomics

- Need to know the potential impact on local schools and their capacity to accommodate the number of incoming students, both during the construction phase and after military and civilian personnel move to the post.

- Need to accurately estimate the number of school-aged children who will be coming to the Fort Belvoir area as a result of BRAC 2005.

- Local communities will not have a sufficient tax base for hiring teachers and creating additional space to accommodate the influx of students.

- Examine the real commuter, road, and air quality impacts; include the precise number of contractors serving DoD entities to be relocated and the dollar figures of contracts under which these contractors perform.

- Include precise numbers of bedrooms in the proposed housing to plan the precise number of children who will attend Fairfax County Public Schools.

Cultural resources

- Request that the Army continue to consult with the Virginia Department of Historic Resources (VDHR) on the impact that the BRAC actions will have on historic properties and archaeological sites at Fort Belvoir.

- Request that construction within sight of the Friends Meetinghouse at Woodlawn be screened from view.

- Request that Woodlawn Gate be closed and access to the Meetinghouse at Woodlawn from U.S. Route 1 be restored.

Traffic and transportation

- Need to know the potential impact on local transportation, especially the increased congestion on I-495 and I-95.

- Need to expand and improve public transportation regionally to accommodate the increase in population in the area.

- Consider the numerous additional private contractors that will be required to relocate to the immediate vicinity of Fort Belvoir.

- The Army should consider both direct and indirect transportation effects of the proposed BRAC action at Fort Belvoir, along with mitigation measures.

- Any serious analysis of the long-term Fort Belvoir transportation needs must consider more than just the final segment of the Fairfax County Parkway and the I-95 fourth lane.

- Need to consider electric bus or light rail systems for employees who commute and visitors to Fort Belvoir to minimize disruption to surrounding communities, traffic, noise, and air pollution.

- Need for better data on the number of current and future commuters coming from each ZIP Code area.

- A grade-separated intersection needs to be constructed for the Fairfax County Parkway and the street that provides access to Greenspring Village to the north and to the residential development to the south.

- Incorporate "demand management" of traffic.

- Build links to mass transit at Springfield and Huntington Metro.

- Need to evaluate the density of the project and the adequacy of infrastructure to support development; rail extension, more road construction, etc.

- Need to study the BRAC impacts on the George Washington (GW) Parkway and the GW Memorial Highway.

- Do not include the replacement of the Woodlawn Road project in the BRAC EIS.

- Request that the Army coordinate with the Virginia Railway Express (VRE) on any proposals to mitigate BRAC impacts that rely on increased use of VRE.

- The alternatives should identify approaches and mitigation that promote transportation mobility, accessibility and multi-modal transportation choices, minimizes single-occupant vehicle use and encourages transit use.

- The Metropolitan Washington Council of Government's (MWCOG) Traffic model is not appropriately scaled for use in this analysis

Land use

- The hospital should not be located at EPG because it is too difficult to find.

- Need to design development projects to minimize impacts on natural resources.

- Need to consider constructing all buildings in accordance with principles of sustainable development, including building parking areas to minimize runoff and impermeable surfaces, using green roofing and solar power, and recycling of grey water.

- Recommend conducting any in-stream activities during low- or no-flow conditions, using non-erodible cofferdams to isolate the construction area, blocking no more than 50 percent of the streamflow at any time, stockpiling excavated material in a manner that prevents reentry into the stream, restoring original streambed and streambank contours, revegetating barren areas with native vegetation, and implementing strict erosion and sediment control measures.

- Ensure that all, or at least part of, the development is Low Impact Development. Use any unoccupied buildings for expansion instead of building new structures if they are not needed.

- Request for the continued accommodation of the Mount Vernon High School Crew Team on-base.

- Request that, due to noise issues, the National Army Museum not be located near the Friends Meetinghouse at Woodlawn, that its proposed location be moved to EPG.

- Suggest use of parking garages instead of parking lots to minimize footprint.

- Eliminate free employee parking.

Natural resources

- Need to consider relocating stream channels rather than filling or channelizing.

- Need to maintain undisturbed wooded buffers of at least 100 feet in width around all on-site wetlands and on both sides of all perennial streams.

- Consider not using storm water management ponds or in-stream storm water management ponds for mitigation of wetland impacts.

- Suggest designing storm water controls to replicate and maintain the hydrographic condition of the site prior to construction.

- Consider the use of Low Impact Development practices such as bioretention areas and grass swales.

- Consider building parking decks instead of parking lots because of environmental impact studies that have been done that show the ways in which parking lots affect wetlands and runoff.

- Include a wildlife corridor at all costs to conserve what wildlife there is on and near the installation.

- Preserve wetlands to prevent damage to the river system and to preserve endangered and threatened species.

- Consider construction of stream crossings using clear-span bridges rather than culverts if possible. If not, recommend countersinking culverts below the streambed at least 6 inches, or use bottomless culverts to allow passage of aquatic organisms.

- EIS should identify all 100-year floodplains and Resource Protection Areas.

- Fort Belvoir should participate in ongoing watershed planning efforts.

- Concern with potential intensification of development in the southwest area.

- Consider installing floodplain culverts to carry bankfull discharges.
- EIS should analyze the use of Leadership in Energy and Environmental Design (LEED) certifications for all buildings and site development.
- Use green roofs.
- Evaluate all alternatives for how, and how effectively, they can achieve the compact, mixed use, pedestrian-friendly, sustainable and connected urban designs that represent a significant component of the "Belvoir New Vision Goals."
- It is essential to commit to avoidance of impacts to tidal and nontidal wetlands.
- Fort Belvoir needs to honor prior agreements concerning environmental quality corridors.
- The Accotink Bay Wildlife Refuge should not be subject to secondary development.
- The western edge of the EPG should preserve a treed buffer to screen it from the parkway.

Other

- Conduct new baseline studies that reflect the cumulative effects of the non-BRAC projects that have occurred since the 1994 master plan, including the Defense Threat Reduction Agency (DTRA), Residential Communities Initiative (RCI), Defense Logistics Agency (DLA), etc. for air quality, water quality, open space, traffic counts, child attendance in local schools.
- The EIS should include information on risk and threat assessments sufficient to identify and evaluate appropriate security measures.
- EIS should address potential need for additional utilities.

1.4.4 Public Information Meeting

The Army held a public information meeting on January 24, 2007, at the Hilton Springfield Hotel on Loisdale Road in Springfield, Virginia, from 7:00 pm to 9:30 pm. Members of the public, including representatives from agencies and the press, attended the public information meeting. The Army provided public notice of the meeting using means similar to the public scoping meeting described in Section 1.4.3. In addition, meeting announcement letters were sent to a mailing list of 1,700 interested agencies and citizens compiled by the Army's Fort Belvoir master planning team. The purpose of the meeting was to provide the public with the most current and available information regarding the progress of the EIS and to provide an open forum for discussion among members of the public and the Army about topics specific to this EIS.

1.4.5 Public Review of the Draft EIS

The Army will make a draft EIS available for public review and comment, publish a notice of availability (NOA) of the draft EIS in the *Federal Register*, and send copies of the draft EIS to federal, state, and local agencies, as well as people who requested copies. In addition, the Army

will provide copies of the draft EIS to local libraries in the vicinity of Fort Belvoir. Agencies, organizations, and individuals will be invited to review and comment on the document. Following EPA publication of the NOA, the draft EIS will be available for a period of 60 days for public review of the proposed action, the alternatives, and the adequacy of the statement.

1.4.6 Public Hearing

The Army will hold a public hearing to receive comments on the draft EIS during the 60-day review period. The Army will advertise the time and place of the meeting in local newspapers.

1.4.7 Final EIS

As provided for in CEQ regulations, the Army will consider all comments provided by the public and agencies on the draft EIS. The final EIS will incorporate changes suggested by the comments on the draft EIS, as appropriate, and will contain responses to all comments received during the review period. The Army will mail copies of the final EIS to various federal, state, and local agencies, and will place copies in local libraries.

1.4.8 Record of Decision

No earlier than 30 days following publication of the final EIS, the Army will publish a record of decision (ROD) that will provide a discussion of all alternatives and the factors the Army considered in making its decision. The ROD will also identify or incorporate by reference mitigation measures. Upon signature of the ROD, the proposed action can proceed. Notice of the approved ROD will be published in the *Federal Register*.

1.5 IMPACT ANALYSIS PERFORMED

The EIS is structured to facilitate review in a logical manner. An interdisciplinary team of environmental scientists, biologists, planners, economists, engineers, archaeologists, historians, and military technicians has analyzed the proposed action and alternatives in light of existing conditions and has identified relevant beneficial and adverse effects associated with the action. The proposed action is described in Section 2.0, and alternatives, including the No Action Alternative, are described in Section 3.0. Conditions existing as of 2005, considered to be the baseline conditions, are described in Section 4.0, Affected Environment and Environmental Consequences. The expected effects of the proposed action, also described in Section 4.0, are presented immediately following the description of baseline conditions for each environmental resource addressed in the EIS. Mitigation actions are identified for each aspect of the proposed actions, as appropriate. Section 5.0 addresses the potential for cumulative effects.

Resources and environmental conditions addressed in this EIS include land use, air quality, noise, transportation, utilities, water resources, geology, infrastructure, hazardous and toxic materials, biological resources and ecosystems, cultural resources, visual resources, and socioeconomic resources.

1.6 REGULATORY FRAMEWORK

This section introduces discussion of pertinent laws and regulations that apply to the Army's proposed actions.

1.6.1 BRAC Procedural Requirements

As noted in Section 1.3, the BRAC Law specifically addresses the applicability of NEPA to BRAC actions, the congressional waiver of the procedural elements of NEPA to the actions of DoD and the BRAC Commission in recommending bases for closure and realignment, and to the actions of the President in approving or disapproving the BRAC Commission's recommendations. The BRAC Commission procedures for identifying affected installations and bases are specified by this law and include the DoD Force Structure Plan, selection criteria (published in the *Federal Register* for public comment and described below), DoD recommendations, review and recommendations by the BRAC Commission, and review by the President. The BRAC Commission assessed the DoD's closure and realignment recommendations for consistency with the eight statutory selection criteria (see Table 1-1) and the DoD Force Structure Plan.

Table 1-1
BRAC statutory selection criteria

Military value (given priority consideration)
1. The current and future mission capabilities and the impact on operational readiness of the total force of the DoD, including the impact on joint warfighting, training, and readiness.
2. The availability and condition of land, facilities, and associated airspace (including training areas suitable for maneuver by ground, naval, or air forces throughout a diversity of climate and terrain areas and staging areas for the use of the Armed Forces in homeland defense missions) at both existing and potential receiving locations.
3. The ability to accommodate contingency, mobilization, surge, and future total force requirements at both existing and potential receiving locations to support operations and training.
4. The cost of operations and the manpower implications.
Other considerations
5. The extent and timing of potential costs and savings, including the number of years, beginning with the date of completion of the closure or realignment, for the savings to exceed the costs.
6. The economic impact on existing communities in the vicinity of military installations.
7. The ability of the infrastructure of both the existing and potential receiving communities to support forces, missions, and personnel.
8. The environmental impact, including the impact of costs related to potential environmental restoration, waste management, and environmental compliance.

Source: BRAC Commission, 2005.

Additionally, the BRAC Law requires that all closures and realignments must be initiated no later than 2 years after the date on which the President transmits a report to Congress including the recommendations for closures and realignments (Sec. 2904 (a)(3) Pub. L. 101-510, as amended) and complete all such closures and realignments no later than the end of the 6-year period beginning on the same date (Sec. 2904(a)(4), Pub. L. 101-510, as amended). President Bush concurred with and sent the 2005 BRAC Commission's report

to Congress on September 15, 2005. Therefore, the BRAC actions at Fort Belvoir must be initiated no later than September 15, 2007, and completed no later than September 15, 2011.

1.6.2 Enhanced Use Leasing

Enhanced use leasing (EUL), authorized in 10 United States Code (U.S.C.) 2667, allows the Army to leverage private-sector expertise and financial resources to obtain maximum value from land and buildings. The EUL program enables the Army to enter into leases that result in benefits to both the Army and the private sector. Under that law, the Army can do the following:

- Lease available non-excess real property to the private sector.
- Receive cash or in-kind services, equal to no less than fair market value of the property, while retaining ownership of the property.
- Apply at least 50 percent of cash payments to the installation from which the proceeds were derived.
- Accept in-kind consideration for any property or facility under Army control, not just the installation where the leased property is located.

Potential uses for EUL include office space, warehouse and industrial buildings, laboratories and research and development facilities, energy cogeneration plants, test tracks, and hotels, temporary lodging, and conference centers. In-kind or cash consideration received by the Army is available for a variety of base operating support functions, including construction or acquisition of new facilities; alteration, repair, and improvement of real property; lease of facilities for Army use; and facilities operation support.

The Army is actively pursuing a variety of EUL projects at several installations. Future projects can be expected to occur at Fort Belvoir, but the details of those projects are not currently known with sufficient detail to enable analysis of their potential environmental and socioeconomic effects. As specific EUL proposals for Fort Belvoir arise the Army will evaluate their potential environmental effects under NEPA.

1.6.3 Defense Access Roads Program

The Defense Access Roads (DAR) program, authorized in 23 U.S.C. 210, provides a means by which the federal government may pay its fair share of the cost of highway improvements needed for adequate highway service to defense and defense-related installations. Administered jointly with the Federal Highway Administration (FHWA), the DAR program provides a means for DoD to work with state and local authorities who execute the projects. Funding for DAR projects is obtained through Military Construction Programs funds appropriated by Congress.

To initiate a DAR project, the Army would identify the access or mobility needs and bring these deficiencies to the attention of the Surface Deployment and Distribution Command (SDDC). In turn, SDDC would prepare a needs evaluation or request the FHWA to make an evaluation, in accordance with 23 CFR Part 660E (*Defense Access Roads*), for improvements that are necessary, develop a cost estimate, and determine the scope of work. The SDDC determines if the project is eligible for DAR funds and certifies the road as important to the national defense. The Army would request funding for the project through its normal budgeting process. Once the funds are provided by Congress, they are transferred to the FHWA and allocated to the agency administering the project.

1.6.4 Relevant Statutes and Executive Orders

A decision on whether to proceed with the proposed action rests on numerous factors such as mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations, the Army is guided by relevant statutes (and their implementing regulations) and Executive Orders (EO) that establish standards and provide guidance on environmental and natural resources management and planning. Relevant statutes include the following:

- Clean Air Act
- Clean Water Act
- Noise Control Act
- Endangered Species Act
- National Historic Preservation Act
- Archaeological Resources Protection Act
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Energy Policy Act of 2005
- Coastal Zone Management Act
- Sikes Act
- Toxic Substances Control Act

EOs bearing on the proposed action include the following:

- EO 11988 (*Floodplain Management*)
- EO 11990 (*Protection of Wetlands*)
- EO 12088 (*Federal Compliance with Pollution Control Standards*)
- EO 12580 (*Superfund Implementation*)
- EO 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*)
- EO 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*)
- EO 13175 (*Consultation and Coordination with Indian Tribal Governments*)
- EO 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*)
- EO 13423 (*Strengthening Federal Environmental, Energy, and Transportation Management*

These authorities are addressed in various sections throughout this EIS when relevant to particular environmental resources and conditions. The full text of the laws, regulations, and EOs is available on the Defense Environmental Network & Information Exchange Web site at http://www.denix.osd.mil.

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SECTION 2.0
PROPOSED ACTION

2.1 INTRODUCTION

The Army proposes to update Fort Belvoir's land use plan and to implement the BRAC Commission's recommendations. The BRAC realignment actions would involve constructing and renovating facilities and, consistent with the BRAC law, relocating units, agencies, and activities to the post by September 2011.

BRAC realignment would result in a net increase of approximately 22,000 personnel assigned at Fort Belvoir. The increase in personnel and facilities requires an updated land use plan. Siting of new facilities for the base realignment action would then comport with the updated land use plan. The master planning, facilities construction, and personnel assignment functions are closely interrelated.

Most BRAC realignment actions for the Army conform to existing, sufficient master plans that are flexible and recognize future needs. BRAC realignment at Fort Belvoir involves two important considerations. First, the post's current master plan does not encompass the EPG because of past intentions to dispose of that 807-acre area for other development. The EPG must be incorporated into the post's land use plan. Second, the proposed increase of 22,000 personnel represents the largest relocation of personnel in the BRAC 2005 round. Approximately 7 million square feet of new and renovated facilities and approximately 7 million square feet of parking must be ready for use by September 15, 2011.

2.2 PROPOSED ACTION DETAILS

2.2.1 Land Use Plan Update

Fort Belvoir's mission is to provide a secure, safe operating environment for numerous missions and functions, including the following:

- Administrative, logistics, and operations support for regional and worldwide military missions
- A creative learning environment for Army and DoD students
- Military support for a variety of National Capital Region (NCR) contingency missions
- Regional housing for active duty military families
- Quality of life support for the military community, including health and recreation
- Environmental stewardship in concert with adequate land and facilities.

RPMP Long-range Component. To support the foregoing, the Army proposes to adopt and implement an RPMP update to respond to changing conditions at the post to comply with AR 210-20, *Real Property Master Planning for Army Installations*, which mandates updating existing plans as circumstances require. This EIS pertains to the initial step of the RPMP update process, the revision of the land use plan, which is necessary to siting of facilities for BRAC

implementation. The update to the RPMP centers on the land use analysis and plan portion of the long-range component (LRC).[5] This portion of the LRC shows the current and future relationships and use of installation land by generalized areas, including such facilities as family housing, troop housing, administration, and range and training areas.

Planning Principles. The following principles embody the aspirations for the future evolution of Fort Belvoir. These principles, compiled by Belvoir New Vision Planners[6] and Fort Belvoir, provide guidance in deciding the future direction of facilities, space needs and meeting the goals of the installation, the Army, and the community. Adherence to these principles can provide the most efficient use of land, maximum use of previously disturbed areas, the least environmental impact and, ultimately, a world-class installation.

- *Transform Fort Belvoir:* Create a world-class installation.
- *Achieve a diversity of use and activities:* Enrich the program—a 24/7 environment.
- *Strengthen the natural habitat:* Protect and enhance the creeks, wetlands, and wildlife corridors.
- *Achieve environmental brilliance:* A sustainable approach in everything that is done.
- *Build compact neighborhoods:* Strengthen the sense of community and place.
- *Improve connectivity:* Foster connections to transit and consider strategies that allow people to "park once."
- *Emphasize the public realm:* Create walkable neighborhoods.
- *Respect Fort Belvoir history:* Continue the legacy for future generations.
- *Foster Community benefits:* Strengthen existing Army and surrounding neighborhoods.

Real property master planning is a continual, collaborative, and integrated process, performed primarily at the installation level. Although master planning reflects local mission requirements, it is strongly influenced by the plans, guidance, and initiatives of higher headquarters. An installation RPMP is, therefore, the principal real property management tool in support of overall installation real property operation, management, development, privatization, realignment, cleanup, and disposal.

2.2.1.1 Fort Belvoir's Existing Land Use Plan

The land use plan that is the subject of this EIS is the 1993 land use plan and a 2002 update of the Fort Belvoir RPMP. The 1993 master plan consisted of four elements*: Real Property Master Plan Long-Range Component—1993*; *Real Property Master Plan Short-Range Component—1993–2000*; a *Capital Investment Strategy*; and a *Mobilization Mission Planning Component*. Figure 2-1 illustrates the 1993 land use plan.

Fort Belvoir developed its current master plan in 1993 to reflect the post's transition from primarily a troop support and training mission to its role as an administrative center providing support to multiple organizations in the NCR. Specifically, the U.S. Army Engineer School moved to Fort Leonard Wood, Missouri, in 1988, and BRAC directives realigned the Belvoir Research and Development Engineering Center (BRDEC). BRAC directives also resulted in relocating administrative functions to Fort Belvoir.

[5] AR 210-20 provides that an RPMP is organized into five components: the RPMP digest, long-range component (LRC), installation design guide (IDG), capital investment strategy (CIS), and short-range component (SRC).

[6] The Army has contracted with Belvoir New Vision Planners, a consortium of firms having experienced planners, managers, engineers, architects, environmental, and transportation experts, for services to help plan and develop Fort Belvoir into a world-class urban federal center and flagship installation in America's national security structure.

The 1993 LRC identified Fort Belvoir's role as "the major administrative and logistics center for the Northern Virginia portion" of the Military District of Washington (MDW). Recognizing that Fort Belvoir would continue to attract military tenants, the plan attempted to determine total build-out (TBO, defined as the total daily employment when all land uses have been fully developed under the constraints and limitations of the plan). The plan recognized that TBO might never be reached and that "Progress toward TBO is mission-driven but infrastructure-constrained." The plan articulated goals, objectives, and assumptions that focused on the amount and type of development anticipated, and it attempted to limit impacts on the natural and man-made environments. The EPG was not included in the 1993 plan.

The 1993 land use plan shown in Figure 2-1 identified 3,287 acres on Main Post as developable. The TBO that could be supported was estimated to be 74,230 people housed in 30.5 million square feet of space. By comparison, in 2005 about 24,000 personnel worked at Fort Belvoir daily, housed in about 10.8 million square feet of space.

The *1993 Real Property Master Plan* was revised in 2002 upon the adoption of a Regional Community Support Center Subarea Development Plan. The plan revision addressed a desire to locate additional related activities in the portion of the Lower North Post area designated in 1993 as the Regional Community Support Center. In particular, the 2002 Subarea Plan recommended that DeWitt Hospital (now on South Post) be relocated to the Regional Community Support Center area, that the post exchange (PX) be expanded, and a chapel be developed. The amendment also decreased the amount of land classified for community facilities, designated land for medical use, and increased the amount of land classified as environmentally sensitive.

2.2.1.2 Proposed Land Use Plan Revision

The proposed land use plan revision is shown in Figure 2-2. It differs from the 1993 land use plan and 2002 revision in several important respects in that it:

- Includes the EPG in planning for future development.
- Uses fewer, but broader, land use designations that encompass compatible land uses. For example, the 1993 land use plan provided for Administration and Education and Research and Development categories; these are now included in the category titled Professional/Institutional. The new categories allow for more flexible groupings of compatible types of facilities.[7]
- Identifies additional areas for present and future Professional/Institutional and Residential uses.
- Relocates the Troop area from North Post to South Post.
- Changes land use designations for a number of areas on the basis of revised assessment of their suitability for particular uses, projection of future needs, and the desire to make land uses broader and more encompassing.

[7] Twelve land use classifications used in the 1993 master plan were Administration and Education, Airfield, Community Facility, Environmentally Sensitive, Family Housing, Industrial, Medical, Outdoor Recreation, Research and Development, Supply/Storage and Maintenance, Training/Ranges, and Troop Housing. These classifications are now aggregated and reduced to seven: Airfields, Community, Industrial, Professional/Institutional, Residential, Training, and Troop.

- Acreage formerly designated as environmentally sensitive is now subject to any of the seven current land use designations.

Table 2-1 provides a comparison of the land use areas in the 1993 master plan, as amended in 2002, to those proposed for the land use plan update.

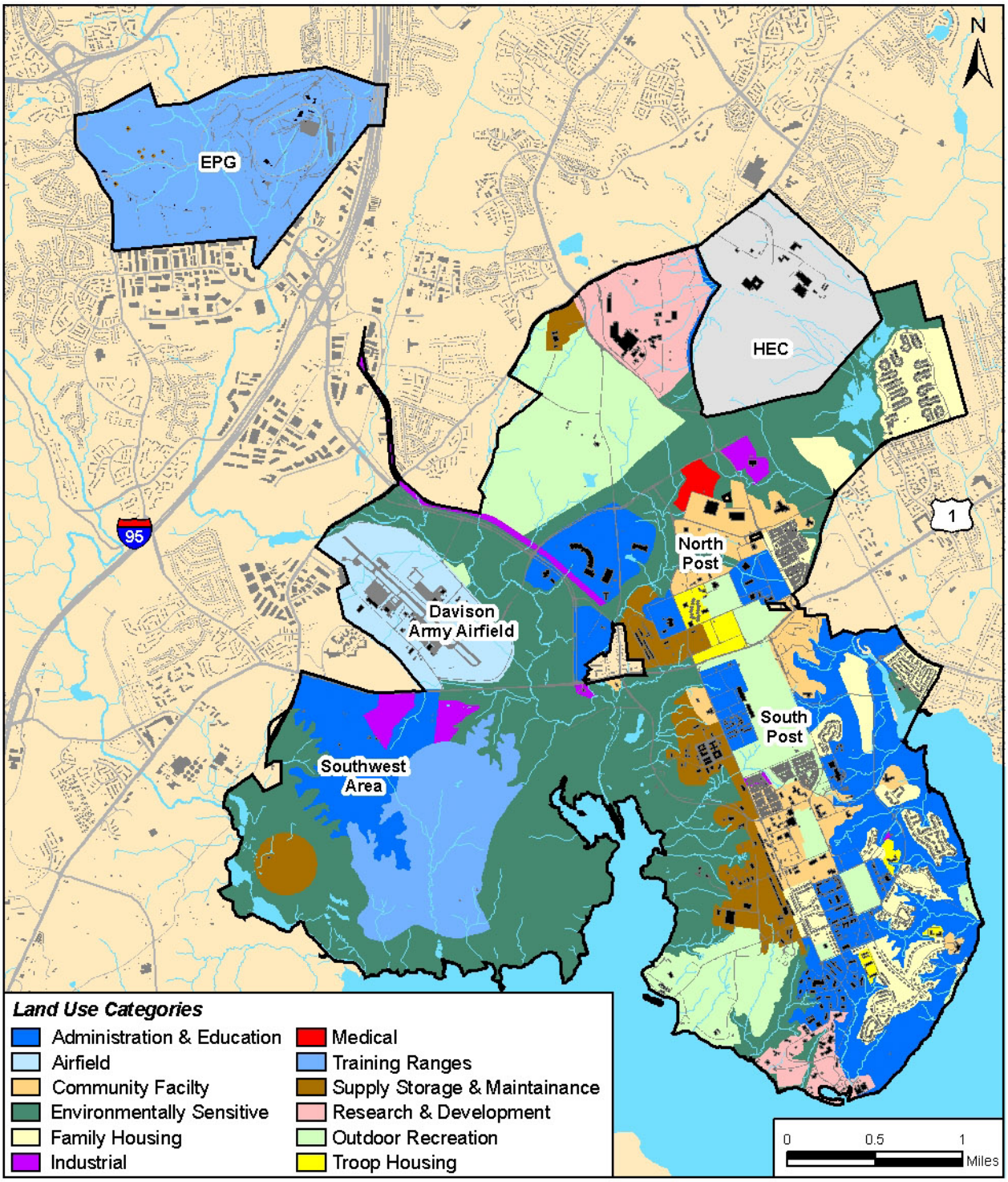
Table 2-1
Comparison of 1993 and 2011 land use allocations

1993 master plan		Proposed land use plan	
Land use	**Acres**	**Land use**	**Acres[a]**
Administration & Education	724	Airfield	697
Airfield	391	Community	2,950
Community Facilities	452	Industrial	213
Family Housing	576	Professional/Institutional	2,132
Industrial	126	Residential	1,116
Medical	97	Training	1,287
Outdoor Recreation	1,006	Troop	101
Research & Development	340		
Supply, Storage, & Maintenance	378		
Training Range	462		
Troop Housing	72		
Environmentally Sensitive	3,063		
Total	**7,687**		**8,508**

[a] All proposed land use designation acreages were calculated in GIS, and the totals may differ from the official acreages for the installation.

The difference between the total number of acres for the 1993 land use plan as amended in 2002 (7,687) and the total for the proposed land use plan (8,484) is the result of including the EPG and several land areas being added or recognized as belonging to Fort Belvoir since 1993. These include 4 acres of islands in Accotink Bay and Gunston Cove; 16 acres west of Colchester Road that became part of Fort Belvoir following realignment of Colchester Road; a net increase of 16 acres resulting from the swap of the McNaughton ballfields. The U.S. Army Corps of Engineers operates HEC, which is considered a separate entity for land use planning purposes and is not evaluated in this EIS.

The proposed land use plan aggregates land uses into larger, more flexible areas than did the 1993 plan (compare Figure 2-1 and Figure 2-2). Reflecting the evolution in Fort Belvoir's mission, the land use categories gaining land are those which support its regional mission as an administrative, logistics, and operations center; military support center; classroom center; housing center; military community support center; and a leader in environmental stewardship. The Airfield land use would gain in acreage land because adjacent areas formerly designated as Environmentally Sensitive around the airfield would be re-designated for Airfield uses. Land use categories losing land—particularly Training Range and Supply, Storage & Maintenance—reflect Fort Belvoir's earlier missions which require fewer resources and less land today.



LEGEND

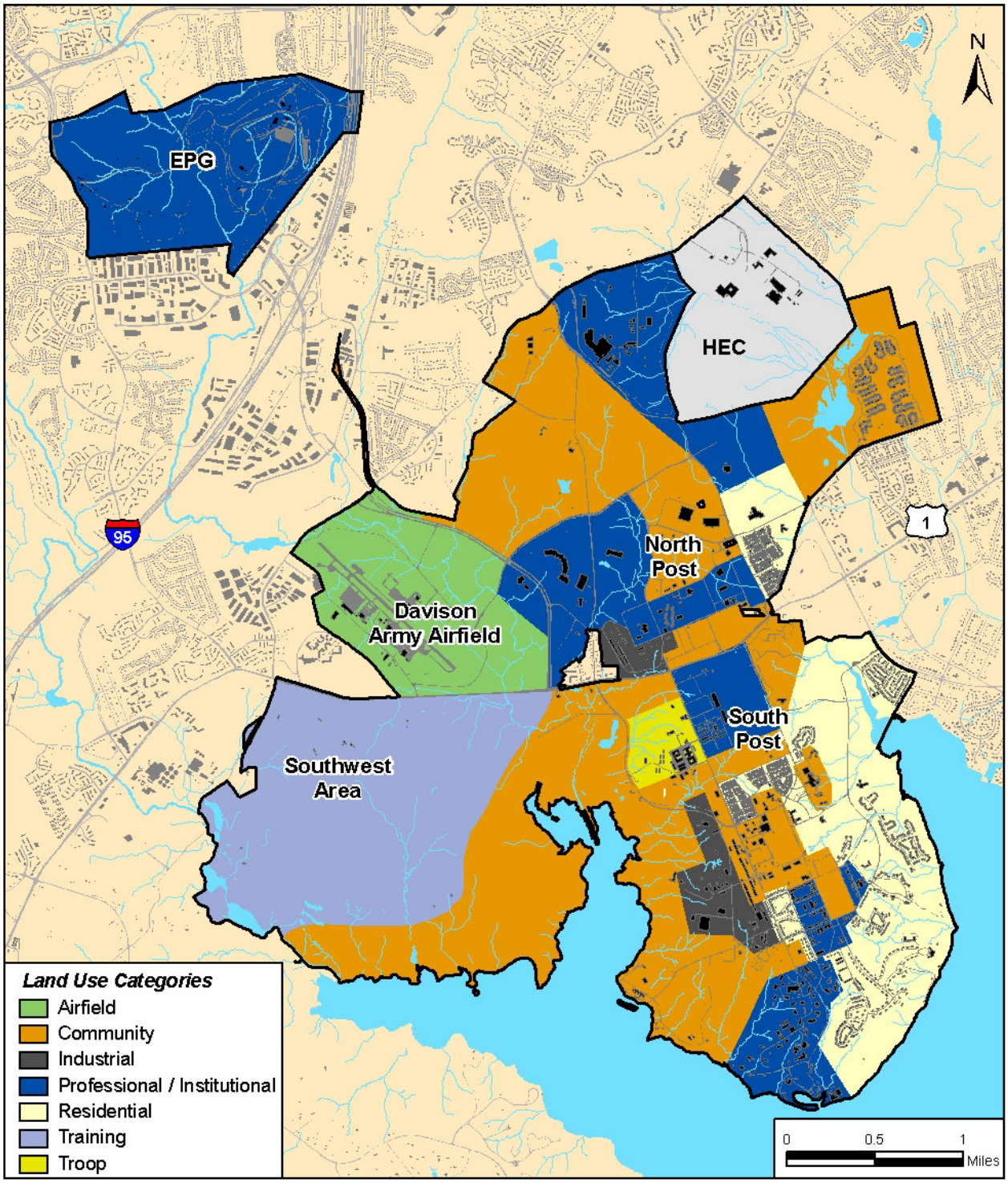
Installation Property

Existing Land Use Designations

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 2-1



LEGEND
Installation Property

Proposed Land Use Plan

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 2-2

Principal features and elements of the proposed land use plan include the following:

- *Professional/Institutional.* The Administration & Education and Research & Development land use categories used in the 1993 land use plan would change to Professional/Institutional. The proposed land use plan increases the amount of land designated for Professional/Institutional use. A substantial part of the increase is due to the inclusion of EPG as well as medical facilities in the Professional/Institutional category.
- *Residential.* The proposed land use plan would increase the land area dedicated to family housing on both the North and South Posts. Fort Belvoir Residential Communities, the program through which family housing has been privatized, is in the process of building and rehabilitating 2,070 family housing units. A portion of the land designated for Residential would be reserved for future development related to long-term growth on the installation.
- *Open Space.* Much of the area designated as Environmentally Sensitive in the 1993 land use plan would be redesignated as Community. This category includes safety clearances, security areas, water areas, wetlands, conservation areas, resource protection areas (RPAs), forest stands, and former training areas. These lands could be used for recreation, conservation, outdoor training, and general uses not involving the construction of facilities. Environmentally constrained land areas would continue to have all regulatory protections in place.
- *McNaughton Ballfields Land Swap.* The three McNaughton ballfields along Pole Road on the southern border of Woodlawn Village are pending exchange for the *Berman Tract* immediately east of Woodlawn Village, which will result in a net increase of 16 acres for Fort Belvoir. This area would be designated as Community land use.
- *South Post Golf Course.* The proposed land use plan would change the land use designation of most of the South Post golf course from Outdoor Recreation to Professional/Institutional.
- *Supply, Storage, and Maintenance Facilities.* The proposed land use plan would enable demolition of outdated and inefficient warehouses; relocation of most of the Supply, Storage, and Maintenance Operations in the 1400 Area to the 700/1100 Areas; and redevelopment of the eastern portion of the 1400 Area east of Gunston Road for Professional/Institutional uses.
- *Unaccompanied Personnel Housing.* The proposed land use plan would change the land use designation from Troop Housing to Troop and convert North Post areas designated for Troop uses to Professional/Institutional. A new Troop land use area would be provided on South Post, west of Gunston Road.
- *DeWitt Army Community Hospital.* In the 2002 master plan amendment, Fort Belvoir planned to site a new Army Community Hospital on a parcel of land south of Kingman Road on North Post. The proposed land use plan now enables the new hospital to be sited on the South Post Golf Course in the southwest quadrant of the intersection of U.S. Route 1 and Belvoir Road. The present DeWitt hospital site would be designated for Community use.

In the proposed land use plan, a new Troop Area would be established on South Post on approximately 75 acres west of Gunston Road in the western portion of the 1400 Area. Industrial

uses in that area would relocate to other designated Industrial sites on post. The present Troop Area in the 2100 Area, consisting of approximately 50 acres generally bounded by Gunston, Abbott, Beauregard, and Goethals Roads on North Post, would become available for Professional/Institutional uses upon relocation of Soldier billeting (living quarters) and activities to the new Troop Area. Notwithstanding the proposed changes in land use classifications of these two areas, current land uses would continue until such time as the Army constructs and occupies necessary troop facilities at the new location on South Post.

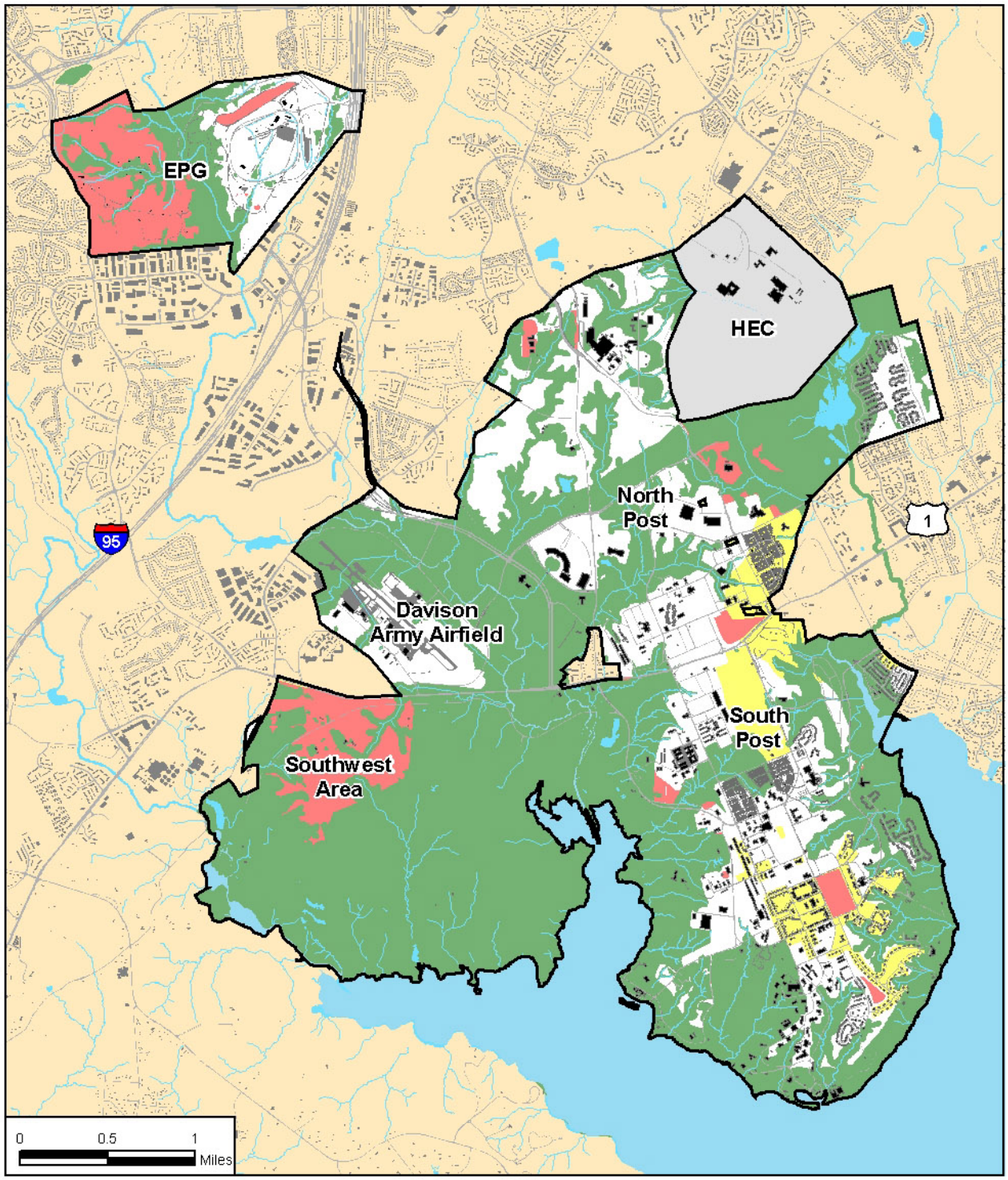
In several cases the change in land use designations from the 1993 plan would allow Fort Belvoir to prepare for potential changes to its mission in the future even though, except to accommodate BRAC realignment actions, no specific uses for the sites are under consideration. For example, this is the case for the area that would be designated Community at the site now occupied by Woodlawn Village.

The proposed land use plan has been structured so that only the best development sites are identified for growth. The best sites are those that have the fewest environmental, operational, cultural resource, and constructability constraints. Figure 2-3 ("Constraints on Development") shows the areas on post that would pose difficulties for development either because of environmental (e.g., RPAs), cultural resource (e.g., historic districts), or operational (e.g., airfield flight paths) constraints. About 5,900 acres (70 percent) of the installation have some form of development constraint. Much of the constrained area has been incorporated into Community, but some is found in other land uses. Therefore, not all of a designated land use area is suitable for the proposed type of development. Figure 2-4 ("Proposed Land Use Plan with Constrained Land Overlay") shows the proposed land use plan with the constraints overlaid. The areas with no constraints could be most easily developed.

Force Protection Standards. The proposed land use plan has been developed to achieve compliance with force protection requirements for military facilities as set forth in DoD Unified Facilities Criteria 4-010-01, *Antiterrorism Standards for Buildings* (2007). The effect of the standards on the master plan is to require that buffer zones around buildings and roads be reserved as force protection standoff areas. The buffer zones affect the amount of land needed for any one facility and also dictate the facility's relationship to other facilities. Future military construction projects will be required to adhere to force protection setbacks. Although buildings already built are exempt, it is strongly recommended that the requirements be implemented to the fullest extent possible. Any major investment requiring renovations or modifications where costs exceed 50 percent of the replacement cost of the building require that the entire building be in compliance with the standards.

Buildings affected by the standoff requirements include those routinely occupied by 50 or more personnel (designated as a primary gathering structure) or buildings inhabited by 11 or more personnel and with a population density of greater than one person per 430 gross square feet (gsf). The standoff buffer for inhabited structures is 33 feet minimum; for primary gathering structures, it is 82 feet minimum, and some facilities require much greater distances than the minimum. Standoff distances from uncontrolled roads (such as U.S. Route 1) are to be 148 feet minimum, and for controlled roads, 82 feet minimum.

The standards recommend that a vulnerability assessment be conducted for existing buildings and that changes be made as necessary to improve building security. These changes can take varying form, from procedures and planning to physical changes to the buildings, such as replacing glass windows with reinforced glass in key areas.



LEGEND

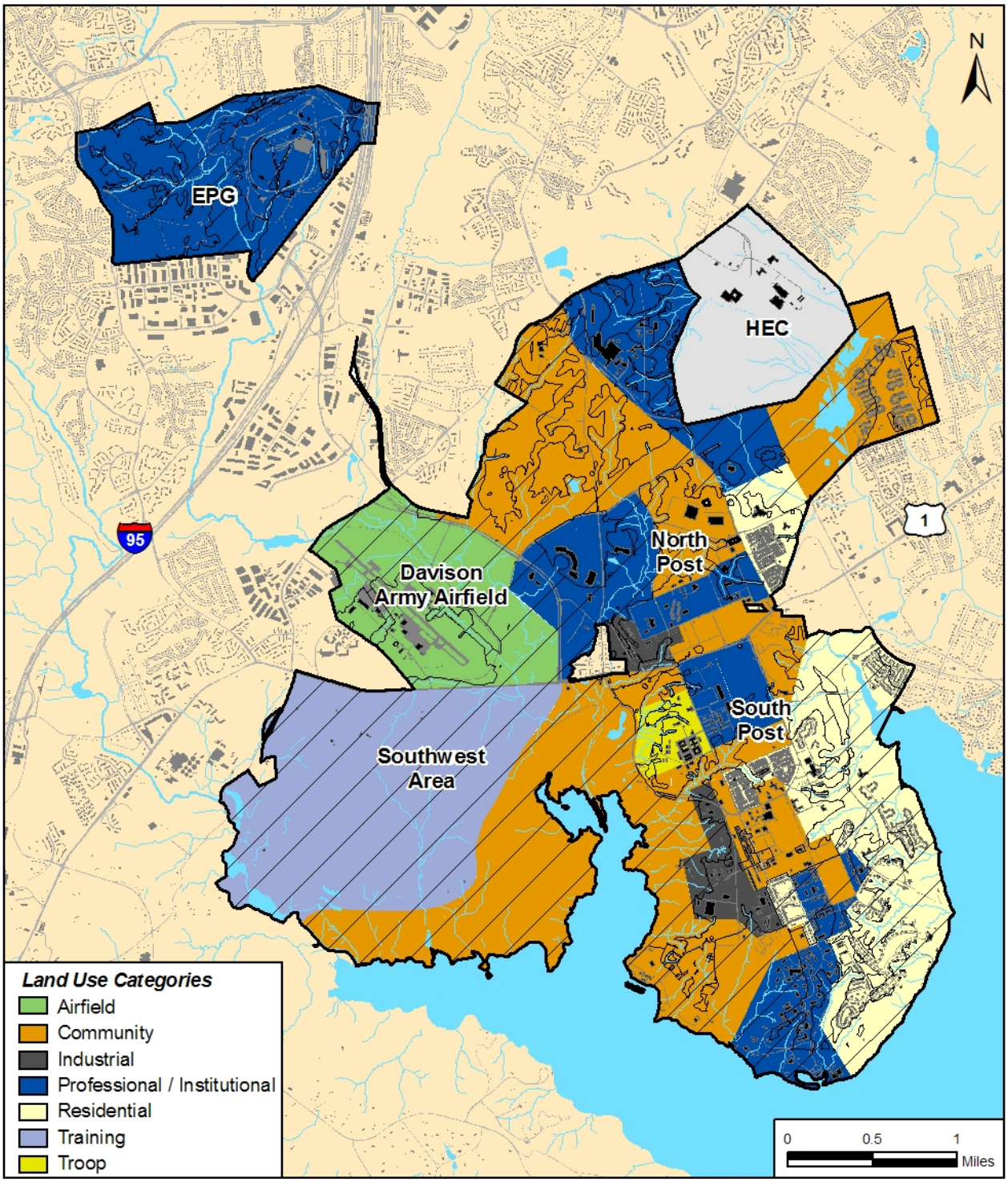
- Installation Property
- Operational Constraints
- Natural Constraints
- Cultural Constraints

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Constraints on Development

Fort Belvoir, Virginia

Figure 2-3



LEGEND
- Installation Property
- Development Constraint

Proposed Land Use Plan with Constrained Land Overlay

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 2-4

2.2.2 Base Realignment

2.2.2.1 Introduction

In July 2006 the Army considered three conceptual development strategies to address the question of where facilities could be sited to accommodate a net increase of 22,000 personnel being assigned to Fort Belvoir.[8] That review process resulted in identifying a preferred land use strategy that reflected the best aspects of each of the three conceptual development strategies.[9] The preferred land use strategy was then used as the basis for the proposed amendment to Fort Belvoir's land use plan.

Accommodation of personnel being realigned must take into account the needs of six major groups slated for realignment by the BRAC Commission: Washington Headquarters Services (WHS), consisting of WHS and elements of the Office of the Secretary of Defense and defense agencies; National Geospatial-Intelligence Agency (NGA); various Army entities moving from leased space in the NCR ("Army Lease"); U.S. Army Medical Command[10] (MEDCOM); Program Executive Office, Enterprise Information Systems (PEO EIS); and Missile Defense Agency Headquarters Command Center (MDA HQCC). The numbers of personnel associated with each of these groups are shown in Table 2-2. Details of the BRAC Commission's recommendation can be found at http://www.brac.gov.

Concurrent with the relocations directed by the BRAC Commission, the Army proposes to implement five "discretionary" moves of units, agencies, and activities to Fort Belvoir.[11] Principal among these would be 90 personnel of the Information Technology, E-Commerce, and Commercial Contracting Center (ITEC4), a group the BRAC Commission directed to be relocated from the Washington, DC area to Fort Sam Houston, Texas. The ITEC4 function employs 97 personnel, 7 of whom are E-Commerce specialists who would move to Fort Sam Houston in order to be co-located with their principal customers. The remaining 90 personnel support Program Executive Office, Enterprise Information Systems, consolidation of which the BRAC Commission directed to occur at Fort Belvoir. In support of the BRAC objective of having supporting functions be co-located with supported functions, the Army proposes that these 90 ITEC4 personnel relocate to Fort Belvoir instead of Fort Sam Houston. Other proposed discretionary moves to Fort Belvoir would involve 37 personnel of the Physical Disability Agency (now at Walter Reed Army Medical Center), 15 personnel of the Physical Evaluation Board (now at Walter Reed Army Medical Center), 3 personnel of the Acquisition Support Center, Northeast Region (now at Fort Monmouth), and 1 person at the Veterinary Activity, U.S. Army Garrison, Selfridge, Michigan. The 146 personnel involved in these five discretionary moves would directly support units, agencies, or activities realigned to Fort Belvoir by the BRAC Commission or join similar activities already assigned to the post. In light of this, the Army has not considered alternative installations for their relocations.

[8] The three conceptual development strategies—Town Center, City Center, and Satellite Campus—are discussed in detail in Section 3.0, Alternatives.

[9] Chief considerations in evaluating the conceptual development strategies included transportation needs, environmental constraints, utilities and infrastructure requirements and availability, security, existing and future development potential, constructability, implementation (schedule and risk), and cost.

[10] This group essentially involves relocations of functions and personnel from Walter Reed Army Medical Center to a new DeWitt Army Community Hospital proposed at Fort Belvoir.

[11] Realignment actions other than those specifically identified by the BRAC Commission or required to implement BRAC Commission recommendations are consider discretionary-location moves.

Table 2-2
Personnel realigning to Fort Belvoir

Agency	Staff	Contractors	Total
Washington Headquarters Services	7,759	1,504	9,263
National Geospatial-Intelligence Agency	4,400	4,100	8,500
Army Lease	2,720	0	2,720
U.S. Medical Command	2,069	0	2,069
Program Executive Office, Enterprise Info Systems	480	0	480
Missile Defense Agency (HQ Command Center)	137	155	292
Total	**17,565**	**5,759**	**23,324**

Note: Personnel being realigned from Fort Belvoir to other installations result in a net increase at Fort Belvoir of approximately 22,000 personnel. Realignments from Fort Belvoir include the relocation of Army Materiel Command Headquarters and US Army Security Assistance Command to Redstone Arsenal, Alabama; Prime Power School to Fort Leonard Wood, Missouri; US Army Criminal Investigation Division Headquarters to Marine Corps Base, Quantico, Virginia; Soldiers Magazine to Fort Meade, Maryland; Biomedical Science and Technology programs of the Defense Threat Reduction Agency to Aberdeen Proving Ground, Maryland; Defense Threat Reduction Agency conventional armaments research to Eglin Air Force Base, Florida; and Information Systems, Research, Development and Acquisition to Aberdeen Proving Ground, Maryland. Evaluation of environmental impacts associated with these realignments will be performed by the receiving locations.

2.2.2.2 Allocation of Facilities and Personnel

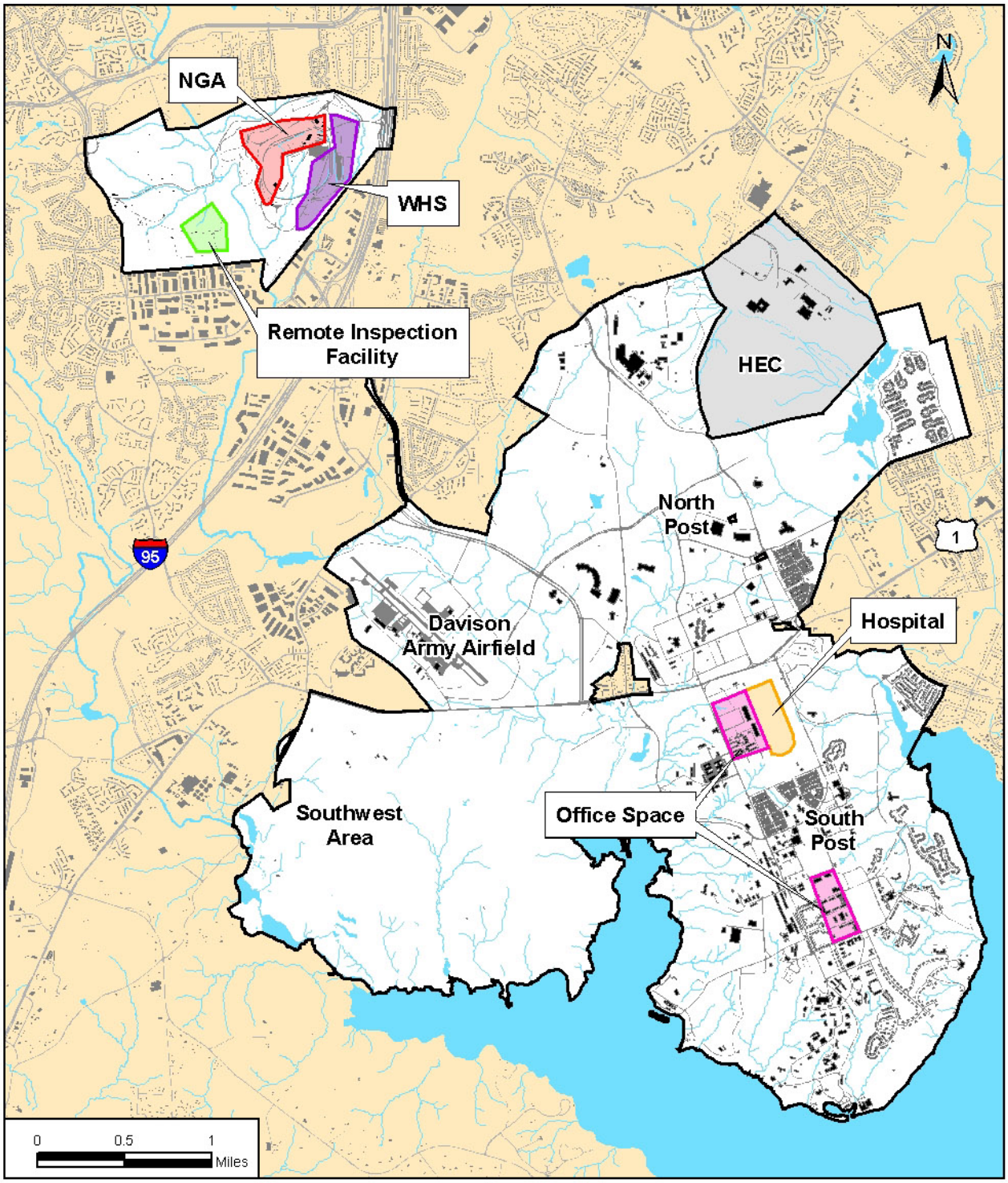
The July 2006 preferred land use strategy translates to a preferred siting plan for major BRAC tenants as shown in Figure 2-5. Accommodations of BRAC requirements would involve the following siting of facilities:

- NGA and WHS would be on the eastern portion of EPG.
- Army lease units, agencies, and activities would be on South Post at sites on Gunston Road and Belvoir Road.
- The new army community hospital would be on the South Post Golf Course.
- PEO EIS and MDA HQCC would be on South Post at sites on Gunston Road and Belvoir Road.

2.2.2.3 Construction and Renovation

Construction and renovation of facilities to support additional personnel at Fort Belvoir would result in approximately 6.2 square feet of additional built space and about 7 million square feet of parking structures.

Fort Belvoir would require essentially two types of construction projects. First, Fort Belvoir must construct or renovate facilities to create working space or other types of special use space for the proposed additional workforce. Second, Fort Belvoir must expand its general support capabilities to meet the needs of a larger on-post population. Table 2-3 identifies these projects, and Figure 2-6 shows where they would be sited. Figure 2-7 presents a conceptual building layout for some of the major BRAC facilities on-post.



LEGEND

Installation Property

Proposed EPG Roadway

Preferred Sitings for Major BRAC Tenants

Fort Belvoir, Virginia

Figure 2-5

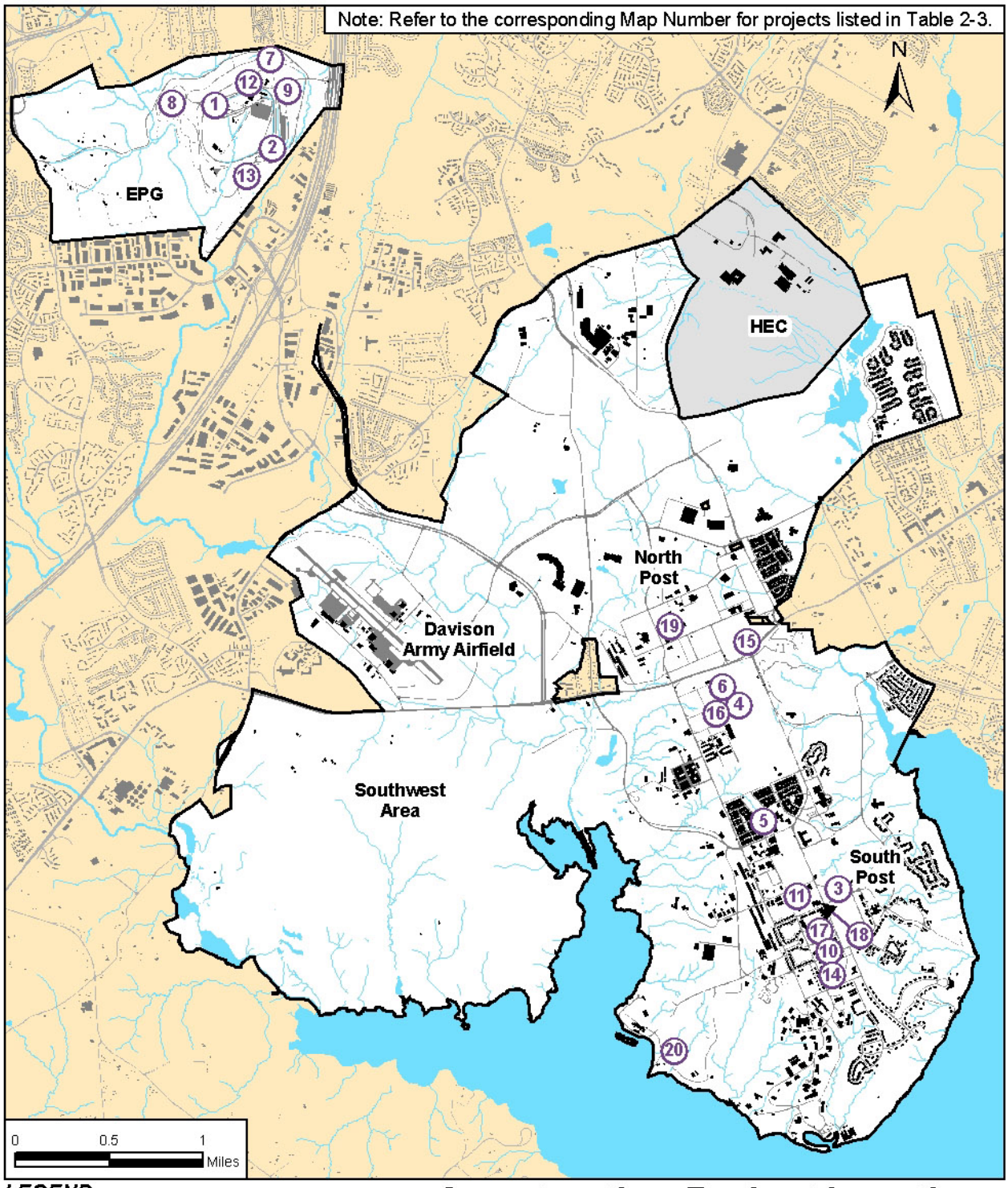
Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Table 2-3
Proposed construction and renovation projects

Map number	Project number	Project title	Fiscal year	Building size (ft^2)	Estimated impervious acreage
1	65416	NGA Administrative Facility	2007–2011	2,419,000	20.3
2	64234	WHS Administrative Facility	2008–2010	2,219,000	22.8
3	MDA 580	MDA Facility	2008–2009	107,000	1.3
4	64238	Hospital	2008	868,800	7.5
4	65676	Hospital	2009	-	-
4	65677	Hospital	2010	-	-
5	64241	Dental Clinic	2010–2011	16,000	0.2
6	65871	NARMC[a] Headquarters Building	2009	50,000	1.0
7	n/a	Corps of Engineers Project Integration Offices	2008	58,600	n/a
8	64097	Infrastructure	2008	n/a	n/a
8	67487	Infrastructure	2009	n/a	n/a
8	67959	Infrastructure	2010	25,000	0.6
9	64076	Emergency Services Center (EPG)	2008	14,700	3.4
10	65448	Network Operations Center (part of PEO EIS)	2010	21,525	0.3
11	65447	USANCA[b] Support Facility	2008	20,000	n/a
12	55661	Child Development Center (NGA)	2011	19,590	0.5
13	55662	Child Development Center	2011	24,036	0.6
14	65450	Administrative Facility (Bldgs 211, 214, 215, 220)	2011	133,000	0.0
15	63571	Access Road/Control Point	2009	280	8.2
16	66228	AMC[c] Relocatables	2007	230,000	0.0
17	65592/67231	PEO EIS Administrative Facility	2008	290,000	2.2
17	67231	PEO EIS Administrative Facility	2008	157,400	1.2
18	54347	Structured Parking Facility, 200 Area	2011	n/a	1.0
19	62892	Modernize Barracks	2011	171,000	n/a
20	54898	MWR[d] Family Travel Camp	2007–2010	1658	1.5

Notes: Project number is the construction project number assigned by the Army. Estimated impervious footprint acreage column was calculated based on the estimated number of building floors and adjacent parking spaces for each project. Parking garages were assumed for the larger projects. See Table 2-4 for additional infrastructure impervious surfaces (i.e. pavement) that would be constructed.

[a]North Atlantic Regional Medical Center
[b]U.S. Army Nuclear and Chemical Agency
[c]Army Materiel Command
[d]Morale, Welfare, and Recreation



LEGEND

Installation Property

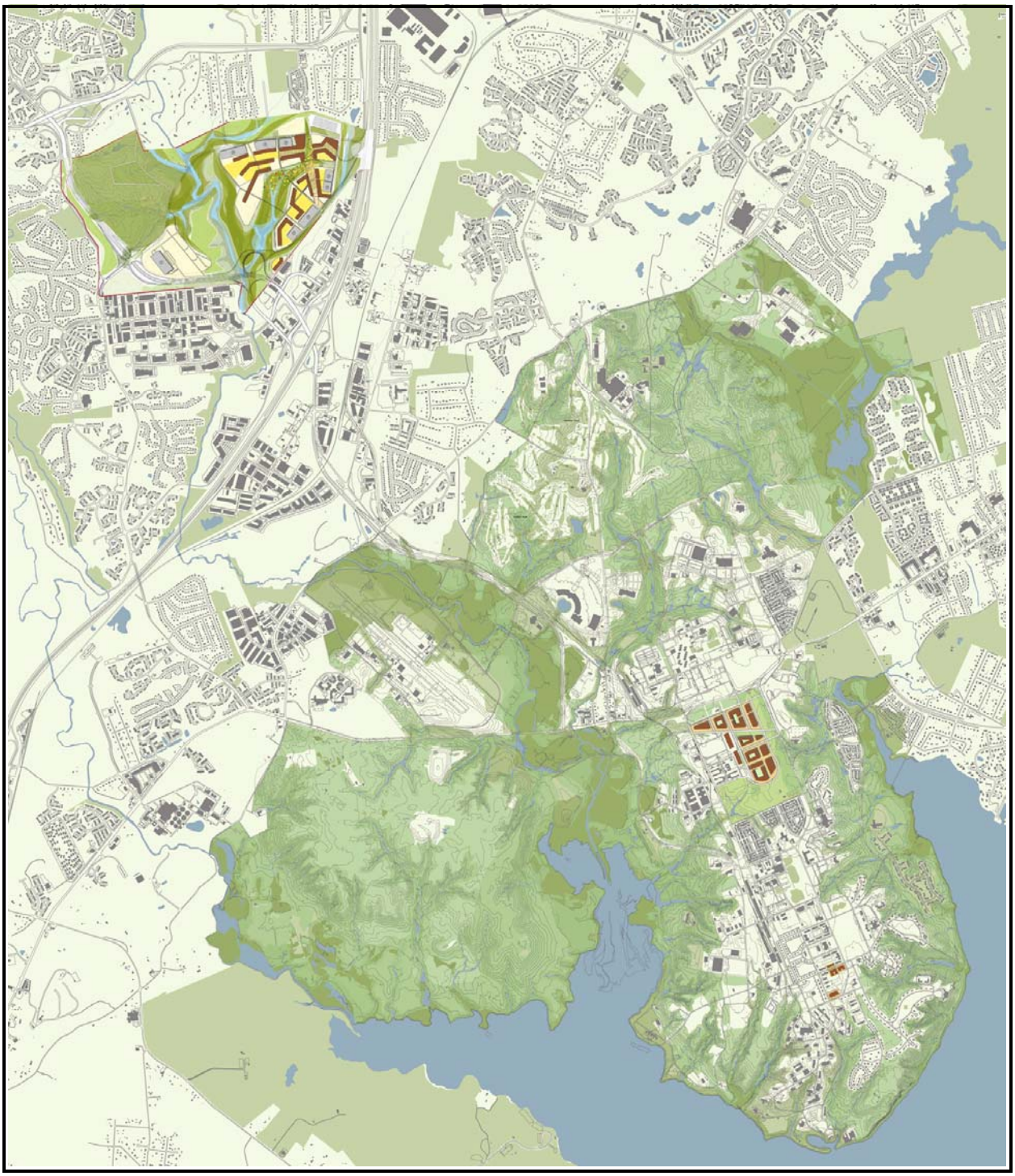
(8) Map Number

Construction Project Locations

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 2-6



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Potential Structure

Conceptual Building Layouts

Fort Belvoir, Virginia

Figure 2-7

Siting of facilities takes into consideration numerous factors. The following discusses chief factors considered in siting facilities.

- *Effects on traffic*. Facilities housing large numbers of employees, predominantly in Professional/Institutional areas, require adequate roadways for movement of personnel to and from those sites.
- *Access.* Certain activities, such as medical care or community services (e.g., PX and commissary) should be placed so that patients or patrons can have suitable access.
- *Security.* The Unified Facilities Criteria (UFC) 4-010-01 (*DoD Minimum Antiterrorism Standards for Buildings*) establishes standards for construction and location of buildings. Several of the standards relate to site planning and require minimum standoff distances for buildings and functional areas, unobstructed space around buildings, design of delivery areas, configuration of access roads, and parking restrictions. The standards for minimum standoff distances also take into account building populations for inhabited or uninhabited buildings, primary gathering buildings, and billeting structures. As a general rule, the standards impose new requirements for significant separations between buildings, between buildings and parking, and between buildings and roads.
- *Consolidation of functions.* Multiple facilities of one unit, activity, or agency should be in close proximity to each other. Such geographic proximity enhances control and promotes the ability of all personnel within the function to work together.
- *Preservation of quality of life.* Siting of facilities should provide a pleasant atmosphere for employees, visitors, and residents. This objective is enhanced through siting and design that respect the existing natural systems of topography, vegetation, and drainage and that minimize ground works and aboveground utilities. The sense of community can be heightened with improved and linked open spaces, strategic tree locations, trail systems, activity areas, and street layouts to enhance the quality of outdoor life.
- *Flexibility for future mission requirements.* Additional missions could be assigned to Fort Belvoir in the future. Facilities siting and planning must take into account the potential for further facilities requirements.
- *Land use compatibilities.* Siting of facilities should adhere to the proposed land use plan, Fort Belvoir's principal tool for enhancing compatibilities among adjacent uses.
- *Preservation of environmental and cultural resources values.* Siting of facilities should avoid, where possible, loss of natural, ecological, and cultural resources such as wetlands, listed or sensitive species or their habitat, wildlife species' travel corridors, archaeological sites, and structures eligible for the National Register of Historic Places.

The following paragraphs provide details on facility construction and renovation projects listed in Table 2-3 that are proposed to occur through fiscal year 2011.

- *NGA Administrative Facility* (Project number 65416, FY 2007-2011, Map number [MN] 1 in Figure 2-6). This project would provide a 2,419,000-square-foot Sensitive Compartmented Information Facility (SCIF) for use by the NGA. This project is required to implement the BRAC 2005 recommendation to consolidate NGA intelligence and training operations; provide a secure facility to enhance command and control; promote acquisition, assimilation, and analysis of real-time intelligence; and enhance organizational productivity and intra-agency connectivity and operability. NGA elements are currently

housed in numerous government-owned and leased facilities in and around the NCR. Their physical separation negatively affects their intelligence mission. There are no existing facilities at Fort Belvoir sufficient to support consolidation of all NGA intelligence operations, administrative functions, and training programs.

- *WHS Administrative Facility* (64234, FY 2008–2010, MN 2). This project would provide 2,219,000 square feet of secure administrative space for various units, agencies, and activities relocating to Fort Belvoir from leased facilities in the NCR. The project would include uninterruptible power supply and standby power generation. It would provide facilities on a secure installation, thereby improving force protection. This project would consolidate a number of similar activities with a resultant improvement in coordination, information exchange, and productivity. Various DoD offices are in leased facilities, primarily in Arlington and Alexandria, Virginia. Most of these facilities do not meet minimal DoD antiterrorism/force protection (AT/FP) construction standards for setbacks, progressive collapse, laminated windows, and so on. The facilities are dispersed throughout the NCR, negatively affecting direct coordination.
- *MDA Facility* (MDA 580, FY 2008–2009, MN 3). This project would provide a 107,000 square-foot administrative facility to serve as the MDA Headquarters Command Center for approximately 292 personnel. The project would consist of a multistory reinforced concrete or structural steel building on concrete footings. Functional areas that would be provided include administrative space, command suite, security operations center, sensitive compartmentalized information facilities, special access areas, and meeting rooms. AT/FP measures would include building standoff distances, structural preventive collapse, laminated glass, lighting, bollards, and control gates.
- *Hospital* (64238, 65676, and 65677, FY 2008–2010, MN 4). This project would provide a new hospital. Primary facilities would include the hospital (868,800 square feet), special foundations, central energy plant, helipad, ambulance shelter (2,200 square feet), vehicle parking garage, and building information systems. This project is required to provide a hospital to support BRAC 2005 restationing actions within the NCR affecting Walter Reed Army Medical Center (WRAMC) in Washington, DC; National Naval Medical Center (NNMC) at Bethesda; Malcolm Grow Medical Center (MGMC) at Andrews Air Force Base; and Dewitt Army Community Hospital at Fort Belvoir. This project is required for integrating WRAMC and NNMC and for establishing the new Walter Reed National Military Medical Center at Bethesda and a large Army community hospital at Fort Belvoir. The NCR medical service market supports care for more than 439,000 beneficiaries. A robust Army community hospital is required to support the relocation of nontertiary patient care functions consequent to the BRAC 2005 restationing actions, which include the closure of WRAMC and closure of inpatient care at MGMC. The restationing actions result in a growth of the NCR South Submarket (supported by a new Army community hospital) of more than 76,000 eligible beneficiaries to a total of 220,803 beneficiaries; a tripling of inpatient workload to more than 9,500 annual admissions; and a doubling of outpatient care, most of which is specialty care. The existing DeWitt Army Community Hospital at Fort Belvoir was constructed in 1957 as a 250-bed inpatient facility and still has the original heating, ventilating, and air conditioning system; plumbing system; medical gas system; and electrical distribution system. The building structure remains intact and usable, but the facility and its major utility systems fall far short of meeting the requirements of a modern medical treatment facility. Outpatient care must be performed in areas designed for inpatient care, resulting in personnel and space inefficiency and patient inconvenience. There are asbestos-containing materials in the existing pipe insulation,

floor tile, and mastic at various locations, which significantly delays and escalates the cost of projects to upgrade and improve the facility.

- *Dental Clinic* (64241, FY 2010-2011, MN 5). This project would provide renovation of, and construction to add to, Building 1099 for a 16,000-square-foot dental clinic. The project is required to provide a quality dental clinic to support BRAC 2005 restationing actions of assigned troops working and living on or near Fort Belvoir. The existing facility, Building 1099, is not large enough to provide 40 dental treatment rooms, the necessary number to serve the larger population at Fort Belvoir. There is no available capacity elsewhere to support the increase in dental workload generated by the projected increase at Fort Belvoir of 4,200 active duty Soldiers as directed by the BRAC 2005 restationing actions.

- *NARMC HQ Building* (65871, FY 2009, MN 6). This project would construct a 50,000-square-foot general administration building for the North Atlantic Regional Medical Command (NARMC), as well as other Office of the Secretary of Defense Supporting Units and regional support offices, such as the North Atlantic Regional Dental Command, North Atlantic Regional Veterinary Command, and the North Atlantic Regional Contracting Office. The project is required to provide administrative and operational space for activities to be relocated to Fort Belvoir in accordance with the recommendations of BRAC 2005. Related medical administrative activities are currently located at the WRAMC and leased space in Virginia (Hoffman Building complex). Currently, there is no adequate, permanent administrative space available at Fort Belvoir to accommodate proposed relocations of medical activities. This project would accommodate such activities by constructing a new, permanent multi-story administrative facility at Fort Belvoir within the proposed hospital campus.

- *Corps of Engineers Project Integration Offices (Temporary)* (FY 2007, MN 7). This project would place temporary facilities for personnel of the Baltimore District Corps of Engineers Integration Office, which would provide integration of BRAC construction management for facilities being developed to accommodate realigned units, agencies, and activities. There would be approximately 22,500 square feet of temporary facilities (relocatable buildings) on EPG, north of Cissna Road and northwest of Building 5073. There would be another 36,100 square feet of temporary facilities on the northwest portion of the South Post golf course. These facilities would be in use for the duration of facilities construction in support of BRAC requirements.

- *Infrastructure* (64097, 67487, and 67959, FY 2008–2010, MN 8). These three projects would provide a 25,000-square-foot communications center, access control facilities, one 10,000-square-foot heating plant building, one 10,000-square foot refrigeration and air conditioning unit, and water, sewer, and electrical services for the EPG. The projects include demolishing 57,000 square feet of existing space. They are required to provide necessary infrastructure for units, agencies, and activities relocating to EPG and to maintain adequate levels of infrastructure support at Main Post. Current infrastructure at EPG is minimal. There is no access control, and heating and air conditioning is provided through self-contained systems adequate to support only past or current use requirements. Communications are virtually nonexistent. The road network consists of a two-lane road in poor condition. The Bailey Bridge over Accotink Creek is structurally compromised and is closed to vehicular traffic. The projects would provide replacement of the present bridge over Accotink Creek, as well as an additional bridge over Accotink and replacement of the bridge over Dogue Creek (South Post). Water, sanitary sewer, and electrical support are

sized to the one occupied building. The perimeter fencing is in such poor condition that it affords little impediment to unauthorized access. Table 2-4 identifies the principal elements of infrastructure included in these projects, as well as infrastructure that would be constructed or installed in support of Main Post requirements.

Table 2-4
Major proposed infrastructure elements

Project element	Element description
Hot/chilled water lines	6,800 linear feet (LF)
Sanitary sewer	13,900 LF (20, 12, and 8 inch lines)
Potable water distribution	32,400 LF (24, 12, and 8 inch lines)
	2 stream crossings (lines attached to bridge)
Perimeter fencing	25 acres clear/grub
	25,000 LF chain link fence
Storm sewer	103,900 LF (24 inch)
Electrical service	25,000 LF underground electrical lines
	2 creek crossings (utilities lines attached to bridge)
	400,000 LF electrical cabling
	375 light poles (30-foot)
	400-watt lights (x 375)
	93,750 LF trench and backfill
Surfaced roads	92 acres clear/grub
	810,000 ft^2 pavement demolition (18.6 acres)
	3,465,000 ft^2 road surfaces (80 acres)
	1 bridge (Accotink Creek)
	2 bridge replacements (Dogue Creek, Accotink Creek)
Access control facilities	5 guardhouses
	5 overwatch booths
	15 guard booths
	Visitor Control Center (2,000 ft^2)
	3 identification checkpoint canopies
	3 vehicles search canopies
Communications center	25,000 ft^2 facility at EPG

- *Emergency Services Center* (64076, FY 2008, MN 9). This project would provide 14,700 square feet of space and 15,000 square yards of maintenance apron for emergency services functions at EPG. The project is required to provide military police, Enhanced 911, hazardous materials response, and fire prevention and protection services at EPG in support of the facilities proposed to be constructed to implement BRAC 2005. The project would provide a combined police and fire station to provide traffic control and law enforcement in support of the agencies and activities on EPG and to provide rapid response to structural fires and medical emergencies. Currently, there is no police or fire station at EPG. There are three fire stations at Fort Belvoir—Building 191 constructed in 1934 and in

poor condition, Building 2119 constructed in 1993, and Building 3242 constructed in 2003 at Davison Army Airfield. The military police station, Building 2124, was constructed in 2002. Because of their physical separation, none of these facilities is adequate to support EPG with emergency services. The fire stations are too far away to meet minimum response times. The police station is capable of supporting EPG with patrols but is too distant to effectively deliver any other law enforcement services.

- *Network Operations Center* (part of PEO EIS) (65448, FY 2010, MN 10). This project would provide a 6,525-square-foot operations center, a 10,000-square-foot storage area, and a 14,000-square-yard satellite yard. The project is required to provide satellite test facilities in support of the BRAC 2005 recommendation to station Project Manager Defense Communications and Army Transmission Systems (PM DCATS) at Fort Belvoir. There are no facilities at Fort Belvoir to support satellite testing and stationing of PM DCATS.

- *USANCA Support Facility* (65447, FY 2008, MN 11). This project, which would approximately 20,000 square feet of renovated spaced in Building 238 required to support additional U.S. Army Nuclear and Chemical Agency (USANCA) personnel as part of BRAC 2005. The project would provide replacement facilities for the USANCA facilities on EPG, thereby allowing construction of multimillion-square-foot campuses for units, agencies, and activities relocating to EPG. USANCA is the unit charged with providing the Army's core critical nuclear and chemical expertise. Primary USANCA missions include enhanced force survivability in nuclear, biological, and chemical (NBC) environments; communication of the impact of nuclear and other weapons of mass destruction on military operations; enhanced interoperability of forces in NBC environments; planning Army employment of and assessing vulnerability to nuclear weapons; safe and secure storage and demilitarization of the DoD chemical weapons stockpile; and safe and secure operation and maintenance of Army nuclear reactors, active or deactivated. USANCA now occupies Building 5073, a 13,618-square-foot facility constructed in 1954 at the EPG. Building 5073 is in the center of the most developable portion of EPG. Its location and associated access and force-protection issues significantly reduce possible development in support of BRAC 2005.

- *Child Development Center (NGA)* (55661, FY 2011, MN 12). This project would provide a child development center with 19,590 square feet of space and a 24,430 square-foot outdoor area for 244 children. The project is required to provide a safe, healthy, and affordable developmental environment for dependent children of eligible personnel assigned to EPG. This project would improve morale and performance by providing affordable, on-site developmental services, thereby improving employees' peace of mind and reducing the time of daily commutes. There are currently three child development centers at Fort Belvoir. They are in Buildings 1028, 1745, and 2468, which were constructed in 1988, 1992, and 1997, respectively. Though in relatively good condition, the facilities are at or near capacity, with waiting lists for some categories of services.

- *Child Development Center* (55662, FY 2011, MN 13). This project would provide a child development center with 24,000 square feet of space and a 40,300-square-foot outdoor area for 303 children. See the description for the similar project MN 12 above.

- *Administrative Facility* (Buildings 211, 214, 215, and 220) (65450, FY 2011, MN 14). This project is required to implement BRAC 2005 by modernizing existing facilities to

provide 133,000 square feet of general and secure administrative space and structured parking for various units, agencies, and activities relocating to Fort Belvoir from leased facilities in the NCR. This project would provide facilities on a secure installation, thereby improving force protection. It would consolidate a number of similar activities, improving coordination, information exchange, and productivity. Currently, the following are in leased facilities, primarily in Arlington and Alexandria, Virginia: administrative assistants to the Secretary of the Army (SA); Office of the Assistant SA Financial Management and Comptroller; Office of the Chief of Chaplains; Communication and Electronics Command; Defense Finance and Accounting Service; Defense Human Resource Activities; Defense Technology Security Administration; Department of Defense Education Activity; Deputy Under SA—Operations Research; DoD Inspector General; MDA HQCC; Office of the Secretary of Defense; Project Manager Acquisition, Logistics, and Technology Enterprise Systems and Services; Senior Executive Public Affairs Training; U.S. Army Audit Agency; U.S. Army Environmental Policy Institute; U.S. Army G1/Army Research Institute; U.S. Army G1/Civilian Personnel Office; U.S. Army G3/Army Simulation; U.S. Army G6; U.S. Army G8/Force Development; U.S. Army Network Enterprise Technology Command; U.S. Army Office of Environmental Technology; U.S. Army Office of the Chief of Army Reserve; U.S. Army Safety Office; U.S. Army G1/Personnel Transformation; and U.S. Army Legal Services Agency. The majority of these facilities do not meet minimal DoD AT/FP construction standards for setbacks, progressive collapse, laminated windows and the like. The facilities are dispersed throughout the NCR, negatively affecting direct coordination.

- *Access Road/Control Point* (63571, FY 2009, MN 15). This project would construct an access control point (ACP) with vehicle inspection station; access control building (280 square feet); booth, and canopy, vehicle turnarounds; security lighting; backup generator; two-lane access road (306,000 square feet) with sidewalks/bike path; street lighting; drainage; traffic signal; and Richmond Highway (U.S. Route 1) left and right turns. The ACP, directly across Richmond Highway from Pence Gate, is required to provide safe force protection-compliant controlled access from Richmond Highway onto Fort Belvoir North Post. It would provide an ACP meeting DoD AT/FP construction standards with sufficient marshalling area and an adequate vehicle inspection station. This project is required to provide a second access onto North Post reducing congestion on Gunston Road and providing alternate access during periods of force protection conditions Charlie and Delta. The only access point from U.S. Route 1 onto North Post is Woodlawn Gate (Route 618). Woodlawn Gate is currently closed. The existing ACP is inadequate. Constructed after the September 11, 2001, terrorist attack, the ACP meets minimal DoD criteria for an ACP; however, the staging area is inadequate, the vehicle inspection station is temporary, the guard post is not hardened, and there is no overhead cover. The configuration of the ACP places the guard force at risk of being hit by vehicles while performing their force protection duties. If this project is not provided, the level of service on U.S. Route 1 would be such that there would be a breakdown in traffic flow resulting in extreme congestion during peak periods. AT/FP would not be provided in accordance with DoD standards. Traffic flow would be degraded, control and inspection of vehicles and personnel entering the installation would be inadequate, and military and contract law enforcement personnel would continue to be at risk from inadequate separation from vehicles and inadequate protective facilities.

- *AMC Relocatables* (66228, FY 2007, MN 16). This project would purchase the facilities at Fort Belvoir that were leased to house the headquarters function of the U.S. Army Materiel

Command (AMC). The facilities consist of two modular, two-story office buildings having a total of 230,000 square feet of space. The buildings include open and closed office space, along with special-purpose areas like an Emergency Operations Center (EOC), SCIF, auditorium, secure and nonsecure conference rooms, video teleconference center, technical library, data process center, and office support space. The facilities, located along Gunston Road, will be vacated upon the tenant's relocation to Redstone Arsenal, Alabama, as required by BRAC 2005. Several Fort Belvoir tenants occupy buildings that do not meet minimum requirements. Inadequate office space negatively affects individual job performance, as does lack of special use space such as training and conference rooms, on-site storage, video conferencing, and so on. In addition, one-tenth of the general-purpose administrative space inventory is inadequate and exacerbates space deficit impacts. Fort Belvoir anticipates that its working population increase will place a further strain on the capacity of the general-purpose administrative space inventory. The two two-story, contractor-owned buildings are available for purchase.

- *PEO EIS Administrative Facility* (65592 and 67231, FY 2007, MN 17). Project Number 65592 would provide 290,000 square feet of general administrative space and a parking garage, and Project Number 67321 would provide an additional 157,400 square feet of secure administrative space. The projects are required to accommodate elements of PEO EIS relocating to Fort Belvoir as a consequence of BRAC 2005 and to consolidate operations to enhance operational efficiencies and to reduce total square footage requirements. Approximately 370 personnel assigned to PEO EIS are at the post in Building 1445 (a converted barracks and dining facility constructed in 1969) and Buildings 322 and 323 (World War II facilities originally constructed as vehicle maintenance shops). Another 454 personnel are at Fort Monmouth, and 802 personnel are in leased space in the NCR. Overall mission performance is degraded by the physical separation of activities, and the lack of adequate space negatively affects mission readiness.

- *Structured Parking Facility, 200 Area* (54347, FY 2011, MN 18). This project would construct a parking structure with a capacity of 400 parking spaces in the 200 Area of Fort Belvoir. The structure would be constructed of reinforced concrete with structural steel framing, and it would have parking decks and a sloped interior ramp system. It is estimated that the parking structure would be three decks in height. Fort Belvoir is required to provide parking for both its military personnel and civilian workforce. Based on 60 percent of the working population in this area, 1,730 parking spaces are required to accommodate vehicle parking. The 200 Area is extensively used by Defense Systems Management College and numerous administrative activities. Parking in this area is extremely inadequate. All land suitable for parking is being used, and there is no room for expansion. The only means of accommodating the shortfall of parking spaces is to construct a parking structure on the existing area. If the project is not provided, the lack of adequate parking will continue to adversely affect the morale and efficiency of personnel who work or conduct business the 200 Area.

- *Modernize Barracks* (62892, FY 2011, MN 19). This project would provide renovations to 171,000 square feet of space in six barracks buildings in the McRee Barracks Complex. Renovation work would extend to living modules, hallways, stairwells, utilities, fire alarms and suppression systems, and building information systems. The existing barracks do not meet current standards for privacy, space, or amenities. The barracks are severely deteriorated. Inadequate heating, air conditioning, and ventilation systems contribute to mold growth and unhealthy living conditions.

- *MWR Family Travel Camp* (54898, FY 2007–2010, MN 20). This project would provide a Family Travel Camp with 52 recreational vehicle (RV) campsites, a camp support facility, 15 cabins, and 12 tent sites in four phases, each of which would be usable upon completion. The camp support facility would include a laundry section, camper's lounge space, restrooms and showers, and vending machine space. The project would also include relocating the existing Johnson Road to provide better camp circulation and space, landscaping, site lighting, sewage lift stations, and utility upgrades. Provisions for persons with disabilities would be provided. This project is required to provide adequate outdoor camping opportunities for the Belvoir/NCR customers. The project would provide for the high demand for RV camp sites, and for those looking for cabin camping opportunities. This project would enhance the morale and quality of life of Soldiers, family members, retirees, and DoD civilians. Currently, there are no family travel campgrounds on-post for customers assigned to or supported by Fort Belvoir, or for those visiting the area. Customers are forced to seek service from commercially operated facilities that are overcrowded in the peak travel times, have higher cost, and are an average of 45 minutes from Washington, DC.

2.3 SCHEDULE

Implementation of the various aspects of the proposed actions would occur until approximately the end of fiscal year 2011. Actions with respect to the land use plan revision would begin upon issuance of the ROD and continue until further revision of the master plan. Construction and renovation of facilities in support of base realignment and other requirements of Fort Belvoir would begin in fiscal year 2007 and continue through fiscal year 2011.

SECTION 3.0
ALTERNATIVES

3.1 INTRODUCTION

A bedrock principle of NEPA is that an agency should consider reasonable alternatives to a proposed action. Considering alternatives helps to avoid unnecessary impacts and allows analysis of reasonable ways to achieve the stated purpose. To warrant detailed evaluation, an alternative must be reasonable. To be considered reasonable, an alternative must be "ripe" for decisionmaking (any necessary preceding events having taken place), affordable, capable of implementation, and satisfy the purpose of and need for the action. The following discussions identify alternatives considered by the Army and whether they are feasible and, hence, subject to detailed evaluation in this EIS. The section also describes the No Action Alternative.

3.2 DEVELOPMENT OF ALTERNATIVES

3.2.1 Means to Accommodate Realignments

Realignment of units, agencies, and activities involves ensuring that the installation has adequate physical accommodations for personnel and their operational requirements. The Army considers four means of meeting increased space requirements: use of existing facilities, modernizing or renovating existing facilities, leasing of off-post facilities, and constructing new facilities.

Army Regulation 210-20, *Master Planning for Army Installations*, establishes Army policy to maximize use of existing facilities. New construction is not authorized when support for a new mission can be achieved by using existing underused adequate facilities, provided that using such facilities does not degrade operational efficiency. Selection and use of facilities to support mission requirements adheres to the foregoing four choices in the order in which they are listed. That is, if there are adequate existing facilities to accommodate requirements, and absent other overriding considerations, further examination of renovation, leasing, or construction alternatives is not required. Similarly, if a combination of using existing facilities and renovation satisfies the Army's needs, leasing or new construction need not be addressed. New construction may proceed only when using existing facilities, renovation, leasing, or a combination of such measures is inadequate to meet mission requirements.

3.2.2 Siting of New Construction

The Army considers new construction of facilities when using existing facilities, renovation, or leasing would fail to provide for adequate accommodations of realigned functions. The Army considers both general and specific siting criteria for construction of new facilities.

General siting criteria include consideration of compatibility between the functions to be performed and the installation's land use designation for the site, adequacy of the site for the function, proximity to related activities, distance from incompatible activities, availability and capacity of roads, efficient use of property, development density, potential future mission requirements, and special site characteristics including potential environmental incompatibilities.

Specific siting criteria include consideration of location of the workforce and efficient, streamlined management of functions. Co-locating similar types of functions, as opposed to dispersing them, generally permits more efficient use of equipment, vehicles, and other assets.

3.2.3 Schedule

Alternatives for scheduling of proposed realignment actions are principally affected by three factors: the availability of facilities to house realigned personnel and functions, efforts to minimize potential disruption of mission activities on the basis of the number of personnel involved in the relocation or the amount of work to be performed, and early realization of benefits to be gained by completion of the realignments. In most cases, minor shifts in schedule would not produce different environmental results.

3.3 ALTERNATIVE LAND USE PLANS

In June and July 2006, the Army considered three conceptual development strategies for accommodating the increase in units, agencies, and activities associated with base realignment at Fort Belvoir. The strategies, named in a manner suggesting the principal concept of each, were identified as *Town Center*, *City Center*, and *Satellite Campuses*. Each strategy had two alternative plans for allocating land to specific functions (e.g., NGA, Army Lease) being realigned to Fort Belvoir; thus, the Army originally considered six different ways to meet base realignment requirements. The following sections present one alternative related to and representative of each of the strategies. Also presented is the Preferred Alternative which emerged as a hybrid of the three conceptual development strategies. Accordingly, this EIS evaluates four land use plan alternatives and four alternatives for implementation of BRAC realignments.

3.3.1 Town Center Alternative

Under the Town Center Alternative, the majority of new facilities to accommodate base realignment would be sited between J.J. Kingman Road on North Post and 12th Street on South Post. Developed areas bounded by 16th and 21st Streets and Gunston Road and Belvoir Road would be available for future redevelopment. The EPG, Davison Army Airfield, and the North Post golf course would remain available for future growth after 2011. Figure 3-1 shows the Town Center Alternative. For land use planning, several land parcels affected by the Town Center strategy would be redesignated for Professional/Institutional or Community uses.

Accommodation of BRAC realignments under this alternative would result in the following major sitings:

- NGA and associated parking structures would be sited in the area bounded by U.S. Route 1, Belvoir Road, 9th Street, and Gunston Road. This would be facilitated by changing the South Post golf course land use designation from Community to Professional/ Institutional.

- WHS and associated parking structures would be sited in the area bounded by U.S. Route 1, Belvoir Road, 9th Street, and Gunston Road and in the adjacent area north of U.S. Route 1 that is bounded by Constitution Drive, U.S. Route 1, and Gunston, Abbott, and Beauregard Roads. This would be facilitated by changing the South Post golf course land use designation from Community to Professional/Institutional and by changing the land

use designations north of U.S. Route 1 from Community and Troop to Professional/Institutional.

- Army Lease and associated parking structures would be sited on North Post, in the southern half of the area bounded by Woodlawn, Abbott, Gunston, and J.J. Kingman Roads. This would be facilitated by changing the present land use designations from Community to Professional/Institutional. Army Lease would also be located in the 200 area, in the northwest quadrant of the intersection of Belvoir Road and 21st Street.

- Medical Command and MDA and associated parking structures would be sited in the area that is bounded by Constitution Drive, U.S. Route 1, and Gunston, Abbott, and Beauregard Roads. This would be facilitated by changing the land use designations north of U.S. Route 1 from Community and Troop to Professional/Institutional.

- PEO EIS and associated parking structures would be sited on North Post, in the southern half of the area bounded by Woodlawn, Abbott, Gunston, and J.J. Kingman Roads. This would be facilitated by changing the present land use designations from Community to Professional/Institutional.

Figure 3-2 shows the proposed locations for facilities projects (see Section 2.2.2.3 and Table 2-3). Since EPG would not be developed in order to accomplish BRAC realignment actions, the proposed emergency services center project and much of the infrastructure project would not be required and would not proceed at EPG. Under this alternative, areas of EPG west of Accotink Creek would be designated for Community use, and areas east of the creek would be designated for Professional/Institutional use to support future development.

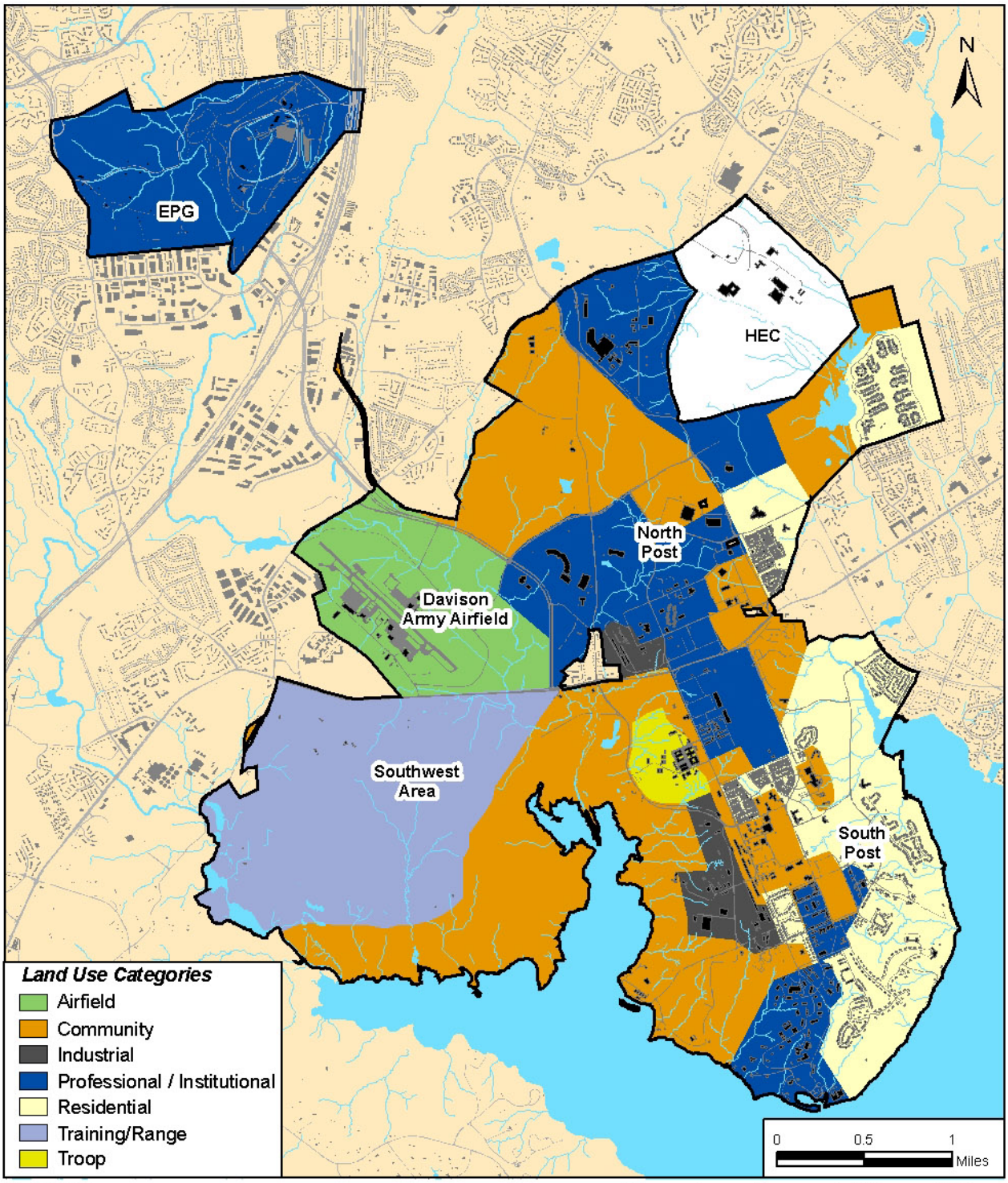
Table 3-1 shows the allocation of land use designations under the Town Center Alternative, compared to the 1993 land use plan as amended in 2002.

The Town Center Alternative contains two sub-alternatives with respect to the present and proposed Troop Area. The proposed plan would change the Troop Area on North Post to Professional/Institutional uses and create a new Troop Area on South Post in an Industrial area (the western portion of the 1400 area) along Gunston Road. Availability of funding, however, might cause current uses in the present and proposed Troop Areas to continue for an indeterminate period. Accordingly, this EIS evaluates both situations: first, relocation of the Troop Area to South Post, with the present Troop Area parcel becoming Professional/Institutional (proposed action) and, second, to continue uses of the North Post and South Post parcels for Troop Area and Industrial purposes, respectively (status quo; delayed implementation).

3.3.2 City Center Alternative

Under the City Center Alternative, all new facilities to accommodate base realignment would be sited on EPG and a nearby 65-acre parcel currently occupied by the General Services Administration (GSA), known as the "GSA Parcel." The North and South Posts at Fort Belvoir would remain available for future growth. Figure 3-3 shows the City Center Alternative. For land use planning, parcels affected by the City Center Alternative would be redesignated for Professional/Institutional use.

Accommodation of BRAC realignments under this alternative would result in the following major sitings:



LEGEND

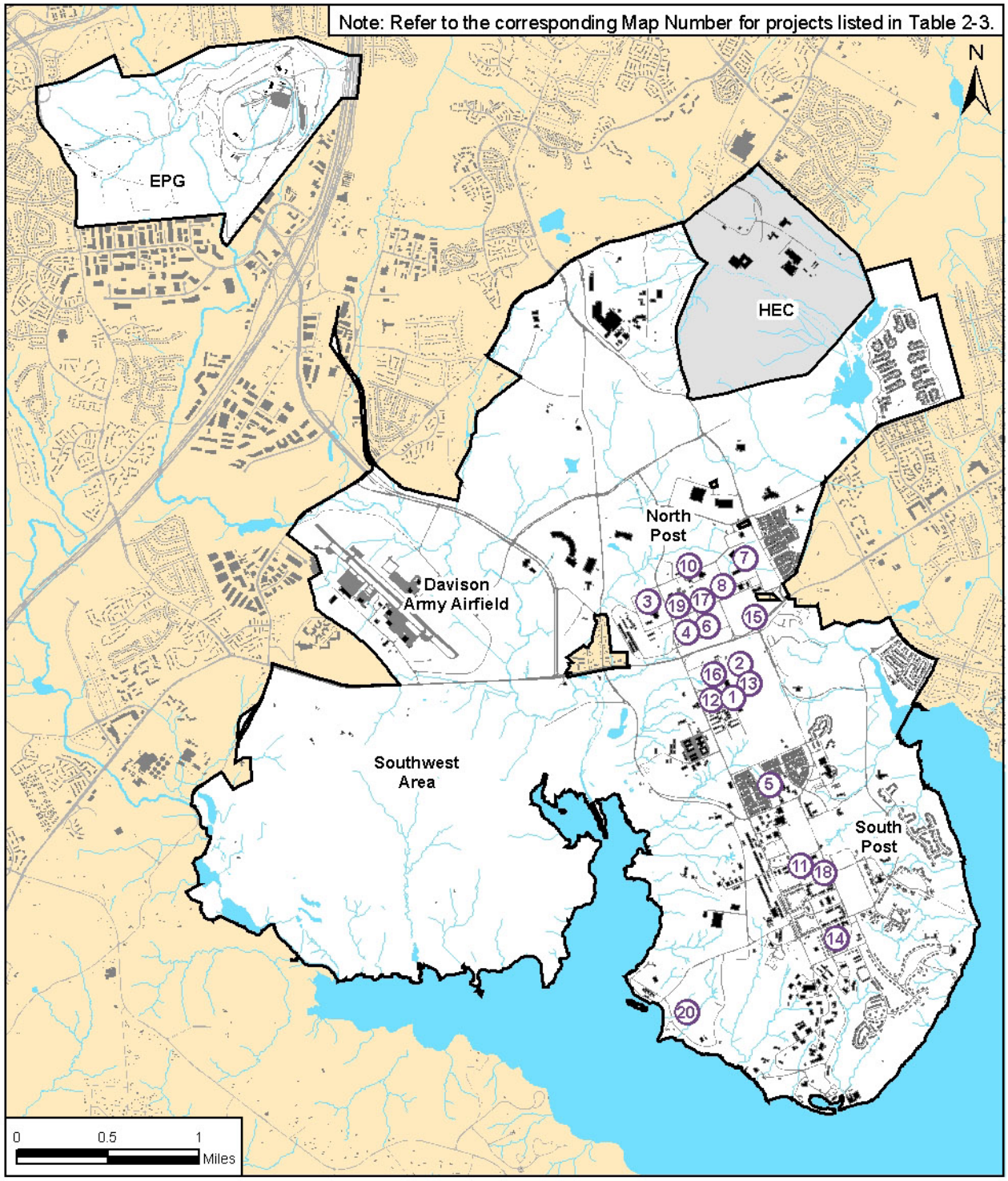
Installation Property

Town Center Land Use Plan

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 3-1



LEGEND

Installation Property

(8) Project Location

Town Center Project Locations

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 3-2

Table 3-1
Comparison of 1993 and Town Center Alternative land use allocations

1993 Land Use Plan		Proposed Land Use Plan	
Land use	**Acres**	**Land use**	**Acres [a]**
Administration & Education	724	Airfield	690
Airfield	391	Community	2,652
Community Facilities	452	Industrial	212
Family Housing	576	Professional/Institutional	2,242
Industrial	126	Residential	1,315
Medical	97	Training	1,280
Outdoor Recreation	1,006	Troop	106
Research & Development	340		
Supply, Storage, & Maintenance	378		
Training Range	462		
Troop Housing	72		
Environmentally Sensitive	3,063		
Total	**7,687**		**8,497**

[a] All proposed land use designation acreages here and in Tables 3-4 and 3-6 were calculated in GIS, and the totals may differ from the official acreages for the installation.

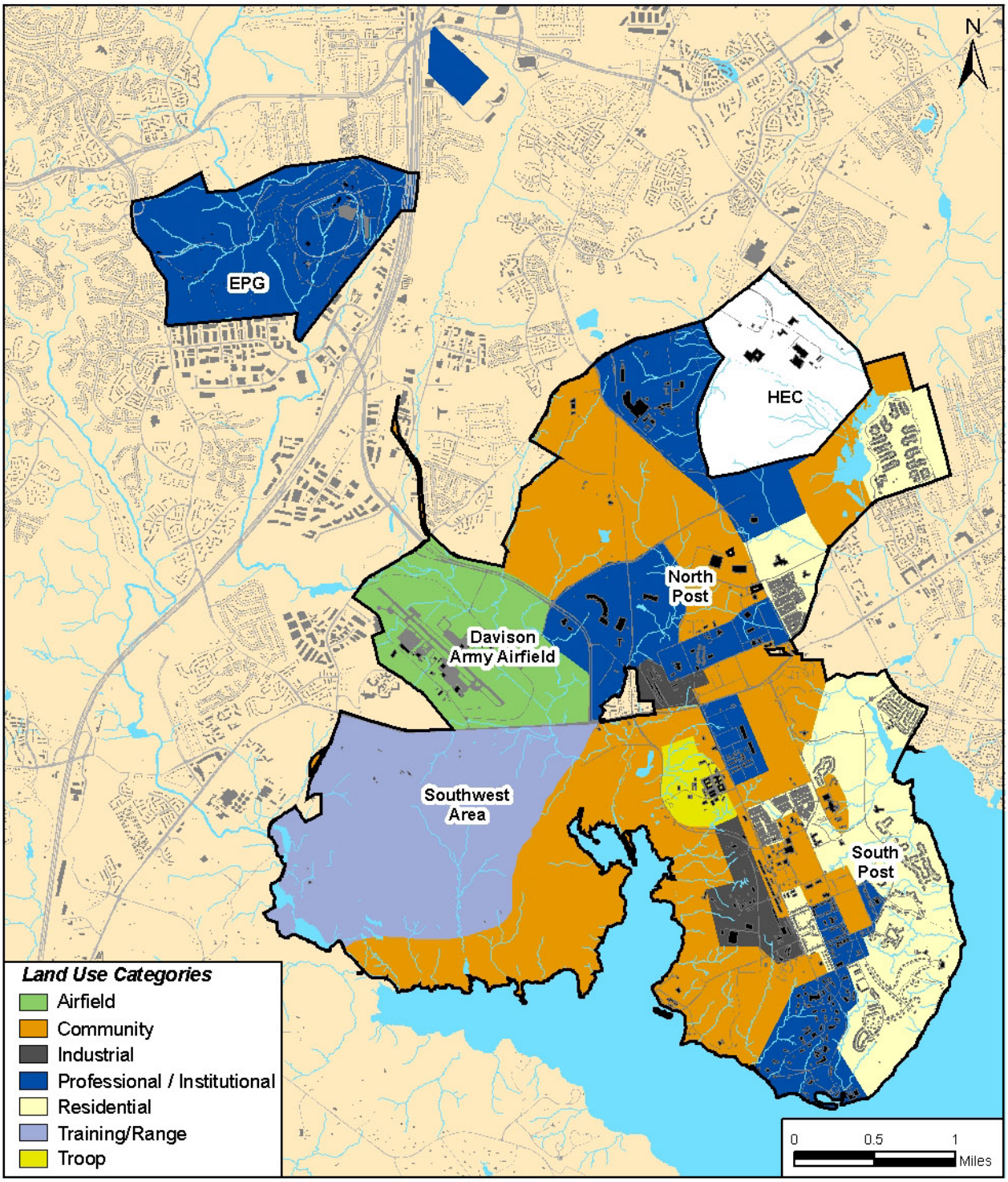
- NGA, Army Lease, Medical Command, PEO EIS, and MDA and associated parking structures would be sited at EPG.

- Portions of Army Lease would occupy existing facilities along the east side of Gunston Road between U.S. Route 1 and 9th Street, and in the southwest quadrant of the intersection of Belvoir Road and 21st Street. Units, agencies, and activities that could not be assigned to the existing facilities would occupy EPG.

- WHS would be sited at the GSA Parcel on Loisdale Road.

Army adoption of the City Center Alternative would require measures not inherent in other alternatives. The Army would expect GSA to vacate its facilities, relocate GSA functions to Fort Belvoir or another location,[12] demolish all existing structures, ensure compliance with applicable laws governing remediation, and transfer administrative control of the property to the Army. These actions would have to occur within a timeframe that would provide the Army sufficient time to construct facilities for WHS use. Location of the WHS element on the GSA parcel would require a change in law; at present, the BRAC recommendations require WHS to relocate to Fort Belvoir, and the GSA parcel is not part of Fort Belvoir. Figure 3-4 shows the proposed locations for facilities projects (see Section 2.2.2.3 and Table 2-3) involved in the City Center Alternative.

[12] The Army estimates that relocation of GSA warehouse functions would require a site of 40 to 60 acres in an area classified for Industrial use. In the event GSA functions relocated to Fort Belvoir, the GSA would prepare appropriate documentation pursuant to NEPA.



LEGEND

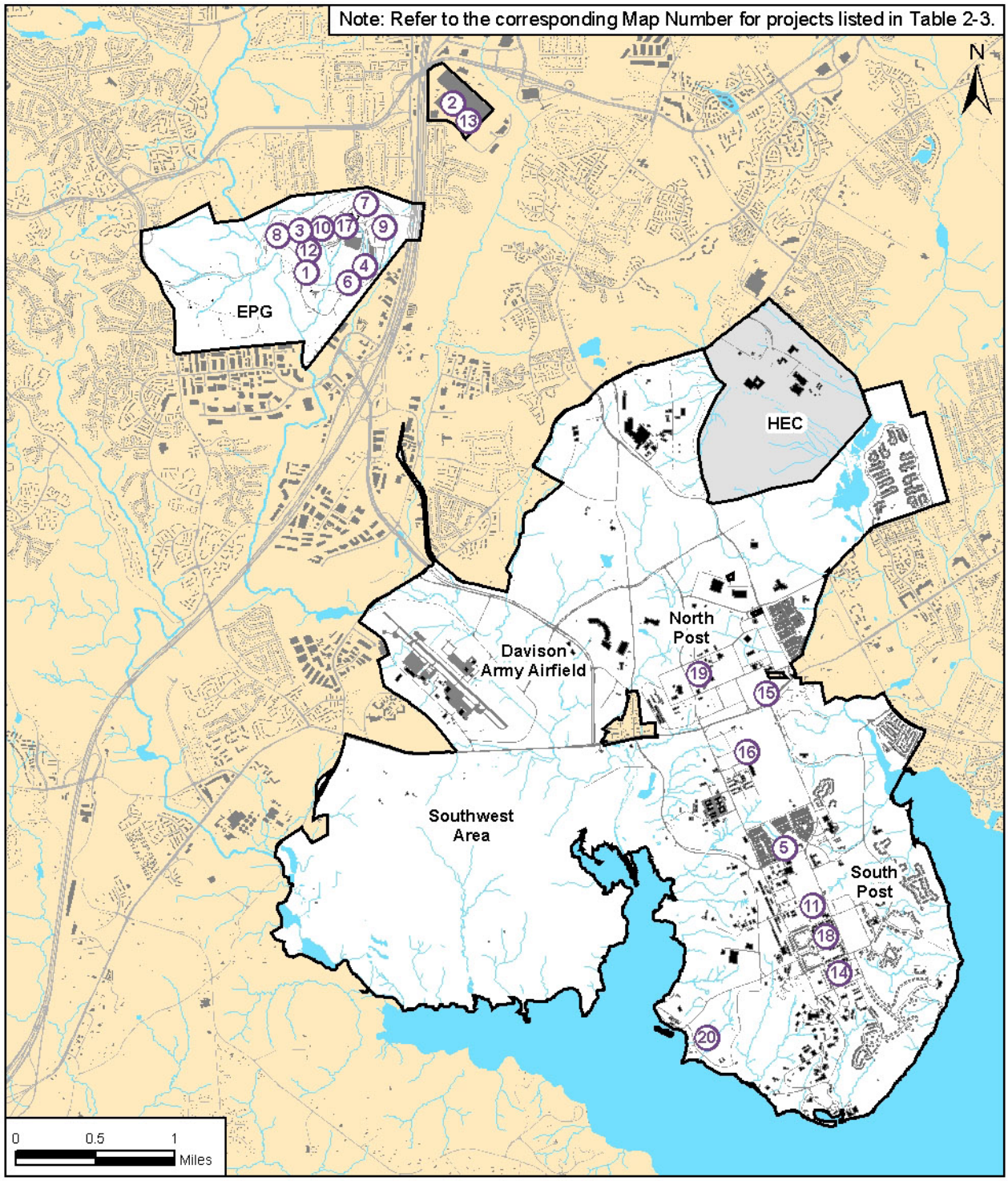
Installation Property

City Center Land Use Plan

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 3-3



LEGEND

Installation Property

(8) Map Number

City Center Project Locations

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 3-4

Table 3-2 shows the allocation of land use designations under the City Center Alternative, compared to the 1993 land use plan as amended in 2002.

Table 3-2
Comparison of 1993 and City Center Alternative land use allocations

1993 master plan		Proposed land use plan	
Land use	**Acres**	**Land use**	**Acres**
Administration & Education	724	Airfield	700
Airfield	391	Community	2,806
Community Facilities	452	Industrial	219
Family Housing	576	Professional/Institutional	2,125
Industrial	126	Residential	1,316
Medical	97	Training	1,282
Outdoor Recreation	1,006	Troop	116
Research & Development	340		
Supply, Storage, & Maintenance	378		
Training Range	462		
Troop Housing	72		
Environmentally Sensitive	3,063		
Total	**7,687**		**8,564**

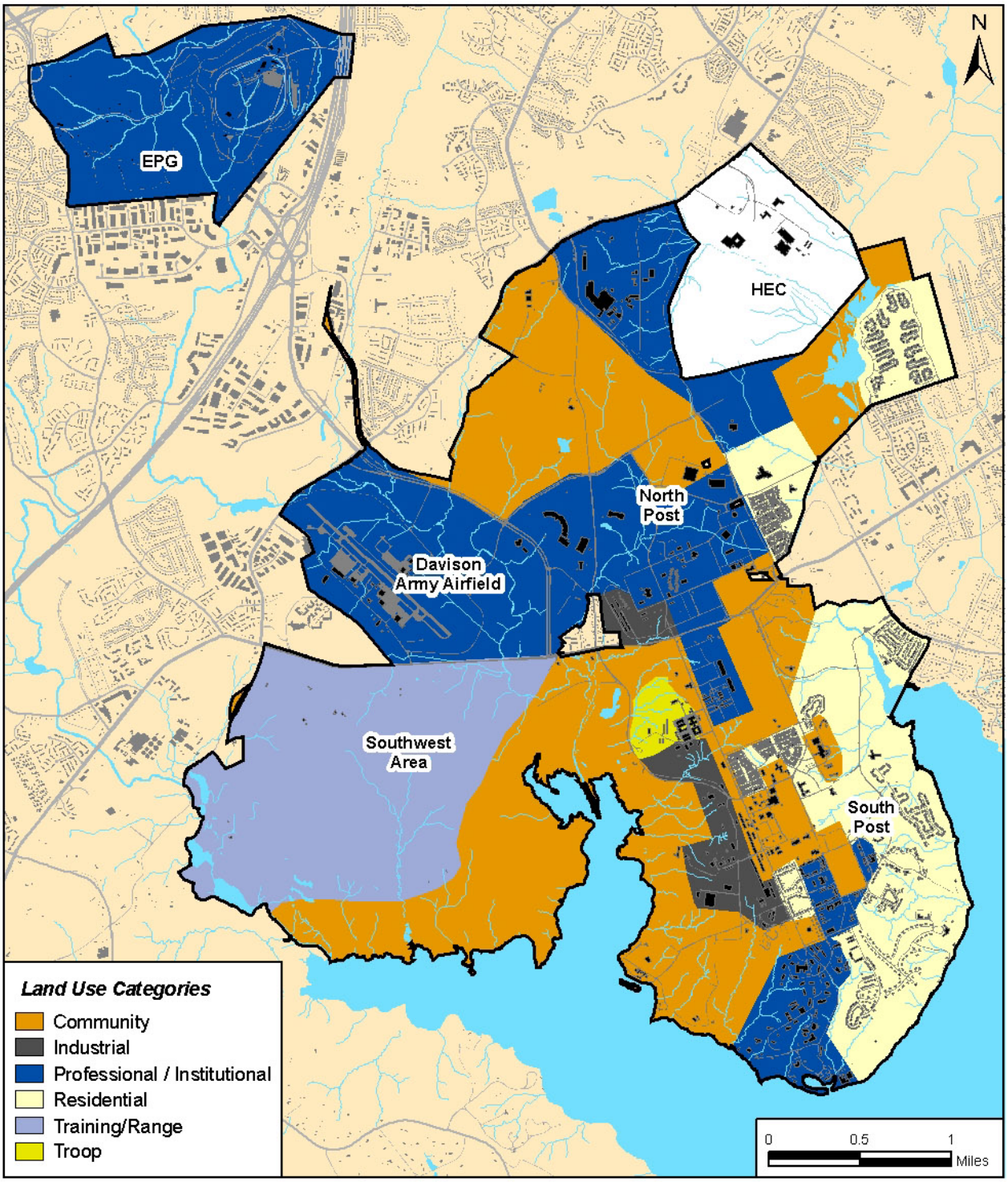
The City Center Alternative contains two sub-alternatives with respect to the present and proposed Troop Area. The proposed plan would change the Troop Area on North Post to Professional/Institutional uses and create a new Troop Area on South Post in an Industrial area (the western portion of the 1400 area) along Gunston Road. Availability of funding, however, might cause current uses in the present and proposed Troop Areas to continue for an indeterminate period. Accordingly, this EIS evaluates both situations: first, relocation of the Troop Area to South Post, with the present Troop Area parcel becoming Professional/Institutional (proposed action) and, second, to continue uses of the North Post and South Post parcels for Troop Area and Industrial purposes, respectively (status quo; delayed implementation).

3.3.3 Satellite Campuses Alternative

Under the Satellite Campuses Alternative, new facilities to accommodate base realignment would be sited on Davison Army Airfield, North Post golf course, and North Post and South Post (from Kingman Road to 12th Street). Figure 3-5 shows the Satellite Campuses Alternative. For land use planning, land parcels affected by the Satellite Campuses strategy would be redesignated for Professional/Institutional or Community uses.

Accommodation of BRAC realignments under this alternative would result in the following major sitings:

- NGA and associated parking structures would be sited at Davison Army Airfield (which would be closed). This would be facilitated by changing the present land use designations from Airfield to Professional/Institutional.



LEGEND

Installation Property

Satellite Campuses Land Use Plan

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 3-5

- WHS and MDA and associated parking structures would be sited in the North Post area that is bounded by Constitution Drive, U.S. Route 1, and Gunston, Abbott, and Beauregard Roads. This would be facilitated by changing the land use designations north of U.S. Route 1 from Community and Troop to Professional/Institutional.

- Army Lease would be sited in existing facilities along the east side of Gunston Road between U.S. Route 1 and 9th Street, and in the northwest quadrant of the intersection of Belvoir Road and 21st Street in renovated facilities.

- Medical Command and associated parking structures would be sited on the southern portion of the North Post golf course. This would be facilitated by changing the land use designation from Recreation to Community.

- PEO EIS and associated parking structures would be sited on North Post, in the southern half of the area bounded by Woodlawn, Abbott, Gunston, and J.J. Kingman Roads. This would be facilitated by changing the present land use designations from Community to Professional/Institutional.

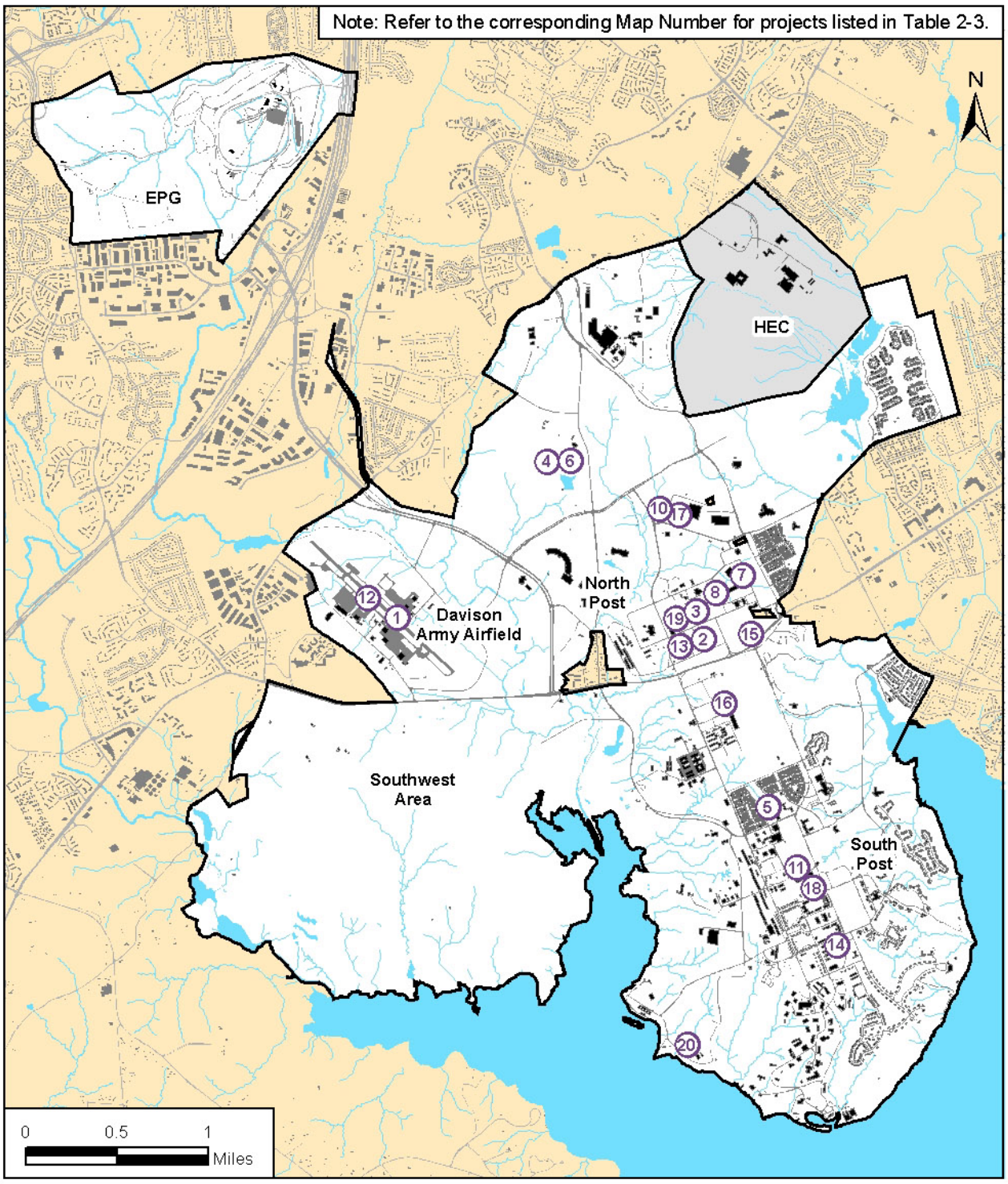
Areas of EPG west of Accotink Creek would be designated as for Community use, and areas east of the creek would be designated for Professional/Institutional use to support future development.

Figure 3-6 shows the proposed locations for facilities projects (see Section 2.2.2.3 and Table 2-3). Since EPG would not be developed in order to accomplish BRAC realignment actions, the proposed emergency services center project and much of the infrastructure project would not be required and would not proceed at EPG.

Table 3-3 shows the allocation of land use designations under the Satellite Campuses Alternative, compared to the 1993 land use plan as amended in 2002.

Table 3-3
Comparison of 1993 and Satellite Campuses Alternative land use allocations

1993 master plan		Proposed land use plan	
Land use	**Acres**	**Land use**	**Acres**
Administration & Education	724	Airfield	0
Airfield	391	Community	2,712
Community Facilities	452	Industrial	257
Family Housing	576	Professional/Institutional	2,874
Industrial	126	Residential	1,298
Medical	97	Training	1,282
Outdoor Recreation	1,006	Troop	73
Research & Development	340		
Supply, Storage, & Maintenance	378		
Training Range	462		
Troop Housing	72		
Environmentally Sensitive	3,063		
Total	**7,687**		**8,496**



LEGEND

- Installation Property
- (8) Map Number

Satellite Campuses Project Locations

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 3-6

The Satellite Campuses Alternative contains two sub-alternatives with respect to the present and proposed Troop Area. The proposed plan would change the Troop Area on North Post to Professional/Institutional uses and create a new Troop Area on South Post in an Industrial area (the western portion of the 1400 area) along Gunston Road. Availability of funding, however, might cause current uses in the present and proposed Troop Areas to continue for an indeterminate period. Accordingly, this EIS evaluates both situations: first, relocation of the Troop Area to South Post, with the present Troop Area parcel becoming Professional/Institutional (proposed action) and, second, to continue uses of the North Post and South Post parcels for Troop Area and Industrial purposes, respectively (status quo; delayed implementation).

3.3.4 Preferred Alternative

Consideration of the Town Center, City Center, and Satellite Campuses conceptual development strategies resulted in a determination that any single strategy was inadequate to meet Fort Belvoir's base realignment needs. The Army reached this determination based on giving high priority to traffic-related issues and development density; specifically, use of EPG for all base realignment units, agencies, and activities would have resulted in development densities that might not be supportable because of traffic congestion. In light of these circumstances, the Army identified a seventh alternative for land use, referred to as the Preferred Alternative Land Use Plan. That alternative is presented in Section 2.2.2.

The Preferred Alternative Land Use Plan contains two sub-alternatives with respect to the present and proposed Troop Area. The proposed plan would change the Troop Area on North Post to Professional/Institutional uses and create a new Troop Area on South Post in an Industrial area (the western portion of the 1400 Area) along Gunston Road. Availability of funding, however, might cause current uses in the present and proposed Troop Areas to continue for an indeterminate period. Accordingly, this EIS evaluates both situations—first, relocation of the Troop Area to South Post, with the present Troop Area parcel becoming Professional/Institutional (proposed action) and, second, continued use of the North Post and South Post parcels for Troop Area and Industrial purposes, respectively (status quo; delayed implementation).

3.4 ALTERNATIVES FOR BRAC IMPLEMENTATION

The BRAC Law requires implementation of base realignment actions by not later than September 15, 2011, 6 years following the President's sending the BRAC Commission's recommendation to Congress. Because those recommendations became law effective November 9, 2005, the Army is required to implement them in accordance with their terms. Consideration of alternatives such as not relocating personnel or relocating them to other installations is not legally permissible.

The implementation of base realignment at Fort Belvoir essentially centers on what facilities must be provided, where those facilities would be sited, and which personnel would be assigned to new or renovated facilities. The determinations on these matters are, in large part, guided by the post's land use plan, which identifies areas appropriate for Professional/Institutional purposes. This EIS examines four land use plan alternatives that serve as the surrogate for alternative means of accommodating the units, agencies, and activities being relocated. No other alternatives to BRAC implementation are evaluated in this EIS.

3.5 NO ACTION ALTERNATIVE

Inclusion of the No Action Alternative is prescribed by the CEQ regulations and serves as the benchmark against which federal actions can be evaluated. No action assumes that the Army would continue its mission at Fort Belvoir as it existed in the fall of 2005, with no units relocating from other locations and no new facilities being constructed. Because the BRAC Commission's recommendations now have the force of law, continuation of the fall 2005 Fort Belvoir mission is not possible. Although the No Action Alternative is not possible to implement without further Congressional action, it serves as a baseline alternative against which other alternatives can be evaluated.

SECTION 4.0
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Sections 4.2 through 4.13 contain descriptions of the baseline (November 2005) affected resource areas on Fort Belvoir, followed by the findings of the impact analyses for implementing the BRAC activities under each alternative. Section 4.14 summarizes mitigation measures applicable to each of the resource areas. Section 4.15 and Sections 5.14 and 5.15 contain information required by CEQ regulations for EISs: Unavoidable Adverse Environmental Impacts (Section 4.15), Irreversible or Irretrievable Commitments of Resources (Section 5.14), and Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity (Section 5.15). A summary of the cumulative effects associated with implementing the Preferred Alternative is presented in Section 5.

For impact analysis purposes in this EIS, the footprints for each BRAC project were estimated based on the building size, parking requirements, and area of additional disturbance. The footprints used for the major BRAC projects were shown in Figure 2-6. Impacts to resources were quantified where possible and are presented in the sections below.

4.2 LAND USE

This section describes the physical use of land in and around Fort Belvoir and the spatial relationships between the installation and surrounding community. The discussion summarizes existing conditions and foreseeable future land use consequences of future development in the context of BRAC planning at Fort Belvoir, Fairfax County, and northern Virginia.

In its Comprehensive Plan published in 2003, Fairfax County describes a detailed land use and site plan for the Engineer Proving Ground (EPG) that is discussed in Section 4.2.1.2.6 below. The county's plan, developed in the mid-1990s, is based on a previous public-private partnership proposal for development of EPG; the Army has since determined its need to retain EPG and implement its own development plans for the site as discussed in Section 2.0. For comparison purposes, some conceptual elements of the county plan are presented below because they are similar to EPG development under the proposed action. .

4.2.1 AFFECTED ENVIRONMENT

The affected environment encompasses Fort Belvoir and the interface (installation boundary area) between Fort Belvoir and the surrounding community. The surrounding community includes natural resources and the human environment that may be enhanced or adversely affected by actions at Fort Belvoir.

4.2.1.1 Regional Geographic Setting and Location

Fort Belvoir is in Fairfax County, Virginia, one of the largest and most populous jurisdictions in the Washington, DC area. The county covers approximately 400 square miles and is home to about one million people. It is a mostly urban jurisdiction that combines residential developments of various densities with major employment and commercial centers. It is bordered by several

other counties that are intensely developed (Arlington and the City of Alexandria) or that have portions that have become more developed over the last several decades as the Washington, DC metropolitan area has expanded (Prince William and Loudoun Counties in Virginia and Montgomery and Prince George's Counties in Maryland).

Fort Belvoir occupies approximately 13.5 square miles in southeastern Fairfax County, approximately 15 miles south of Washington, DC. Fort Belvoir employs approximately 22,000 workers, and has 2,070 homes in on-post residential developments. The post consists of five general areas: North Post, South Post, Southwest Area, and Davison Army Airfield (collectively referred to as Main Post) and the EPG. A sixth location is the off-post GSA Parcel. Figure 1-2 showed these principal areas.

The approximately 2,720-acre South Post, south of U.S. Route 1, occupies a peninsula extending into the Potomac River between Gunston Cove and Accotink Bay to the west and Dogue Creek to the east. The South Post is the most developed portion of the installation, and is the location for the garrison headquarters and associated functions, numerous administrative facilities, warehouses, 11 housing areas, and a nine-hole golf course. The North Post occupies about 2,400 acres in most of the area between U.S. Route 1 and Telegraph Road from its intersection with Route 1 westward towards Fairfax County Parkway and northward toward Telegraph Road at the northernmost corner of the 579-acre Humphreys Engineer Center (HEC). The HEC, however, is not considered to be part of Fort Belvoir and is not addressed in this EIS. The North Post is somewhat developed with administrative facilities for larger tenant agencies, two housing areas, and a two 18-hole golf courses. The Southwest Area is a generally undeveloped, approximately 1,900-acre area that extends west of Accotink Creek and south of U.S. Route 1 and the Davison Army Airfield to Pohick Bay. It is separated from the South Post by Accotink Bay and Accotink Creek. To the west, the Southwest Area is bounded by Pohick Creek and Old Colchester Road. Accotink Village, at the intersection of U.S. Route 1 and Backlick Road, is an enclave of privately owned land within Fort Belvoir. Accotink Village is under the jurisdiction of Fairfax County. Davison Army Airfield occupies about 740 acres (the developed areas for the runways and nearby buildings occupy about 400 acres) in the portion of the installation west of Fairfax County Parkway and north of U.S. Route 1, and provides the airfield and associated functions for Fort Belvoir. These four areas—South Post, North Post, Southwest Area, and Davison Army Airfield—comprise Fort Belvoir's Main Post of a little more than 7,700 acres.

The fifth area of Fort Belvoir, EPG, is a former military training and testing area on an 807-acre noncontiguous portion of the installation approximately 1.5 miles northwest of the Main Post. EPG is bounded by I-95 to the east and by commercial and residential properties to the north, west, and south. EPG is further inland and on higher ground than the Main Post. Accotink Creek traverses EPG from north to south, dividing it into two nearly equal parts. Broad level terraces are present on each half of the site. The Army acquired EPG in the early 1940s for the testing of a wide range of engineering equipment and supplies, including methods and equipment for the deployment, detection, and neutralization of landmines. The Army used EPG for these purposes from the 1940s through the mid-1950s. Section 4.2.1.2.6 provides additional information on the history of EPG.

A sixth area under consideration in the EIS is the GSA Parcel. The 70-acre parcel is not managed as part of Fort Belvoir, although the site is being evaluated for use in the BRAC realignment process. The parcel is developed and has over 1 million square feet of warehouse space used for storage. The parcel location relative to Fort Belvoir, shown in Figure 1-2, is approximately 4 miles north of the Main Post in the southeast corner of the intersection of U.S. I-95 and the Franconia-Springfield Parkway.

4.2.1.2 Land Use on Fort Belvoir

The 1993 land use plan, as amended in 2002, is the guiding document for Army planners to assure that incremental improvements and new additions to installation facilities fully serve the primary and support functions of the Fort Belvoir mission. Figure 2-1 presented the current land use designations at Fort Belvoir.

Approximately 70 percent of Fort Belvoir is undeveloped. The installation includes extensive forested areas, particularly in the Southwest Area. Developed areas are found primarily in the South and North Posts.

4.2.1.2.1 Existing Land Use Designations

Land utilization at Fort Belvoir conforms fairly closely to the existing designations. However, areas shown on a land use designation map as being under a given land use generally also include associated open areas and supporting facilities (e.g., utility services, access roads, parking areas). Therefore, the map does not reflect actual densities of development. The land use designations currently in use are Administration & Education; Airfield; Community Facilities; Family Housing; Industrial; Medical; Outdoor Recreation; Research & Development; Supply, Storage, & Maintenance; Training Range; Troop Housing; and Environmentally Sensitive.

4.2.1.2.2 North Post

The North Post is generally divided in two sections by Abbott Road into an upper portion and lower portion. The 2,100-acre upper portion of the North Post (corresponding to the Upper North Post planning district) is characterized primarily by Administration & Education, Research & Development, Environmentally Sensitive, and Outdoor Recreation uses. Outdoor Recreation includes the 36-hole North Post Golf Course, north of John J. Kingman Road. The principal Environmentally Sensitive features on the North Post are the Forest and Wildlife Corridor connecting Huntley Meadows to the northeast of the Main Post with the Accotink Bay Wildlife Refuge in the Southwest Area and the Jackson Miles Abbott Wetland Refuge on the eastern edge of the installation. The latter Refuge separates Woodlawn Village—one of two Family Housing areas on the North Post—from the rest of the installation. The Administration & Education and Research & Development categories reflect the presence of large tenant organizations that occupy fenced and secured compounds on the North Post, including the Defense Logistics Agency (DLA), Defense Threat Reduction Agency (DTRA), U.S. Army Intelligence and Security Command (INSCOM), and Defense Communications Electronics Evaluation and Testing Agency (DCEETA).

Development in the upper portion of the North Post is clustered and of moderate to low density. This is consistent with the installation's 1993 land use plan. The plan, noting the presence of numerous environmental constraints and that Upper North Post developable areas are not contiguous, provides that these areas be developed individually as cohesive units, both functionally and visually, with shared support facilities and parking structures.

The lower portion of the North Post consists of about 300 acres and is more densely developed and predominantly characterized by Community Facilities as well as Supply, Storage, & Maintenance; Troop Housing (McRee Barracks); and Family Housing (Lewis Heights, the second of two Family Housing areas on the North Post). Community facilities are concentrated in an area designated as the Regional Community Support Center (north of Abbott Road). This area was the subject of the 2002 amendment to the 1993 land use plan, which re-designated a portion of it for

medical use, to allow for construction of a future Army Community Hospital planned at Fort Belvoir. Existing uses in this area include the Commissary and Post Exchange (PX). Supply, Storage, & Maintenance uses in the Lower North Post consist mostly of five motor pools and six maintenance shops between Meade and Goethals Roads, just north of Route 1.

The more densely developed nature of the Lower North Post is consistent with the 1993 land use plan. Because of the relatively unconstrained nature of the area, the 1993 plan noted that the Lower North Post provided the opportunity to create a successful transition between the Upper North Post and the South Post. Structures in the Lower North Post were to relate visually to the South Post, but could be larger.

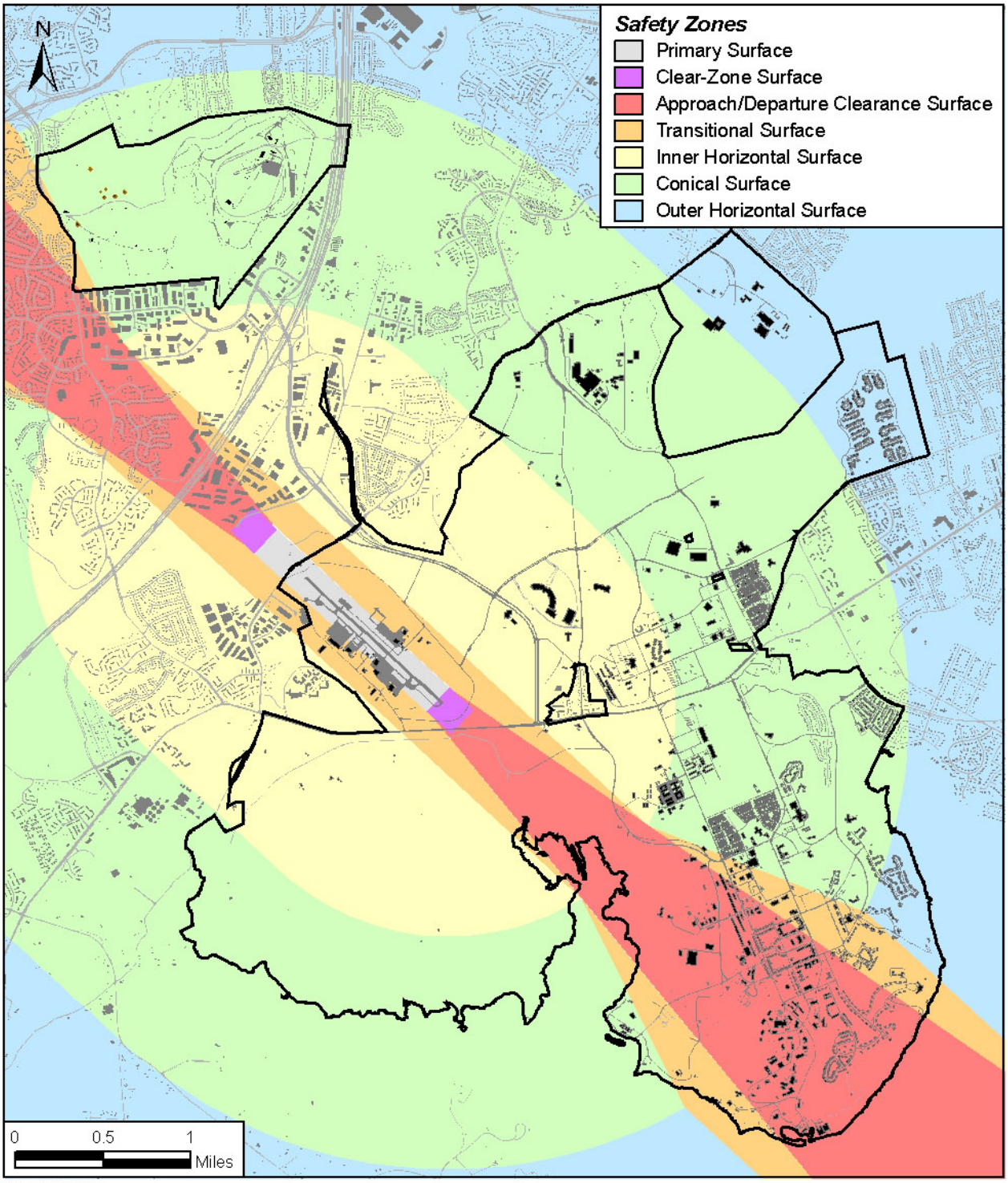
4.2.1.2.3 Davison Army Airfield

Davison Army Airfield (DAAF) occupies about 400 developed acres of land west of Fairfax County Parkway. The mission of the Davison Army Airfield is to transport passengers and freight for the Army and DoD to, from, and within the National Capital Region (NCR). The airfield fulfills this mission with an average of 20 missions per day (takeoffs and landings) (Fort Belvoir, 2005b). There are 36 buildings surrounding the airfield, and the facility employs over 400 people. It has a 450-by-40-foot helipad and a 5,500-by-80-foot paved runway with a parallel 4,900-foot taxiway. Davison Army Airfield serves five tenant flight units and is home to two Army aviation commands: the Army's fixed-wing Operational Support Airlift Agency (OSAA), a Department of the Army field-operating agency under the Army National Guard with its co-located Operational Support Airlift Command (OSACOM) headquarters; and the rotary wing 12th Aviation Battalion, under the administration of the Military District of Washington (MDW).

Two- and three-dimensional safety zones are defined around all runways and taxiways, including those at Davison Airfield, to minimize the potential for accidents during take-off and landing operations. These zones are to remain clear of objects, such as buildings, that could cause or be affected by an accident. Figure 4.2-1 illustrates airspace restrictions at the DAAF. The footprint of the safety zones associated with the airfield extends well beyond the airfield itself. The safety zones constrain the presence and height of potential developments in parts of the surrounding land, including the North Post, Southwest Area, and EPG. Building height restrictions are governed by guidelines and regulations relating to the identification and construction of obstructions within airspace are established in the Federal Aviation Regulations (FAR Part 77, *Objects Affecting Navigable Airspace*). Another constraint associated with the airfield results from aircraft-generated noise, as described in Section 4.5 of this EIS.

Building restrictions within the conical surface begin at the 150 feet level above the runway at the boundary with the inner horizontal surface and extend outward at a slope of 20:1 (horizontal: vertical) for a distance of 7,000 feet to an elevation of 500 feet above the airfield. The majority of the remaining portion of the Main Post (with the exception of the extreme northeast and southeast sections) and EPG fall within the 150- to 500-foot building height restriction within the conical surface. Portions of the Mount Vernon, Rose Hill, Springfield, Pohick, and Lower Potomac planning districts also fall within portions of the conical surface height restriction boundary.

The 1993 land use plan noted that because of its remote location and function, the Davison Army Airfield planning district did not have a close relationship with the other areas of the post and recommended that future development strive for consistent future renovations, additions, and rehabilitation projects for functions of Davison Army Airfield itself.



Davison Army Airfield Safety Zones

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.2-1

4.2.1.2.4 South Post

Land uses on the South Post are more diverse than on the North Post. With the exception of Airfield, all land use categories are represented on the South Post, which includes the most densely developed areas of Fort Belvoir. It has as its core a densely built quadrangle of land comprising approximately 400 acres. This core area, bounded approximately by 9th and 21st Streets and Gunston and Belvoir Roads, is the heart of Fort Belvoir and its historic character.

This area has a coherent architectural style and includes the Fort Belvoir Historic District (see Section 4.9). Land uses found there include the following:

- Administration and Education—with Fort Belvoir's headquarters, the NGA College, the Army Management Staff College, and Defense Acquisition University)
- Family Housing—Gerber, Fairfax, and Belvoir villages
- Community Facilities—South Post Community Center, service station, home and garden center, shopette and video rental store, laundromat, fitness center, Belvoir Chapel, Mount Vernon Chapel, library, bowling center, sports fields, outdoor running track, skate park, Barden Education Center, and Army Community Services
- Medical—DeWitt Army Community Hospital

Outside the core area, the South Post is characterized by a range of more widely spaced facilities. Family Housing is concentrated east of Belvoir Road (River Village, George Washington Village, Colyer Village, Dogue Creek Village, Park Village, Jadwin Loop), giving that part of the Post a marked residential character. Research & Development uses are represented by an access-controlled compound at the southern end of the peninsula, which includes the Center for Night Vision, Army Knowledge Online (AKO) center, and other functions for which access must be controlled. West of this area, the Tompkins Basin recreation area represents Outdoor Recreation uses. Another substantial area of Outdoor Recreation use is the nine-hole South Post golf course south of U.S. Route 1 and north of 9th Street, between Gunston and Belvoir Roads. Between the South Post and the Southwest Area, just south of U.S. Route 1, at the Tulley Gate entrance to the Main Post, the Eleanor U. Kennedy Homeless Shelter draws homeless persons seeking assistance to the area. The shelter is on the installation but is leased to Fairfax County. Supply, Storage, & Maintenance uses are concentrated in warehouses west of Gunston Road. These warehouses abut a large area of environmentally sensitive lands that extend to Accotink Bay and include about a quarter of the Accotink Bay Wildlife Refuge. An area of Administration & Education use west of the South Post golf course includes the Army Materiel Command (AMC) temporary facilities, the Criminal Investigation Division Command (CIDC), and various other administrative activities.

The 1993 land use plan, recognizing the special character of the South Post, and particularly the South Post Core Area, recommended that development take place within the historic context of this Core Area. Because much of the future development in these districts would be redevelopment or infill, compatibility was considered very important. The plan recommended that activities remain the same and that new development be scaled and sited to relate directly to existing land use patterns in the immediate area.

4.2.1.2.5 Southwest Area

The Southwest Area is largely undeveloped and wooded. Although a substantial amount of land was designated for Administration & Education use under the 1993 land use plan, this land has remained undeveloped. A portion of the Southwest Area is reserved for outdoor training with

little infrastructure or land development appurtenances. Former landfills are found in the northern portion of the Southwest Area. The north-central portion of the area formerly served as an open burning/open detonation (OB/OD) area. Most of the Accotink Bay Wildlife Refuge and a portion of Fort Belvoir's Forest and Wildlife Corridor are in the Southwest Area (Environmentally Sensitive category). Overall, the Southwest Area bears little functional and visual relationship to the rest of the Main Post.

The 1993 plan noted that the Southwest Area is severely constrained and recommended a pattern of development similar to what it proposed for the Upper North Post planning district: high-density clusters with shared support facilities and structured parking that work around constrained areas.

4.2.1.2.6 EPG

EPG is an 807-acre parcel that is 1.5 miles northwest of the Main Post. It is roughly bounded on the east by I-95, by commercial properties to the south, and by residential properties on the west and north sides.

The Army acquired EPG in the early 1940s and used it to support the installation's Research, Development, and Engineering Center. EPG was established early in World War II for testing of a wide range of engineering equipment and supplies. The highest level of activity at EPG occurred during the 1940s to the mid-1950s. Commercial and residential encroachment in the vicinity of EPG in the 1960s and 1970s contributed to the reduction of testing activities at the facility.

The historical testing and training activities on the eastern portion of EPG included the following:

- Construction, material handling, maintenance, railway, power generation, air compression, and bridging equipment
- Fuels and fuel handling and storage equipment, mobile water purification equipment, and waste and sewage structures
- Climatic effects on paints, tactical sensors, and anti-mine systems and techniques.

Activities on the western portion of EPG included the following:

- Methods and equipment for the deployment, detection, and neutralization of land mines
- Anti-intrusion and counter-barrier systems and techniques
- Tactical sensors and anti-mine systems and techniques.

In 1989, the Research, Development, and Engineering Center turned the property back over to Fort Belvoir. Most of EPG is currently inactive with the exception of the administrative offices of the U.S. Army Nuclear and Chemical Agency (USANCA), which currently occupies Building 5073. Additional activities at the site include those associated with ongoing environmental and geophysical work at several of the range areas in the west. A 170-acre tract of land along the western and southern boundaries is reserved as the right-of-way for completion of the Fairfax County Parkway.

4.2.1.2.7 GSA Parcel

The 70.6-acre GSA Parcel, controlled by the GSA, is not part of Fort Belvoir. Therefore, it is not categorized by the land use designations that apply to Fort Belvoir. The area consists of 1 million square feet of warehouse and office space and paved parking, which would correspond to the Army's Administration & Education and Supply, Storage & Maintenance land use categories.

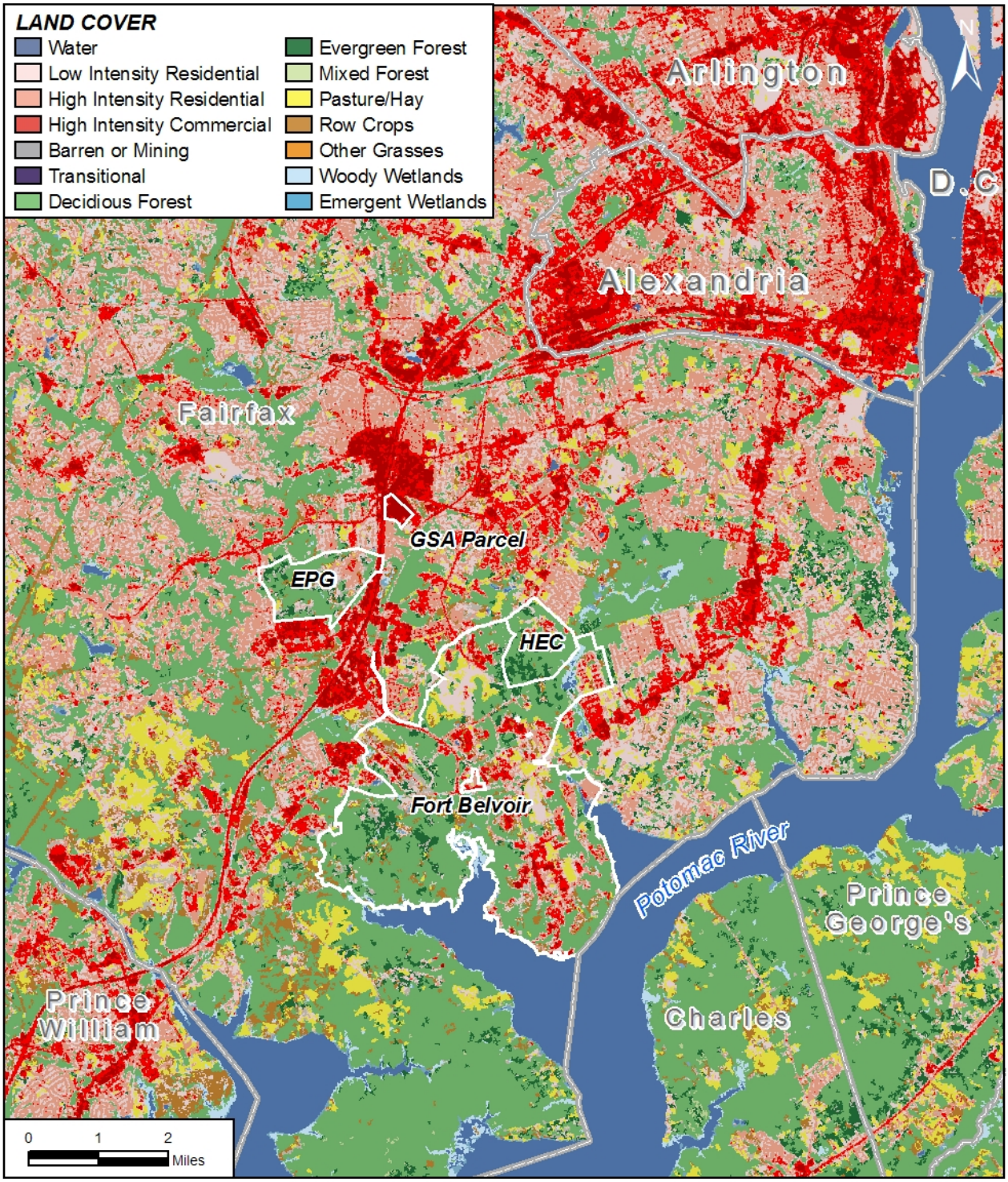
4.2.1.3 Antiterrorism and Force Protection

The proposed land use plan update has been developed in full awareness of force protection requirements for military facilities (DoD, 2003). Force protection is one of the primary drivers for realignment at Fort Belvoir in that agencies would be relocated from non-secure locations to Fort Belvoir in order to meet DoD security requirements. Fort Belvoir is one of the premier military garrisons in the Army, providing a broad variety of critical intelligence, training, and Headquarters services throughout the Department of the Army. Antiterrorism and Force Protection (AT/FP) is considered mission-critical and is considered inviolable. AT/FP involves strictly defined measures to protect these vital services and resources, including personnel, information, and infrastructure from any terrorist attack. AT/FP encompasses four principles: physical security, command and control security, personal security, and law enforcement operations (Rokosz and Hash, 1998). AT/FP involves public safety, access control, visitor/delivery centers, line of sight, mandatory setback minimum distances, and compatibility with adjacent uses/operations, particularly as they relate to transportation and infrastructure. Army regulations establish setback and construction requirements on the basis of risk and vulnerabilities of resources/operations in question. The installation has developed a security and force protection plan and program designed to meet regulatory guidance. Measures implemented under the plan include barrier plans, enhancements at access control points, visitor in-processing, and changes in parking layout (BNVP, 2006).

In terms of land use, AT/FP is addressed by considering the siting of facilities or agencies in relation to their particular needs. The most effective and least disruptive approach to implementing AT/FP measures will be to consider them from the beginning of the planning process.

4.2.1.4 Surrounding Land Use

The Region of Influence (ROI) for the purposes of consideration of land use generally describes a rough semicircle (excluding the Potomac River) extending 3 miles in all directions from Fort Belvoir. Figure 4.2-2 shows the general ROI for land use (Fairfax County), as well as surrounding counties. Fort Belvoir is in a predominantly residential part of Fairfax County, which is rich in natural and cultural resources. Adjacent to or near the installation to the southwest are Pohick Bay Regional Park, Mason Neck State Park, and Mason Neck National Wildlife Refuge, and, to the northeast, Huntley Meadows County Park. Fort Belvoir's Forest and Wildlife Corridor (consisting of approximately 742 acres) provides a connection for all these natural areas. Cultural features adjacent to or near Fort Belvoir include Woodlawn Plantation, Society of Friends Meeting House, Pohick Church, and Mount Vernon. Figure 4.2-2 also shows the land cover for the greater Fort Belvoir community.



Fort Belvoir Land Cover

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006; NLCD 2001.

Figure 4.2-2

Counties in the Fort Belvoir region include Fairfax, Prince William, Arlington, and Loudoun Counties and the City of Alexandria in Virginia; Montgomery, Prince George's, and Charles Counties in Maryland; and Washington, DC. Outside of Fairfax County, Prince William County is the nearest county jurisdiction about three miles to the south of Fort Belvoir. The City of Alexandria is about four miles northwest of Fort Belvoir, and Arlington County is north of Alexandria. These counties were shown on Figure 1-3. As Fort Belvoir is entirely surrounded by Fairfax County land, a detailed description of land use planning in the vicinity of Fort Belvoir is generally limited to Fairfax County.

4.2.1.4.1 Fairfax County Comprehensive Plan

The Fairfax County Comprehensive Plan consists of the Policy Plan, four Area Plans, the Plan map, and the Transportation Plan map. The Policy Plan contains goals, objectives, and policies relating to eight functional elements: Land Use, Transportation, Housing, the Environment, Heritage Resources, Public Facilities, Human Services, and Parks and Recreation. The goals, objectives, and policies guide planning and development review by describing future development patterns in Fairfax County and protecting natural and cultural resources for present and future generations (Fairfax County, 2003).

The countywide element, contained in the Policy Plan, offers a broad statement of county policy to guide decisions toward enhancing the built and natural environment. The Area Plans give more site-specific guidance, from the Planning District down to the Community Planning Sector level. As a federal facility, Fort Belvoir is not bound by the plan. However, to the greatest extent possible, the Army strives to ensure that its actions are compatible with county planning. Although the county's plan is based on a previous public-private partnership proposal for development of EPG, the Army has since determined that it must retain EPG and implement its own development plans for the site. For comparison purposes, some conceptual elements of the county plan are presented below because they are similar to EPG development under the proposed action.

With respect to the land use functional element, the county has adopted both a specific land use countywide goal and related goals to provide land use development guidance, as follows:

- *Land Use.* Maintain quality of life, coordinate public and private development, provide adequate public services and facilities, implement sound environmental practices, follow growth criteria and standards, and achieve economic goals.

- *Transportation.* Balance land use with transportation infrastructure by developing rapid rail, commuter rail, expanded bus service, sidewalks and trails, and reduced dependency on automobiles.

- *Open Space.* Support conservation of plants, animals, and natural land areas, including small open spaces within already-developed areas.

- *Revitalization.* Encourage and facilitate commercial and residential revitalization to prevent or eliminate deterioration.

- *Private Sector Facilities.* Develop commercial and industrial facilities to meet needs for goods, services, and employment, with special attention to small and minority businesses.

- *Employment Opportunities*. Maintain a strong economy and varied employment opportunities.

The Lower Potomac Planning District, which contains the Main Post of Fort Belvoir, is addressed in Area Plan IV. The Main Post is within, and is the namesake of, Community Planning Sector Lower Potomac 4 (LP4). Recommendations for the Fort Belvoir planning sector that are relevant to the proposed action assessed in this EIS include the following:

- *Land use*. Proposed development or redevelopment on Fort Belvoir should be undertaken in cooperation with the county. Development or redevelopment plans should be supported only if they are consistent with the county goals and Comprehensive Plan. Consideration should be given to the construction of on-post housing to meet the needs of military families in southern Fairfax County. On-post housing for military families reduces the competition for affordable housing in the county. The Village of Accotink should generally maintain its current uses and densities/intensities.

- *Heritage Resources*. The remains of the Belvoir site continue to reflect an important element of local heritage and should be protected. Pohick Church, Mount Air, and Woodlawn Historic Districts abut Fort Belvoir. Protection of these historic resources should be considered in any redevelopment of the Fort Belvoir property.

- *Public Facilities*. Construct a new elementary school on Fort Belvoir to replace the existing Fort Belvoir school (this school has been built).

EPG and the GSA Parcel are within the Springfield Planning District in Area Plan IV, with EPG situated within the Fort Belvoir Community Planning Sector (S5) and the GSA Parcel within the Springfield East Community Planning Sector (S7). However, both areas are part of the Springfield-Franconia Planning Area. The countywide goals that serve as land use guidance for the Springfield-Franconia area are the same as discussed above. The county's recommendations relevant to the proposed action assessed in this EIS as they relate to these two parcels are slightly different and include the following:

- *Land Use (EPG)*. Development is limited to an overall density of 0.17 Floor Area Ratio (FAR) to reflect a total of no more than 4.5 million gross square feet of nonresidential development and 1,500 multifamily and 85 patio-style, single-family dwelling units.

- *Environment (EPG)*. The principal environmental feature of EPG is the Accotink Stream Valley Environmental Quality Corridor (EQC). The EQC includes some wetlands outside the stream valley that should be preserved and protected from development.

- *Land Use (GSA Parcel)*. Recognize existing industrial uses and minimize traffic generation in an area with limited transportation capacity. The federal government and the county should work together to facilitate the implementation of the county's Comprehensive Plan, which calls for mixed-use development. Development could include light industrial/research and development use, a conference center, and office and support retail use.

Generally, it is the county's intent to comprehensively plan future land uses and protect natural and cultural assets. The county further is eager to see development of on-post housing for military

families to reduce pressure on affordable off-post housing in the county. Housing should be well-designed, buffered, and located well away from U.S. Route 1.

The county wishes to see development of a 107-acre parcel west of Davison Army Airfield and north of U.S. Route 1 for elderly housing, a nursing care facility, and low-rise office buildings. The county would like Accotink Village to maintain current densities.

Urban design objectives for the U.S. Route 1 corridor near Fort Belvoir include the following:

- Establishing visual continuity along right-of-way and highway edges
- Providing user orientation within the corridor
- Establishing a clear corridor image
- Improving access and functional amenities for both pedestrian and vehicular traffic
- Reducing effects on adjacent residential communities, such as glare, noise, and incompatible building forms

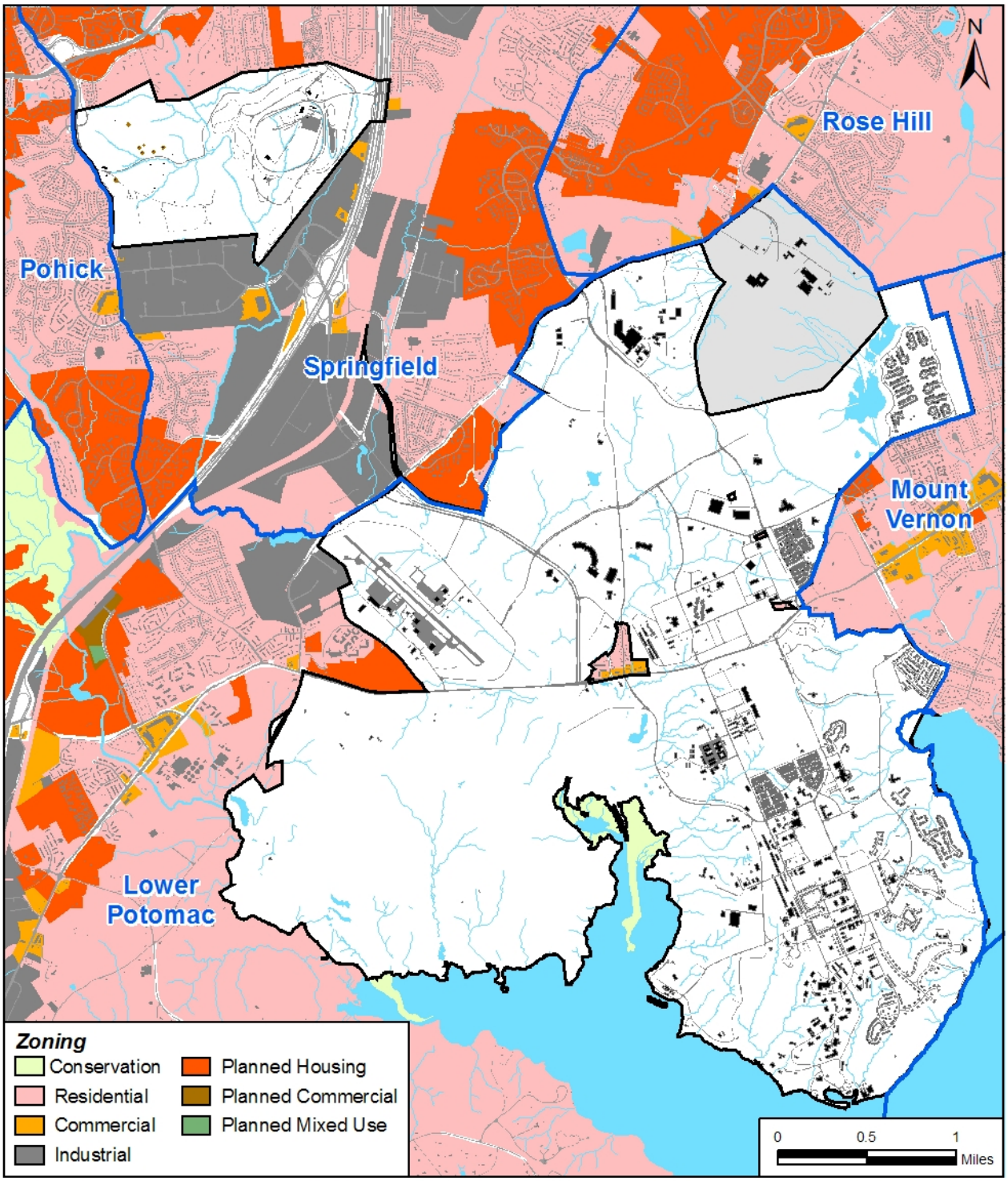
4.2.1.4.2 Adjacent Fairfax County Planning Districts

For the purposes of land use planning, Fairfax County has been subdivided into 14 planning districts. The Main Post falls within the Lower Potomac Planning District, of which it occupies the northeastern corner as shown in Figure 4.2-3. Planning districts are further subdivided into community planning sectors. The Fort Belvoir Community Planning Sector is bounded by Fort Belvoir, Rolling Road, and I-95. Developed land around Fort Belvoir is primarily residential, with commercial uses along major roadways. Adjacent planning districts to the installation are the Springfield, Rosehill, Pohick, and Mount Vernon Districts.

There are two major issues that must be addressed before undertaking future development in any of the districts nearby or abutting Fort Belvoir, particularly in light of the substantial realignment mandated by BRAC. They are transportation and environmental stewardship. Both these fundamental issues are addressed in detail in other sections of this EIS. The planning districts that are closest to Fort Belvoir are highlighted below (Fairfax County, 2003).

Lower Potomac Planning District. Of the 14 planning districts in the county, the Lower Potomac is the fourth largest, with 23,611 acres. The Lower Potomac Planning District contains a variety of land uses (Fairfax County, 2003). Particularly noticeable are two large institutional land areas—Fort Belvoir and the former District of Columbia Department of Corrections site at Lorton. The former Lorton prison property (approximately 3,000 acres) was transferred from the DC Department of Corrections to Fairfax County in July 2002 (116 acres of the property, designated for a high school and a middle school, were transferred in May 2002) and is slated for redevelopment under the name of Laurel Hill. Master planning for the adaptive reuse of Laurel Hill is underway. Future uses may include parkland and housing (Fairfax County, 2004a).

Farther south, across Gunston Cove from Fort Belvoir, the Mason Neck area is characterized by parkland, open space, and very-low-density residential uses (Fairfax County, 2003). Protected areas in Mason Neck include Pohick Bay Regional Park, Mason Neck National Wildlife Refuge, and Mason Neck State Park. Many prehistoric and historic archaeological sites exist within this sector, including Gunston Hall and Pohick Church, which are listed on the National Register of Historic Places. Industrial uses are along portions of the Richmond, Fredericksburg, and Potomac



LEGEND

Installation Boundary

Planning District Boundary

County Zoning and Planning Districts

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.2-3

Railroad tracks, Lockport Place, and U.S. Route 1 south of Gunston and Gunston Cove Roads. Townhouses; garden apartments; single-family, detached homes; and community-serving retail uses are found along U.S. Route 1 between Telegraph and Gunston Roads (Fairfax County, 2003). Fairfax County's Noman M. Cole, Jr. Pollution Control Plant is on the eastern bank of Pohick Creek between the Main Post boundary and U.S. Route 1.

North of U.S. Route 1 along Backlick Road, Accotink Village is a mostly single-family-home residential area entirely surrounded by Fort Belvoir. There are some commercial uses (e.g., gas station, fast food restaurant, convenience store, and various shops) at the intersection of U.S. Route 1 and Backlick Road. A large communication tower dominates the eastern edge of Accotink Village.

Mount Vernon Planning District. Low-density, single-family residences are the predominant land use in this planning district, which is adjacent to the eastern edge of Fort Belvoir. Higher-density residential and commercial uses (local-serving retail and strip malls) are found along U.S. Route 1, between Alexandria and Woodlawn Plantation, a National Register-listed site east of Fort Belvoir's North Post (Fairfax County, 2003). Woodlawn Plantation, The Alexandria Society of Friends Meeting House and Woodlawn Baptist Church are historic resources included in the Woodlawn Historic Overlay District, an approximately 1-square-mile buffer that is one of 13 such districts in Fairfax County (Fairfax County, 2002; 2003). The Woodlawn Community Business Center on U.S. Route 1 is the closest commercial area to the east of Fort Belvoir. The area along Mount Vernon Memorial Highway, across Dogue Creek from Fort Belvoir, is characterized by low-density residential and recreational uses (Mount Vernon Country Club, Grist Mill Park).

Rose Hill Planning District. The Rose Hill Planning District extends northeast of Fort Belvoir to the boundary line with the city of Alexandria. It is substantially developed with stable residential neighborhoods, mostly characterized by single-family, detached dwellings at a density of 2–4 dwelling units per acre. A relatively large portion of the district is public parkland, including Huntley Meadows. Another major feature in the district is Kingstowne, a very large planned community characterized by a wide range of mixed residential development at 3–4 dwelling units per acre, with a mixed-use Community Business Center (CBC) as its focal point. Depending on the housing market and attendant lending industry attitudes, Kingstowne is expected to burgeon over the next 4 years.

Springfield Planning District. This planning district is the most intensively developed area in the ROI. It extends north from Fort Belvoir to the Capital Beltway. It includes the I-95 corridor, the Fairfax County Parkway, the Franconia-Springfield Parkway, and CSX Railroad lines (Fort Belvoir, 2005b). The presence of these major transportation corridors has favored commercial and industrial development in the district. Examples are the Newington Commerce Center and Industrial Park, and, farther north, the Springfield Industrial Center and the Springfield Mall. The Franconia-Springfield Area, in the central portion of the Springfield Planning District, generally extends along I-95 from Commerce Street to the I-95/Newington interchange. The EPG and GSA Parcels are within the Franconia-Springfield Area.

EPG is bordered by low-density, residential uses to the north and west and industrial development to the south and east. The residential development in the immediate area is predominantly single-family detached in nature. The typical residential density is 3–4 dwelling units per acre. The industrial development to the south and east of EPG is mostly warehousing and distribution. The GSA Parcel is bordered by commercial and industrial land uses, including the Metro Springfield

Center Business Park to the south and the Franconia-Springfield Metro Station to the east. The Springfield Mall is north of the GSA Parcel, across the Franconia-Springfield Parkway.

Pohick Planning District. The Pohick Planning District is in southwest Fairfax County, which is west of Springfield and northwest of the Lower Potomac Planning District. The development character is suburban, comprising mainly residential neighborhoods and supporting commercial and institutional uses. The district is bisected by the Fairfax County Parkway (Route 7100) and is served by a network of secondary roads, including Braddock Road, Ox Road, Old Keene Mill Road, Rolling Road, Pohick Road, and Clifton Road. It includes the Occoquan Reservoir, which is a major source of drinking water for the region. It is also a major wildlife habitat. Development in the Occoquan watershed is low density. The Fairfax County Comprehensive Plan designates the Occoquan Reservoir as a major water quality preservation resource.

4.2.1.4.3 Zoning in Areas Surrounding Fort Belvoir

Zoning imposed by local entities does not apply to federal property. Therefore, Fort Belvoir is not bound by Fairfax County zoning regulations.

For areas surrounding Fort Belvoir, Fairfax County has defined several zones within the broad categories of residential (R), commercial (C), industrial (I), and planned development. Additionally, the county has designated overlay and commercial revitalization districts. The overlay districts include historic, natural resources, airport noise impacts, sign control, highway corridor, and water supply protection overlay districts.

Accotink Village, an enclave within Fort Belvoir, includes two residential zones (R-3, Residential District, 3 dwelling units/acre, and R-20, Residential District, 20 dwelling units/acre) and three commercial zones (C-5, Neighborhood Retail Commercial District; C-6, Community Retail Commercial District; and C-8, Highway Commercial District). The area surrounding Fort Belvoir is zoned primarily low- to mid-density residential (from R-1, Residential District, 1 dwelling unit/acre, to R-8, Residential District, 8 dwelling units/acre), although there are several small areas zoned for R-20, Residential District, 20 dwelling units/acre. The higher-density residential zones can generally be found near U.S. Route 1 and I-95. Small areas of Planned Development Housing (PDH) zones exist throughout the area around Fort Belvoir. Much of the former Lorton correctional facility area is zoned PDH as well. The area south of Fort Belvoir (mostly the Mason Neck area) is zoned R-E, Residential Estate District. Commercial zones are scattered in small areas throughout the area around Fort Belvoir. Industrial zones are concentrated along the I-95 corridor and range in density from I-3, Light Intensity Industrial District, to I-6, Heavy Industrial District. Figure 4.2-3 presents a zoning map in the vicinity of Fort Belvoir.

4.2.1.5 Current and Future Development in the Region of Influence

The ROI for land use for Fort Belvoir is defined in Section 4.2.1.4 above. Notable new developments are principally sited north of Fort Belvoir along the Franconia-Springfield Parkway. Specific projects include the following:

- *Metro Park.* This project includes six office buildings, five of which are complete as of late spring 2006. Four of the five are leased out. One of the buildings is being marketed to large tenants.
- *Kingstowne Center.* This project is a four-building, mixed use development with 2 million square feet of capacity for office space and 6,300 residential units and associated retail space.

- *Midtown Springfield.* This project is a proposed mixed use complex to include 800 apartments and condominiums, a 160-room hotel, 40,000 square feet of office space, and nearly 100,000 square feet of retail.
- *Springfield Mall.* Vornado Realty Trust has plans to redevelop the Springfield Mall complex and add a hotel, residential units, and office space.

Other long-term Fairfax County projects that might affect future land use in the ROI include increased housing, office, retail, hotel and smaller developments for industrial and institutional uses.

The general county objectives for development in Springfield Planning District include the following:

- Revitalizing and redeveloping the Springfield CBC
- Establishing land use and urban patterns in the Springfield area that support mass transit
- Developing the Franconia-Springfield Transit Station Area
- Providing affordable housing near mass-transit facilities and transportation corridors
- Ensuring that future development of EPG does not result in adverse effects on surrounding neighborhoods and transportation service
- Protecting stable residential neighborhoods and environmental resources from development effects

The general county objectives for development in the Lower Potomac Planning District include the following:

- Create a town center in the Lorton-South Route 1 area; preserve stable residential areas through compatible infill development
- Limit commercial encroachment into residential areas
- Encourage the creation of new parks, open space and recreation areas, and increase the acreage of the EQC program
- Provide screening, buffering, and transitional land uses between residential and nonresidential areas
- Preserve significant heritage resources

Fairfax County reports that about 390 acres of long-term, mixed-use developments are planned within three miles of Fort Belvoir, including about 18 acres under development at Midtown Springfield and redevelopment of the Springfield Mall as mentioned above. About 372 acres of long-term development projects are in the Area Plan Review process and are expected to be approved (Fairfax County Department of Planning and Zoning, 2006).

There are much smaller-scale, short-term developments occurring eastward from Fort Belvoir along the Route 1 corridor. The Southeast Fairfax Development Corporation (SFDC) has identified 32 projects of significance in the Mount Vernon Planning District, stretching from Fort Belvoir to the west and ending at the Capital Beltway to the east. These are mostly small renovation and building addition sites that, in some cases, are confined to façade beautification and signage. Some are typical construction of small buildings like banks and a variety of

commercial and light industrial land uses. These projects require only simple building permits. They do not involve rezoning or special exception rulings.

By contrast, the Fairfax County Department of Planning and Zoning has a long list of short-term projects that will require rezoning, zoning appeals (because their rezoning bids failed), and other procedural techniques before they can apply for construction permits. There is almost no overlap between the SFDC project roster along Route 1 and the county's long- and short-term lists.

Fairfax County and the SFDC report a total of 2,380 acres in short-term development projects that are under construction or approved for construction. Nearly all are single-story with the exception of a planned hotel. The breakdown by land use is presented in Table 4.2-1.

Table 4.2-1
Land use summary for proposed off-post development projects

Land use	Acreage
Professional/Institutional	546
Residential	1,150
Commercial/Light Industry	291
Public/Community	394
TOTAL	**2,380**

The National Capital Planning Commission (NCPC) provides overall planning guidance for federal land and buildings in the National Capital Region (NCR), including Fort Belvoir. Through its planning policies and review of development proposals, the Commission seeks to protect and enhance the extraordinary historical, cultural, and natural resources of the nation's capital.

Additional details about off-post projects, as well as a map of their locations, are provided in Section 5, Cumulative Effects.

4.2.1.6 Coastal Zone Management Program

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. Section 1451, et seq., as amended) provides assistance to the states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Section 307(c)(1) of the Coastal Zone Management Act Reauthorization Amendment (CZMARA) stipulates that federal projects that affect land uses, water uses, or coastal resources of a state's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of that state's federally approved coastal management plan.

The Commonwealth of Virginia has developed and implemented a federally approved Coastal Resources Management Program (CRMP). The program brings together a series of laws and policies pertaining to the protection of the Commonwealth's coastal zone. These laws and policies regulate the following areas: tidal and non-tidal wetlands, fisheries, sub aqueous lands, dunes, point source air pollution, point source water pollution, non-point source water pollution, shoreline sanitation, and coastal lands management.

The Commonwealth of Virginia coastal zone includes all of Fairfax County, including Fort Belvoir's Main Post, EPG, and the GSA Parcel. Therefore, federal actions at Fort Belvoir are subject to federal consistency requirements. The Virginia Department of Environmental Quality

(VDEQ) serves as the lead agency for Virginia's CRMP. Coastal consistency review may be coordinated with the NEPA review process (VDEQ, 2005a). Through coordination with VDEQ, this EIS contains the draft coastal zone management consistency determination at Appendix C. Additional information about the CZMA is provided in Section 4.7.1.5.1.

4.2.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

With respect to adoption of an update land use plan, the environmental consequences to land use relate to the relative acreage allocation and proximity (compatibility) of land use categories. For implementation of BRAC, environmental consequences to land use relate to adherence to land use categorization and preservation of flexibility to meet future mission requirements. For Fort Belvoir, these parameters drive the evaluation of land use.

4.2.2.1 Land Use Plan Update

Long-term minor beneficial effects would be expected. The Preferred Alternative land use plan would aggregate land use categories in a way that reflects and supports the evolution in Fort Belvoir's mission. The expanded land use categories—chiefly, Professional/Institutional and Community—support Fort Belvoir's mission within the region as an administrative, logistics, and operations center; military support center; classroom center; housing center; military community support center; and a leader in environmental stewardship.

The Preferred Alternative land use plan provides for the orderly development of EPG. It also allows for the consolidation of current Professional/Institutional uses on North Post with new Professional/Institutional uses along the south side of Abbott Road. As this occurs, the Troop area would relocate to South Post to an area near several community services, creating convenience for personnel permanently assigned to the installation. Re-designation of the South Post golf course from Outdoor Recreation to Professional/Institutional would allow siting of the new hospital; its easy accessibility would benefit numerous outpatients and visitors. While the Environmentally Sensitive land use category would not be carried forth to the revised land use plan, the regulatory requirements protecting high-value resources would remain in effect.

The proposed land use designations simplify and consolidate the existing (1993) land use categories in that they recognize broader actual compatibility between adjacent land uses on the installation. The more broadly defined categories provide Army planners at Fort Belvoir with greater flexibility for future development without having to grapple with compatibility.

The Preferred Alternative land use plan would result in more than 2,000 acres of the post's 8,300 acres available for Professional/Institutional uses. This amount of acreage would allow for development densities that would be consistent with the post's current landscape. Lands designated for Airfield use would nearly double, with land to the east of the flight line being added to that category. Similarly, lands allocated to Residential uses would nearly double in acreage. The Preferred Alternative land use plan increases the post's available acreage for development by approximately 800 acres.

Designation of the northwest corner of EPG as Professional/Institutional would mean that the Army intends to retain this parcel in lieu of transferring it to Fairfax County.

Off-post effects of the Preferred Alternative land use plan would be negligible. The proposed plan would not contravene local planning efforts. In the event access to EPG were to be made possible by creation of a transportation corridor along Neuman Street, approximately 19

residences and one former commercial property (now used as a church) would be changed from their current designations. This would be an indirect effect of adopting the Preferred Alternative land use plan.

4.2.2.2 BRAC Implementation and Facilities Projects

Long-term minor beneficial and adverse effects would be expected. Construction to support BRAC realignment actions would create moderately dense development chiefly in two locations, EPG and South Post. The development of EPG would be new, occurring in an area that historically has not been developed to any substantial degree. Despite the density of development at EPG, in light of the set-back provisions and buffering, the new land uses at EPG would be compatible with adjacent uses (residential to the north and west and industrial and commercial to the east and south). Development of South Post would occur in areas that are already moderately developed. The density of development on South Post would rise, creating noticeable zones for administrative facilities, community facilities, and residential neighborhoods. The separation of these land uses would be sufficient to avoid incompatibilities between adjacent uses.

Implementation of BRAC would hold two major consequences with respect to land use. First, total existing development, new construction, and renovated floor area on Fort Belvoir would grow from nearly 11 million square feet to approximately 16 million square feet. New parking space would add another 7 million square feet, primarily in structured parking. About two-thirds of the new development would occur at EPG for NGA and WHS. Second, development density on South Post would rise. At both EPG and South Post, new development and renovations would, with minor exception (e.g. minor wetlands), take into consideration areas currently identified for environmental preservation and conservation.

Within the inner horizontal surface safety zone around Davison Army Airfield, building heights would remain restricted to a height of 150 feet above the elevation of the runway (approximately 50 feet). Therefore, within a 7,500-foot oval from the edge of the runway, building elevations would be restricted to less than 200 feet above mean sea level (msl). Portions of both the Main Post and EPG lie within the 150-foot height building restriction. If the airfield continues normal, fixed-wing and rotary flight operations as would be expected with the Preferred Alternative, the height and proximity restrictions may not be diminished with the incoming construction program.

Table 4.2-2 summarizes the potential land use consequences associated with build-out of the Preferred Alternative for the largest BRAC facilities projects. The remaining BRAC projects would not result in effects to land use because they are very small projects that would occur within areas that are compatible with neighboring land uses, or they involve modest renovations to existing structures.

4.2.2.3 BMPs/Mitigation

No specific land use BMPs or mitigation measures would be required under the Preferred Alternative.

Use of EPG as the principal location for siting of BRAC-related facilities would alleviate traffic problems and relieve some of the operational land use and environmental constraint pressures on the Main Post (e.g., those possibly arising in connection with DAAF building height restrictions). This, however, is true only if the Fairfax County Parkway extension is built prior to implementation of the Preferred Alternative (see Section 4.3, Transportation).

Table 4.2-2
Land use effects of the largest BRAC projects under the Preferred Alternative

Project/ location	Gross square feet (gsf)	Land use	On-site personnel	Potential effects
NGA EPG	2,419,000	Professional/ Institutional	8,500	– Separation from garrison security forces (potential effects to AT/FP)) – Compatible with adjacent land uses – Reduction of open space – Addition of 5,100 structured parking spaces – Supports key realignment mission
WHS EPG	2,219,000	Professional/ Institutional	9,263	– Separation from garrison security forces (potential effects to AT/FP) – Compatible with adjacent land uses – Reduction of open space – Addition of 5,600 structured parking spaces – Supports key realignment mission
Hospital South Post golf course	868,800	Professional/ Institutional	2,069	– Moderate loss of open space – Location accessible to users – Supports key realignment mission – Loss of recreational facility and reduction of NAF generated revenues
PEO EIS South Post	447,400	Professional/ Institutional	849	– Moderate loss of open space – Supports key realignment mission
Army Lease South Post (AMC site)	230,000	Professional/ Institutional	~1,300	– No changes to land use – Beneficial renovation and use of existing offices
Army Lease South Post (Buildings in 200 Area)	133,000	Professional/ Institutional	~750	– No effects to land use – Beneficial use of existing office space
MDA South Post	107,000	Professional/ Institutional	290	– Minor loss of open space – Loss of recreational area (ball fields) – Supports key realignment mission

4.2.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

The Town Center Alternative would provide for areas that would enable development just north and south of Route 1. The total acreage gained (about 800 acres) in the Professional/Institutional land use category would be identical to that of the Preferred Alternative land use plan, with very little difference in areas for other land use categories.

4.2.3.1 Land Use Plan Update

Long-term minor beneficial effects would be expected. As in the case of the Preferred Alternative land use plan, the Town Center Alternative land use plan aggregates land use categories in a way that reflects and supports the evolution in Fort Belvoir's mission.

The Town Center Alternative land use plan would designate 1,811 acres for Professional/ Institutional uses. While this is the least amount of acreage for Professional/Institutional uses

among the four land use plan alternatives, it represents an increase of 650 acres over what the current land use plan provides for similar types of uses.

The Town Center Alternative land use plan would highly centralize the post's administrative facilities. This would provide advantages for both current and future requirements in that Professional/Institutional uses would be collocated in a core area of the post, leaving other land uses at the post's periphery. As a result, residential and community uses would be physically separated, reducing the potential for potentially incompatible adjacent uses.

Off-post effects of the Town Center Alternative land use plan would be negligible. The proposed plan would not contravene local planning efforts.

4.2.3.2 BRAC Implementation and Facilities Projects

Long-term minor beneficial and adverse effects would be expected. Implementation of the Town Center Alternative would result in loss of community areas and open space in the heart of the North Post. The Town Center Alternative would cluster most major BRAC construction projects on the North and South Posts just north and south of Route 1 (see Figure 3-2). Under present land use planning, 11 of the 24 BRAC and other facilities projects would be on about 88 acres of what is now recreational and open space. The Town Center Alternative would convert the Outdoor Recreation (e.g., South Post golf course) and open space areas to Community and Professional/Institutional uses.

The Town Center Alternative provides for the relocation of the Troop Area on North Post to what is now an industrial and supply/storage area on South Post along Gunston Road. The present North Post barracks can house 1,200 Soldiers. The South Post location would be re-designated as a Troop Area land use. The proposed plan would change the Troop Area on North Post to Professional/Institutional uses. In both areas, the relocation would be compatible with existing surrounding land uses.

EPG, Davison Army Airfield, and the North Post golf course would remain undeveloped and available for future growth after 2011.

Table 4.2-3 summarizes the potential land use consequences associated with build-out of the Preferred Alternative for the largest BRAC facilities projects. The remaining BRAC projects would not result in effects to land use because they are very small projects that would occur within areas that are compatible with neighboring land uses, or they involve modest renovations to existing structures.

4.2.3.3 BMPs/Mitigation

No specific BMPs or mitigation measures would be required under the Town Center Alternative.

4.2.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

The City Center Alternative would provide designate EPG and the GSA site for Professional/ Institutional uses. Nearly all BRAC-related development would occur at those two locations. Only renovations, additions, and minor new construction would occur on the Main Post.

Table 4.2-3
Land use effects of the largest BRAC projects under the Town Center Alternative

Project/ location	Gross square feet (gsf)	Land use	On-site personnel	Potential effects
NGA South Post	2,419,000	Professional/ Institutional	8,500	– Compatible with adjacent land uses – Addition of 5,100 structured parking spaces – Supports key realignment mission
WHS/ South Post	2,219,000	Professional/ Institutional	9,263	– Compatible with proposed adjacent land uses – Density pressures on child care and and adjacent residential areas (Troop Area) – Addition of 5,500 structured parking spaces – Supports key realignment mission
Hospital North Post	868,800	Professional/ Institutional	2,069	– Loss of open space – Supports key realignment mission – Location reduces ease of visitor access
PEO EIS North Post	447,800	Professional/ Institutional	849	– Compatible with adjacent land uses – Minor loss of open space – Supports key realignment mission
Army Lease South Post (AMC site)	230,000	Professional/ Institutional	~1,300	– No effects – Beneficial renovation and use of existing office space
Army Lease South Post Buildings in 200 Area)	133,000	Professional/ Institutional	~ 750	– No effects – Beneficial renovation and use of existing office space
MDA North Post	107,000	Professional/ Institutional	290	– Exposed location for a high-security facility – Minor loss of open space – Supports key realignment mission

4.2.4.1 Land Use Plan Update

Long-term minor beneficial effects would be expected. The City Center Alternative land use plan would designate EPG and the GSA Parcel for Professional/Institutional uses, resulting in there being more than 2,100 acres available in this category. This allocation would enable ample support for current and future requirements for administrative space. This alternative would also more than double the amount of land designated for residential use, inviting future residential development on-post, thereby potentially reducing commuting by Soldiers.

Off-post effects of the City Center Alternative land use plan could be moderate. The county's Comprehensive Plan calls for mixed-use development of the GSA Parcel. Army development of the site for Professional/Institutional uses would not meet this goal directly, but neither would it contravene local planning efforts. Subsequent high density development of EPG and the GSA Parcel might lead the county to limit or reduce the density of other development projects in the vicinity of those locations. Also, in the event access to EPG were to be made possible by creation of a transportation corridor along Neuman Street, approximately 19 residences and one former

commercial property (now used as a church) would be changed from their current designations. This would be an indirect effect of adopting the City Center Alternative land use plan.

4.2.4.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects would be expected. Development of the EPG and GSA site for all but a small portion of the inbound units, agencies, and activities would result in unusually high floor area ratios at both locations. As with other EPG development scenarios, the amount of acreage at EPG available for development would be reduced by land set aside for completion of the Fairfax County Parkway, protection of Accotink Creek, other protected resources (e.g., scattered wetlands), and perimeter buffers. Footprints for parking structures, access roads, and utilities corridors and infrastructure would further reduce the amount of usable land, possibly resulting in a floor area ratio in excess of 0.50.

The City Center Alternative would co-locate NGA, a portion of Army Lease, MEDCOM, PEO EIS, MDA, and associated parking structures at EPG. While all of these activities qualify for placement within the Professional/Institutional land use category, the propriety of their proximity to one another is not optimal. Security requirements for NGA and MDA require considerable building setback distances and buffering from adjacent uses. Moreover, traffic in the vicinity of NGA and MDA should be kept to a minimum to thwart observation of the agency's personnel and activities. Siting of Army Lease, PEO EIS, and the hospital on EPG with NGA and MDA could produce incompatibilities among the tenants.

Development of the 70-acre GSA Parcel for more than 9,200 personnel would result in a densely-built site. Six-story parking structures for 6,000 vehicles would require not less than 8 acres. Notionally, three buildings each having 9 stories, with each floor being 100,000 square feet, could be furnished while ensuring adequate set-back distance for AT/FP purposes. The floor area ratio at the GSA site would likely exceed 0.70. As at the EPG site, however, this would be a development density out of proportion with surrounding uses.

Locating more than 9,200 WHS personnel at the GSA Parcel on Loisdale Road would pose substantial indirect impacts to the transportation system, as access to the site is very limited. Although seemingly close to the Springfield-Franconia Metro station, WHS employees and visitors would have to walk at least half a mile to reach the GSA Parcel. In the event only a portion of WHS were to be located at the GSA Parcel, the remainder would be assigned to facilities either at EPG or Main Post. The additional WHS personnel at EPG would only exacerbate the "mixture" of functions at EPG.

In the short- to mid-term, use of the GSA Parcel would be delayed while GSA arranged for closure and turnover of the site. The GSA would have to locate and obtain use of a new parcel of approximately the same size, build new facilities, relocate functions, and demolish its existing facilities prior to acceptance by the Army of control of the property. These actions likely could not be taken in time for the Army to meet its statutory deadline of September 2011 for completion of BRAC realignment actions. Delays by GSA in vacating its site would delay all Army planning for the site, likely resulting in units, agencies, and activities slated to move from leased space in Northern Virginia having to remain in place for indeterminate periods. This would produce turmoil for landlords, since they would find it difficult to implement capital improvements prior to leasing to new tenants.

Despite the expected increased use of mass transit, it is anticipated that there would be an increase in traffic congestion due to limited access points. For both the EPG and GSA Parcel, the

major drawback would be the concentration of vehicular traffic and the significant effects on the transportation system. In this regard, traffic congestion would be a direct effect of development under the City Center Alternative.

Table 4.2-4 summarizes the potential land use consequences associated with build-out of the City Center Alternative, with the clear majority of the BRAC actions on EPG and the GSA Parcel. The other on-post BRAC projects would not contribute to adverse land use consequences because they are small projects that are compatible with neighboring land uses, or they involve renovations to existing structures.

Table 4.2-4
Land use effects of the largest BRAC projects under the City Center Alternative

Project/ location	Gross square feet (gsf)	Land use	On-site personnel	Potential consequences
NGA EPG	2,419,000	Professional/ Institutional	8,500	– Separation from garrison security forces (potential effects to AT/FP) – Likely incompatibilities with adjacent tenants – Reduction of open space at EPG – Addition of 5,100 structured parking spaces – Supports key realignment mission
WHS GSA Parcel	2,219,000	Professional/ Institutional	9,263	– Use would required additional legislation – Potential AT/FP security risk (access point limitations) – Disproportionate development density to adjacent uses – Poor site access – Required parking difficult to accommodate on site – Not responsive to key realignment mission – Land use compatible with adjacent properties
Hospital EPG	868,800	Professional/ Institutional	2,069	– Major community benefits (access) – Reduction of open space at EPG – Supports key realignment mission
PEO EIS EPG	447,800	Professional/ Institutional	849	– Supports key realignment mission
Army Lease South Post (AMC site)	230,000	Professional/ Institutional	~1,300	– No changes to land use – Beneficial renovation and use of existing office space
Army Lease South Post (Buildings in 200 Area)	133,000	Professional/ Institutional	~750	– No effects – Beneficial renovation and use of existing office space
MDA EPG	107,000	Professional/ Institutional	290	– Loss of open space – Supports key realignment mission

4.2.4.3 BMPs/Mitigation

No specific BMPs or mitigation measures would be required under the City Center Alternative.

4.2.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

This Alternative would maximize designation of the post's lands for Professional/Institutional and Community uses. The airfield would no longer be operational. The Satellite Campuses Alternative land use plan differs from the Preferred Alternative land use plan in that it would convert Airfield land to Professional/Institutional and provide a larger area designated Professional/Institutional on the North Post.

4.2.5.1 Land Use Plan Update

Long-term minor beneficial and adverse effects would be expected. The Satellite Campuses land use plan would convert Davidson Army Airfield to Professional/Institutional uses. This change would result in the elimination of an active airfield from the Army's inventory. Aviation activities at DAAF would have to be relocated, resulting in higher operational tempos and noise levels at the receiving location(s).

Closure and decommissioning of DAAF would affect on and off-post development by removing current building height restrictions that might otherwise constrain future property development. Other off-post effects of the Satellite Campuses land use plan would be negligible. The proposed plan would not contravene local planning efforts.

4.2.5.2 BRAC Implementation and Facilities Projects

Long-term significant adverse effects would be expected. Conversion of DAAF to Professional/Institutional uses would require the relocation of aviation activities from Fort Belvoir. Potential receiving sites have not been examined. Replication of an Army airfield would be expensive. The lack of suitable undeveloped lands in northern Virginia would force any new air facility to be farther away from the Pentagon that DAAF is.

Implementation of the Satellite Campuses Alternative would result in loss of open space on the North Post. One of the two North Post golf courses would be displaced by the Army Medical Command complex. The proposed location of the new hospital, in an area designated for Community use, would be compatible with surrounding uses. The proposed location of the PEO EIS administrative complex would also result in the loss of open space, a public amenity.

The Satellite Campuses Alternative provides for the relocation of the North Post Troop Area to an industrial and supply/storage area on South Post along Gunston Road. The present North Post barracks can house 1,200 Soldiers. The South Post location would be re-designated for Troop use. The proposed plan would change the Troop Area on North Post to Professional/Institutional uses. This relocation would be compatible with existing surrounding land uses.

Table 4.2-5 summarizes the potential land use consequences associated with build-out of the major projects of the Satellite Campuses plan. The remaining BRAC projects are typically smaller in scale and would be compatible with neighboring land uses or involve modest renovations to existing structures.

4.2.5.3 BMPs/Mitigation

No specific BMPs or mitigation measures would be required under the Satellite Campuses Alternative.

Table 4.2-5
Land use effects of the largest BRAC projects under the Satellite Campuses Alternative

Project/location	Gross square feet (gsf)	Land use	On-site personnel	Potential consequences
NGA DAAF	2,419,000	Professional/ Institutional	8,500	– Loss of air operations capabilities – Supports key realignment mission
WHS North Post	2,219,000	Professional/ Institutional	9,263	– Compatible with adjacent land uses – Supports key realignment mission
Hospital North Post golf course	868,800	Professional/ Institutional	2,069	– Substantial loss of outdoor recreation – Supports key realignment mission – Loss of NAF revenue – Hospital activities compatible with Community land use designation
PEO EIS North Post	447,800	Professional/ Institutional	849	– Compatible with adjacent land uses – Loss of open space – Supports key realignment mission
Army Lease South Post (AMC site)	230,000	Professional/ Institutional	~1,300	– No effects – Beneficial renovation and use of existing office space
Army Lease South Post (Buildings in 200 Area)	133,000	Professional/ Institutional	~750	– No effects – Beneficial renovation and use of existing office space
MDA North Post	107,000	Professional/ Institutional	290	– Compatible land use – Supports key realignment mission

4.2.6 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the current land use plan (1993, as amended in 2002) would remain in effect. There would be no new (i.e., previously unplanned) construction or development on the scale of the proposed BRAC program at Fort Belvoir in either the short- or the long-term and existing land uses would continue unchanged. Therefore, the No Action Alternative would have no effects on land use at Fort Belvoir because there is adequate developable land for incremental facilities expansion or renovation on existing building sites. For the same reason, the No Action Alternative would have no net additional effect on land use in the vicinity of the Post. There are areas on-post designated for development under the 1993 plan as amended that have not yet moved toward implementation phases. Thus, the No Action Alternative does not preclude previously approved additional construction, including certain discretionary relocations not necessitated by BRAC.

4.2.7 SUMMARY OF COMPARISON OF ALTERNATIVES

Table 4.2-6 compares the acreages of land use designations for the 1993 land use plan and the four alternatives. The four alternative land use plans all provide substantially more areas for Professional/Institutional uses than were available for similar uses under the 1993 plan.

Table 4.2-6
Comparison of land use category acreages between the 1993 land use plan and the proposed land use plan

1993 land use plan Designation	Proposed land use plan designation	1993 acreage	Preferred Alternative[a]	Town Center Alternative[a]	City Center Alternative	Satellite Campuses Alternative[a]
Administrative & Education		724	0	0	0	0
Research & Development		340	0	0	0	0
Medical		97	0	0	0	0
	Professional/ Institutional	0	2,132	2,242	2,125	2,874
Airfield		391	0	0	0	0
	Airfield	0	697	690	700	0
Community Facilities		452	0	0	0	0
Outdoor Recreation		1,006	0	0	0	0
Environmentally Sensitive		3,063	0	0	0	0
	Community	0	2,950	2,652	2,806	2,712
Family Housing		576	0	0	0	0
	Residential	0	1,116	1,315	1,316	1,298
Industrial		126	0	0	0	0
Supply, Storage, & Maintenance		378	0	0	0	0
	Industrial	0	213	212	219	257
Training Ranges		462	0	0	0	0
	Training	0	1,287	1,280	1,282	1,282
Troop Housing		72	0	0	0	0
	Troop		101	106	116	73
Total		**7,687**	**8,508**	**8,497**	**8,564**	**8,496**

[a] All proposed land use designation acreages were calculated in GIS, and there are minor differences in the totals due to digitizing.

In all four land use plans, the EPG would be re-designated for Professional/Institutional uses. Under current proposals, development would occur at EPG, however, only under the Preferred Alternative and City Center Alternative. As a result, implementation of BRAC and other facilities projects under the Town Center and Satellite Campuses Alternatives would not distribute new development across all of Fort Belvoir's land resources. In these latter two alternatives, usable land would await future initiatives for development at Fort Belvoir.

Adoption of an updated land use plan and implementation of BRAC would produce a variety of long-term effects, both minor and significant and both beneficial and adverse. Table 4.2-7 summarizes the effects identified in the preceding discussions.

Table 4.2-7
Summary of impacts to land use

Alternative	Land use plan adoption	BRAC implementation
Preferred Alternative	Long-term	Long-term
	Minor	Minor
	Beneficial	Beneficial and adverse
Town Center Alternative	Long-term	Long-term
	Minor	Minor
	Beneficial	Beneficial and adverse
City Center Alternative	Long-term	Long-term
	Minor	Minor
	Beneficial	Adverse
Satellite Campuses Alternative	Long-term	Long-term
	Minor	Significant
	Beneficial and adverse	Adverse

4.3 TRANSPORTATION

This section describes existing transportation systems as they relate to Fort Belvoir, EPG, and the GSA Parcel. Each subsystem is addressed from both a regional and local perspective. Furthermore, this section presents the expected conditions and consequences of transportation under each of the alternatives.

4.3.1 TRANSPORTATION STUDIES

The Congressional Directive regarding the BRAC action and its associated impacts requires that the transportation system be studied to determine the impacts that would be expected due to the BRAC action, to identify projects that would mitigate and off-set those impacts, and to quantify the needs for new transportation infrastructure.

4.3.1.1 Congressional Directive

In the Conference Report on the National Defense Authorization Act for Fiscal Year 2007, the conferees identified the following Items of Special Interest:

> "Impact of 2005 Defense Base Closure and Realignment decisions to the transportation infrastructure in Northern Virginia.
>
> "The conferees note that the decisions of the 2005 Defense Base Closure and Realignment (BRAC) round will have a significant impact on the transportation infrastructure and national highway system in Northern Virginia supporting Fort Belvoir and Marine Corps Base Quantico. These effects, if not studied and addressed through a long-term investment strategy, have the potential to adversely affect timely access to these two critical military installations, as well as the quality of life for military members and their families on the installations and in the local communities.
>
> "The conferees acknowledge that the Department of the Army is currently studying the impact to the environment resulting from relocation of functions and personnel to Fort Belvoir and the former Engineering Proving Grounds in Fairfax County, Virginia.
>
> "The conferees direct the Secretary of the Army to work with appropriate Federal, Commonwealth, and local agencies to ensure the draft and final environmental impact statements address the following factors:
>
> (1)a description of the demographic, population, and other planning assumptions used to determine traffic infrastructure requirements;
>
> (2)an analysis of the direct and indirect impact to the transportation infrastructure resulting from the BRAC decisions;
>
> (3)a description of the standards and methodologies for the traffic impact studies contained in the study; and
>
> (4)an assessment of specific traffic infrastructure improvements and new construction projects identified to mitigate the effects of the increase of personnel, and estimates of the costs to carry out the projects."

The procedures and methodologies for transportation analyses in this EIS conform to the preceding congressional directive. Cost estimates for transportation facilities improvements typically are not available until the 30 percent engineering design stage; however, they are provided even though the 30 percent design stage has not been reached. These estimates will be subject to refinement as the planning process moves forward. At present, the cost estimates are believed to be within an order-of-magnitude of ultimate costs, though caution must be exercised when referring to them. The order-of-magnitude costs (term used for preliminary estimated cost) have been developed from comparisons to similar projects. There have been no quantities take-offs (technical term of developing estimates of the amount of material needed, i.e. *XX tons of asphalt*), no assessments of existing utilities, and no surveys performed, all of which are needed to provide a more reliable cost estimate.

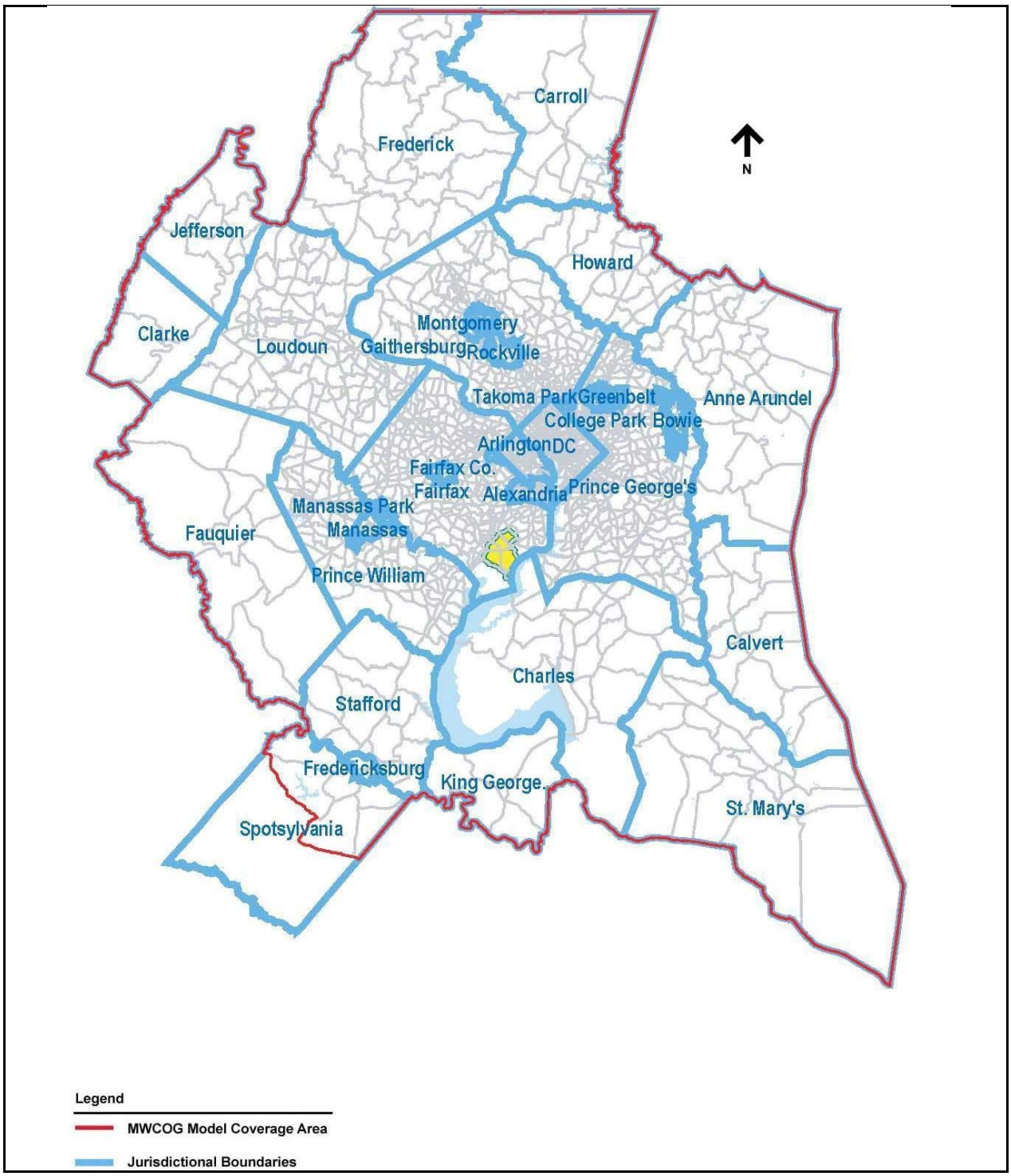
4.3.1.2 Transportation Analyses and Design

As part of the transportation analysis for BRAC implementation, traffic operations studies are ongoing in support of the planning and design of infrastructure (including transportation systems) and facilities. Information from these activities provides the basis for the transportation analysis for this EIS. These studies will continue throughout the planning and design phase; therefore, more detail will become available as they progress. At this point, the studies have been taken to a level of detail sufficient for an EIS, thereby allowing for the assessment of the transportation systems and the identification of potential mitigating actions.

The transportation studies referred to in this EIS used the regional travel demand model maintained by the Metropolitan Washington Council of Governments (MWCOG). The model, encompassing the greater metropolitan Washington area, reaches as far as Fredericksburg and portions of Spotsylvania County to the south; Anne Arundel, Calvert, and St. Mary's Counties to the east; Fauquier, Clarke, and Jefferson Counties to the west; and Frederick, Carroll, and Howard Counties to the north, as was illustrated in Figure 4.3-1. Figure 4.3-2 presents the detail of the model within the study area, showing roadway links, zones, and zone connectors. Post–processing of the travel demand forecasts follows the standard procedures outlined in the National Cooperative Highway Research Program Circular 255 (Pedersen, 1982).

Smaller, routine traffic impact studies use traffic forecasts that are derived by simply adding the trips to and from a site to existing traffic and then allowing for annual traffic growth. This approach tends to overestimate the effect on streets in the immediate area and underestimate the effect on the transportation system as a whole. Larger projects such as the BRAC action require the more sophisticated approach of travel demand models, as these models are more appropriate to assess larger projects that have greater and more far-reaching effects. When significant numbers of new jobs or housing are placed in an area, a complex series of changes occurs, including the relocation of households, changes in work locations, and changes in travel routes to and from current destinations. A travel demand model accounts for all these relationships and forecasts the net change in traffic on each facility.

The traffic forecasts developed using the regional travel demand model are used to support the current planning level of analysis. In addition, as design progresses, these forecasts will be used to conduct operational analyses according to the procedures outlined in the Highway Capacity Manual (TRB, 2000) and through the use of traffic simulation models. Detailed operational analyses of any proposed mitigating actions will be conducted as design development permits to support studies required by VDOT and FHWA. Typically, these studies are completed following the completion of an EIS; however, because of the project timelines, some of the studies are being



MWCOG Regional Model Coverage Area

Fort Belvoir, Virginia

Figure 4.3-1

LEGEND

- Zone Boundaries
- Roadway Links
- Study Area
- Zone Connections
- Zone Centroid

MWCOG Model Roadway Network within the Study Area

Fort Belvoir, Virginia
Figure 4.3-2

overlapped with the EIS. The results of the more detailed analyses for many of the key mitigation projects will be provided to the public as part of the on-going outreach program. The Army will cooperate with participating agencies to develop designs.

To assess the effects on the transportation systems and identify mitigating actions, travel demand has been projected and performance has been evaluated for the following land use scenarios:

- Existing Conditions
- No Action Alternative
- Preferred Land Use Alternative
- Town Center Land Use Alternative
- City Center Land Use Alternative
- Satellite Campuses Land Use Alternative

The analyses completed for the No Action Alternative and the four Land Use Alternatives use the year 2011 as the baseline analysis year, as that is the requirement of the reviewing transportation agencies. Further subsections of this Transportation section will document the existing conditions, the conditions in 2011 if the BRAC action did not occur (the No Action Alternative), and the 2011 conditions for each of the four Land Use Alternatives. The BRAC action would require mitigation strategies to ensure that the impacts due to the BRAC action are mitigated, so that the roadway improvements would provide at least the same level of operation, if not better, than the conditions expected if the BRAC action did not occur.

Analysis in this section uses multiple perspectives—it begins with the broader regional context, moves to narrower views of the sub regional area around Fort Belvoir, and then it ends with conditions in the immediate vicinity of the Main Post and EPG. That is, for each land use alternative, the effects on local and regional travel patterns is examined through the use of screen lines (natural or man-made barriers and/or imaginary lines used to divide a study area into large sections; examples of barriers include a river, a stream, or a railroad track) and cordons (imaginary closed loop defined within a study area, used to tally total inbound and outbound trips) to determine the change in travel demand from one area to another. Representative locations along major traffic routes have been identified throughout the study area to measure the effect of the proposed action on traffic volumes. Finally, key intersections (intersections of secondary and primary roads that are approaching capacity) surrounding both the Main Post and EPG have been analyzed under each scenario. In areas such as Northern Virginia where traffic congestion typically lasts for several hours, it is necessary to examine additional criteria at key locations, such as hours of congestion, delay, and travel times to gain a complete understanding of the effect. For the four action alternatives, potential mitigating actions have been considered as well.

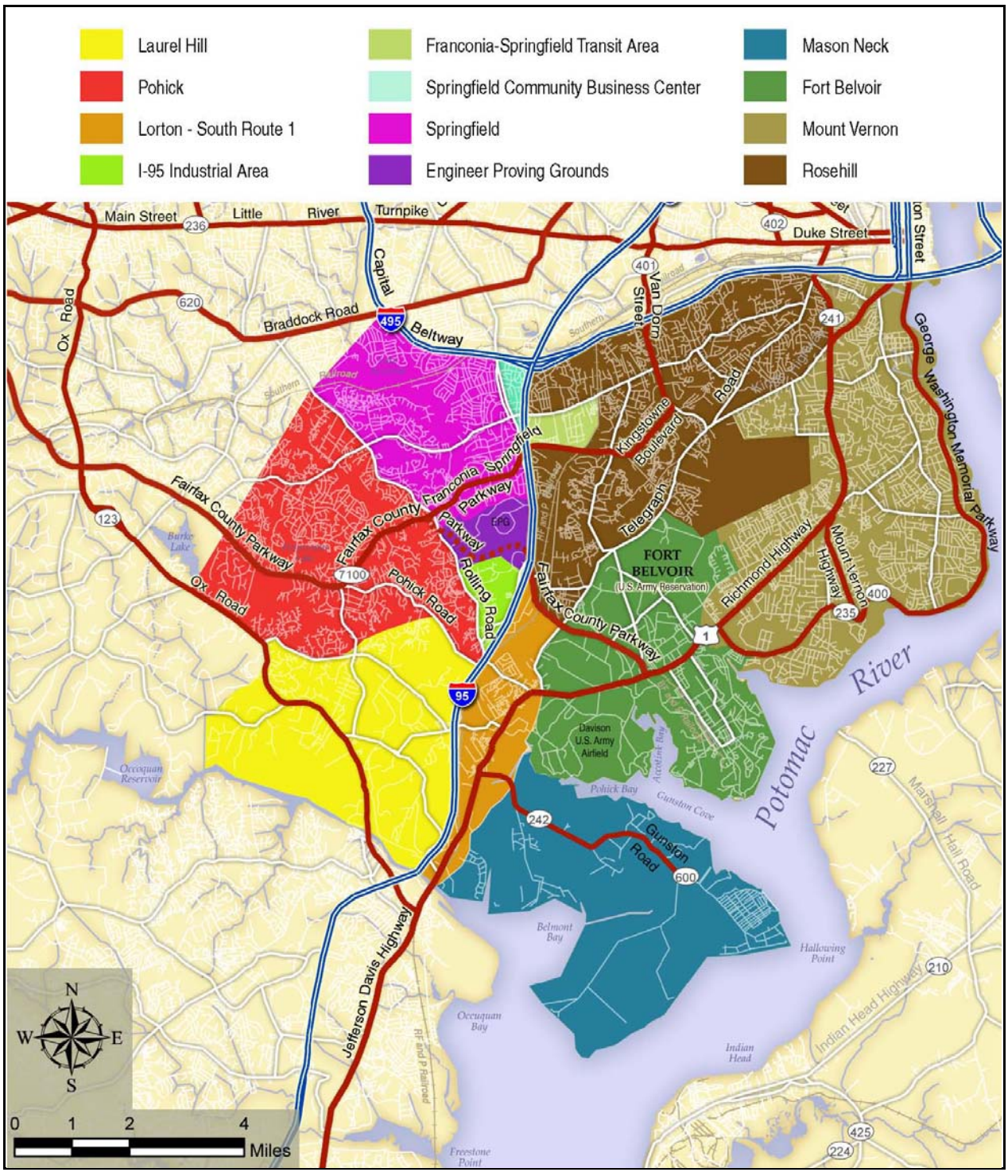
4.3.1.3 Travel Demand Modeling Approach

Scoping in connection with this EIS exposed concerns regarding the travel demand modeling approach and the assumptions that would be used during the modeling process. In response to these concerns, the analytical approach and assumptions were developed in conjunction with Fairfax County and VDOT staff. The interpretation and use of the modeling results is solely the responsibility of the EIS preparers. The basic procedures and assumptions were as follows:

- Used MWCOG regional travel demand model and Round 7 Cooperative Land Use Forecast (revised).
- Figure 4.3-3 shows the study area and the 12 reporting districts within the study area used for the ongoing traffic studies. Within the Main Post and east of I-95, the zone structure as defined by MWCOG was used. For EPG, one zone was used. Entry links and zone connectors to EPG and the Main Post were modified so that only trips originating from or destined to those locations could use the links. Roadway links within the study area were reviewed, and adjustments were made to the number of lanes or roadway capacities so that model assumptions reflected actual conditions.
- Trip generation rates were developed for EPG and the Main Post using data provided by the various agencies. Off-post, MWCOG's trip generation rates were used unless alternate data were provided by Fairfax County or adjustments (based on professional judgment and the use of the Institute of Transportation Engineers (ITE) Trip Generation Manual as a reference) were required to achieve a reasonable validation.
- Trip distribution was developed using the available survey and employee data combined with MWCOG distributions. For 2011, it was assumed that 50 percent of the civilian employee population would maintain its current residential locations and 50 percent would relocate in a pattern typical of the current Fort Belvoir distribution. Military employees would be expected to continue their bias toward the I-95 corridor to the south. These distributions were developed in consensus with VDOT and Fairfax County, realizing that through attrition and new hires, that the distribution of incoming employees would follow the existing distribution that favors the south.
- The sensitivity of road improvements and access design to changes in employee distribution was tested by manually applying a plus-or-minus 15 percent range to forecast volumes.
- Model runs (described further within this section) were completed for existing conditions, the 2011 No Action Alternative and the Preferred, Town Center, City Center, and Satellite Campuses Land Use Alternatives.

The need for additional transportation system improvements can be assessed based on the model runs using the above procedures and assumptions. The study area (see Figure 4.3-3) was defined such that it captured the area around the Main Post, EPG, and GSA Parcel to assess traffic flows to and from the sites and to allow for the assessment of effects on adjacent facilities. To delineate an area in which the influence could be distinctly measured across roadways, screen lines were set on physical boundaries that had limited roadways crossing them. To the west, a screen line was set just west of Route 123, as limited roadways cross this area. The Capital Beltway (I-495) and the rail line forms a physical barrier to the north, because there are limited crossing points over those facilities. To the south, the Occoquan River forms a natural barrier to the study area, because access from that direction is limited to four bridge crossings. The Potomac River forms the eastern boundary to the study area.

Estimating traffic effects of any proposed development could produce considerable technical debate and strong opinion within the transportation planners' professional community. Most cities and all the country's major Metropolitan Planning Organizations (MPO) maintain a regional travel demand model that is certified by EPA for estimating the effect on air quality, and so on. These models are based on what is known as the four-step process involving Trip Generation, Trip Distribution, Mode Share, and Assignment. These four steps are described further below.



LEGEND

- Interstate Highway
- Highway
- River/ Water

Reporting Districts within the Study Area

Fort Belvoir, Virginia

Figure 4.3-3

- *Trip Generation.* Trip generation accounts for movements between origins and destinations. The MWCOG model has more than 2,100 traffic analysis zones (TAZ) and includes the major roadway network in the region. Each TAZ is assigned population and employment in several categories. Population is described in terms of households (e.g., single family, multifamily). Employment is described by employment type (e.g. office, retail, industrial). Within each zone, productions and attractions are generated based on typical behavior; population creates productions and employment creates attractions. Each trip requires a production and an attraction.
- *Trip Distribution.* Productions and attractions are balanced (matched) based on distribution patterns that have been observed in the region (ZIP Code surveys and other travel data) and other factors such as travel times, average trip length, income, and so on. This information is based on periodic surveys conducted by MWCOG and 2000 census data from the Census Transportation Planning Package, and the data is uploaded into the model and maintained by MWCOG (MWCOG, 2004a). For large developments, focused surveys such as the ZIP Code information provided were used to adjust the distribution. The model has a *control total* for population and employment for each year modeled (normally 5-year increments) because the total population and employment for the region is much more predictable than individual TAZs. Control totals are also established for each jurisdiction. These control totals must be maintained; otherwise, results for projects throughout the region would not be consistent and would overestimate or underestimate effects.
- *Mode Share.* Mode share, also referred to as mode split, is a person's choice of mode of travel. A person can travel by automobile or by transit, or can walk or bike. The automobile trip is carried out in one of two ways: either as a single occupancy vehicle (SOV) or high occupancy vehicle (HOV). In the Metropolitan Washington area, the type of HOV trip depends on the corridor because the I-95/I-395 facility requires a minimum of three persons per vehicle, while most facilities require only at least two people. Transit trips are made by bus or by train. The latter includes commuter trains or the Metro train. The MWCOG model calculates mode share for each TAZ on the basis of demand, availability of service, and travel time.
- *Assignment.* After the trip generation, distribution, and mode share steps are completed, the model assigns vehicle trips onto the roadway network. The trips are assigned on the minimum path with capacity constraints (i.e., the trips are distributed on the links on the basis of their origins or destinations until each link reaches capacity. Vehicle trips are loaded in an iterative manner to allow travel times to be recalculated to reflect congestion. As the most direct route becomes congested, vehicles are redirected to longer routes and the demand is balanced across the alternate routes available. This process plays a critical role in the way traffic changes created by the proposed action were analyzed. As traffic increases because of the new employment, people who used those routes to make their trip might divert to other routes to avoid congestion. The diversion of trips to alternate routes reduces the magnitude of the net increase in traffic on facilities adjacent to Fort Belvoir; however, it could increase the trips on other facilities in the transportation system.

The Army's proposed action involves the net relocation of approximately 22,000 jobs within the region, not the creation of new jobs. Alternate methods to account for the reduced number of jobs elsewhere were considered; after consultation with VDOT and Fairfax County, the following methodology was adopted. In the MWCOG model, when jobs in the region shift geographically, the model can identify the new site of those jobs and *control by production*" (as the total

population did not change) to maintain the attractions at a constant regional level. This approach simulates very small reductions in employment throughout the region to match the increase in jobs at Fort Belvoir. In Fort Belvoir's case, the jobs are changing location and, as a result, some residents might relocate as well. This change is factored into the model input by having 50 percent of the personnel follow the existing Fort Belvoir distribution of residential location, with the remaining 50 percent of employees following their existing residential locations. The assumption of this distribution is that through attrition, retiring, and hiring, new employees will tend to favor residential locations to the south, while existing employees that stay with their current agencies will not be inclined to move.

The results of the model runs using this approach show the effect on the transportation system to be substantial in the areas immediately surrounding Fort Belvoir. This traffic effect, however, decreases relatively quickly and accounts for less than 10 percent of the traffic flow within approximately 3 miles. In lay terms, what is happening is that when the people stop reporting to Crystal City, Reston, Bethesda, and so on, those offices are filled by other jobs and different people (productions) who report to work in those locations (attractions), and this occurrence draws trips away from the areas surrounding Fort Belvoir. The trips are rebalanced and the effect is not as great as might be perceived by some. This phenomenon is often described as the "bean bag effect." Adding more trips in the areas surrounding Fort Belvoir pushes trips out of the other areas; this effect is similar to sitting on a bean bag chair and changing its shape. The total volume of the bean bag (total regional trips) does not change, but the shape does (the matching of trips to productions and, thus, the choice of route for the trips).

4.3.2 AFFECTED ENVIRONMENT

This section documents existing conditions and travel patterns in the vicinity of Fort Belvoir's Main Post and EPG and the GSA Parcel. The transportation systems consist of the road network and transit system (comprising rail and bus services). Available capacity and performance of the transportation system indicate the conditions that commuters and travelers encounter.

4.3.2.1 Existing Regional Transportation Network

As shown in Figure 4.3-4, in the vicinity of Fort Belvoir, the following roadways serve as commuter routes, with I-95 and I-495 serving longer distance, non-commuter traffic as well:

- Interstate 95 (I-95)
- I-395 (Shirley Highway)
- I-495 (Capital Beltway)
- U.S. Route 1 (Richmond Highway)
- State Route 7100 (Fairfax County Parkway)
- State Route 235 (Mount Vernon Memorial Highway)
- State Route 611 (Telegraph Road)
- State Route 613 (Beulah Street/Van Dorn Street)
- State Route 641 (Pohick Road)
- State Route 642 (Lorton Road)
- George Washington Memorial Parkway

LEGEND

- Interstate Highway
- Highway
- Mass Transit Line
- River/ Water

Existing Regional Transportation Network

Fort Belvoir, Virginia

Figure 4.3-4

In addition to I-95 and the Fairfax County Parkway, the following regional roadways also serve EPG:

- State Route 7900 (Franconia-Springfield Parkway)
- State Route 617 (Backlick Road)
- State Route 638 (Rolling Road)

The interstate roadways, serving as major commuter routes to employment locations in Fairfax County, Alexandria, Arlington, and the Washington, DC core, provide access to land uses adjacent to the Main Post and EPG. They also provide for long distance truck and auto travel along the Eastern Seaboard's I-95 corridor.

4.3.2.2 Fort Belvoir Local Street Network

Figure 1-2 presented a detailed view of the roadways within approximately one mile of Fort Belvoir's two primary sites, the Main Post and EPG.

Main Post. The roadway system on Fort Belvoir's Main Post includes the following:

- John J. Kingman Road on North Post, which provides access from the Fairfax County Parkway to a number of sites, including the Andrew T. McNamara Headquarters Complex, Mosby Reserve Center, and Davison Army Airfield.
- Beulah Street, which provides access to the North Post from Telegraph Road.
- Gunston Road, which serves as the major north-south roadway connecting the North and South Posts and is the only connector that has a bridge across U.S. Route 1. Gunston Road crosses over U.S. Route 1 with no ramp connection to that facility, except on weekdays from 3:00 PM to 6:00 PM, when one ramp is open from northbound Gunston Road to northbound U.S. Route 1.
- Pohick Road, which provides access to the South Post from U.S. Route 1 via Tulley Gate. All visitors to Fort Belvoir must enter the post via Tulley Gate and be processed at the Post Visitor Center.
- Belvoir Road, which provides access to the South Post from U.S. Route 1 via Pence Gate.
- Mount Vernon Road, which provides access to South Post from Mount Vernon Memorial Highway via Walker Gate.
- 9th, 12th, 16th, 18th, 21st, and 23rd Streets, which provide for east-west movement on South Post and connect Gunston Road with Belvoir Road.

EPG. EPG can be entered via gates from Backlick Road and Rolling Road. There is minimal roadway circulation within the grounds itself. Barta Road provides entry from Backlick Road on the east side of EPG. Barta Road connects to Cissna Road, which crosses EPG from east to west; the bridge over Accotink Creek is presently not in service.

4.3.2.3 The Transit System

Three public agencies provide transit service to the Fort Belvoir area of Fairfax County. The Washington Metropolitan Area Transit Authority (WMATA) provides rail service (Metrorail) and bus service (Metrobus) throughout the Washington metropolitan area. Fairfax County's

Department of Transportation provides local bus service throughout the county, operated under the name of Fairfax Connector. Virginia Railway Express (VRE) provides commuter rail service into Washington from the Virginia suburbs to the south and southwest. In addition to these three public agencies, one private company, Lee Coaches, also provides commuter bus service to Fort Belvoir from the Fredericksburg/Stafford County area.

4.3.2.3.1 The Rail System

While no rail transit service is provided directly to Fort Belvoir or EPG, two rail services—WMATA's Metro and the VRE—have stations within a few miles of Fort Belvoir, as discussed below.

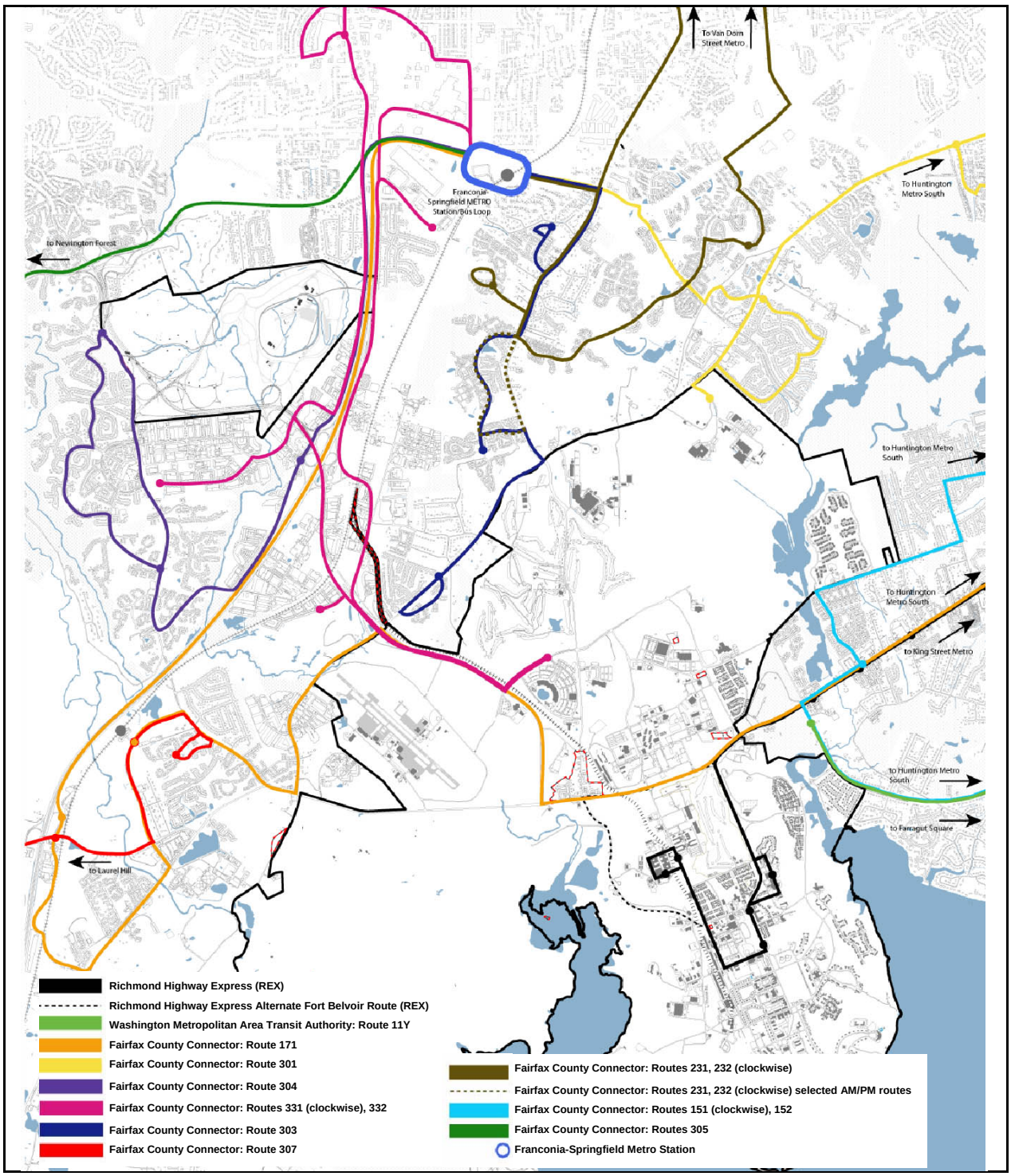
Metrorail. Metrorail has two stations that serve Fort Belvoir. The Franconia-Springfield station on the Blue Line is approximately 3 miles north of Fort Belvoir. The Huntington station on the Yellow Line is located just south of Alexandria, approximately 7 miles northeast of Fort Belvoir. Both the Blue and Yellow Lines provide service to Ronald Reagan National Airport and the Pentagon as well as the central core area of Washington, DC, with connections to each of the other Metro lines. Metro operates 7 days a week with weekday service generally available from 5:30 AM to midnight. Service frequency on the Blue and Yellow Lines generally is 6 minutes during peak times and 12 minutes during off-peak times.

Virginia Railway Express (VRE). The Fort Belvoir area of Fairfax County is served by VRE's Fredericksburg Line. Two VRE stations are in the general vicinity of Fort Belvoir. The Lorton station is approximately 1.5 miles west of Fort Belvoir, east of I-95, and south of Pohick Road. The Franconia-Springfield station is adjacent to the Franconia-Springfield Metro station, approximately 3 miles north of Fort Belvoir. The Fredericksburg Line operates between Fredericksburg and Union Station in Washington, DC. It serves locations in Stafford County, Prince William County, Fairfax County, Alexandria, and Arlington County. Service frequency at these stations is every 30 minutes from approximately 6:00 AM to 8:30 AM and from 4:00 PM to 7:00 PM.

4.3.2.3.2 Bus Service—Routes Serving Main Post

Six bus routes directly serve portions of Main Post, including one WMATA Metrobus route, four Fairfax Connector routes, and one private bus line. Each route is described briefly below. Figure 4.3-5 illustrates the existing bus services that are provided by the Fairfax Connector and WMATA Metrobus in this section of Fairfax County.

- *Metrobus REX* (Richmond Highway Express). The REX route provides express service between Fort Belvoir and the King Street Metro station in Alexandria.
- *Fairfax Connector Route 171* (Richmond Highway Line). Route 171 provides service between the Franconia-Springfield Metro station and the Huntington Metro station.
- *Fairfax Connector Route 301* (Telegraph Road Line). Route 301 also provides local service between the Franconia-Springfield Metro station and the Huntington Metro station.
- *Fairfax Connector Routes 331/332* (I-95 Circulator). These two routes operate in a loop connecting the Franconia-Springfield Metro station, Springfield Mall, the Springfield business district, Fort Belvoir, and various destinations along both sides of the I-95 corridor.



Bus Routes in Southern Fairfax County

Fort Belvoir, Virginia

Figure 4.3-5

- *Lee Coaches*. A private bus company in Stafford County, Lee Coaches operates one weekday round trip between the Route 208 Commuter Lot in Spotsylvania and Fort Belvoir. It also serves the Route 17 North Commuter Lot near Fredericksburg. At Fort Belvoir, the bus circulates through the South Post and makes a number of stops.

4.3.2.3.3 Bus Service – Routes Operating in Proximity to Main Post

Six additional bus routes operate within the vicinity of Main Post, either terminating immediately outside the boundaries of the post or passing in close proximity. These routes are included here because they represent a potential resource for expanded service to the Main Post. They could be modified at relatively low cost to provide service if the demand for transit service at the Main Post were to increase. None of these routes serve any Main Post locations. Brief descriptions of these routes are provided below.

- *Metrobus Route 11Y* (Mt. Vernon Express Line). Route 11Y provides express service between the Mount Vernon area and Farragut Square in downtown Washington, D.C.
- *Fairfax Connector Routes 231/232* (Kingstowne Line). These loop routes operate between the Van Dorn Metrorail Station and the Franconia-Springfield Metrorail Station.
- *Fairfax Connector Route 303* (Island Creek Line). This route provides local service between the Franconia-Springfield Metrorail Station and the intersection of Mt. Air Drive and Telegraph Road.
- *Fairfax Connector Routes 151/152* (Richmond Highway Circulator). These routes operate in a loop between the Mount Vernon area and the Huntington Metrorail Station.

4.3.2.3.4 Transit Service at EPG

The EPG site is not currently served by transit. A number of bus and rail lines operate in close proximity to the site. The Franconia-Springfield Metro and VRE stations are approximately 1 mile to the northeast of the EPG site. A number of bus routes operate within a half-mile or less of the site. These include Fairfax Connector Routes 304, 305, 331, and 332 and Metrobus Routes 18R and 18S. All six of these routes connect to the Franconia-Springfield Station. The major roads adjacent to or in close proximity to the EPG site on which transit service is provided include Backlick Road, Fullerton Road, Rolling Road, the Fairfax County Parkway, and the Franconia-Springfield Parkway.

4.3.2.3.5 Transit Service at the GSA Parcel

The GSA Parcel abuts Loisdale Road, which is currently serviced by Fairfax Connector Route 331 and Route 332. These two bus routes operate on ½ hour frequency during the peak periods and hour frequency during the off-peak hour. The routes, referred to as the I-95 circulator routes and are described in section 4.3.2.3.2 above, provide services to the Franconia-Springfield Metrorail Station and the Medical College, which is located to the northeast and south of the GSA site, respectively. No other routes operate in proximity of the GSA Parcel. The Franconia-Springfield Metrorail site is located less than ½ mile to the northeast.

4.3.2.4 Travel Patterns to and from Fort Belvoir

Existing travel patterns were examined by reviewing Fort Belvoir employees' residential locations via payroll data as of August 2006 and by examining MWCOG's Cooperative Land Use Forecast (Round 7, revised).

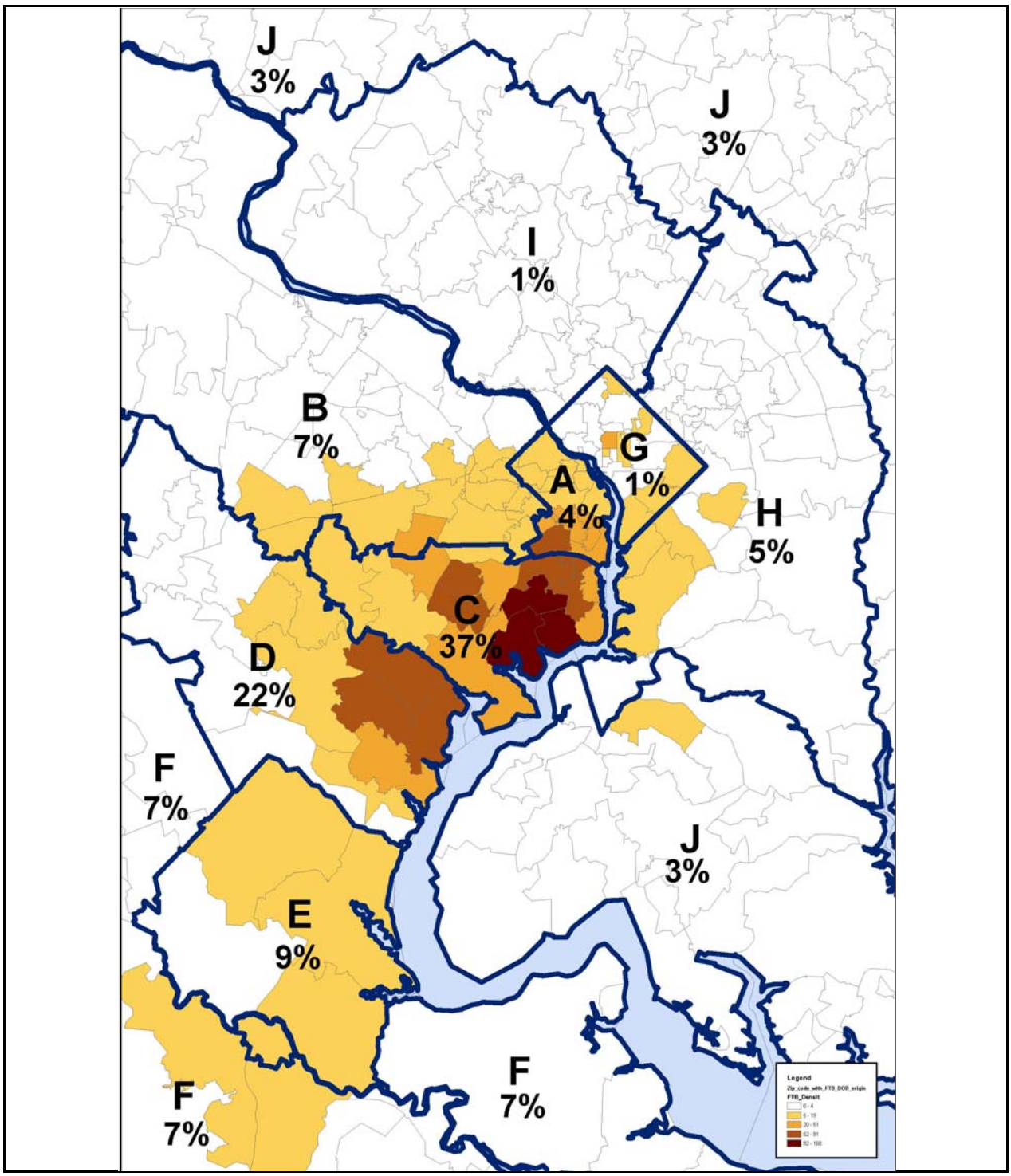
Table 4.3-1 and Figure 4.3-6 show the distribution of place of residence for employees at Fort Belvoir in August 2006. The distribution based on the payroll data is similar to the distribution identified from a 2002 survey conducted of Fort Belvoir employees in conjunction with the Fort Belvoir Transit Study, with the most notable difference being an increase in the estimated number of employees in Fairfax County. The difference between the payroll and survey data suggests that those employees with longer commutes tend to be more likely to respond to surveys regarding transportation, which could result in an overestimation of longer distance trips.

Table 4.3-1
Existing residential locations of Fort Belvoir employees

District	Location	Existing residential distribution of Fort Belvoir employees[a]
A	Arlington/Alexandria	4%
B	Northern Fairfax County and Loudoun County	7%
C	Southern Fairfax County	37%
D	Prince William County	22%
E	Near South	9%
F	Remainder of Virginia	7%
G	District of Columbia	1%
H	Prince George's County	5%
I	Montgomery County	1%
J	Remainder of Maryland	3%
K	Outside of DC, Maryland, and Virginia	4%
	TOTAL	100%

[a]Percentages are based on review of payroll data for 10,548 Fort Belvoir employees.

Potential shifts in the residential location of employees in response to the change in employment location could alter the distribution of employee residences and thus, affect regional travel patterns. To assess this effect, travel time contours surrounding Fort Belvoir's Main Post and EPG for both the AM and PM peak hours were developed and are illustrated in Figures 4.3-7 and 4.3-8. These figures illustrate the travel time contours for existing Fort Belvoir employees traveling to work in the morning and returning home in the evening. Depending on specific residential location, some employees travel in the off-peak direction for a large portion of their trip. Comparing the contours to available information of residential locations of existing employees indicates that more than 70 percent of incoming employees currently live within an hour of Fort Belvoir at peak-hour travel speeds. This proportion suggests that rapid, large-scale relocation of residences is not likely. Rather, change would occur over time in response to turnover in staff, the affordability of housing, and construction of new transportation infrastructure such as the high occupancy toll (HOT) lanes on I-95 from Fredericksburg to the Potomac River.

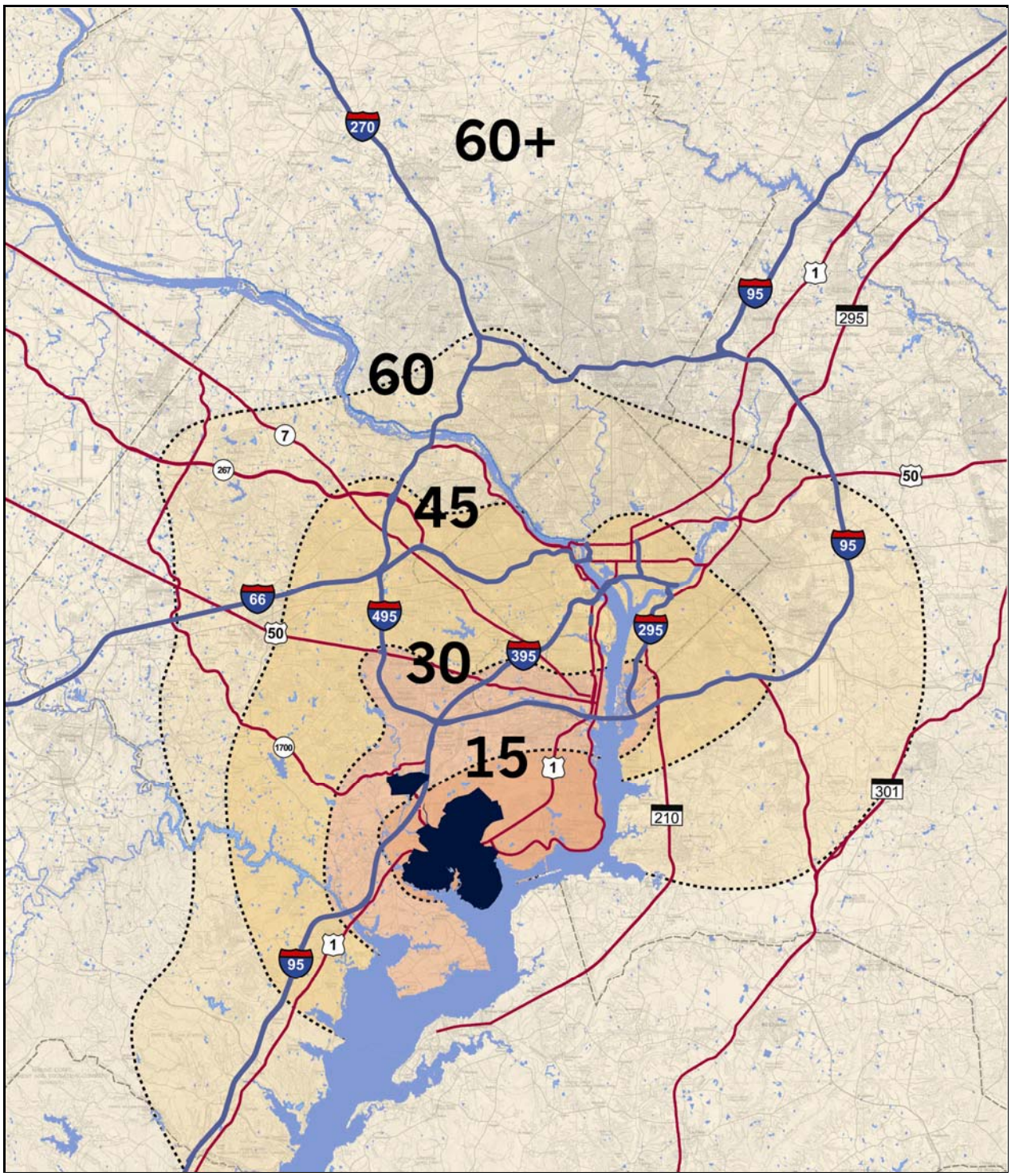


Note: Employee Density within Zip Code Boundary (Employee/sq.mi.) based on payroll data

Current Residential Distribution of Fort Belvoir Employees

Fort Belvoir, Virginia

Figure 4.3-6



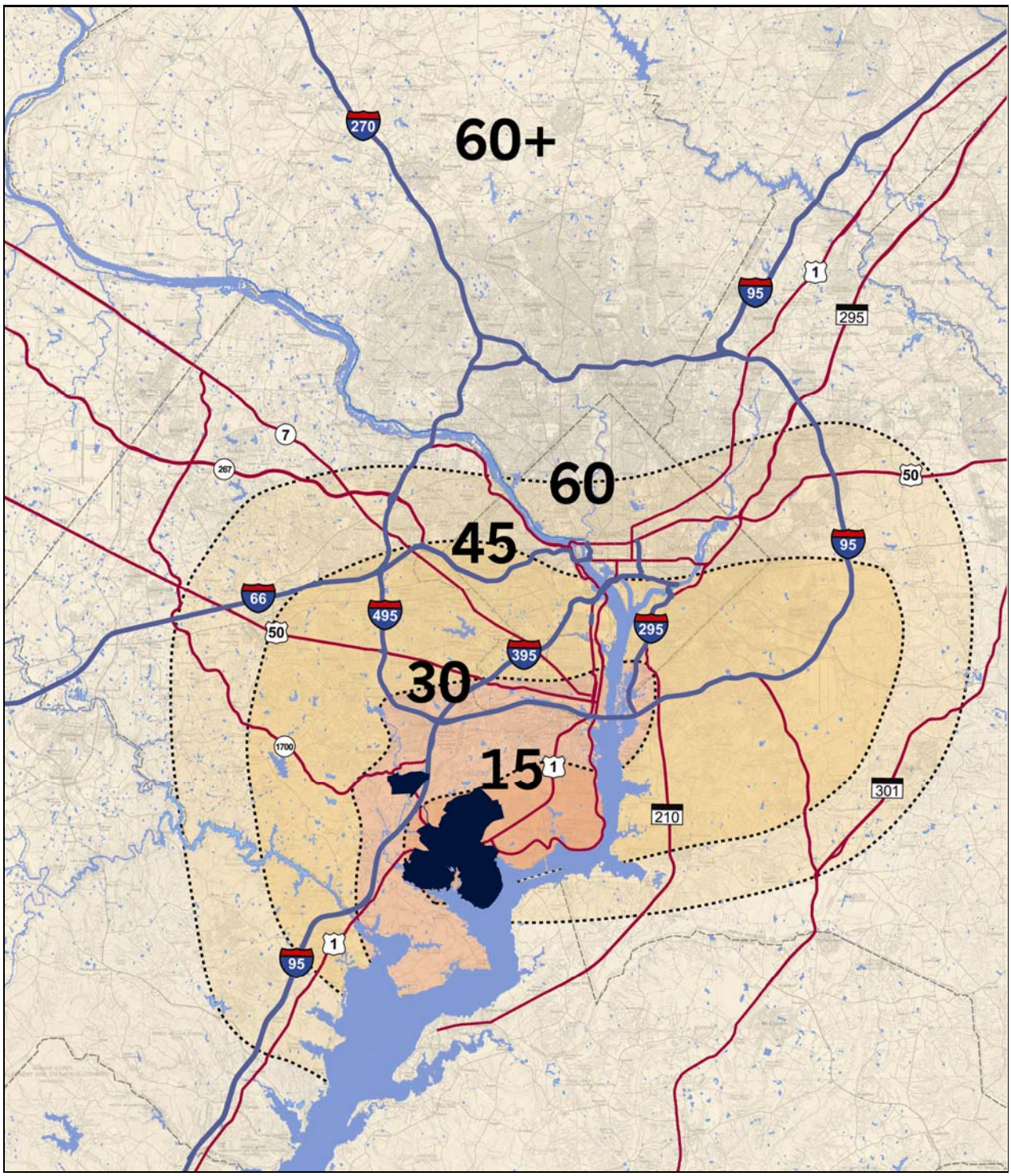
LEGEND

Interstate Highway
Highway
River/ Water

AM Peak Hour Travel Time, Existing Fort Belvoir Conditions

Fort Belvoir, Virginia

Figure 4.3-7



LEGEND

Interstate Highway
Highway
River/ Water

PM Peak Hour Travel Time, Existing Fort Belvoir Conditions

Fort Belvoir, Virginia
Figure 4.3-8

Table 4.3-2 presents the population, employment, trip productions, and trip attractions for the 2006 existing conditions MWCOG model that was run. Data for the study area are shown in the context of the larger region. Figure 4.3-9 displays the population and employment levels in the sub-districts within the study area. Almost every district surrounding Fort Belvoir has a higher population than employment, while Fort Belvoir is higher in employment because of its function.

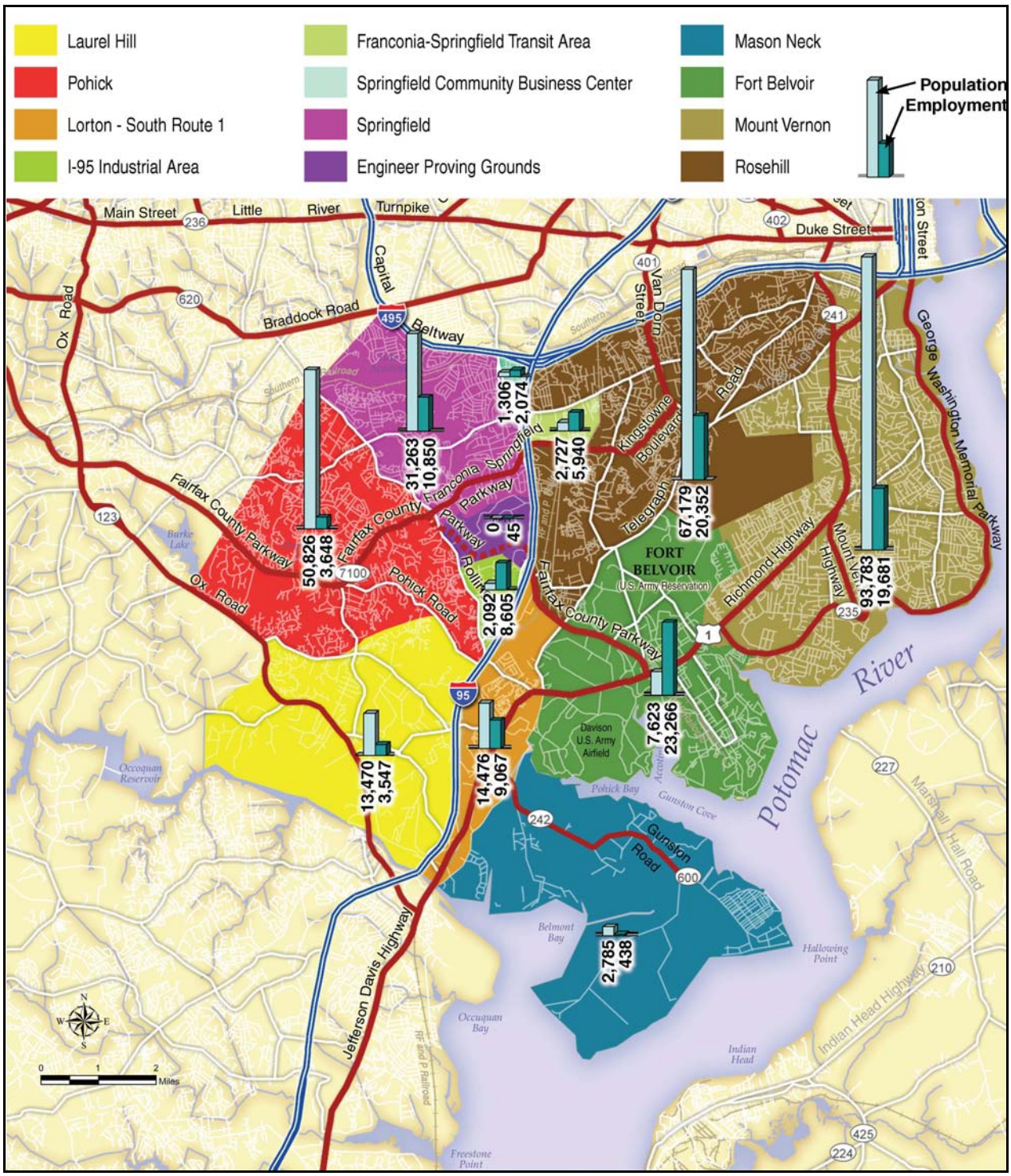
Table 4.3-2
2006 population, employment, productions, and attractions

District	Land use		Daily	
	Population	Employment	Productions	Attractions
Laurel Hill	13,470	3,547	31,891	31,825
Pohick	50,826	3,648	109,597	109,719
Lorton South of U.S. Route 1	14,476	9,067	43,441	43,430
I-95 Industrial Area	2,092	8,605	20,802	20,753
Franconia-Springfield Transit Area	2,727	5,940	37,799	38,044
Springfield Community Business Center	1,306	2,074	11,586	11,601
Springfield	31,263	10,850	98,365	98,274
EPG	0	45	81	87
Mason Neck	2,785	438	5,979	5,948
Fort Belvoir (Main Post)	7,623	23,266	35,176	35,342
Mount Vernon	93,783	19,681	250,418	250,606
Rose Hill	67,179	20,352	184,223	184,200
Total Study Area	287,530	107,513	829,357	829,830
Rest of Virginia	2,142,682	1,258,264	6,952,561	6,952,125
Maryland	3,318,699	1,723,958	10,587,588	10,586,616
District of Columbia	583,733	752,719	1,572,672	1,572,360
West Virginia	47,735	15,173	153,721	153,849
Other States	0	0	715,116	716,236
Total Outside Study Area	6,092,849	3,750,114	19,981,658	19,981,186
REGIONAL TOTAL	**6,380,379**	3,857,627	20,811,015	20,811,015

Source: VHB, 2006.

Note: Production and attraction totals for each district includes internal trips within that district. A production is the beginning of a trip; an attraction is the end of a trip.

To gain a sense of the scope and scale of the BRAC action, it is useful to compare the number of jobs and the expected vehicle trips involved to several benchmarks. The net increase in employment of 22,000 is relatively small when compared to the region (approximately 3,750,000 employees) and even to Fairfax County (Fort Belvoir represents approximately 3.5 percent of the total employment within all of Fairfax County in 2006). Perhaps more relevant is the relationship to employment and vehicle trips within the transportation corridors serving Fort Belvoir and the study area. A recent study by the Northern Virginia Transportation Commission (NVTC) to develop The TransAction 2030 Plan (see Section 4.3.2.6) identified eight transportation corridors in Northern Virginia that serve the major employment centers. While no corridor is totally independent of the transportation system as a whole, each corridor does have its own characteristics and a significant degree of operational independence. Fort Belvoir is located at approximately the midpoint of the I-95/U.S. Route 1 Corridor (Corridor 8) and at the southeastern end of the Fairfax County Parkway Corridor (Corridor 5). These two corridors serve as the primary access routes to the Fort Belvoir sites. Within Corridor 8, Fort Belvoir represents



LEGEND

Interstate Highway
Highway
River/ Water

2006 Population and Employment Within the Study Area

Fort Belvoir, Virginia

Figure 4.3-9

approximately 6.1 percent of the total employment level of 385,000 workers. Within Corridor 5, Fort Belvoir represents approximately 15 percent of the total employment level of 155,000 workers.

Fort Belvoir and EPG represent 2.7 percent (7,623 residents on Fort Belvoir and 0 on EPG for a total population of 7,623 within the study area total of 287,530) of the population in the study area in 2006. Fort Belvoir and EPG account for 21.7 percent (23,266 employees on Fort Belvoir and 45 on EPG for a total employment of 23,311 within the study area total of 107,513) of the employment and attract 4.3 percent of all trips in the study area. This proportion is notable because Fort Belvoir is not a large attractor of trips, considering its share of the study area employment, when compared to such districts as Rose Hill, which has 18.5 percent of the study area employment but 30.2 percent of the attractions. The higher percentage of attractions at Rose Hill is likely because of land use within the area, such as shopping plazas.

In Fairfax County, the ratio of workers to jobs is about 1.0. This means that the county is balanced, and if every worker worked at a job available within the county, no one would have to leave the county to work, and no one would be coming to the county to work (TRB, 2006). The MWCOG model, however, only looks at population and employment. The ratio of jobs (employment) to total population (includes workers and non-workers), however, can be used as a basis to assess how the study area performs in striving to meet this balanced ratio. The ratio of jobs to population within the study area is 0.37, or 37 jobs to 100 residents. Ideally, the ratio should be similar to the ratio of Fairfax County of 0.60. The regional average ratio is also approximately 0.60, because the region is relatively balanced as a whole. Note that not all of the population works, as some are retired, some are homemakers, and others are still in school. Some parts of the region have a higher ratio than the regional average, such as the District of Columbia (DC), with a ratio of 1.29. A ratio higher than the regional average means that the area needs workers from outside the area to come in to work. DC's ratio is high because commuters from Virginia and Maryland travel into DC in the morning peak period, because many jobs are there. From the other perspective, if the ratio is lower than the regional average, people have to leave the area for their jobs, much like the study area. A balanced ratio within an area means that potentially external trips are reduced, because the ability for workers to live and work within the same area exists. This balance helps to reduce the overall average trip length and potentially the number of vehicular trips.

These comparisons indicate that at a regional level, the redirection of vehicle trips is not significant and even at the corridor level, traffic effects are likely limited to the immediate area of the installation.

A trip within the regional model consists of a beginning and an end, and the trip occurs on roadway links (or rail, depending on mode of transport). A production is the beginning of a trip; an attraction is the end of a trip. An analogy can be used to explain this process. In the morning, people leave their homes to go to work; the residential locations produce trips in the morning—this is production. Work locations attract these trips that started at the homes (i.e., work attracts trips in the morning). Thus, a trip begins with a production at home, travels on roads or rail links (depending on the mode), and ends with an attraction at work. Together, one production and one attraction produces one trip.

Table 4.3-3 presents the internal trips to the study area, external trips destined to the study area, and external trips that originate within the study area. The table illustrates that most of the trips that have an origin or a destination within the study area originate from or are destined to points

Table 4.3-3
2006 Study Area Trips

Time	Internal trips within study area	External trips ending in study area	External trips beginning in study area
AM Peak	66,376	55,349	71,782
PM Peak	122,669	100,834	87,235
Off-Peak	294,120	190,482	187,175
Daily	**483,165**	**346,665**	**346,192**

outside the study area, as opposed to being an internal trip within the study area (i.e., a trip beginning and ending within the study area). That is, approximately 693,000 external trips begin or end in the study area, and approximately 483,000 trips occur completely within the study area. The table does not include external trips that pass through the study area (i.e., a trip from Fredericksburg to Washington DC, traveling on I-95).

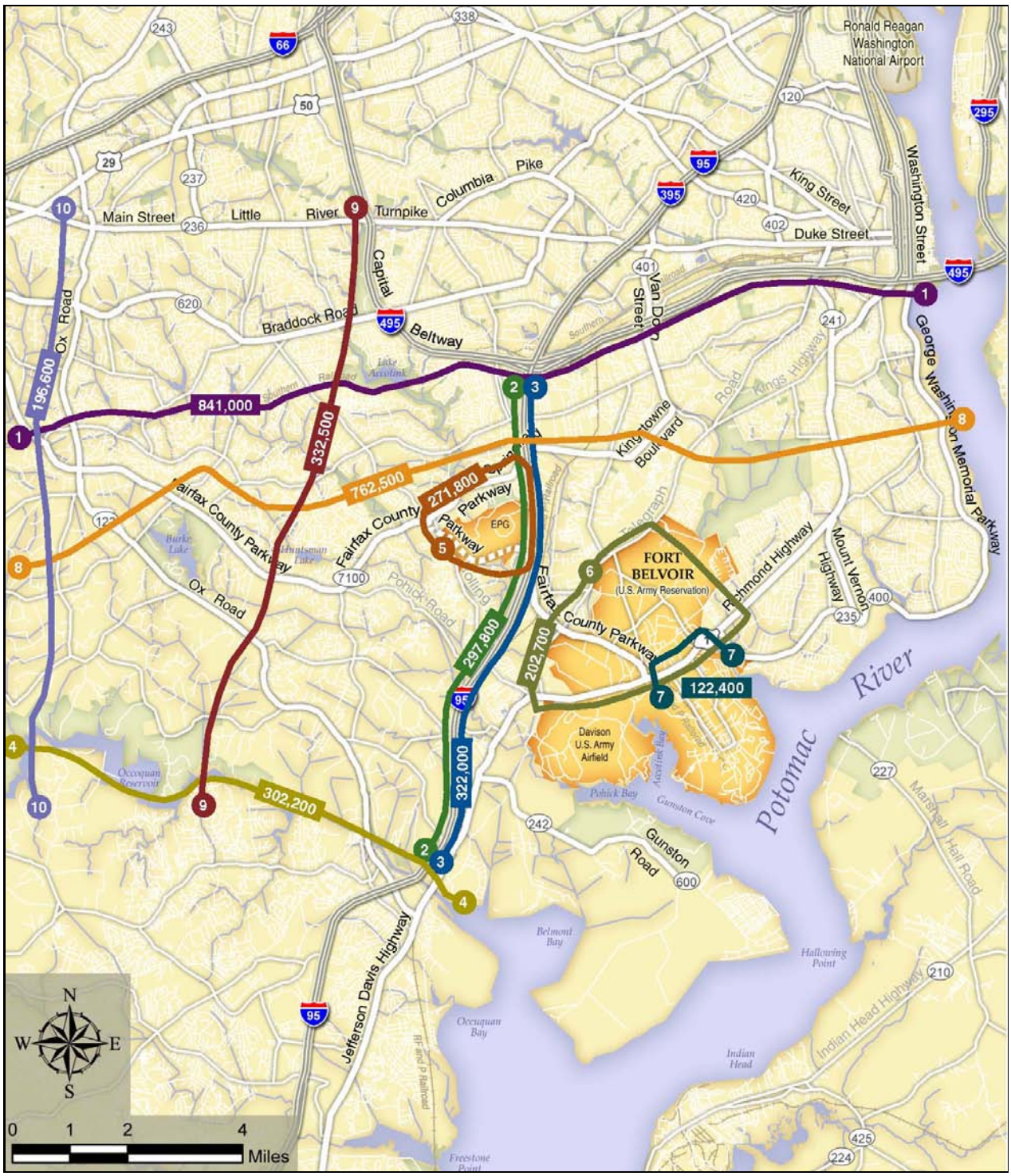
Figure 4.3-10 illustrates the volumes on the screen lines (natural or man-made barriers and/or imaginary lines used to divide a study area into large sections; examples of barriers include a river, a stream, or a railroad track) and cordons (imaginary closed loop defined within a study area, used to tally total inbound and outbound trips) on roadways in the study area surrounding and within Main Post and EPG. The screen lines and cordons identify volumes of traffic crossing them in either direction. This data enables comparisons of existing conditions to future conditions created by implementation of proposals or alternatives.

4.3.2.5 Available Capacity and Performance

In the area of the proposed action, the transportation network is greatly strained from rapid development, significant employment growth within Fairfax County and Alexandria's Cameron Valley area, and residential growth in Prince William County, Stafford County, and Fredericksburg. The result is one of the busiest and most congested transportation corridors in the country. Even if no further growth were to result from the proposed action, area traffic would substantially increase over the next 2 decades.

To assess available roadway capacity and identify possible transportation system improvements to accommodate the projected travel demand, available traffic counts from the past 3 years were reviewed and compared to the capacity of the major facilities approaching Fort Belvoir. Assessing the transportation network for its available capacity will allow for understanding the constraints to accommodate additional traffic destined for Fort Belvoir. The available capacity then can be used to determine the sizing of any transportation improvements that might be needed. As the expected traffic conditions are analyzed for each of the alternatives, the assessment of available capacity will allow for sizing that would be needed to mitigate any effects to the transportation system. The following per lane assumptions were made for each facility type, as identified in Table 4.3-4.

Review of available capacity indicates that the existing transportation network within the Fort Belvoir area is operating at or near capacity during peak periods in peak directional travel. Available vehicle capacity for additional vehicle trips traveling to Fort Belvoir or EPG is limited to trips to and from the north and west, because there is no available capacity from the south on I-95 and U.S. Route 1 under existing conditions. I-95 will be widened from three to four general purpose lanes between the Fairfax County Parkway and Route 123 by 2011. This improvement is



2006 Existing Daily Volumes on Screen Lines

Fort Belvoir, Virginia

Figure 4.3-10

Table 4.3-4
Capacity per lane by facility type

Facility type	Capacity	Explanation
Freeway	1,600–1,800 vehicles per hour (vph)	Varies because of interchange spacing; weaving, merge, and diverge operations; and downstream bottlenecks
HOV	1,900–2,100 vph	Volume is higher because of fewer ramps (ideally, volume would remain below 1,700 vph to provide an adequate level of service)
Ramp	1,200–1,600 vph	Specific design features determine actual capacity
Major arterial	1,100–1,300 vph	Varies based on signal progression, green time split, and cross-street volume
Minor arterial	850–1,000 vph	Varies based on signal progression, green time split, and cross-street volume

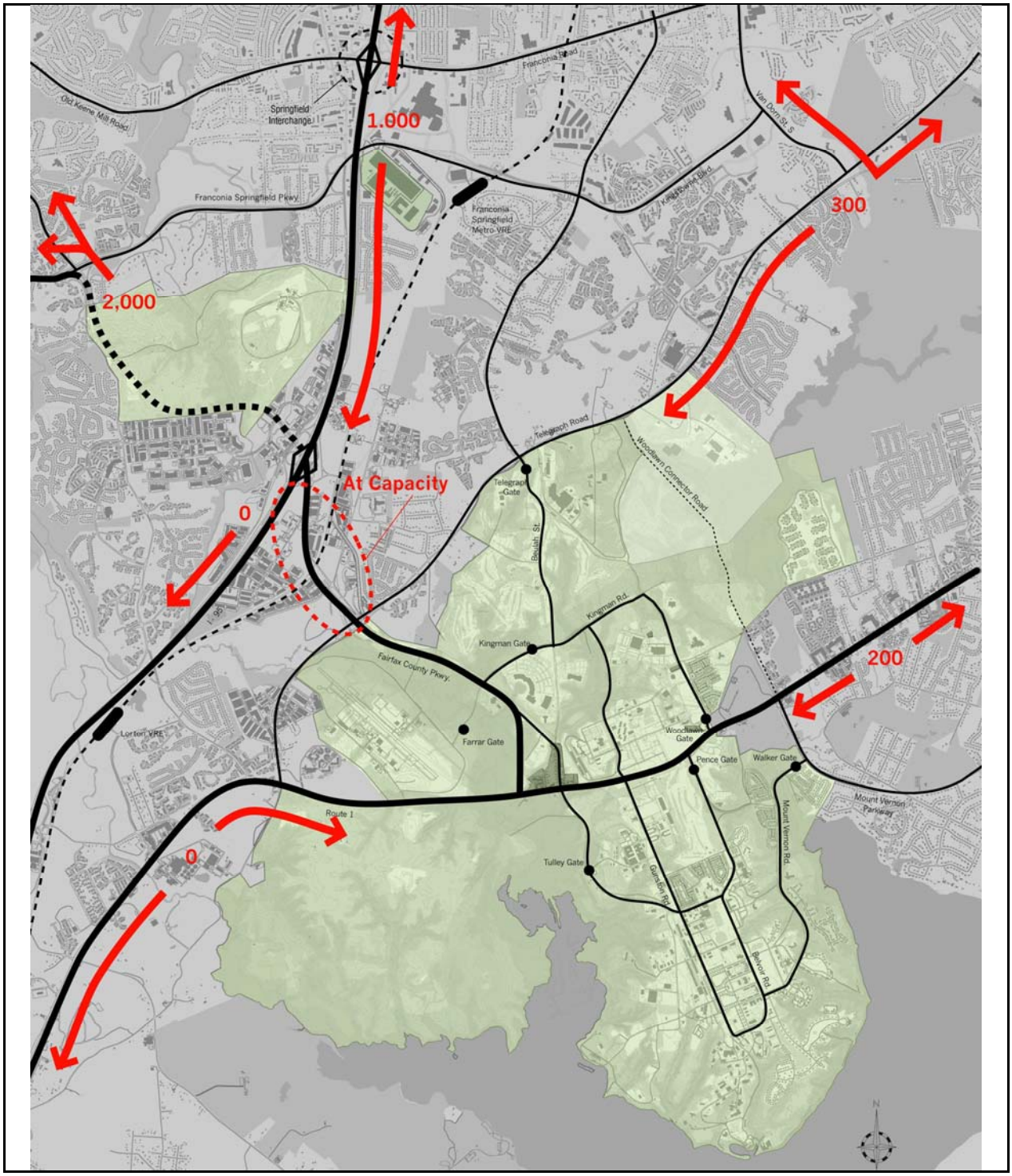
not expected to help alleviate congestion along I-95 because the region will continue to grow, offsetting any additional roadway capacity.

Regional and local roadways (upon completion of the Springfield Interchange, the Fairfax County Parkway through the EPG, and the Van Dorn Street/Franconia Road Interchange) could potentially accommodate up to 3,500 vehicles per hour (vph) for new vehicle trips to Fort Belvoir. This available capacity is illustrated in Figure 4.3-11. From the west, the proposed Fairfax County Parkway extension, depending on ultimate design, could provide access for up to 2,000 additional vehicles per hour. From the north, up to an additional 1,000 vph could travel to Fort Belvoir or EPG via I-95. Local access via the major arterials could provide access to approximately 500 vph under existing conditions.

Regional and local roadways (upon completion of the Springfield Interchange, the Fairfax County Parkway through the EPG, and the Van Dorn Street/Franconia Road Interchange) could potentially accommodate up to 3,500 vehicles per hour (vph) for new vehicle trips to Fort Belvoir. This available capacity is illustrated in Figure 4.3-11. From the west, the proposed Fairfax County Parkway extension, depending on ultimate design, could provide access for up to 2,000 additional vph. From the north, up to 1,000 additional vph could travel to Fort Belvoir or EPG via I-95. Local access via the major arterials could provide access to approximately 500 vph under existing conditions.

To assess existing conditions and available capacity in the immediate areas surrounding EPG and the Main Post, turning movement counts were performed at 28 intersections. The summary of the turning movement counts for the Existing Conditions is provided in Table D-1 and Figures D-1 and D-2 in Appendix D. These intersections were analyzed for their operational performance. The following table presents the *Volume-to-Capacity* (V/C) ratio, intersection *Level-of-Service* (LOS), and *delay* measures of effectiveness. The V/C ratio is a quantitative measure of demand versus the capacity of an intersection. LOS is a qualitative measure of an intersection's performance. LOS is ranked A to F, where A represents free flow or negligible delay, and F represents extensive delay and congestion. An intersection's LOS is typically at LOS F once the control delay at the intersection reaches an average of 80 seconds per vehicle.

Several intersections shown in Table 4.3-5 are of key interest because of their proximity to the Main Post and EPG. Key intersections along U.S. Route 1 operate at or above capacity. The intersection of Franconia- Springfield Parkway and Spring Village Drive is at capacity, and a



LEGEND

Roadways

River/ Water

Available Capacity

Fort Belvoir, Virginia

Figure 4.3-11

Table 4.3-5
Intersection Measures of Effectiveness—Existing Conditions

	AM Peak Hour[a]			PM Peak Hour[a]		
Intersection Location	**V/C**	**LOS**	**Delay[b]**	**V/C**	**LOS**	**Delay[b]**
Commerce Street/Old Keene Mill Road	0.59	B	16.3	0.80	C	20.5
Commerce Street/Amherst Ave.	0.65	C	27.1	0.79	D	36.6
Commerce Street/Backlick Road	0.29	C	22.1	0.70	D	38.5
Commerce Street/Franconia Road EB	0.45	C	30.6	0.78	C	31.6
Commerce Street/Franconia Road. WB	0.55	E	59.4	0.57	D	45.0
Backlick Road/Calamo Street	0.68	A	5.6	0.73	B	17.4
Loisdale Road/Spring Mall Drive	0.42	C	21.8	0.80	D	36.4
Franconia Springfield Parkway/Spring Village Drive	1.02	E	59.5	1.07	E	70.7
Franconia Springfield Parkway EB Ramp/Backlick Road	0.93	E	55.6	0.78	D	36.0
Franconia Springfield Parkway WB Ramp/Backlick Road	0.85	B	10.3	0.77	B	19.4
Franconia Springfield Parkway/I-95 HOV Ramps	0.89	D	35.5	1.23	F	96.6
Franconia Springfield Parkway EB Ramp/Frontier Drive	0.61	C	28.3	0.82	D	39.4
Franconia Springfield Parkway WB Ramp/Frontier Drive	0.45	C	24.3	0.75	F	99.3
Franconia Springfield Parkway/Beulah Street	1.12	F	87.4	1.26	F	135.7
Fairfax County Parkway/Fullerton Road	1.23	F	304.1	1.66	F	349.6
Fairfax County Parkway/Terminal Road	0.84	D	40.4	0.82	C	21.9
Fairfax County Parkway SB Ramps/Telegraph Road	0.45	B	18.0	0.68	D	50.7
Fairfax County Parkway NB Ramps/Telegraph Road	0.49	B	14.3	0.66	C	21.8
Fairfax County Parkway/John J. Kingman Road	0.75	D	40.0	0.99	F	83.6
Telegraph Road/Beulah Street	0.56	D	35.2	0.54	C	28.1
Telegraph Road/S. Van Dorn Street	0.73	C	21.3	0.90	D	42.4
U.S. Route 1/Telegraph Road—Old Colchester Road	0.76	D	47.6	0.74	D	43.8
U.S. Route 1/Fairfax County Parkway	0.94	D	36.2	0.87	C	32.8
U.S. Route 1/Backlick Road—Pohick Road	0.85	C	29.3	1.06	F	107.4
U.S. Route 1/Belvoir Road	0.80	B	16.1	0.57	B	11.7
U.S. Route 1/Woodlawn Road	0.70	A	6.2	0.72	B	11.9
U.S. Route 1/Old Mill Road	1.37	F	187.8	1.08	F	118.5
Loisdale Road./GSA Access Road[b]	0.50	A	1.5	0.30	A	1.1

Note: Delay represents the average number of seconds a vehicle is delayed from free-flow conditions.

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM

[b]Intersection analyzed as unsignalized intersection

number of intersections on Fairfax County Parkway are also congested. The intersection between the Franconia-Springfield Parkway and the I-95 HOV ramps operates under LOS F. This indicates the need for improvements to the HOV system under existing conditions.

The trip generation at Fort Belvoir must be examined to understand how the above intersection capacity analyses relate to Fort Belvoir. Understanding Fort Belvoir arrival and travel patterns

will aid in the development of the concepts for the proposed action and its four land use alternatives. Currently, a total of 26,000 daily trips are destined to Fort Belvoir. This value is a low trip generation to the site, considering that approximately 23,000 military personnel, civilians, and contractors work on the Main Post. Also, approximately 7,000 people live on Fort Belvoir, which helps reduce external trips to the site, as some residents work on-post. During the AM peak hour, the heaviest arrival hour in the morning peak period, there are only approximately 4,000 trips destined to Fort Belvoir, a generation rate of 18 inbound trips per 100 people (0.18 trips for every person). The Fort Belvoir trip generation rate is lower than typical rates calculated in the Institute of Trip Engineers (ITE) Trip Generation Manual. Sample rates for the AM peak hour, the heaviest arrival period, for other types of development from the ITE manual include 54 inbound trips per 100 employees traveling to a government office complex and 40 trips per 100 employees traveling to an office park (ITE, 2003). The comparisons of Fort Belvoir to other development for the heaviest arrival hour allow for assessment of the potential impacts of the proposed BRAC action. Thus, Fort Belvoir traffic does not have as large an effect on the transportation system as would other developments of similar size. Table 4.3-6 presents the inbound hourly flow into Fort Belvoir and Figure 4.3-12 presents the hour-by-hour flow rate.

Figure 4.3-12 illustrates the inbound flow into Fort Belvoir of approximately 4,000 vph during the AM peak hour of the cumulative daily flow of about 26,400 vehicles (14.7 percent of the daily flow). Tulley Gate is the most heavily used gate for South Post with more than 9,000 trips per day (representing 34 percent of the total trips) because it serves all visitors and is the southernmost gate on U.S. Route 1 for traffic from U.S. Route 1 and the Fairfax County Parkway. The Kingman Gate is the busiest gate for North Post with more than 5,000 trips per day (25 percent of the total trips). Since the time of the count reported in Table 4.3-6, the Woodlawn Road Gate has been closed to traffic. The counts do not include all gates at Fort Belvoir because the DLA and DCEETA gates are not included above. These gate counts are used as a guide in conjunction with turning movement counts at intersections that serve as gateways onto the Main Post as well as employee surveys, to develop future trip generation rates for Fort Belvoir.

There are a number of problems with traffic circulation on the Main Post, as some locations on the Main Post experience traffic congestion. Chief among these problematic locations are the following:

- Gunston Road, which is the only north-south connection between North and South Posts that is grade separated from U.S. Route 1. This roadway carries a high volume of traffic and is often congested during the peak periods.
- Lack of north-south connections over U.S. Route 1 in the vicinity of Belvoir Road. Travelers can use Pence Gate and Kingman Gate to travel on U.S. Route 1 and Fairfax County Parkway to get from South Post to North Post or vice versa. These much longer routes deter their use, resulting in heavy use of Gunston Road.
- Belvoir Road is congested between U.S. Route 1 and 12th Street.
- A lack of cross streets between Gunston and Belvoir Roads forces all traffic onto the limited number of connections between the two roadways, adding to the congestion on both of these major roadways.

Table 4.3-6
Inbound Gate Counts for Fort Belvoir Access Points

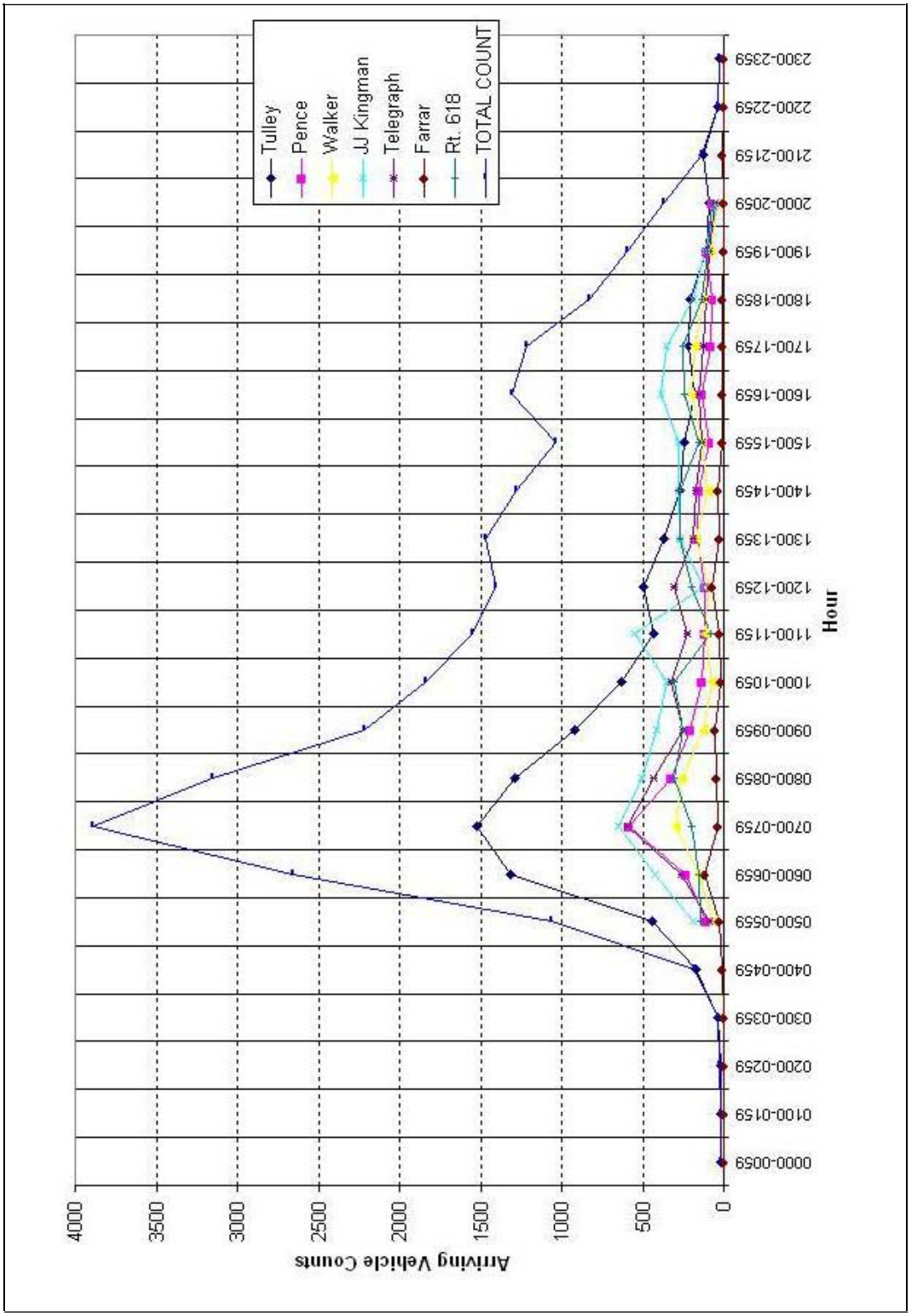
Gate	Tulley	Pence	Walker	Kingman	Telegraph	Farrar	Woodlawn	All Gates
Gate serves	South Post	South Post	South Post	North Post	North Post	Airfield	North Post	Fort Belvoir
No. of ID booths	3	2	1	2	1	1	1	11
Hour								
0000–0059	21					1		22
0100–0159	18					3		21
0200–0259	21					4		25
0300–0359	34					3		37
0400–0459	171					9		180
0500–0559	441	112	64	192	90	25	140	1,064
0600–0659	1,317	230	157	423	264	114	150	2,655
0700–0759	1,519	585	301	651	597	40	200	3,893
0800–0859	1,287	321	265	504	429	42	303	3,151
0900–0959	921	203	125	413	248	52	254	2,216
1000–1059	630	138	68	351	325	15	307	1,834
1100–1159	428	119	119	548	224	27	81	1,546
1200–1259	495	120	92	128	303	74	197	1,409
1300–1359	368	162	172	271	192	31	274	1,470
1400–1459	273	155	103	275	174	37	266	1,283
1500–1559	245	88	133	280	133	9	150	1,038
1600–1659	181	134	198	388	157	5	242	1,305
1700–1759	214	81	178	352	130	7	255	1,217
1800–1859	203	70	114	189	111	5	135	827
1900–1959	110	105	82	116	91	0	95	599
2000–2059	88	76	37	37	50	2	76	366
2100–2159	123					8		131
2200–2259	34					2		36
2300–2359	27					0		27
Total	**9,169**	**2,699**	**2,208**	**5,118**	**3,518**	**515**	**3,125**	**26,352**

Source: Greenhorn and O'Mara, 2005.
Notes: Cross-hatching indicates time period when gate is closed; dark shading represents the AM Peak Hour.

4.3.2.6 Transportation Plans

Various transportation projects within regional, state, and local long-range plans could have the potential to alleviate some of the congestion anticipated to occur with the BRAC relocations and to meet the shortfall in roadway capacity. These plans are described below. In addition, Tables 4.3-7 through 4.3-9 and Figure 4.3-13 illustrate the improvements within these plans that are slated for this area of the region.

VDOT Six-Year Improvement Program. The Commonwealth Transportation Board (CTB) of Virginia maintains this program, which allocates funds for transportation projects proposed for



Inbound Gates Hour-by-Hour Flow Rate
Fort Belvoir, Virginia

Figure 4.3-12

Table 4.3-7
List of improvements to be constructed by 2011

VDOT 6-Year Improvement Program	From (where applicable)	To (where applicable)	Map #
Highways			
Reconstruct I-95/I-395/I-495 Interchange (Phase II-VII)			1
I-95, widen to 8 lanes	Newington	VA 123	5
VA 7100 (Fairfax County Parkway), construct 4 lanes	Rolling Road	Fullerton Road	2
Telegraph Connector Road[1]	U.S. Route 1	Telegraph	4
Transit			
U.S. Route 1 bus priority project			3

[1]Timeline depends on funding. Most funding has been identified to construct Phase 1 (2 lane cross-section); however, there is a funding shortfall for the full cross-section.

Fairfax County spot improvements per CIP			
Highways			
Additional turn lane for NB U.S. Route 1 left turn movement at Engleside Post Office			
Provide turn lanes at Harrison Lane and South Kings Highway			
Additional turn lane for NB Mount Vernon Highway left turn movement at U.S. Route 1			
Additional turn lane for SB Roberts Road left turn movement at Braddock Road			
Transit			
Park & Ride lots along Franconia-Springfield Parkway			
New structured parking at Burke Centre VRE station			
U.S. Route 1 Public Transit initiatives			
New structured parking at Huntington Metro station to replace and expand existing parking			

Note: all projects listed above are funded and are expected to be completed by 2011.

Table 4.3-8
List of Improvements per the Constrained Long-Range Plan

Improvement	From (where applicable)	To (where applicable)	Map #
Highways			
I-95, reconstruct interchange at VA 642	Reconstruct Lorton Road Interchange		1
I-95, construct interchange at VA 7900	LOV access to & from West / from & to North		2
U.S. Route 1 Improvements			4
U.S. Route 1 Location Study (4 to 6 lanes, 6 to 8 lanes)	Stafford County Line	SCL Alexandria	
Widen (4 to 6 lanes)	Armistead Road	Lorton Road	

Table 4.3-8
List of Improvements per the Constrained Long-Range Plan *(continued)*

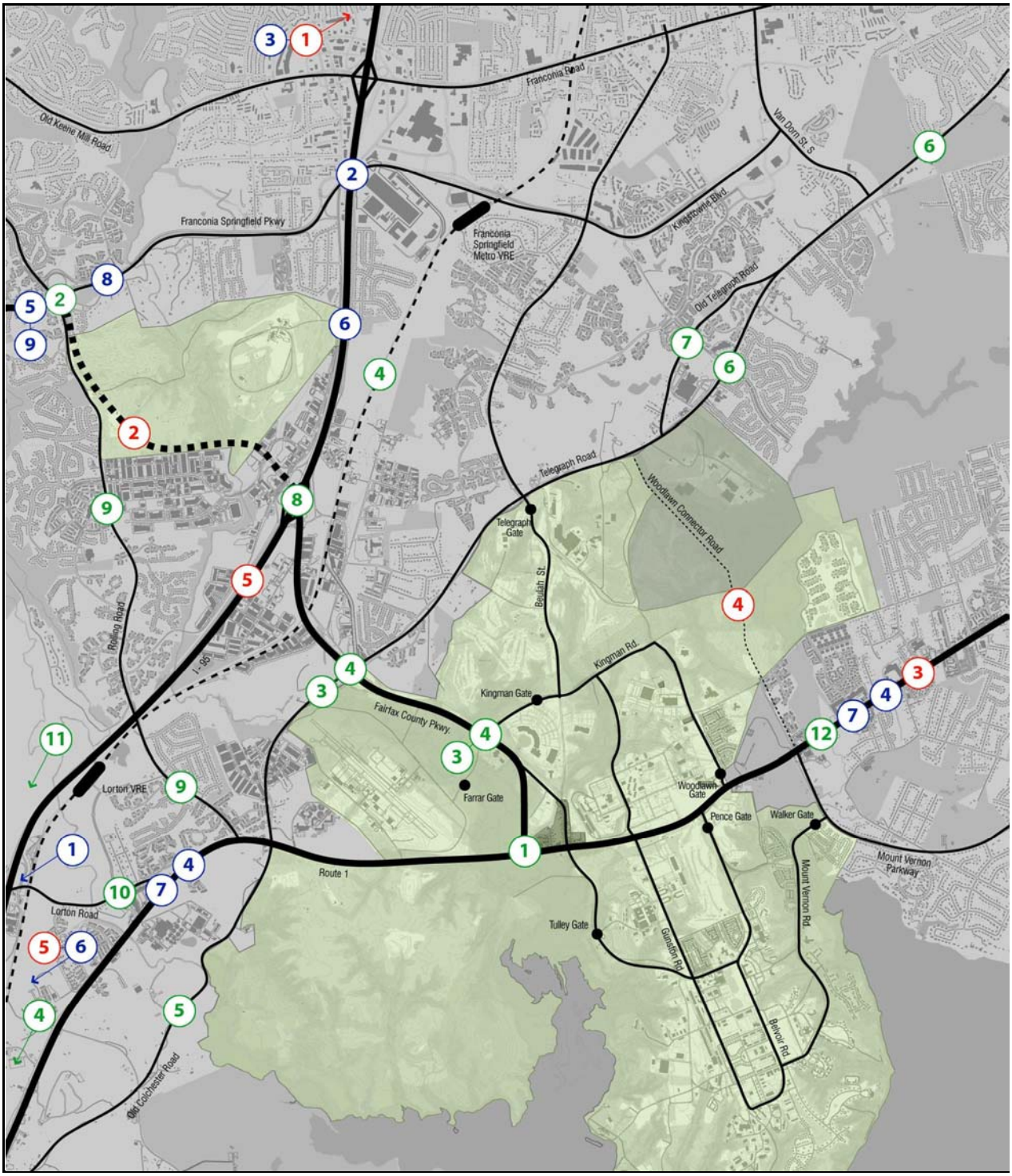
Transit	From (where applicable)	To (where applicable)	Map #
Widen (3 lanes NB, 4 lanes SB)	Lorton Road	Telegraph Road	
Install	@ VA 1332 (Huntington Avenue)		
Reconstruct intersection	@ VA 619 (Joplin Road)	USMC Heritage Ctr Access	
Widen (Neabsco Creek Bridge) (4 to 6 lanes)	VA 610 (Neabsco Road)	VA 638 (Neabsco Mills Road)	
Reconstruct Interchange	@ Russell Road		
Widen (4 to 6 lanes)	VA 235 South	VA 235 North	
Widen (4 to 6 lanes)	Stafford County Line	VA 235 South	
Widen (bus/right-turn lanes) (6 to 8 lanes)	VA 235 North	SCL Alexandria	
VA 123, widen to 6 lanes, 2008, 2015			
Widen (4 to 6 lanes)	U.S. Route 1	Occoquan Road	
Construct interchange	@ U.S. Route 1		
VA 7100, widen from 4 to 6 lanes	VA 640 (Sydenstricker Road)	VA 7900 (F-S Pkwy)	5
I-95 HOV, extend HOV lanes	Stafford County Line	Quantico Creek	6
I-95 HOV, restripe to 3 lanes	Quantico Creek	I-395/I-495 intersection	
I-95/I-395/I-495, interchange reconstruction with access ramps to I-495, HOV	Reconstruct Springfield Interchange		3
U.S. Route 1, widen for bus right turn lanes			
U.S. Route 1 Transit Improvements			
U.S. Route 1 Corridor Light Rail Study	King Street Metro Station	Potomac Yard	
Install U.S. Route 1 Traffic Signal Preemption	Mount Vernon Highway / Old Mill Road	Fort Hunt Road	
Implement U.S. Route 1 Transit Improvements	Gunston Road	Huntington Avenue	
U.S. Route 1 Transit Service Improvements Study	Stafford County Line	Pentagon	7
U.S. Route 1 Bus Rapid Transit (BRT) Study	Stafford County Line	Pentagon	
U.S. Route 1 Priority Bus Study	Stafford County	SCL Alexandria	
U.S. Route 1 Corridor Light Rail Study	Potomac Yard	Pentagon	
U.S. Route 1 Priority Bus Study	SCL Alexandria	King Street Metro station	
Franconia/Springfield Parkway HOV	VA 7100	VA 2677 (Frontier Dr.)	8
Fairfax County Parkway HOV, construct 2 lanes	VA 640 (Sydenstricker)	VA 7900 (F-S Pkwy)	9

Note: Projects are planned to be constructed by 2030, in the timeframe following the BRAC action. Specific order and timeline will depend on funding and priorities.

Table 4.3-9
List of Improvements beyond the Constrained Long-Range Plan

TRANSACTION 2030 - BEYOND CLRP	From (where applicable)	To (where applicable)	Map #
Corridor 8 - I-95/I-395/U.S. Route 1			
Highways			
Construct U.S. Route 1 interchange	Rippon Boulevard/Dale Boulevard		
Construct U.S. Route 1 interchange	Fairfax County Pkwy, Kings Hwy, Huntington Ave./Ft Hunt Rd		1
U.S. Route 1/Neabsco Creek Bridge, widen	VA 610 (Neabsco Road)	VA 638 (Neabsco Mills Road)	
Transit			
Metro Extension	Springfield	Potomac Mills	4
High capacity transit along U.S. Route 1	Alexandria	the Pentagon	
Corridor 5 - Fairfax County Parkway			
Highways			
Route 7100 (Fairfax County Parkway), construct interchanges	Rolling Road, Pohick Road		2
Transit			
Implement Corridor-Wide Priority Bus Service			3
Fairfax County Transportation Plan–beyond CLRP	**From**	**To**	**Map #**
Highways			
Improve Old Colchester Road	U.S. Route 1	Southern terminus	5
Widen Telegraph Road	Beulah Street	I-495 Capital Beltway	6
Improve Old Telegraph Road	North and south of Hayfield	North and south of Hayfield	7
Improve I-95/Route 7100 interchange			8
Route 7900 (Franconia-Springfield Parkway), construct interchange	Neuman Street		
Widen Rolling Road–Pohick Road	Route 7100	U.S. Route 1	9
Widen Lorton Road	Laurel Hill area	U.S. Route 1	10
Widen Silverbrook Road	Laurel Hill area	Lorton Road	11
Transit			
Construct LRT along U.S. Route 1	Fort Belvoir	Huntington Metrorail Station	12

Note: The above projects are beyond the funding constraints as identified in the CLRP. Projects may/may not occur by 2030 depending on funding source. For example, Fairfax County may proceed to widen Telegraph Road without funding from FHWA or VDOT. No commitments have been given to these projects.



LEGEND
Roadways
River/ Water

Transportation Improvements Identified by State and County Transportation Plans

Fort Belvoir, Virginia

Figure 4.3-13

construction, development, or study in the next 6 fiscal years. The program is updated annually. The CTB has updated the VDOT Six-Year Improvement Program, which identifies the roadway improvements to be identified in the next six years.

Fairfax County Capital Improvement Program (CIP). The CIP is Fairfax County's 5-year roadmap for creating, maintaining, and funding present and future infrastructure requirements. While the program serves as a long-range plan, it is reviewed and revised annually. When adopted, the CIP provides the framework for the County Executive and the County Board of Supervisors with respect to managing bond sales, investment planning, and project planning. Fairfax County's CIP includes not only a 5-year plan but a future outlook with potential long-term requirements.

Constrained Long Range Plan (CLRP). The CLRP is a comprehensive plan of transportation projects and strategies that the Metropolitan Washington Transportation Planning Board realistically anticipates can be implemented over the next 25 years. The major highway, HOV, and transit improvements and major studies are identified in the plan, which is updated annually. These projects cover the metropolitan Washington region, including a portion of Virginia.

Fairfax County Comprehensive Plan. This plan is required by state law to be used as a guide in decision-making about the built and natural environment by the County's Board of Supervisors and other agencies, such as the Planning Commission and the Board of Zoning Appeals. It is also a guide for county staff and the public to use in the planning process. The Fairfax County Transportation Plan is an element of the Fairfax County Comprehensive Plan and serves as a guide for long-range transportation development in the county. The county makes modifications to the Comprehensive Plan, including the Transportation Plan, through a continual plan review process. The county recently completed a comprehensive review of the Transportation Plan to provide an updated outlook for the county's vision for the transportation system.

TransAction 2030. This plan, sponsored by the Northern Virginia Transportation Authority, was a regional transportation planning effort covering the counties of Arlington, Fairfax, Loudoun, and Prince William and the cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park. TransAction 2030 is a study that identified the short-, medium-, and long-term transportation needs in Northern Virginia and the specific improvements that should be pursued to meet those needs.

Between November 2006 (baseline period) and 2011, the existing conditions that have been discussed in this section can be expected to change. Projects in the VDOT Six-Year Improvement Program and the Fairfax County CIP are assumed to be completed within their respective time frames. Moreover, upon their completion, the projects become part of the baseline for modeling effects of the Army's proposed action and alternatives, beginning in 2011. Projects identified in the recommendations of transportation planners, especially those outside the 6-year planning horizon, are also considered in cumulative effects analyses.

4.3.3 NO ACTION ALTERNATIVE

This section presents the projected traffic conditions for the 2011 No Action Alternative.

Section 4.3.2 describes existing conditions as of 2006 (the existing conditions used the 2006 analysis year because the data collection effort for intersection turning movement counts was conducted in the first part of 2006). The proposed action, however, would not be fully implemented until 2011. Between 2006 and 2011, several transportation-related changes can be

expected to occur, independently of the proposed action, thus shifting the baseline for transportation analysis from 2006 to 2011, with the latter typically being referred to as the *opening year*. The transportation review agencies require that this opening year be used as the analysis year.

The 2011 opening year of the proposed action includes transportation projects expected to be operational by that time. Also, regional population and economic growth are factored into the MWCOG model in the out-years. Doing so recognizes a more appropriate baseline (2011) for comparison of effects associated with the alternatives. This approach is consistent with methodologies typically employed within the transportation planning community.

The following section identifies transportation projects expected to occur before 2011.

4.3.3.1 Planned Transportation Projects

On the regional roadway network, several projects that would increase roadway capacity are ongoing or can be expected to begin in the near future. Table 4.3-10 lists these projects within the Fort Belvoir study area.

These projects will be needed to address the continued growth expected in Northern Virginia and the Washington metropolitan area; however, they are not expected to alleviate the congestion because highway improvements have generally not kept pace with the growth in the region. Implementing these projects represents the changed baseline for analysis of the No Action Alternative.

4.3.3.2 Fort Belvoir Main Post Roadway Network

Fort Belvoir would widen or construct new roadway links before 2011, regardless of the proposed action. These projects, as illustrated in Figure 4.3-14 by letter, include the following:

a. Widening of Gunston Road from 2 to 4 lanes between 12th Street and John J. Kingman Road, to include a widened grade-separation over U.S. Route 1.

b. Widening of Belvoir Road from 2 to 4 lanes between 12th Street and U.S. Route 1.

c. Widening of 9th Street from 2 to 4 lanes between Gunston and Belvoir Roads.

d. Constructing a new access control point to serve North Post.

These transportation improvements would improve traffic flow on the Main Post. The biggest improvement is likely to be the widening of Gunston Road. This widening would improve the connectivity between North and South Post and improve traffic flow.

4.3.3.3 The Transit System

No major changes to the transit services within the study area are planned during the period 2006 to 2011. VRE is examining the potential to add a third track between the Lorton area and Alexandria to address current issues with service reliability because of the sharing of the CSX freight rail line tracks. The third line would improve on-time service reliability and allow for future headway improvements on VRE (headway is defined as the amount of time between trains, i.e., a 5 minute headway means that a train leaves every 5 minutes). Metro is not planning to extend either the Blue or Yellow Lines.

Table 4.3-10
Projects assumed to be completed by 2011

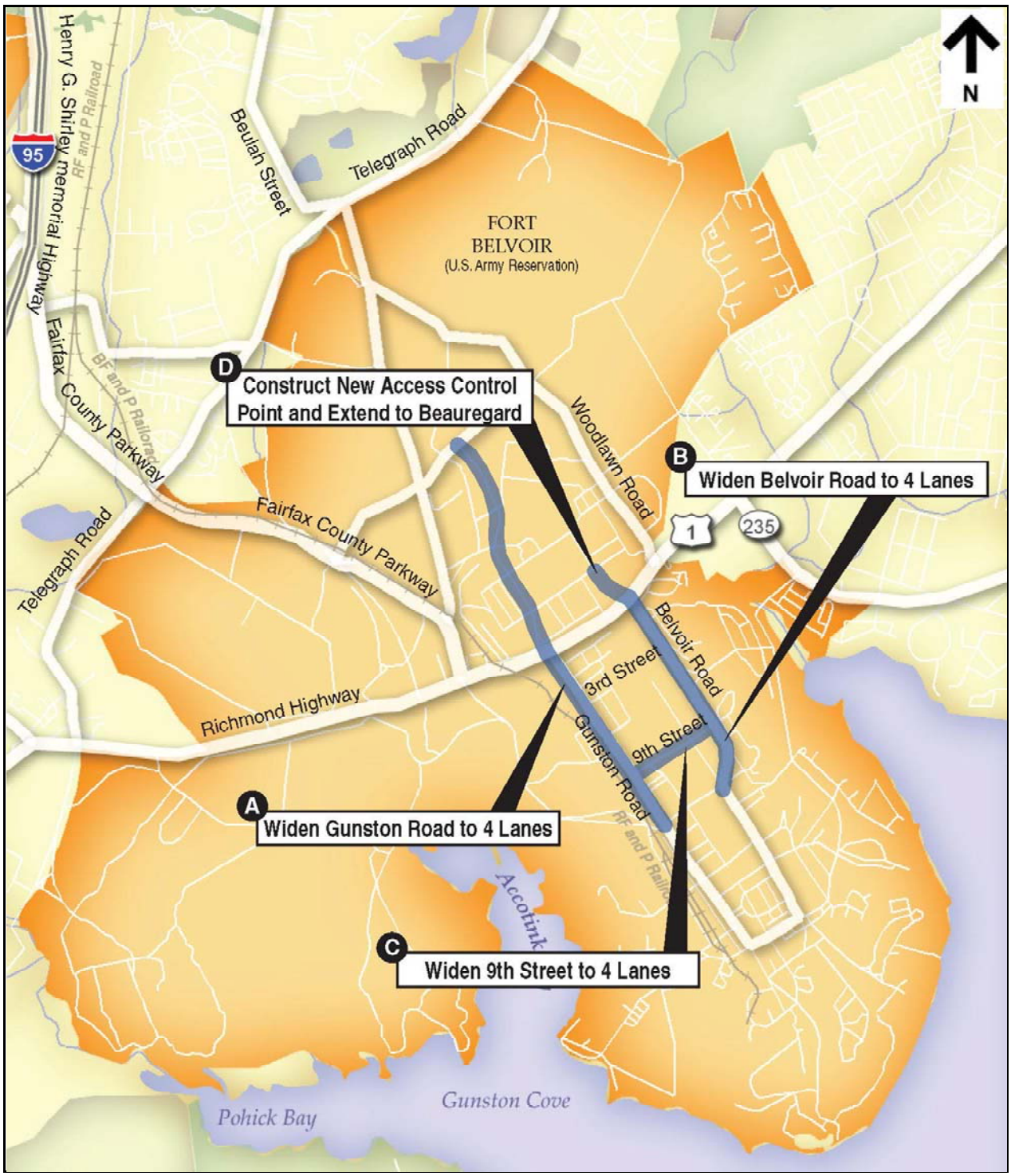
VDOT 6-Year Improvement Program	From (where applicable)	To (where applicable)	Map #
Reconstruct I-95/I-395/I-495 interchange (Phase II-VII)			1
VA 7100 (Fairfax County Parkway), construct 4 lanes	Rolling Road	Fullerton Road	2
VA 645 (Burke Lake Road)	VA 643 (Lee Chapel Road)	VA 7100 (Fairfax County Parkway)	
U.S. Route 1 (3 lanes NB, 4 lanes SB)	Lorton Road	Telegraph Road	
U.S. Route 1 (4 to 6 lanes)	Armistead Road	Lorton Road	
VA 642 (Lorton Road)	VA 600 (Silverbrook Road)	U.S. Route 1 (Richmond Highway)	10
VA 123 (complete widening to 6 lanes & widen Occoquan Bridge crossing)	VA 722 North	Hooes Road	
I-95 (provide fourth lane)	Newington	VA 123	5
I-95 (Wilson Bridge and approaches)	U.S. Route 1	MD 210	
I-95 (Wilson Bridge and approaches)	VA 241 (Telegraph Road)	U.S. Route 1	
Construct interchange at U.S. Route 1 and Route 123			
Widen U.S. Route 1 from 4 to 6 lanes at Neabsco Creek			
Transit–U.S. Route 1 Bus Priority Project			12
Trails–Bike trails/routes	throughout Fairfax County		
Fairfax County CIP (spot improvements)			
Additional turn lane for NB U.S. Route 1 left turn movement at Engleside Post Office			
Provide turn lanes at Harrison Lane and South Kings Highway			
Additional turn lane for the left turn movement from Mount Vernon Highway onto U.S. Route 1 (toward Pence Gate)			
Additional turn lane for SB Roberts Road left turn movement at Braddock Road			
Four Park & Ride lots along Franconia-Springfield Parkway, one on Gambrill Road, one on Sydenstricker Road, and two on Backlick Road			
New structured parking at Burke Centre VRE station to replace the existing 614 spaces with 1290 structured parking spaces and 235 surface parking spaces			
U.S. Route 1 Public Transit initiatives			
New structured parking at Huntington Metro station to replace and expand existing parking. This improvement will increase the total parking spaces from 925 to 1,425.			
FHWA funding (federal project)	**From**	**To**	
New Connector Road—Extend Old Mill Road to provide connection from U.S. Route 1 to Telegraph	Pole Road	Telegraph Road	4

Note: Map numbers refer to Figure 4.3-13

Overall, bus services are expected to remain similar to current services. Note that service providers routinely examine and readjust their services as needed to provide their clientele with better service options and to respond to changes in demand.

4.3.3.4 Travel Patterns

It is assumed that the current distribution of Fort Belvoir employees' residential locations will remain constant. Over the next 5 years, the region will continue to grow in both population and



Assumed Main Post Improvements Under the No Action Alternative

Fort Belvoir, Virginia

Figure 4.3-14

employment. This growth, in turn, will increase the productions and attractions, which means that the total number of trips will increase. Several observations can be made from the following tables. The population of the Laurel Hill district will nearly double from 2006 to 2011 under the No Action Alternative, and the population within the study area increases by more than 10 percent. The large increase in Laurel Hill can potentially increase the number of trips on the I-95 corridor through the study area. The net increase to the study area employment under the No Action Alternative is less than half of the employment that would occur at Fort Belvoir (Main Post and BRAC) as a result of the proposed action. Tables 4.3-11 and 4.3-12 present the population, employment, productions, and attractions for the No Action Alternative in 2011.

Table 4.3-11
Population and employment for the existing conditions (2006) and 2011 No Action Alternative

	Population		Employment	
District	**Existing**	**No Action**	**Existing**	**No Action**
Laurel Hill	13,470	25,121	3,547	3,996
Pohick	50,826	51,766	3,648	3,849
Lorton South of U.S. Route 1	14,476	18,200	9,067	11,233
I-95 Industrial Area	2,092	2,175	8,605	8,683
Franconia-Springfield Transit Area	2,727	2,821	5,940	6,764
Springfield Community Business Center	1,306	1,483	2,074	2,141
Springfield	31,263	32,201	10,850	11,387
EPG	0	0	45	45
Mason Neck	2,785	5,552	438	464
Fort Belvoir (Main Post)	7,623	7,623	23,266	23,267
Mount Vernon	93,783	102,230	19,681	21,457
Rose Hill	67,179	70,513	20,352	23,157
Total Study Area	287,530	319,685	107,513	116,443
Rest of Virginia	2,142,682	2,399,710	1,258,264	1,427,055
Maryland	3,318,699	3,483,648	1,723,958	1,870,517
District of Columbia	583,733	615,375	752,719	790,205
West Virginia	47,735	52,555	15,173	17,191
Other States	0	0	0	0
Total Outside Study Area	6,092,849	6,551,288	3,750,114	4,104,968
Regional Total	**6,380,379**	**6,870,973**	**3,857,627**	**4,221,411**

Source: VHB, 2006.

In the No Action Alternative in 2011, Fort Belvoir represents 2.4 and 20.0 percent of the population and employment in the study area, respectively; however, Fort Belvoir accounts for only 3.9 percent of the attractions in the study area. This value is a slight decrease compared to existing conditions (2006). The reason for this change is that the region continues to grow, while little change would occur at Fort Belvoir. The ratio of jobs to population within the study area is 0.36, or 36 jobs to 100 residents, in both 2006 and 2011. Figure 4.3-15 presents the population and employment for the study area. Generally, the ratio of population and employment stays the same as in existing conditions for all districts. The population in Laurel Hill and Mason Neck almost doubles.

Table 4.3-12
Productions and attractions for the existing conditions (2006) and 2011 No Action Alternative

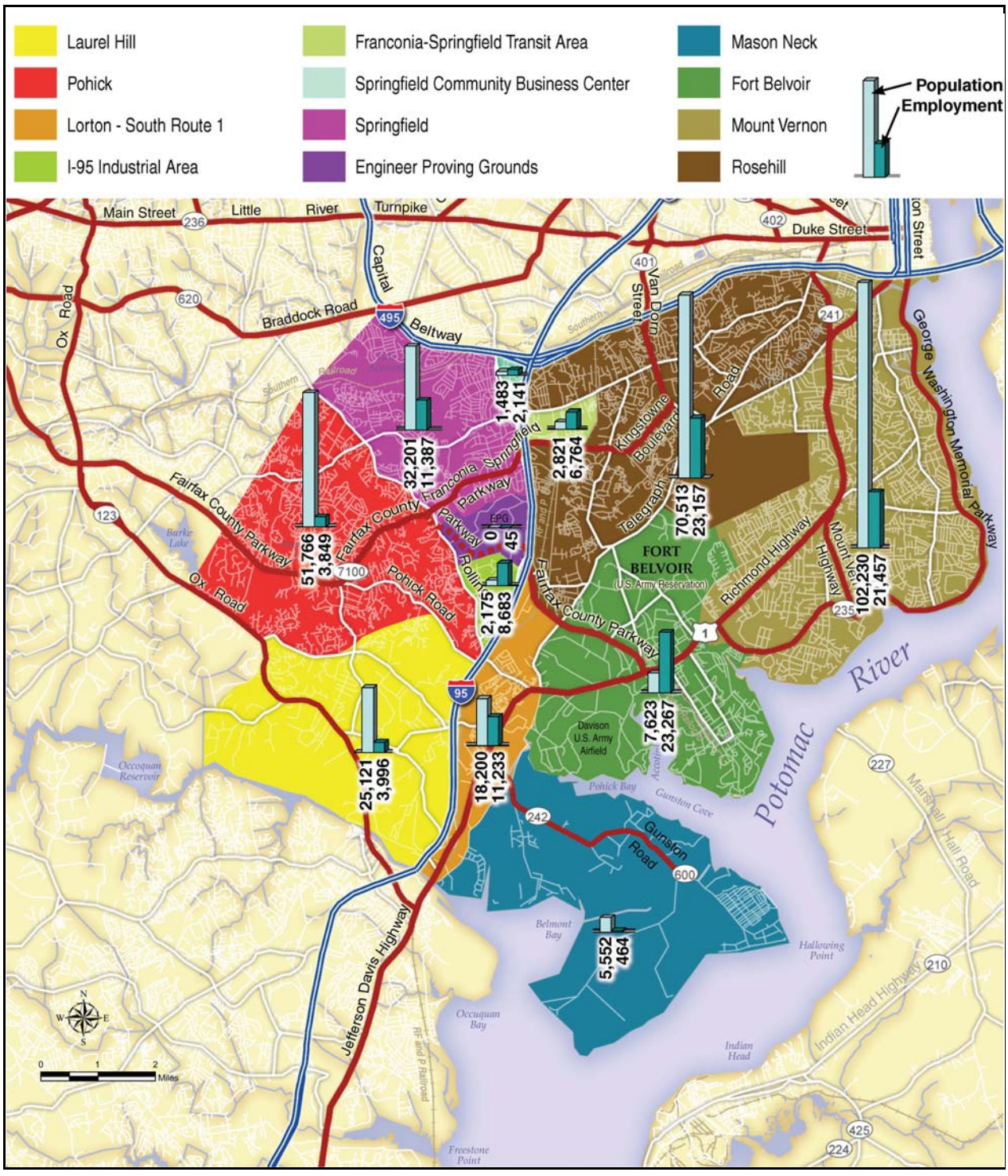
	Productions		Attractions	
District	**Existing**	**No Action**	**Existing**	**No Action**
Laurel Hill	31,891	52,247	31,825	52,327
Pohick	109,597	110,862	109,719	110,848
Lorton South of U.S. Route 1	43,441	55,677	43,430	55,560
I-95 Industrial Area	20,802	20,880	20,753	20,969
Franconia-Springfield Transit Area	37,799	41,046	38,044	41,275
Springfield Community Business Center	11,586	12,158	11,601	12,053
Springfield	98,365	101,148	98,274	101,153
EPG	81	89	87	102
Mason Neck	5,979	11,012	5,948	10,998
Fort Belvoir (Main Post)	35,176	35,177	35,342	35,343
Mount Vernon	250,418	271,298	250,606	271,297
Rose Hill	184,223	197,462	184,200	197,283
Total Study Area	829,357	909,055	829,830	909,209
Rest of Virginia	6,952,561	7,768,560	6,952,125	7,768,134
Maryland	10,587,588	11,254,561	10,586,616	11,252,945
District of Columbia	1,572,672	1,614,479	1,572,360	1,614,396
West Virginia	153,721	172,023	153,849	172,056
Out of State	715,116	828,980	716,236	830,919
Total Outside Study Area	19,981,658	21,638,603	19,981,186	21,638,450
Regional Total	**20,811,015**	**22,547,658**	**20,811,015**	**22,547,658**

Source: VHB, 2006.

Fort Belvoir represents approximately 3.2 percent of the total employment within Fairfax County in 2011. Within TransAction's Corridor 8, the I-95/U.S. Route 1 corridor, Fort Belvoir represents approximately 5.5 percent of the total employment. This corridor is the main route for Fort Belvoir employees. Table 4.3-13 presents the internal trips to the study area, external trips destined to the study area, and external trips that originate within the study area. Like the existing conditions, internal trips account for less than half of the trips that have an origin or destination in the study area. The table does not include external trips that pass through the study area.

4.3.3.5 Performance under Expected Conditions (2011)

Under the No Action Alternative, the region is expected to continually grow, with little changes occurring at Fort Belvoir. Therefore, an increase in traffic volumes on roadways surrounding Fort Belvoir and EPG would occur naturally and not be caused by Fort Belvoir. Several projects are expected to be completed by 2011 that would improve transportation flows near the study area.



LEGEND

- Interstate Highway
- Highway
- River/ Water

Population and Employment for the 2011 No Action Alternative

Fort Belvoir, Virginia

Figure 4.3-15

Table 4.3-13
Study area trips – 2011 No Action Alternative

Time	Internal Trips Within Study Area	External Trips Ending in Study Area	External Trips Beginning in Study Area
AM Peak	73,797	58,621	77,863
PM Peak	135,590	109,426	93,733
Off-Peak	324,713	207,062	203,359
Daily	**534,100**	**375,109**	**374,955**

Congestion along the I-95 corridor is not expected to increase by 2011 under the No Action Alternative. A series of roadway improvement projects will increase capacity along the I-95 corridor through the study area; however, the region will continue to grow, so the increased capacity will be offset by the increased demand. Thus, the overall congestion levels will remain similar to existing conditions. The I-95 Fourth Lane project will be completed before the BRAC action and the Springfield Interchange (up to construction Phase 8, which is on hold) will be completed in 2007. The Woodrow Wilson Bridge is also slated to be completed sometime in 2011. These projects will add capacity to the road network within the study area. Any bottlenecks upstream or downstream of these transportation improvements, however, would limit the benefit of this roadway improvement.

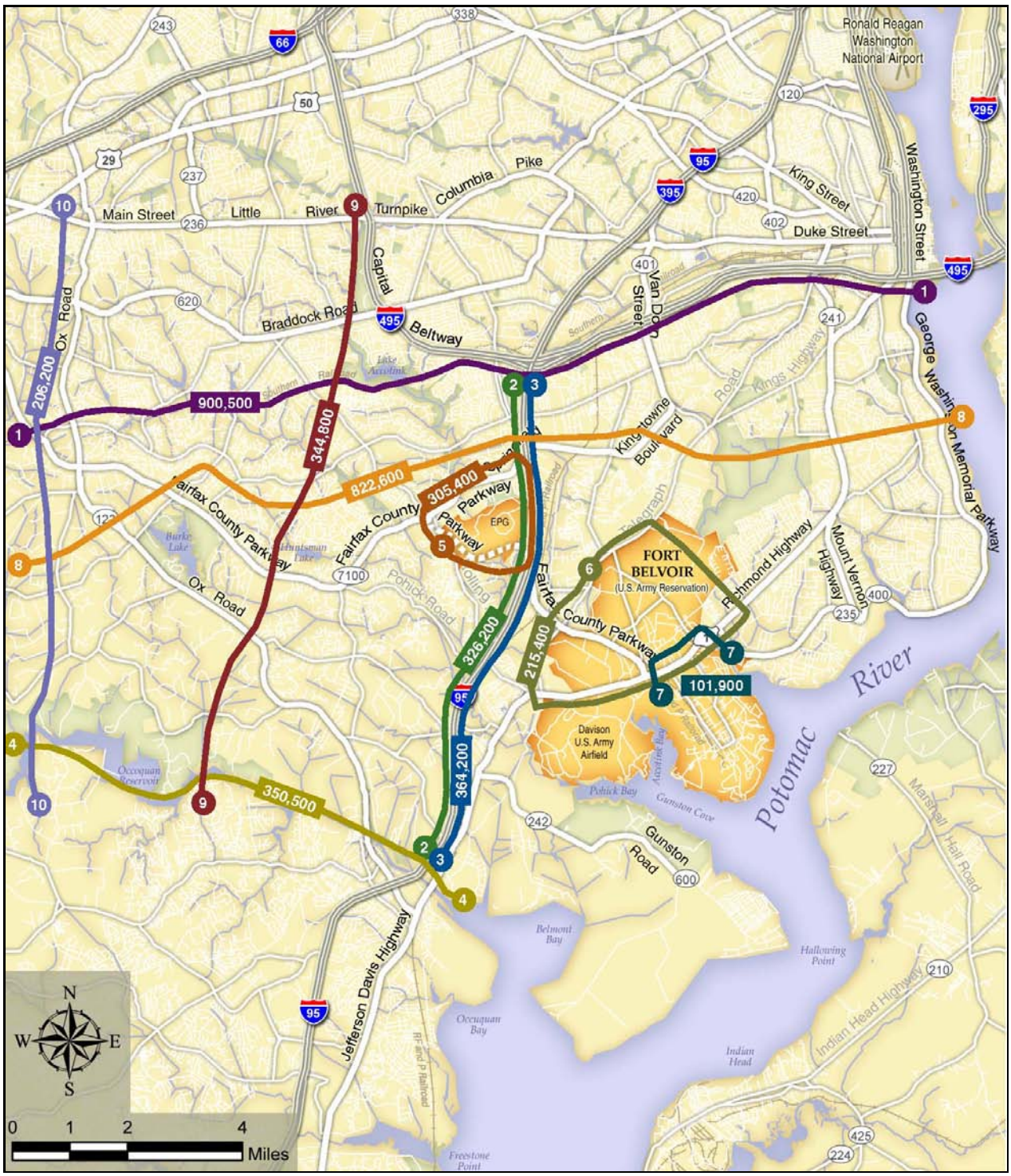
Increased traffic volumes along U.S. Route 1 will increase the hours of congestion on that roadway by one-half to one hour. Because of the increase of traffic volumes on regional roadways and roadways adjacent to Fort Belvoir, the intersection LOS will deteriorate, impeding access to and egress from Fort Belvoir. This impediment will increase travel times for personnel exiting from Fort Belvoir in the evening.

The biggest effect to the transportation system is the addition of the Fairfax County Parkway through the EPG site. This segment creates a new transportation link and diverts trips from I-95 and the Capital Beltway. Figure 4.3-16 presents the screen line volumes for the No Action Alternative

As the region continues to grow, the traffic volumes on the roadways will continue to increase, as shown by comparing the screen lines in the above figure to those of the existing conditions. Only Screen Line 7 experiences a decrease of traffic volumes; this change is from the addition of the new Connector Road along the eastern boundary of North Post linking U.S. Route 1 to Telegraph Road. The new road will cause a redistribution of east-west trips across the roadway facilities surrounding the study area and divert some trips away from U.S. Route 1 through Fort Belvoir.

Intersection operational analyses were performed at 23 key intersections within the study area for the No Action Alternative. The summary of the turning movement counts for the No Action Alternative can be found in Table D-2 and Figures D-3 and D-4 in Appendix D. The results of the analyses are summarized in Table 4.3-14.

As shown in Table 4.3-14 and compared to 2006 existing conditions, regional growth will continue to deteriorate LOS at a number of intersections within the study area. For instance, the 2006 AM Peak Hour V/C for the U.S. Route 1/Backlick—Pohick intersection (*downtown Accotink*) of 0.85 will increase to 0.97 by 2011 and LOS will degrade from C to D. The 2006 PM peak hour V/C of 0.99 for the Fairfax County Parkway/John. J. Kingman intersection will



Daily Screen Line Volumes under The 2011 No Action Alternative

Fort Belvoir, Virginia

Figure 4.3-16

Table 4.3-14
Intersection measures of effectiveness–2011 No Action Alternative

	AM peak hour			PM peak hour		
Intersection location	**V/C**	**LOS**	**Delay**	**V/C**	**LOS**	**Delay**
Commerce St./Amherst Ave.	0.72	D	35.3	0.85	D	48.0
Commerce St./Backlick Rd.	0.38	C	29.9	0.75	D	46.8
Backlick Rd./Calamo St.	0.73	B	12.3	0.80	C	23.7
Loisdale Rd./Spring Mall Dr.	0.47	C	24.0	0.86	D	40.2
Franconia Springfield Parkway/Spring Village Dr.	1.06	E	66.3	1.09	F	90.1
Franconia Springfield Parkway EB Ramp/Backlick Rd.	0.99	E	66.9	0.79	D	37.9
Franconia Springfield Parkway WB Ramp/Backlick Rd.	0.66	B	10.3	0.90	C	24.1
Franconia Springfield Parkway/I-95 HOV Ramps	1.01	E	56.5	1.41	F	185.2
Franconia Springfield Parkway EB Ramp/Frontier Dr.	0.82	C	29.2	0.87	D	50.3
Franconia Springfield Parkway WB Ramp/Frontier Dr.	0.50	C	33.8	0.78	F	93.0
Franconia Springfield Parkway/Beulah St.	1.12	F	116.0	1.34	F	153.9
Fairfax County Parkway/Terminal Rd.	0.93	C	26.4	0.87	B	19.2
Fairfax County Parkway SB Ramps/Telegraph Rd.	0.57	C	20.8	0.87	C	31.1
Fairfax County Parkway NB Ramps/Telegraph Rd.	0.62	B	15.2	0.78	C	23.1
Fairfax County Parkway John J. Kingman Rd.	0.79	D	45.7	1.16	F	112.8
Telegraph Rd./Beulah St.	0.66	D	37.0	0.67	C	30.3
Telegraph Rd./S. Van Dorn St.	0.91	C	29.3	1.02	D	44.2
U.S. Route 1/Telegraph Rd. - Old Colchester Rd.	0.82	D	54.4	0.77	E	76.7
U.S. Route 1/Fairfax County Parkway	0.96	D	38.8	0.89	D	35.9
U.S. Route 1/Backlick Rd.—Pohick Rd.	0.97	D	37.0	1.12	F	129.9
U.S. Route 1/Belvoir Rd.	0.83	B	19.3	0.59	B	12.0
U.S. Route 1/Old Mill Rd.	0.86	E	65.1	0.89	E	57.8
Loisdale Rd./GSA Access Rd.	0.64	A	6.5	0.42	A	5.0

Note: Delay represents the average number of seconds a vehicle is delayed from free-flow conditions.

increase to 1.16 by 2011 and the time delay per vehicle will rise from 83.6 seconds to 112.8 seconds, an increase of 35 percent. The growth in non-fort traffic would cause five intersections in the AM and five in the PM to deteriorate by a letter grade, including one intersection from an E under existing conditions to an F under expected conditions for the No Action Alternative.

Intersections where improvements could potentially be needed to reduce future congestion and delays include the following:

- Franconia-Springfield Parkway at Spring Village Drive/Bonniemill Lane
- Franconia-Springfield Parkway at Beulah Street
- Fairfax County Parkway at John J. Kingman Road
- U.S. Route 1 at Backlick and Pohick Roads

Subsequent analyses in this section of the document compare the Army's Preferred Alternative and other alternatives to the conditions of the No Action Alternative set forth above.

4.3.4 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

4.3.4.1 Land Use Plan Update

No effects would be expected. Adopting a revised land use plan would not, in the absence of additional activities such as facilities' development and increased population, result in effects to the transportation system. Effects to the transportation system would not occur until further development occurred in accordance with the terms of the new land use plan. The Preferred Alternative Land Use Plan would add the EPG to the inventory of actively managed resources. Inclusion of this area within the planning regime would not, by itself, affect the transportation system unless and until development occurred at the site. Similarly, an alternative location for the troop area at Fort Belvoir would have negligible effects, or none, on the transportation system.

4.3.4.2 BRAC Implementation and Facilities Projects

Long-term significant adverse effects would be expected. Implementing the Preferred Alternative, when compared to the No Action Alternative set forth in Section 4.3.3, would worsen traffic conditions in the immediate vicinity of Fort Belvoir. From the regional perspective, implementation would produce a combination of minor (negligible) adverse and beneficial effects. This section will further discuss and present the impacts at the localized level.

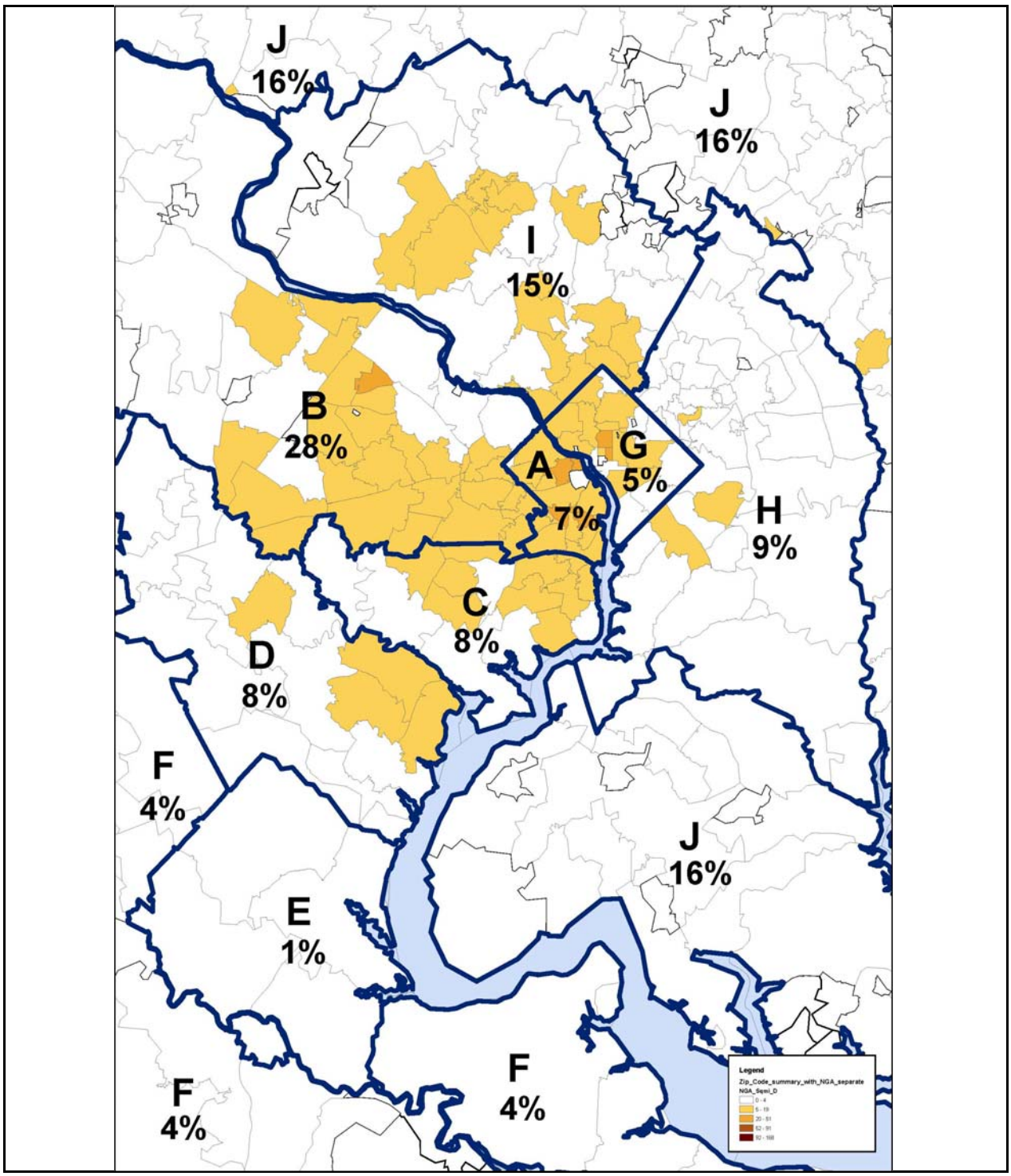
Under the Preferred Alternative, NGA and WHS would be on EPG. A new hospital would be constructed on South Post. Army Lease, PEO EIS, and MDA would also be on South Post in a combination of existing and new facilities. The BRAC action would increase total employment levels on the Main Post and EPG by approximately 22,000 personnel, with slightly fewer than 18,000 of the personnel being assigned to EPG. The following subsection discusses and evaluates the effects to the transportation system that would occur as a result of assigning these additional personnel to the specific portions of the post.

4.3.4.2.1 Travel Patterns to and from Fort Belvoir

Existing travel patterns were examined using the following sources:

- MWCOG's Cooperative Land Use Forecast (Round 7, revised)
- A survey conducted on the approximately 23,000 Fort Belvoir employees in December 2002
- Zip code surveys provided by the NGA
- A survey of incoming DoD agencies completed by the Fort Belvoir BRAC office
- Residential and duty locations from the DoD's payroll register for the NCR as of August 2006

Figure 4.3-6 showed the distribution of residential locations for existing employees at Fort Belvoir in August 2006. Figure 4.3-17 shows the distribution of residences for current NGA employees, and Figure 4.3-18 shows the distribution of residences for the DoD employees (WHS and others) reporting to work in Crystal City, Pentagon City, the Pentagon, and Rosslyn. Table 4.3-15 presents the assumed existing distribution based on the data received from the various agencies.

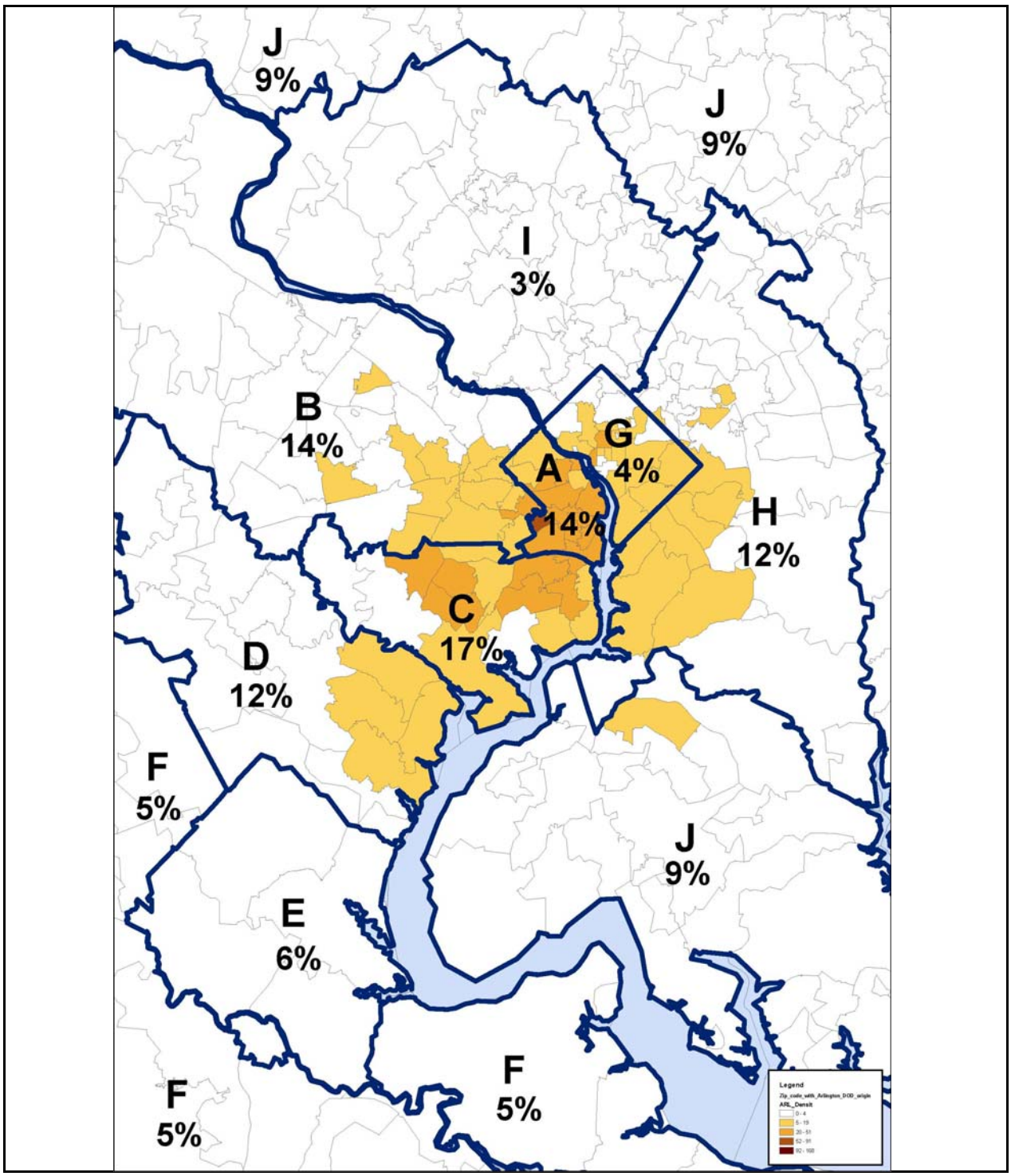


Note: Employee Density within Zip Code Boundary (Employee/sq.mi.) based on payroll data

Current Residential Distribution of NGA Employees

Fort Belvoir, Virginia

Figure 4.3-17



Note: Employee Density within Zip Code Boundary (Employee/sq.mi.) based on payroll data

Current Residential Distribution of WHS and DoD Employees

Fort Belvoir, Virginia

Figure 4.3-18

Table 4.3-15
Existing residential locations of Fort Belvoir, WHS/DoD, and NGA employees

District	Location	Residential distribution of Fort Belvoir employees[a]	Residential distribution of WHS and DoD (Arlington) employees[a]	Residential distribution of NGA employees[b]
A	Arlington/Alexandria	4%	14%	7%
B	Northern Fairfax Co. and Loudoun Co.	7%	14%	28%
C	Southern Fairfax Co.	37%	17%	8%
D	Prince William Co.	22%	12%	8%
E	Near South	9%	6%	1%
F	Remainder of Virginia	7%	5%	4%
G	District of Columbia	1%	4%	5%
H	Prince Georges Co.	5%	12%	9%
I	Montgomery Co.	1%	3%	15%
J	Remainder of Maryland	3%	9%	16%
K	Non DC, MD, VA	4%	4%	1%
	TOTAL	**100%**	**100%**	**100%**

Notes:

[a]Information based on employee data provided on September 20, 2006 from DoD.

[b]NGA ZIP Code Study Data, dated June 20, 2006 and received August 22, 2006.

Percentages are based on review of payroll data and survey results for 10,548 Fort Belvoir employees, 19,004 WHS/DoD employees, and 3,243 NGA employees.

It can be expected that the residential locations of employees of NGA, WHS, and other incoming agencies affected by BRAC (hospital, MDA, PEO EIS) would shift, becoming similar to the patterns of current Fort Belvoir employees. The time frame for this shift to occur cannot be predicted, though it would be expected to take up to 10 to 15 years. For 2011 it was assumed that 50 percent of both NGA and WHS employees would adhere to their existing distribution and the remaining 50 percent would mimic the distribution of Fort Belvoir's existing employees. The net effect is that more trips would be northbound on I-95 destined for the BRAC sites than currently combined to Fort Belvoir, Arlington County, and the NGA sites. Table 4.3-16 presents the distribution of employees in 2011, given the assumption above. This future distribution under the Preferred Alternative is assumed the same for all four alternatives.

The consequence of the shifting travel patterns to the south is that traffic to Fort Belvoir (including EPG) northbound on I-95 would represent a larger portion of the overall traffic flow. Current highway facilities to the south would constrain the traffic flows if adequate roadway capacity is not provided.

The total number of trips within the region remains fixed as the regional employment total is held constant; it is the redistribution of employment that causes a shift in travel patterns. As discussed under travel demand modeling in Section 4.3.1.1, the net increase in traffic is noticeably less than the amount of traffic headed to or from the BRAC sites because of the rebalancing of productions (households) and attractions (employment) throughout the region resulting from the relocation of

Table 4.3-16
Assumed residential location of employees in Year 2011 due to the BRAC action

		Fort Belvoir employees		WHS & DoD employees		NGA employees	
District	Location	Number of employees	Percentage	Number of employees	Percentage	Number of employees	Percentage
A	Arlington/Alexandria	964	4.3%	855	9.2%	469	5.5%
B	Northern Fairfax Co. Loudoun Co.	1,561	6.9%	950	10.3%	1,466	17.2%
C	Southern Fairfax Co.	8,398	37.1%	2,488	26.9%	1,901	22.4%
D	Prince William Co.	5,018	22.2%	1,604	17.3%	1,268	14.9%
E	Near South	2,016	8.9%	674	7.3%	428	5.0%
F	Remainder of Virginia	1,684	7.4%	576	6.2%	471	5.5%
G	District of Columbia	262	1.2%	258	2.8%	251	3.0%
H	Prince Georges Co.	1,024	4.5%	749	8.1%	581	6.8%
I	Montgomery Co.	236	1.0%	205	2.2%	664	7.8%
J	Remainder of Maryland	685	3.0%	553	6.0%	817	9.6%
K	Non-DC, MD, VA	801	3.5%	349	3.8%	184	2.2%
	TOTAL	**22,650**	**100.0%**	**9,263**	**100.0%**	**8,500**	**100.0%**

employment to Fort Belvoir. In essence, the residential redistribution within the region would increase the portion of Fort Belvoir traffic that is coming up from the south during the AM peak period. A potential consequence of the additional Fort Belvoir traffic is that this traffic could force other trips to divert to other roadways to avoid any potential congestion on facilities adjacent to Fort Belvoir and EPG. For example, a person that currently would use I-95 and the Capital Beltway to reach the Dulles Corridor might use Route 123 instead as he chooses to divert away from BRAC traffic. This means that trips on other facilities could increase as trips are diverted.

Table 4.3-17 presents the population and employment levels, which is also illustrated in Figure D-5 in Appendix D, for the 2011 conditions for the Preferred Alternative. Table 4.3-18 presents the productions and attractions for the study area. Total study area employment increases by approximately 30 percent over existing conditions, compared to the study area growth of approximately 8 percent from existing conditions to the No Action Alternative.

Under the Preferred Alternative, Fort Belvoir's Main Post and EPG would represent 2.9 percent of the population and 33.4 percent of the employment within the study area, and the two sites account for only 8.6 percent of the attractions in the study area. The ratio of jobs to residents within the study area would be 0.43, or 43 jobs per 100 residents, an increase of 7 jobs per 100 residents over the No Action Alternative. Compared to the existing and No Action conditions, the percentage of employment at Fort Belvoir within the study area in the Preferred Alternative would be approximately 12 percent higher. This higher employment percentage within the study area would increase the number of trips to Fort Belvoir. The population would be less than one percent higher. The increased ratio, compared to the ration under the No Action Alternative, means that the study area would be closer to being balanced between jobs and population.

Table 4.3-17
Population and employment for existing conditions (2006), 2011 No Action Alternative, and 2011 Preferred Alternative

	Population			Employment		
District	Existing	No Action	Preferred	Existing	No Action	Preferred
Laurel Hill	13,470	25,121	25,121	3,547	3,996	3,996
Pohick	50,826	51,766	51,766	3,648	3,849	3,849
Lorton South of U.S. Route 1	14,476	18,200	18,200	9,067	11,233	11,233
I-95 Industrial Area	2,092	2,175	2,175	8,605	8,683	8,683
Franconia-Springfield Transit Area	2,727	2,821	2,821	5,940	6,764	6,764
Springfield Community Business Center	1,306	1,483	1,483	2,074	2,141	2,141
Springfield	31,263	32,201	32,201	10,850	11,387	11,387
EPG	0	0	0	45	45	18,794
Mason Neck	2,785	5,552	5,552	438	464	464
Fort Belvoir (Main Post)	7,623	7,623	9,387	23,266	23,267	27,959
Mount Vernon	93,783	102,230	102,230	19,681	21,457	21,457
Rose Hill	67,179	70,513	70,513	20,352	23,157	23,157
Total Study Area	287,530	319,685	321,449	107,513	116,443	139,884
Rest of Virginia	2,142,682	2,399,710	2,399,710	1,258,264	1,427,055	1,430,055
Maryland	3,318,699	3,483,648	3,483,648	1,723,958	1,870,517	1,870,517
District of Columbia	583,733	615,375	615,375	752,719	790,205	790,205
West Virginia	47,735	52,555	52,555	15,173	17,191	17,191
Other States	0	0	0	0	0	0
Total Outside Study Area	6,092,849	6,551,288	6,551,288	3,750,114	4,104,968	4,107,968
Regional Total	**6,380,379**	**6,870,973**	**6,872,737**	**3,857,627**	**4,221,411**	**4,247,852**

Source: VHB, 2006.

Fort Belvoir would represent approximately 6.1 percent of the total employment within all of Fairfax County in the Preferred Alternative. This value would be almost a doubling of the employment at the post over the No Action Alternative. Within transportation Corridor 8, Fort Belvoir would be approximately 10.4 percent of the total employment; a near doubling of the percentage within Corridor 8 over the No Action Alternative from implementing BRAC. Table 4.3-19 presents the internal trips to the study area, external trips destined for the study area, and external trips that originate within the study area. The table illustrates that most of the trips that have an origin or a destination within the study area originate from or are destined for points outside of the study area, as opposed to being an internal trip within the study area (i.e., a trip beginning and ending within the study area). The table does not include external trips that pass through the study area, such as a trip traveling on I-95 from Fredericksburg to Washington, DC. The proposed action would relocate jobs from Arlington County and other areas to Fort Belvoir, which would redistribute the trips within the region, which would cause some locations to decrease in volume compared to the No Action Alternative.

Table 4.3-18
Productions and attractions for existing conditions (2006), 2011 No Action Alternative, and Preferred Alternative

	Productions			Attractions		
District	**Existing**	**No Action**	**Preferred**	**Existing**	**No Action**	**Preferred**
Laurel Hill	31,891	52,247	52,416	31,825	52,327	52,413
Pohick	109,597	110,862	109,442	109,719	110,848	109,361
Lorton South of U.S. Route 1	43,441	55,677	55,022	43,430	55,560	54,842
I-95 Industrial Area	20,802	20,880	20,249	20,753	20,969	20,304
Franconia-Springfield Transit Area	37,799	41,046	40,705	38,044	41,275	40,803
Springfield Community Business Center	11,586	12,158	12,057	11,601	12,053	12,052
Springfield	98,365	101,148	100,143	98,274	101,153	100,316
EPG	81	89	25,609	87	102	26,298
Mason Neck	5,979	11,012	10,917	5,948	10,998	10,896
Fort Belvoir (Main Post)	35,176	35,177	55,308	35,342	35,343	54,831
Mount Vernon	250,418	271,298	269,647	250,606	271,297	269,691
Rose Hill	184,223	197,462	195,649	184,200	197,283	195,472
Total Study Area	829,357	909,055	947,163	829,830	909,209	947,278
Rest of Virginia	6,952,561	7,768,560	7,731,797	6,952,125	7,768,134	7,731,018
Maryland	10,587,588	11,254,561	11,239,590	10,586,616	11,252,945	11,238,401
District of Columbia	1,572,672	1,614,479	1,606,015	1,572,360	1,614,396	1,605,998
West Virginia	153,721	172,023	171,904	153,849	172,056	171,912
Out of State	715,116	828,980	829,168	716,236	830,919	831,029
Total Outside Study Area	19,981,658	21,638,603	21,578,474	19,981,186	21,638,450	21,578,359
Regional Total	**20,811,015**	22,547,658	22,525,637	20,811,015	22,547,658	22,525,637

Source: VHB, 2006

Table 4.3-19
Study area trips–2011 Preferred Alternative

Time	Internal trips within study area	External trips ending in study area	External trips beginning in study area
AM Peak	79,193	64,251	78,469
PM Peak	139,316	109,142	97,933
Off-Peak	342,747	212,629	209,505
DAILY	**561,256**	**386,022**	**385,907**

4.3.4.2.2 Performance under Expected Conditions

Few changes to Northern Virginia's transportation system are expected over the next 5 years, as identified in Section 4.3.3.1 because of funding shortfalls and the resulting delays in implementing long-term transportation plans. The modeling assumed that the off-post transportation improvement projects identified in the No Action Alternative are also included in the Preferred Alternative.

A key finding from the analyses of the Preferred Alternative is that EPG would need additional access points beyond the access points provided by the currently approved VDOT project to extend the Fairfax County Parkway through EPG as a four-lane facility. The assessment of available capacity (under the current funded roadway configuration) and the capacity needed is discussed further in this section.

Road Network. Use of the MWCOG model shows that increased traffic to and from Fort Belvoir accounts for up to 30 percent of the traffic flow on roadways adjacent to the gates (EPG entrances in the case of the Preferred Alternative) and quickly drops to under 10 percent of the traffic away from the gates as shown in Figures D-6 and D-7 in Appendix D. These figures illustrate the areas of influence under the Preferred Alternative.

Figures D-8 and D-9 show both the growth in traffic and the change in the traffic flow that would be due to BRAC at selected locations. To understand these graphics, the following explanation is provided, referring to the location "SB Beltway (Rte 236)." The purple and blue bars break out the total number of trips on the link into BRAC trips (726) and non-BRAC trips (13,730) that would occur on this roadway segment under the Preferred Alternative. The green and yellow bars break out the total trips on that link between the No Action Alternative (14,003) volume and the increase in volume that the link would exhibit due to the BRAC action (453). This illustrates that the total number of BRAC trips (726 on this specific link) is more than the increase of traffic volumes on the link, because some of the BRAC trips (273, which is the difference between the total BRAC trips and the growth) were already in the traffic stream, but with other destinations previously. The purpose of showing multiple locations is to illustrate that the growth on individual highway links is not as high as the total volume of BRAC traffic, because some of the BRAC traffic would already be in the traffic stream at those locations. Other factors that affect the growth of volumes on the links include the redistribution of trips onto other facilities and the rebalancing of productions and attractions because of the redistribution of residential locations.

The area of influence shows that the effect of BRAC traffic on roadways would diminish as one moves away from the sites. This decrease would be from traffic getting off and on at the interchanges along the roadways. Traffic volumes crossing the Occoquan River would increase over the No Action volumes on this link because of the residential patterns assumed for the modeling. Currently, most of the employees that work for the agencies being relocated commute north via I-95 and are already included in the traffic flow. Therefore, the increase in traffic across the Occoquan River that would occur with implementing BRAC would be from the assumed gradual relocation of residences as discussed previously.

The traffic volumes projected by the MWCOG model represent the best estimate of traffic given the current, long-range land use plans of the local jurisdictions. Concern has been expressed, however, that the relocation of jobs in such numbers would cause a ripple effect in the marketplace and the long-range plans of the local jurisdictions. In response to companies who desire to be close to government agencies, increased office development might be approved along with increases in housing density in surrounding areas. The current planning and travel demand

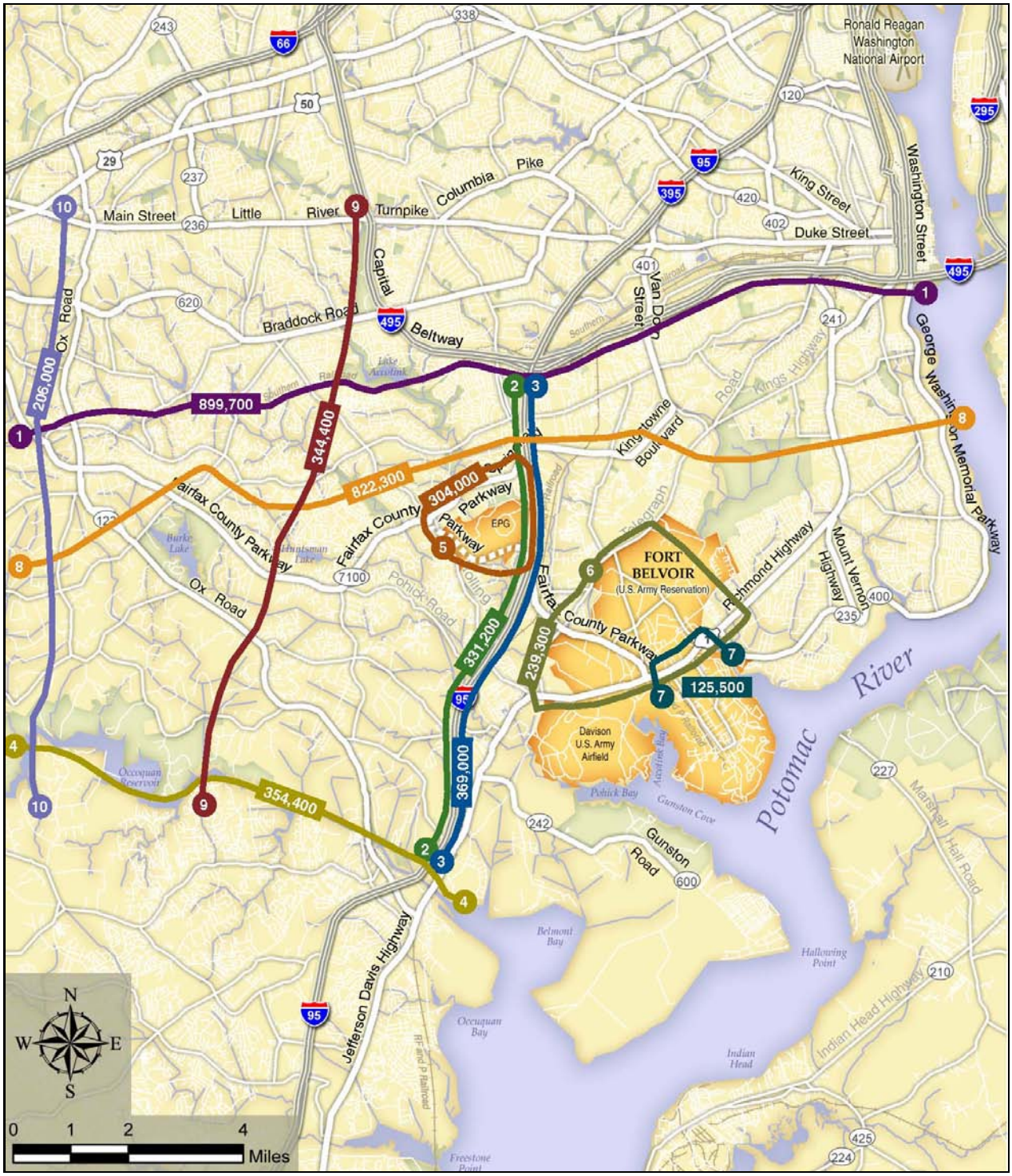
modeling process in Northern Virginia does not provide the information or tools to assess these types of potential changes.

Figure 4.3-19 provides another perspective on the changes in travel patterns. Total volumes crossing selected screen lines are shown. Again, the net effects on traffic volumes would decrease quickly as the distance from Fort Belvoir grows.

The screen lines north of EPG and Main Post show there would be slight decreases in traffic volumes over the No Action Alternative due to trips diverting from I-95 at the Fairfax County Parkway to travel to EPG or Fort Belvoir. Under the No Action Alternative, these trips would continue on I-95/I-395 to head to the Pentagon or other nearby employment centers. For instance, Screen Line 1 in the No Action Alternative shows a total daily two-way volume of 900,500 vehicles trips. Upon implementation of BRAC, that number would decrease to 899,700 two-way vehicle trips. This slight decrease is due to the redistribution of these trips from points in Arlington County to Fort Belvoir (Main Post and EPG). On the other hand, Screen Line 4 to the south shows an increase in daily volume from the No Action Alternative to the Preferred Alternative over the Occoquan River of approximately 5,000 two-way vehicle trips. This increase is due to the assumed gradual shift in employee residential location to the south. Moving closer to Fort Belvoir, the effect on adjacent roadway facilities is shown in Table 4.3-20, which show V/C ratios, LOS, and delay for 23 key intersections. The summary of the turning movement counts for the Preferred Alternative can be found in Table D-3 and Figures D-10 and D-11 in Appendix D.

The intersection measures of effectiveness would deteriorate over the No Action Alternative and existing conditions because the traffic volumes at these intersections would be higher from the additional employment. For instance, under the No Action Alternative, the V/C ratio at U.S. Route 1/Backlick-Pohick Roads in the AM peak hour is 0.97, the LOS is D, and the delay is 37.0 seconds. Upon implementation of the Preferred Alternative, in the AM peak hour for that intersection the analysis reveals a V/C ratio of 1.25, a LOS of F, and delay of 197.3 seconds. An example close to the EPG site would involve the Franconia-Springfield Parkway intersection with Spring Village Drive. At that location, under the No Action Alternative, the AM peak hour V/C ratio would be 1.06, the LOS would be E, and delays would be 66.3 seconds. Under implementation of the Preferred Alternative, in the AM peak hour for that intersection the V/C ratio would be 1.43, the LOS would be F, and there would be an average delay of 198.9 seconds per vehicle. A comparison of 2011 No Action Alternative and 2011 Preferred Alternative measures of effectiveness at selected intersections is provided in Table 4.3-21. Overall comparison of the expected operational performance of these intersections in the Preferred Alternative over the expected No Action Alternative, indicate that the LOS at nine intersections degrade by a LOS letter grade of one or more (i.e., from LOS D to LOS E). These intersections would be examples of intersections in which mitigating actions would reduce the effects from the Preferred Alternative.

The hours of congestion along the I-95 corridor are not expected to increase substantially over the duration of the No Action Alternative, because the growth in demand would be less than 5 percent if the BRAC action were to be implemented. Some localized congestion points might result with the increased traffic volumes within the I-95/Fairfax County Parkway interchange.



Daily Screen Line Volumes under The 2011 Preferred Alternative

Fort Belvoir, Virginia

Figure 4.3-19

Table 4.3-20
Intersection measures of effectiveness – 2011 Preferred Alternative

Intersection Location	AM Peak Hour[a]			PM Peak Hour[a]		
	V/C	LOS	Delay (seconds)	V/C	LOS	Delay (seconds)
Commerce St./Amherst Ave.	0.76	D	37.4	0.91	D	51.5
Commerce St./Backlick Rd.	0.41	C	30.6	0.78	D	50.6
Backlick Rd./Calamo St.	0.75	B	13.5	0.81	C	24.6
Loisdale Rd./Spring Mall Dr.	0.49	C	25.1	0.89	D	43.9
Franconia Springfield Parkway/Spring Village Dr.	1.43	F	198.9	1.31	F	146.5
Franconia Springfield Parkway EB Ramp/Backlick Rd.	1.00	E	68.2	0.82	D	41.8
Franconia Springfield Parkway WB Ramp/Backlick Rd.	0.91	B	11.9	0.92	C	22.0
Franconia Springfield Parkway/I-95 HOV Ramps	1.05	E	78.1	1.48	F	199.1
Franconia Springfield Parkway EB Ramp/Frontier Dr.	0.82	C	29.8	0.97	E	72.8
Franconia Springfield Parkway WB Ramp/Frontier Dr.	0.50	D	40.2	0.88	F	96.6
Franconia Springfield Parkway/Beulah St.	1.20	F	118.7	1.36	F	155.8
Fairfax County Parkway/Terminal Rd.	0.94	C	31.4	0.85	B	19.1
Fairfax County Parkway SB Ramps/Telegraph Rd.	0.57	C	20.2	0.70	C	30.6
Fairfax County Parkway NB Ramps/Telegraph Rd.	0.70	B	19.9	0.58	B	18.0
Fairfax County Parkway/John J. Kingman Rd.	0.85	D	36.3	0.70	F	140.8
Telegraph Rd./Beulah St.	0.60	D	46.8	1.27	C	30.6
Telegraph Rd./S. Van Dorn St.	0.91	D	53.2	1.05	D	48.2
U.S. Route 1/Telegraph Rd. – Old Colchester Rd.	0.82	E	55.2	0.75	E	59.1
U.S. Route 1/Fairfax County Parkway	1.10	F	89.4	0.94	D	37.5
U.S. Route 1/Backlick Rd. – Pohick Rd.	1.10	F	89.0	1.25	F	197.3
U.S. Route 1/Belvoir Rd.	1.18	E	77.8	0.89	C	29.1
U.S. Route 1/Old Mill Rd.	0.95	E	78.9	1.03	F	81.6
Loisdale Rd./GSA Access Rd.	0.71	A	7.2	0.49	A	5.0

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM.

The analyses assumed completion of the I-95 Fourth Lane Project. Even with the completion of the widening project, the hours of congestion on I-95 are expected to increase by 30 to 45 minutes. The duration of congestion along U.S. Route 1 would increase by approximately 30 minutes over the No Action Alternative conditions under the Preferred Alternative if there is no widening of U.S. Route 1. Along the Fairfax County Parkway east of I-95, the duration of congestion would likely increase by an hour.

Table 4.3-21
Comparison of 2011 No Action Alternative and 2011 Preferred Alternative measures of effectiveness at selected intersections

	AM Peak Hour[a]			PM Peak Hour[a]		
Intersection	**V/C**	**LOS**	**Delay (seconds)**	**V/C**	**LOS**	**Delay (seconds)**
U.S. Route 1 and Backlick Road/Pohick Road (near Main Post)						
No Action Alternative	0.97	D	37.0	1.12	F	129.9
Preferred Alternative	1.10	F	89.0	1.25	F	197.3
Franconia-Springfield Parkway and Spring Village Drive (near EPG)						
No Action Alternative	1.06	E	66.3	1.09	F	90.1
Preferred Alternative	1.43	F	198.9	1.31	F	146.5

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM.

In the areas immediately surrounding EPG, severe congestion lasting 3 to 4 hours would occur if mitigating actions, including transportation improvements, are not taken. With only the currently funded improvements, the available access to EPG could process between 2,000 and 3,000 vph, roughly 40 to 50 percent of the projected peak-hour demand. Queuing of traffic from the access point off the Fairfax County Parkway adjacent to EPG can be expected to back up onto the I-95 corridor. This queuing would translate into an extension of the AM congested period by over an hour, up to 2 hours. In the evening peak period, egress from EPG would be slow and spread over several hours. As a result, the effects on the regional transportation facilities would be limited as compared to the AM peak period. If the Fairfax County Parkway segment through EPG is not constructed as per the currently funded improvements, then the sole access to EPG will be via Backlick Road. Providing only this single access point would require that work arrivals be spread out over an 11 to 12-hour period, due to limited capacity on Backlick Road. Currently, the issue over full funding of the Parkway improvements, ownership of the facility, and environmental clean-up is stalling the construction of this approved facility.

Backlick Road would also experience an increase in traffic flows if only the currently approved and funded improvements were provided, because Barta Road would be a secondary access point to EPG. Limited capacity exists in the Backlick Road corridor to handle much increase in traffic flow, the constraint being downtown Springfield, which is immediately to the north. This location would also cause congestion.

Assessing the transportation network for its available capacity would allow for understanding the constraints to accommodate additional traffic destined to Fort Belvoir (Main Post or EPG) and the needed improvements to the transportation network to ensure that the LOS does not deteriorate unacceptably. The current approved plan for the Fairfax County Parkway through EPG would yield an access capacity of approximately 2,000 to 3,000 vph, well below the forecasted demand of 5,600–6,200 vph to the EPG site. This demand, if left unserviced, would cause severe congestion on roadways surrounding EPG, including I-95, which would affect the regional traffic through the study area. Additional capacity and access points would be required to mitigate this effect. In identifying various mitigations, which are described in Section 4.3.4.4, considerations need to be given to the constraints posed by the existing transportation infrastructure and adjacent land uses. A widened Fairfax County Parkway, to the ultimate build-out design of six lanes, and other access points would increase the capacity to access EPG.

Adjacent to the Main Post, the effects on off-post traffic would be less. The delays at intersections along U.S. Route 1 and the Fairfax County Parkway between U.S. Route 1 and I-95, however, would increase, thus increasing the delays exiting the post in the evening. The Fairfax County Parkway is the main gateway between Fort Belvoir and the I-95 corridor. With increased site traffic and no improvements to the Parkway, including interchange improvements, increased congestion and travel time would result.

Pohick Road (via Tulley Gate) on South Post is the main thoroughfare for exiting traffic. Without any improvements to the intersections along U.S. Route 1, egress from South Post would become more difficult, as traffic would attempt to shift over to Belvoir Road (via Pence Gate), increasing congestion of egress traffic along that facility. The lack of improvements to U.S. Route 1 would also affect through-traffic along U.S. Route 1, potentially forcing vehicles to find alternate routes, including local roadways, to avoid the Fort Belvoir area. Congestion spillover onto local roadways would decrease the quality of life for local residents and could potentially create undesirable conditions for the residents with the higher traffic volumes.

Transit Systems. Mode split—the fraction of the employee population that would use mass transit—for the Main Post is 1 to 2 percent. The rail portion of the transit system does not directly serve the Main Post or EPG. Implementation of the BRAC-related projects, which would affect the vast majority of new personnel at Fort Belvoir, would likely not adversely affect use of the rail systems because of the continued lack of direct service. Consequences of implementing the Preferred Alternative would be similar with respect to the bus portion of the transit system. Neither the Main Post nor EPG are served to any substantial degree because of the perceived difficulties in those modes' gaining access to the post because of security requirements. Demand for additional bus services could evolve, resulting in higher ridership figures. The local bus routes, however, tend to be limited to the study area, which represents only a small fraction of the locations where the employee population would reside. There are only a limited number of long-haul routes serving the Main Post. A 1 to 2 percent mode share equates to approximately 200 to 450 daily riders. Achieving a 10 percent mode share would remove approximately 725 vehicles from the roadway in the peak hour; this number includes both the Main Post and EPG.

4.3.4.3 Other Projects Sitings/Operations

Minor effects would be expected during the AM and PM peak periods. Other projects associated with BRAC implementation (see Section 2.2.2.3) would include projects such as infrastructure, the USANCA support facility, access control point, barracks modernization, and MWR family travel camp. These projects generally involve a relatively minor or negligible number of personnel that would be using the transportation system.

4.3.4.4 Mitigation

Implementing the Preferred Alternative would result in significant adverse effects to the transportation system with respect to congestion and increased travel time. These effects would lead to reduced employee productivity, higher commuting costs, and degradation of quality of life. These effects would not be limited to personnel at Fort Belvoir. Through commuters and the local community would also be affected. Note that VDOT has stated that I-95 will not be widened beyond the current planned widening from three to four general purpose lanes in each direction. It is expected that under the Preferred Alternative, there would be some increase to traffic on I-95 that would lengthen the peak period.

This section identifies potential mitigation actions to avoid, reduce, or compensate for the magnitude of predicted effects. The mitigation actions are evaluated for their efficacy so that an informed decision over their adoption and implementation can be made.

Road Network and Associated Facilities. Thirteen projects have been identified to mitigate adverse effects to the road network associated with implementing the Preferred Alternative. Another objective of the projects is to ensure that arriving personnel can access EPG and the Main Post without queue spillback onto the adjacent roadways. The following describes each of these potential measures and their estimated costs. Estimated mitigation costs presented in this EIS represent order-of-magnitude costs and are subject to change as the design is carried forward. The designs have not reached a level where quantities take-off (developing estimates of the amounts of materials needed, i.e., *XX tons of asphalt,* by reviewing engineering drawings) have been prepared. Costs presented here are order-of-magnitude on the basis of comparisons to similar projects.

1. *Reconstruction of the I-95/Fairfax County Parkway Interchange.* This measure would reconstruct the I-95/Fairfax County Parkway interchange to add HOV connections to and from the south. It would encourage new HOV trips between Fort Belvoir and points to the south on I-95, reducing SOV trips and, thus, overall demand on the road network. This improvement would provide better traffic operations for the increased traffic flows from EPG and from the Main Post, reducing delays during the peak periods. Estimated cost: $75 million.
2. *Additional or Improved Ramps to and from I-95 for EPG.* This measure would add new connections from I-95 into EPG. It would reduce the vehicular demand at the I-95/Fairfax County Parkway interchange and on the Parkway through EPG by providing alternative access options, such as (1) direct connection for southbound (SB) I-95 traffic into EPG at Fairfax County Parkway, (2) SB I-95 flyover ramp to Backlick Road, with a direct connection into EPG, and (3) northbound (NB) I-95 HOV traffic to I-95 general purpose (GP) lanes flyover ramp connection into EPG for NB HOV and egress for SB HOV vehicles. Estimated cost: $40 million.
3. *Widen EPG Segment of Fairfax County Parkway.* Widening the Parkway from four to six lanes through EPG would increase capacity on the Parkway to accommodate the additional vehicular demand from development at EPG. Estimated cost: $50 million.
4. *Fairfax County Parkway Improvements between I-95 and Kingman Road.* Improvements to the parkway between I-95 and Kingman Road would provide additional roadway capacity, via intersection improvements and widening, to improve traffic flow and reduce congestion. Estimated cost: $55 million.
5. *Rideshare Facility.* A rideshare facility on EPG would encourage a shift from SOV to HOV trips. This shift would reduce traffic volumes on the roadway, which in turn would reduce the effects of the development. Estimated cost: $15 million.
6. *Transit Center/Facilities.* This measure would construct a transit center and other facilities to provide for additional choices of travel over the SOV. This improvement would be developed in conjunction with increased bus service. Siting has not been determined. Estimated cost: $30 million.
7. *Additional EPG Access.* This measure would provide multiple choices for access to EPG, which would diffuse traffic to multiple points and provide alternative routes for employees and visitors if one access is blocked. The access would be from I-95 in the

vicinity of the Newington interchange, enabling HOV access to and from EPG. Estimated cost: $15 million.

8. *Intersection Improvements.* Intersection improvements at key locations such as U.S. Route 1 at Backlick/Pohick (Tulley Gate), U.S. Route 1 at Fairfax County Parkway, U.S. Route 1 at Belvoir Road (Pence Gate), Franconia-Springfield Parkway ramps at Frontier Drive, and Franconia-Springfield Parkway at Beulah Street, would improve traffic flow and reduce congestion. Improvements could include signalization, additional turning lanes, lengthening of turning lanes, or other measures appropriate to an intersection. Estimated cost: $15 million.
9. *Additional U.S. Route 1 Crossing for Main Post.* An additional crossing over U.S. Route 1 would improve internal roadway circulation on Fort Belvoir between North and South Posts. The likely location of this improvement would be between Gunston and Belvoir Roads, with final siting dependent on the site layout of other facilities projects (e.g., the new hospital proposed at the South Post golf course). This improvement would reduce the number of trips on off-post roadways between North and South Posts. Estimated cost: $15 million.
10. *Fairfax County Parkway/John J. Kingman Road Intersection Improvements.* This measure would provide a flyover ramp to reduce congestion on the parkway and improve access to North Post. Estimated cost: $10 million.
11. *Franconia-Springfield Parkway/Neuman Street Interchange.* This measure would replace the existing at-grade intersection on the Franconia-Springfield Parkway with a full interchange at Neuman Street. An interchange would provide additional access to EPG from the north by creating a direct connection between the Franconia-Springfield Parkway and EPG, in conjunction with the following improvement. These two improvements would reduce congestion on the Fairfax County Parkway through EPG by diverting traffic to this point. For employees living north or west of EPG, this measure would provide a shorter route and thereby reduce commuting time. Estimated cost: $50 million.
12. *Access to EPG via Neuman Street.* This project would provide roadway access to EPG from the north, with entry into EPG occurring east of Accotink Creek. Existing residences and a building used as a church would likely have to be removed. Estimated cost: $26 million.
13. *Beulah and Telegraph Roads Improvements.* This measure would widen roadways and provide other improvements, such as signalization and safety measures (e.g., improved crosswalks, lighting), to enhance flow of the increased traffic volumes caused by BRAC. Estimated cost: $50 million.

Total estimated cost for the foregoing mitigation measures would be $446 million. This figure excludes contingency costs and costs associated with supervision, inspection, and overhead. More detailed studies and designs will be required, including potential NEPA studies.

The transportation network has been evaluated from a regional, sub-regional, and local perspective, and the effects on the transportation system have been quantified and compared to both existing conditions and the No Action Alternative. On the basis of these comprehensive comparisons, improvements have been identified that would mitigate most of the significant adverse effects of the Preferred Alternative on the transportation system in the immediate area of Fort Belvoir. The additional site entrance points, improved site circulation, improved interchanges, and widened roadways would result in reduced delay, limit the possibility of Fort

Belvoir traffic backing up onto the major regional highways, and improve the operation of the intersections within the area of influence of the BRAC-related actions. As engineering and design work proceeds, detailed traffic operations studies would be completed to ensure that intersection levels of service are maintained or improved in the immediate area of Fort Belvoir.

On a regional level, the relocation of 22,000 jobs toward the south of the metropolitan area, combined with regional projects, such as the widening of I-95 and construction/implementation of HOT lanes in the I-95 corridor, would be expected to lead to additional travel demand from the south. With no plans for additional capacity in the corridor beyond the planned widening and HOT lanes, the analysis indicates that the congested period during the morning and afternoon would be extended by 30 to 45 minutes. Traffic traveling toward Fort Belvoir on regional facilities could experience some limited congestion during the peak hour, but that direction of travel remains the "reverse commute," with heavier traffic headed toward Tyson's Corner, Arlington, Alexandria, and Washington, DC.

Transit System. This section describes proposed mitigation measures to the transit system to help avoid, reduce, or compensate for the effects associated with implementing the Preferred Alternative. Mitigation measures are appropriate for bus service but none are identified for rail services. Expansion or improvements to rail service might occur in the future on the basis of further evaluation of the transportation system undertaken as a result of experiences related to BRAC or other developments in the study area.

Initial bus service concept plans have been developed on the basis of the origin data for the BRAC employees destined for EPG and existing origin patterns for Main Post employees. These are preliminary concept plans intended to serve as a guide to the levels of transit service that could be required to serve both a 5 and 10 percent transit mode share to EPG and the Main Post. Detailed route and service planning would be conducted later. The purpose of these concept plans is to demonstrate that feasible transit service options are viable to support the assumed mode shares. Reduction of the mode share from 10 percent to 5 percent would not occur by reducing in half the number of bus trips, an action that would result in longer headways. It is assumed that no headways would exceed 30 minutes. For an overall 5 percent transit mode share, it is assumed that the major reductions would come out of the local buses rather than the Metro shuttle. The quality and quantity of Metro service and feeders would remain the same, so it is assumed that this portion of the transit ridership would remain at the same levels as in the 10 percent scenario.

Five basic service areas have been identified, as follows:

- Southern Prince William County (Dumfries, Cherry Hill, and Powells Creek areas)
- Northern Prince William County (Woodbridge, Dale City, and Lake Ridge areas)
- U.S. Route 1 in Fairfax County (Lorton, Fort Belvoir, Mount Vernon, Hybla Valley, Beacon Hill, and Huntington areas)
- Western Fairfax County (Burke, Fairfax, and Chantilly areas and, possibly, the Herndon and Reston areas)
- Franconia-Springfield Metro station

General route and service level concepts have been developed for each service area for both modal share assumptions. These are based on the projected 2011 origin patterns for EPG site employees along with existing Fort Belvoir origin patterns.

Main Post Service Concept for 10 Percent Mode Share

- *Southern Prince William County (2 Peak Hour Buses).* Bus service on a 30-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (2 Peak Hour Buses).* A 30-minute headway is also assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.
- *U.S. Route 1 in Fairfax County (2 Additional Peak Hour Buses).* Two additional buses per hour would be added to existing services along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Western Fairfax County (1 Additional Peak Hour Bus).* One additional bus per hour would operate in the Fairfax County Parkway corridor to the Burke area. This service would require a transfer to shuttle bus at the Franconia-Springfield Metro station.
- *Franconia-Springfield (5 Peak Hour Buses).* A shuttle linking the Main Post to the Franconia-Springfield Metro station would be needed. Pending a refinement of the numbers, a 12-minute headway on this shuttle is assumed. This service would link those commuters with access to one of the regional Metro lines to the Main Post area.

Main Post Service Concept for 5 Percent Mode Share

- *Prince William County (2 Peak Hour Buses).* One combined route serving major origin locations in both the northern and southern portions of the county, operating on a 30-minute headway, is assumed.
- *U.S. Route 1 in Fairfax County (1 Additional Peak Hour Bus).* One additional peak hour vehicle would provide service along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Franconia-Springfield (5 Additional Peak Hour Buses).* A 12-minute headway on the shuttle linking the Main Post to the Franconia-Springfield Metro is also assumed under the 5 percent mode share scenario.

EPG Service Concept for 10 Percent Mode Share

- *Southern Prince William County (2 Peak Hour Buses).* Bus service on a 30-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (4 Peak Hour Buses).* Two routes linking the northern portion of Prince William County to EPG would be operated to serve the Dale City, Woodbridge, and Lake Ridge areas. A combined headway of 15 minutes is assumed.
- *U.S. Route 1 in Fairfax County (2 Additional Peak Hour Buses).* Two additional buses per hour would be added to existing services along the U.S. Route 1 corridor between Huntington and Lorton and continuing north to the EPG site.
- *Western Fairfax County (3 Peak Hour Buses).* This route would link the western portion of Fairfax County to EPG via the Fairfax County Parkway. The current assumption includes a route serving the Burke area with extended service to the Route 50 corridor into the Fair Oaks or Chantilly areas. The route would need to be

anchored by a park and ride lot on the western end and likely operate as a limited stop route to EPG. A 20-minute headway is assumed to be required.

- *Franconia-Springfield Metrorail (5 Peak Hour Buses).* This route would be the shuttle from the Franconia-Springfield Metro station to EPG operating on a 12-minute headway.

EPG Service Concept for 5 Percent Mode Share

- *Prince William County (3 Peak Hour Buses).* Under this scenario, one combined route from Prince William County serving major park and ride lots in the southern and northern sections operating on a 20-minute headway is assumed.
- *U.S. Route 1 in Fairfax County (1 Additional Peak Hour Bus).* Under this scenario, one additional peak hour vehicle would provide service along the U.S. Route 1 corridor between Huntington, Lorton, and EPG.
- *Western Fairfax County (2 Additional Peak Hour Buses).* A 30-minute service linking the EPG to the Burke area via the Fairfax County Parkway is assumed.
- *Franconia-Springfield Metrorail (5 Additional Peak Hour Buses).* As indicated above, the assumption of a 12-minute headway for the shuttle would still be called for under this scenario.

Bus service of a high enough quality to realize a 5 to 10 percent mode share for transit would complement the road network mitigation actions and help to reduce congestion and limit vehicle delays resulting from the Preferred Alternative. Achieving a 10 percent mode split would reduce the number of vehicles accessing the Fort Belvoir area in the peak hour by nearly 725 on the basis of the MWCOG average auto occupancy of 1.1 passengers per vehicle. A 5 percent mode share for transit would reduce the number of peak hour vehicles by approximately 360.

The foregoing expanded bus services would be supplemented by internal circulator bus systems designed to provide more direct access to various areas of Fort Belvoir not directly accessible from the regional transit services. Such circulator buses would operate within the grounds of Fort Belvoir on schedules designed to meet the needs of employees.

The estimated cost of the transit-related mitigation actions would be $10 to $12 million in initial capital costs and $6 to $9 million in annual operating expenses depending on the ultimate operational requirements of the system. Note that these estimates are preliminary order-of-magnitude costs. More precise cost estimates can be prepared when site circulation and security plans are finalized and detailed route and service planning are completed.

Transportation Management Plan—Framework. The largest contributor to traffic congestion is the SOV. Implementing the Preferred Alternative would result in many personnel reporting to Fort Belvoir every day as SOV trips. To reduce adverse effects on the road network, the Army could appoint a Transportation Demand Management Coordinator (TDMC) whose principal function would be to develop and manage a transportation management plan (TMP), which would include measures to reduce the number of SOVs. Appointing a TDMC before fiscal year 2009 would allow development of transportation program initiatives before BRAC relocation of personnel.

A TDMC would be knowledgeable of principles, practices, and methods of transportation demand management. These would include, but not be limited to, employee rideshare and commute programs; current regional programs regarding air quality and transportation; employer

trip reduction requirements; marketing, promotion, and event planning practices; and parking management practices. The TDMC would perform the following functions:

- Administer the post's transportation demand management program and direct the planning and implementation of transportation demand strategies, programs, and policies
- Promote employee awareness of available programs and commuting alternatives; conduct employee surveys to determine commuting needs and preferences; distribute ride-match forms and transit/commuter information packets; and administer a rideshare program for all employees
- Consider implementing use of flextime, compressed workweek, and teleworking as a requirement to reduce peak period travel
- Manage employee access to parking facilities and implement preferential parking for carpools and vanpools
- Develop and implement programs to provide financial incentives such as subsidized bus passes, carpool mileage, and subscription custom bus operation
- Select, train, supervise, and evaluate staff

In coordination with the Fort Belvoir Master Planner, the TDMC would maintain a TMP that takes travel demand management practices into account. A TMP documents programs and adopts strategies for efficient employee commuting patterns. The plan would include specific strategies and timeline goals to encourage change in employee travel modes, trip timing, frequency, length, and travel routes. The goal of the TMP would be to encourage alternative commuting modes to reduce traffic congestion and the demand for parking spaces. The TMP should emphasize ridesharing, transit, and other non-SOV modes of transportation for commuters; maximize telework strategies in accordance with applicable laws and regulations; and promote the use of compressed and variable work schedules. The following is a list of some of the potential transportation demand management programs that a TDMC could assist in implementing and managing.

- *Commuter information programs.* Establishing of a centralized point of information on available commuter options and a means of disseminating information to employees and employers.
- *Alternative work schedules.* Using various strategies to reduce peak hour traffic including flex-time (variable work schedules so that not all employees arrive and depart at the same time) and compressed work schedules (such as working four 10-hour days rather than five 8-hour days to reduce the total number of vehicle trips).
- *Rideshare matching services.* Helping establish carpools by matching up employees with similar residential locations and schedules.
- *Ad hoc carpooling (slugging).* Establishing and managing of an informal carpool area where ad hoc carpools can be assembled each day so that the drivers can take advantage of the regional HOV lanes.
- *Encouragement and promotion of commuting by bicycle.* Providing of appropriate amenities to encourage bicycle commuting, such as secure bike lockers and showers.
- *Guaranteed ride home.* Providing information and assistance to commuters wishing to take part in the region's guaranteed ride home program wherein carpoolers and

transit riders have an alternative means of getting home in case of emergency or unexpected schedule change.

- *High occupancy vehicle (HOV) priority.* Providing preferred parking or site access to carpool vehicles.
- *Transit service interface.* Providing a centralized point of contact with the regional transit service providers to help get transit information into the hands of employees and to provide feedback to the transit providers about schedules, bus stop locations, or operating problems.
- *Pedestrian accommodation.* Promoting efforts to ensure that on-post pedestrian paths are available where needed and that transit riders and others arriving on foot are appropriately accommodated.
- *Telecommuting.* Promoting programs whereby certain employees are allowed and encouraged to work away from the office on occasion, thus reducing the amount of daily travel to Fort Belvoir.
- *Shuttle services.* Providing various shuttles including on-site shuttle services so that people can travel from one building or campus to another without needing to drive their own vehicles; shuttles connecting Fort Belvoir to the regional rail transit system; and shuttles between Fort Belvoir and other major installations such as the Pentagon.
- *Transit and ridesharing incentives.* Working with employees and employers to encourage participation in the MetroChek program, which provides fare transit and vanpool subsidies on a tax-free basis. The MetroChek program is authorized under federal legislation that allows employers to provide employees with a tax-free or pre-tax transit benefit. The maximum amount allowable each month under this program is adjusted every few years. Such incentives encourage additional transit and vanpool usage and can help in meeting the transit mode share goals and assist in mitigating the traffic effects from SOV trips.

The effectiveness of appointing a TDMC to reduce traffic congestion would depend on several factors including the amount of resources applied (to provide adequate staffing levels and facilities) and the receptiveness of Fort Belvoir's personnel towards efforts to reduce commuting in SOVs. It would be expected that the TDMC would invoke environmental management program procedures to review TMP initiatives. For instance, data tracking employee participation in a rideshare program could be compiled to quantify the TMP's effectiveness in reducing SOV usage. A comprehensive TMP program is expected to be developed as the design and Master Plan processes are carried forth. A successful TMP would need to incorporate all agencies located at Fort Belvoir, both existing and incoming BRAC agencies.

The proposed mitigations have been examined for the efficacy of mitigating the effects of the Preferred Alternative. Table 4.3-22 presents the results of the evaluation.

Table 4.3-22
Efficacy of transportation mitigation measures for the Preferred Alternative

Mitigation Measure	Before	After	Comments
1) Improvements at I-95/Fairfax County Parkway interchange with HOV connections	LOS F 50-200 HOV trips during peak periods on I-95 corridor destined to Fort Belvoir	LOS D 500-600 HOV trips during peak periods on HOV ramps	With directional ramps, LOS D could be achieved, but modifications of interchange would require coordination with I-95 HOT Lanes Project Each HOV vehicle would remove 2 SOV vehicles from the traffic stream
2) Additional EPG Access SB I-95 at Backlick flyover SB I-95 direct connections at parkway	 N/A N/A	LOS C, with expected 900 vph on ramp LOS D, with expected 1,100 vph on ramp	Final Site Access plans would ensure LOS D or better SB to EPG connections would reduce the sizing of improvements needed at the I-95/Pkwy interchange Volumes on the Parkway would decrease by 2,500, LOS = D
3) Modified section of Fairfax County Parkway through EPG	LOS = F	LOS = D	Analyzed in conjunction with number 2. Modified interchange design at Rolling Road to provide improved connections into EPG
4) Fairfax County Parkway Improvements	V/C = 0.9 or higher in peak direction, LOS F	V/C = 0.7 in peak direction, LOS = D	Allows for improvements as described in number 10
5) Rideshare facility	N/A	Allows for 200-300 HOV trips per hour to form at EPG	Each HOV vehicle would remove 2 SOV vehicles from the traffic stream.
6) Transit Center/Facilities (in conjunction with increased bus services)	N/A	5% mode share would attract 350 riders in the peak period, while a 10% mode share would attract 700-750 riders	To be developed with increased bus services. One full bus can carry 40 people, so would remove 40 SOV trips.
7) Additional EPG access	N/A	LOS A, with expected 300 vph	Provides for NB HOV direct access.
8) Intersection Improvements U.S. Route 1/Pkwy U.S. Route 1/Tulley Gate U.S. Route 1/Pence Gate Franconia-Springfield/Frontier Drive	v/c is presented as AM/PM peak hour 1.1 and 0.94 1.1 and 1.29 1.12 and 0.89 0.82 and 0.97	 0.86 and 0.91 1.01 and 1.2 1.02 and 0.83 0.75 and 0.88	Improvements would restore intersection performance similar to that under No Action Alternative
9) Additional Crossing over U.S. Route 1	Gunston Road LOS = E	Gunston Road and new crossing LOS = C	New crossing alleviates congestion on Gunston Road and reduces trips traveling off-post between North and South Posts
10) Fairfax County Parkway and Kingman intersection improvements	LOS D in AM and LOS F in PM	LOS B in AM and LOS C in PM	Improvement specific to SB access and WB egress on North Post
11) Franconia-Springfield/Neuman Interchange	LOS F in AM and PM	LOS C or better	Requires coordination with VDOT

Table 4.3-22
Efficacy of transportation mitigation measures for the Preferred Alternative *(continued)*

Mitigation Measure	Before	After	Comments
12) Access to EPG via Neuman Street	N/A	LOS C Reduces volume on Parkway by 500 vph	Needs improvement 11 and likely requires property acquisition
13) Roadway Improvements: Telegraph Road Beulah Street	v/c is presented as AM/PM peak hour 1.12 and 1.13 1.02 and 1.14	0.7 and 0.65 0.8 and 0.85	Improves traffic flow

4.3.5 ENVIRONMENTAL CONSEQUENCES OF TOWN CENTER ALTERNATIVE

4.3.5.1 Land Use Plan Update

No effects would be expected. Adoption of a revised land use plan would not, in the absence of additional activities such as facilities' development, result in effects to the transportation system. Effects to the transportation system would not occur until further development occurred in accordance with the terms of the new land use plan. The Town Center Land Use Plan would not, by itself, affect the transportation system unless and until development occurred at the site. The area that would be developed would straddle both sides of U.S. Route 1. The total number of personnel relocating to Fort Belvoir would not differ from the Preferred Alternative.

4.3.5.2 BRAC Implementation and Facilities Projects

Long-term significant adverse effects would be expected. Implementing the Town Center Alternative, when compared to the No Action Alternative (Section 4.3.3), would worsen traffic conditions in the immediate vicinity of Fort Belvoir. From the regional perspective, implementation would produce a combination of minor (negligible) adverse and beneficial effects.

Under the Town Center Alternative, NGA and WHS would be on the Main Post. A new hospital would be constructed on South Post. Army Lease, PEO EIS, and MDA would also be on the South Post in a combination of existing and new facilities. The BRAC action would increase total employment levels on the Main Post by approximately 22,000 personnel. The following subsections discuss and evaluate the effects to the transportation system that would occur as a result of assigning these additional personnel to the specific portions of the post.

4.3.5.2.1 Travel Patterns to and from Fort Belvoir

The assumed residential distribution for the expected BRAC employees for the Town Center Alternative is the same as described under the Preferred Alternative.

The net increase in traffic on the roadways (proposed action over no action) would be noticeably less than the amount of BRAC traffic due to the rebalancing of productions (households) and attractions (employment) throughout the region resulting from the relocation of employment to Fort Belvoir. In essence, the residential redistribution within the region would increase the portion of Fort Belvoir traffic that is coming up from the south during the AM peak period. A potential consequence of the additional Fort Belvoir traffic on some facilities is that it could cause

other trips to seek alternative routes to avoid U.S. Route 1 and increase the total traffic volumes on those facilities. I-95, Telegraph Road, and Beulah Street would likely become alternative roadway paths, depending on the length and final destination of those trips.

The MWCOG model distributed the decrease in employment to other traffic analysis zones across the region, as the model process was to control the amount of production in the region. The way the market would react is that the loss of employment in one location would spread throughout the region and that some building projects in some areas of the region could be delayed.

Residential locations of employees of NGA and WHS would slowly shift toward Fort Belvoir, the same distribution assumed for the Preferred Alternative. Thus, regional travel would be similar to that of the Preferred Alternative.

Tables 4.3-23 and 4.3-24 present the population and employment levels for the 2011 conditions for the Town Center Alternative, as well as the production and attractions for the study area. The only difference between the Town Center Alternative and the Preferred Alternative is the specific siting of the agencies affected by the Town Center Alternative. This change would also affect the productions and attractions between the various districts. These are also illustrated in Figure D-12 in Appendix D.

Table 4.3-23
Population and employment for existing conditions (2006), 2011 No Action Alternative, and 2011 Town Center Alternative

	Population			Employment		
District	Existing	No Action	Town Center	Existing	No Action	Town Center
Laurel Hill	13,470	25,121	25,121	3,547	3,996	3,996
Pohick	50,826	51,766	51,766	3,648	3,849	3,849
Lorton South of U.S. Route 1	14,476	18,200	18,200	9,067	11,233	11,233
I-95 Industrial Area	2,092	2,175	2,175	8,605	8,683	8,683
Franconia-Springfield Transit Area	2,727	2,821	2,821	5,940	6,764	6,764
Springfield Community Business Center	1,306	1,483	1,483	2,074	2,141	2,141
Springfield	31,263	32,201	32,201	10,850	11,387	11,387
EPG	0	0	0	45	45	0
Mason Neck	2,785	5,552	5,552	438	464	464
Fort Belvoir (Main Post)	7,623	7,623	9,387	23,266	23,267	46,753
Mount Vernon	93,783	102,230	102,230	19,681	21,457	21,457
Rose Hill	67,179	70,513	70,513	20,352	23,157	23,157
Total Study Area	287,530	319,685	321,449	107,513	116,443	139,884
Rest of Virginia	2,142,682	2,399,710	2,399,710	1,258,264	1,427,055	1,430,055
Maryland	3,318,699	3,483,648	3,483,648	1,723,958	1,870,517	1,870,517
District of Columbia	583,733	615,375	615,375	752,719	790,205	790,205
West Virginia	47,735	52,555	52,555	15,173	17,191	17,191
Out of State	0	0	0	0	0	0
Total Outside Study Area	6,092,849	6,551,288	6,551,288	3,750,114	4,104,968	4,107,968
Regional Total	**6,380,379**	**6,870,973**	**6,872,737**	**3,857,627**	**4,221,411**	**4,247,852**

Source: VHB, 2006.

Table 4.3-24
Productions and attractions for existing conditions (2006), 2011 No Action Alternative, and 2011 Town Center Alternative

	Productions			Attractions		
District	Existing	No Action	Town Center	Existing	No Action	Town Center
Laurel Hill	31,891	52,247	52,426	31,825	52,327	52,424
Pohick	109,597	110,862	109,442	109,719	110,848	109,362
Lorton South of U.S. Route 1	43,441	55,677	55,040	43,430	55,560	54,862
I-95 Industrial Area	20,802	20,880	20,250	20,753	20,969	20,308
Franconia-Springfield Transit Area	37,799	41,046	40,708	38,044	41,275	40,810
Springfield Community Business Center	11,586	12,158	12,057	11,601	12,053	12,053
Springfield	98,365	101,148	100,142	98,274	101,153	100,320
EPG	81	89	0	87	102	0
Mason Neck	5,979	11,012	10,920	5,948	10,998	10,899
Fort Belvoir (Main Post)	35,176	35,177	81,003	35,342	35,343	81,174
Mount Vernon	250,418	271,298	269,746	250,606	271,297	269,794
Rose Hill	184,223	197,462	195,675	184,200	197,283	195,504
Total Study Area	829,357	909,055	947,410	829,830	909,209	947,509
Rest of Virginia	6,952,561	7,768,560	7,731,717	6,952,125	7,768,134	7,730,979
Maryland	10,587,588	11,254,561	11,239,496	10,586,616	11,252,945	11,238,333
District of Columbia	1,572,672	1,614,479	1,606,010	1,572,360	1,614,396	1,605,999
West Virginia	153,721	172,023	171,904	153,849	172,056	171,912
Out of State	715,116	828,980	829,157	716,236	830,919	831,021
Total Outside Study Area	19,981,658	21,638,603	21,578,284	19,981,186	21,638,450	21,578,244
Regional Total	**20,811,015**	**22,547,658**	**22,525,694**	**20,811,015**	**22,547,658**	**22,525,753**

Source: VHB, 2006.

Under the Town Center Alternative, Fort Belvoir would represent 2.9 and 33.4 percent of the population and employment, respectively, and the post would account for only 8.6 percent of the attractions in the study area. The ratio of jobs to residents within the study area would be 0.43, or 43 jobs per 100 residents, an increase of 7 jobs per 100 residents over the No Action Alternative. The change over the No Action Alternative would be identical to that of the Preferred Alternative.

Fort Belvoir would represent approximately 6.1 percent of the total employment within all of Fairfax County in the Town Center Alternative; an increase of 2.9 percent over the No Action Alternative. Within transportation Corridor 8, Fort Belvoir would be approximately 10.4 percent of the total employment, a near doubling of the percentage over the No Action Alternative. The only difference between the Town Center Alternative and the Preferred Alternative is the specific siting of the employees affected by the BRAC action. This shift in employment causes a change in the productions and attractions for the study area.

Table 4.3-25 presents the internal trips to the study area, external trips destined to the study area, and external trips that originate within the study area. The table illustrates that most of the trips that have an origin or a destination within the study area would originate from or be destined to points outside the study area, as opposed to being an internal trip within the study area (i.e., a trip beginning and ending within the study area). The table does not include external trips that pass through the study area (i.e., a trip from Fredericksburg to Washington, DC, traveling on I-95). Findings on total study area trips under the Town Center Alternative are similar to that of the Preferred Alternative. Slight differences do exist between the two alternatives; however, the differences are insignificant and likely due to the slight difference in the locations of employees.

Table 4.3-25
Study area trips – 2011 Town Center Alternative

Time	Internal trips within study area	External trips ending in study area	External trips beginning in study area
AM Peak	79,303	64,179	78,451
PM Peak	139,404	109,077	97,827
Off-Peak	343,461	212,576	209,514
Daily	**562,168**	385,832	385,792

4.3.5.2.2 Performance under Expected Conditions

Few changes to Northern Virginia's transportation system would be expected over the next 5 years because of funding shortfalls and the resulting delays in implementing long-term transportation plans. The modeling assumed that the off-post transportation improvement projects identified in the No Action Alternative are also included in the Town Center Alternative.

One key finding from the analyses is that the Fairfax County Parkway would need to be widened from I-95 to U.S. Route 1. The cross-section would need to change from 4 lanes (2-2 configuration) to at least 8 lanes, such as a 3-2-3 configuration, in which the middle two lanes would be reversible.

Road Network. Increased traffic to and from Fort Belvoir would account for up to 40 percent of the traffic flow on roadways adjacent to the gates and quickly drop to under 10 percent of the traffic away from the gates, as shown in Figures D-13 and D-14, area of influence.

Figures D-15 and D-16 show both the growth in traffic and the change in the traffic flow that would be a result of the BRAC action at selected locations.

The area of influence shows that the effect of BRAC traffic on roadways diminishes as one moves away from the site. This decrease would be due to traffic getting off and on at the interchanges along the roadways. Regional travel patterns would be similar to the Preferred Alternative. It is only when moving closer to the specific siting that changes are noticeable between the alternatives. Because the Town Center Alternative would place more development at the Main Post, the effects would be higher at that location and less to the west. The roadways that are affected to a greater extent are the Fairfax County Parkway (east of I-95), U.S. Route 1, Telegraph Road, and Beulah Street.

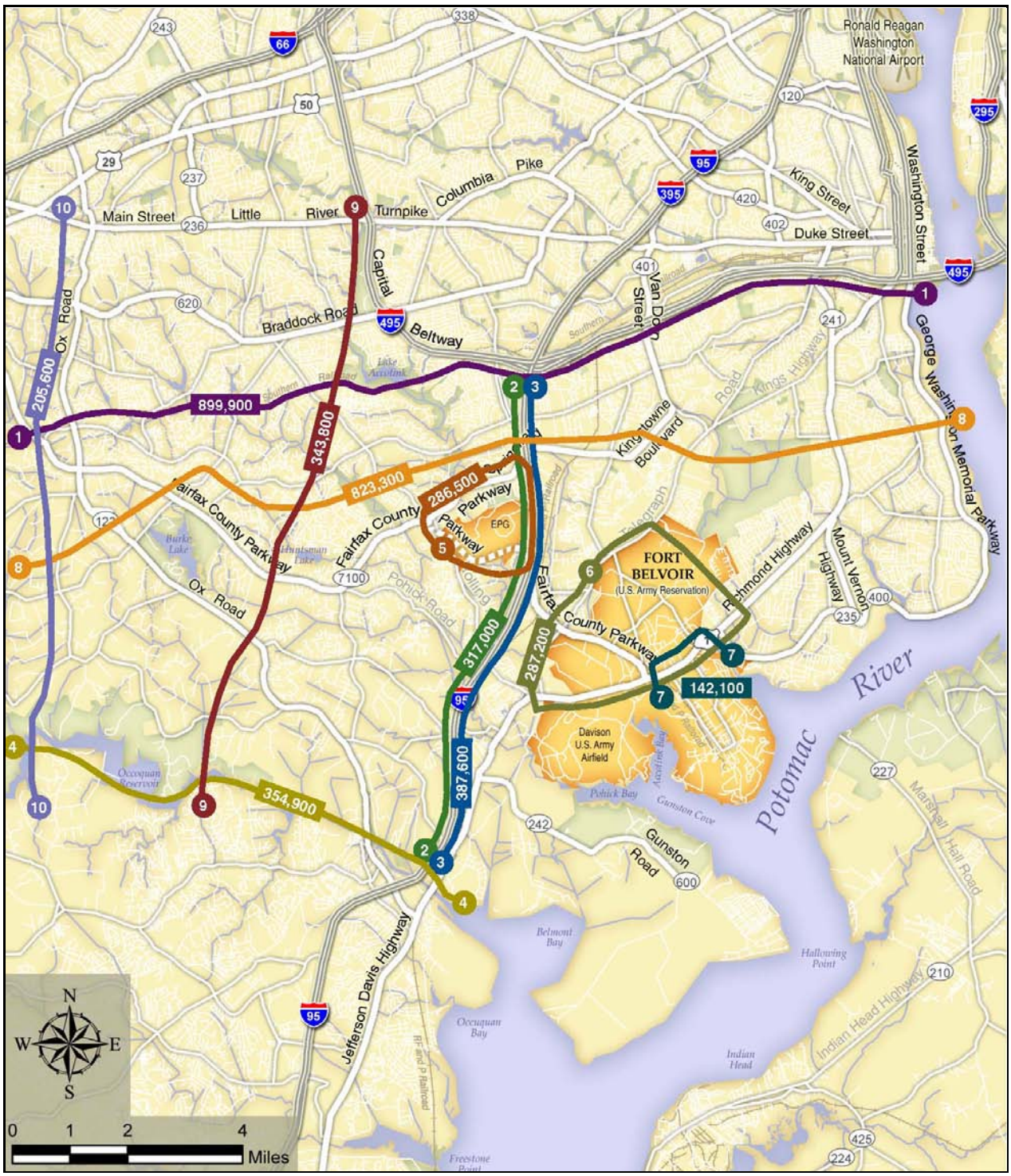
Figure 4.3-20 provides another perspective on the changes in travel patterns. Total volumes crossing selected screen lines are shown. Again, the net effect on traffic volumes would decrease quickly as the distance from Fort Belvoir grows.

The screen lines north of Fort Belvoir show a slight decrease in traffic volumes over the No Action Alternative. This change would be due to trips diverting from I-95 at the Fairfax County Parkway that previously traveled north to the Pentagon or other nearby employment centers, which would now travel to Fort Belvoir. To the south, the increase in daily volume from the No Action Alternative to the Town Center Alternative crossing the Occoquan River would be approximately 5,000 trips (two-way). A major reason that there would be only a slight increase at this screen line is that some trips that are part of BRAC are already within the traffic stream (in the No Action Alternative) but their destination would be the Pentagon or other nearby employment centers. Screen lines around the Main Post show that the Town Center Alternative would increase volumes on roadways in the immediate Fort Belvoir area over the No Action Alternative.

Moving closer to the post, the projected effects on adjacent roadway facilities are shown in Table 4.3-26, which shows V/C ratios, delay, and LOS for 23 key intersections. The summary of the turning movement counts for the Town Center Alternative can be found in Table D-4 and Figures D-17 and D-18 in Appendix D.

The intersection measures of effectiveness (MOEs) would deteriorate over the No Action Alternative and existing conditions as the traffic volumes at these intersections would be higher because of the additional employment, especially the intersections adjacent to Fort Belvoir. Several intersections that are near the main gateways to North and South Posts should be highlighted for effects due to the BRAC action; these intersections are along U.S. Route 1 adjacent to Main Post and the intersection of Fairfax County Parkway and Kingman Road. A comparison of 2011 No Action Alternative and 2011 Town Center Alternative measures of effectiveness at these intersections is provided in Table 4.3-27. These intersections would perform at LOS F, with delays exceeding 200 seconds at those intersections, which are at or near the main gateways to North and South Posts. A total of 10 intersections in the AM peak hour experience a degradation of at least one letter grade, and 8 intersections did in the PM peak hour. Mitigating actions could include intersection improvements or upgrading the intersection to an interchange.

Congestion along U.S. Route 1 would increase to 5 to 6 hours in the peak direction of travel, and the off-peak direction would become congested as trips from the north in the AM peak period increase. Likewise, the Fairfax County Parkway would also be congested 3 to 4 hours in the peak direction of travel in each peak period if no improvements were made. These effects would be from the doubling of the employment levels at Fort Belvoir. If improvements were not made to the major roadways, the traffic would spill onto adjacent roadways, potentially creating congestion on those facilities; such roadways include Beulah Street, Hayfield Road, and South Kings Highway.



Daily Screen Line Volumes under The Town Center Alternative

Fort Belvoir, Virginia

Figure 4.3-20

Table 4.3-26
Intersection measures of effectiveness—2011 Town Center Alternative

	AM Peak Hour[a]			PM Peak Hour[a]		
Intersection location	**V/C**	**LOS**	**Delay**	**V/C**	**LOS**	**Delay**
Commerce St./Amherst Ave.	0.75	D	36.8	0.91	D	50.8
Commerce St./Backlick Rd.	0.41	C	30.6	0.78	D	49.6
Backlick Rd./Calamo St.	0.75	B	13.3	0.80	C	23.1
Loisdale Rd./Spring Mall Dr.	0.51	C	25.3	0.88	D	43.9
Franconia Springfield Parkway/Spring Village Dr.	1.06	E	65.0	1.09	F	86.3
Franconia Springfield Parkway EB Ramp/Backlick Rd.	0.99	E	66.7	0.81	D	41.6
Franconia Springfield Parkway WB Ramp/Backlick Rd.	0.91	B	12.0	0.92	C	22.4
Franconia Springfield Parkway/I-95 HOV Ramps	1.00	E	56.1	1.36	F	175.1
Franconia Springfield Parkway EB Ramp/Frontier Dr.	0.84	C	31.9	0.90	E	57.5
Franconia Springfield Parkway WB Ramp/Frontier Dr.	0.53	D	37.9	0.90	F	92.4
Franconia Springfield Parkway/Beulah St.	1.21	F	113.3	1.42	F	167.3
Fairfax County Parkway/Terminal Rd.	1.11	F	86.2	1.03	D	41.5
Fairfax County Parkway SB Ramps/Telegraph Rd.	0.59	C	21.3	0.89	C	33.5
Fairfax County Parkway NB Ramps/Telegraph Rd.	0.75	C	21.9	0.78	C	23.4
Fairfax County Parkway/John J. Kingman Rd.	1.34	F	160.3	1.84	F	285.1
Telegraph Rd./Beulah St.	0.82	D	44.9	0.75	C	33.3
Telegraph Rd./S. Van Dorn St.	1.01	D	47.0	1.05	D	50.1
U.S. Route 1/Telegraph Rd.—Old Colchester Rd.	0.86	E	57.9	0.96	F	82.6
U.S. Route 1/Fairfax County Parkway	1.23	F	99.7	0.80	F	85.9
U.S. Route 1/Backlick Rd.—Pohick Rd.	1.60	F	201.0	1.16	F	226.7
U.S. Route 1/Belvoir Rd.	1.19	F	113.3	1.34	F	167.3
U.S. Route 1/Old Mill Rd.	1.1	F	111.0	1.01	E	79.8
Loisdale Rd./GSA Access Rd.	0.73	A	7.5	0.52	A	5.1

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM

Traffic from the Fairfax County Parkway could potentially spill back onto I-95, as the parkway would have insufficient capacity to handle the increased demand. Furthermore, traffic would spill onto adjacent roadways, such as Telegraph Road and Beulah Street, and would decrease the quality of life for local residents and could potentially create undesirable conditions for the residents with the higher traffic volumes. Major congestion in the area would prompt the need to widen the parkway, likely to a 3-2-3 lane configuration in which the center lanes would be reversible HOV lanes.

The severe congestion on the major roadways adjacent to Fort Belvoir would affect the ability of Fort Belvoir traffic to exit during the PM peak hour, especially via the three main access points: Pohick Road (via Tulley Gate), Belvoir Road (via Pence Gate), and Kingman Road.

Table 4.3-27
Comparison of 2011 No Action Alternative and 2011 Town Center Alternative measures of effectiveness at selected intersections

	AM Peak Hour[a]			PM Peak Hour[a]		
Intersection	**V/C**	**LOS**	**Delay (seconds)**	**V/C**	**LOS**	**Delay (seconds)**
Fairfax County Parkway/John J. Kingman Road						
No Action Alternative	0.79	D	45.7	1.16	F	112.8
Town Center Alternative	1.34	F	160.3	1.84	F	285.1
U.S. Route 1/Telegraph Road-Old Colchester Road						
No Action Alternative	0.82	D	54.4	0.77	E	76.7
Town Center Alternative	0.86	E	57.9	0.96	F	82.6
U.S. Route 1/Fairfax County Parkway						
No Action Alternative	0.96	D	38.8	0.89	D	35.9
Town Center Alternative	1.23	F	99.7	0.80	F	85.9
U.S. Route 1/Backlick Road-Pohick Road						
No Action Alternative	0.97	D	37.0	1.12	F	129.9
Town Center Alternative	1.60	F	201.0	1.16	F	226.7
U.S. Route 1/Belvoir Road						
No Action Alternative	0.83	B	19.3	0.59	B	12.0
Town Center Alternative	1.19	F	113.3	1.34	F	167.3

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM

Transit Systems. Mode split—the fraction of the employee population that would use mass transit—for Main Post is 1 to 2 percent. The rail portion of the transit system does not directly serve the Main Post. Implementing the BRAC-related projects, which would affect the vast majority of new personnel at Fort Belvoir, would likely not adversely affect use of the rail systems because of the continued lack of direct service. Consequences of implementing the Town Center Alternative would be similar with respect to the bus portion of the transit system. Fort Belvoir is not served to any substantial degree because of the difficulties in those modes' gaining access to the post because of security requirements. Demand for additional bus services could evolve, resulting in higher ridership figures. The local bus routes, however, tend to be limited to the study area, which represents only a small fraction of the locations where the employee population would reside. There are only a limited number of long-haul routes serving the Main Post. A 1 to 2 percent mode share equates to approximately 200 to 450 daily riders. Achieving a 10 percent mode share would remove approximately 725 vehicles from the roadway in the peak hour; this number includes both the Main Post and EPG.

4.3.5.3 Other Projects Sitings/Operations

No effects would be expected. Other projects associated with BRAC implementation (see Section 2.2.2.3) include projects such as infrastructure, access control point, barracks modernization, and MWR family travel camp. These projects generally involve a relatively minor or negligible number of personnel that would be using the transportation system.

4.3.5.4 Mitigation

Implementing the Town Center Alternative would result in significant adverse effects to the transportation system with respect to congestion and increased travel time. These effects would lead to reduced employee productivity, higher commuting costs, and degradation of quality of life. These effects would not be limited to personnel at Fort Belvoir. Through commuters and the local community would also be affected.

This section identifies potential mitigation actions to avoid, reduce, or compensate for the magnitude of predicted effects. The mitigation actions are evaluated for their efficacy so that an informed decision can be made regarding their adoption and implementation.

Road Network and Associated Facilities. Measures for the Town Center Land Use Alternative have been identified to mitigate the effects associated with its implementation.

1. *Reconstruction of the I-95/Fairfax County Parkway Interchange.* This measure would reconstruct the I-95/Fairfax County Parkway interchange to add HOV connections to and from the south. It would encourage new HOV trips between Fort Belvoir and points to the south on I-95, reducing SOV trips and, thus, overall demand on the road network. This improvement would provide better traffic operations for the increased traffic flows from EPG and the Main Post, reducing delays during the peak periods. Estimated cost: $75 million.
2. *Improvements to Fairfax County Parkway between I-95 and John J. Kingman Road.* Widening the Parkway to a 3-2-3 lane configuration, similar to I-395, would provide the necessary directional capacity. Additional roadway capacity, via intersection improvements and widening, would improve traffic flow and reduce congestion. The center lanes could be reserved for HOV traffic only, or be used by all traffic. Estimated cost: $100 million.
3. *Rideshare Facility.* A rideshare facility on the Main Post would encourage a shift from SOV to HOV trips. This shift would reduce traffic volumes on the roadway, which, in turn, would reduce the effect of the development. Estimated cost: $15 million.
4. *Transit Center/Facilities.* This measure would construct a transit center and other facilities to provide for additional choices of travel over the SOV. This improvement would be developed in conjunction with increased bus service. Siting has not been determined. Estimated cost: $30 million.
5. *Intersection Improvements.* Intersection improvements at key locations such as U.S. Route 1 at Backlick/Pohick (Tulley Gate), U.S. Route 1 at Belvoir Road (Pence Gate), Telegraph Road at South Van Dorn Street, Franconia-Springfield Parkway ramps at Frontier Drive, and Franconia-Springfield Parkway at Beulah Street, would improve traffic flow and reduce congestion. Improvements could include signalization, additional turning lanes, lengthening of turning lanes, or other measures appropriate to an intersection. Estimated cost: $15 million.
6. *Additional U.S. Route 1 Crossings for Main Post.* Two additional crossings over U.S. Route 1 would improve internal roadway circulation on Fort Belvoir between North and South Posts. The likely location of these two improvements would be between Gunston and Belvoir Roads, with final sitings dependent on the site layout of other facilities projects (e.g., the new hospital proposed at the South Post golf course). These improvements would reduce the number of trips on off-post roadways between North and South Posts. Estimated cost: $25 million

7. *Fairfax County Parkway/John J. Kingman Road Intersection Improvements.* Improvement would consist of upgrading the intersection into a full interchange configuration, which would reduce congestion on the parkway at this intersection and improve access to North Post. Estimated cost: $30 million.
8. *Improvements to Beulah, Telegraph, and Newington Roads.* This measure would widen roadways and provide other improvements, such as signalization and safety measures (e.g., improved crosswalks, lighting), to enhance flow of the increased traffic volumes caused by BRAC. Estimated cost: $80 million.
9. *Widening of U.S. Route 1 through Fort Belvoir.* Widening U.S. Route 1 through Fort Belvoir would provide needed capacity to handle the additional influx of workers on the Main Post. The widening could also include interchanges at the Fairfax County Parkway and U.S. Route 1. Estimated cost: $75 million.
10. *Improvements to Lorton Road.* Widening and other improvements to Lorton Road would improve the access between U.S. Route 1 and I-95 and reduce the effects on the Fairfax County Parkway. Estimated cost: $10 million.
11. *Franconia-Springfield Parkway/Neuman Street Interchange.* This measure would improve traffic flow along the Franconia-Springfield Parkway and reduce vehicular demand on the Fairfax County Parkway. Estimated cost: $50 million.
12. *Completion of Van Dorn Street/Franconia Road Interchange.* This improvement would reduce congestion at this intersection, which is an expected pathway for vehicles traveling to and from Fort Belvoir. Estimated cost: $90 million.
13. *Interchange at U.S. Route 1 and Fairfax County Parkway.* Improvement would reduce the delays at the intersection and improve traffic flows. It also could serve as a replacement to Pohick Road to provide access to Tulley Gate. Estimated cost: $55 million.
14. *Interchange at U.S. Route 1 and Telegraph Road.* Improvements would reduce the delays at the intersection and improve traffic flows. Estimated cost: $75 million.

Total estimated cost for the foregoing mitigation measures would be $720 million. This figure excludes contingency costs and costs associated with supervision, inspection, and overhead. More detailed studies and designs will be required, including potential NEPA studies.

The transportation network has been evaluated from a regional, sub-regional, and local perspective, and the effects on the transportation system have been quantified and compared to both existing conditions and the No Action Alternative. On the basis of these comprehensive comparisons, improvements have been identified that would mitigate most of the adverse effects of the Town Center Alternative on the transportation system in the immediate area of Fort Belvoir. The additional site entrance points, improved site circulation, improved interchanges, and widened roadways would result in reduced delay, limit the possibility of Fort Belvoir traffic backing up onto the major regional highways, and improve the operation of the intersections within the area of influence of the BRAC-related actions. As engineering and design work proceeds, detailed traffic operations studies would be completed to ensure that intersection levels of service are maintained or improved in the immediate area of the installation. A major improvement needed would be to widen the Fairfax County Parkway eastward from the I-95 interchange from a 4-lane cross-section to a 3-2-3 lane configuration.

On a regional level, the relocation of 22,000 jobs toward the south of the metropolitan area, combined with regional projects, such as the widening of I-95 and construction/implementation of HOT lanes in the I-95 Corridor, would be expected to lead to additional travel demand from the south. With no plans for additional capacity in the corridor beyond the planned widening and HOT lanes, the analysis indicates that the congested period during the morning and afternoon would be extended by 30 to 45 minutes. Traffic traveling towards Fort Belvoir on regional facilities could experience some limited congestion during the peak hour, but that direction of travel remains the "reverse commute," with heavier traffic headed towards Tyson's Corner, Arlington, Alexandria, and Washington, DC.

Transit System. This section describes proposed mitigation measures to the transit system to help avoid, reduce, or compensate for the effects associated with implementing the Town Center Alternative. Mitigation measures are appropriate for bus service but none are identified for rail services. Expansion or improvements to rail service could occur in the future on the basis of further evaluation of the transportation system undertaken as a result of experiences related to BRAC or other developments in the study area.

Initial bus service concept plans have been developed based on the origin data for the BRAC employees destined for Fort Belvoir and existing origin patterns for Main Post employees. These are preliminary concept plans intended to serve as a guide to the levels of transit service that could be required to serve both a 5 and 10 percent transit mode share to the Main Post. Detailed route and service planning would be conducted later. The purpose of these concept plans is to demonstrate that feasible transit service options are viable to support the assumed mode shares.

Five basic service areas have been identified. These basic service areas are identical to those identified in the Preferred Alternative; however, the appropriate service routes might vary, because all routes would be serving just the Main Post. The service areas are as follows:

- Southern Prince William County (Dumfries, Cherry Hill, and Powells Creek areas)
- Northern Prince William County (Woodbridge, Dale City, and Lake Ridge areas)
- U.S. Route 1 in Fairfax County (Lorton, Fort Belvoir, Mount Vernon, Hybla Valley, Beacon Hill, and Huntington areas)
- Western Fairfax County (Burke, Fairfax, and Chantilly areas and, possibly, the Herndon and Reston areas)
- Franconia-Springfield Metro station

Service Concept for 10 Percent Mode Share

- *Southern Prince William County (4 Peak Hour Buses).* Bus service on a 15-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (6 Peak Hour Buses).* A 10-minute headway is assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.
- *U.S. Route 1 in Fairfax County (4 Additional Peak Hour Buses).* Four additional buses per hour would be added to existing services along the U.S. Route 1 corridor between Huntington and the Main Post.

- *Western Fairfax County (4 Additional Peak Hour Buses).* Four additional buses per hour would operate in the Fairfax County Parkway corridor to the Burke area. This service would require a transfer to shuttle bus at the Franconia-Springfield Metro station.
- *Franconia-Springfield Metrorail (10 Peak Hour Buses).* A shuttle linking the Main Post to the Franconia-Springfield Metro station would be needed. Pending a refinement of the numbers, a 6-minute headway on this shuttle is assumed. This service would link those commuters with access to one of the regional Metro lines to the Main Post area.

Service Concept for 5 Percent Mode Share

- *Southern Prince William County (2 Peak Hour Buses).* Bus service on a 30-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (3 Peak Hour Buses).* A 20-minute headway is assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.
- *U.S. Route 1 in Fairfax County (2 Additional Peak Hour Buses).* Two additional peak hour vehicles would provide service along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Western Fairfax County (2 Additional Peak Hour Buses).* Two additional buses per hour would operate in the Fairfax County Parkway corridor to the Burke area. This service would require a transfer to shuttle bus at the Franconia-Springfield Metrorail Station.
- *Franconia-Springfield Metrorail (10 Additional Peak Hour Buses).* A 6-minute headway on the shuttle linking the Main Post to the Franconia-Springfield Metrorail Station is also assumed under the five percent mode share scenario.

Bus service of a high enough quality to realize a 5 to 10 percent mode share for transit would complement the road network mitigation actions and help to reduce congestion and limit vehicle delays resulting from the Town Center Alternative. Achieving a 10 percent mode split would reduce the number of vehicles accessing the Fort Belvoir area in the peak hour by nearly 725 according to the MWCOG average auto occupancy of 1.1 passengers per vehicle. A 5 percent mode share for transit would reduce the number of peak hour vehicles by approximately 360.

The foregoing expanded bus services would be supplemented by internal circulator bus systems designed to provide more direct access to various areas of Fort Belvoir not directly accessible from the regional transit eservices. Such circulator buses would operate within the grounds of Fort Belvoir on schedules designed to meet the needs of employees.

The estimated cost of the transit-related mitigation actions would be $8 to $10 million in initial capital costs and $5 to $7 million in annual operating expenses depending on the ultimate operational requirements of the system. Note that these estimates are preliminary order-of-magnitude costs. More precise cost estimates can be prepared when site circulation and security plans are finalized and detailed route and service planning are completed.

Transportation Management Plan—Framework. Effects associated with implementing the Town Center Alternative could be reduced by appointing a TDMC and deploying a TMP. Such a mitigation action, described at the end of Section 4.3.4, could apply equally to implementation of the Town Center Alternative.

The proposed mitigations have been examined for the efficacy of mitigating the effects of the Town Center Alternative. Table 4.3-28 presents the results of the evaluation.

Table 4.3-28
Efficacy of the transportation mitigation for the Town Center Alternative

Mitigation Measure	Before	After	Comments
1) Improvements at I-95/Fairfax County Parkway interchange with HOV connections	LOS F 100-250 HOV trips during peak periods on I-95 corridor destined for Fort Belvoir	LOS D 800-1000 HOV trips during peak periods on HOV ramps	With directional ramps, LOS D could be achieved, but modifications of interchange would require coordination with I-95 HOT Lanes Project Each HOV vehicle would remove 2 SOV vehicles from the traffic stream
2) Fairfax County Parkway improvements	V/C ranging 0.9 to 1.13, LOS = F	V/C less than= 0.7 in peak direction, LOS = D	Improves HOV traffic's LOS to B with improvements in conjunction with 1
3) Rideshare facility	N/A	Allows for 200-300 HOV trips per hour	Each HOV vehicle would remove 2 SOV vehicles from the traffic stream. Would also require improvements 1 & 2
4) Transit center/facilities (in conjunction with increased bus services)	N/A	5% mode share would attract 400 riders in the peak period, while a 10% mode share would attract 800-850 riders	To be developed with increased bus services. One full bus can carry 40 passengers; so one bus would remove 40 SOV trips.
5) Intersection improvements U.S. Route 1/Pence Gate Telegraph/Van Dorn Streets Franconia-Springfield Parkway/Beulah Street	v/c is presented as AM/PM peak hour 1.19 and 1.34 1.01 and 1.05 1.21 and 1.42	 1.01 and 0.86 0.7 and 0.72 1.02 and 1.12	Improvements at Telegraph and Van Dorn would be in conjunction with the widening and improvements to Telegraph Road. Improvements would restore intersection performance similar to that under No Action Alternative
6) Additional Crossing over U.S. Route 1	Gunston Road LOS = F	Gunston Road and new crossings LOS = C	New crossings would alleviate congestion on Gunston Road and reduces trips traveling off-post between North and South Posts
7) Fairfax County Parkway and Kingman Interchange	LOS F in both AM and PM peaks	LOS C in both AM and PM peaks	Improvement would alleviate congestion at this intersection that occurs due to heavy turning movements
8) Roadway Improvements Beulah Street Telegraph Road Newington Road	v/c is presented as AM/PM peak hour 1.11 and 0.98 1.23 and 1.22 0.86 and 0.8	 0.8 and 0.75 0.75 and 0.73 0.40 and 0.45	Reduces traffic spillover into adjacent residential neighborhoods

Table 4.3-28
Efficacy of the transportation mitigation for the Town Center Alternative *(continued)*

Mitigation Measure	Before	After	Comments
9) Widen U.S. Route 1	v/c ranges between 1.05-1.17 in AM and 1.25-1.43 in PM	v/c ranges of 0.65-0.7 in AM; PM = 0.8-0.95	Completed in conjunction to intersection improvement and interchange construction
10) Widen Lorton Road	v/c of 1.04 in AM and 1.08 in PM	v/c 0.82 in AM and 0.85 in PM	Improves access from U.S. Route 1 to I-95
11) Franconia-Springfield/Neuman Street Interchange	LOS F in AM and PM	LOS C or better	Requires coordination with VDOT
12) Van Dorn/Franconia Interchange	LOS F in AM and PM	LOS D or better	Requires coordination with VDOT
13) U.S. Route 1 and parkway interchange	LOS F in AM and PM	LOS D or better	Replaces access via Pohick Road (Tulley Gate)
14) U.S. Route 1 and Telegraph Road interchange	LOS E in AM and F in PM	LOS D or better	Improves traffic flow on U.S. Route 1 immediately west of Fort Belvoir

4.3.6 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.3.6.1 Land Use Plan Update

No effects would be expected. Adoption of a revised land use plan would not, in the absence of additional activities such as facilities development, result in effects to the transportation system. Effects to the transportation system would not occur until further development occurred in accordance with the terms of the new land use plan. The proposed land use plan would add the EPG and the GSA Parcel to the inventory of actively managed resources. Including these areas within the planning regime would not, by itself, affect the transportation system unless and until development occurred at the sites.

4.3.6.2 BRAC Implementation and Facilities Projects

Long-term significant adverse effects would be expected. Implementing the City Center Alternative, when compared to the No Action Alternative (set forth in Section 4.3.3), would worsen traffic conditions in the immediate vicinity of EPG and the GSA Parcel. From the regional perspective, implementation would produce a combination of minor (negligible) adverse and beneficial effects.

Under the City Center Alternative, all personnel relocating to Fort Belvoir would be located at EPG and the GSA Parcel. No additional personnel would be at the Main Post. The City Center Alternative would increase total employment levels at EPG and the GSA Parcel by approximately 22,000 personnel. The following subsection discusses and evaluates the effects on the transportation system that would occur as a result of assigning these additional personnel.

4.3.6.2.1 Travel Patterns to and from Fort Belvoir

The assumed residential distribution for the expected BRAC employees for the City Center Alternative is the same as described under the Preferred Alternative.

As discussed previously under travel demand modeling, the net increase in traffic would be noticeably less than the amount of traffic headed to or from the BRAC sites because of the rebalancing of productions (households) and attractions (employment) throughout the region resulting from the relocation of employment to Fort Belvoir. In essence, the residential redistribution within the region would increase the portion of post traffic that is coming from the south during the AM peak period. A potential consequence of the additional Fort Belvoir traffic is that it might force traffic away from the I-95 corridor onto U.S. Route 1 and other minor/local roadways as travelers attempt to avoid any consequence of the traffic destined to EPG. Specific routing of each vehicle would depend on its final destination.

The MWCOG model distributed the decrease in employment to other traffic analysis zones across the region, because the model process was to control the amount of production in the region. Residential locations of employees of NGA and WHS would slowly shift toward being similar to those of Fort Belvoir employees, the same distribution assumed for the Preferred Alternative. Thus, regional travel would be similar to that of the Preferred Alternative.

Tables 4.3-29 and 4.3-30 presents the population and employment levels, which is also illustrated in Figure D-19 (in Appendix D), for the 2011 conditions for the City Center Alternative, as well as the production and attractions for the study area.

Table 4.3-29
Population and employment for existing conditions (2006), 2011 No Action Alternative, and 2011 City Center Alternative

	Population			Employment		
District	Existing	No Action	City Center	Existing	No Action	City Center
Laurel Hill	13,470	25,121	25,121	3,547	3,996	3,996
Pohick	50,826	51,766	51,766	3,648	3,849	3,849
Lorton South of U.S. Route 1	14,476	18,200	18,200	9,067	11,233	11,233
I-95 Industrial Area	2,092	2,175	2,175	8,605	8,683	8,683
Franconia-Springfield Transit Area	2,727	2,821	2,821	5,940	6,764	7,795
Springfield Community Business Center	1,306	1,483	1,483	2,074	2,141	2,141
Springfield	31,263	32,201	32,201	10,850	11,387	11,387
EPG	0	0	0	45	45	22,702
Mason Neck	2,785	5,552	5,552	438	464	464
Fort Belvoir (Main Post)	7,623	7,623	9,387	23,266	23,267	23,020
Mount Vernon	93,783	102,230	102,230	19,681	21,457	21,457
Rose Hill	67,179	70,513	70,513	20,352	23,157	23,157
Total Study Area	287,530	319,685	321,449	107,513	116,443	139,884
Rest of Virginia	2,142,682	2,399,710	2,399,710	1,258,264	1,427,055	1,430,055
Maryland	3,318,699	3,483,648	3,483,648	1,723,958	1,870,517	1,870,517
District of Columbia	583,733	615,375	615,375	752,719	790,205	790,205
West Virginia	47,735	52,555	52,555	15,173	17,191	17,191
Out of State	0	0	0	0	0	0
Total Outside Study Area	6,092,849	6,551,288	6,551,288	3,750,114	4,104,968	4,107,968
Regional Total	**6,380,379**	**6,870,973**	**6,872,737**	**3,857,627**	**4,221,411**	**4,247,852**

Source: VHB, 2006

Table 4.3-30
Productions and attractions for existing conditions (2006), 2011 No Action Alternative, and 2011 City Center Alternative

	Productions			Attractions		
District	Existing	No Action	City Center	Existing	No Action	City Center
Laurel Hill	31,891	52,247	52,439	31,825	52,327	52,433
Pohick	109,597	110,862	109,476	109,719	110,848	109,388
Lorton South of U.S. Route 1	43,441	55,677	55,049	43,430	55,560	54,868
I-95 Industrial Area	20,802	20,880	20,256	20,753	20,969	20,313
Franconia-Springfield Transit Area	37,799	41,046	42,020	38,044	41,275	42,167
Springfield Community Business Center	11,586	12,158	12,060	11,601	12,053	12,055
Springfield	98,365	101,148	100,162	98,274	101,153	100,334
EPG	81	89	28,736	87	102	29,382
Mason Neck	5,979	11,012	10,923	5,948	10,998	10,901
Fort Belvoir (Main Post)	35,176	35,177	51,981	35,342	35,343	51,555
Mount Vernon	250,418	271,298	269,763	250,606	271,297	269,806
Rose Hill	184,223	197,462	195,700	184,200	197,283	195,522
Total Study Area	829,357	909,055	948,565	829,830	909,209	948,724
Rest of Virginia	6,952,561	7,768,560	7,732,052	6,952,125	7,768,134	7,731,233
Maryland	10,587,588	11,254,561	11,239,616	10,586,616	11,252,945	11,238,423
District of Columbia	1,572,672	1,614,479	1,606,027	1,572,360	1,614,396	1,606,012
West Virginia	153,721	172,023	171,904	153,849	172,056	171,912
Out of State	715,116	828,980	829,176	716,236	830,919	831,036
Total Outside Study Area	19,981,658	21,638,603	21,578,776	19,981,186	21,638,450	21,578,617
Regional Total	**20,811,015**	**22,547,658**	**22,527,341**	**20,811,015**	**22,547,658**	**22,527,341**

Source: VHB, 2006.

Fort Belvoir (Main Post and EPG) and the GSA Parcel would represent 2.9 and 32.7 percent of the population and employment, respectively, and the sites would account for only 8.5 percent of the attractions in the study area. The ratio of jobs to residents within the study area would be 0.43, or 43 jobs per 100 residents, an increase of 7 jobs per 100 residents over the No Action Alternative. The change over the No Action Alternative would be identical to that of the Preferred Alternative.

Fort Belvoir would represent approximately 6.1 percent of the total employment within all of Fairfax County in the City Center Alternative, an increase of 2.9 percent over the No Action Alternative. Within the transportation Corridor 8, Fort Belvoir would be approximately 10.4 percent of the total employment, a near doubling of the percentage of the county total over the No Action Alternative. These percentages and changes over the No Action Alternative would be identical to the other alternatives, because the total employment would not change between the alternatives. Specific siting of the employees change the employment levels compared to the other alternatives. In turn, this changes the production and attractions to and from the districts under the City Center Alternative.

Table 4.3-31 presents the internal trips to the study area, external trips destined for the study area, and external trips that originate within the study area. The table illustrates that most of the trips that have an origin or a destination within the study area originate from or are destined for points outside of the study area, as opposed to being an internal trip within the study area (i.e., a trip beginning and ending within the study area). The table does not include external trips that pass through the study area (i.e., a trip from Fredericksburg to Washington, DC, traveling on I-95). The numbers of study area trips are similar to that of the other alternatives. Slight differences do exist between the alternatives because of the specific locations of the employees; however, the differences are not significant.

Table 4.3-31
Study area trips – 2011 City Center Alternative

Time	Internal trips within study area	External trips ending in study area	External trips beginning in study area
AM Peak	78,711	63,067	78,216
PM Peak	138,710	108,791	96,802
Off-Peak	341,358	211,217	208,061
Daily	**558,779**	**383,075**	**383,078**

4.3.6.2.2 Performance under Expected Conditions

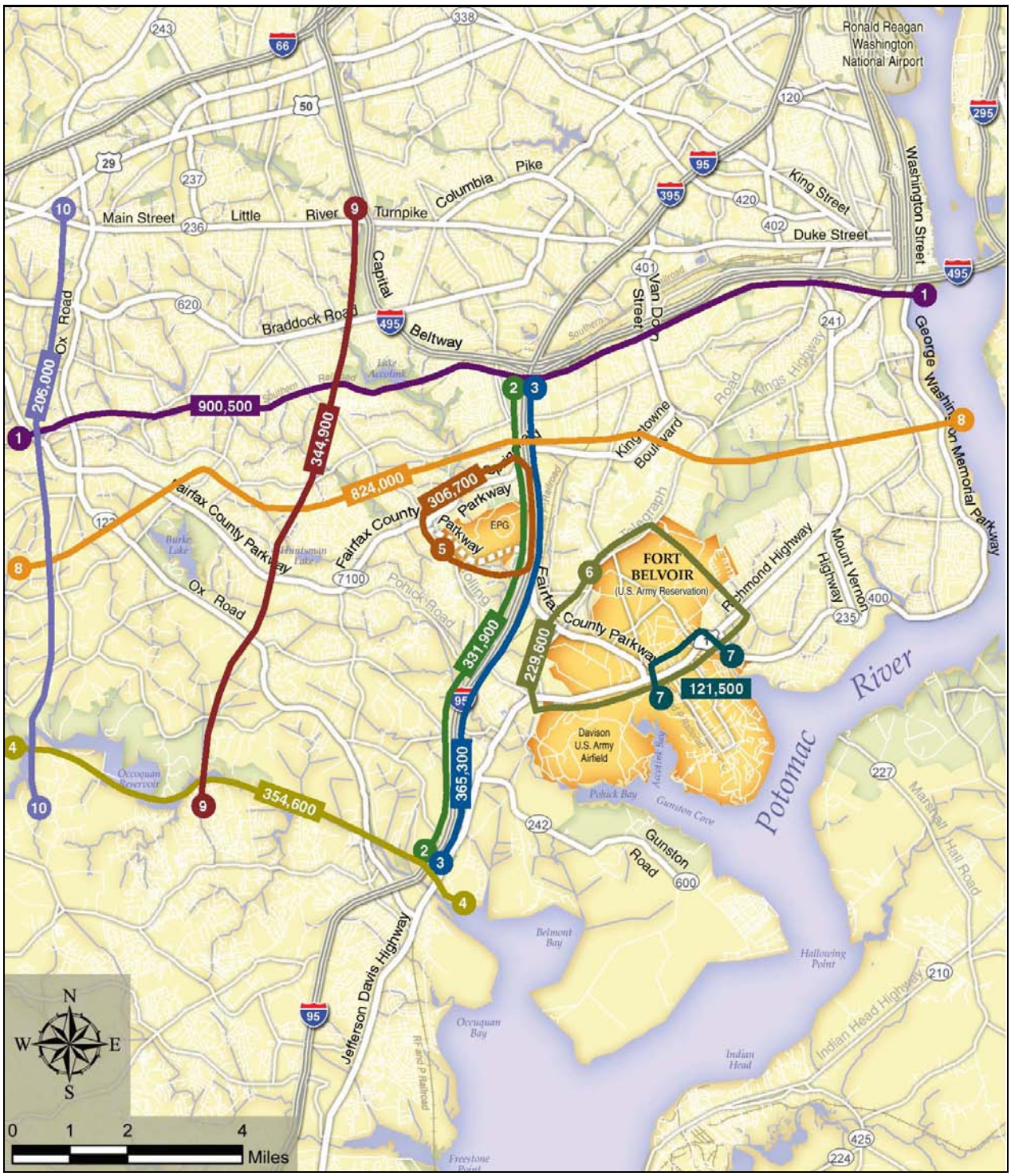
Few changes to Northern Virginia's transportation system are expected over the next 5 years because of funding shortfalls and the resulting delays in implementing long-term transportation plans. The modeling assumed that the off-post transportation improvement projects identified in the No Action Alternative would be in place for the City Center Alternative.

One key finding of the analyses is that to accommodate the 9,263 new employees at the GSA Parcel, a new access point would be needed on the Franconia-Springfield Parkway. This new access point would require major reconfiguration of that facility. Alternatively, the total employment at the GSA Parcel could be reduced so that access from Loisdale Road would be the only one required.

Road Network. Increased traffic to and from EPG and the GSA Parcel would account for up to 40 percent of the traffic flow on roadways adjacent to the gates and quickly drops to less than 10 percent of the traffic, as shown in Figures D-20 and D-21 in Appendix D. These figures illustrate the areas of influence from implementing the City Center Alternative.

The area of influence shows that the effect of BRAC-related traffic on roadways diminishes as one moves away from the sites. This would be because of traffic getting off and on at the interchanges along the roadways. Regional travel patterns would be similar to the Preferred Alternative. It is only when moving closer to the specific siting that changes are noticeable between the alternatives. Because the City Center Alternative would place more development at EPG and the GSA Parcel, the effects would be higher at those locations and minimal around the Main Post. Figures D-22 and D-23 in Appendix D show both the growth in traffic and the change in the traffic flow that would be caused by the BRAC action at selected locations.

Figure 4.3-21 provides another perspective on the changes in travel patterns. Total volumes crossing selected screen lines are shown. Again, the net effects on traffic volumes would decrease quickly as the distance from the post grows.



Daily Screen Line Volumes under The City Center Alternative

Fort Belvoir, Virginia

Figure 4.3-21

The screen lines north of Fort Belvoir show a slight decrease in traffic volumes over the No Action Alternative. This would be because of trips diverting from I-95 at the Fairfax County Parkway that previously traveled north to the Pentagon or other nearby employment centers; now they would travel to Fort Belvoir. To the south, the increase in daily volume from the No Action Alternative to the City Center Alternative crossing the Occoquan River would be approximately 5,000 trips (two-way). A major reason that there would be only a slight increase at this screen line is that some trips that would be caused by the BRAC action are already within the traffic stream (in the No Action Alternative), but their destination would be the Pentagon or other nearby employment centers.

Moving closer to the post, the effect on adjacent highway facilities are shown in Table 4.3-32, which shows V/C ratios, delay, and LOS for 23 key intersections. The summary of the turning movement counts for the City Center Alternative can be found in Table D-5 and Figures D-24 and D-25 in Appendix D.

Table 4.3-32
Intersection measures of effectiveness—2011 City Center Alternative

	AM Peak Hour[a]			PM Peak Hour[a]		
Intersection Location	**V/C**	**LOS**	**Delay**	**V/C**	**LOS**	**Delay**
Commerce St./Amherst Ave.	0.77	D	37.8	0.94	D	53.6
Commerce St./Backlick Rd.	0.42	C	30.4	0.80	D	52.3
Backlick Rd./Calamo St.	0.75	B	14.1	0.82	C	24.2
Loisdale Rd./Spring Mall Dr.	0.69	D	36.5	1.08	E	76.5
Franconia Springfield Parkway/Spring Village Dr.	1.43	F	200.6	1.29	F	136.1
Franconia Springfield Parkway EB Ramp/Backlick Rd.	1.00	E	68.2	0.82	D	41.9
Franconia Springfield Parkway WB Ramp/Backlick Rd.	0.91	B	12.1	0.93	C	22.1
Franconia Springfield Parkway/I-95 HOV Ramps	1.06	E	79.6	1.51	F	198.7
Franconia Springfield Parkway EB Ramp/Frontier Dr.	0.82	C	30.9	0.99	E	78.0
Franconia Springfield Parkway WB Ramp/Frontier Dr.	0.51	D	40.5	0.9	F	101.1
Franconia Springfield Parkway/Beulah St.	1.23	F	122.2	1.35	F	155.5
Fairfax County Parkway/Terminal Rd.	0.91	C	24.9	0.85	B	19.6
Fairfax County Parkway SB Ramps/Telegraph Rd.	0.56	B	19.6	0.90	C	33.7
Fairfax County Parkway NB Ramps/Telegraph Rd.	0.70	B	19.8	0.77	C	22.8
Fairfax County Parkway/John J. Kingman Rd.	0.81	D	45.8	1.21	F	120.2
Telegraph Rd./Beulah St.	0.65	D	36.1	0.72	C	30.7
Telegraph Rd./S. Van Dorn St.	0.90	C	30.7	1.04	D	47.3
U.S. Route 1/Telegraph Rd. - Old Colchester Rd.	0.82	D	54.5	0.76	E	62.9
U.S. Route 1/Fairfax County Parkway	1.02	E	62.0	0.97	D	45.3
U.S. Route 1/Backlick Rd. - Pohick Rd.	1.12	E	71.5	1.17	F	157.9
U.S. Route 1/Belvoir Rd.	0.95	C	28.4	0.83	C	23.4
U.S. Route 1/Old Mill Rd.	0.96	F	82.8	0.99	E	79.4
Loisdale Road/GSA Access Road	1.65	F	120.5	1.16	F	92.1

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM

The intersections adjacent to Fort Belvoir along U.S. Route 1, Telegraph Road, and Fairfax County Parkway would perform at a similar LOS as in the No Action Alternative, with some increase to through traffic due to trip diversion. This would be expected, as no new major development would occur at North or South Posts. A total of seven intersections would experience a degradation of LOS under the City Center Alternative in the AM and PM peak hour.

The results of the LOS analysis indicate that if access to EPG were made via Neuman Street, an interchange would be required to mitigate the effects. Having only a signalized intersection would result in severe congestion, as shown in Table 4.3-32. The Fairfax County Parkway section through EPG would also need to be widened beyond the current funded plan of four lanes to reduce congestion under the City Center Alternative.

The hours of congestion along the I-95 corridor would not be expected to increase much because the growth in demand would be less than 5 percent if the City Center Alternative were to be implemented. The period of congestion is likely to lengthen by 30 to 45 minutes on the I-95 corridor, even with the I-95 widening project being completed before 2011. Some localized congestion points might result with the increased traffic volumes within the I-95/Fairfax County Parkway interchange. The analyses assumed completion of the I-95 Fourth Lane Project.

Congestion along U.S. Route 1 would increase by 30 minutes over the No Action Alternative under the City Center Alternative because of increased through movement if no widening or improvements of U.S. Route 1 occurred. Increased through traffic, likely caused by a diversion of traffic because of implementing the City Center Alternative, traveling through Fort Belvoir on U.S. Route 1 would increase delays for vehicles exiting South Post via Tulley Gate. Congestion along Fairfax County Parkway (east of I-95) would be similar to that of the No Action Alternative, because no new development would occur at Main Post.

The GSA Parcel would require major access improvements to satisfy demand from the influx of WHS employees. Because of site constraints, access would be limited to Loisdale Road. The Franconia-Springfield Parkway and Metro station limit access to the north, and the location of the CSX railroad prevents access to the east. Thus, Loisdale Road is the only viable means of ingress and egress for the GSA Parcel. Congestion on Loisdale Road would last all day if this site were developed as proposed; therefore, it would need to be widened to four lanes between Spring Mall Road to the GSA Parcel access point, with major intersection improvements. Even with these improvements, access capacity would be limited to 1,000 to 1,500 vph. This limitation of capacity would require that WHS stagger workers' arrival across 5 hours to avoid severe congestion on Loisdale Road. This drives the need for an additional access point from the Franconia-Springfield Parkway, which would require a costly reconfiguration of the Franconia-Springfield Parkway.

Overall, at a regional level, traffic patterns under the City Center Alternative would be similar to those of the Preferred Alternative. It is only when moving closer to the Main Post, EPG, and the GSA Parcel that the differences would become apparent. The differences would be because of the different land use in each alternative. This would be from the siting of the additional 22,000 employees under the BRAC action. The Preferred Alternative would split the employment between EPG and Main Post (North and South Posts), while the City Center Alternative would locate all employees at EPG and the GSA Parcel.

In the areas immediately surrounding EPG, severe congestion lasting 3 to 4 hours would occur if mitigating actions including transportation improvements were not taken. This range is approximately the same as would be expected under the Preferred Alternative around the EPG

site. With only the currently funded improvements, the available access to EPG could process between 2,000 and 3,000 vph, roughly 55 to 70 percent of the projected peak-hour demand. This traffic would cause queuing from the access point off of the Fairfax County Parkway and would back up onto the I-95 corridor, affecting through movement vehicles. The spillback in this area would be similar to that of the Preferred Alternative. This queuing would translate into an extension of the AM congested period by one hour. In the evening peak period, egress from EPG would be slow and spread over several hours. As a result, the effect on the regional transportation facilities in the PM peak period would be limited as compared to the AM peak period.

The effect of not improving the Fairfax County Parkway beyond the currently funded improvement would be that it would cause vehicles to find alternative routes around the EPG area to avoid the congestion at EPG. Such routes would include Backlick Road and Rolling Road to the south. Congestion spillover onto local roadways would decrease the quality of life for local residents and could potentially create undesirable conditions for the residents with the higher traffic volumes.

Backlick Road would also experience an increase in traffic flows if only the currently approved funded improvements were provided because Barta Road would be a secondary access point to EPG. Limited capacity exists along the Backlick Road corridor to handle much increase in traffic flow—the constraint being downtown Springfield which is immediately to the north. This constraint would also cause severe congestion on the local roadways.

If roadway improvements beyond the currently funded improvements were to occur, site traffic could be dispersed across multiple points, reducing the effects to any one location. The City Center Alternative would have little effect on the roadways surrounding the Main Post because the alternative would not increase the employment population on the Main Post. The traffic volumes on the Fairfax County Parkway east of I-95 would increase but would not prompt the need for major improvements because the increase in traffic would be in the off-peak direction of the parkway. Improvements would be required to Loisdale Road to provide for improved access to the GSA Parcel to accommodate the influx of WHS employees.

Transit Systems. Mode split—the fraction of the employee population that uses mass transit—for Main Post is 1 to 2 percent. The rail portion of the transit system does not directly serve the Main Post. Implementing the BRAC-related projects, which would affect the vast majority of new personnel at Fort Belvoir, would likely not adversely affect use of the rail systems because of the continued lack of direct service. Consequences of implementing the City Center Alternative would be similar with respect to the bus portion of the transit system. Demand for additional bus services could evolve, resulting in higher ridership figures. The local bus routes, however, tend to be limited to the study area, which represents only a small fraction of the locations where the employee population would reside. The GSA Parcel is potentially accessible from the rail system by foot, assuming that adequate walkways are provided as part of the detailed site design process. A 1 to 2 percent mode share equates to approximately 200 to 450 daily riders. Achieving a 10 percent mode share would remove approximately 725 vehicles from the roadway in the peak hour; this number includes both the Main Post and EPG/GSA Parcel.

4.3.6.3 Other Projects Sitings/Operations

No effects would be expected. Other projects associated with BRAC implementation (see Section 2.2.2.3) include projects such as infrastructure, the USANCA support facility, access control point, barracks modernization, and MWR family travel camp. These projects generally

involve a relatively minor or negligible number of personnel that would be using the transportation system.

4.3.6.4 Mitigation

Implementing the City Center Alternative would result in significant adverse effects to the transportation system with respect to congestion and increased travel time. These effects would lead to reduced employee productivity, higher commuting costs, and degradation of quality of life. These effects would not be limited to personnel at Fort Belvoir. Through commuters and the local community would also be affected.

This section identifies potential mitigation actions to avoid, reduce, or compensate for the magnitude of predicted effects. The mitigation actions are evaluated for their efficacy so that an informed decision can be made regarding their adoption and implementation.

Road Network and Associated Facilities. Proposed mitigating actions for the City Center Land Use Alternative have been identified. These include improvements to highway and transit facilities and potential transit service improvements.

1. *Reconstruction of the I-95/Fairfax County Parkway Interchange.* This measure would reconstruct the I-95/Fairfax County Parkway interchange to add HOV connections to and from the south. It would encourage new HOV trips between Fort Belvoir and points to the south on I-95, reducing SOV trips and, thus, overall demand on the road network. This improvement would provide better traffic operations for the increased traffic flows from EPG and from the Main Post, reducing delays during the peak hours. Estimated cost: $75 million.
2. *Additional or Improved Ramps to and from I-95 for EPG.* This measure would add new connections from I-95 into EPG. It would reduce the vehicular demand at the I-95/Fairfax County Parkway interchange and on the Parkway through EPG by providing alternative access options, such as (1) direct connection for SB I-95 traffic into EPG at Fairfax County Parkway, (2) SB I-95 flyover ramp to Backlick Road, with a direct connection into EPG, and (3) NB I-95 HOV traffic to I-95 GP lanes and flyover ramp connection into EPG for NB HOV and egress for SB HOV vehicles. Estimated cost: $40 million.
3. *Widen EPG Segment of Fairfax County Parkway.* Widening the parkway from four to six lanes through EPG would increase capacity on the parkway to accommodate the additional vehicular demand due to development at EPG. This improvement includes the costs for a reconfigured interchange. Estimated cost: $50 million.
4. *Fairfax County Parkway Improvements between I-95 and John J. Kingman Road.* Improvements to the Parkway between I-95 and Kingman Road would provide additional roadway capacity, via intersection improvements and widening, to improve traffic flow and reduce congestion. Estimated cost: $40 million.
5. *Rideshare Facility.* A rideshare facility on EPG would encourage a shift from SOV to HOV trips. This shift would reduce traffic volumes on the roadway, which, in turn, would reduce the effects of the development. Estimated cost: $15 million.
6. *Transit Center/Facilities.* This measure would construct a transit center and other facilities to provide for additional choices of travel over the SOV. This improvement would be developed in conjunction with increased bus service. Siting has not been determined. Estimated cost: $30 million.

7. *Additional EPG Access.* This measure would provide multiple choices for access to EPG, which would diffuse traffic to multiple points and provide alternative routes for employees and visitors if one access is blocked. The access would be from I-95 in the vicinity of the Newington interchange, enabling HOV access to and from EPG. Estimated cost: $15 million.
8. *Intersection Improvements.* Intersection improvements at key locations such as along Backlick Road (north of Franconia Springfield Parkway), Loisdale Road at Spring Mall Drive, Franconia-Springfield Parkway ramps at Frontier Drive, intersections along U.S. Route 1 through Fort Belvoir, and Franconia-Springfield Parkway at Beulah Street, would improve traffic flow and reduce congestion. Improvements could include signalization, additional turning lanes, lengthening of turning lanes, or other measures appropriate to an intersection. Estimated cost: $15 million.
9. *Franconia-Springfield Parkway/Neuman Street Interchange.* This measure would replace the existing at-grade intersection on the Franconia-Springfield Parkway with a full interchange at Neuman Street. An interchange would provide additional access to EPG from the north by creating a direct connection between the Franconia-Springfield Parkway and EPG in conjunction with the subsequent improvement. This improvement would reduce congestion on the Fairfax County Parkway through EPG by diverting traffic to this point. For employees living north or west of EPG, this measure would provide a shorter route and thereby reduce commuting time. Estimated cost: $50 million.
10. *Access to EPG via Neuman Street.* This project would provide roadway access to EPG from the north, with entry into EPG occurring east of Accotink Creek. Existing residences and a building used as a church would have to be removed. Estimated cost: $26 million.
11. *Improvements to Beulah, Newington, and Telegraph Roads.* This measure would widen roadways and provide other improvements, such as signalization and safety measures (e.g., improved crosswalks, lighting), to enhance flow of the increased traffic volumes caused by BRAC. Estimated Cost: $50 million.
12. *Franconia-Springfield Parkway Improvements.* This improvement would construct a direct connection from the parkway to the GSA Parcel would alleviate congestion on Loisdale Road. Estimated cost: $50 million.
13. *Improvements to Loisdale Road for Additional GSA Parcel Access.* This improvement would provide needed capacity improvements on Loisdale Road at the intersection with the access point into the GSA Parcel. This improvement would help alleviate congestion because of the influx of WHS employees at this site. Estimated cost: $5 million.

Total estimated cost for the foregoing mitigation measures would be $461 million. This figure excludes contingency costs and costs associated with supervision, inspection, and overhead. More detailed studies and designs will be required, including potential NEPA studies.

The transportation network has been evaluated from a regional, sub-regional, and local perspective, and the effect on the transportation system have been quantified and compared to both existing conditions and the No Action Alternative. On the basis of these comprehensive comparisons, improvements have been identified that would mitigate most of the adverse effects of the City Center Alternative on the transportation system in the immediate area of Fort Belvoir. The additional site entrance points, improved site circulation, improved interchanges, and widened roadways would result in reduced delay, limit the possibility of Fort Belvoir traffic backing up onto the major regional highways, and improve the operation of the intersections

within the area of influence of the BRAC-related actions. As engineering and design work proceeds, detailed traffic operations studies can be completed to ensure that intersection levels of service are maintained or improved in the immediate area of the installation. The GSA Parcel would require access to the Franconia-Springfield Parkway, which would result in major reconstruction of that segment of roadway.

On a regional level, the relocation of 22,000 jobs toward the south of the metropolitan area, combined with regional projects, such as the widening of I-95 and construction/implementation of HOT lanes in the I-95 Corridor, would be expected to lead to additional travel demand from the south. With no plans for additional capacity in the corridor beyond the planned widening and HOT lanes, the analysis indicates that the congested period during the morning and afternoon would be extended by 30 to 45 minutes. Traffic traveling toward Fort Belvoir on regional facilities could experience some limited congestion during the peak hour, but that direction of travel remains the "reverse commute," with heavier traffic headed towards Tyson's Corner, Arlington, Alexandria, and Washington, DC.

Transit System. This section describes proposed mitigation measures to the transit system to help avoid, reduce, or compensate for the effects associated with implementing the City Center Alternative. Mitigation measures are appropriate for bus service but none are identified for rail services. Expansion or improvements to rail service could occur in the future on the basis of further evaluation of the transportation system undertaken as a result of experiences related to BRAC or other developments in the study area.

Initial bus service concept plans have been developed based on the origin data for the BRAC employees destined for EPG and the GSA Parcel. These are preliminary concept plans intended to serve as a guide to the levels of transit service that could be required to serve both a 5 and 10 percent transit mode share to EPG and the GSA Parcel. Detailed route and service planning would be conducted later. The purpose of these concept plans is to demonstrate that feasible transit service options are viable to support the assumed mode shares.

Five basic service areas have been identified. These basic service areas are identical to those identified in the Preferred and Town Center Alternatives; however, the appropriate service routes might vary, because all routes would be serving multiple destination points, differing from the Preferred Alternative. The service areas are as follows:

- Southern Prince William County (Dumfries, Cherry Hill, and Powells Creek areas)
- Northern Prince William County (Woodbridge, Dale City, and Lake Ridge areas)
- U.S. Route 1 in Fairfax County (Lorton, Fort Belvoir, Mount Vernon, Hybla Valley, Beacon Hill, and Huntington areas)
- Western Fairfax County (Burke, Fairfax, and Chantilly areas and, possibly, the Herndon and Reston areas)
- Franconia-Springfield Metro station

EPG/GSA Parcel Service Concept for 10 Percent Mode Share

- *Southern Prince William County (3 Peak Hour Buses).* Bus service on a 20-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.

- *Northern Prince William County (5 Peak Hour Buses).* A 12-minute headway is assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.
- *U.S. Route 1 in Fairfax County (2 Additional Peak Hour Buses).* Two additional buses per hour would be added to existing services along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Western Fairfax County (4 Additional Peak Hour Buses).* Four additional buses per hour would operate in the Fairfax County Parkway corridor to the Burke area.
- *Franconia-Springfield Metrorail (5 Peak Hour Buses).* A shuttle linking the Main Post to the Franconia-Springfield Metro station would be needed. Pending a refinement of the numbers, a 12-minute headway on this shuttle is assumed. This service would link those commuters with access to one of the regional Metro lines to the Main Post area.

EPG/GSA Parcel Service Concept for 5 Percent Mode Share

- *Southern Prince William County (2 Peak Hour Buses).* Bus service on a 30-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (2 Peak Hour Buses).* A 30-minute headway is also assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.
- *U.S. Route 1 in Fairfax County (2 Additional Peak Hour Buses).* Two additional peak hour vehicles would provide service along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Western Fairfax County (3 Additional Peak Hour Buses).* Three additional buses per hour would operate in the Fairfax County Parkway corridor to the Burke area. This service would require a transfer to shuttle bus at the Franconia-Springfield Metro station.
- *Franconia-Springfield Metrorail (5 Additional Peak Hour Buses).* A 12-minute headway on the shuttle linking the Main Post to the Franconia-Springfield Metro station is also assumed under the 5 percent mode share scenario.

Bus service of a high enough quality to realize a 5 to 10 percent mode share for transit would complement the road network mitigation actions and help to reduce congestion and limit vehicle delays resulting from the City Center Alternative. Achieving a 10 percent mode split would reduce the number of vehicles accessing the Fort Belvoir area in the peak hour by nearly 725 using the MWCOG average auto occupancy of 1.1 passengers per vehicle. A 5 percent mode share for transit would reduce the number of peak hour vehicles by approximately 360.

The foregoing expanded bus services would be supplemented by internal circulator bus systems designed to provide more direct access to various areas of Fort Belvoir not directly accessible from the regional transit services. Such circulator buses would operate within the grounds of Fort Belvoir on schedules designed to meet the needs of employees.

The estimated cost of the transit-related mitigation actions would be $10 to $12 million in initial capital costs and $6 to $9 million in annual operating expenses depending on the ultimate operational requirements of the system. Note that these estimates are preliminary order-of-

magnitude costs. More precise cost estimates can be prepared when site circulation and security plans are finalized and detailed route and service planning are completed.

Transportation Management Plan—Framework. Effects associated with implementing the City Center Alternative could be reduced by appointing a TDMC and deploying a TMP. Such a mitigation action, described at the end of Section 4.3.4, could apply equally to implementation of the City Center Alternative.

The proposed mitigations have been examined for the efficacy of mitigating the effects of the City Center Alternative. Table 4.3-33 presents the results of the evaluation.

Table 4.3-33
Efficacy of the transportation mitigation for the City Center Alternative

Mitigation Measure	Before	After	Comments
1) Improvements at I-95/Fairfax County Parkway interchange with HOV connections	LOS F 50-100 HOV trips during peak periods on I-95 corridor destined to Fort Belvoir	LOS D 200-300 HOV trips during peak periods on HOV ramps	With directional ramps, LOS D could be achieved, but modifications of interchange would require coordination with I-95 HOT Lanes Project Each HOV vehicle would remove 2 SOV vehicles from the traffic stream
2) Additional EPG Access SB I-95 at Backlick flyover SB I-95 direct connections at Fairfax County Parkway	 N/A N/A	 LOS C, with expected 600 vph on ramp LOS D, with expected 800 vph on ramp	Final Site Access plans would ensure LOS D or better SB to EPG connections would reduce the sizing of improvements needed at the I-95/Pkwy interchange Volumes on the Parkway would decrease by 1,500, LOS = D
3) Modified section of Fairfax County Parkway through EPG	LOS = F	LOS = D	Analyzed in conjunction with number 2. Modified interchange design at Rolling Road to provide improved connections into EPG
4) Fairfax County Parkway Improvements	V/C = 0.85 or higher in peak direction, LOS F	V/C = 0.65 in peak direction, LOS = D	
5) Rideshare facility	N/A	Allows for 200-300 HOV trips per hour to form at EPG	Each HOV vehicle would remove 2 SOV vehicles from the traffic stream.
6) Transit Center/Facilities (in conjunction with increased bus services)	N/A	5% mode share would attract 350 riders in the peak period, while a 10% mode share would attract 700-750 riders	To be developed with increased bus services. One full bus can carry 40 people, so would remove 40 SOV trips.
7) Additional EPG access	N/A	LOS A, with expected 200-300 vph	Provides for NB HOV direct access.

Table 4.3-33
Efficacy of the transportation mitigation for the City Center Alternative *(continued)*

Mitigation Measure	Before	After	Comments
8) Intersection Improvements Along Backlick Loisdale/Spring Mall Road Franconia-Springfield/Frontier U.S. Route 1/Parkway U.S. Route 1/Tulley Gate	v/c is presented as AM/PM peak hour 0.9 and 1.1 0.69 and 1.08 0.82 and 0.99 1.02 and 0.97 1.12 and 1.17	 0.7 and 0.7 0.7 and 0.87 0.8 and 0.9 0.86 and 0.96 0.99 and 0.99	Improvements would restore intersection performance similar to that under No Action Alternative
9) Franconia-Springfield/Neuman Street Interchange	LOS F in AM and PM	LOS C or better	Requires coordination with VDOT
10) Access to EPG via Neuman Street	N/A	LOS C Reduces volume on Parkway by 500 vph	Needs improvement 11 and likely requires property acquisition
11) Roadway Improvements Beulah Street Newington Road Telegraph Road	v/c is presented as AM/PM peak hour 1.02 and 1.14 0.86 and 0.8 1.12 and 1.13	 0.8 and 0.85 0.45 and 0.4 0.7 and 0.65	Improves traffic flow
12) Access to GSA site via Franconia-Springfield Pkwy	N/A	LOS C or better	Alleviates congestion on Loisdale Road
13) Improvements to Loisdale Road, including access to GSA site	LOS F in AM and PM	LOS C in AM and PM	Requires improvement number 12

4.3.7 ENVIRONMENTAL CONSEQUENCES OF SATELLITE CAMPUSES ALTERNATIVE

4.3.7.1 Land Use Plan Update

No effects would be expected. Adoption of a revised land use plan would not, in the absence of additional activities such as facilities development, result in effects to the transportation system. Effects to the transportation system would not occur until further development occurred in accordance with the terms of the new land use plan. The Satellite Campuses Land Use Plan would not, by itself, affect the transportation system unless and until development occurred at the site. The area that would be developed would straddle U.S. Route 1. The total number of personnel relocating to Fort Belvoir would not differ from that which was presented in the section on the Preferred Alternative.

4.3.7.2 BRAC Implementation and Facilities Projects

Long-term significant adverse effects would be expected. Implementing the Satellite Campuses Alternative, when compared to the No Action Alternative (set forth in Section 4.3.3), would worsen traffic conditions in the immediate vicinity of the Main Post. From the regional

perspective, implementation would produce a combination of minor (negligible) adverse and beneficial effects.

Under the Satellite Campuses Alternative, all personnel relocating to Fort Belvoir would be situated on North Post, South Post, and Davison Army Airfield. The Southwest Area of Fort Belvoir and the EPG would not be developed. The BRAC action would results in a net increase in total employment of approximately 22,000 personnel. The following subsection discusses and evaluates the effects on the transportation system that would occur as a result of assigning these additional personnel.

4.3.7.2.1 Travel Patterns to and from Fort Belvoir

The assumed residential distribution for the expected BRAC employees for the Satellite Campuses Alternative is the same as described under the Preferred Alternative.

As discussed previously under travel demand modeling, the net increase in traffic would be noticeably less than the amount of traffic headed to or from the BRAC sites because of the rebalancing of productions (households) and attractions (employment) throughout the region resulting from the relocation of employment to Fort Belvoir. In essence, the residential redistribution within the region would increase the portion of post traffic that is coming from the south during the AM peak period. A potential consequence of the additional post traffic is that it might force traffic away from U.S. Route 1 onto adjacent roadways as drivers attempt to avoid any consequence of the additional Fort Belvoir traffic. I-95 and Telegraph Road might become alternative roadway paths, depending on the length and final destination of those trips.

The MWCOG model distributed the decrease in employment to other traffic analysis zones across the region because the model process was to control the amount of production in the region. Residential locations of employees of NGA and WHS would slowly shift towards that of Fort Belvoir, the same distribution assumed for the Preferred Alternative. Thus, regional travel would be similar to that of the Preferred Alternative.

Table 4.3-34 presents the population and employment levels, which are also illustrated in Figure D-26 in Appendix D for the 2011 conditions for the Satellite Campuses Alternative. Table 4.3-35 presents the production and attractions for the study area. The population and employment levels are identical to the other alternatives. The specific siting of the employees compared to the other alternatives (Main Post vs. EPG vs. GSA Parcel) does shift the productions and attractions; however, the overall study area remains similar between the alternatives.

Fort Belvoir would represent 2.9 and 33.4 percent of the population and employment, respectively, within the study area, and the post would account for only 8.6 percent of the attractions in the study area. The ratio of jobs to residents within the study area would be 0.43, or 43 jobs per 100 residents, an increase of 7 jobs per 100 residents over the No Action Alternative.

Fort Belvoir would represent approximately 6.1 percent of the total employment within all of Fairfax County in the Satellite Campuses Alternative, an increase of 2.9 percent over the No Action Alternative. Within the transportation Corridor 8, Fort Belvoir would be approximately 10.4 percent of the total employment, a near doubling of the percentage of the Corridor total over the No Action Alternative. This corridor is important because it is the primary route of travel for most existing employees at Fort Belvoir and is expected to be the main travel route for the employees relocated to Fort Belvoir. The percentage change over the No Action Alternative is

Table 4.3-34
Population and employment for existing conditions (2006), 2011 No Action Alternative, and 2011 Satellite Campuses Alternative

	Population			Employment		
District	Existing	No Action	Satellite Campuses	Existing	No Action	Satellite Campuses
Laurel Hill	13,470	25,121	25,121	3,547	3,996	3,996
Pohick	50,826	51,766	51,766	3,648	3,849	3,849
Lorton South of U.S. Route 1	14,476	18,200	18,200	9,067	11,233	11,233
I-95 Industrial Area	2,092	2,175	2,175	8,605	8,683	8,683
Franconia-Springfield Transit Area	2,727	2,821	2,821	5,940	6,764	6,764
Springfield Community Business Center	1,306	1,483	1,483	2,074	2,141	2,141
Springfield	31,263	32,201	32,201	10,850	11,387	11,387
EPG	0	0	0	45	45	0
Mason Neck	2,785	5,552	5,552	438	464	464
Fort Belvoir (Main Post)	7,623	7,623	9,387	23,266	23,267	46,753
Mount Vernon	93,783	102,230	102,230	19,681	21,457	21,457
Rose Hill	67,179	70,513	70,513	20,352	23,157	23,157
Total Study Area	287,530	319,685	321,449	107,513	116,443	139,884
Rest of Virginia	2,142,682	2,399,710	2,399,710	1,258,264	1,427,055	1,430,055
Maryland	3,318,699	3,483,648	3,483,648	1,723,958	1,870,517	1,870,517
District of Columbia	583,733	615,375	615,375	752,719	790,205	790,205
West Virginia	47,735	52,555	52,555	15,173	17,191	17,191
Out of State	0	0	0	0	0	0
Total Outside Study Area	6,092,849	6,551,288	6,551,288	3,750,114	4,104,968	4,107,968
Regional Total	**6,380,379**	**6,870,973**	**6,872,737**	**3,857,627**	**4,221,411**	**4,247,852**

Source: VHB, 2006.

The same for the Satellite Campuses Alternative because it is for the Preferred Alternative, as the total employment levels would not change between alternatives.

Table 4.3-36 presents the internal trips to the study area, external trips destined to the study area, and external trips that originate within the study area. The table illustrates that most of the trips that have an origin or a destination within the study area originate from or are destined to points outside of the study area, as opposed to being an internal trip within the study area (i.e., a trip beginning and ending within the study area). The table does not include external trips that pass through the study area (i.e., a trip from Fredericksburg to Washington, DC, traveling on I-95). The total number of study area trips is similar to the other alternatives, with minor differences because of the specific siting of the employees.

Table 4.3-35
Productions and attractions for existing conditions (2006), 2011 No Action Alternative, and 2011 Satellite Campuses Alternative

	Productions			Attractions		
District	**Existing**	**No Action**	**Satellite Campuses**	**Existing**	**No Action**	**Satellite Campuses**
Laurel Hill	31,891	52,247	52,194	31,825	52,327	52,227
Pohick	109,597	110,862	109,099	109,719	110,848	109,094
Lorton South of U.S. Route 1	43,441	55,677	54,948	43,430	55,560	54,790
I-95 Industrial Area	20,802	20,880	20,167	20,753	20,969	20,239
Franconia-Springfield Transit Area	37,799	41,046	40,668	38,044	41,275	40,800
Springfield Community Business Center	11,586	12,158	12,029	11,601	12,053	12,030
Springfield	98,365	101,148	99,942	98,274	101,153	100,173
EPG	81	89	0	87	102	0
Mason Neck	5,979	11,012	10,901	5,948	10,998	10,886
Fort Belvoir (Main Post)	35,176	35,177	78,866	35,342	35,343	77,433
Mount Vernon	250,418	271,298	269,378	250,606	271,297	269,462
Rose Hill	184,223	197,462	195,489	184,200	197,283	195,393
Total Study Area	829,357	909,055	943,680	829,830	909,209	942,528
Rest of Virginia	6,952,561	7,768,560	7,729,361	6,952,125	7,768,134	7,729,465
Maryland	10,587,588	11,254,561	11,239,511	10,586,616	11,252,945	11,238,622
District of Columbia	1,572,672	1,614,479	1,605,988	1,572,360	1,614,396	1,606,036
West Virginia	153,721	172,023	171,906	153,849	172,056	171,914
Out of State	715,116	828,980	829,045	716,236	830,919	830,927
Total Outside Study Area	19,981,658	21,638,603	21,575,812	19,981,186	21,638,450	21,576,964
Regional Total	**20,811,015**	**22,547,658**	**22,519,492**	**20,811,015**	**22,547,658**	**22,519,492**

Source: VHB, 2006.

Table 4.3-36
Study Area Trips – 2011 Satellite Campuses Alternative

Time	Internal Trips Within Study Area	External Trips Ending in Study Area	External Trips Beginning in Study Area
AM Peak	78,796	63,597	78,387
PM Peak	138,545	107,970	97,503
Off-Peak	341,828	211,792	208,622
Daily	**559,169**	**383,359**	**384,511**

4.3.7.2.2 Performance under Expected Conditions

Few changes to Northern Virginia's transportation system are expected over the next 5 years because funding shortfalls and the resulting delays in implementing long-term transportation plans. The modeling assumed that the off-post transportation improvement projects identified in the No Action Alternative would be in place for the Satellite Campuses Alternative.

One key finding from the analyses is that the Fairfax County Parkway would need to be widened from I-95 to U.S. Route 1 to accommodate the increased travel demand. The cross-section would need to change from four lanes (2-2 configuration) to at least eight lanes, such as a 3-2-3 configuration, in which the middle two lanes would be reversible.

Road Network. Increased traffic to and from Fort Belvoir would account for 30 to 40 percent of the traffic flow on roadways adjacent to the gates and quickly drop to less than 10 percent of the traffic, as shown in Figures D-27 and D-28 in Appendix D.

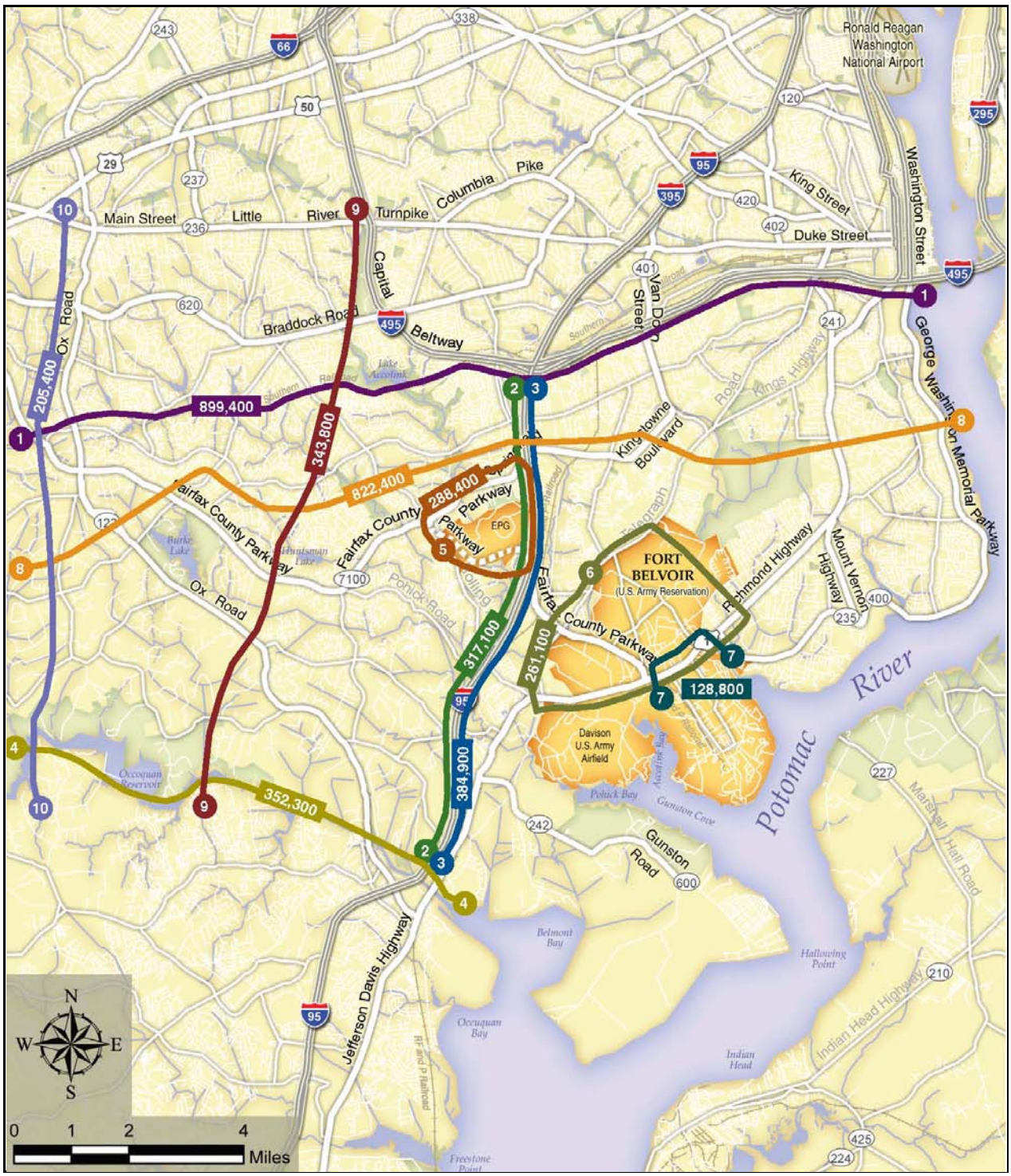
The area of influence shows that the effects of BRAC-related traffic on roadways diminishes as one moves away from the sites. This would be because of traffic getting off and on at the interchanges along the roadways. Regional travel patterns would be similar to the Preferred Alternative. It is only when moving closer to the specific siting that changes are noticeable between the alternatives. As the Satellite Campuses Alternative would place more development at the Main Post, including Davison Airfield, the effects would be higher in the vicinity of Main Post and less pronounced to the west when compared to the Preferred Alternative. Figures D-29 and D-30 show both the growth in traffic and the change in the traffic flow that would be caused by BRAC-related actions at selected locations. On the regional roadways, the growth in traffic would be less than the percentage of BRAC traffic in the overall traffic stream because some BRAC traffic is already in the existing traffic stream, as previously described.

Figure 4.3-22 provides another perspective on the changes in travel patterns. Total volumes crossing selected screen lines are shown. Again, the net effects on traffic volumes would decrease quickly as the distance from the post grows. The screen lines show that the traffic effects from the Satellite Campuses Land Use Alternative is higher around Main Post and is less west of I-95 when compared with the Preferred Alternative.

The screen lines north of Fort Belvoir show that there would be a slight decrease in traffic volumes over the No Action Alternative. This would be because of trips diverting from I-95 at the Fairfax County Parkway that previously traveled north to the Pentagon or other nearby employment centers; now they would travel to Fort Belvoir. To the south, the increase in daily volume from the No Action Alternative to the Satellite Campuses Alternative crossing the Occoquan River would be approximately 5,000 trips (two-way). A major reason for there being only a slight increase at this screen line would be that some trips that would be caused by the BRAC action would already be within the traffic stream (in the No Action Alternative), but their destination would be the Pentagon or other nearby employment centers.

Moving closer to Fort Belvoir, the effects on adjacent highway facilities are shown in Table 4.3-37, which shows V/C ratios, delay, and LOS for 23 selected locations. The summary of the turning movement counts for the Satellite Campuses Alternative can be found in Table D-6 and Figures D-31 and D-32 in Appendix D.

The intersection MOEs would deteriorate over the No Action Alternative and existing conditions because the traffic volumes at these intersections would be higher from the additional



Daily Screen Line Volumes under The Satellite Campuses Alternative

Fort Belvoir, Virginia

Figure 4.3-22

Table 4.3-37
Intersection measures of effectiveness—2011 Satellite Campuses Alternative

	AM Peak Hour[a]			PM Peak Hour[a]		
Intersection Location	**V/C**	**LOS**	**Delay**	**V/C**	**LOS**	**Delay**
Commerce St./Amherst Ave.	0.75	D	36.8	0.87	D	50.1
Commerce St./Backlick Rd.	0.41	C	30.6	0.80	D	52.2
Backlick Rd./Calamo St.	0.75	B	12.9	0.80	C	23.2
Loisdale Rd./Spring Mall Dr.	0.49	C	24.8	0.91	D	46.7
Franconia Springfield Parkway/Spring Village Dr.	1.05	E	63.6	1.09	F	86.2
Franconia Springfield Parkway EB Ramp/Backlick Rd.	0.99	E	67.1	0.82	D	40.4
Franconia Springfield Parkway WB Ramp/Backlick Rd.	0.91	B	10.5	0.92	C	22.9
Franconia Springfield Parkway/I-95 HOV Ramps	1.00	E	55.6	1.37	F	179.7
Franconia Springfield Parkway EB Ramp/Frontier Dr.	0.82	C	32.1	0.90	E	56.1
Franconia Springfield Parkway WB Ramp/Frontier Dr.	0.52	D	36.2	0.87	F	93.4
Franconia Springfield Parkway/Beulah St.	1.20	F	112.2	1.41	F	161.8
Fairfax County Parkway/ Terminal Rd.	1.16	F	96.9	1.04	D	49.6
Fairfax County Parkway SB Ramps/Telegraph Rd.	0.63	C	21.7	0.86	C	32.6
Fairfax County Parkway NB Ramps/Telegraph Rd.	0.77	C	22.6	0.76	C	20.9
Fairfax County Parkway/John J. Kingman Rd.	1.19	F	101.5	1.7	F	248.7
Telegraph Rd./Beulah St.	0.73	D	39.5	0.67	C	32.1
Telegraph Rd./S. Van Dorn St.	0.97	D	43.6	1.04	D	47.3
U.S. Route 1/Telegraph Rd.—Old Colchester Rd.	0.85	E	61.4	0.82	F	80.8
U.S. Route 1/Fairfax County Parkway	1.15	F	80.5	1.1	E	71.4
U.S. Route 1/Backlick Rd.—Pohick Rd.	1.08	E	69.6	1.23	F	193.5
U.S. Route 1/Belvoir Rd.	1.05	D	48.6	0.96	D	42.6
U.S. Route 1/Old Mill Rd.	1.03	F	101.1	1.05	F	87.5
Loisdale Road/GSA Access Road	0.75	A	7.8	0.53	A	5.1

[a]AM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM

employment, especially at the intersections adjacent to Fort Belvoir. A total of 10 intersections in each the AM and PM peak hour, would experience a degradation in LOS under the Satellite Campuses Alternative. These intersections are along U.S. Route 1 adjacent to the Main Post and the intersection of Fairfax County Parkway and Kingman Road. These intersections, which are the main gateways to North and South Posts, perform at LOS F with excessive delays.

The hours of congestion along the I-95 corridor would not be expected to increase much because the growth in demand would be less than 5 percent if the Satellite Campuses Alternative were to be implemented. The period of congestion is likely to lengthen by 30 to 45 minutes on the I-95 corridor, even with the I-95 widening project being completed before 2011. Some localized congestion points might result with the increased traffic volumes within interchanges along the corridor because of BRAC-related traffic accessing the interstate, such as the I-95/Fairfax County Parkway interchange.

Congestion along U.S. Route 1 would increase to 5 to 6 hours in the peak direction of travel without widening U.S. Route 1, and the off-peak direction would become congested as trips from the north in the AM peak period increase. This occurrence illustrates the need for a widened U.S. Route 1 with interchanges for Main Post access. Likewise, the Fairfax County Parkway would

also be congested 3 to 4 hours in the peak direction of travel in each peak period if no improvements were made.

The intersection of Fairfax County Parkway and John J. Kingman Road would be a major bottleneck to the transportation system in the Satellite Campuses Alternative if no roadway improvements were made at this location. Severe congestion would result from the increase in travel demand resulting from the doubling of the employment levels at Fort Belvoir Main Post, including development at Davison Airfield. If improvements were not made to the major roadways approaching the Post, the traffic would spill onto adjacent roadways, potentially creating congestion on those facilities; such roadways include Beulah Street, Hayfield Road, and South Kings Highway.

In the areas immediately surrounding Fort Belvoir, severe congestion would last from 5 to 6 hours during each of the morning and evening peak periods unless major improvements were included as part of the access improvements. The congestion would spill into the off-peak hours, effectively extending the peak periods into a larger portion of the day. Without major improvements to U.S. Route 1 and the Fairfax County Parkway, these facilities would become congested because they are the major corridors for the post's traffic.

More so, the Fairfax County Parkway could potentially spill back onto I-95 because the parkway would have insufficient capacity to handle the increased demand. This traffic would also spill onto adjacent roadways, such as Telegraph Road and Beulah Street, and would potentially create undesirable conditions of higher traffic volumes for the local residents.

The severe congestion on the major roadways adjacent to Fort Belvoir would affect the ability of Fort Belvoir's traffic to exit during the PM peak hour, especially via the three main access points: Pohick Road (via Tulley Gate), Belvoir Road (via Pence Gate), and Kingman Road. The inability of the major roadways to handle the demand, unless increased capacity were to be provided, would cause spillover onto the adjacent local roadways such as Telegraph Road, Beulah Street, and Mount Vernon Highway. Traffic spillover onto local roadways would adversely affect the local traffic.

Transit Systems. Mode split—the fraction of the employee population that would use mass transit—for the Main Post is 1 to 2 percent. The rail portion of the transit system does not directly serve the Main Post. Implementing the BRAC-related projects, which would affect the vast majority of new personnel at Fort Belvoir, would likely not adversely affect use of the rail systems because of the continued lack of direct service. Consequences of implementing the Satellite Campuses Alternative would be similar with respect to the bus portion of the transit system. Fort Belvoir is not served to any substantial degree because of the difficulties in those modes' gaining access to the post because of security requirements. Demand for additional bus services could evolve, resulting in higher ridership figures. The local bus routes, however, tend to be limited to the study area, which represents only a small fraction of the locations where the employee population would reside. There are only a limited number of long-haul routes serving the Main Post. A 1 to 2 percent mode share equates to approximately 200 to 450 daily riders. Achieving a 10 percent mode share would remove approximately 725 vehicles from the roadway in the peak hour; this number includes both the Main Post and EPG.

4.3.7.3 Other Projects Sitings/Operations

No effects would be expected. Other projects associated with BRAC implementation (see Section 2.2.2.3) include projects such as infrastructure, access control point, barracks

modernization, and MWR family travel camp. These projects generally involve a relatively minor or negligible number of personnel that would be using the transportation system.

4.3.7.4 Mitigation

Implementing the Satellite Campuses Alternative would result in significant adverse effects to the transportation system with respect to congestion and increased travel time. These effects would lead to reduced employee productivity, higher commuting costs, and degradation of quality of life. These effects would not be limited to personnel at Fort Belvoir. Through commuters and the local community would also be affected.

This section identifies potential mitigation actions to avoid, reduce, or compensate for the magnitude of predicted effects. The mitigation actions are evaluated for their efficacy so that an informed decision can be made regarding their adoption and implementation.

Road Network and Associated Facilities. Proposed mitigating actions for the Satellite Campuses Alternative have been identified, including improvements to highway and transit facilities and potential transit service improvements.

1. *Reconstruction of the I-95/Fairfax County Parkway Interchange.* This measure would reconstruct the I-95/Fairfax County Parkway interchange to add HOV connections to and from the south. It would encourage new HOV trips between Fort Belvoir and points to the south on I-95, reducing SOV trips and, thus, overall demand on the road network. This improvement would provide better traffic operations for the increased traffic flows to and from the Main Post, reducing delays during the peak periods. Estimated cost: $75 million.
2. *Fairfax County Parkway Improvements between I-95 and John J. Kingman Road.* Widening the Parkway to a 3-2-3 lane configuration, similar to I-395, would provide the necessary directional capacity. Additional roadway capacity, via intersection improvements and widening, would improve traffic flow and reduce congestion. The center lanes could be reserved for HOV traffic only, or be used by all traffic. Estimated cost: $100 million.
3. *Rideshare Facility.* A rideshare facility on the Main Post would encourage a shift from SOV to HOV trips. This shift would reduce traffic volumes on the roadway, which, in turn, would reduce the effects of the development. Estimated cost: $15 million.
4. *Transit Center/Facilities.* This measure would construct a transit center and other facilities to provide for additional choices of travel over the SOV. This improvement would be developed in conjunction with increased bus service. Siting has not been determined. Estimated cost: $30 million.
5. *Intersection Improvements.* Intersection improvements at key locations such as U.S. Route 1 at Backlick/Pohick (Tulley Gate), U.S. Route 1 at Belvoir Road (Pence Gate), Telegraph Road at South Van Dorn Street, and Franconia-Springfield Parkway at Beulah Street would improve traffic flow and reduce congestion. Improvements could include signalization, additional turning lanes, lengthening of turning lanes, or other measures appropriate to an intersection. Estimated cost: $20 million.
6. *Additional U.S. Route 1 Crossings for Main Post.* Two additional crossings over U.S. Route 1 would improve internal roadway circulation on Fort Belvoir between North and South Posts. The likely location of these two improvements would be between Gunston and Belvoir Roads, with final sitings dependent on the site layout of other facilities

projects (e.g., the new hospital proposed at the South Post golf course). These improvements would reduce the number of trips on off-post roadways between North and South Posts. Estimated cost: $25 million.

7. *Fairfax County Parkway/John J. Kingman Road Intersection Improvements.* Improvements would consist of upgrading the intersection into a full interchange configuration, which would reduce congestion on the parkway at this intersection and improve access to North Post. Estimated cost: $30 million.
8. *Beulah and Telegraph Roads Improvements.* This measure would widen roadways and provide other improvements, such as signalization and safety measures (e.g., improved crosswalks, lighting), to enhance flow of the increased traffic volumes caused by BRAC. Estimated cost: $80 million.
9. *Widening of U.S. Route 1 through Fort Belvoir.* Widening U.S. Route 1 through Fort Belvoir would provide needed capacity to handle the additional influx of workers on Main Post. The widening could also include interchanges at the Fairfax County Parkway and U.S. Route 1. Estimated cost: $75 million.
10. *Interchange at U.S. Route 1 and Fairfax County Parkway.* This improvement would reduce the delays at the intersection and improve traffic flows. It also could serve as a replacement to Pohick Road to provide access to Tulley Gate and provide a direct connection to South Post. Estimated cost: $55 million.
11. *Interchange at U.S. Route 1 and Telegraph Road.* Improvements would reduce the delays at the intersection and improve traffic flows. Estimated cost: $75 million.
12. *Improvements to Lorton Road.* Widening and other improvements to Lorton Road would improve the access between U.S. Route 1 and I-95 and reduce the effects on the Fairfax County Parkway. Estimated cost: $10 million.
13. *Franconia-Springfield Parkway/Neuman Street Interchange.* This measure would improve traffic flow along the Franconia-Springfield Parkway and reduce vehicular demand on the Fairfax County Parkway. Estimated cost: $50 million.
14. *Completion of Van Dorn Street/Franconia Road Interchange.* This improvement would reduce congestion at this intersection, which is an expected pathway for vehicles traveling to and from Fort Belvoir. Estimated cost: $90 million.

Total estimated cost for the foregoing mitigation measures would be $730 million. This figure excludes contingency costs and costs associated with supervision, inspection, and overhead. More detailed studies and designs will be required, including potential NEPA studies.

The transportation network has been evaluated from a regional, sub-regional, and local perspective and the effects on the transportation system have been quantified and compared to both existing conditions and the No Action Alternative. On the basis of these comprehensive comparisons, improvements have been identified that would mitigate most of the adverse effects of the Satellite Campuses Alternative on the transportation system in the immediate area of Fort Belvoir. The additional site entrance points, improved site circulation, improved interchanges, and widened roadways would result in reduced delay, limit the possibility of Fort Belvoir traffic backing up onto the major regional highways, and improve the operation of the intersections within the area of influence of the BRAC-related actions. As engineering and design work proceeds, detailed traffic operations studies would be completed to ensure that intersection levels of service are maintained or improved in the immediate area of the Fort. A major improvement

needed would be to widen the Fairfax County Parkway east of the I-95 interchange from a 4-lane cross-section to a 3-2-3 lane configuration.

On a regional level, the relocation of 22,000 jobs toward the south of the metropolitan area, combined with regional projects, such as the widening of I-95 and construction and implementation of HOT lanes in the I-95 corridor, would be expected to lead to additional travel demand from the south. With no plans for additional capacity in the corridor beyond the planned widening and HOT lanes, the analysis indicates that the congested period during the morning and afternoon would be extended by 30 to 45 minutes. Traffic traveling toward Fort Belvoir on regional facilities might experience some limited congestion during the peak hour, but that direction of travel would remain the "reverse commute," with heavier traffic headed toward Tyson's Corner, Arlington, Alexandria, and Washington, DC.

Transit System. This section describes proposed mitigation measures to the transit system to help avoid, reduce, or compensate for the effects associated with implementing the Satellite Campuses Alternative. Mitigation measures are appropriate for bus service but none are identified for rail services. Expansion or improvements to rail service could occur in the future based on further evaluation of the transportation system undertaken as a result of experiences related to BRAC or other developments in the study area.

Initial bus service concept plans have been developed on the basis of the origin data for the BRAC employees destined for Fort Belvoir and existing origin patterns for Main Post employees. These are preliminary concept plans intended to serve as a guide to the levels of transit service that could be required to serve both a 5 and 10 percent transit mode share to the Main Post. Detailed route and service planning would be conducted later. The purpose of these concept plans is to demonstrate that feasible transit service options are viable to support the assumed mode shares.

Five basic service areas have been identified. These basic service areas are identical to those identified in the other three alternatives; however, the appropriate service routes could vary because as all routes would be serving multiple destination points, different from those under the Preferred Alternative. The service areas are as follows:

- Southern Prince William County (Dumfries, Cherry Hill, and Powells Creek areas)
- Northern Prince William County (Woodbridge, Dale City, and Lake Ridge areas)
- U.S. Route 1 in Fairfax County (Lorton, Fort Belvoir, Mount Vernon, Hybla Valley, Beacon Hill, and Huntington areas)
- Western Fairfax County (Burke, Fairfax, and Chantilly areas and, possibly, the Herndon and Reston areas)
- Franconia-Springfield Metro station

Service Concept for 10 Percent Mode Share

- *Southern Prince William County (4 Peak Hour Buses).* Bus service on a 15-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (6 Peak Hour Buses).* A 10-minute headway is assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.

- *U.S. Route 1 in Fairfax County (4 Additional Peak Hour Buses).* Four additional buses per hour would be added to existing services along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Western Fairfax County (4 Additional Peak Hour Buses).* Four additional buses per hour would operate in the Fairfax County Parkway corridor to the Burke area. This service would require a transfer to shuttle bus at the Franconia-Springfield Metro station.
- *Franconia-Springfield Metrorail (10 Peak Hour Buses).* A shuttle linking the Main Post to the Franconia-Springfield Metro station would be needed. Pending a refinement of the numbers, a 6-minute headway on this shuttle is assumed. This service would link those commuters with access to one of the regional Metro lines to the Main Post area.

Service Concept for 5 Percent Mode Share

- *Southern Prince William County (2 Peak Hour Buses).* Bus service on a 30-minute headway serving the southern portion of Prince William County along the I-95/U.S. Route 1 corridor.
- *Northern Prince William County (3 Peak Hour Buses).* A 20-minute headway is assumed for service from northern Prince William County. This service would operate in the Dale City, Woodbridge, and Lake Ridge areas.
- *U.S. Route 1 in Fairfax County (2 Additional Peak Hour Buses).* Two additional peak hour vehicles would provide service along the U.S. Route 1 corridor between Huntington and the Main Post.
- *Western Fairfax County (2 Additional Peak Hour Buses).* Two additional buses per hour would operate in the Fairfax County Parkway corridor to the Burke area. This service would require a transfer to shuttle bus at the Franconia-Springfield Metro station.
- *Franconia-Springfield (10 Additional Peak Hour Buses).* A 6-minute headway on the shuttle linking the Main Post to the Franconia-Springfield Metro station is also assumed under the 5 percent mode share scenario.

Bus service of a high enough quality to realize a 5 to 10 percent mode share for transit would complement the road network mitigation actions and help to reduce congestion and limit vehicle delays because of implementing the Satellite Campuses Alternative. Achieving a 10 percent mode split would reduce the number of vehicles accessing the Fort Belvoir area in the peak hour by nearly 725 using the MWCOG average auto occupancy of 1.1 passengers per vehicle. A 5 percent mode share for transit would reduce the number of peak hour vehicles by approximately 360.

The foregoing expanded bus services would be supplemented by internal circulator bus systems designed to provide more direct access to various areas of Fort Belvoir not directly accessible from the regional transit services. Such circulator buses would operate within the grounds of Fort Belvoir on schedules designed to meet the needs of employees.

The estimated cost of the transit-related mitigation actions would be $10 to $12 million in initial capital costs and $6 to $9 million in annual operating expenses depending on the ultimate operational requirements of the system. Note that these estimates are preliminary order-of-

magnitude costs. More precise cost estimates will be prepared when site circulation and security plans are finalized and detailed route and service planning are completed.

Transportation Management Plan—Framework. Effects associated with implementing the Satellite Campuses Alternative could be reduced by appointing a TDMC and deploying a TMP. Such a mitigation action, described at the end of Section 4.3.4, could apply equally to the Satellite Campuses Alternative.

The proposed mitigations have been examined for the efficacy of mitigating the effects of the Satellite Campuses Alternative. Table 4.3-38 presents the results of the evaluation.

Table 4.3-38
Efficacy of the transportation mitigation for the Satellite Campuses Alternative

Mitigation Measure	Before	After	Comments
1) Improvements at I-95/Fairfax County Parkway interchange with HOV connections	LOS F 100-250 HOV trips during peak periods on I-95 corridor destined to Fort Belvoir	LOS D 800-1000 HOV trips during peak periods on HOV ramps	With directional ramps, LOS D could be achieved, but modifications of interchange would require coordination with I-95 HOT Lanes Project Each HOV vehicle would remove 2 SOV vehicles from the traffic stream
2) Fairfax County Parkway Improvements	V/C ranging 0.9 to 1.25, LOS = F	V/C less than= 0.8 in peak direction, LOS = D	Improves HOV traffic's LOS to B with improvements in conjunction with 1
3) Rideshare facility	N/A	Allows for 200-300 HOV trips per hour	Each HOV vehicle would remove 2 SOV vehicles from the traffic stream. Would also require improvements 1 & 2
4) Transit Center/Facilities (in conjunction with increased bus services)	N/A	5% mode share would attract 400 riders in the peak period, while a 10% mode share would attract 800-850 riders	To be developed with increased bus services. One full bus can carry 40-45 passengers; so one bus would remove 40-45 SOV trips.
5) Intersection Improvements U.S. Route 1/Pence Gate Telegraph/Van Dorn Street Franconia-Springfield/Beulah Street	v/c is presented as AM/PM peak hour 1.05 and 0.96 0.97 and 1.04 1.2 and 1.4	 0.7 and 0.65 0.6 and 0.67 1.1 and 1.2	Improvements would restore intersection performance similar to that under No Action Alternative, some intersection improvements would be completed in conjunction with the widening of Route 1.
6) Additional Crossing over U.S. Route 1	Gunston Road LOS = F	Gunston Road and new crossings LOS = C	New crossings would alleviate congestion on Gunston Road and reduces trips traveling off-post between North and South Posts
7) Fairfax County Parkway and Kingman Road interchange	LOS F in both AM and PM peaks	LOS C in both AM and PM peaks	Improvement would alleviate congestion at this intersection that occurs due to heavy turning movements

Table 4.3-38
Efficacy of the transportation mitigation for the Satellite Campuses Alternative
(continued)

Mitigation Measure	Before	After	Comments
8) Roadway Improvements Beulah Street Telegraph Road	v/c is presented as AM/PM peak hour 1.15 and 0.98 1.25 and 1.24	 0.81 and 0.76 0.78 and 0.74 0.40 and 0.45	Reduces traffic spillover into adjacent residential neighborhoods
9) Widen U.S. Route 1	v/c ranges between 1.0-1.2 in AM and 1.25-1.45 in PM	v/c ranges of 0.65-0.7 in AM; PM = 0.8-0.95	Completed in conjunction to intersection improvement and interchange construction
10) U.S. Route 1 and parkway interchange	LOS F in AM and PM	LOS D or better	Replaces access via Pohick Road (Tulley Gate)
11) U.S. Route 1 and Telegraph Road interchange	LOS E in AM and F in PM	LOS D or better	Improves traffic flow on U.S. Route 1 immediately west of Fort Belvoir
12) Widen Lorton Road	v/c of 1.05 in AM and 1.10 in PM	v/c 0.8 in AM and 0.85 in PM	Improves access from U.S. Route 1 to I-95
13) Franconia-Springfield/Neuman Street Interchange	LOS F in AM and PM	LOS C or better	Requires coordination with VDOT
14) Van Dorn Street/Franconia Interchange	LOS F in AM and PM	LOS D or better	Requires coordination with VDOT

4.3.8 SECURITY IMPLICATIONS

Evaluation of the Army's proposed action reveals that relocation of personnel to result in a net increase of 22,000 employees at Fort Belvoir would increase traffic congestion in the vicinity of the post. The adequacy of the road network to support the employees' travel, however, is not the only important matter to address. There is also a potential transportation-related effect on maintaining security on-post. Stopping vehicles entering the post to verify each occupant's identity could cause delays at the post's access control points, resulting in vehicular backups (queues) onto the local road network.

The degree or level of vehicle-checking at Fort Belvoir's access control points depends on the Force Protection Condition (FPCON) in effect at the time a vehicle seeks entry. As set forth in DoD Instruction 2000.16, *DoD Antiterrorism (AT) Standards* (October 2, 2006), Force Protection Conditions are a DoD-approved system standardizing identification of and recommending preventive actions and responses to terrorist threats against U.S. personnel and facilities. There are five FPCONs:

- *FPCON Normal.* Applies when a general global threat of possible terrorist activity exists and warrants a routine security posture
- *FPCON Alpha.* Applies when there is an increased general threat of possible terrorist activity against personnel or facilities, the nature and extent of which are unpredictable

- *FPCON Bravo.* Applies when an increased or more predictable threat of terrorist activity exists
- *FPCON Charlie.* Applies when an incident occurs or when intelligence is received indicating some form of terrorist action or targeting against personnel or facilities is likely
- *FPCON Delta.* Applies in the immediate area where a terrorist attack has occurred or when intelligence has been received that terrorist action against a specific location or person is imminent

The level of effort and time required for occupant identification and vehicle inspection increases with the progression from FPCON Normal to FPCON Delta.

This section discusses potential transportation system effects associated with the FPCONs. The discussion recognizes the importance of gate inspection processing rates, and it presents operating scenarios for reducing delays at the post's entry points.

4.3.8.1 Gate Inspection Processing Rates

Today, approximately 4,000 vehicle trips enter Fort Belvoir gates during the peak hour. On the basis of the tenant profiles developed to date, future vehicle trips through the gates during the peak hour would fall in the range of 9,000 to 11,000, which equates to 5,000 to 7,000 new trips during the AM peak hour.

At FPCONs Alpha and Bravo, the gates currently process approximately 400 vehicles per hour per lane (vphpl). Table 4.3-39 illustrates the relationship between the time required for each inspection and the number of vehicles processed per hour. Even at relatively quick processing rates, implementing the proposed action would require 30 to 40 lanes, distributed at several gates, to avoid extensive queuing. This assessment suggests that parking strategies that rely on parking areas outside the security perimeter be explored to avoid the construction of extensive plaza areas for vehicle inspections.

To validate the above scenarios of gate capacity, various operating conditions were analyzed. An assumed flow rate of 1,900 vph was used to analyze the gates. The purpose is to quantify the effects of various operating scenarios (inspection processing effort) on traffic flow. Table 4.3-40 presents the results of the queue analyses, where it is assumed that a gate has two entry lanes.

Table 4.3-39
Gate capacity scenarios

Relationship	Time (seconds)				
Inspection time (seconds)	8–10	15	30	60	90
Total inspection and clearance time (seconds)	8–10	25	40	70	100
Vehicles per hour per lane	360–450	144	90	51	36

Table 4.3-40
Queue lengths for various inspection scenarios

Capacity (vph/gate)	Inspection and clearance time (sec/veh)	Throughput volume[(a)] (vph)	Unserviced volume (vph)	Queue length per lane[(b)] (miles)
400	10	1,594	306	0.7
200	20	791	1,109	2.6
120	30	473	1,427	3.4
60	60	236	1,664	3.9

[a]Assumed a four-gate screening facility and a demand of 1,900 vph.

[b]Queue length assumed to be 25 ft/veh for unserviced volume and two travel lanes approaching the facility from the off-post roadway network.

The results of the analyses show that as inspection time increases, the capacity (flow rate) of the gate decreases. Under a full vehicle-check, approximately 240 vehicles could be processed at a four-gate facility and would result in a queue of four lane-miles. This study illustrates the need to develop a security operating plan that would prevent backups onto adjacent roadways. To prevent traffic spillback onto the adjacent roadways, either more gates would need to be provided to handle the volume of traffic under higher threat levels, or some personnel would be required to not report in order to reduce the inbound traffic flow. As the FPCON increases, the level of effort for inspection increases as well. This occurrence causes longer inspection and clearance times. Under higher threat levels, some nonessential personnel might be required not to report to their office locations.

If a consolidated parking strategy with parking outside the security perimeter is possible for large numbers of personnel, these requirements would be reduced significantly. Without full identification checking or inspections, approximately 400 vphpl could be processed at the entrances to each garage, depending on the final design (layout and circulation patterns) of the garages.

4.3.8.2 Potential Security Operating Scenario for EPG

A conceptual security plan has been developed to provide a secured perimeter for EPG. This security plan enables development of the site access and circulation plan because security drives the number and size of access points, as well as the cross-section of the internal roadways. With an estimated 18,000 employees reporting to work each day at offices on EPG, a major challenge would be the screening of vehicles and the maintenance of the required setbacks from unscreened vehicles without causing extensive queuing back onto the regional roadway network. A layered approach to security and screening has been developed to address this issue, wherein EPG could be subdivided into the following zones that reflect increasing levels of security.

- *Installation Perimeter:* Access to EPG would be restricted to authorized vehicles at all access points except the entrance off the Fairfax County Parkway at the Rolling Road interchange. The latter access point would be the sole access point for visitors and trucks. Enforcement of this restriction would be passive (i.e., no stopping or vehicle inspection). Each access point would be signed to prohibit entry and would have the capability to detect unauthorized entry (e.g., via cameras, temporary gates) and to deploy temporary or permanent barricades to stop unauthorized entry. It is

anticipated that authorized vehicles could be equipped with decals or radio frequency identification (RFID) tags. All roadways in this zone would be outside the security setback requirements applicable to occupied buildings.

- *Campus East:* The second level of security would involve a personnel identity and vehicle-check as vehicles enter the Campus East zone from the proposed north or south spine road on EPG. No trucks would be allowed to enter this zone without first undergoing an inspection at the truck screening facility in the southwest area of EPG. Roadway and vehicle access in the Campus East zone would meet standoff distance requirements.
- *Other Facilities:* The highest level of security would be maintained at agency sites—garages, office buildings, and office areas. Garages, buildings, roads, and other parking areas would conform to standoff distance requirements.

4.3.8.3 Potential Security Operating Scenario for Main Post

The Main Post has a comprehensive security program that includes seven access control points. All visitors and trucks would continue to access both North and South Posts via Tulley Gate (Pohick Road). The gates that would need to increase capacity to handle the BRAC action include Pence Gate (Belvoir Road) and Kingman Gate because these are primary access points from the north on U.S. Route 1 and Fairfax County Parkway. Improvements or modifications to Pence Gate will likely be needed to accommodate the Hospital on the South Golf Course; the configuration will be developed during the final design process. Final configuration of each of these gates would be dependent on the alternative selected in the ROD.

4.3.8.4 Potential Security Operating Scenario for the GSA Parcel

Security checkpoints to the GSA Parcel would be on the present site access roadway from Loisdale Road and from the ramp(s) from the Franconia-Springfield Parkway (assuming approval and construction of such mitigation). Adjacent land development results in the GSA Parcel's being a compressed parcel with limited potential for access points. The configuration of the parcel would limit how the security checkpoints could be configured. Specific siting and layouts of the security checkpoints would be developed as the designs are carried forth and the security requirements for WHS occupying this site are developed.

4.3.9 SUMMARY OF COMPARISON OF ALTERNATIVES

The BRAC action would be expected to have significant effects on the transportation system, regardless of the land use alternative selected. The effects of each alternative would vary because of the siting of each of the agencies affected by the BRAC action. For example, the Preferred Alternative land use plan concentrates most of the new development onto EPG, with some increases to South Post. The Town Center Alternative's land use plan places all development on the Main Post on either side of U.S. Route 1. Thus, the effects on the transportation system caused by the new developments would vary by location. For example, the Preferred Alternative would affect the Fairfax County Parkway adjacent to EPG greater than the Town Center Alternative because of the locations of the various agencies. The Town Center Alternative has the greatest effect along U.S. Route 1 because more development is concentrated in that segment of the Main Post.

From a regional perspective, the alternatives are very similar. Overall, regional travel patterns would be expected to be identical, with any differences showing up only on a localized scale, depending upon the specific siting of individual BRAC elements within the immediate Fort Belvoir area. The MWCOG model was used to evaluate the alternatives, as that is the accepted transportation modeling tool for evaluating the impacts at a local and regional level. For all the alternatives, the significant transportation effects would be limited to the entrance points and the immediately adjacent transportation facilities. These significant effects would disappear into the regional traffic flow within 3 to 5 miles of Fort Belvoir. While the alternatives differ somewhat in terms of the detailed extent and location of these effects, on a regional basis, beyond the 3 to 5-mile range, the effects become negligible for all alternatives.

In terms of specifics, the alternatives placing all BRAC-related development within the Main Post area have greater effects than those that disperse the activities between the Main Post and the EPG site. The most significant of these larger effects relates to the added traffic on the segment of the Fairfax County Parkway between I-95 and U.S. Route 1. Mitigation to address this issue is likely to require a Fairfax County Parkway cross-section in this area of eight lanes, including a two-lane reversible HOV facility.

The City Center Alternative would also require additional mitigation because of the significant effect on the Franconia-Springfield Parkway by including the GSA Parcel into the BRAC planning regime. That site is relatively landlocked and would require additional access beyond what currently exists off Loisdale Drive. This mitigation would include the construction of new access from the Franconia-Springfield Parkway, which would have significant costs and adverse effects on existing traffic.

The Satellite Campuses Alternative is most similar to that of the Town Center Alternative, as the development is centered on Main Post and Davison Airfield. Slight differences in localized impacts exist due to the use of Davison Airfield.

An additional consideration for the Preferred Alternative is the fact that the needed transportation improvements can largely be constructed without interfering with existing traffic because the EPG site is largely undeveloped and the major access-related project would be constructing the new segment of the Fairfax County Parkway. Constructing this segment could be accomplished with minimal effect on existing traffic. Each of the other alternatives involves more highway projects that would need to be constructed within active traffic zones.

As noted previously, any significant traffic effects as a result of the BRAC action should be mitigated with transportation improvements, such that the negative effects become minor or negligible. Any development would always have some effects to the transportation system; however, the state and local agencies require, for development they control, that the developer mitigate those effects with some improvements to the transportation system. The level of mitigation depends on the alternative selected. Funding mechanisms to pay for improvements needed for the BRAC action would be commensurate within the legal authority of the Army, likely through the Defense Access Road Program.

The region's transportation system is already strained under existing traffic volumes (2006 conditions), and it will continue to be constrained under the No Action Alternative (2011), even with the transportation improvements proposed by FHWA, VDOT, and Fairfax County in their transportation improvement programs (see section 4.11.3.1). The 2011 conditions, which represent the opening year of BRAC, were assessed and compared to the 2011 No Action Alternative to determine the level of effects caused by the development in each land use alternative. Through the analyses of the four alternative land use plans, a series of transportation improvements have been proposed to mitigate the effects of each of the proposed alternatives. These improvements would be needed to maintain the transportation system's operational performance at an acceptable level of service and delay. These mitigation actions, along with the associated costs, are summarized in Table 4.3-41. Note that these costs are order-of-magnitude costs only.

Table 4.3-41 indicates that the order-of-magnitude costs for the mitigation actions are lowest for the Preferred Alternative and significantly higher for the two alternatives (Town Center and Satellite Campuses) that consolidate all BRAC-related development on the Main Post.

Finally, for the Preferred and City Center Alternatives, the ability of transit to contribute to the mitigation is greater than for the other alternatives because these alternatives use sites that are closer to the regional rail network. Their locations make it easier to achieve the targeted 5 to 10 percent transit mode share goals.

Table 4.3-41
Transportation improvements as mitigation strategies

	Transportation improvement costs in millions				
Transportation Improvement	**No Action Alternative**	**Preferred Alternative**	**Town Center Alternative**	**City Center Alternative**	**Satellite Campuses Alternative**
Complete the Fairfax County Parkway	89				
Reconstruction (with direct connections to the HOV lanes) of the I-95/Fairfax County Parkway interchange		75	75	75	75
Additional or improved ramps to and from I-95 for EPG		40		40	
Widen EPG Segment of Fairfax County Parkway (beyond what is already funded)		50		50	
Fairfax County Parkway improvements between I-95 and John J. Kingman Road		55	100	40	100
Rideshare facility (slugs)		15	15	15	15
Transit center/facilities		30	25	30	30
Expanded bus service		12	12	10	12

Table 4.3-41
Transportation improvements as mitigation strategies *(continued)*

Transportation Improvement	Transportation improvement costs in millions				
	No Action Alternative	**Preferred Alternative**	**Town Center Alternative**	**City Center Alternative**	**Satellite Campuses Alternative**
Additional EPG access		15		15	
Intersection improvements (not shown on map)		15	15	15	20
Access to GSA Parcel from Franconia-Springfield Parkway				50	
Improvements to Loisdale for additional GSA Parcel access				5	
Additional U.S. Route 1 crossing for Main Post		15	25		25
Widening of I-95 from 3 to 4 lanes from Newington to Route 123	68				
Fairfax County Parkway/John J. Kingman Road intersection improvements		10	30		30
Completion of the connector road between Telegraph Road and U.S. Route 1	48				
Franconia Springfield Parkway/Neuman Street interchange		50	50	50	50
Access to EPG via Neuman Street		26		26	
Improvements to Beulah, Telegraph, Backlick, Loisdale, and Newington Roads		50	80	50	80
Completion of Van Dorn Street/Franconia Road interchange			90		90
Widening of U.S. Route 1 through Fort Belvoir			75		75
Interchange at U.S. Route 1 and Fairfax County Parkway			55		55
Interchange at U.S. Route 1 and Telegraph Road			75		75
Improvements to Lorton Road			10		10
Total estimated costs in millions	**205**	**458**	**732**	**471**	**742**

Notes: Estimates include both costs for roadway network and associated facilities improvements, as well as capital costs for increased transit services, as described in the mitigation section for each alternative.

Costs for the No Action Alternative are considered "sunk" costs, as those costs would occur prior to the BRAC action and as the improvements are being built to address the on-going regional traffic needs.

Cost estimates are subject to change as the design process is carried forth, and they should therefore only be considered as order-of-magnitude costs. Costs exclude contingency costs and costs associated with supervision, inspection, and overhead. Costs do not include annual operating costs, such as the costs to operate the expanded bus services, or annual maintenance costs of the new roadways and facilities.

4.4 AIR QUALITY

This air quality analysis includes a description of the existing air quality conditions, a general conformity analysis, a regulatory review, and a discussion of microscale carbon monoxide (CO) concentrations resulting from potential changes in traffic patterns because of implementing of the alternatives.

4.4.1 AFFECTED ENVIRONMENT

4.4.1.1 National Ambient Air Quality Standards and Attainment Status

Main Post, EPG, and the GSA Parcel. U.S. Environmental Protection Agency (EPA) Region 3 and the Virginia Department of Environmental Quality (VDEQ) regulate air quality in Virginia. The Clean Air Act (CAA) (42 U.S.C. 7401-7671q), as amended, gives EPA the responsibility to establish the primary and secondary National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) that set acceptable concentration levels for seven criteria pollutants: particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), nitrous oxides (NOx), Ozone (O_3), and lead. Short-term NAAQS (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term NAAQS (annual averages) have been established for pollutants contributing to chronic health effects. Each state has the authority to adopt standards stricter than those established under the federal program; however, the Commonwealth of Virginia accepts the federal standards. Appendix E.3 describes each of the criteria pollutants' sources and impacts on public health and welfare.

Federal regulations designate Air-quality Control Regions (AQCRs) in violation of the NAAQS as *nonattainment* areas. Federal regulations designate AQCRs with levels below the NAAQS as *attainment* areas. *Maintenance* AQCRs are areas that have previously been designated *nonattainment* and have been redesignated to *attainment* for a probationary period through implementation of maintenance plans. According to the severity of the pollution problem, nonattainment areas can be categorized as marginal, moderate, serious, severe, or extreme.

Fairfax County (and therefore Fort Belvoir Main Post, EPG and the GSA Parcel) is within the National Capital Interstate AQCR (AQCR 47) (40 CFR 81.12). AQCR 47 is in the O_3 transport region (OTR) that includes 22 states and Washington, DC. EPA has designated Fairfax County as the following:

- Moderate nonattainment for the 8-hour O_3 NAAQS
- Nonattainment for the $PM_{2.5}$ NAAQS
- Attainment for all other criteria pollutants (40 CFR 81.347)

4.4.1.2 State Implementation Plan

The CAA, as amended in 1990, mandates that state agencies adopt State Implementation Plans (SIPs) that target the elimination or reduction of the severity and number of violations of the NAAQS. SIPs set forth policies to expeditiously achieve and maintain attainment of the NAAQS.

Because monitored levels of O_3 in the Washington, DC Metropolitan Area exceeded the 1-hour NAAQS, the Commonwealth of Virginia, State of Maryland, and Washington, DC were required to develop SIPs that outline the actions that would be taken to achieve the 1-hour NAAQS before

2007. The current SIP presents the regional air quality plan for attainment of the federal 1-hour NAAQS for ground-level O_3 developed by the Metropolitan Washington Air Quality Committee (MWAQC) for the Washington, DC multijurisdictional nonattainment area. MWAQC was established in accordance with Section 174 of the CAA by the governors of Maryland and Virginia, and the mayor of the District of Columbia to prepare a regionally coordinated air quality plan to comply with these requirements.

The current EPA-approved regional air quality plan is the *State Implementation Plan—Plan to Improve Air Quality in the Washington, DC–MD–VA–Region* (MWCOG, 2004a). This SIP revision estimates a total daily emissions inventory of 487.5 tons per day (tpd) of NOx and 325.8 tpd of volatile organic compounds (VOC) for the region.

Currently the region has no applicable SIP for the 8-hour O_3 or the $PM_{2.5}$ NAAQS. The SIP revisions to address nonattainment conditions with respect to the new 8-hour O_3 and $PM_{2.5}$ NAAQS are being developed and are expected to be approved by EPA by 2008 and 2009, respectively. In the interim period, EPA has published some guidance to address compliance with the CAA regarding these new NAAQS (USEPA, 2004; 2005a; 2005b; and 2006b). In addition, in December of 2006 a federal appellate court partially invalidated EPA's implementation of the 8-hour ozone standard (U.S. Court of Appeals, 2006). As of this time, no changes in effective regulations or guidance have been issued based on this court decision.

Since 1990, Virginia has developed a core of air quality regulations that have been approved by EPA. These approvals signified the development of the general requirements of the Virginia SIP. The Virginia program for regulation of air emissions affects industrial sources, commercial facilities, and residential development activities. Regulation occurs primarily through a process of reviewing engineering documents and other technical information, applying emission standards and regulations in the issuance of permits, performing field inspections, and assisting industries in determining their compliance status with applicable requirements.

4.4.1.3 Clean Air Act Conformity

Main Post, EPG, and the GSA Parcel. The 1990 amendments to the CAA require federal agencies to ensure that their actions conform to the SIP in a nonattainment area. EPA has developed two distinctive sets of conformity regulations: one for transportation projects and one for nontransportation projects. Nontransportation projects are governed by general conformity regulations (40 CFR Parts 6, 51 and 93), described in the final rule for *Determining Conformity of General Federal Actions to State or Federal Implementation Plans,* published in the *Federal Register* on November 30, 1993. The general conformity rule became effective January 31, 1994. Under Section 176(c) of CAA, the general conformity rule became applicable one year after the O_3 and the $PM_{2.5}$ nonattainment designations became effective. In addition, Virginia has adopted conformity regulations (9 Virginia Administrative Code [VAC] 5-160-10 through 9 VAC 5-160-200). The Virginia General Conformity regulations were approved as part of the SIP by EPA on January 7, 2003 (68 FR 723). This occurred after the new O_3 NAAQS were approved but before they went into effect, so it is likely that the approved rules were written with the new standards in mind.

The proposed action is a nontransportation project within a nonattainment area. Therefore, a general conformity analysis is required with respect to the 8-hour O_3 and $PM_{2.5}$ NAAQS. Under the general conformity rule, a project conforms if such activities DO NOT

- Cause or contribute to any new violations of an NAAQS in an area

- Increase the frequency or severity of any existing violation of any NAAQS in an area
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in an area

The general conformity rule specifies threshold emission levels by pollutant to determine the applicability of conformity requirements for a project (Table 4.4-1). For an area in moderate nonattainment for the 8-hour O_3 NAAQS within the OTR, the applicability criterion is 100 tons per year for NOx and 50 tons per year for VOCs (40 CFR 93.153). For an area in nonattainment for the $PM_{2.5}$ NAAQS, the applicability criterion is 100 tons per year for $PM_{2.5}$, NOx, and SO_2 (USEPA, 2006b). VOCs and ammonia were also identified as potential $PM_{2.5}$ precursors. However, neither Virginia nor EPA has found that ammonia contributes to $PM_{2.5}$ problems in AQCR 47 or other downwind areas. Therefore, ammonia was not carried forward for detailed analysis. Appendix E.1 presents an applicability analysis and general conformity determination (GCD) under the general conformity rule.

Table 4.4-1
Applicability thresholds for nonattainment areas

Criteria pollutants	Applicability threshold (tpy)
O_3 (NO_x or VOCs)	
Serious NAAs	50
Severe NAAs	25
Extreme NAAs	10
Other O_3 NAAs outside an O_3 transport region	100
Marginal and moderate NAAs inside an O_3 transport region	
VOC	50
NO_x	100
CO	100
All NAAs	100
SO_2 or NO_x	
All NAAs	100
PM_{10}	
Moderate NAAs	100
Serious NAAs	70
$PM_{2.5}$ ($PM_{2.5}$, NO_x, SO_2)	
All NAAs	100
Lead	
All NAAs	25

Sources: 40 CFR 93.153; USEPA, 2006b.

Notes:

tpy = tons per year

NAA = nonattainment area

4.4.1.4 Local Ambient Air Quality

Main Post, EPG, and the GSA Parcel. Existing ambient air quality conditions in the vicinity of Fort Belvoir can be estimated from measurements conducted at air quality monitoring stations close to the installation. The most recent available data from VDEQ for nearby monitoring stations are used to describe the existing ambient air quality conditions at Fort Belvoir (Table 4.4-2). With the exception of the 8-hour O_3 NAAQS, most recent air quality measurements are below the NAAQS (VDEQ, 2005a). The reported measurement of 0.093 parts per million (ppm) for the 8-hour level exceed the NAAQS of 0.08 ppm. This exceedence is expected, because the region has been designated an O_3 nonattainment area.

Table 4.4-2
2005 Local ambient air quality monitoring results

Pollutant	Primary NAAQS[a]	Secondary NAAQS[a]	Monitored data[b] (regional maximum)	Location where maximum was recorded
CO				
8-Hour Maximum[c] (ppm)	9	None	1.7	Fairfax County
1-Hour Maximum[c] (ppm)	35	None	2.7	Alexandria
NO_2				
Annual Arithmetic Mean (ppm)	0.053	0.053	0. 024	Alexandria
O_3				
8-Hour Maximum[d] (ppm)	0.08	0.12	0. 097	Fairfax County
$PM_{2.5}$				
Annual Arithmetic Mean[e] ($\mu g/m^3$)	15	15	15. 3	Arlington
24-Hour Maximum[f] ($\mu g/m^3$)	65	65	37.7	Loudoun County
PM_{10}				
Annual Arithmetic Mean[g] ($\mu g/m^3$)	50	50	20	Fairfax County
24-Hour Maximum[c] ($\mu g/m^3$)	150	150	59	
SO_2				
Annual Arithmetic Mean (ppm)	0.03	None	0.006	Fairfax County
24-Hour Maximum[c] (ppm)	0.14	None	0.021	Fairfax County
3-Hour Maximum[c](ppm)		0.5	0. 077	Alexandria

Notes:

a - Source: 40 CFR 50.1-50.12.

b - Source: VDEQ, 2005; 2006b.

c - Not to be exceeded more than once per year.

d - The 3-year average of the fourth highest daily maximum 8-hour average O_3 concentrations over each year must not exceed 0.08 ppm.

e- The 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from must not exceed 15.0 ug/m^3.

f- The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor must not exceed 65 ug/m^3.

g - The 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

NO_2 = Nitrogen dioxide

4.4.1.5 Mobile Sources

Main Post, EPG, and the GSA Parcel. Mobile sources of concern include primarily automobiles and vehicular traffic. The primary air pollutants from mobile sources are CO, NOx, and VOCs. Lead emissions from mobile sources have declined in recent years through the increased use of unleaded gasoline and are extremely small. Potential SO_2 and particulate emissions from mobile sources are small compared to emissions from point sources, such as power plants and industrial facilities. Although, emissions of SO_2 and particulates are relatively small, they have been included in a more detailed analysis. Air quality effects from traffic are generally evaluated on two scales.

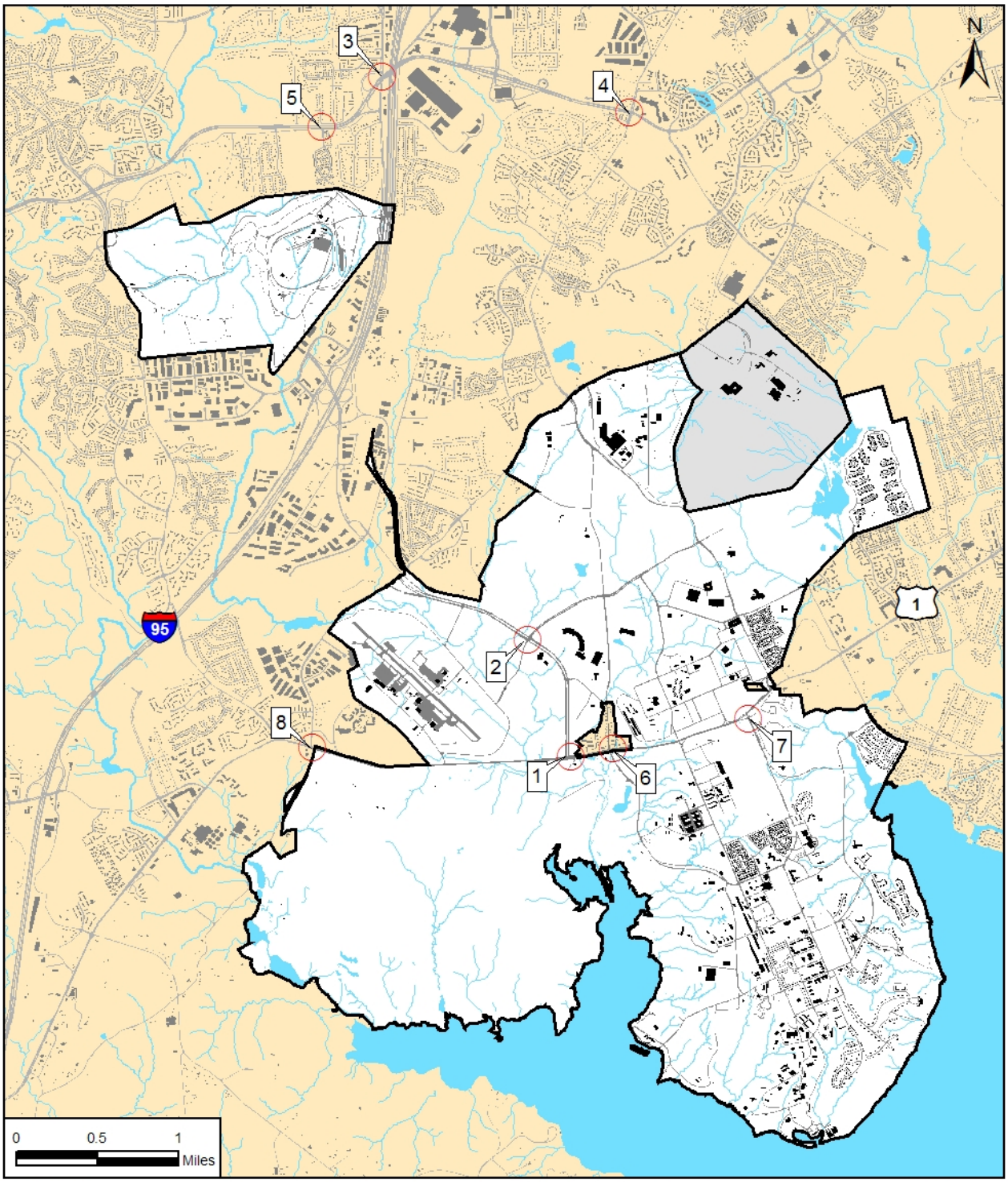
Meso-scale—Meso-scale analysis is performed at the regional level. Potential emission increases from additional vehicle miles traveled (VMT) resulting from an action could affect regional O_3 and/or $PM_{2.5}$ levels. However, because these are problems of regional concern and subject to air transport phenomena under different weather conditions, regional effects are generally evaluated by the Metropolitan Planning Organization (MPO) using regional airshed model(s). Meso-scale analysis is generally not conducted on a project-specific basis and is not necessary for this EIS.

Microscale—CO is a site-specific pollutant with higher concentrations found adjacent to roadways and signalized intersections. Microscale analysis is performed to identify localized *hot spots* of criteria pollutants at the intersection level. Microscale analysis is often conducted on an intersection-specific basis, and this approach was conducted for this EIS. Existing CO concentrations were estimated for receptor locations during weekday worst-case peak periods at the following eight intersections. The locations are generally shown on Figure 4.4-1.

- Route 1 and Fairfax County Parkway
- Fairfax County Parkway and John J. Kingman Road
- Franconia Springfield Parkway EB Ramp and Backlick Road
- Franconia Springfield Parkway and Beulah Street
- Franconia Springfield Parkway and Spring Village Drive
- Route 1 and Backlick Road–Pohick Road
- Route 1 and Belvoir Road
- Route 1 and Telegraph Road–Old Colchester Road

These intersections were selected on the basis of their existing traffic conditions and potential for maximum increase in traffic volumes and congestion associated with implementing the proposed action and alternatives. Individual intersections were examined based on traffic conditions on the associated roadways. Beyond the immediate area surrounding the intersections, CO emissions are anticipated to decrease. CO concentration levels at the other intersections of the study area are expected to be comparatively lower. Modeled CO levels under existing conditions at the study intersections with an unacceptable Level of Service (LOS) are shown in Table 4.4-3. The modeled CO levels show no existing violations of the NAAQS for any of the modeled intersections. Appendix E.2 describes CO modeling procedures and detailed results.

The traffic from these intersections is not anticipated to be an air quality concern for PM particulate matter because it does not involve new highways and expressways, and the intersections affected are primarily secondary arterial roads. Although in a $PM_{2.5}$ nonattainment



LEGEND

Installation Property

Approximate Air Quality Monitoring Station Location

CO Modeling Intersections

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.4-1

Table 4.4-3
Existing peak hour CO levels

Intersection	Maximum 1-hour CO concentration (ppm)[a]	1-Hour NAAQS for CO (ppm)	Maximum 8-Hour CO concentration (ppm)[a]	8-Hour NAAQS for CO (ppm)	Exceeds NAAQS? (Yes/No)
Route 1/Fairfax County Parkway	5.8	35.0	4.1	9.0	No
Fairfax County Parkway/ John J. Kingman Road	6.6	35.0	4.6	9.0	No
Franconia Springfield Parkway EB Ramp/Backlick Road	7.6	35.0	5.3	9.0	No
Franconia Springfield Parkway/ Beulah Street	6.7	35.0	4.7	9.0	No
Franconia Springfield Parkway/ Spring Village Drive	6.2	35.0	4.3	9.0	No
Route 1/Backlick Road–Pohick Road	5.2	35.0	3.6	9.0	No
Route 1/Belvoir Road	5.0	35.0	3.5	9.0	No
Route 1/Telegraph Road–Old Colchester Road	6.2	35.0	4.3	9.0	No

Source: 40 CFR 50.1-50.12.

[a] CO levels include background concentrations of 3.7 ppm 1-hour and 2.5 ppm 8-hour (VDEQ, 2005a)

area, quantitative procedures to address $PM_{2.5}$ hot spot analysis have not yet been standardized and it is not standard practice to conduct such analysis for nontransportation projects, therefore such analysis is not included in this EIS (USEPA, 2006c).

In addition, Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the CAA. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. As with particulate matter, traffic from these intersections is not anticipated to be an air quality concern for MAST because the intersections affected are primarily secondary arterial roads. Quantitative procedures to conduct MSAT analysis have not yet been standardized and is not standard practice for nontransportation projects on secondary arterials; therefore such analysis is not included in this EIS (FHWA, 2006).

4.4.1.6 Stationary Sources and Permitting Requirements

VDEQ oversees programs for permitting the construction and operation of new or modified stationary source air emissions in Virginia. Virginia air permitting is required for many industries and facilities that emit regulated pollutants. On the basis of the size of the emission units and type of pollutants emitted (criteria pollutants or hazardous air pollutants [HAPs]), VDEQ sets permit rules and standards for emission sources.

Construction Permits. The air quality permitting process begins with the application for a construction permit. There are three types of construction permits available through the VDEQ for the construction and temporary operation of new emission sources: Major New or Modified Source Construction Permits in Nonattainment Areas (Nonattainment New Source Review

(NNSR)); Prevention of Significant Deterioration (PSD) permits; and Minor New, Modified, and Certain Major Source Construction Permits (Minor NSR). NNSR and PSD permits are both part of the VDEQ Major NSR program. Thresholds that determine the type of construction permit that may be required depend on the emissions (both quantity and type) and if the permitted source is a new source or a modification to an existing source. Thresholds requiring either an NNSR or a PSD permit in Fairfax County are outlined in Table 4.4-4. For sources whose emissions are less than these threshold values, a Minor NSR permit would be required.

Nonattainment New Source Review. Major New or Modified Source Construction Permits in Nonattainment Areas (or Nonattainment New Source Review (NNSR) Permit) are required for any major new sources or major modifications to existing sources intended to be constructed in an area designated as nonattainment. NNSR permits are legal documents that specify what construction is allowed; what emission limits must be met; reporting, recordkeeping, and monitoring requirements; and often how the source must be operated. The NNSR permitting process typically takes 18–24 months. Specifically typical requirements for a NNSR permit may include

- Best Available Control Technology (BACT) review for qualifying attainment criteria pollutants
- Lowest Achievable Emission Rate (LAER) review for qualifying nonattainment pollutants (VOC, NO_x and $PM_{2.5}$)
- Maximum Achievable Control Technology (MACT) review for HAPs
- Air quality analysis (predictive air dispersion modeling)
- Acquiring emission offsets at a 1:1 or greater ratio for all contemporaneous emission increases that have occurred or are expected to occur on the Main Post, or for all new permits sources of emissions at EPG
- A public involvement process.

- **Prevention of Significant Deterioration (PSD).** The PSD program preserves the air quality in attainment areas. PSD regulations impose limits on the amount of pollutants

Table 4.4-4
Major thresholds of pollutants regulated under the CAA within Fairfax County

	New major source (tpy)		Major modification to an existing source[a] (tpy)	
Pollutant	**PSD[b]**	**NNSR**	**PSD**	**NNSR**
Carbon monoxide	250		100	
Nitrogen oxides		100		40
Sulfur dioxide	250		40	
Particulate matter	250		25	
PM_{10}	250		15	
$PM_{2.5}$		100		10
VOCs		50		40
Lead	250		0.6	

Source: VAC 5-20-204, 9 VAC 5-80-2010, and 40 CFR 52.21 (b) (23) (i)

Notes:

a – Represents the project emission increase considered 'significant'.

b – Applies to sources not listed in 40 CFR 52.21 (b) (1) (i) (a).

- that major sources may emit. The PSD process would apply to all pollutants for which the region is in attainment (all but O_3 and $PM_{2.5}$). The PSD permitting process typically takes 18–24 months to complete. Sources subject to PSD are typically required to complete the following:
  - BACT review for criteria pollutants
  - extensive predictive modeling of emissions from proposed and existing sources
  - extensive public involvement
- **Minor New Source Review.** A Minor New, Modified, and certain Major Source Construction Permit (or Minor NSR permit) would be required to construct minor new sources, minor modifications of existing sources, and major sources not subject to NNSR or PSD permit requirements. The Minor NSR permitting process typically takes 6–10 months to complete. Sources subject to Minor NSR may be required to complete the following:
  - BACT review for each criteria pollutant
  - MACT review for regulated HAPs and designated categories
  - air quality analysis (predictive air dispersion modeling), upon VDEQ's request
  - establish procedures for measuring and recording emissions and/or process rates

Operation Permits. Operating Permit applications are typically required within one year of operation of the sources. State Operating Permits are available through VDEQ. A Federal Operating Permit (Title V) may be required if a source is determined to be a major source.

- **State Operating Permits.** State Operating Permits are elective and may be used to obtain federally enforceable limits on criteria pollutants and HAPs below applicable major source thresholds. These "synthetic minor" sources would designate a stationary source or emission unit as a synthetic minor or area stationary source and thus be exempt from major source permitting requirements. State Operating Permits are also used to combine stationary source or emissions unit requirements under multiple permits into one permit.
- **Federal Operating Permit (Title V).** A Title V permit would be required for major sources of criteria pollutants as defined at 40 CFR Part 70. Title V permits would be required if the annual potential to emit exceeds thresholds for criteria and HAPs. The attainment status in each AQCR determines the major source threshold criteria. Fairfax County is a nonattainment area for $PM_{2.5}$, moderate nonattainment area for O_3, and within the O_3 transport region. The Title V major source thresholds for pollutant emissions are the same as the NNSR thresholds for major new sources and major modifications outlined in table 4.4-4.

Other Regulatory Requirements. In addition to the permitting requirements to construct and operate new or modified emission sources, New Source Performance Standards (NSPS) and the National Emission Standards for HAPs (NESHAPs) set emission control standards for categories of new stationary emission sources of both criteria pollutants and HAPs.

The NSPS process requires EPA to list categories of stationary sources that cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare. The NSPS program sets uniform emission limitations for many industrial sources. As of July 11, 2005, stationary diesel engines are subject to NSPS. Applicability to the NSPS is based on engine size

and date of purchase and construction. Limitations on emissions come into effect using a tiered approach over time. Boilers with a maximum heat input of 10 million British thermal units (BTUs) or greater would be required to comply with NSPS.

The CAA Amendments of 1990, under revisions to section 112, required EPA to list and promulgate NESHAPs to reduce the emissions of HAPs, such as formaldehyde, benzene, xylene, and toluene from categories of major and area sources (40 CFR Part 63). New stationary sources whose potential to emit HAPs exceeds either 10 tpy of a single HAP, or 25 tpy of all regulated HAPs would be subject to MACT requirements.

Virginia's Administrative Code (9 VAC 5-40-90 and 9 VAC 5-50-90) requires reasonable precautions to prevent particulate matter from becoming airborne. Such precautions may include, but would not be limited to the following:

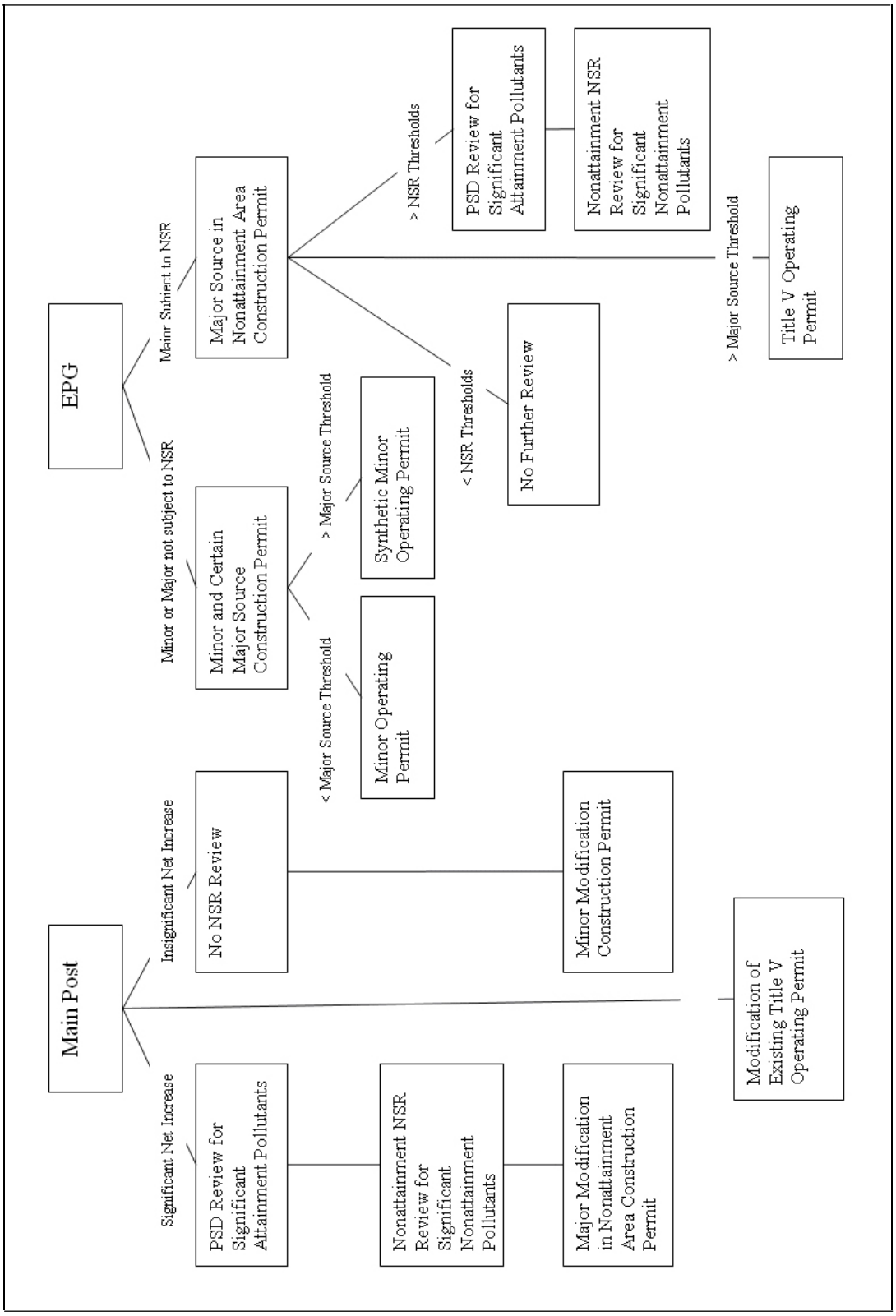
- Using water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land
- Applying water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces that might create airborne dust
- Paving roadways and maintaining them in a clean condition
- Installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty material, including the implementation of adequate containment methods during sandblasting or other similar operations
- Covering open equipment for conveying or transporting material likely to create objectionable air pollution when airborne
- Promptly removing spilled or tracked dirt or other materials from paved streets.

Main Post. On the basis of the installation's potential to emit, Fort Belvoir is a major source. Stationary sources of air emissions at Fort Belvoir include boilers, generators, incinerators, degreasers, and gasoline dispensers. An installation wide Title V permit was issued on March 24, 2003 (VDEQ, 2004). As part of the Title V permit requirements, the installation must submit a comprehensive emission statement annually. Table 4.4-5 summarizes 2005 on-post emissions from stationary sources. NNSR or PSD preconstruction permitting would be required if the thresholds for major modifications outlined in Table 4.4-4 were exceeded. Modification to the existing Title V permit will be required under any modification scenario. Figure 4.4-2 highlights the possible permitting scenarios for both the Main Post and EPG.

Table 4.4-5
2005 emissions from significant stationary sources at Fort Belvoir (tpy)

SO_2	CO	PM_{10}	$PM_{2.5}$	NOx	VOC	Total HAP
35.79	24.43	2.82	2.71	60.48	2.97	0.048

Source: Fort Belvoir, 2006a.



Potential Air Quality Permitting Scenarios

Figure 4.4-2

EPG and the GSA Parcel. There are no permitted stationary sources of air emissions at EPG or the GSA Parcel. An NNSR or PSD preconstruction permitting and eventually a Title V operating permit would be required if thresholds for a major new source outlined in Table 4.4-4 were exceeded.

4.4.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

Implementing the Preferred Alternative would be expected to have both short-term and long-term minor adverse effects to air quality. However, minor increases in emissions would conform to the SIP, would not introduce localized CO concentrations greater than the NAAQS, nor be expected to contribute to a violation of any federal, state, or local air regulations.

4.4.2.1 Land Use Plan Update

The planning activities associated with the land use plan update under this Alternative would not generate any direct or indirect air emissions. Therefore, updating the land use plan designations (comparison of 1993 land use [Figure 2-1] versus proposed [Figure 2-2]) would have no effect on the air quality. A detailed analysis is presented in the next section on BRAC implementation and potential effects associated these activities.

4.4.2.2 BRAC Implementation and Facilities Projects

Implementing the BRAC and other facilities projects could affect air quality in three ways: by generating pollutants during construction; by introducing new stationary sources of pollutants, such as heating boilers and standby generators; and through changes in vehicular traffic that could raise vehicle emission levels locally and possibly regionally. Air quality effects would be considered minor unless the estimated emissions would not conform to the SIP; contribute to a violation of any federal, state, or local air regulations; or introduce localized CO concentrations greater than the NAAQS.

4.4.2.2.1 General Conformity

The Draft GCD (Appendix E.1) demonstrates that the emissions associated with the Preferred Alternative conform to the purpose and intent of the applicable SIP. Therefore, by definition they do not interfere with the region's ability to attain the NAAQS in a timely fashion. The following summarizes the methodologies used to evaluate the applicability of the General Conformity Rule (GCR), and the results of the conformity evaluation.

The GCR requires the federal agency to consider net emissions generated from all direct and indirect sources of air emission that are reasonably foreseeable be considered. Direct emissions are emissions that would be caused or initiated by a federal action and occur at the same time and place as the action. Indirect emissions are defined as reasonably foreseeable emissions that would be caused by the action, but may occur later in time or be farther removed in distance from the action itself, and the federal agency can practicably control. For the evaluation of the Fort Belvoir realignment, direct emissions subject to the GCR are considered emissions from construction activities, motor vehicles, and point sources that would not be large enough to be subject to the Non-attainment New Source Review permitting process. Permits for minor stationary and area sources under Virginia's new minor source review program are not exempt from analysis under the regulations. However, to issue such a permit, the state must determine that the emissions are in conformity with the SIP and thus, an operator can generally rely on the permit as evidence of a determination and documentation that the emissions are included in the

SIP (USEPA, 2002a). Because both EPG and the Main Post are within the NCR, the emissions at both locations subject to the GCD have been combined throughout this discussion. More specifically, project-related direct and indirect emissions would result from the following:

- **Demolition and construction activities—**use of construction equipment, worker vehicles (e.g., bulldozers, backhoes), using use of VOC paints, paving off gasses, and fugitive particles from surface disturbances
- **Operational activities**— emergency generators, small heating boilers, and use of private motor vehicles

Demolition and construction emission associated with using construction equipment (e.g., bulldozers, backhoes), worker vehicles, using VOC paints, paving off gasses, and fugitive particles from surface disturbances are tabulated below for all the years of construction (Table 4.4-6).

Table 4.4-6
Estimated construction emissions

	Construction emissions (tpy)			
Year	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
2007	129	76	99	19
2008	323	188	21	48
2009	329	215	20	52
2010	374	238	25	63
2011	130	69	13	24

2007 Annual construction emissions				
Construction activity	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
Heavy equipment emissions	128	12	8	19
Worker trip emissions	1	1	0	0
Architectural coating emissions	0	63	0	0
Paving off-gas emissions	0	0	0	0
Fugitive dust emissions	0	0	1	0
Total	129	76	9	19

2008 Annual construction emissions				
Construction activity	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
Heavy equipment emissions	318	29	20	48
Worker trip emissions	5	4	0	0
Architectural coating emissions	0	155	0	0
Paving off-gas emissions	0	0	0	0
Fugitive dust emissions	0	0	1	0
Total	323	188	21	48

2009 Annual construction emissions				
Construction activity	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
Heavy equipment emissions	323	29	20	52
Worker trip emissions	6	5	0	0
Architectural coating emissions	0	181	0	0
Paving off-gas emissions	0	0	0	0
Fugitive dust emissions	0	0	0	0
Total	329	215	20	52

Table 4.4-6
Estimated construction emissions *(continued)*

	Construction emissions (tpy)			
	NO_x	VOC	$PM_{2.5}$	SO_2
2010 Annual construction emissions				
Construction activity	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
Heavy equipment emissions	368	32	24	63
Worker trip emissions	6	6	0	0
Architectural coating emissions	0	200	0	0
Paving off-gas emissions	0	0	0	0
Fugitive dust emissions	0	0	1	0
Total	374	238	25	63
2011 Annual construction emissions				
Construction activity	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
Heavy equipment emissions	128	11	12	24
Worker trip emissions	2	2	0	0
Architectural coating emissions	0	56	0	0
Paving off off-gas emissions	0		0	0
Fugitive dust emissions	0	0	1	0
Total	130	69	13	24

Appendix E.1 outlines the calculations and assumptions made to derive the construction emission estimations.

With respect to proposed Fort Belvoir BRAC action, project-related emissions would be those emissions that would occur with the action (build) when compared to the emissions that would occur without the action (no-build) (the net change in emission level). Table 4.4-7 presents the estimated increase in emissions with the proposed Fort Belvoir BRAC action, respectively (the project-related emissions). Notably, the net emissions would be slightly less than the overall construction emission because of the reduction in on-road vehicle emissions.

Table 4.4-7
Estimated total annual emissions subject to the general conformity rule from the 2005 realignment of Fort Belvoir

	Annual emissions (tpy)			
Year	**NO_x**	**VOC**	**$PM_{2.5}$**	**SO_2**
2007	129.2	76.0	9.5	18.5
2008	318.9	183.6	20.5	48.3
2009	320.9	206.7	20.4	51.7
2010	364.5	224.7	25.3	62.7
2011	119.5	53.8	12.8	23.2
2012 (and after)	–11.6	–16.2	–0.3	–0.5

Sources: USEPA NONROAD, 2005; SQAQMD, 1993; USEPA, 2002a; MOBILE6.2, USEPA AP-42; and DOE, 1999

Applicability. EPA established levels to exclude federal actions from the requirements to provide a GCD and would not impede an area's ability to attain the NAAQS. The applicability levels for O_3 and $PM_{2.5}$ within the Metropolitan Washington region were compared to the greatest annual project related emissions (Table 4.4-8). In addition, action (project)-related emissions are determined to be regionally significant if the emission level represents 10 percent or more of the regional total of emissions for which the area is nonattainment.

Table 4.4-8
Applicability thresholds applicable to the National Capital Interstate Air Quality Control Region

Criteria pollutants	Greatest annual project related emissions	Applicability threshold (tpy)	Exceeds applicability threshold (yes/no)
O_3 (NO_x or VOCs)			
Marginal and moderate NAAs inside an O_3 transport region			
VOC	224.7	50	Yes
NO_x	364.5	100	Yes
$PM_{2.5}$ ($PM_{2.5}$, NOx, SO_2)			
$PM_{2.5}$	25.3	100	No
NO_x	364.5	100	Yes
SO_2	62.7	100	No

Sources: 40 CFR 93.153; USEPA, 2006c

Notes:

tpy = tons per year

NAA = nonattainment area

Because the total of direct and indirect emissions of NO_x and VOC exceed the respective general conformity applicability thresholds, the general conformity requirements apply to these pollutants. As such, a formal conformity determination is required, and these pollutants were carried forward for detailed analysis. Notably, because the project-related emissions of these pollutants exceed the applicability thresholds, performing the regional significance applicability test would be redundant.

The total of direct and indirect emissions of $PM_{2.5}$ and of SO_2 is less than the applicability thresholds. Pending the full implementation of the $PM_{2.5}$ NAAQS, there is no current regional emission budget for $PM_{2.5}$ or SO_2. However, because of the limited size and scope of the proposed action when compared to the overall regional activity, it is not anticipated that emissions of $PM_{2.5}$ or SO_2 would be regionally significant. Therefore, the general conformity requirements do not apply, and there will be no further evaluation of these pollutants.

Construction Activity. The construction emission budgets in the currently approved 1-hour SIP or the draft 8-hour SIP does not identify specific or individual projects with respect to emissions resulting from regional construction activity. As such, the BRAC related emission estimates were compared to SIP-based projected emissions for the region for this type of activity to determine if the emissions could reasonably be accounted for in the regional totals. On the basis of the results of the comparison, the greatest level of construction-related VOC and NO_x emissions would represent approximately 0.7 and 1.9 percent of the VDEQ's regional emissions, respectively

(Table 4.4-9). Because the project-related construction emissions would represent a relatively small percentage of the regional projections, the Army, in consultation with VDEQ, determined that it is reasonable to assume that the construction emissions can be accounted for in the inventories for the 1-hour O_3 attainment demonstration SIP (40 CFR 93.158(a)(5)). Notably, the regional inventory for nonroad sources was used for the NO_x comparison because of the overwhelming contribution of these sources to the project related emissions of NO_x. In addition, the regional inventory for area sources was used for the VOC comparison because of the overwhelming contribution of architectural coatings and paving off gasses to the project related emissions of VOCs. The Draft General Conformity Determination and supporting emission estimations are provided in Appendix E.1.

Table 4.4-9
Comparison of 2010 project-related emissions and SIP-based inventories - construction activities

Pollutant	SIP regional emission inventory (tons/summer weekday)	Project-related non-road emissions (tons/summer weekday)	Percent of regional emissions
Approved 1-hour SIP			
Nitrogen oxides (NO_x)	82.8[a]	1.58	1.9%
Volatile organic compounds (VOCs)	147.3[b]	0.98	0.7%
Draft 8-hour SIP			
Nitrogen oxides (NO_x)	76.9[c]	1.58	2.1%
Volatile organic compounds (VOCs)	191.8[d]	0.98	0.5%

Source: MWCOG, 2004a.

[a] Reflects 2005 nonroad controlled NOx emissions inventory

[b] Reflect 2005 area controlled VOC emissions inventory

[c] Reflects 2009 nonroad controlled NOx emissions inventory

[d] Reflect 2009 area controlled VOC emissions inventory

Motor Vehicles. The realignment of Fort Belvoir would decrease both the number of vehicles and subsequently the total vehicle miles traveled within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily because of a net reduction of approximately 1,700 personnel leaving Fort Belvoir to locations outside the region. Although overall additional personnel at Fort Belvoir is expected to increase, the new personnel and the miles they currently commute are already with in the NCR. In addition, many of the new personnel are expected to either relocated to or be replaced by individuals living in areas outside, primarily south of, the region. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality. Therefore, although there is an SIP-based regional budget for motor vehicles, it was unnecessary to perform a direct comparison.

In accordance with Section 176 of the CAA, the Army has assessed whether pollutant and pollutant precursor emissions that would result from the Army's actions with respect to the proposed base realignment at Fort Belvoir would conform to the SIP. The emission estimates for the GCD were prepared

- Using the latest planning assumptions
- Using the latest and most accurate emission estimation techniques

- According to the applicable air quality models, databases, and other requirements specified in the most recent version of the EPA's *Guideline on Air Quality Models*, including supplements.

On the basis of the results of the evaluation, the total direct and indirect project-related emissions of NO_x, VOCs, $PM_{2.5}$, and SO_2 and were determined to be any one of the following:

- Less than the applicability thresholds
- Accounted for in the emission projections incorporated into the 1-hour O_3 attainment demonstration SIP (the applicable SIP)
- Could reasonably be accounted for in established emission totals and or excess regional emission estimates.

A detailed discussion and the formal conformity analysis and determination are located in Appendix E.

4.4.2.2.2 Transportation Emissions and Localized CO Concentrations

Implementing the Preferred Alternative and the realignment of Fort Belvoir would decrease both the number of vehicles and the total VMT within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily because of a net reduction of approximately 1,700 personnel from the region and a slight overall decrease in VMT by individuals remaining. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality.

However, increases in localized traffic near the installation would result in an increase in traffic congestion and subsequent long-term minor increases in localized CO concentrations at nearby intersections (Table 4.4-10). These minor increases would not contribute to a violation of the CO NAAQS. The traffic changes associated with the Preferred Alternative would not be expected to cause significant long-term increases of other criteria pollutants, such as O_3, Pb, SO_2, VOCs, and NO_x. Detailed methodology for the determination of localized CO concentrations at intersections of interest is provided in Appendix E.2.

4.4.2.2.3 Regulatory Review and Air Permit Requirements

The new facilities would be equipped with several natural gas boilers and emergency generators. No other stationary sources of air emissions would be anticipated. The estimated potential emissions from proposed new sources for Fort Belvoir Main Post and EPG under the Preferred Land Use Alternative are outlined in Table 4.4.11. The supporting emission estimations are provided in Appendix E.3.

Main Post. All projects sited on Main Post are anticipated to have stationary source emission levels below the threshold that constitutes a major modification. However minor NSR construction permits may be required for some of the projects. A modification to Fort Belvoir's existing Title V permit would also be anticipated under this alternative. All new stationary sources would meet the NSPS and NESHAP requirements.

EPG and the GSA Parcel. The Army intends to limit the potential emissions of the stationary sources installed at EPG through federally enforceable limits to less than the major new source threshold. The Army anticipates that a minor NSR construction permit will be needed. All new stationary sources would meet the NSPS and NESHAP requirements.

Table 4.4-10
Peak hour CO levels under the Preferred Alternative

Intersection	Maximum 1-hour CO concentration (ppm)[a]	1-Hour NAAQS for CO (ppm)	Maximum 8-hour CO concentration (ppm)[a]	8-Hour NAAQS for CO (ppm)	Exceeds NAAQS? (Yes/No)
Fairfax County Parkway/John J. Kingman Road	6.8	35.0	4.8	9.0	No
Franconia Springfield Parkway EB Ramp/ Backlick Road	7.6	35.0	5.3	9.0	No
Franconia Springfield Parkway/Beulah Street	6.8	35.0	4.8	9.0	No
Franconia Springfield Parkway/Spring Village Drive	7.3	35.0	5.1	9.0	No
Route 1/Backlick Road–Pohick Road	6.0	35.0	4.2	9.0	No
Route 1/Belvoir Road	5.7	35.0	4.0	9.0	No
Route 1/Fairfax County Parkway	6.2	35.0	4.3	9.0	No
Route 1/ Telegraph Road–Old Colchester Road	6.9	35.0	4.8	9.0	No

Source: 40 CFR 50.1-50.12

[a] CO levels include background concentrations of 3.7 ppm 1-hour and 2.5 ppm 8-hour (VDEQ, 2005a)

Table 4.4-11
Estimated potential emissions for stationary sources for the Preferred Alternative

	Potential to emit (tpy)				
	CO	NO_x	$PM/PM_{10}/PM_{2.5}$	SO_2	VOC
Main Post—proposed new sources	3	38	1	1	2
EPG Roll-up	39	73	15	11	4

Sources: AP-42, DOE 1999

4.4.2.3 BMPs/Mitigation

BMPs. BMPs would be required and implemented for both construction emissions and stationary point source emission associated with this alternative. BMPs to control fugitive particle emissions implemented during construction may include:

- Using water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land
- Applying water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces that might create airborne dust
- Paving roadways and maintaining them in a clean condition
- Installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty material, including the implementation of adequate containment methods during sandblasting or other similar operations
- Covering open equipment for conveying or transporting material likely to create objectionable air pollution when airborne

- Promptly removing spilled or tracked dirt or other materials from paved streets

BMPs associated with the new permitted stationary sources of emissions would include:

- BACT review for each criteria pollutant
- MACT review for regulated HAPs and designated categories
- Air quality analysis (predictive air dispersion modeling), upon VDEQ's request
- Establishing procedures for measuring and recording emissions and/or process rates
- Meeting the NSPS and NESHAP requirements.

Mitigation. No specific mitigation measures with respect to air quality would be required with the implementation of the Preferred Alternative.

4.4.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

Implementing the Town Center Use Plan Alternative would be expected to have both short-term and long-term minor adverse effects to air quality. However, minor increases in emissions would conform to the SIP, would not introduce localized CO concentrations greater than the NAAQS, and would not be expected to contribute to a violation of any federal, state, or local air regulations.

4.4.3.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not generate any direct or indirect air emissions. Therefore, updating the land use plan designations would have no affect on the air quality. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated these activities.

4.4.3.2 BRAC Implementation and Facilities Projects

Implementing the BRAC and other facilities projects under this alternative could affect air quality in three ways: by generating pollutants during construction; by introducing new stationary sources of pollutants, such as heating boilers and standby generators; and through changes in vehicular traffic that could raise vehicle emission levels locally and possibly regionally. Air quality effects would be considered minor unless the estimated emissions would not conform to the SIP, contribute to a violation of any federal, state, or local air regulations, or introduce localized CO concentrations greater than the NAAQS.

4.4.3.2.1 General Conformity

Regardless of alternative, all activities associated with the BRAC action that would generate emissions would be identical in magnitude and occur within the region. Variation in the siting of the new facilities on Fort Belvoir under the Town Center Alternative would not change the emission estimations, the applicability of the GCR, or the determination of conformity. For these reasons, the Army has determined that the emissions associated with the Town Center Alternative conform to the CAA, and by definition, would not significantly impede the timely attainment of the NAAQS in the NCR.

4.4.3.2.2 Transportation Emissions and Localized CO Concentrations

Implementing the Town Center Alternative and the realignment of Fort Belvoir would decrease both the number of vehicles and the total vehicle miles traveled within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily due to a net reduction of approximately 1,700 personnel from the region and a slight overall decrease in vehicle miles traveled by individuals remaining. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality.

However, similar to the previous alternative, increases in localized traffic near the installation would result in an increase in traffic congestion and subsequent long-term minor increases in localized CO concentrations at nearby intersections (Table 4.4-12). These minor increases would not contribute to a violation of the CO NAAQS. The traffic changes associated with the Town Center Alternative would not be expected to cause significant long-term increases of other criteria pollutants, such as O_3, Pb, SO_2, VOCs, and NO_x. Detailed methodology for the determination of localized CO concentrations at intersections of interest is provided in Appendix E.2.

Table 4.4-12
Peak hour CO levels under the Town Center Alternative

Intersection	Maximum 1-Hour CO concentration (ppm)[a]	1-Hour NAAQS for CO (ppm)	Maximum 8-Hour CO concentration (ppm)[a]	8-Hour NAAQS for CO (ppm)	Exceeds NAAQS? (Yes/No)
Fairfax County Parkway/John J. Kingman Road	7.0	35.0	4.9	9.0	No
Franconia Springfield Parkway/Beulah Street	6.8	35.0	4.8	9.0	No
Route 1/Backlick Road–Pohick Road	6.3	35.0	4.4	9.0	No
Route 1/Belvoir Road	5.4	35.0	3.8	9.0	No
Route 1/Fairfax County Parkway	6.6	35.0	4.6	9.0	No
Route 1/Telegraph Road–Old Colchester Road	6.8	35.0	4.8	9.0	No

Source: 40 CFR 50.1-50.12

[a] CO levels include background concentrations of 3.7 ppm 1-hour and 2.5 ppm 8-hour (VDEQ, 2005a)

4.4.3.2.3 Regulatory Review and Air Permit Requirements

The new facilities would be equipped with several natural gas boilers and emergency generators. No other stationary sources of air emissions would be anticipated. Estimated potential emissions from proposed new sources for the Fort Belvoir Main Post and EPG under the Town Center Alternative are outlined in Table 4.4-13.

Table 4.4-13
Estimated potential emissions for stationary sources for the Town Center Alternative

	Potential to emit (tpy)				
	CO	NO_x	$PM/PM_{10}/PM_{2.5}$	SO_2	VOC
Main Post	43	111	16	11	6
EPG	0	0	0	0	0

Sources: AP-42; DOE, 1999

Main Post. All projects sited on Main Post are anticipated to have stationary source emission levels below the threshold that constitutes a major modification. However minor NSR construction permits may be required for some of the projects. A modification to Fort Belvoir's existing Title V permit would also be anticipated under this alternative. All new stationary sources would meet the NSPS and NESHAP requirements.

EPG. Because no new sources of air emissions would be sited at EPG under the Town Center Alternative, no construction or operating permits would be required for these sites.

4.4.3.3 BMPs/Mitigation

BMPs. BMPs would be similar to those listed in Section 4.4.2.3.

Mitigation. No specific mitigation measures with respect to air quality would be required with the implementation of the Town Center Alternative.

4.4.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

Implementing the City Center Use Plan Alternative would be expected to have both short-term and long-term minor adverse effects to air quality. However, minor increases in emissions would conform to the SIP, would not introduce localized CO concentrations greater than the NAAQS, and would not be expected to contribute to a violation of any federal, state, or local air regulations.

4.4.4.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not generate any direct or indirect air emissions. Therefore, updating the land use plan designations would have no affect on the air quality. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated these activities.

4.4.4.2 BRAC Implementation and Facilities Projects

Implementing the BRAC and other facilities projects under this alternative could affect air quality in three ways: through pollutants generated during construction; by introducing new stationary

sources of pollutants, such as heating boilers and standby generators; and through changes in vehicular traffic that could raise vehicle emission levels locally and possibly regionally. Air quality effects would be considered minor unless the estimated emissions would not conform to the SIP; contribute to a violation of any federal, state, or local air regulations; or introduce localized CO concentrations greater than the NAAQS.

4.4.4.2.1 General Conformity

Regardless of the alternative, all activities associated with the BRAC action that would generate direct and indirect emissions would be identical in magnitude and occur within the region. Variation in the siting of the new facilities on Fort Belvoir with the City Center Alternative would not change the emission estimations, the applicability of the GCR, or the determination of conformity. For these reasons, the Army has determined that the emissions associated with the City Center Alternative conform to the CAA, and by definition, would not significantly impede the timely attainment of the NAAQS in the NCR.

4.4.4.2.2 Transportation Emissions and Localized CO Concentrations

Implementing the City Center Alternative and the realignment of Fort Belvoir would decrease both the number of vehicles and the total vehicle miles traveled within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily due to a net reduction of approximately 1,700 personnel from the region and a slight overall decrease in vehicle miles traveled by individuals remaining. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality.

However, increases in localized traffic near the installation would result in an increase in traffic congestion and subsequent long-term minor increases in localized CO concentrations at nearby intersections (Table 4.4-14). These minor increases would not be expected to contribute to a violation of the CO NAAQS. The traffic changes associated with the Preferred Alternative would not cause significant long-term increases of other criteria pollutants, such as O_3, Pb, SO_2, VOCs, and NO_x. Detailed methodology for the determination of localized CO concentrations at intersections of interest is provided in Appendix E.2.

Table 4.4-14
Peak hour CO levels under the City Center Alternative

Intersection	Maximum 1-Hour CO concentration (ppm)[a]	1-Hour NAAQS for CO (ppm)	Maximum 8-Hour CO concentration (ppm)[a]	8-Hour NAAQS for CO (ppm)	Exceeds NAAQS? (Yes/No)
Fairfax County Parkway/John J. Kingman Road	6.7	35.0	4.7	9.0	No
Franconia Springfield Parkway EB Ramp/Backlick Road	7.6	35.0	5.3	9.0	No
Franconia Springfield Parkway/Beulah Street	6.8	35.0	4.8	9.0	No
Franconia Springfield Parkway/Spring Village Drive	7.3	35.0	5.1	9.0	No
Route 1/Backlick Road–Pohick Road	5.7	35.0	4.0	9.0	No
Route 1/Fairfax County Parkway	6.1	35.0	4.3	9.0	No
Route 1/Telegraph Road–Old Colchester Road	6.8	35.0	4.8	9.0	No

Source: 40 CFR 50.1-50.12

[a]CO levels include background concentrations of 3.7 ppm 1-hour and 2.5 ppm 8-hour (VDEQ, 2005a)

4.4.4.2.3 Regulatory Review and Air Permit Requirements

The new facilities would be equipped with several natural gas boilers and emergency generators. No other stationary sources of air emissions would be anticipated. Estimated potential emissions from proposed new sources for the Fort Belvoir Main Post and EPG under the City Center Alternative are outlined in Table 4.4-15.

Table 4.4-15
Estimated potential emissions for stationary sources for the City Center Alternative

	Potential to emit (tpy)				
	CO	NO_x	$PM/PM_{10}/PM_{2.5}$	SO_2	VOC
Main Post	1	2	0	0	0
EPG and GSA Parcel	43	109	16	11	6

Sources: AP-42; DOE, 1999

Main Post. All projects sited on Main Post are anticipated to have stationary source emission levels below the threshold that constitutes a major modification. However minor NSR construction permits may be required for some of the projects. A modification to Fort Belvoir's existing Title V permit would also be anticipated under this alternative. All new stationary sources would meet the NSPS and NESHAP requirements.

EPG and the GSA Parcel. EPG and the GSA Parcel areis discontiguous with respect to the Main Post; therefore, it meets the requirements of a separate facility. Exceedence of the major source thresholds would be anticipated with the implementation of the City Center Alternative. A NNSR permit would be required for these facilities. All new stationary sources would meet the NSPS and NESHAP requirements. Emission estimations were made using the current planning assumption on size and type of stationary sources.

4.4.4.3 BMPs/Mitigation

BMPs. BMPs would be similar to those listed in Section 4.4.2.3.

Mitigation. Mitigation with respect to air quality would be required with the implementation of the City Center Alternative. Under the NNSR permitting requirements, NO_x emission offsets at a ratio of 1:1.15 would have to be located and obtained for all stationary sources sited on EPG. Emission offsets are generally unavailable in this region and could be extremely expensive if they could be obtained at all.

4.4.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

Implementing the Satellite Campuses Alternative would be expected to have both short-term and long-term minor adverse effects to air quality. However, minor increases in emissions would be expected to conform to the SIP, would not introduce localized CO concentrations greater than the NAAQS, and would not be expected to contribute to a violation of any federal, state, or local air regulations.

4.4.5.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not be expected to generate any direct or indirect air emissions. Therefore, updating the land use plan designations would have no affect on the air quality. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated these activities.

4.4.5.2 BRAC Implementation and Facilities Projects

Implementing the BRAC and other facilities projects under this alternative can affect air quality in three ways: by generating pollutants during construction; by introducing new stationary sources of pollutants, such as heating boilers and standby generators; and through changes in vehicular traffic that may raise vehicle emission levels locally and possibly regionally. Air quality effects would be considered minor unless the estimated emissions would not conform to the SIP; contribute to a violation of any federal, state, or local air regulations; or introduce localized CO concentrations greater than the NAAQS.

4.4.5.2.1 General Conformity

Regardless of the alternative, all activities associated with the BRAC action that would generate direct and indirect emissions would be identical in magnitude and occur within the same region. Variation in the siting of the new facilities on Fort Belvoir with the Satellite Campuses Alternative would not change the emission estimations, the applicability of the GCR, or the determination of conformity. For these reasons, the Army has determined that the emissions associated with the Satellite Campuses Alternative conform to the CAA and, by definition, would not significantly impede the timely attainment of the NAAQS in the NCR.

4.4.5.2.2 Transportation Emissions and Localized CO Concentrations

Implementing the Satellite Campuses Alternative and the realignment of Fort Belvoir would decrease both the number of vehicles and the total vehicle miles traveled within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily due to a net reduction of approximately 1,700 personnel from the region, and a slight overall decrease in vehicle miles traveled by individuals remaining. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality.

However, increases in localized traffic near the installation would result in an increase in traffic congestion and subsequent long-term minor increases in localized CO concentrations at nearby intersections (Table 4.4-16). These minor increases would not be expected to contribute to a violation of the CO NAAQS. The traffic changes associated with the Satellite Campuses Alternative would not be expected to cause significant long-term increases of other criteria pollutants, such as O_3, Pb, SO_2, VOCs, and NO_x. Detailed methodology for the determination of localized CO concentrations at intersections of interest is provided in Appendix E.2.

Table 4.4-16
Peak hour CO levels under the Satellite Campuses Alternative

Intersection	Maximum 1-Hour CO concentration (ppm)[a]	1-Hour NAAQS for CO (ppm)	Maximum 8-Hour CO concentration (ppm)[a]	8-Hour NAAQS for CO (ppm)	Exceeds NAAQS? (Yes/No)
Fairfax County Parkway/John J. Kingman Road	7.0	35.0	4.9	9.0	No
Franconia Springfield Parkway/Beulah Street	6.8	35.0	4.8	9.0	No
Route 1/Backlick Road–Pohick Road	6.1	35.0	4.3	9.0	No
Route 1/Fairfax County Parkway	6.4	35.0	4.5	9.0	No
Route 1/Telegraph Road–Old Colchester Road	6.8	35.0	4.8	9.0	No

Source: 40 CFR 50.1-50.12

[a]CO levels include background concentrations of 3.7 ppm 1-hour and 2.5 ppm 8-hour (VDEQ, 2005a)

4.4.5.2.3 Regulatory Review and Air Permit Requirements

The new facilities would be equipped with several natural gas boilers and emergency generators. No other stationary sources of air emissions would be anticipated. Estimated potential emissions from proposed new sources for Fort Belvoir Main Post and EPG under the Satellite Campuses Alternative are outlined in Table 4.4-17.

Main Post. All projects sited on Main Post are anticipated to have stationary source emission levels below the threshold that constitutes a major modification. However minor NSR

Table 4.4-17
Estimated potential emissions for stationary sources for the Satellite Campuses Alternative

	Potential to emit (tpy)				
	CO	NO_x	$PM/PM_{10}/PM_{2.5}$	SO_2	VOC
Main Post	43	111	16	11	6
EPG	0	0	0	0	0

Sources: AP-42, DOE 1999

construction permits may be required for some of the projects. A modification to Fort Belvoir's existing Title V permit would also be anticipated under this alternative. All new stationary sources would meet the NSPS and NESHAP requirements.

EPG. Because no new sources of air emissions would be sited at EPG under the Satellite Campuses Alternative, no construction or operating permits would be required for these sites.

4.4.5.3 BMPs/Mitigation

BMPs. BMPs would be similar to those listed in Section 4.4.2.3.

Mitigation. No specific mitigation measures with respect to air quality would be required with the implementation of the Satellite Campuses Alternative.

4.4.6 NO ACTION ALTERNATIVE

The No Action Alternative would not result in changes in ambient air quality conditions if the BRAC action at Fort Belvoir were not implemented. No BRAC-related construction activities would be undertaken, and no BRAC-related changes in operations or traffic would take place. A GCD for the action and the permitting of stationary sources would not be required. However, under the No Action Alternative, regional traffic growth would continue and there would be no net exodus of Fort Belvoir personnel from the region. Below is a description of the No Action Alternative as a comparative baseline—knowing that primarily vehicle emissions both locally and regionally would continue to change under the No Action Alternative.

4.4.6.1 Transportation Emissions and Localized CO Concentrations

The No Action Alternative would not decrease the number of vehicles and the overall total VMT within the region. In turn, regional motor vehicle emissions would increase due to the in situ growth without the proposed changes. The BRAC-related reductions in vehicle emissions, and their subsequent ongoing net benefit to the region's air quality, would not be realized under the No Action Alternative.

However, non-BRAC increases in localized traffic near the installation would result in an increase in traffic congestion and subsequent long-term minor increases in localized CO concentrations at nearby intersections (Table 4.4-18). These minor increases would not contribute to a violation of the CO NAAQS. The traffic changes associated with the No Action Alternative would not be expected to cause significant long-term increases of other criteria pollutants, such as O_3, Pb, SO_2, VOCs, and NO_x. Detailed methodology for the determination of localized CO concentrations at intersections of interest is provided in Appendix E.2.

Table 4.4-18
Peak hour CO levels under the No Action Alternative

Intersection	Maximum 1-Hour CO concentration (ppm)[a]	1-Hour NAAQS for CO (ppm)	Maximum 8-Hour CO concentration (ppm)[a]	8-Hour NAAQS for CO (ppm)	Exceeds NAAQS? (Yes/No)
Route 1/Fairfax County Parkway	5.9	35.0	4.1	9.0	No
Fairfax County Parkway/John J. Kingman Road	6.7	35.0	4.7	9.0	No
Franconia Springfield Parkway EB Ramp/ Backlick Road	7.6	35.0	5.3	9.0	No
Franconia Springfield Parkway/Beulah Street	7.0	35.0	4.9	9.0	No
Franconia Springfield Parkway/Spring Village Drive	6.7	35.0	4.7	9.0	No
Route 1/Backlick Road–Pohick Road	5.6	35.0	3.9	9.0	No
Route 1/Belvoir Road	5.0	35.0	3.5	9.0	No
Route 1/Telegraph Road–Old Colchester Road	6.6	35.0	4.6	9.0	No

Source: 40 CFR 50.1-50.12

[a]CO levels include background concentrations of 3.7 ppm 1-hour and 2.5 ppm 8-hour (VDEQ, 2005a)

4.4.7 SUMMARY OF COMPARISON OF ALTERNATIVES

For all the development alternatives, implementing the BRAC action would be expected to have both short-term and long-term minor adverse effects to air quality. However, minor increases in emissions would conform to the SIP; would not be expected to contribute to a violation of any federal, state, or local air regulations; or introduce localized CO concentrations greater than the NAAQS.

Regionally the alternatives are very similar. Each would constitute approximately the same amount of both construction and operating emissions within the region for all years. A Draft General Conformity Determination was prepared and demonstrates that the emissions associated with each of the alternatives conform to the purpose and intent of the applicable SIP. Therefore, by definition, they do NOT:

- Interfere with the region's ability to attain the NAAQS in a timely fashion
- Cause or contribute to any new violations of an NAAQS
- Increase the frequency or severity of any existing violation of any NAAQS
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones.

For all the alternatives, both construction and operating permits for the new sources of air emission would be required for some of the new sources of air emissions. Implementation of some of the projects on Main Post under the Town Center or Satellite Campuses Alternatives could potentially exceed the major modification threshold. Emission resulting from the implementation of the City Center Alternative would exceed major source thresholds. For these alternatives, a Nonattainment New Source Review permit would may be required and emission offsets at a ration of 1:1.15 would have to be located and obtained for all stationary sources that fell under this permit.

For all the alternatives, implementing the BRAC action would decrease both the number of vehicles and the total VMT within the region. In turn, regional motor vehicle emissions would decrease. This decrease would be primarily due to a net reduction of approximately 1,700 personnel from the region. These are personnel leaving Fort Belvoir to areas outside the NCR. These BRAC-related reductions in emissions would constitute an ongoing net benefit to the region's air quality. However, increases in localized traffic near the installation would result in minor increase in traffic congestion and subsequent long-term minor increases in localized CO concentrations at nearby intersections. For all the alternatives, these minor increases would not be expected to contribute to a violation of the CO NAAQS. The traffic changes would not be expected to cause significant long-term increases of other criteria pollutants, such as O_3, Pb, SO_2, VOCs, and NO_x.

4.5 NOISE

4.5.1 AFFECTED ENVIRONMENT

4.5.1.1 Noise Fundamentals

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. 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. Noise is often generated by activities essential to a community's *quality of life*, such as construction or vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure level (SPL), described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz (Hz) are use to quantify sound frequency. The human ear responds differently to different frequencies. *A-weighing*, described in a-weighted decibels (dBA), approximates this frequency response to express accurately the perception of sound by humans. Sounds encountered in daily life and their approximate level in dBA is provided in Table 4.5-1.

Table 4.5-1
Common sounds and their levels

Outdoor	Sound level (dBA)	Indoor
Jetcraft at 50 feet	110	
Snowmobile	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: Harris, 1998

The ability to perceive changes in noise levels varies widely from person to person, as do individuals' responses to perceived changes. In general, a three-dBA change in noise level is barely perceptible to most listeners. A ten-dBA change is normally perceived as a doubling (or halving) of noise levels and is considered a substantial change. These thresholds make it possible to estimate a person's probable perception of changes in noise levels (Table 4.5-2).

4.5.1.2 Traffic Noise

The dBA noise metric describes steady noise levels; however, very few noises are, in fact, constant. Therefore, a noise metric, equivalent sound level (L_{eq}), has been developed. L_{eq} represents the average sound energy over a given time period presented in dB(e.g., 1-hour L_{eq} [$L_{eq}(1)$]). The Federal Highway Administration (FHWA) and the Commonwealth of Virginia

Table 4.5-2
Perception of changes in noise levels

Change in dBA	Perception
3	Barely perceptible change
5	Readily perceptible change
10	Twice or half as loud
20	Four times or 1/4 as loud
40	Eight times or 1/8 as loud

Source: FHWA, 1995

Department of Transportation (VDOT) use the $L_{eq}(1)$ descriptor to estimate the degree of nuisance or annoyance arising from changes in traffic noise. Because the principal noise-related concern is traffic noise, the $L_{eq}(1)$ descriptor is used in this analysis.

FHWA has established noise abatement criteria (NAC) that define traffic-related noise thresholds. These NAC vary depending on the type of land use and provide a convenient benchmark to assess the level at which noise becomes a clear source of annoyance (Table 4.5-3). Category B, which represents moderately sensitive land uses, best describes areas surrounding the Main Post, EPG and the GSA Parcel. The NAC for category B is 67 dBA.

Table 4.5-3
FHWA noise-abatement criteria

Activity category	Description of activity category	NAC $L_{eq}(1)$
A	Land for which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose	57 (exterior)
B	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals	67 (exterior)
C	Developed lands, properties, or activities not included in Categories A or B	72 (exterior)
D	Undeveloped lands	N/A
E	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums	52 (interior)

Source: FHWA, 1995

4.5.1.3 Aircraft Noise

Another metric used to quantify the noise environment is the A-weighted Day-night Sound Level (ADNL). Day-night Sound Level (DNL) is defined as the average sound energy in a 24–hour period with a 10–dB penalty added to the nighttime levels (10 p.m. to 7 a.m.). DNL is a useful descriptor for noise because (1) it averages ongoing yet intermittent noise, such as aircraft overflights, and (2) it measures total sound energy over a 24-hour period. The Federal Aviation Administration (FAA), DoD, and other organizations have adopted ADNL as the appropriate metric for estimating community annoyance from aircraft operations. In this analysis, ADNL is used to assess aircraft noise from Davison Army Airfield.

In June 1980, a Federal Interagency Committee on Urban Noise published guidelines (FICUN 1980) relating DNL to compatible (and incompatible) land uses. Since these guidelines were issued, federal agencies have generally adopted them for aircraft related noise analyses. Although these guidelines are not mandatory, they are the most accepted criteria used to assess the effects of noise in areas surrounding airports. In general, residential land uses are not compatible with an outdoor DNL above 65 dBA.

4.5.1.4 Existing Ambient Noise Levels

Main Post, EPG, and GSA Parcel. Existing ambient noise levels for Noise Sensitive Receptors (NSR) adjacent to the main traffic routes near the Main Post, EPG, and the GSA Parcel were modeled using the FHWA's Traffic Noise Model (TNM), Version 2.5. TNM combines noise levels of automobiles, medium and heavy trucks, busses, and motorcycles. TNM computes $L_{eq}(1)$ for comparison to the FHWA NAC. Several NSRs (including several residences, one school, and two churches) adjacent to the main traffic routes were category B land uses that were identified and carried forward for detailed analysis (Figure 4.5-1). Selected NSRs were the closest to the roadway of interest and were considered worst-case. All other NSRs would have both existing and future noise levels less than of the chosen NSR.

Morning and afternoon peak traffic periods have the highest potential for adverse noise conditions. Noise modeling was conducted using traffic information obtained during peak traffic hours at adjacent intersections. Estimated existing noise levels for the NSRs are summarized in Table 4.5-4. Existing noise levels do not exceed the NAC for category B land uses (67-dBA) at any of the sites identified.

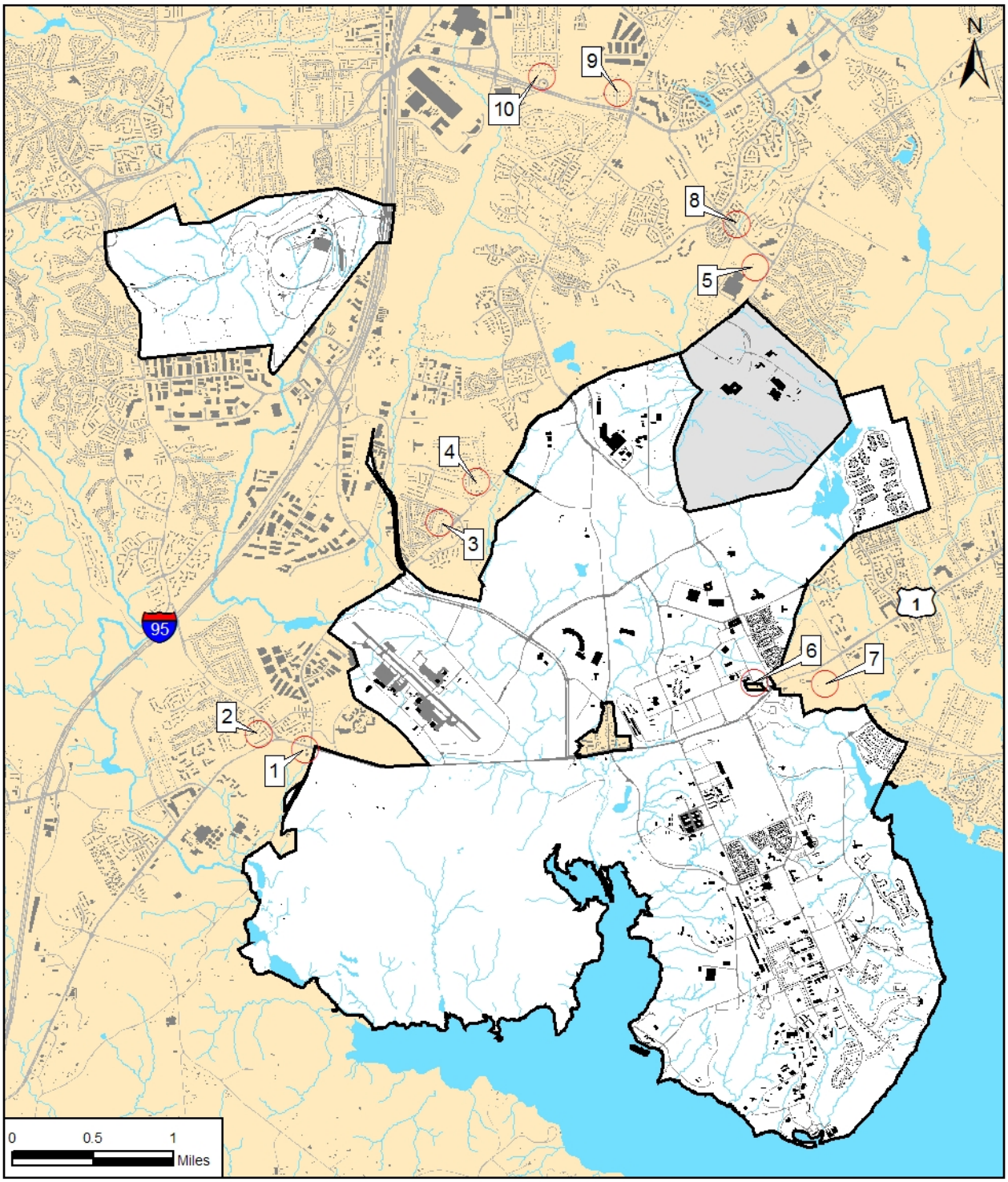
Davison Army Airfield is in the western portion of the Main Post and primarily serves five tenant units that operate aircraft such as C-12, C-172, UH-60, UH-1, and other military and general aviation aircraft. The airfield supports operations from helicopters, military fixed-wing aircraft, military jets, and general aviation aircraft (Wyle, 2000).

A review of the airfield's noise footprint and its compatibility with surrounding land uses on and adjacent to the Main Post was performed. This analysis was conducted using the NOISEMAP aircraft noise prediction model. NOISEMAP incorporates a database of known sound levels from various military aircraft and predicts noise levels (ADNL) from aircraft operations at and around military airfields. In 2004, approximately 26 acres of off-post land, including 11 residences, were exposed to ADNL levels greater than 65-dB. This area, adjacent to the Main Post, is not considered compatible with the existing noise environment.

There are no aircraft operations associated with EPG or the GSA Parcel. The 65-dB ADNL contour from Davison Airfield is confined to the Main Post and a limited area adjacent to it. Although the predominant flight track to and from the airfield is directly over EPG, the limited size and frequency of overflight events do not create any incompatible land uses within the boundaries of, or adjacent to, EPG or the GSA Parcel. EPG, GSA Parcel, and some areas on the Main Post outside the noise contours are exposed to mid-altitude aircraft overflight noise. These acoustical events are limited in level, duration, and frequency. They are not loud enough to create existing incompatible land uses of any of the areas being examined.

4.5.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

Implementing the Preferred Alternative would be expected to have both short-term and long-term minor adverse effects to the noise environment. However, minor increases in noise would not be



LEGEND

Installation Property

Approximate Noise Sensitive Receiver Location

Noise Sensitive Receptors

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.5-1

Table 4.5-4
Estimated existing traffic noise levels for noise sensitive receptors

Noise sensitive receptor (NSR)	Description	Location	Distance to roadway centerline (feet)	Estimated $L_{eq}(1)$ (dBA)
1	Pohick Church	Route 1 east of Telegraph Road	100	64.6
2	Residence	Route 1 east of Telegraph Road	124	62.9
3	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	82	60.5
4	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	96	62.5
5	Hayfield Elementary School	Telegraph Road between Beulah Street and Hayfield	650	60.8
8	Residence	Hayfield east of Telegraph and west of Franconia Springfield Parkway	100	65.9
9	Residence	Franconia Springfield Parkway east of Backlick Road and west of Beulah Road	150	64.1
10	Residence	Franconia Springfield Parkway east of Backlick Road and west of Beulah Road	300	58.7

Source: FHWA, 2005.

Note: Currently No existing information is available for NSRs 6 and 7. Future baseline conditions for these NSRs are outlined under the No Action Alternative.

expected to contribute to a violation of any federal, state, or local regulations or introduce areas of incompatible land use due to noise.

4.5.2.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not generate any direct or indirect noise. Therefore, updating the land use plan designations (comparison of 1993 land use [Figure 2-1] versus proposed [Figure 2-2]) would have no affect on the noise environment. Development on EPG doubles Professional/Institutional land use acreage, a likely adverse effect due to new noise sources where there previously were few activities occurring at EPG. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated with noise-producing activities.

4.5.2.2 BRAC Implementation and Facilities Projects

Implementing the BRAC action under the Preferred Alternative would change the existing noise environment. These changes would be primarily due to construction activities, changes in traffic

patterns, and the establishment of new facilities on both the Main Post and EPG. The following is a discussion of these changes and potential effects.

4.5.2.2.1 Construction Noise

Main Post and EPG. The Preferred Alternative would require construction activities at the Main Post and EPG. Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet. With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction sites. The zone of relatively high construction noise typically extends to distances of 400 to 800 feet from the site of major equipment operations. Locations more than 1,000 feet from construction sites seldom experience noteworthy levels of construction noise. Table 4.5-5 presents typical noise levels (dBA at 50 feet) that EPA has estimated for the main phases of outdoor construction. Given the temporary nature of proposed construction activities and the limited amount of noise that construction equipment would generate, this effect would be considered minor.

Table 4.5-5
Noise levels associated with outdoor construction

Construction phase	Sound level (dBA)
Ground clearing	84
Excavation, grading	89
Foundations	78
Structural	85
Finishing	89

Source: USEPA, 1971

Construction noise would be expected to dominate the soundscape for all on-site personnel. Construction personnel, and particularly equipment operators, would don adequate personal hearing protection to limit exposure and ensure compliance with federal health and safety regulations.

4.5.2.2.2 Traffic Noise

Noise levels for NSRs adjacent to the main traffic routes near the Main Post and EPG were modeled using traffic information obtained during peak traffic hours for the Preferred Alternative. By implementing the Preferred Alternative, estimated noise levels would not exceed the NAC for category B land uses (67 dBA) at any of the sites identified. In addition, the change in levels would not be perceptible (greater than 3 dB change) over the levels associated with the implementation of the No Action Alternative (Table 4.5-6). These effects would be negligible when compared to the future conditions without implementing the BRAC action. New access roads at EPG would introduce a minor increase in traffic noise for nearby NSR. However, the traffic volume would be much less than, and the distance to the closest NSR would be greater than, any of the locations considered in this analysis. Therefore, levels are not expected to exceed the NAC for category B land uses (67 dBA) at any of these locations.

Table 4.5-6
Estimated traffic noise levels for noise sensitive receptors for the Preferred Alternative

Noise sensitive receptor (NSR)	Description	Location	Distance to roadway centerline (feet)	Estimated $L_{eq}(1)$ (dBA)	No Action estimated $L_{eq}(1)$ (dBA)	Change in level $L_{eq}(1)$ (dBA)
1	Pohick Church	Route 1 east of Telegraph Road	100	65.4	64.7	0.7
2	Residence	Route 1 east of Telegraph Road	124	63.7	62.9	0.8
3	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	82	61.4	61.3	0.1
4	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	96	63.5	63.4	0.1
5	Hayfield Elementary School	Telegraph Road between Beulah Street and Hayfield	650	61.2	61.2	0.0
6	Alexandria Friends Meeting House	Route 1 between Belvoir Road and Mt. Vernon Road	375	55.8	55.7	0.1
7	Woodlawn Baptist Church	Route 1 between Belvoir Road and Mt. Vernon Road	200	60.5	60.0	0.5
8	Residence	Hayfield east of Telegraph and west of Franconia Springfield Parkway	100	66.4	66.4	0.0
9	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	150	64.3	64.3	0.0
10	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	300	59.0	59.0	0.0

Source: FHWA, 2005.

4.5.2.2.3 Aircraft Noise and Military Training Noise

The primary use of the proposed facilities would be administrative office space. There would be no changes to aircraft operations, small arms training, artillery training, or use of demolitions at Fort Belvoir with the implementation of the Preferred Alternative. Therefore, there would be no changes in the existing noise environment due to these types of activities. In addition, the selected sites for the new facilities would not be in areas of incompatible land use due to noise generated by air operations at Davison Army Airfield.

4.5.2.3 BMPs/Mitigation

BMPs. BMPs would be required and implemented for construction noise associated with this alternative. BMPs implemented during construction may include:

- Limting construction to predominately occur during normal weekday business hours in areas adjacent to noise-sensitive land uses such as residential areas, recreational areas, and off-post areas
- Properly maintaining construction equipment mufflers to be in good working order.

Mitigation. No specific mitigation measures with respect to noise would be required with the implementation of the Preferred Alternative.

4.5.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

Implementing the Town Center Alternative would be expected to have both short-term and long-term minor adverse effects to the noise environment. However, minor increases in noise would not be expected to contribute to a violation of any federal, state, or local regulations or introduce areas of incompatible land use due to noise.

4.5.3.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not generate any direct or indirect noise. Therefore, updating the land use plan designations would have no affect on the noise environment. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated noise-producing activities.

4.5.3.2 BRAC Implementation and Facilities Projects

Implementing the BRAC action under this alternative would change the existing noise environment. These changes would be primarily due to construction activities, changes in traffic patterns, and the establishment of new facilities on both the Main Post and EPG. The following is a discussion of these changes and potential effects.

4.5.3.2.1 Construction Noise

Main Post. Under the Town Center Alternative, construction activities would take place at the Main Post only. Construction noise would be similar to those outlined under the Preferred Alternative for the Main Post and EPG. Therefore, due to the limited noise (both levels and time of day) and the temporary nature associated with construction, these effects would be considered minor.

EPG. The Town Center Alternative would not require construction activities at EPG. Therefore, there would be no effect due to construction noise at these locations.

4.5.3.2.2 Traffic Noise

Noise levels for NSRs adjacent to the main traffic routes near the Main Post and EPG were modeled using traffic information obtained during peak traffic hours for the Town Center Alternative. By implementing the Town Center Alternative, estimated noise levels would not exceed the NAC for category B land uses (67 dBA) at any of the sites identified. In addition, the

change in levels would not be perceptible (greater than 3 dB change) over the levels associated with the implementation of the No Action Alternative (Table 4.5-7). These effects would be negligible when compared to the future conditions without implementing the BRAC action.

4.5.3.2.3 Aircraft Noise and Military Training Noise

The primary use of the proposed facilities would be administrative office space. There would be no changes to aircraft operations, small arms training, artillery training, or use of demolitions at Fort Belvoir with the implementation of the Town Center Alternative. Therefore, there would be no changes in the existing noise environment due to these types of activities. In addition, the selected sites for the new facilities would not be in areas of incompatible land use due to noise generated by air operations at Davison Army Airfield.

Table 4.5-7
Estimated traffic noise levels for noise sensitive receptors for the Town Center Alternative

Noise sensitive receptor (NSR)	Description	Location	Distance to roadway centerline (feet)	Estimated $L_{eq}(1)$ (dBA)	No Action estimated $L_{eq}(1)$ (dBA)	Change in level $L_{eq}(1)$ (dBA)
1	Pohick Church	Route 1 east of Telegraph Road	100	65.2	64.7	0.5
2	Residence	Route 1 east of Telegraph Road	124	63.5	62.9	0.6
3	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	82	61.4	61.3	0.1
4	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	96	63.5	63.4	0.1
5	Hayfield Elementary School	Telegraph Road between Beulah Street and Hayfield	650	61.2	61.2	0.0
6	Alexandria Friends Meeting House	Route 1 between Belvoir Road and Mt. Vernon Road	375	55.6	55.7	-0.1
7	Woodlawn Baptist Church	Route 1 between Belvoir Road and Mt. Vernon Road	200	60.3	60.0	0.3
8	Residence	Hayfield east of Telegraph and west of Franconia Springfield Parkway	100	66.3	66.4	-0.1
9	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	150	64.3	64.3	0.0
10	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	300	59.0	59.0	0.0

Source: FHWA, 2005.

4.5.3.3 BMPs/Mitigation

BMPs. BMPs would be similar to those listed in Section 4.5.2.3.

Mitigation. No specific mitigation measures with respect to noise would be required with the implementation of the Town Center Alternative.

4.5.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

Implementing the City Center Alternative would be expected to have both short-term and long-term minor adverse effects to the noise environment. However, minor increases in noise would not be expected to contribute to a violation of any federal, state, or local regulations or introduce areas of incompatible land use due to noise.

4.5.4.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not generate any direct or indirect noise. Therefore, updating the land use plan designations would have no affect on the noise environment. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated noise-producing activities.

4.5.4.2 BRAC Implementation and Facilities Projects

Implementing the BRAC action under this alternative would change the existing noise environment. These changes would be primarily due to construction activities, changes in traffic patterns, and the establishment of new facilities on both the Main Post and EPG. The following is a discussion of these changes and potential effects.

4.5.4.2.1 Construction Noise

Under the City Center Alternative construction, activities would take place at the Main Post, EPG and the GSA Parcel. Construction noise at these locations would be similar to those outlined under the Preferred Alternative for the Main Post and EPG. Therefore, due to the limited noise (both levels and time of day) and the temporary nature associated with construction, these effects would be considered minor.

4.5.4.2.2 Traffic Noise

Noise levels for NSRs adjacent to the main traffic routes near the Main Post, EPG, and the GSA Parcel were modeled using traffic information obtained during peak traffic hours for the City Center Alternative. By implementing the City Center Alternative, estimated noise levels would not exceed the NAC for category B land uses (67 dBA) at any of the sites identified. In addition, the change in levels would not be perceptible (greater than 3 dB change) over the levels associated with the implementation of the No Action Alternative (Table 4.5-8). These effects would be negligible when compared to the future conditions without the implementation of the BRAC action.

4.5.4.2.3 Aircraft Noise and Military Training Noise

The primary use of the proposed facilities would be administrative office space. There would be no changes to aircraft operations, small arms training, artillery training, or use of demolitions at Fort Belvoir with the implementation of the City Center Alternative. Therefore, there would be no changes in the existing noise environment due to these types of activities. In addition, the

Table 4.5-8
Estimated traffic noise levels for noise sensitive receptors for the City Center Alternative

Noise sensitive receptor (NSR)	Description	Location	Distance to roadway centerline (feet)	Estimated $L_{eq}(1)$ (dBA)	No Action estimated $L_{eq}(1)$ (dBA)	Change in level $L_{eq}(1)$ (dBA)
1	Pohick Church	Route 1 east of Telegraph Road	100	65.8	64.7	1.1
2	Residence	Route 1 east of Telegraph Road	124	64.0	62.9	1.1
3	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	82	62.0	61.3	0.7
5	Hayfield Elementary School	Telegraph Road between Beulah Street and Hayfield	650	61.3	61.2	0.1
6	Alexandria Friends Meeting House	Route 1 between Belvoir Road and Mt. Vernon Road	375	56.3	55.7	0.6
7	Woodlawn Baptist Church	Route 1 between Belvoir Road and Mt. Vernon Road	200	61.0	60.0	1.0
8	Residence	Hayfield east of Telegraph and west of Franconia Springfield Parkway	100	66.4	66.4	0.0
9	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	150	64.4	64.3	0.1
10	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	300	59.1	59.0	0.1

Source: FHWA, 2005.

selected sites for the new facilities would not be in areas of incompatible land use due to noise generated by air operations at Davison Army Airfield. New access roads at EPG and the GSA parcel would introduce a minor increase in traffic noise for nearby NSR. However, the traffic volume would be much less than, and the distance to the closest NSR would be greater than, any of the locations considered in this analysis. Therefore, levels are not expected to exceed the NAC for category B land uses (67 dBA) at any of these locations.

4.5.4.3 BMPs/Mitigation

BMPs. BMPs would be similar to those listed in Section 4.5.2.3.

Mitigation. No specific mitigation measures with respect to noise would be required with the implementation of the City Center Alternative.

4.5.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

Implementing the Satellite Campuses Alternative would be expected to have both short-term and long-term minor adverse effects to the noise environment. However, minor increases in noise would not be expected to contribute to a violation of any federal, state, or local regulations or introduce areas of incompatible land use due to noise.

4.5.5.1 Land Use Plan Update

The planning activities associated with the land use plan update under this alternative would not generate any direct or indirect noise. Therefore, updating the land use plan designations would have no affect on the noise environment. Detailed analysis is presented in the next section on BRAC implementation and potential effects associated noise-producing activities.

4.5.5.2 BRAC Implementation and Facilities Projects

Implementing the BRAC action under this alternative would change the existing noise environment. These changes would be primarily due to construction activities, changes in traffic patterns, and the establishment of new facilities on both the Main Post and EPG. The following is a discussion of these changes and potential effects.

4.5.5.2.1 Construction Noise

Main Post. Under the Satellite Campuses Alternative, construction activities would take place at the Main Post only. Construction noise would be similar to those outlined under the Preferred Alternative for the Main Post and EPG. Therefore, due to the limited noise (both levels and time of day) and the temporary nature associated with construction, these effects would be considered minor.

EPG. The Satellite Campuses Alternative would not require construction activities at EPG. Therefore, there would be no effect due to construction noise at these locations.

4.5.5.2.2 Traffic Noise

Noise levels for NSRs adjacent to the main traffic routes near the Main Post and EPG were modeled using traffic information obtained during peak traffic hours for the Satellite Campuses Alternative. By implementing the Satellite Campuses Alternative, estimated noise levels would not exceed the NAC for category B land uses (67 dBA) at any of the sites identified. In addition, the change in levels would not be perceptible (greater than 3 dB change) over the levels associated with the implementation of the No Action Alternative (Table 4.5-9). These effects would be negligible when compared to the future conditions without the implementation of the BRAC action.

4.5.5.2.3 Aircraft Noise and Military Training Noise

Under the Satellite Campus Alternative, DAAF would be closed to allow for the establishment of the NGA facilities. Aircraft operations would potentially cease and a corresponding net benefit to the noise environment realized. There would be no changes to aircraft operations, small arms training, artillery training, or use of demolitions at Fort Belvoir with the implementation of the Satellite Campuses Alternative. Therefore, there would be no changes in the existing noise environment due to these types of activities. In addition, the selected sites for the new facilities

Table 4.5-9
Estimated traffic noise levels for noise sensitive receptors for the Satellite Campuses Alternative

Noise sensitive receptor (NSR)	Description	Location	Distance to roadway centerline (feet)	Estimated $L_{eq}(1)$ (dBA)	No Action estimated $L_{eq}(1)$ (dBA)	Change in level $L_{eq}(1)$ (dBA)
1	Pohick Church	Route 1 east of Telegraph Road	100	65.5	64.7	0.8
2	Residence	Route 1 east of Telegraph Road	124	63.7	62.9	0.8
3	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	82	61.8	61.3	0.5
4	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	96	63.9	63.4	0.5
5	Hayfield Elementary School	Telegraph Road between Beulah Street and Hayfield	650	61.3	61.2	0.1
6	Alexandria Friends Meeting House	Route 1 between Belvoir Road and Mt. Vernon Road	375	56.0	55.7	0.3
7	Woodlawn Baptist Church	Route 1 between Belvoir Road and Mt. Vernon Road	200	60.7	60.0	0.7
8	Residence	Hayfield east of Telegraph and west of Franconia Springfield Parkway	100	66.4	66.4	0.0
9	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	150	64.3	64.3	0.0
10	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	300	59.0	59.0	0.0

Source: FHWA, 2005.

would not be in areas of incompatible land use due to noise generated by air operations at Davison Army Airfield.

4.5.5.3 BMPs/Mitigation

BMPs. BMPs would be similar to those listed in Section 4.5.2.3.

Mitigation. No specific mitigation measures with respect to noise would be required with the implementation of the Satellite Campuses Alternative.

4.5.6 NO ACTION ALTERNATIVE

Implementing the No Action Alternative would be expected to have no effects to the noise environment.

4.5.6.1 Land Use Plan Update

Under the No Action Alternative, BRAC-related construction or changes in operations would not take place. Therefore, there would be no effect on the noise environment.

4.5.6.2 BRAC Implementation and Facilities Projects

Although there would be no implementation of the BRAC action under this Alternative, traffic would increase due to in-place regional growth. An analysis of the future traffic noise environment was carried forward as a comparative baseline for the other alternatives under consideration.

Noise levels for NSRs adjacent to the main traffic routes near the Main Post, EPG, and the GSA Parcel were modeled using traffic information obtained during peak traffic hours for the No Action Alternative. By implementing the No Action Alternative, estimated noise levels would not exceed the NAC for category B land uses (67 dBA) at any of the sites identified (Table 4.5-10).

Table 4.5-10
Estimated traffic noise levels for noise sensitive receptors for the No Action Alternative

Noise sensitive receptor (NSR)	Description	Location	Distance to roadway centerline (feet)	No Action estimated L_{eq}(1) (dBA)
1	Pohick Church	Route 1 east of Telegraph Road	100	64.7
2	Residence	Route 1 east of Telegraph Road	124	62.9
3	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	82	61.3
4	Residence	Telegraph Road between Fairfax County Parkway and Beulah Street	96	63.4
5	Hayfield Elementary School	Telegraph Road between Beulah Street and Hayfield	650	61.2
6	Alexandria Friends Meeting House	Route 1 between Belvoir Road and Mt. Vernon Road	375	55.7
7	Woodlawn Baptist Church	Route 1 between Belvoir Road and Mt. Vernon Road	200	60.0
8	Residence	Hayfield east of Telegraph and west of Franconia Springfield Parkway	100	66.4
9	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	150	64.3
10	Residence	Franconia Springfield Parkway east of Backlick west of Beulah	300	59.0

Source: FHWA, 2005.

There would be no changes to aircraft operations, small arms training, artillery training, or use of demolitions at Fort Belvoir with the implementation of the Satellite Campuses Alternative. Therefore, there would be no changes in the existing noise environment due to these types of activities. In addition, the selected sites for the new facilities would not be in areas of incompatible land use due to noise generated by air operations at Davison Army Airfield.

4.5.6.3 BMPs/Mitigation

No BMPs or mitigation with respect to noise would be required with the implementation of the No Action Alternative.

4.5.7 SUMMARY OF COMPARISON OF ALTERNATIVES

For all the development alternatives, the BRAC action would be expected to have both short-term and long-term minor adverse effects to the noise environment. However, minor increases in noise would not be expected to contribute to a violation of any federal, state, or local regulations or introduce areas of incompatible land use due to noise.

Each development alternative would require construction activities at the Main Post, EPG, or the GSA Parcel. Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet. With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction sites. The zone of relatively high construction noise typically extends to distances of 400 to 800 feet from the site of major equipment operations. Locations more than 1,000 feet from construction sites seldom experience noteworthy levels of construction noise. Given the temporary nature of proposed construction activities and the limited amount of noise that construction equipment would generate, this effect would be considered minor.

Noise levels for NSRs adjacent to the main traffic routes near the Main Post, EPG, and the GSA Parcel were modeled using traffic information obtained during peak traffic hours for all the alternatives. Estimated noise levels would not exceed the noise-abatement criteria for residential land uses (67 dBA). In addition, the change in levels would not be perceptible (greater than 3 dB change) over the levels associated with the implementation of the No Action Alternative. These effects would be negligible when compared to the future conditions without the implementation of the BRAC action.

There would be no changes to aircraft operations, small arms training, artillery training, or use of demolitions at Fort Belvoir by implementing the BRAC action. Therefore, there would be no changes in the existing noise environment due to these types of activities. In addition, the selected sites for the new facilities would not be in areas of incompatible land use due to noise generated by air operations at Davison Army Airfield.

4.6 TOPOGRAPHY, GEOLOGY, AND SOILS

4.6.1 AFFECTED ENVIRONMENT

4.6.1.1 Topography

Main Post. The topography of Fort Belvoir's Main Post (Figure 4.6-1, Topography of Fort Belvoir) is characterized by uplands and plateaus, lowlands, and steeply sloped terrain. The land ranges in elevation from approximately sea level along the Potomac River to approximately 230 feet above mean sea level (msl) near the intersection of Beulah Street and Woodlawn Road in the upland area of the installation (Horne, 2001).

Uplands and plateaus make up approximately 40 percent of the installation. Upland areas dominate the topography on the North Post and are gently rolling to steeply sloped. The South Post and Southwest Area contain nearly level plateaus that are oriented from north to south. The South Post plateau is almost a mile wide and extends from Route 1 southeast to 23rd Street. Another plateau is in the Southwest Area. This plateau is lower in elevation and more gently sloping than the South Post plateau (Horne, 2001).

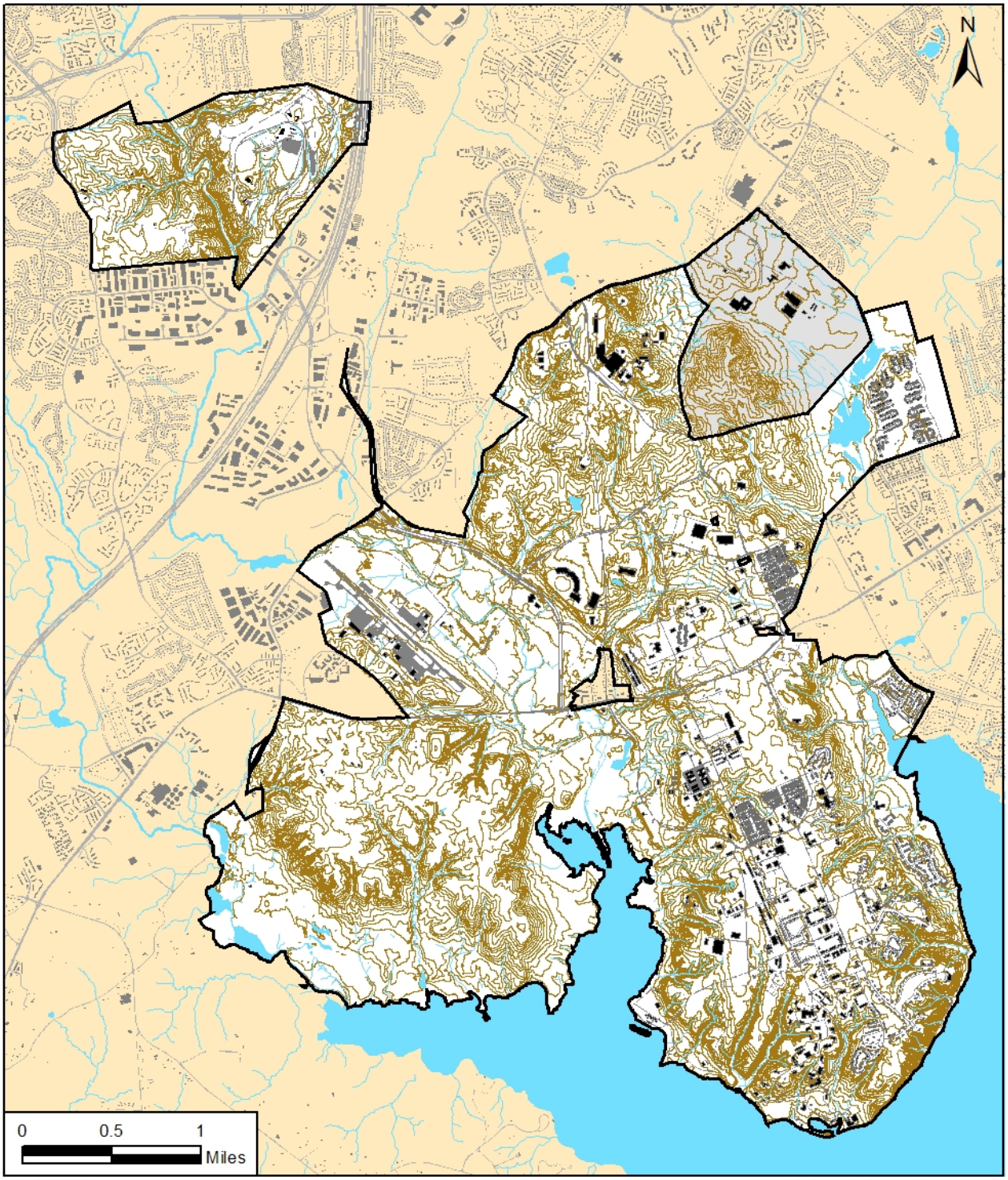
Lowlands make up another 40 percent or so of the land at Fort Belvoir. Lowland areas on Fort Belvoir are mostly associated with the floodplains of Accotink, Pohick, and Dogue Creeks. Additional lowland areas exist between the shoreline and the steeply sloped terrain that surrounds the two plateaus. The lowland topography is gently sloped (from about 10 percent at their upland fringes to almost zero along the active floodplains) (Horne, 2001).

Steeply sloped (greater than 20 percent) terrain characterizes the remaining 20 percent of the installation's land. Areas of steeply sloped terrain, ravines, and stream valleys surround the two plateaus separating them from the lowlands. Seeps and springs occur along slope faces. Fringe slopes surrounding the South Post plateau range from 20 to 90 percent. Southeast of 23rd Street, the ground plunges to approximately sea level at slopes that range from 10 to almost 90 percent along the southern edge of Fairfax Village. Unstable, steep-slope conditions are mostly because of a combination of weakly cemented sedimentary substrates and wind and water erosion near the Potomac River (Horne, 2001).

Steep and highly erodible slopes are also found along the eastern and western edges of the Southwest Area plateau and in deeply cut stream channels. These slopes range from 10 to 50 percent (Horne, 2001).

EPG. The topography of EPG is gently rolling, except for steep slopes bordering Accotink Creek. Accotink Creek enters EPG from the north at an elevation of approximately 120 feet above msl and descends to an elevation of approximately 100 feet msl before exiting EPG to the south. Steep slopes rise from both the eastern and western banks of Accotink Creek to an elevation of approximately 200 feet above msl, forming a narrow stream valley. The grades on the slopes range between 20 and 30 percent at most locations (USGS, 1984).

The areas to the east of Accotink Creek range in elevation between approximately 200 and 230 feet above msl. The highest lands are situated in the northern part of Heller Loop, and elevations descend gently to the south and west. Elevations also descend sharply toward the eastern and northern perimeters of EPG, along the creek beds for small unnamed tributaries to Accotink Creek. The areas to the west of Accotink Creek range in elevation between approximately 200



LEGEND

Installation Property

10' Contour Interval

Topography of Fort Belvoir

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.6-1

and 300 feet msl. The highest lands are situated near the northwest corner of EPG, and elevations descend gently to the south and east (USGS, 1984).

GSA Parcel. The topography of the GSA Parcel is generally flat because almost the entire site has been graded to support the construction of warehouse buildings. Portions of the parcel that have not been cut or filled slope slightly upward from the east side where the lowest point is approximately 200 feet above msl to the west side where the highest point reaches just over 240 feet above msl (Fairfax County, 2002).

4.6.1.2 Geology and Soils

The following sections provide detailed descriptions of geology and soils on Fort Belvoir.

4.6.1.2.1 Geology

Main Post. Fairfax County is divided into two physiographic provinces: the Coastal Plain and the Piedmont Plateau (Hobson, 1996). The fall line, which runs north to south through Virginia, crosses Fairfax County and forms the boundary between the resistant, metamorphic rocks of the Piedmont and the softer, sedimentary rocks of the Coastal Plain (Terwilliger, 1991,).

Fort Belvoir's Main Post lies below the fall line within the high and low Coastal Plain Terraces of the Coastal Plain Physiographic Province, which are two of the five Fairfax County province sub-sections. There are several geologic formations associated with the Coastal Plain Physiographic Province, including the Potomac Formation, Bacons Castle Formation, Shirley Formation, and Alluvium and Pliocene sand and gravel (Hobson, 1996,). The Potomac Formation outcrops along the slopes leading down to the Potomac River shoreline on the Main Post.

The Coastal Plain Physiographic Province consists of unconsolidated sand, silt, and clay underlain by residual soil and weathered crystalline rocks. Most of the Coastal Plain Physiographic Province deposits in the Fort Belvoir area consist of a sequence of unconsolidated sediments that belong to the Potomac Group (Hobson, 1996,).

The Potomac Group is characterized by lens-shaped deposits of interbedded sand, silt, clay, and gravel, primarily of non-marine origin. The Potomac Group is approximately 600 feet thick beneath most of Fort Belvoir (Law Engineering and Environmental Services, 1995, as cited in U.S. Army 2001).

Fort Belvoir's uplands are underlain by sands, silts, and clays of riverine origin. Uplands underlain by sands and silts tend to be more stable than those underlain by clays. Uplands that are underlain by clayey soils form undulating and rolling hills where the dominant land-forming process is mass wasting, which includes downhill creep, landslides, slumping, and rockfalls. Lowlands and valley bottoms are typically underlain with sediments deposited by moving water (Horne, 2001). The dominant land-forming process in these lower areas is active riverine erosion and deposition during overbank flooding. Surface drainage is commonly poor due to the shallow water table. Drainage usually occurs as surface runoff, with runoff greatest on the steeper slopes. The extent of runoff increases with construction activity and the removal of vegetation, which in turn increases the rate of erosion and the probability of creep and slumping.

EPG. EPG is near the Fall Line, which is the northeastern-trending physiographic boundary separating the eastern edge of the Piedmont Upland physiographic province and the western edge of the Coastal Plain physiographic province (USATHAMA, 1990). Piedmont areas consist

largely of Precambrian metamorphic and Cambrian igneous rock formations, whereas Coastal Plain areas consists of an eastward thickening wedge of unconsolidated sediments of gravel, sand, silt, and clay from the Cretaceous to Tertiary periods.

Rock formations from both provinces can be found within the boundaries of EPG as a finger of Piedmont Upland province bedrock extends from north to south along Accotink Creek. Piedmont Upland bedrock outcrops form the bed and adjacent slopes of the creek. Most of the more gently sloping areas to the east and west of the creek consist of unconsolidated deposits from the Coastal Plain province.

GSA Parcel. The GSA Parcel is in the Coastal Plain physiographic province, northeast of EPG and directly north of the Main Post. Similar to the eastern portion of EPG, the site is underlain by unconsolidated sediments (gravel, sand, silt and clay) (USATHAMA, 1990). Land-forming activity within the parcel is limited because of its small size, gentle slope, and the fact that much of the area is covered with impervious surfaces.

4.6.1.2.2 Soils

Main Post. The Natural Resource Conservation Service (NRCS, formerly the Soil Conservation Service) surveyed Fort Belvoir Main Post soils in 1982. The NRCS soil survey described and delineated 19 named soil series within Fort Belvoir. The survey data have been incorporated into the Fort Belvoir Geographic Information System. In addition to the 19 named soil series, there are areas of mixed waterborne sediments (Entisols) and tidal marsh (Histosols) that are not sufficiently defined to be classified as series (Horne, 2001).

Of the area included in the survey, 1,898 acres are described as urban built-up, and 587 acres are cut and fill. The urban, built-up unit includes primarily ridgetop or other well-drained, flatter areas that have been disturbed minimally to drastically by construction and development over the years. Areas within the urban, built-up units that are not under buildings or pavement are vegetated, and soil fertility is maintained by fertilizer application and landscaping. The cut-and-fill unit consists of areas where soil material has been removed (cut) and non-native material placed into low areas (fill) in order to level/lower slopes, facilitating construction activities. Fill material is generally of unknown source but is likely to be material selected for high structural stability following placement. Table 4.6-1 lists the soils mapped within Fort Belvoir Main Post, along with some selected features (Horne, 2001). Figure 4.6-2 (Soils of Fort Belvoir) depicts the distribution of soil types throughout the Main Post and EPG.

For each soil type, Table 4.6-1 provides soil name; drainage and problem classes; whether they are highly erodible or subject to flooding; foundation support rating; and acreage. The problem class ranks the installation's soils with respect to the degree of difficulty they present in building-site development, including the construction of buildings with and without basements; local roads and streets; shallow excavations; small commercial buildings; and lawns and landscaping. Soils classified as problem class A are severe and present significant, unfavorable constraints to development and require substantial design work, increased construction costs, and increased maintenance work, with lesser problems associated with classes B and C in that order. Each class is further defined below.

- ***Problem Class A***. Problems attributed to these soils include unstable slopes and land slippage, high shrink-swell clays, poor foundation support, and high water table conditions. The Fairfax County Public Facilities Manual and Building Codes require that a geotechnical engineering report be prepared by or under the direction of a professional

Table 4.6-1
Fort Belvoir Main Post soils

Soil name (series-phase)	Drainage class	Problem Class	Highly erodible	Flooding	Foundation support	Acres
Dumfries sandy loam 2–50% slopes	WD	A	No	No	Generally stable west of I-95; could be unstable east of I-95 especially near marine clays	1,557
Beltsville silt loam 0–15% slope	MWD	B	Yes	No	Good with proper drainage; foundation drains and waterproofing necessary	805
Mattapex silt loam 2–15% slope	WD–MWD	B	Yes	No	Marginal; foundation drains and waterproofing needed	508
Mixed alluvial 0–2% slope	PD	A	No	Frequent (Jan–Dec)	Poor	479
Matapeake silt loam 2–15% slope	WD	C	Yes	No	Generally favorable	264
Lenoir silt loam 0–2% slope	SPD	B	Yes	No	Marginal	238
Lunt fine sandy loam 2–25% slope	WD–MWD	A	No	No	Stable above sands; could be unstable near marine clays	217
Keyport silt loam 0–2% slope	MWD	B	No	No	Fair	203
Wehadkee silt loam 0–2% slope	PD	A	Yes	Frequent (Nov–Jun)	Poor; basements not recommended	169
Bertie silt loam 0–2% slope	MWD	B	No	No	Marginal to poor; foundation drains needed for basements and crawl spaces	140
Sassafras fine sandy loam 2–15% slope	WD	C		No	No data	130
Woodstown fine sandy loam 0–15% slope	MWD	C	Yes	No	Marginal; foundation drains needed for basements and crawl spaces	119
Dragston fine sandy loam 0–2% slope	SPD	B	No	No	Marginal; foundation drains and waterproofing needed	103
Fallsington fine sandy loam 0–2% slope	PD	A	No	No	Poor	62
Quantico 7–25% slope	WD	No data	No	No	No data	60
Galestown loamy fine sand 0–2% slope	SED	C	Yes	No	Adequate for small buildings (three stories or fewer)	54
Chewacla silt loam 0–2% slope	SPD	A	Yes	Frequent (Nov–Apr)	Poor; basements not recommended	17

Table 4.6-1
Fort Belvoir Main Post soils *(continued)*

Soil name (series-phase)	Drainage class	Problem class	Highly erodible	Flooding	Foundation support	Acres
Urban 0-10% slope	N/A	Not rated	No	N/A	Suitable	1,742
Cut and fill	N/A	Not rated	N/A	N/A	Suitable	412
Unknown	N/A	Not rated	N/A	N/A	N/A	388
TOTAL						**7,793**

Sources: US SCS, 1982, as cited in Horne, 2001; Fairfax County, 2001a.
Drainage Class Abbreviations:
MWD = moderately well-drained SPD = somewhat poorly drained PD = poorly drained
VPD = very poorly drained SED = somewhat excessively drained WD = well-drained
See text for problem class definitions.

engineer experienced in soil and foundation engineering. The engineering evaluation and report must be submitted for approval, and the recommendations incorporated into the grading plans as requirements for construction prior to plan approval.

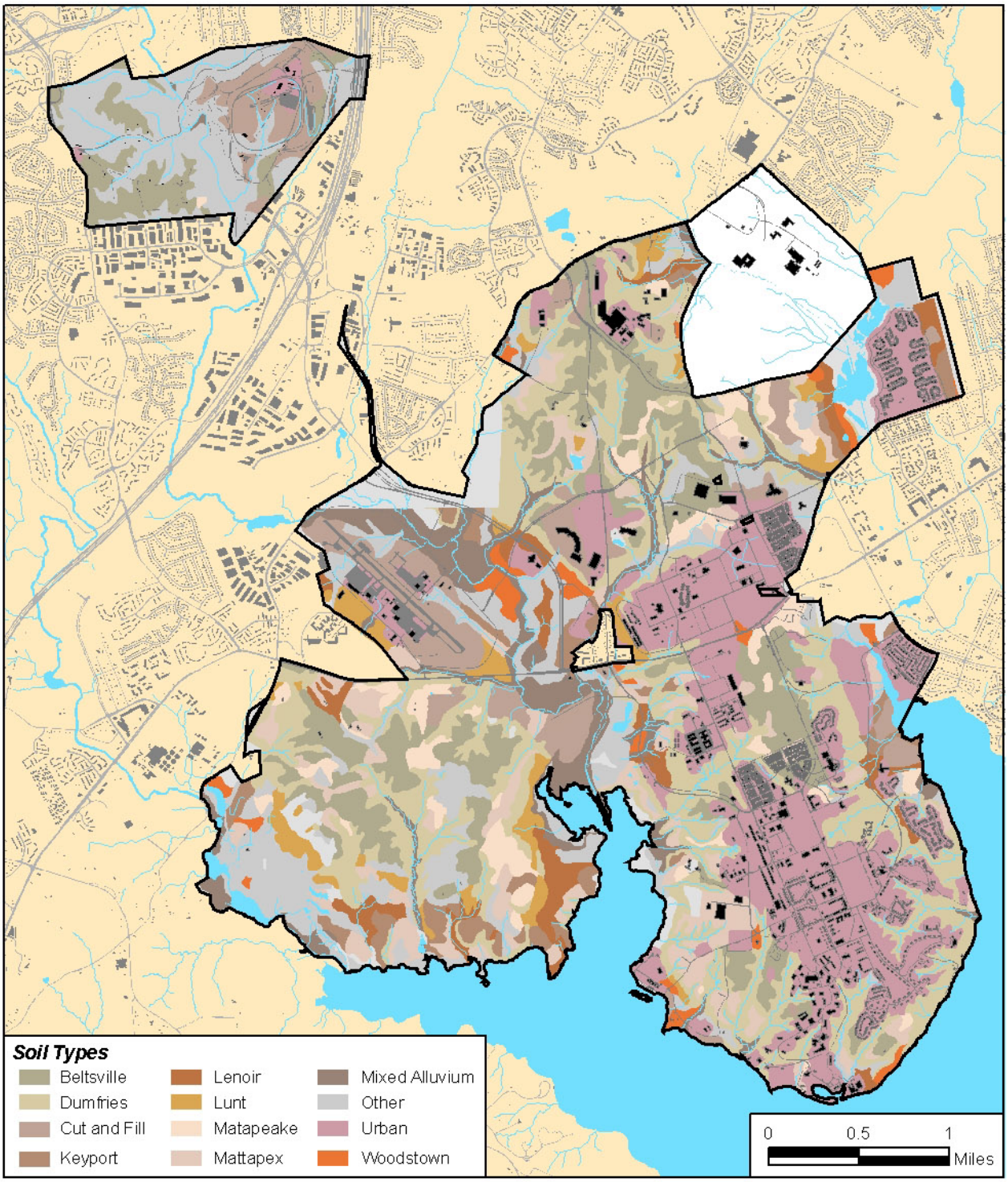
- ***Problem Class B***. Problems attributed to these soils primarily result from wetness and drainage problems that can be addressed on the construction plans with appropriate geotechnical notes and drawings, such as foundation drain details for basements and crawl spaces. Geotechnical investigation by an engineer is recommended; however, the submission of the resulting report for separate county approval may not be required in all cases.

- ***Problem Class C***. These soils are not considered problem soils for foundations. These soils typically have few problems that would adversely affect most residential uses. A geotechnical investigation by an engineer is recommended.

Regardless of the soil problem class, Fairfax County requires that a geotechnical report be prepared and submitted for major construction projects involving multi-story buildings, mat foundation, deep foundation, deep excavations, sheeting and shoring, retaining walls, embankments, and ground modification (Fairfax County, 2007).

Soils identified as having limitations with respect to building-site development are along streams and creeks along the shores of Pohick Bay, Accotink Bay, Gunston Cove, and the Potomac River. Limitations to construction include cutbank cave-ins, wetness, flooding, frost action related to the seasonally high water table, shrink-swell related to clay content, and slope and soil erosion. These coincide with steep slopes and wetland areas.

Five hydric soils types occur within the Main Post: Mixed Aluvial, Chewacla silt loam, Wehadkee silt loam, Fallsington fine sandy loam, and tidal marsh. These soils are typically associated with wetland areas including tidal flats and the areas within and immediately adjacent to floodplains. These soil types encompass approximately 931 acres. The location of these soils within the landscape generally results in limitations to development because of their tendency for flooding or saturation.



Soils of Fort Belvoir

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.6-2

Prime farmland is land federally designated under the Farmland Protection Policy Act (FFPA; 7 U.S.C. 4201) as having the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor and without intolerable soil erosion. Other land recognized under the FPPA includes unique farmland and farmland of statewide or local importance. Unique farmland is land other than prime farmland that is federally designated as important for production of specific high-value food and fiber crops. Farmland of statewide or local importance is land other than prime or unique farmland that is designated by state or local authorities as important for the production of food feed, fiber, forage, or oilseed crops. Status under any of the farmland designations is based on soil characteristics and does not depend on a history of current or past agricultural use. However, lands already in urban use or otherwise irreversibly committed to nonagricultural uses do not typically qualify.

Soil types on the Main Post designated as prime farmland account for approximately 1,283 acres, comprising the entire Mattaplex silt loam, Woodstown fine sandy loam, Matapeake silt loam, Sassafras fine sandy loam, and Glenelg silt loam units and approximately 12 acres of the Appling gritty loam type (Soil ID 60C) (Table 4.6-1) (EA, 2005). No lands on the Main Post contain soils designated as unique farmland.

EPG. Soils mapped on EPG by Fairfax County in 1990 are presented in Figure 4.6-2 and described in Table 4.6-2 (Fairfax County, 1990). The Fairfax County survey described and delineated 15 named soil series within EPG. The survey data have been incorporated into the Fort Belvoir Geographic Information System. Of the EPG area included in the survey, 121 acres are described as urban built-up, and approximately 7 acres are cut and fill (Paciulli, 1999). The developed areas include open areas surrounding former training and administrative building in the northeastern part of the Heller Loop, which is in the northeast quadrant of EPG; buildings near the intersection of Cissna and Telegaph Roads along the western edge of EPG; and smaller, scattered areas. Table 4.6-2 lists the soil types mapped within EPG, along with some selected features: soil name; drainage and problem classes; whether they are highly erodible or subject to flooding; foundation support rating; and acreage.

The only hydric soils mapped on EPG are Mixed Alluvial soils, which comprise approximately 26 acres of relatively level floodplain land adjoining Accotink Creek and the lower reach of an unnamed west-flowing tributary (Fairfax County, 2006a).

Within EPG, soils designated as prime farmland are limited to approximately 10 acres, comprising small areas mapped in the Meadowville and Birdsboro soil series (Table 4.6-2). No lands on EPG contain soils designated as unique farmland.

GSA Parcel. More than 68 acres of the 70-acre GSA Parcel consists of urban built-up soils. Mapped soil units make up a negligible portion of the area, with four different map units each contributing less than 1 acre (Fairfax County, 1990). The GSA Parcel contains no hydric or prime farmland soils (Fairfax County, 2006a).

Table 4.6-2
EPG soils

Soil name	Drainage class	Problem class	Highly erodible	Flooding	Foundation support	Acres
Beltsville silt loam 0–7% slope	MWD	B	Yes	No	Good, foundation drains and waterproofing needed	140
Louisburg coarse sandy loam, 7–25% slope	SED–WD	C	Yes	No	Good to marginal	108
Dumfries sandy loam, 7–50% slope[a]	WD	A	No	No	Marginal	83
Hyattsville, 2–7% slope	SPD	B	No	Yes within drainageway	Marginal to poor, foundation drains and waterproofing as necessary	67
Appling gritty loam, 2–14% slope	WD	C	No	No	Good	60
Mixed Alluvial, 0–2% slope	PD	A	No	Frequent (Jan–Dec)	Poor	26
Rocky Land (Acidic) 25–50% slope	WD	C	No	No	Good	9
Birdsboro 7–14% slope	WD	B	Yes	Yes	Marginal	6
Meadowville 2–7% slope	WD	B	Yes	Yes within drainageway	Marginal to poor, foundation drains and waterproofing needed	3
Fairfax (silt loam) 7–14% slope	WD	B	No	No	Favorable for small buildings, foundation drains and waterproofing needed	<1
Augusta (Loam) 2–7% slope	WD	B	No	Yes	Marginal	<1
Urban 0-10% slope	N/A	Not rated	N/A	N/A	Favorable	121
Cut and fill	N/A	Not rated	N/A	N/A	Suitable	7
Unclassified (Accotink Creek drainage)	N/A	N/A	N/A	N/A	N/A	175
TOTAL						**807**

[a] Dumfries sandy loam designation from the 1982 US SCS survey is designated as 61B-E, Loam and Gravelly Sediments, in the 1990 Fairfax County soil survey.

Sources: US SCS, 1982, as cited in Horne, 2001; Fairfax County, 1990; Fairfax County, 2001a.

Drainage Class Abbreviations:

MWD = moderately well-drained SPD = somewhat poorly drained PD = poorly drained
VPD = very poorly drained SED = somewhat excessively drained WD = well-drained
See text for problem class definitions.

4.6.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

The Preferred Alternative would be expected to have no effect on geology and result in localized changes in topography as a result of construction. Soils would undergo long-term direct effects where replaced with impervious surfaces and would experience short-term effects in areas disturbed in the process of developing structures and or installing infrastructure. A detailed description of the effects is presented below.

4.6.2.1 Topography

4.6.2.1.1 Land Use Plan Update

Development that could be allowed under the Preferred Alternative land use plan would result in localized long-term changes to topography resulting from construction. The change in land use designations with implementing the Preferred Alternative land use plan could produce more changes in topography than the 1993 land use plan because of the development, particularly roadways, that would be allowed on EPG. The Professional/ Institutional, Community, and Residential land uses would allow development in areas that were that were considered Environmentally Sensitive in the 1993 land use plan, although environmental constraints (e.g. endangered species habitat) would retain their protected status and continue to limit potential development in some of these areas. Changes to topography on the Main Post as a result of the change in land use plans would be minor and localized.

4.6.2.1.2 BRAC Implementation and Facilities Projects

Implementing the Preferred Alternative and other facilities projects would produce minor long-term changes to topography. Direct effects would result as the land in the vicinity of buildings and parking structures would generally be leveled although cuts in adjacent portions of the landscape could increase slopes. On EPG, construction would be concentrated in the relatively level areas on the plateaus east (NGA and WHS campuses) and west (remote inspection facility) of Accotink Creek, minimizing the overall effect. However, the placement of fill in association with stream crossings could result in an increase in the topography in the vicinity of the Accotink Creek drainage and its tributaries. On an installation-wide basis, these topographic changes would be minimal. Implementing the BRAC action would require upgrading existing roads and constructing new roads within EPG. Roads construction would also result in the leveling of the topography immediately below the pavement but would result in localized increases in slopes adjacent to the pavement as a result of cut and fill activities. The construction of roads on EPG would create changes in topography over a wider area than construction of buildings and parking structures. Therefore, this alternative would result in more changes to topography compared to alternatives that do not include substantial development on EPG (Town Center and Satellite Campuses Alternatives). While the degree of changes to topography would be greater under the Preferred Alternative than under the Town Center or Satellite Campuses Alternatives, the overall change would still be minor.

4.6.2.2 Geology

4.6.2.2.1 Land Use Plan Update

The Preferred Alternative would be expected to have no adverse effects on geology within Fort Belvoir's Main Post and EPG. The geology of the area remains unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities. Such effects would be inconsequential and localized.

4.6.2.1.2 BRAC Implementation and Facilities Projects

Implementing the BRAC action and other facilities projects would be expected to have no adverse effects on geology within Fort Belvoir's Main Post and EPG. The NGA and WHS campuses and joint parking structure would be located on the EPG within the Coastal Plain Physiographic Province geologic materials. Since these materials are unconsolidated, excavation for foundations and utilities would be simple and not require blasting. Crossings of Accotink Creek would involve geology of the Piedmont Upland Physiographic Province and could require drilling or small amounts of blasting to manipulate the bedrock features adjacent to the creek. Overall, the geology of the area would remain unchanged, although small portions of the bedrock underlying the area could be directly affected by these construction activities. These effects would be inconsequential and localized.

4.6.2.3 Soils

4.6.2.3.1 Land Use Plan Update

Effects to soils are typically assessed by the nature and extent of disturbance that would occur to the resource under the different scenarios. In this case, changes in land use plans do not define the extent of effects that would result if the plan were implemented. Instead, the land use plans define the types of activities that could occur within the various land use categories. The Preferred Alternative land use plan would not include an Environmentally Sensitive category that is part of the 1993 plan and instead incorporates those areas into, Community, Residential, and Professional/Institutional land use categories. Therefore, under the Preferred Alternative land use plan, the potential for development in a wider range of areas is possible than under the 1993 plan. Construction activities, the largest potential source of impacts on the soil resource would require the standard erosion and sediment control, standard engineering practices, and stormwater control measures that are designed to minimize the loss of soils from erosion and sediment.

Soil types that could support prime farmlands occur within the project area. However, since the lands within Fort Belvoir are in urban use or otherwise irreversibly committed to other uses, the prime farmland designation does not apply.

4.6.2.3.2 BRAC Implementation and Facilities Projects

Minor short- and long-term adverse effects to soils would be expected under the Preferred Alternative as a result of construction activities. The extent of disturbance that would be expected provides the most direct measure of determining the extent of impacts to the soil resource. Because some of the soils within the Main Post and EPG have already been impacted by previous construction and land clearing activities, not all soils within the project area are in their undisturbed state and at maximum productivity. The raw acreage values of *new* disturbance, therefore, overestimate the extent of impacts that would occur. Regardless, the extent of new disturbance provides a reasonable basis for comparison.

Under the Preferred Alternative, development activities would be distributed between the Main Post and EPG. While some degree of development and land disturbance has occurred within EPG during its years as a training facility, the area has less existing development than the areas on the Main Post. Therefore, it would undergo a greater extent of impact to previously undisturbed soils. The total amount of new disturbance that would result by implementing the BRAC action along with other facilities projects would be approximately 353 acres. Table 4.6-3 presents the extent of new disturbance that would occur under each alternative and the areas where development activities would be concentrated.

Table 4.6-3
Acreage of soil impact (disturbance footprint) under each alternative

Alternative	Acres impacted	Main area(s) of disturbance
Preferred	353	Primarily South Post and EPG; North Post to a lesser extent
Town Center	330	North Post, South Post
City Center	298	EPG and GSA (North and South Post to a lesser extent)
Satellite Campuses	471	Primarily North Post; South Post to a lesser extent

Disturbances would affect soil resources in a number of ways. In some cases, topsoil would be stripped from a site before the placement of pavement of building foundations. Productivity of stripped soils would be completely lost because vegetation would be unable to grow in the new impervious areas. The process of excavating trenches for pipelines and power lines would result in a loss of soil structure and a mixing of horizons (layers) that develop over time. While these soils are often placed back into the excavated areas, the mixing of the soils results in a long-term loss of productivity and presents the potential for erosion until vegetation is reestablished. Erosion would be minimized by using standard construction BMPs and the loss of productivity within managed landscapes could be overcome by applying fertilizer.

Under the Preferred Alternative, development activities would be distributed between the Main Post and EPG. Much of the EPG, particularly the eastern portion has been disturbed through training and testing activities. Natural vegetation has become reestablished in a number of these areas and many of the soils disturbed 1940s and 1950s will have started to redevelop the structure and biological activity. The biological activity would result in an increase in productivity over similar soils that were more recently disturbed, although the productivity levels would not be equivlanet to that of native soils.

Table 4.6-4 presents the primary soil types that would affected by each of the proposed BRAC projects. The majority of the areas proposed for development of the NGA and WHS facilities consist of either Urban or Cut and Fill soil types. On the main post, the DeWitt Army Community Hospital and the NARMC HQ building would be built on Beltsville, Metapeake and Mattapex soil types while the majority of other projects would occur on Urban soils. Urban and Cut and Fill soils are not naturally occurring soils and have suffered a loss in productivity as a result in a loss of structure and horizonation (layering). Beltsville, Matapeake, and Mattapex soils are considered highly erodible, sediment and erosion control measures would be required under the Commonweatlh's stormwater program to minimize effects. Mattapex's characteristic of being marginal for foundations could be overcome with standard engineering practices.

Development of roads and infrastructure would result in impacts across a wider range of soil types. Infrastructure improvements would include the installation of 157,000 liner feet of water and wastewater lines ranging up to 24 inches in diameter. These lines would require temporary disturbance of the soil resource during the process of excavation and burial. These direct impacts would be minor and short term (days to weeks) with the attendant loss in productivity being a minor but more long term (months to years) indirect effect. Electrical service lines would require an additional 93,750 linear feet of trenching and backfill, which would result in similar impacts. Approximately 92 acres of existing soils would be cleared in the process of developing new roads; the productivity of the soils under the newly paved surfaces would be permanently lost.

Table 4.6-4
Soil types impacted by proposed BRAC projects under the Preferred Alternative

Map Number	BRAC Facility	Soil Types Impacted
1	NGA Facility	Cut/Fill, Quantico
2	WHS Facility	Cut/Fill
3	MDA Facility	Urban
4	DeWitt Hospital	Beltsville, Mattapex
5	Dental Clinic	Urban
6	NARMC HQ Building	Beltsville, Matapeake
7	Corps of Engineers Integration Office	Cut/Fill
8	Infrastructure	Various
9	Emergency Services Center	Cut/Fill
10	Network Ops – PEO EIS	Urban
11	USANCA Support Facility	Urban
12	Child Development Center (NGA)	Urban
13	Child Development Center	Cut/Fill
14	Administrative Facility	Urban
15	Access Control Point	Urban
16	AMC Relocatables	Urban
17	PEO EIS Administrative Facility	Urban
18	Structured Parking Facility	Urban
19	Modernize Barracks	Urban
20	MWR Family Travel Camp	Urban

Road construction would also require the construction of one new bridge over Accotink Creek which would also result in direct impacts to soils associated with the construction of piers and footings. These effects would be permanent but localized. Infrastructure would also include the installation of approximately 25,000 linear feet of perimeter fencing, which would require clearing and grubbing of an area approximately 40 feet wide throughout the length of the fence. Impacts as a result of installing the fence would be short term although control measures (BMPs) would be necessary to ensure that erosion was minimized and the soils stabilized as quickly as possible following construction.

As noted above, soils that could support prime farmlands occur within the project area. Because the lands within Fort Belvoir are in urban use or otherwise irreversibly committed to other uses, the designation of prime farmland does not apply.

4.6.2.4 BMPs/Mitigation

4.6.2.4.1 Topography

Construction activities would result in changes to topography rather than impacts per se, since an increase or decrease in slope would not be beneficial or detrimental for topography in and of itself. Standard engineering practices, BMPs, and building codes have been developed and are employed to address construction in varying topographic conditions. Since there would be no impact on the resource, no specific mitigation measure for topography would be necessary.

4.6.2.4.2 Geology

Standard engineering practices and BMPs would be implemented to address construction-related issues stemming from local geology. Such practices could include appropriate design criteria (e.g. depth and location) for placement of footings and piers in preparation for building roads, bridges and foundations. None of the Alternatives would result in effects to the regional geology and localized effects would be minimal. Therefore, no specific mitigation measures would be necessary for this resource.

4.6.2.4.3 Soils

Fort Belvoir and the Virginia Department of Conservation and Recreation (VDCR) require that construction site operators minimize erosion by developing and implementing a site specific stormwater pollution prevention plan (SWPPP). The SWPPP describes BMPs and procedures to control erosion and sediment at the construction site. Because the Commonwealth of Virginia has already established requirements to limit soil erosion from construction sites, specific mitigation measures would not be required.

4.6.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

Implementing the Town Center Alternative would be expected to result in no effect on geology and result in short- and long-term minor adverse effects on topography and soils. A detailed description of the effects is presented below.

4.6.3.1 Topography

4.6.3.1.1 Land Use Plan Update

Development under either the 1993 land use plan or the Town Center Alternative land use plan would result in minor, localized long-term effects on topography resulting from construction activities.

The change in land use designations with the selection of the Town Center Alternative could produce more changes to topography than the 1993 land use plan because it would include EPG. The Town Center Alternative land use plan would remove the Environmentally Sensitive category that is part of the 1993 plan and incorporate those areas into Community, Residential, and Professional/Institutional land use categories. While development could potentially occur over a greater area, environmental constraints (e.g. jurisdictional wetlands) would retain their protected status and would continue to limit potential development in some of these areas. Effects to topography on the Main Post would likely be similar under both the Town Center Alternative and the 1993 land use plan and would, in either case, be minimal and localized.

4.6.3.1.2 BRAC Implementation and Facilities Projects

Similar to the Preferred Alternative, developing the Town Center Alternative would result in minor, localized, long-term effects on topography associated with construction activities. The Town Center Alternative would focus development on the North Post and South Post; therefore, construction of new roads within EPG would not be required. Because this alternative would avoid effects on EPG, changes in topography would be less than what would occur under the Preferred or City Center Alternatives.

4.6.3.2 Geology

4.6.3.2.1 Land Use Plan Update

Implementing the Town Center Alternative would be expected to have no adverse effects on geology. The geology of the area would remain unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities. Such effects would be inconsequential and localized.

4.6.3.2.2 BRAC Implementation and Facilities Projects

Implementing the Town Center Alternative would be expected to have no adverse effects on geology within Fort Belvoir's Main Post and EPG. Under this alternative, none of the BRAC facilities would be located on the EPG; therefore all construction would occur within the Coastal Plain Physiographic Province. While construction could affect small portions of the unconsolidated bedrock materials, no blasting would be likely and the overall direct effects would be minimal.

4.6.3.3 Soils

4.6.3.3.1 Land Use Plan Update

Similar to the discussion under the Preferred Alternative above, the changes in land use between the Town Center land use plan and the 1993 land use plan do not define the extent of effects that would result in each case. Instead, the land use plans define the types of activities that could occur within the various land use categories. The 1993 land use plan includes the Environmentally Sensitive land use category. These lands have generally been reclassified as Professional/Institutional, Community, and Residential under the Town Center Alternative land use plan. While the potential exists for development to occur over a greater area under the proposed land use plan, environmental constraints (e.g. critical habitat) would retain their protected status and would continue to limit development in sensitive areas..

Soil types that could support prime farmlands occur within the project area. However, because the lands within Fort Belvoir are in urban use or otherwise irreversibly committed to other uses, the prime farmland designation does not apply.

4.6.3.3.2 BRAC Implementation and Facilities Projects

As discussed above, minor short- and long-term adverse effects to soils would be expected under any of the alternatives as a result of construction activities. Under the Town Center Alternative, development activities would be distributed between the North Post and South Post with no new development proposed for EPG. The total amount of new disturbance that would result by implementing Town Center Alternative would be approximately 330 acres (see Table 4.6-3). Table 4.6-5 presents the primary soil types that would be affected by each of the BRAC projects; the majority of development would occur on the Urban soil type with only the WHS facility and Child Development Center occurring primarily on Beltsville, Matapeake, and Mattapex soil types. As noted under the Preferred Alternative, while these soils are considered highly erodible, BMPs required under the Commonwealth of Virginia's stormwater regulations would minimize the extent of impacts. Infrastructure improvement, including water, sewer, and electrical lines would cross numerous soil types but only result in minor short- to long-term impacts as a result of disturbing soil profiles.

Table 4.6-5
Soil types impacted by proposed BRAC projects under the Town Center Alternative

Map Number	BRAC Facility	Soil Types Impacted
1	NGA Facility	Urban
2	WHS Facility	Beltsville, Matapeake
3	MDA Facility	Urban
4	DeWitt Hospital	Urban
5	Dental Clinic	Urban
6	NARMC HQ Building	Urban
7	Corps of Engineers Integration Office	Urban
8	Infrastructure	Various
10	Network Ops – PEO EIS	Urban, Dumfries
11	USANCA Support Facility	Urban
12	Child Development Center (NGA)	Urban
13	Child Development Center	Beltsville, Mattapex
14	Administrative Facility	Urban
15	Access Control Point	Urban
16	AMC Relocatables	Urban
17	PEO EIS Administrative Facility	Urban
18	Structured Parking Facility	Urban
19	Modernize Barracks	Urban
20	MWR Family Travel Camp	Urban

4.6.3.4 BMPs/Mitigation

BMPs would be similar to those for the Preferred Alternative (Section 4.6.2.4). Mitigation measures would not be required for topography, geology, and soils for reasons similar to those for the Preferred Alternative.

4.6.4 ENVIRONMENTAL CONSEQUENCES OF CITY CENTER ALTERNATIVE

Implementing the City Center Alternative would be expected to result in no effect on geology and result in minimal changes to topography. Short- and long-term minor adverse effects on soils would occur. A detailed description of the effects is presented below.

4.6.4.1 Topography

4.6.4.1.1 Land Use Plan Update

Development under either the 1993 land use plan or the City Center Alternative land use plan would result in minor, localized effects on topography associated with construction activities.

The change in land use designations with the selection of the City Center Alternative land use plan would produce more impacts than the 1993 land use plan because of the development, particularly roadways, that would be allowed on EPG. The recharacterization of lands designated

as Environmentally Sensitive under the 1993 land use plan to Professional/Institutional, Community, and Residential land use designations would allow development that was not considered in the 1993 land use plan. The City Center Alternative also designates the GSA Parcel as Professional/Institutional, which would allow development of new facilities; however, the extent of development already existing at the site would suggest minimal if any changes in the topography. Effects on topography on the Main Post would likely be similar under both the City Center Alternative and the 1993 land use plans and would, in either case, be minimal and localized.

4.6.4.1.2 BRAC Implementation and Facilities Projects

Similar to the Preferred Alternative discussion above, development under the City Center Alternative would result in long-term minor changes to topography associated with construction activities.

Because the City Center Alternative would focus development on EPG and to a lesser extent on the North Post and South Post, extensive construction, including new roads and utilities, would be required within EPG and the GSA Parcel. While still localized and inconsequential, the City Center Alternative would likely have the greatest extent of effects on topography compared to the others.

4.6.4.2 Geology

4.6.4.2.1 Land Use Plan Update

Implementing the City Center land use plan would have no effects on geology within Fort Belvoir's Main Post, EPG, or the GSA Parcel. The geology of the area would remain unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities. Such effects would be inconsequential and localized.

4.6.4.2.2 BRAC Implementation and Facilities Projects

The City Center Alternative would be expected to have no effects on geology within Fort Belvoir's Main Post, EPG, or the GSA Parcel. The geology of the area would remain unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities. Such effects would be inconsequential and localized and be similar to those discussed under the Preferred Alternative (Section 4.6.2.2.2).

4.6.4.3 Soils

4.6.4.3.1 Land Use Plan Update

As discussed previously, the changes in land use between the City Center land use plan and the 1993 land use plan do not define the extent of effects that would result in each case, only the types of activities that would be permitted. As noted above, the 1993 land use plan includes an Environmentally Sensitive category that is not carried through the City Center Alternative land use plan, rather, these lands would be recharacterized as Professional/Industrial, Community, and Residential. As noted above, environmental protections would remain in place for a portion of these areas (e.g. jurisdictional wetlands).

Soil types that could support prime farmlands occur within the project area. However, because the lands within Fort Belvoir are in urban use or are otherwise irreversibly committed to other uses, the prime farmland designation does not apply.

4.6.4.3.2 BRAC Implementation and Facilities Projects

As discussed above, implementing any of the Alternatives would be expected to result in minor long-term and short-term effects on soils as a result of construction activities. Under the City Center Alternative, development activities would be concentrated on EPG and, to a much lesser extent, in the North Post and South Post. The total amount of new disturbance that would result by implementing City Center Alternative would be approximately 298 acres (see Table 4.6-3), most of which would be concentrated on EPG. The soil types that would be affected by this alternative are presented in Table 4.6-6. Note that all BRAC development on the Main Post would occur on soils classified as Urban. Most development on EPG would occur on soils characterized as Urban or Cut and Fill, although part of the NGA facility would be built on Quantico soils. Infrastructure, including roads, water lines, sewer lines and buried electrical lines would affect a wide range of soil types resulting in minor short- to long-term losses in soil productivity where pipelines were buried and a permanent loss where soils were converted to impervious surfaces. The loss of soils in these relatively small areas would be minor. This alternative would also require the relocation of facilities to the GSA Parcel. Because that site consists primarily of buildings and other impervious surfaces, the effect on the soil resource in that parcel would be negligible.

Table 4.6-6
Soil types impacted by proposed BRAC projects under the City Center Alternative

Map Number	BRAC Facility	Soil Types Impacted
1	NGA Facility	Cut/Fill, Quantico
2	WHS Facility	Urban
3	MDA Facility	Cut/Fill
4	DeWitt Hospital	Cut/Fill
5	Dental Clinic	Urban
6	NARMC HQ Building	Cut/Fill, Beltsville
7	Corps of Engineers Integration Office	Cut/Fill
8	Infrastructure	Various
9	Emergency Services Center	Cut/Fill
10	Network Ops – PEO EIS	Cut/Fill
11	USANCA Support Facility	Urban
12	Child Development Center (NGA)	Cut/Fill
13	Child Development Center	Urban
14	Administrative Facility	Urban
15	Access Control Point	Urban
16	AMC Relocatables	Urban
17	PEO EIS Administrative Facility	Urban
18	Structured Parking Facility	Urban
19	Modernize Barracks	Urban
20	MWR Family Travel Camp	Urban

4.6.4.4 BMPs/Mitigation

BMPs would be similar to those for the Preferred Alternative (Section 4.6.2.4). Mitigation measures would not be required for topography, geology, and soils for reasons similar to those for the Preferred Alternative.

4.6.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

Implementing the Satellite Campuses Alternative would be expected to result in no effect on geology and short- and long-term minor adverse effects on topography and soils. A detailed description of the effects is presented below.

4.6.5.1 Topography

4.6.5.1.1 Land Use Plan Update

Development under either the 1993 land use plan or the Satellite Campuses Alternative land use plan would result in long-term minor, localized effects on topography associated with construction activities.

The change in land use designations with the selection of the Satellite Campuses land use plan could produce slightly higher levels of effects than the 1993 land use plan since it would include EPG. The recharacterization of lands designated as Environmentally Sensitive under the 1993 land use plan to Professional/Institutional, Community, and Residential land use designations would allow development that was not considered in the 1993 land use plan. Development would be limited in areas with environmental constraints (e.g. critical habitat) because these areas would retain their protected status regardless of the land use designation; however changes in topography could occur over a broader area under the Satellite Campuses Alternative land use plan. Changes in topography on the Main Post would likely be similar under both land use plans and would, in either case, be minimal and localized.

4.6.5.1.2 BRAC Implementation and Facilities Projects

Similar to the discussions above, development under the Satellite Campuses Alternative would result in minor, localized changes in topography associated with construction activities.

The Satellite Campuses Alternative would focus development on the North and South Posts. Because this alternative would avoid effects on EPG, it would result in less change to topography than the Preferred or City Center Alternatives.

4.6.5.2 Geology

4.6.5.2.1 Land Use Plan Update

Implementing the Satellite Campuses land use plan would have negligible effects on geology within Fort Belvoir's Main Post and EPG. The geology of the area would remain unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities. Such effects would be inconsequential and localized.

4.6.5.2.2 BRAC Implementation and Facilities Projects

Implementing the Satellite Campuses Alternative would be expected to have negligible effects on geology within Fort Belvoir's Main Post and EPG. The geology of the area would remain unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities. Such effects would be inconsequential and localized and be similar to those discussed under the Preferred Alternative (Section 4.6.2.2.2).

4.6.5.3 Soils

4.6.5.3.1 Land Use Plan Update

The changes in land use between the Town Center land use plan and the 1993 land use plan define the types of activities that could occur within the various land use categories. As noted above, the 1993 land use plan includes an Environmentally Sensitive category that is not carried through the Satellite Campuses Alternative land use plan, rather, these lands would be recharacterized as Professional/Industrial, Community, and Residential. As noted above, environmental protections would remain in place for a portion of these areas (e.g. jurisdictional wetlands).

Soil types that could support prime farmlands occur within the project area. However, because the lands within Fort Belvoir are in urban use or are otherwise irreversibly committed to other uses, the prime farmland designation does not apply.

4.6.5.3.2 BRAC Implementation and Facilities Projects

Implementing any of the Alternatives would likely result in effects to soils as a result of construction activities. Under the Satellite Campuses Alternative, development activities would be distributed between the North Post and South Post with no new development proposed for EPG. This alternative would include the development of multiple facilities on the North Post golf coarse, which is an area where soils, if not in their native condition, are still highly productive. New development at Davison Army Airfield would not be expected to result in impacts to soils because this area was previously disturbed. Implementing Satellite Campuses Alternative would result in the greatest potential effect on soil resources of any of the alternatives (approximately 471 acres, see Table 4.6-3). Table 4.6-7 presents the primary soil types that would be affected by each of the BRAC projects; the majority of development would occur on the Urban soil type. with only the, DeWitt Hospital and the NAMRC HQ Facility would be built on Mattapex and Lunt soils. The PEO EIS Network Operations would be built on Sassafras and Bertie soils and the PEO EIS Administrative Facility would be built on Beltsville soils. Beltsville, Mattapex, and Bertie soil types are considered highly erodible although BMPs required under the Commonwealth of Virginia's stormwater regulations would minimize the extent of impacts. Soils with shrink/swell or other undesirable characteristics for construction would be addressed using standard engineering practices. Infrastructure improvement, including water, sewer, and electrical lines would cross numerous soil types but only result in minor short- to long-term impacts as a result of disturbing soil profiles. A permanent loss of the soil resource would occur where soils were covered with impervious surfaces; in these cases, the impacts would be minor and localized.

Table 4.6-7
Soil types impacted by proposed BRAC projects under the Satellite Campuses Alternative

Map Number	BRAC Facility	Soil Types Impacted
1	NGA Facility	Cut/Fill
2	WHS Facility	Urban
3	MDA Facility	Urban
4	DeWitt Hospital	Mattapex
5	Dental Clinic	Urban
6	NARMC HQ Building	Mattapex, Lunt
7	Corps of Engineers Integration Office	Urban
8	Infrastructure	Various
10	Network Ops – PEO EIS	Sassafras, Bertie
11	USANCA Support Facility	Urban
12	Child Development Center (NGA)	Urban
13	Child Development Center	Urban
14	Administrative Facility	Urban
15	Access Control Point	Urban
16	AMC Relocatables	Urban
17	PEO EIS Administrative Facility	Beltsville
18	Structured Parking Facility	Urban
19	Modernize Barracks	Urban
20	MWR Family Travel Camp	Urban

4.6.5.4 BMPs/Mitigation

BMPs would be similar to those for the Preferred Alternative (Section 4.6.2.4). Mitigation measures would not be required for topography, geology, and soils for reasons similar to those for the Preferred Alternative.

4.6.6 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

The No Action Alternative would not affect the local geology but would be expected to result in short- and long-term minor adverse effects on topography and soils. A detailed description of the effects is presented below.

4.6.6.1 Topography

Under the No Action Alternative, the 1993 land use plan would remain in place. Under this plan, the existing land use designations would continue to allow construction activities that could result in minor changes to topography. There would be no changes to land use designations and no development would occur at EPG or the GSA Parcel.

4.6.6.2 Geology

The No Action Alternative would be expected to have negligible effects on geology within Fort Belvoir's Main Post and none at EPG or the GSA Parcel. The geology of the area would remain

unchanged regardless of the small portions of bedrock underlying the area that could be affected by construction activities that would occur under the current 1993 land use plan. Such effects would be localized and inconsequential.

4.6.6.3 Soils

The continued use of the 1993 land use plan would allow future development to occur throughout the Main Post governed by future needs and the existing land use categories. The 1993 land use plan identifies 4,531 acres in Environmentally Sensitive, Training Range, and Outdoor Recreation land use types. Soil disturbances within these land use categories would be less extensive than in the other land use categories. Impacts on soil resources would be limited in size and minor in severity.

Soil types that could support prime farmlands occur within the project area. However, because the lands within Fort Belvoir are in urban use or otherwise irreversibly committed to other uses, the prime farmland designation does not apply.

4.6.7 SUMMARY OF COMPARISON OF ALTERNATIVES

4.6.7.1 Topography

Implementing any of the alternatives would be expected to result in minor changes in topography. The construction of buildings and infrastructure would result in alterations in topography under each Alternative. These activities would be more like to alter previously unaffected land under the Preferred Alternative and City Center Alternative land use plans because these would focus most new development on EPG. Changes to topography under all alternatives would generally result where the cut and fill approach is used to level areas for roads and buildings. While the degree of impact on topography would be greater under the Town Center and Satellite Campuses Alternatives, the overall effect would still be insignificant.

4.6.7.2 Geology

Implementing any of the alternatives would have negligible effects on geology within Fort Belvoir's Main Post and EPG. The geology of the area would remain unchanged, although small portions of the bedrock underlying the area could be affected by construction activities. Such effects would be inconsequential and localized.

4.6.7.3 Soils

Short and long term effects to soils' productivity would occur under all the alternatives resulting from construction activities and the installation of impervious surfaces. These effects would be minor when considered on the landscape level. Soils covering many areas within the Main Post and EPG that are amenable to construction have already been subject to previous construction and land-clearing activities; therefore, not all soils within the project area are in their undisturbed state and at maximum productivity (e.g. Urban and Cut and Fill). With the acres of disturbance being the simplest measure to compare alternatives, the Preferred Alternative and City Center Alternative land use plans would affect 353 and 298 acres of soils, respectively, concentrated primarily in EPG. Construction proposed under the City Center Alternative would affect the lowest amount of native soils, with most development planned to occur on Urban or Cut and Fill soil types. The Satellite Campuses Alternative would result in the greatest extent of disturbance (471 acres) with disturbances occurring primarily in the North Post. The Town Center

Alternative land use plan would affect 330 acres on the North Post and South Post. Under all alternatives, soil erosion arising from construction activities would be minimized using a standard set of BMPs applied throughout the construction process. Soils characteristics that are not well suited to construction (e.g., shrink/swell, shallow groundwater) can be overcome with standard engineering practices and would not contribute to direct or indirect effects as long as the characteristics were taken into consideration.

4.7 WATER RESOURCES

Water resources on Fort Belvoir are described in the following section under major topics that include watershed characterization, surface water quality, pollutant sources, groundwater, and other water resources policies. Potential effects on water resources as a result of the proposed action and alternatives are also described.

4.7.1 AFFECTED ENVIRONMENT

4.7.1.1 Watershed Characterization

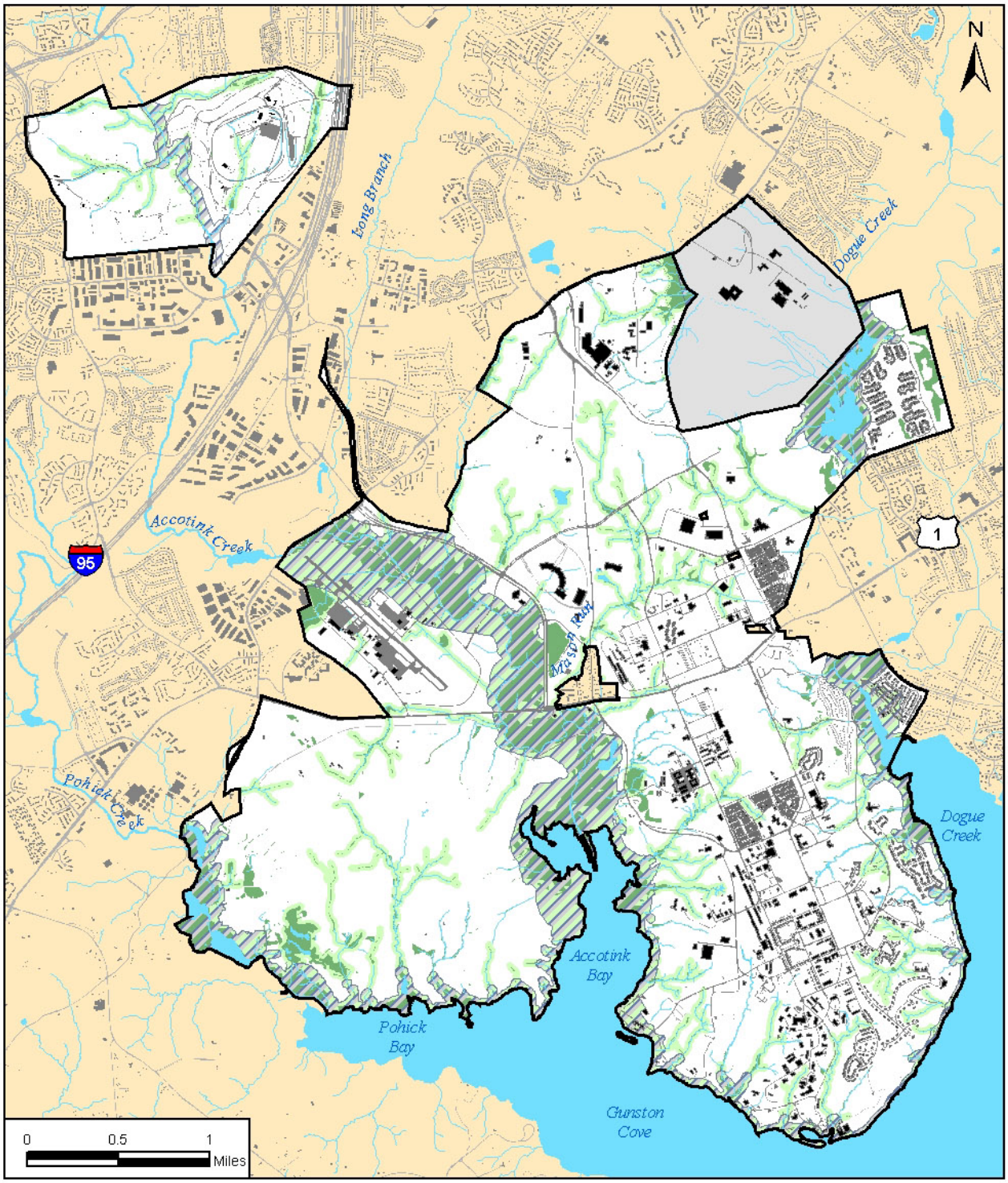
Fort Belvoir is located along the Potomac River, which is the second largest tributary to the Chesapeake Bay. Surface water from Fort Belvoir drains directly to the Potomac River and to the lower reaches of three major Potomac River tributaries: Pohick Creek, Accotink Creek, and Dogue Creek (Figure 4.7-1). The headwaters of these tributaries are off-post to the north and west of Fort Belvoir in Fairfax County, Virginia. The headwaters of Mason Run (tributary to Accotink Creek) and several unnamed tributaries are located within the installation. Fort Belvoir's EPG is a large training area that is located just northwest of the Main Post, across I-95. EPG is located entirely within the Accotink Creek watershed. Accotink Creek flows southward through EPG and the Main Post, before emptying into Accotink Bay. The Main Post is bounded by Pohick Creek (which flows into Pohick Bay) to the southwest and Dogue Creek along the installation's eastern boundary. Pohick Bay and Accotink Bay combine to form Gunston Cove along the southern tip of the Main Post.

Fort Belvoir includes approximately 105.5 stream miles, of which 28 miles are perennial and 31.1 miles are intermittent. Ephemeral streams (channels that have water only during or following storm events) comprise 1.9 miles, and other storm water conveyances total 44.5 miles on the installation (Fort Belvoir, 2004). Stream classifications and mileage were determined for Resource Protection Area (RPA) planning purposes and are subject to change as Fort Belvoir streams are evaluated in the field using Fairfax County's perennial streams assessment protocol during project planning. Three manmade ponds and numerous groundwater seeps are also present on the installation (Fort Belvoir, July 2002). Additional information on wetlands and other biological resources is discussed in Section 4.8.

4.7.1.1.1 Watersheds and Subwatersheds

The watersheds of Fort Belvoir are part of the Middle Potomac-Anacostia-Occoquan hydrologic unit. A hydrologic unit is a geographic area that represents all or part of a surface drainage basin, combination of drainage basins, or a distinct hydrologic feature. The U.S. Geological Survey (USGS) designated Hydrologic Unit Code (or HUC) for this watershed is 02070010. HUCs were established by the USGS to identify U.S. watersheds and their subwatersheds using a standardized numeric classification system. USGS hydrologic units are arranged into four levels of progressively smaller watershed divisions and subdivisions, which are identified by a series of 2-digit (largest area) to 8-digit (smallest area) HUCs. Efforts are underway to catalog even smaller drainage subdivisions.

Fort Belvoir is drained by seven watersheds that contribute to the Potomac River and, ultimately, the Chesapeake Bay. During development of the Fort Belvoir Integrated Natural Resources Management Plan (INRMP), these seven watersheds were divided into 53 subwatersheds for the



LEGEND

- Installation Property
- 100-Year Flood Zone
- Wetland
- Resource Protection Area

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Water Resources

Fort Belvoir, Virginia

Figure 4.7-1

purposes of characterizing the installation's waterbodies, identifying existing issues, and recommending solutions (Horne, 2001). The subwatershed that includes EPG (53) was divided into seven smaller subwatersheds: 53A–53G. These subwatersheds were subsequently re-numbered (53–59) in the current Fort Belvoir watersheds GIS coverage (Fort Belvoir GIS, 2006). Figure 4.7-2 shows the seven primary watersheds and the 59 numbered subwatersheds. Table 4.7-1 presents summary statistics for the seven watersheds that encompass Fort Belvoir.

Accotink Creek, Dogue Creek, and Pohick Creek drain most of Fort Belvoir. These streams also drain much of eastern Fairfax County. This area of Fairfax County, particularly within the Accotink Creek watershed, is primarily urban and suburban in character and is approximately 80 percent developed north and west of the installation. The remaining four watersheds—Accotink Bay, Gunston Cove, Pohick Bay, and Potomac River—represent areas on Fort Belvoir that directly drain to these waterbodies (Horne, 2001).

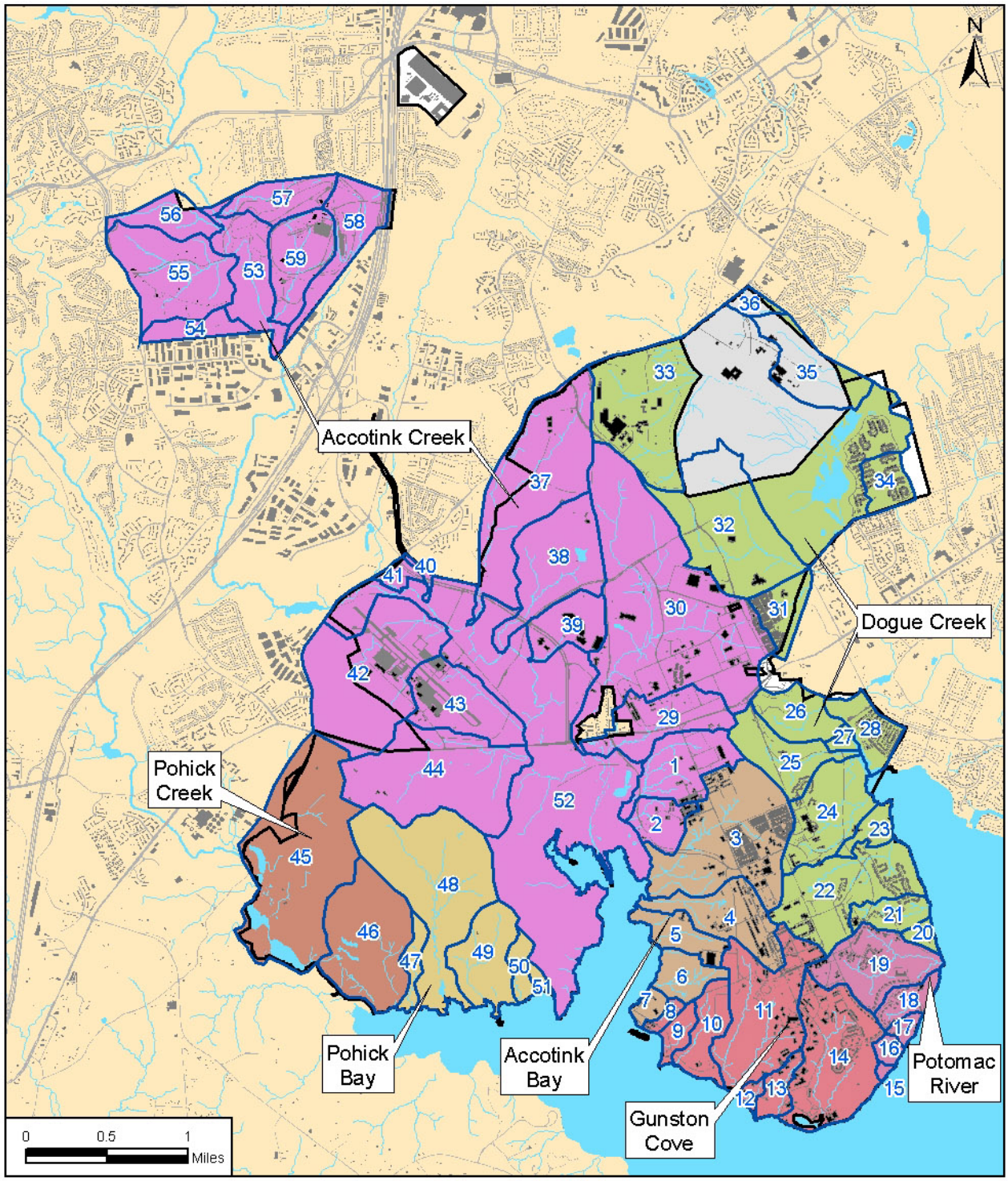
The largest watershed on the installation, Accotink Creek, covers approximately 48 percent of the installation (including EPG) and contains 20 subwatersheds (Horne, 2001; Fort Belvoir GIS, 2006). EPG is entirely within the Accotink Creek watershed and is divided into seven subwatersheds. The Main Post includes the remaining 13 Accotink Creek subwatersheds.

The Dogue Creek watershed covers approximately 20 percent of Fort Belvoir and is divided into 15 subwatersheds. The remaining five watersheds contain between two and seven subwatersheds each. Pohick Creek and Gunston Cove each covers roughly 8 percent of the installation. Accotink Bay and Pohick Bay each covers 7 percent of the installation. The Fort Belvoir INRMP (Horne, 2001) and the Fort Belvoir *Watershed Delineation Project Update* (Landgraf, 2003) provide additional background information on development conditions in the Fort Belvoir watersheds and subwatersheds.

The Fort Belvoir INRMP commits Fort Belvoir to follow a watershed approach to land management that acknowledges the relationship of land use and upstream areas with downstream resources (Horne, 2001). The Virginia Coastal Zone Management Act (CZMA) and Chesapeake Bay initiatives, discussed in Section 4.7.1.5, establish far-reaching, natural resources protection policies, strategies, and actions for landholders to undertake throughout the Chesapeake Bay watershed. The DoD and the Army are signatory agencies to the agreements and have incorporated watershed and tributary protection strategies into the master plan and other installation policies.

4.7.1.1.2 Flows and Exchanges

The USGS has historically maintained stream flow gauges at locations throughout the Potomac-Anacostia-Occoquan watershed. USGS gauges have measured stream flow on the Potomac River, Pohick Creek, Accotink Creek, Piney Run, and Dogue Creek. Historical flow records were analyzed to determine the range of flow conditions and average stream flows. The nearest active USGS stream gage is Station 01654000 on Accotink Creek, approximately 5 miles upstream from the northern perimeter of EPG and upstream of Lake Accotink in Annandale, Virginia. This station monitors a 24 square mile watershed and has been in operation since 1947. Daily average flow recorded at this station is 28.4 cubic feet per second (cfs). The mean monthly flow between October 1947 and September 2004 ranged from 18.1 cfs in October to 42.3 cfs in March. The minimum monthly flow recorded over this period was 0.45 cfs in September 1954, and the maximum monthly flow recorded over the period was 125 cfs in May 1989.



Fort Belvoir Subwatersheds

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.7-2

Table 4.7-1
Fort Belvoir Watersheds

Fort Belvoir watershed	Total watershed surface area (acres)	Percentage of total watershed area within Fort Belvoir	Surface Area within Fort Belvoir (acres)	Percent of Fort Belvoir land area	Number of subwatersheds within Fort Belvoir
Accotink Creek[a]	33,156	14	4,040	48	20
Dogue Creek	10,883	21	1,713	20	15
Pohick Creek	22,755	3	638	8	2
Gunston Cove	681	100	681	8	7
Accotink Bay	604	100	613	7	5
Pohick Bay[b]	569	100	571	7	5
Potomac River[b]	237	100	239	2	5
TOTAL			8495	100	59

Source: Horne, 2001; Fort Belvoir GIS, 2006.

[a]EPG is located entirely within the Accotink Creek watershed. The number of subwatersheds was updated to include the 7 re-numbered EPG subwatersheds

[b]Total watershed surface area shown represents acreage on Fort Belvoir only.

4.7.1.2 Surface Water Quality

4.7.1.2.1 Applicable Standards

The Virginia Department of Environmental Quality (VDEQ) defines surface water quality standards that protect designated uses for surface waters in Virginia. Water quality standards consist of three components: use designations, general and numeric water quality criteria necessary to protect those uses, and an antidegradation statement. Water quality standards have the dual purposes of establishing the water quality goals for specific waterbodies and serving as the regulatory basis for establishing water quality-based treatment controls and strategies beyond the technology-based levels of treatment required by sections 301(b) and 306 of the Clean Water Act (CWA). All streams in Virginia, including those flowing through Fort Belvoir, are minimally assigned the uses of recreation (e.g., swimming and boating); propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish).

Virginia water quality standards contain general criteria statements and a wide range of numeric water quality criteria for pesticides and polychlorinated biphenyls (PCBs), VOCs, acid- and base-extractable organics, other organics, metals, pH, and inorganics, as well as conventional pollutants such as total dissolved solids. Table 4.7-2 lists numeric water quality criteria and fish tissue screening levels for constituents that are of particular interest on the basis of information contained in Virginia's 303(d) list of impaired waters for Fort Belvoir waterbodies (and receiving waters). Note that VDEQ is currently developing nutrient criteria for surface waters. Streams on Fort Belvoir are Class III nontidal waters, according to Virginia water quality standards. Tidal receiving waters including the Potomac River, Accotink Bay, Pohick Bay, and Gunston Cove are Class II waters. Virginia water quality criteria apply to Class II and Class III waters unless otherwise specified.

Table 4.7-2
Virginia water quality standards and fish tissue screening levels

General water quality parameters

Parameter	Units	Criteria
Water temperature—Class III nontidal waters[a]	ºC	32 (instantaneous maximum)
Dissolved oxygen–Class III nontidal waters	mg/l	4.0 (instantaneous minimum); 5.0 (daily average)
Dissolved oxygen—Class II tidal waters[b]	mg/l	30 day mean > 5.5 mg/l (tidal habitats with 0-0.5 ppt salinity); 30 day mean > 5 mg/l (tidal habitats with >0.5 ppt salinity); 7 day mean > 4 mg/l; Instantaneous minimum > 3.2 mg/l at temperatures < 29°C; Instantaneous minimum > 4.3 mg/l at temperatures > 29°C
pH	SU	6.0-9.0
Fecal coliform bacteria[c]	#/100 ml	200/400
E. coli[d]	#/100 ml	126/235
enterococci[e]	#/100 ml	35/104

Other parameters

Parameter	Units	Aquatic life—freshwater acute	Aquatic life—freshwater chronic	Human health—public water supplies	Human health—all other surface waters
Total PCBs (water)	µg/l	NA	NA	0.0017	0.0017
Total PCBs (fish tissue screening level)	ppb	NA	NA	54	54
Benzo(k)fluoranthene (water)	µg/l	NA	NA	0.044	0.49
Benzo(k)fluoranthene (fish tissue screening level)	ppb	NA	NA	15	15
Benzo(b)fluoranthene (water)	µg/l	NA	NA	0.044	0.49
Benzo(b)fluoranthene (fish tissue screening level)	ppb	NA	NA	15	15
Chrysene (water)	µg/l	NA	NA	0.044	0.49
Chrysene (fish tissue screening level)	ppb	NA	NA	15	15

[a]Temperature criteria are not specified for Class II tidal waters.

[b]Open Water criteria shown. For information on seasonal DO criteria for specific designated uses refer to Virginia Water Quality Standards 9 VAC 25-260-185 and for information on implementation of DO criteria for naturally low DO waters refer to 9 VAC 25-260-55.

[c]The Virginia fecal coliform bacteria standard for primary contact recreational waters is as follows: "Fecal coliform bacteria shall not exceed a geometric mean of 200 fecal coliform bacteria per 100 ml of water for two or more samples over a calendar month nor shall more than 10 percent of the total samples taken during any calendar month exceed 400 fecal coliform bacteria per 100 ml of water." For information on fecal coliform criteria for shellfish waters refer to Virginia Water Quality Standards 9 VAC 25-260-160.

[d]The Virginia *E. coli* standard for primary contact recreational waters (freshwaters) states that *E. coli* shall not exceed a geometric mean of 126 per 100ml for two or more samples over any calendar month and shall not exceed a single sample maximum of 235 per 100 ml.

[e]The Virginia enterococci standard for primary contact recreational waters (saltwater and transition zone) states that enterococci shall not exceed a geometric mean of 35 per 100ml for two or more samples over any calendar month and shall not exceed a single sample maximum of 104 per 100 ml.

In addition to Virginia's water quality standards, the Army's administrative publication, DA PAM 200-1, Environmental Protection and Enhancement, requires installations to conserve all water sources and protect them from contamination by developing and implementing plans to ensure a level of water quality that supports "the propagation of fish, shellfish and wildlife; recreation in and on the water; and the protection of drinking water sources."

4.7.1.2.2 Clean Water Act Section 303(d) Listing

Section 303(d) of the CWA requires states to identify and develop a list of waterbodies that are impaired and for which technology-based and other required controls have not resulted in attainment of water quality standards. Several waterbodies that flow through Fort Belvoir, or are immediately downstream, are listed on Virginia's 2004 303(d) list of impaired waters (VDEQ, 2004). Virginia also recently prepared the Draft 2006 303(d) list, which includes updated impairment information (VDEQ, 2006). Impaired segments within or adjacent to Fort Belvoir are listed in Table 4.7-3. The development of Total Maximum Daily Loads (TMDLs) is required for waterbodies that are included on the 303(d) list. TMDLs and load reductions are required for the pollutants of concern for each listed waterbody. VDEQ is currently developing TMDLs in accordance with the 10-year EPA consent decree schedule (for waterbodies originally listed on the 1998 303(d) list). A fecal coliform bacteria TMDL for Accotink Creek (portion upstream of Lake Accotink) was developed by VDEQ and approved by EPA in 2002.

4.7.1.2.3 In-Stream Water Quality

Current and historical water quality conditions of the watersheds of Fort Belvoir were determined using available VDEQ water quality data, Fairfax County Health Department data, EPA's STOrage and RETrieval (STORET) database information, the Fort Belvoir INRMP, and other Fort Belvoir documents. Water quality data collected at VDEQ stations within the vicinity of Fort Belvoir are presented in Table 4.7-4, and monitoring station locations are shown in Figure 4.7-3. VDEQ uses ambient water quality, sediment, fish tissue, and other available data to assess water quality conditions, threats to human health, and the impairment status for each waterbody (see Section 4.7.1.2.2). Data for selected water quality parameters collected from 1/1/1990 to 9/1/2006 were summarized to provide background information on water quality conditions for Fort Belvoir waterbodies.

The Fairfax County Health Department also samples several streams in the County and publishes the results in an annual report. Four stations are located in the immediate vicinity of Fort Belvoir, upstream from the installation on Pohick, Accotink, and Dogue Creeks. The Pohick Creek station (#17-08) is located just outside the installation boundary on Old Colchester Road. The Dogue Creek station (#15-06) is located just outside of the installation boundary upstream from George Washington Village. The two stations in the Accotink Creek watershed are on Long Branch (#16-13) just outside the installation boundary on the northern side of Telegraph Road and on Accotink Creek (#16-09) 5 miles upstream from Fort Belvoir. The stations are shown on Figure 4.7-3.

The results from the 2002 water quality report for fecal coliform, nitrate nitrogen, pH, and total phosphorus in these watersheds are presented in Table 4.7-5. For dissolved oxygen (DO), the farthest downstream stations in the Pohick watershed and on Long Branch in the Accotink watershed reported no DO levels under the minimum DO criterion of 4.0 mg/l in 2002. However, the Dogue Creek station reported that 29 percent of samples did not meet the minimum criterion, and the station farther upstream on Accotink Creek (#16-09) reported that 20 percent of samples did not meet the criterion (Fairfax County Health Department, 2003a).

Table 4.7-3
303(d) Listed waterbodies within or downstream of Fort Belvoir

303(d) listed waterbody	Extent	Use impaired	Impairment cause (initial list date)
Accotink Creek	Confluence of Calamo Branch downstream to end of free-flowing waters (8.62 miles)	Aquatic Life, Recreation	General Standard (Benthic)—(1996), Fecal Coliform (2004)
Pohick Creek	Confluence of South Run downstream to end of free-flowing waters (3.2 miles)	Fish Consumption, Recreation	Fish Tissue—PCBs, PAH (2002). PAH listing was for Benzo[k]fluoranthene. Benzo[b]fluoranthene and Chrysene also noted in 2002. *E. coli* (2006)
Dogue Creek	Tidal waters of Dogue Creek, extending from approximately rivermile 2.1 until the confluence with the Potomac River. Portion of CBP segment POTTF[a] (0.74 mi^2)	Fish Consumption, Recreation, Aquatic Life, Shallow-Water SAV[b]	Fish Tissue—PCBs (2002), Fecal Coliform (2006), Aquatic Plants (2006)
Accotink Bay	Tidal waters of Accotink Creek until the confluence with the tidal waters of Pohick Bay/Gunston Cove. Portion of CBP segment POTTF[a] (0.35 mi^2)	Fish Consumption, Aquatic Life, Shallow-Water SAV[b]	Fish Tissue—PCBs (2002), Aquatic Plants (2006)
Pohick Bay	Tidal waters of Pohick Creek, from the boundary of watershed A15, extending to rivermile 1.31 in Gunston Cove. Portion of CBP segment POTTF[a] (0.61 mi^2) Tidal waters of Pohick Creek upstream from the boundary of watershed A16. Portion of CBP segment POTTF[a] (0.29 mi^2)	Fish Consumption, Recreation, Aquatic Life, Shallow-Water SAV[b]	Fish Tissue—PCBs (2002), Fecal Coliform (2006), Aquatic Plants (2006) * Ammonia was also listed in 2002 for the upper segment but was not included on the 2006 list.
Gunston Cove	Segment extends from rivermile 1.31 in Gunston Cove until the confluence with the Potomac River. Portion of CBP segment POTTF[a] (1.51 mi^2)	Fish Consumption, Aquatic Life, Shallow-Water SAV[b]	Fish Tissue—PCBs (2002), Aquatic Plants (2006)

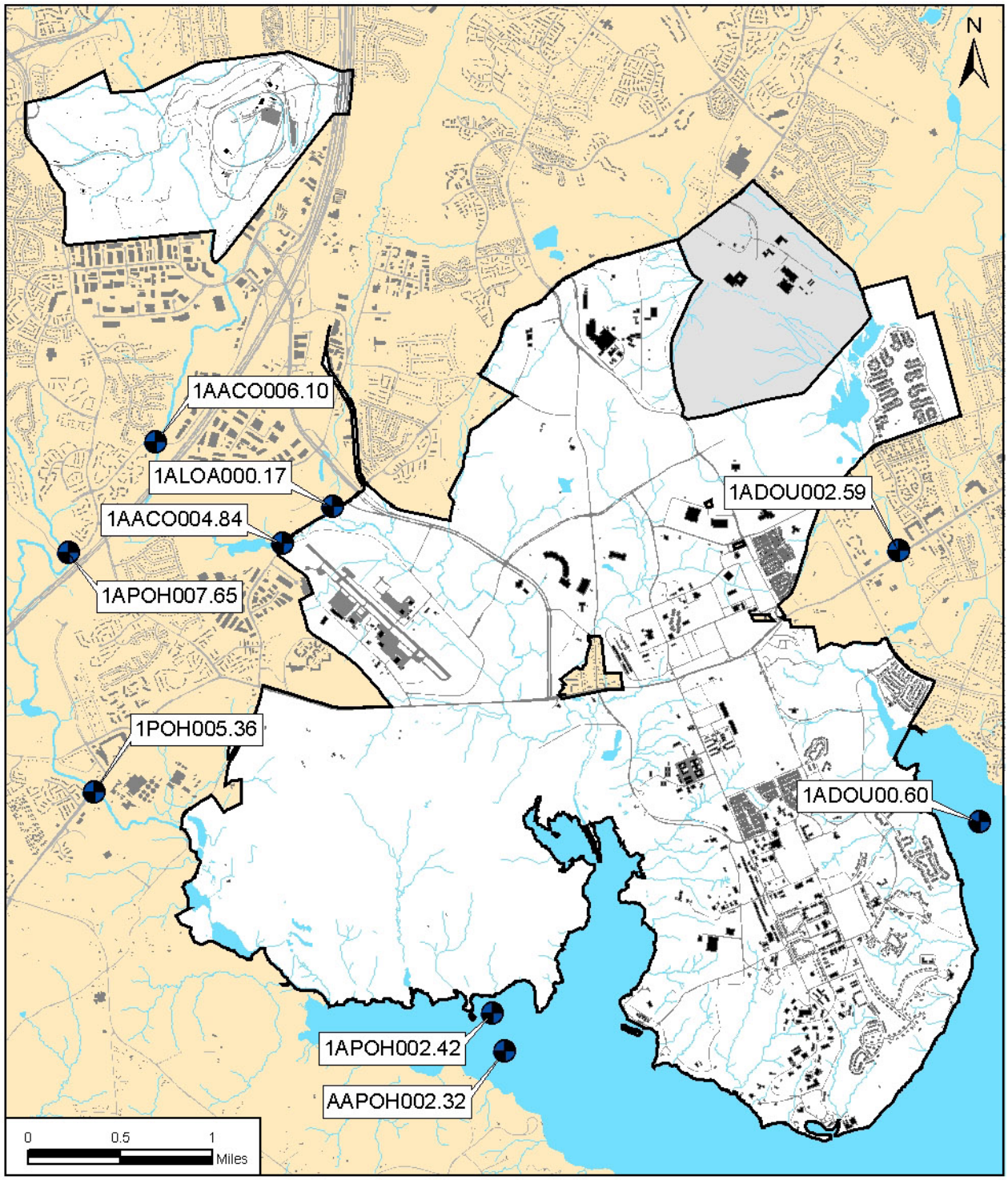
[a]POTTF refers to the Upper Potomac River segment of the Chesapeake Bay Program (CBP)
[b]Submerged Aquatic Vegetation.

The report also provided data for heavy metals. For the sampling period 1989 to 1998, the Pohick, Accotink, and Dogue Creek watersheds were all within the acceptable Primary Maximum Contaminate Levels (PMCLs) for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver (Fairfax County Health Department, 2003a).

Water samples were also collected on Fort Belvoir in 1998 and 1999 as part of the installation's baseline aquatic survey (EA, 2000 as cited in Horne, 2001). Water samples were analyzed for nutrients, pesticides, metals, and total petroleum hydrocarbons on the installation's five main perennial waterways: Accotink Creek, Dogue Creek, Mason Run, and two unnamed tributaries. With the exception of aluminum, manganese, and iron, none of the analytes measured were at high levels. The EPA human health criteria for manganese and iron are based on prevention of

Table 4.7-4
Water quality summary for VDEQ stations near Fort Belvoir

Station ID	Data period	Statistic	Water quality data summary: pH (SU)	DO (mg/l)	Temp (degrees C)	*E. coli* (# colonies/ 100 ml)	Fecal Coliform (# colonies/ 100 ml)	Total N (mg/l)	Total P (mg/l)	TSS (mg/l)
Accotink Creek										
1ALOA000.17 (Long Branch, Trib. to Accotink Creek)	8/11/05–1/9/06	# samples	5	5	5	5	1	4	4	4
		Min	6.30	8.27	5.99	50	50	0.46	0.03	3
		Mean	6.8	10.30	13.67	415	50	0.62	0.04	8.75
		Max	7.38	12.95	27.66	1,600	50	0.80	0.06	24
1AACO004.84 (Telegraph Road)	8/11/05–1/9/06	# samples	5	5	5	5	1	4	4	4
		Min	6.79	8.26	4.11	25	50	0.69	0.01	3
		Mean	7.06	10.49	12.37	374	50	0.89	0.05	14.5
		Max	7.45	13.11	26.57	1,600	50	1.21	0.12	49
1AACO006.10 (Rt. #790)	10/17/90–6/13/01	# samples	102	99	108	-	102	-	110	109
		Min	6.17	6.00	0.80	-	18	-	0.01	1
		Mean	7.40	10.33	15.28	-	588	-	0.18	10.37
		Max	8.70	15.00	29.80	-	16,000	-	10.00	227
Pohick Creek										
1APOH005.36 (Rt. 1 bridge)	9/6/01–1/18/06	# samples	20	20	20	18	21	14	19	21
		Min	6.35	6.38	1.09	25	25	0.51	0.01	3
		Mean	7.29	10.70	13.90	325	431	0.84	0.03	15.04
		Max	8.21	15.75	25.36	2,000	2,000	1.51	0.05	188
1APOH007.65 (Rt. #642)	10/17/90–6/19/01	# samples	37	36	41	-	37	-	42	43
		Min	6.20	6.00	0.40	-	20	-	0.01	1
		Mean	7.18	10.81	13.48	-	360	-	0.09	7.18
		Max	8.00	14.00	26.70	-	3,600	-	0.07	75
Pohick Bay										
1APOH002.42 (Boat ramp, Rd 242)	8/15/02	# samples	1	1	1	-	-	-	-	1
		Value	9.17	8.80	29.07	-	-	-	-	7
1APOH002.32 (West side of Pohick boat ramp)	2/5/90–11/7/05	# samples	143	126	154	14	131	13	154	166
		Min	6.00	2.00	1.6	10	2	0.98	0.03	0
		Mean	7.71	9.62	19.01	75	254	2.37	0.15	21.37
		Max	10.00	16.00	32.50	400	8,000	4.36	3.90	68
Dogue Creek										
1ADOU002.59 (Rt. #1)	11/17/90–5/16/02	# samples	4	2	4	1	2	-	4	4
		Min	6.30	9.00	5.00	500	100	-	0.07	11
		Mean	6.66	11	8.25	500	125	-	0.12	22.75
		Max	6.99	13.00	17.70	500	150	-	0.20	31
1ADOU000.60 (Mt. Vernon Yacht Club)	2/5/90–11/7/05	# samples	117	108	127	14	121	13	134	133
		Min	6.00	6.00	0.50	10	2	0.95	0.01	0
		Mean	7.86	10.53	18.02	107.50	264	1.59	0.03	20.06
		Max	9.00	16.00	31.50	800	9,200	2.24	0.06	139



LEGEND

Installation Property

Water Monitoring Stations

Monitoring Stations

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.7-3

Table 4.7-5
Fairfax County Health Department water quality sampling results for 1998-2002 for selected parameters in selected Fairfax County watersheds

Parameter	Criterion	Year	Pohick Creek[a]	Accotink Creek[b]	Dogue Creek[c]
Fecal coliform % of samples with < 200 colonies per 100 mg/l)	200 colonies/100 mg/l	1998	7	7	18
		1999	12	13	5
		2000	13	10	13
		2001	19	18	11
		2002	21	12	6
Nitrate nitrogen Geometric mean (mg/l)	10 mg/l	1998	0.3	0.5	0.2
		1999	0.3	0.6	0.2
		2000	0.3	0.5	0.1
		2001	0.3	0.5	0.2
		2002	0.3	0.4	0.2
pH Geometric mean	6.0–9.0	1998	7.1	7.2	6.9
		1999	7.2	7.3	6.9
		2000	6.9	7.0	6.8
		2001	6.9	7.0	7.0
		2002	6.8	6.9	6.7
Total phosphorus Geometric mean (mg/l)	No established criteria	1998	0.10	0.10	0.11
		1999	0.11	0.10	0.11
		2000	0.10	0.11	0.12
		2001	0.09	0.10	0.10
		2002	0.09	0.10	0.10

Source: Fairfax County Health Department, 2003a.
[a]Station #17-08, at Old Colchester Road
[b]Station #16-09, 5 miles upstream from Fort Belvoir
[c]Station #15-06, upstream from George Washington Village

objectionable taste and laundry staining, not adverse toxicological effects. The criterion for aluminum is based on long-term exposures for striped bass rather than humans and is frequently exceeded under natural conditions. The sampling results do not address contaminant inputs from storm flow conditions.

Accotink Creek, at 0.8 miles upstream from Fort Belvoir, was part of the USGS National Water-Quality Assessment (NAWQA) for the Potomac River Basin from 1992 to 1996 (USGS, 1998). The study concluded that concentrations of nutrients and pesticides in streams of the Potomac River Basin are among the highest in the nation, primarily as a result of urbanization. Habitat condition is one of the primary factors influencing biological condition in a waterway, and the

Accotink Creek site exhibited typical urban habitat degradation, including lower bank stability, increased bank erosion, and less riparian vegetation than less degraded sites. Pohick Creek and Dogue Creek, although not included in the NAWQA study, could be expected to have similar situations, though not as severe.

Of the three main Fort Belvoir watersheds, Dogue Creek, which contains most of the present housing areas on Fort Belvoir, is undergoing the most intensive development (Fort Belvoir, 2005b). However, the Huntley Meadows area, Jackson Miles Abbott Wetland Refuge in the upper reaches of Dogue Creek, and a chain of storm water ponds in Pohick Creek may help moderate storm water flows and biological condition by slowing storm flows and absorbing nutrients (Fort Belvoir, 2001).

4.7.1.3 Pollutant Sources

Pollutant sources are typically characterized as point or nonpoint sources under the CWA. Point sources, according to 40 CFR 112.3, are defined as any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. The National Pollutant Discharge Elimination System (NPDES) Program, under CWA Section 402, requires permits for the discharge of pollutants from point sources. VDEQ administers the NPDES program in Virginia, which is referred to as the Virginia Pollutant Discharge Elimination System (VPDES) Program. VDEQ also issues permits for dredge and fill activities that may affect wetlands and other State waters under the Virginia Water Protection (VWP) Permit Program. This program extends the state's authority over impacts to wetlands and other State waters granted under Section 401 (Water Quality Certification) of the CWA. The U.S. Army Corps of Engineers also regulates dredge and fill activities under Section 404 of the CWA. These permit programs and potential impacts to wetlands are discussed in more detail in Section 4.8 (Biological Resources).

Nonpoint sources are generally precipitation-driven and occur as overland flow carries pollutants, often attached to sediment, into streams. However, nonpoint sources may also include non-precipitation driven events such as contributions from groundwater, sanitary sewer systems, direct deposition of pollutants from wildlife and livestock, and atmospheric deposition. Nonpoint source pollution is managed under various federal, state, and local programs. Although storm water and associated pollutants are typically characterized as nonpoint source, Virginia regulates storm water runoff from urban areas as a point source, as described in the following section.

4.7.1.3.1 Point Sources

As mandated by the CWA and EPA's Phase I and Phase II storm water regulations, Virginia issues permits to dischargers of storm water from (1) industrial activities (including construction activities), and (2) municipal separate storm sewer systems (MS4s) under the VPDES program. There are several types of permits under the VPDES permit program, including permits issued for effluent from facilities; discharges from municipal wastewater treatment plants; storm water from industrial activities; storm water from construction sites; and storm water from urban MS4s. The VPDES storm water program responsibility is divided between VDEQ and the Virginia Department of Conservation and Recreation (VDCR). In January 2005, VPDES construction activity and MS4 storm water permitting responsibilities transferred from VDEQ to VDCR to become part of the Virginia Stormwater Management Program (VSMP) (VDCR, 2005; VDEQ,

2005b). The VDCR is responsible for the issuance, denial, revocation, termination, and enforcement of NPDES permits for the control of storm water discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program. The VDEQ continues to manage traditional wastewater point sources and other VPDES activities. Fort Belvoir has a VPDES Phase II Stormwater Permit (No. VAR040093) as a regulated small MS4 that expires in December 2007. In addition, the installation has a Phase I VPDES Industrial Stormwater General Permit (No. VAR051080) that specifically covers storm water runoff from Davison Army Airfield. Six additional storm water permits have been issued to the installation for storm water discharges associated with petroleum-contaminated sites, including a permit that was issued for remediation of the M-26 petroleum spill at EPG (Russell, 2005; Fort Belvoir, 2005b; USACE, 2003).

The VPDES Phase I permit program historically governed any construction activity including clearing, grading, and excavation activities, except for operations that result in the disturbance of an area less than 5 acres that is not part of a larger common plan of development or sale. The new Phase II VPDES program expands permit coverage to storm water discharges from construction activities affecting more than 2,500 square feet in areas that are considered to be within the Chesapeake Bay Preservation area (VDCR, 2005). All of Fort Belvoir is considered to be within the Chesapeake Bay Preservation area. The installation is currently developing and implementing pollution control measures in accordance with the standard permit conditions (Horne, 2001; Landgraf, 2003). Under Fort Belvoir's MS4 permit, construction plans and design documents must be submitted to DPW-ENRD for a technical review of new and redevelopment projects that disturb greater than or equal to 2,500 square feet of land surface to evaluate proposed storm water controls. Plans will be evaluated in accordance with the Virginia Erosion and Sediment Control Manual, the Virginia Stormwater Management (SWM) Handbook, and the Fairfax County Public Facilities Manual (PFM). Deficient or non-compliant documents will be returned to the designers for modification and resubmission prior to initiation of site work. Excavation permits will not be granted until plans are approved.

Pollution prevention for construction activities is addressed by VPDES Stormwater Permits for Construction Activities and Phase II MS4 permits as defined under the CWA, Virginia's Stormwater Management Act and Erosion and Sediment Control regulations, and by Army administrative publication DA PAM 200-1: Environmental Protection and Enhancement. VPDES general storm water permits require that Storm Water Pollution Prevention Plans (SWPPP) be developed and implemented. These plans identify potential sources of pollution, describe storm water control measures to be implemented, and ensure compliance with the permit. Virginia's SWM and Erosion and Sediment Control Acts require that, "properties and receiving waterways downstream of any land-development project shall be protected from erosion and damage due to increases in volume, velocity and peak flow rate of storm water runoff…in accordance with" minimum design standards as defined in Minimum Standard 19 of the Erosion and Sediment Control regulations or alternate design standards as defined in the Stormwater Management regulations. DA PAM 200-1 also requires installations to conserve all water sources and protect them from contamination by developing and implementing plans to ensure a level of water quality that supports "the propagation of fish, shellfish and wildlife; recreation in and on the water; and the protection of drinking water sources."

The Noman M. Cole, Jr. Pollution Control Plant, formerly known as the Lower Potomac Pollution Control Plant, is a wastewater treatment facility located about one half mile upstream from Fort Belvoir along Pohick Creek. This facility receives approximately half of Fairfax County's domestic and commercial wastewater flow and has a treatment capacity of 54 million

gallons per day (mgd) (Horne, 2001). The plant operates and discharges effluent into Pohick Creek under VPDES permit number VA0025364 . The plant achieves a 99 to 99.5 percent removal of suspended matter, organic substances, nutrients, infectious microorganisms, and other pollutants through its treatment processes (Fairfax County DPWES, 2001). However, water quality and flow conditions in the lower reach of Pohick Creek adjacent to Fort Belvoir may be influenced by discharges from the wastewater treatment plant (Horne, 2001).

4.7.1.3.2 Nonpoint Sources

Nonpoint sources may also contribute pollutants to downstream waterbodies and cause other impacts. Nonpoint sources represent contributions from diffuse, non-permitted sources. This does not include storm water from MS4 permitted areas, which is typically collected and discharged to surface waterbodies through an extensive storm water collection system. Storm water discharges and associated pollutants from these areas act as nonpoint sources, but are regulated as point sources.

Because of Fort Belvoir's administrative mission and the extent of development on the installation (approximately 30 percent of the installation is developed (USGS, 2001) and approximately 12 percent of the installation is covered with impervious surfaces (Horne, 2001)), the primary source of nonpoint pollution on Fort Belvoir is storm water runoff (Fort Belvoir, 2005b). Activities such as clearing vegetation or grading, removing and compacting soils, as well as extensive uses of impervious surfaces could increase the amount of storm water runoff in a watershed and result in pollutant contamination. Increased storm water runoff could cause increased flooding, stream bank erosion, and degradation of in-stream habitat. Storm water runoff could become contaminated as it flows across the surface and picks up pollutants from roadways, yards, farms, golf courses, and parking lots. Watershed land cover distribution is an important factor in the delivery of nonpoint source pollutants, such as sediment, nutrients, heavy metals, and pathogens, through soil erosion. As the amount of impervious surface area increases, the amount of storm water runoff increases.

The percentage of impervious surface area in a watershed is directly related to the hydrological, habitat, and water quality characteristics of the watershed (CWP, 2003). The threshold where indicators of stream quality shift toward degraded water quality is around 25 to 30 percent impervious cover (CWP, 2003).

As indicated above and shown in Figure 4.7-2 and Table 4.7-1, there are seven watersheds and 59 subwatersheds on Fort Belvoir (including EPG). The Accotink Bay, Gunston Cove, and Potomac River watersheds have the highest percentage of impervious surfaces, at 19, 16, and 14 percent, respectively. The Dogue Creek and Accotink Creek watersheds are 11 and 10 percent impervious, respectively; however, these watersheds contain the largest overall amount of impervious surface area because they are the two largest watersheds on the installation.

The Pohick Creek and Pohick Bay watersheds are less than one percent impervious (Horne, 2001). Unlike the Pohick Creek watershed, the Pohick Bay watershed originates on and is entirely contained within Fort Belvoir (Horne, 2001). With only 0.01 percent of its area being impervious, and 93.46 percent covered by forest lands (Horne, 2001), the Pohick Bay watershed is considered an intact watershed, as shown on Figure 4.7-1 (Fort Belvoir, 2004).

At the subwatershed level, seven subwatersheds exceed the 25 percent impervious threshold: subwatersheds 4, 29, 34, 39, 40, 41, and 43. Subwatershed 4 is in the Accotink Bay watershed

and west of the South Post Town Center. Subwatershed 29 is in the Accotink Creek watershed and in the center of the installation east of Accotink Village. Subwatershed 34 overlaps Woodlawn Village in the Dogue Creek watershed. The remaining four subwatersheds are on the North Post west of the DLA facility and north of Davison Army Airfield within the Accotink Creek watershed.

A quantitative determination of the relative impact of various construction options on water resources within Fort Belvoir requires the development of a baseline. The watersheds identified in the 1999 baseline watershed survey and revised with information from the 2003 update represents baseline conditions (Landgraf, 1999; 2003).

4.7.1.3.3 Storm Water Management

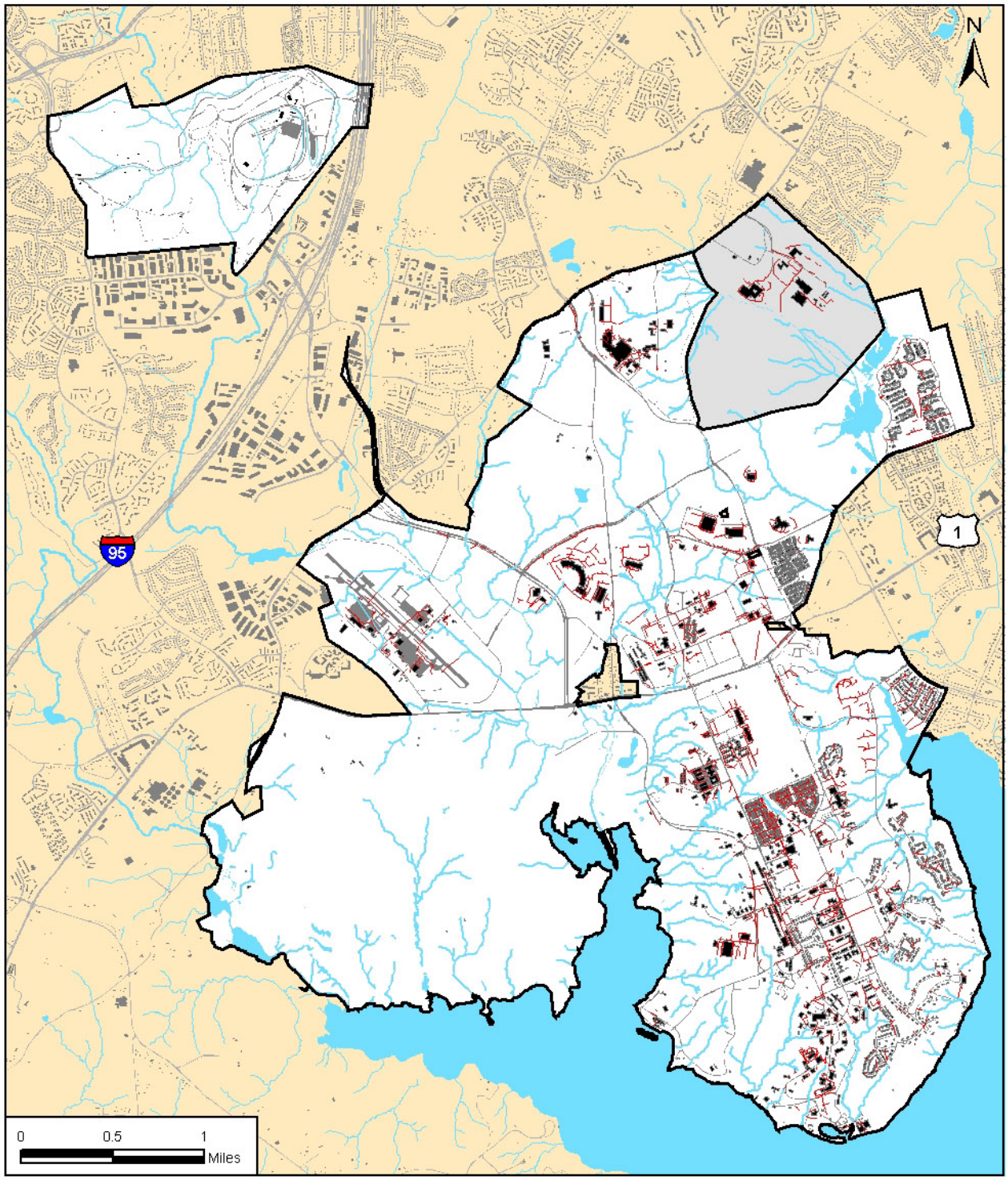
Developed areas on Fort Belvoir, including parking lots and roadways, are generally served by storm water drainage systems. EPG has historically been used as a training area and is currently little used. Storm water drainage on EPG is managed by a limited system of drainage ditches and culverts or conduits. For developed areas on the Main Post, the terrain has generally been modified to move storm water runoff away from facilities. Storm water draining off Fort Belvoir enters a storm water system consisting of approximately 22.4 miles of paved drainage ditches and 59.8 miles of storm drain pipes that ultimately discharge into various surface waterbodies. Additional storm water management structures on Fort Belvoir include storm water detention ponds and oil/water separators (Fort Belvoir, 2005b; Horne, 2001). Existing storm water management facilities include a DLA water feature, a rock catchment on the North Post, a Residential Communities Initiative (RCI) storm water management pond on the South Post, and various hydrodynamic devices, underground storage/detention pipes, storm water filter systems, and bioretention filters. Conventional infiltration practices are mostly used to control storm water from RCI housing areas. Figure 4.7-4 shows the location of storm water drainage pipes on Fort Belvoir. The pipes tend to be clustered around the developed portions of the installation. Section 4.7.2.4 presents information about storm water management practices at Fort Belvoir.

Generally, Fort Belvoir has had inadequate existing storm water management facilities because much of the development on the installation predated any storm water management regulations. Problem areas exist where unmanaged storm water threatens the viability of roads and utility lines, presents safety hazards, causes stream bank erosion, and renders sites undevelopable because of erosion and soil slumping. Refer to Section 4.12 for information on Fort Belvoir utilities and existing deficiencies.

The *Watershed Delineation Project Update* (Landgraf, 2003) identifies issues of concern with respect to sedimentation on Fort Belvoir: sedimentation from construction projects, inadequate installation and maintenance of erosion and sediment control measures, and lack of enforcement of minimum standards for erosion and sediment control. According to Landgraf (2003), Fort Belvoir has taken steps to improve these conditions, including the identification of 14 sites with erosion problems that had been remediated since the prior project survey in 1999.

Other storm water and flooding problems on the installation were recently noted by Fort Belvoir ENRD personnel, as follows (Master Plan/Drainage Study meeting on 11/16/06):

- Erosion and gullying occurs downstream of storm sewer outfalls. Erosion has also exposed utility lines at channel crossings.



LEGEND

Installation Property

Stormwater Line

Stormwater Lines

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.7-4

- Every subwatershed on South Post has deeply incised stream channels. Channel erosion is also a problem on North Post and EPG but not as severe. Deeply incised channels are a sign of extreme flow conditions, instable stream banks and abnormal channel evolution.
- Problems exist with the intersection of larger storm water pipes into smaller ones.
- Flooding problems exist because of very flat drainage at the intersection of Gunston Road and 21st Street.
- Storm water management is limited on South Post. Several facilities are on North Post.
- Storm water management facilities were not designed to provide water quality control.
- Historical storm water mitigation strategies, such as dumping of concrete debris to remediate problem erosion sites in streams, were not effective. Also, the existing storm water system was not designed to handle storm flows from large areas of impervious surfaces.

Fort Belvoir is incorporating storm water management and protection methods into land planning and new development as well as correcting and retrofitting existing problem areas. A storm water drainage system master plan study is currently underway, as discussed above. This study will identify current deficiencies (e.g. capacity problems, outfall problems, stream bank erosion) and determine infrastructure needs required to meet BRAC requirements and long-term growth through 2030. This study will also provide recommendations for storm water quality and quantity control, such as required design criteria, potential locations for new facilities, and methodologies that should be used or avoided.

The MS4 storm water management program discussed in Section 4.7.1.3.1 requires "minimum control measures," including Best Management Practices (BMPs) to control storm water and pollutants in runoff. Fort Belvoir is developing pollution control measures that must be implemented within 5 years of permit issuance. The following management recommendations from the Fort Belvoir INRMP (Horne, 2001), Landgraf (2003), and the *Watershed-based Stream Corridor Management and Protection, Fort Belvoir, VA* report by Allen et al. (1999) are being considered for incorporation into the Phase II Storm Water Regulations as part of the INRMP planning process:

- Maintain a riparian buffer along all installation waterways and shorelines.
- Correct existing storm water-related problems as recommended by Landgraf (2003) and continue long-term stream corridor restoration projects.
- Implement actions to counter existing flow excesses from developed areas as recommended by Allen et al. (1999).
- Develop a program for routine drainageway maintenance, to include maintenance of existing storm water structures, and establish a storm water management working group.
- Implement storm water management actions, including BMPs, on all construction projects.
- Continue to incorporate principles of LID in facility siting and design on-post as recommended in *Low-Impact Development Design Strategies* (Prince George's County Department of Environmental Resources, 1999).

Numerous practices have been implemented on Fort Belvoir to control storm water runoff. These efforts include the construction of permanent storm water management ponds; reduction in the use of fertilizers to reduce nutrient runoff to receiving waters; revegetation of exposed slopes, creeks and stream banks; percolation trenches adjacent to parking lots; and using temporary sedimentation basins at construction sites. More recent efforts include implementing the *rain garden* concept of storm water management, which maximizes groundwater penetration as

opposed to runoff. Rain gardens are landscape design features consisting of localized topographic depressions planted with naturally hardy plants, usually a combination of trees, shrubs, hardy perennials, or grasses, and strategically located next to hard surfaces from which storm water runoff and snowmelt can be diverted and can collect. Rain gardens serve as retention areas that promote infiltration and reduce runoff. Examples are in place at the AMC temporary buildings and at the Davison Army Airfield Fire Station (Fort Belvoir, 2005b).

4.7.1.4 Groundwater

Fort Belvoir is underlain by three subsurface aquifers: Lower Potomac, Middle Potomac, and Bacons Castle Formation. These three aquifers are within the Potomac Group, a sequence of unconsolidated sediments characteristic of the Coastal Plain and underlying Fort Belvoir. The Lower Potomac aquifer, the primary aquifer in eastern Fairfax County, contains potable water below Fort Belvoir. The aquifer lies between a layer of crystalline bedrock and a clay wedge containing sandy clays and interbedded layers of sand. The aquifer is recharged by surface infiltration north and west of Fort Belvoir and flows to the southeast.

The Middle Potomac aquifer consists of interbedded lenses of differing thicknesses of sand, silt, and clay, but its confining unit is not present in the vicinity of Fort Belvoir. The Bacons Castle Formation is the shallowest aquifer of the three and is recharged by and discharges to waterbodies on the installation (Horne, 2001; Fort Belvoir DPW ENRD, 2002).

The water table on Fort Belvoir lies approximately 10 to 35 feet below the ground surface (except within and directly adjoining wetland and floodplain areas). Some areas on the installation have perched water tables approximately 2 feet below the surface as a result of groundwater trapped in strata overlying impermeable clays (Fort Belvoir DPW ENRD, 2002; Fort Belvoir, 2005b). Groundwater flow patterns for the unconfined uppermost saturated layer (water table aquifer) on EPG generally follow surface water drainage. However, local groundwater flow patterns could be affected by the heterogeneous nature of the unconsolidated fluvial deltaic Coastal Plain sediments. Groundwater could become perched in lenses within the unconsolidated sediments, as referenced above. The density and orientation of fracture and fault systems existing within the rock formations generally control groundwater flow within the crystalline rocks or saprolite of the Piedmont. The orientation of these systems is highly variable on a local scale.

Fort Belvoir does not have any active potable groundwater wells on the Main Post or EPG but rather obtains all its potable water supply from the Fairfax County Water Authority in the amount of 2.2 mgd. A well inventory counted 220 groundwater supply and monitoring wells on Fort Belvoir, the majority of which are monitoring wells or inactive. Four wells are used for irrigation for the golf courses, and one supplies the MDW horse stables. Between 2001 and 2004, an average of 12.9 million gallons per year was drawn from the golf course wells for irrigation (Russell, 2005; Horne, 2001).

4.7.1.5 Other Water Resources Policies

In general, Fort Belvoir must comply with all applicable DoD, Army, Fort Belvoir, federal, and state statutes and regulations concerning water resources. The Fort Belvoir INRMP (Horne, 2001) provides a comprehensive list of relevant regulations and policies. Applicable regulations including the CZMA, Chesapeake Bay agreements, and floodplain management are described below. In addition, Fairfax County is developing watershed management plans for each of the County's watersheds. These plans include information on watershed characterization, storm

water management, baseline and future watershed modeling scenarios, recommended BMPs, and recommended policies and other initiatives to improve watershed conditions.

4.7.1.5.1 Coastal Zone Management Act (CZMA) and Chesapeake Bay Initiatives

The CZMA's goal is to preserve, protect, develop, and where possible, restore or enhance the resources of the coastal zone of the United States. The CZMA as it applies to Fort Belvoir contains a federal consistency requirement, by which federal actions must be consistent to the maximum extent practicable with the enforceable policies of the federally approved Virginia Coastal Resources Management Program (VCRMP). This program focuses on problems associated with polluted runoff, habitat protection, riparian buffers, Resource Protection Areas (RPAs), wetlands, fisheries, sustainable development, waterfront redevelopment and encroachment, septic systems, erosion and sediment control, and air pollution control (VDEQ Coastal Program Office, 2004). Virginia's coastal zone includes all of Fairfax County, which encompasses Fort Belvoir and the 12.25 miles of Potomac River shoreline on the installation (VDEQ Coastal Program Office, 2003). Under the CZMA and VCRMP, the Commonwealth of Virginia will be notified and then has six months from notification, to concur with or object to the Consistency Determination under CZMA. A federal consistency determination letter will be submitted in accordance with CZMA and VCRMP requirements.

Waterbodies on Fort Belvoir drain to the Potomac River and ultimately into the Chesapeake Bay. The Potomac River watershed covers approximately 14,670 square miles of diverse land uses in four states (Virginia, West Virginia, Maryland, and Pennsylvania) and the District of Columbia. The Potomac River extends more than 380 miles and reaches a width of more than 11 miles where it meets the Chesapeake Bay at Point Lookout, Maryland. The Potomac River was designated an American Heritage River in 1998 (EPA, 2004).

The Chesapeake Bay is the nation's largest estuary. It supplies vast amounts of seafood, is a major hub for shipping and commerce, provides natural habitat for a wide range of wildlife, and offers a variety of recreational opportunities for residents and visitors. The Chesapeake Bay watershed is a 64,000-square-mile drainage basin covering parts of New York, Pennsylvania, West Virginia, Delaware, Maryland and Virginia, as well as the entire District of Columbia (Chesapeake Bay Program, 2000).

Management of Fort Belvoir waterbodies is guided by several Chesapeake Bay agreements. These include the 1987 Chesapeake Bay Agreement, the Cooperative Agreement between DoD and EPA Concerning Chesapeake Bay Activities, the Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay, Federal Agencies Chesapeake Ecosystem Unified Plan (FACEUP), and Chesapeake 2000. These agreements address water quality and aim to protect and restore the Chesapeake Bay's aquatic resources. They accomplish this by consolidating existing regulatory requirements, such as water quality protection under the CWA, and supplementing these regulations with policy and guidance addressing unregulated, but ecologically significant management considerations, such as the establishment of adequate vegetated cover, the protection of wetlands, and storm water runoff control (Horne, 2001). In addition, since Fort Belvoir is considered to be a Chesapeake Bay Preservation area, the new Phase II VPDES program expands permit coverage to storm water discharges from construction activities affecting more than 2,500 square feet (VDCR, 2005).

State and local efforts for protection of the Chesapeake Bay also guide management of Fort Belvoir waterbodies. In response to the 1987 Chesapeake Bay Agreement, the Virginia

Chesapeake Bay Preservation Act (CBPA) was enacted to protect the Chesapeake Bay from further degradation from nonpoint source pollution and sedimentation. Under the CBPA, Fairfax County adopted a Chesapeake Bay Preservation Ordinance that designates RPAs and Resource Management Areas (RMAs).

RPAs are regulatory zones along streams protected from most forms of development to preserve their function as biological filters and buffers. RPAs generally include major floodplains, riparian areas, and vegetated lands within 100 feet of tidal and nontidal wetlands, tidal shores, and perennial streams. Fort Belvoir has about 1,984 acres of RPAs, covering about 23 percent of the installation (Fort Belvoir GIS, 2006). RPAs on Fort Belvoir are shown in Figure 4.7-1. RPAs help filter storm water runoff and prevent nutrients, toxic substances, and sediments from entering streams, rivers, and, ultimately, the Chesapeake Bay. They also provide valuable wildlife habitat (Horne, 2001). All land outside of an RPA in Fairfax County is classified as an RMA.

Riparian areas should be given special consideration when planning development (Directive No. 94-1 in the Chesapeake Bay Agreements, Riparian Forest Buffers). A riparian area is generally an area of land adjacent to a body of water, stream, river, marsh, or shoreline that provides a transition zone between the aquatic and terrestrial environment. The riparian areas shown on Figure 4.7-1 represent areas within 35 feet of an intermittent or perennial stream, alluvial soils, and soils with slopes greater than 15 percent (Fort Belvoir GIS, 2006). Riparian areas are generally vegetated and act as a buffer to reduce effects of upland sources of pollution by trapping or filtering sediments, nutrients, and other chemicals and preventing them from entering a waterbody. Benefits from vegetated riparian areas include water quality enhancement, storm water and floodwater management, stream bank and shoreline stabilization, water temperature modification, wildlife habitat protection, pollutant absorption, and a high overall aesthetic appearance. New development must be minimized in riparian areas and continuous riparian corridors maintained, particularly in ravines and along the shoreline. Section 4.8 provides additional information on flora and fauna typically found within riparian areas on Fort Belvoir.

4.7.1.5.2 Floodplain Management

Under Executive Order (EO) 11988, Floodplain Management (May 24, 1977), Fort Belvoir is required to evaluate any potential effects of any action occurring in a floodplain (Horne, 2001). Approximately 1,593 acres, or 19 percent of the installation, are within a 100-year floodplain of a waterway (Fort Belvoir GIS, 2006; FEMA, 1990). Notable floodplains occur along Pohick, Accotink, and Dogue Creeks and their larger tributaries, and along the Potomac River on the installation.

4.7.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

Environmental effects on water resources as a result of the proposed action primarily relate to the potential for increases in storm water runoff and associated pollutants from land disturbance activities, construction-associated effects, conversion of pervious areas to impervious, potential loss of riparian buffers, and other physical changes to watershed features. Storm water runoff increases flow volumes, velocity, peak flows, and the delivery of sediment and other pollutants to streams. The potential for erosion in an area is characterized by the interaction of four primary factors: the characteristics of its soils, its vegetative cover, its topography, and its climate. All these factors also determine the magnitude of storm water runoff. In general, storm water runoff potential increases with decreasing soil moisture retention and vegetative cover and increasing impervious land area, land slope, and precipitation volume. Similarly, erosion potential increases

with decreasing soil consolidation and vegetative cover and increasing land slope, precipitation volume and storm water runoff.

To determine the potential environmental consequences on water resources as a result of the proposed action, an assessment of current, or baseline, conditions was made. This required a detailed examination of the existing distribution of land use areas and soil types and characterization of surface elevations, subwatersheds, and stream networks on the installation. Baseline peak flow conditions and potential effects of the proposed development scenarios within each subwatershed were modeled using the Technical Release 55 (TR-55) small watershed runoff model (NRCS, 1986). Potential changes in pollutant loads were estimated for each subwatershed using the Generalized Watershed Loading Functions (GWLF) model. Watershed modeling was also used to assess potential cumulative effects on flow and pollutant loads due to anticipated future development in the watersheds that drain Fort Belvoir. The process of evaluating the different development scenarios required the modification of land uses to account for the location of proposed facilities and associated development areas. The increase in impervious surfaces and their locations as a result of the proposed land use development scenarios were the variable factors used to assess potential effects on water resources. Note that these analyses were performed based on the preliminary siting of proposed BRAC facilities and other future development projects within the watersheds that drain Fort Belvoir; therefore, potential reductions in storm water runoff and associated pollutants due to BMP implementation and mitigation efforts were not considered. The types of BMPs that will be implemented and other storm water control activities will depend on final site/parcel development plans. Proper storm water planning and implementation of effective storm water management practices, as required by regulation and through proposed mitigation efforts, will reduce the estimated runoff and pollutant loads presented under each of the alternatives discussed below. Additional information on model development, technical assumptions, and analysis is presented in Appendix F.

4.7.2.1 Surface Water Quality

4.7.2.1.1 Land Use Plan Update

Short- and long-term minor adverse effects to surface water quality, ground water quality, and water resources protection would be expected at the watershed scale; however, localized effects could be more pronounced. Construction of facilities and infrastructure as a result of changes in land use designations could result in increased runoff due to an overall increase in impervious surface area, increased erosion, and increased sediment and pollutant loads. A reduction in pervious area may reduce infiltration and groundwater levels which can cause increases in pollutant concentrations in surface runoff. Decreased infiltration can also lead to lower stream baseflow conditions during dry periods. RPAs and riparian buffers also extend into areas proposed for land use designation changes. Encroachment into these areas decreases the buffer between developed land and sensitive natural resources. In addition, proposed infrastructure projects include a new bridge crossing over Accotink Creek and the replacement of existing bridges over Accotink Creek and Dogue Creek. Bridge construction and repairs will require the issuance of a Corps of Engineers Section 404 permit and a VWP permit by VDEQ.

Table 4.7-6 presents the land use changes that could have an impact on water resources (i.e., land use change from undeveloped to developed). Section 4.7.2.1.2 provides a detailed analysis of the potential effects to surface water quality from short- and long-range development projects.

Table 4.7-6
Potential land use plan effects to water resources under the Preferred Alternative

Proposed change	Water resources present in area	Potential effects
Develop Administrative Center on EPG for NGA and WHS; convert land use designation from Training to Professional/ Institutional	RPAs and riparian areas extend into EPG east and the proposed Remote Delivery Facility on EPG west along tributaries of Accotink Creek and the creek along the eastern boundary of EPG.	Encroachment of development near RPAs and riparian areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads. Reduction in pervious surfaces would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present
Convert South Post golf course (Recreation land use) on South Post into Community land use for new hospital	Apart from storm water drainage features, RPAs, riparian areas and wetlands.	Encroachment of development near RPAs, riparian areas and wetlands. Increased area of impervious surfaces could increase runoff, erosion, and pollutant and sediment loads, and could reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present. Increased sediment could affect the new storm water system and filters for the new on-post development.
South Post eastern and southern areas–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	On the South Post plateau, apart from storm water drainage features, no notable water resources present	Increased area of impervious surfaces could increase runoff, erosion, and pollutant and sediment loads, and could reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.
North Post–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	RPAs, riparian areas, and flood zones along Mason Run and tributaries	Encroachment of development near RPAs and riparian areas; no development would occur within these areas. Increased area of impervious surfaces could increase runoff, erosion, and pollutant and sediment loads, and could reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.

4.7.2.1.2 BRAC Implementation and Facilities Projects

Storm water

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential effects through effective storm water planning, the development of adequate infrastructure, and the use of BMPs. Storm water requirements are addressed under the VPDES program, which includes the development of comprehensive SWPPPs that describe the BMPs to be used to minimize runoff and soil erosion from each construction site and Virginia's Erosion and Sediment Control Regulations. Fort Belvoir's storm water permits (general permits and MS4) regulate storm water discharges on the installation. The state reviews and oversees implementation of the required storm water practices.

Note that in the absence of state-required storm water management practices and erosion control measures being implemented on a watershed basis, short- and long-term effects would be much greater in severity.

Approximately 86 acres of high-intensity and 262 acres of medium-intensity development would be added to the installation by implementing the Preferred Alternative. High-intensity development includes areas where people work or reside in high numbers (e.g. apartment complexes and commercial/industrial areas). Medium-intensity includes a mixture of developed and nondeveloped land with impervious cover occupying 50-80 percent of the total land area. Impervious surfaces would substantially increase in Subwatersheds 1 (119 percent), 3 (32 percent), 25 (75 percent), 53 (910 percent), 54 (352 percent), 55 (325 percent), 57 (285 percent), 58 (194 percent), and 59 (134 percent). Increased impervious surface associated with development typically causes an increase in volume, velocity, and peak flow rates of runoff to nearby streams. Stream channels naturally attempt to accommodate the increased flows by increasing their cross-sectional area. This occurs through erosion of stream banks or down-cutting of the channel beds.

Virginia's Storm Water Management (SWM) Regulations specify evaluating storm water runoff using 2-year or 1-year storm event data in order to assess potential erosion problems and channel adequacy. These regulations also include the requirement for an adequate outfall analysis or use of 1-year, 24-hour extended detention to protect receiving waters. Increased volume might translate to flooding where the stream channel is not adequate to contain the flow. During the 10-year, 24-hour storm event, an increase in volume increases the potential for bank overtopping and flooding. Virginia's Erosion and Sediment Control Regulations (4VAC50-30-40.19) and SWM Regulations (4VAC3-20-81) require that, "downstream channels and properties be protected from erosion and damage due to increases in volume, velocity and peak flow rate." Because of this, site-specific BMPs or mitigation measures would be required for each construction site. A watershed-based approach would be implemented to evaluate upstream and downstream concerns and mitigate possible effects. As discussed above, BMPs and potential mitigation efforts were not included in the following analyses. The types of BMPs that will be implemented and other storm water control activities will depend on final site/parcel development plans.

The 1-year and the 10-year, 24-hour storm events were modeled using the Technical Release 55 (TR-55) model, developed by the NRCS (1986), to evaluate potential changes in peak flows as a result of the proposed action in each subwatershed. These storm events are identified in Virginia's Erosion and Sediment Control Regulations. These regulations require that properties and waterways be protected from damages from flooding due to increases in volume, velocity, and peak flow rates. The 10-year, post-development peak discharge flow rate is not to exceed the 10-year, pre-development peak rate (4VAC50-30-40.19). The threshold used to determine potential adverse effects for this analysis was a 10 percent increase in peak flow occurring from a 1-year, 24-hour and a 10-year, 24-hour storm event. Subwatersheds 1, 3, 25, 53, 54, 55, 57, 58, and 59 would all be expected to have greater than a 10 percent increase in peak flow during the 1-year storm event under the Preferred Alternative, with Subwatershed 1 experiencing the highest percent increase (100 percent). Table 4.7-7 lists the percent increase in peak flow from a 1-year, 24-hour storm event for each subwatershed and the proposed construction projects that would affect runoff. Each of these subwatersheds, except for Subwatershed 3 would also experience at least a 10 percent increase in peak discharge during a 10-year, 24-hour storm event, indicating there would be a moderate to high increase in flood levels (Table 4.7-7). Table F-1 in Appendix F lists the peak flow percent increase for each subwatershed if the Preferred Alternative projects were implemented.

Table 4.7-7
Subwatersheds with greater than 10 percent increase in 1-year or 10-year storm event peak discharge under the Preferred Alternative

Subwatershed number	Percent increase in 1-year storm event peak discharge	Percent increase in 10-year storm event peak discharge	Affecting projects
1	100%	63%	Hospital, Dental Clinic, AMC Relocatables, Infrastructure
3	12%	< 10%	Hospital, Dental Clinic, AMC Relocatables, Infrastructure
25	36%	16%	Hospital, Dental Clinic, NARMC HQ Building
53	77%	22%	NGA, Infrastructure
54	29%	10%	Infrastructure
55	56%	17%	Infrastructure
57	93%	33%	NGA, Infrastructure, Child Development Center (CDC) (NGA), Corps Integration Office
58	70%	31%	NGA, WHS, Infrastructure, Emergency Services Center (EPG) , Corps Integration Office
59	82%	34%	NGA, WHS, Infrastructure, Emergency Services Center (EPG)

Sediment

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential erosion and sedimentation effects through storm water planning, development of adequate infrastructure, and the use of BMPs. During the initial development phase, proper erosion and sediment controls would be used to manage construction activities that could result in an increase in the sedimentation in adjacent waterbodies. A VPDES permit would be required for construction projects disturbing at least 2,500 square feet. A soil erosion and sediment control plan and SWPPP would be required to provide guidance for reducing sedimentation effects during the construction process. In the long-term, an increase in storm water volume from impervious surfaces could result in an increase in erosion and sedimentation. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of increased sediment loads during wet-weather events.

Fort Belvoir was surveyed to characterize watershed conditions and identify erosion problem site locations in 1999, and monitoring of these sites has occurred since (Landgraf, 2003). Table 4.7-8 lists the Preferred Alternative projects that are within close proximity (150 feet) of the previously identified erosion and other problem sites in each watershed. Construction activities and impervious surfaces could increase sediment and storm water runoff into waterbodies, thereby exacerbating erosion and other stream effects at these sites. Ten Preferred Alternative projects have existing erosion sites and other stream effects within 150 feet of their footprint. These projects could affect one or more existing problem areas due to an increase in impervious surfaces and resulting storm water from each site. Other projects have few or no erosion/problem

Table 4.7-8
Projects located within proximity of erosion and other problem sites under the Preferred Alternative

Map number (see Table 2-3)	Project description	Watershed number	Nearby watersheds	Erosion and other problems noted within 150 feet
1	NGA	53, 59	Accotink Creek	1 blocked pipe, 3 corroded or corrupt pipe, 1 gully, 1 scour hole, 3 undercut structure low
2	WHS	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 10 down-cutting low, 3 down-cutting medium, 1 down-cutting severe, 2 scour hole, 1 sediment deposition, 1 undercut structure low, 2 undercut structure medium, 1 undercut structure severe
8	Infrastructure	53, 54, 55, 57, 58, 59	Accotink Creek, Field Lark Branch, trib. to Accotink Creek	3 bank erosion low, 11 bank erosion medium, 4 bank erosion severe, 5 blocked pipe, 7 corroded or corrupt pipe, 11 down-cutting low, 3 down-cutting medium, 2 down-cutting severe, 2 gully, 9 scour hole, 3 sediment deposition, 2 undercut structure medium, 1 undercut structure severe
8	Gunston Road Improvements (Infrastructure)	1, 3, 29, 30	Trib. to Accotink Creek, Mason Run	2 bank erosion severe, 4 blocked pipe, 1 corrected sites, 4 down-cutting low, 4 down-cutting medium, 2 down-cutting severe, 3 scour hole, 1 sediment deposition, 1 undercut structure low, 3 undercut structure medium, 2 undercut structure severe
9	Emergency Services Center (EPG)	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 2 down-cutting medium, 1 down-cutting severe, 1 scour hole, 1 sediment deposition, 1 undercut structure low, 1 undercut structure medium, 1 undercut structure severe
10	Network Ops Center	14	Trib. to Accotink Creek, Accotink Creek	1 blocked pipe, 2 down-cutting low, 1 down-cutting medium, 1 scour hole
12	Child Development Center (NGA)	53, 59	Accotink Creek, trib. to Accotink Creek	1 blocked pipe, 3 corroded or corrupt pipe, 1 gully, 1 undercut structure low
13	Child Development Center	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 2 down-cutting medium, 1 down-cutting severe, 1 scour hole, 1 sediment deposition, 1 undercut structure low, 1 undercut structure medium, 1 undercut structure severe
16	AMC Relocatables	1	Trib. to Accotink Creek, trib. to Dogue Creek	2 blocked pipe, 1 corroded or corrupt pipe, 1 down-cutting low, 1 down-cutting medium, 2 scour hole, 2 undercut structure low
17	PEO EIS Admin. Facility	22	Trib. to Dogue Creek, trib. to Accotink Creek	1 undercut structure low, 1 bank erosion medium, 1 down-cutting severe

sites in the vicinity and would have minimal or no effect on stream bank erosion and other characteristics.

Other Pollutants

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. During the initial development phase, construction activities could result in an increase in sediment loading, dissolved solids, petroleum hydrocarbons, and other pollutants in adjacent waterbodies. Measurable effects would be expected to be minimal because the installation would comply with federal, state, and installation regulations, and necessary permits for storm water control would be obtained. Site-specific SWPPPs describing the BMPs to be used to minimize effects from increased runoff during site construction would be prepared.

In the long-term, an increase in storm water volume from additional impervious surfaces could result in an increase in nutrients, metals, and other potential contaminants in waterbodies. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of pollutant loading during wet-weather events. Implementation of low impact development (LID) techniques would also be used, where possible, to manage the hydrology and quality of storm water runoff from impervious surfaces to reduce this adverse effect. Examples of LID techniques include decreasing the connectivity and amount of impervious cover, limiting land clearing, and capturing runoff.

Nutrients, such as total nitrogen and total phosphorus, are parameters of concern according to the Chesapeake Bay agreement. Total nitrogen loading from land to streams is influenced by the use of fertilizers, presence of animal waste, and faulty septic systems, as well as by natural sources. Urban, agricultural, and barren land uses are the primary contributors. Nitrogen contributes to low dissolved oxygen levels through bacterial activity and could be toxic to aquatic life. Total phosphorus loading from land to streams is influenced by the use of fertilizers and the presence of animal waste, as well as by natural sources. Urban and agricultural land uses are the primary contributors. Phosphorus is typically the limiting nutrient in freshwater systems and could accelerate waterbody eutrophication.

Potential increases in nutrient loads in Fort Belvoir subwatersheds as a result of the Preferred Alternative were calculated using land use-specific loading coefficients. Loading coefficients were developed based on the watershed modeling results for Accotink Creek using the GWLF model (Haith and Shoemaker, 1987; Haith, Mandel, and Wu, 1992; Dai et al., 2000). GWLF was used to compute the nutrient loads contributed by various land uses in each of the subwatersheds that drain Fort Belvoir. A detailed description of the GWLF model and its capabilities is presented in Appendix F.

Using the land use distributions and applying the associated loading ratios, the average annual percent change in total nitrogen (TN) and total phosphorus (TP) loading was calculated for each subwatershed. Subwatersheds with greater than a 10-percent change in nitrogen and phosphorus loads as a result of the proposed action are shown in Table 4.7-9. Proposed construction projects in each subwatershed that would affect nitrogen and phosphorus loading are also shown in this table. Table F-2 in Appendix F shows the percent change for each subwatershed.

Table 4.7-9
Subwatersheds with greater than 10-percent increase in TN and TP loads under the Preferred Alternative

Subwatershed number	Percent increase in TP	Percent increase in TN	Affecting projects
53	51%	68%	NGA, Infrastructure
54	8%	17%	Infrastructure
55	26%	39%	Infrastructure
57	19%	31%	NGA, Infrastructure, CDC (NGA)
58	22%	33%	NGA, WHS, Infrastructure, Emergency Services Center (EPG)

4.7.2.2 Groundwater Quality

4.7.2.2.1 Land Use Plan Update

Short- and long-term effects on groundwater quality are presented in Section 4.7.2.1.1

4.7.2.2.2 BRAC Implementation and Facilities Projects

Long-term indirect minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. Approximately 183 acres, or about two percent of the installation, would be converted to impervious surfaces under the Preferred Alternative. Much of this acreage is on an upland plateau, which follows the I-95 corridor and serves as a groundwater recharge area. The reduction in pervious surfaces would reduce the absorption of runoff into the ground, and therefore reduce flow to existing groundwater seeps, such as the rare coastal plain/piedmont acidic seepage swamp communities scattered around the installation (Fort Belvoir DPW ENRD, 2002). Seepage swamp communities could be affected by projects within close proximity, depending on ground water flow patterns. The Gunston Road Improvements site (part of Infrastructure, Project #8) is the only project located within 200 feet of a seepage swamp community. In addition, infiltration of increased storm water runoff into the groundwater in other areas could increase nitrogen loads and other contaminants such as soluble metals. Absorption loss and infiltration of pollutants could partially be alleviated by installing BMPs that facilitate infiltration to groundwater, such as bioretention facilities planted with native, wet-tolerant plants (Davis, 2004; Fort Belvoir July 2003). By increasing infiltration, plant uptake and soil processes will filter and decrease pollutant loads. Groundwater withdrawal for potable water supply would not be adversely affected by the proposed action because, although an aquifer containing potentially potable groundwater is present below Fort Belvoir, it is not used for drinking water supply. In addition, the proposed action would not include installation or removal of any septic tanks.

4.7.2.3 Water Resources Protection

4.7.2.3.1 Land Use Plan Update

Short- and long-term effects on water resources protection are presented in Section 4.7.2.1.1

4.7.2.3.2 BRAC Implementation and Facilities Projects

Chesapeake Bay

Short- and long-term minor adverse effects could be expected at the watershed scale; however, localized effects could be more pronounced. In the short-term, vegetation in the RPAs could be damaged or destroyed by construction activities in and near the RPAs. There is also potential for increased storm water flow and increased scouring in the RPAs along tributaries due to increased sedimentation from construction site runoff, and in the long-term, increased impervious surfaces. Pursuant to the Fairfax County Chesapeake Bay Preservation Ordinance amendments of 2003, storm water runoff must be controlled through the effective use of BMPs to avoid or minimize erosion and control sediment, nutrients, and other pesticides.

In the long-term, approximately 14 acres of RPAs would be affected by seven projects under the Preferred Alternative (Table 4.7-10). The impact acreages were based on project footprint data provided by BRAC personnel. Prior to construction, project locations will be adjusted based on consultation between Army and federal/state regulators to avoid, minimize, and mitigate potential impacts to wetlands and RPAs to the maximum extent practicable. The following projects encroach into designated RPA areas: WHS (Project #2), Emergency Services Center (EPG) (Project #9), CDC (EPG) (Project #13), Infrastructure (Project #8), and Gunston Road Improvements (Project #8). Roadways may be permitted to be constructed in RPAs, if SWPPPs are completed and all other permits obtained. Final siting of all other projects should avoid or minimize effects to RPAs. For those projects, a Water Quality Impact Assessment would be required for development in RPAs because they do not qualify for the roadway or utility right-of-way exclusion.

Table 4.7-10
Affected RPAs in the Preferred Alternative

Area (Acres)	Projects affecting RPAs
1.0	WHS, Emergency Svcs Center (EPG), Child Dev Center – 303 (EPG)
4.8	Infrastructure (Gunston Road Improvements)
7.9	Infrastructure
13.7	**Total**

Coastal Zone Management Act

Implementation of the Preferred Action would occur in a manner consistent with the CZMA and the Commonwealth of Virginia's CRMP. As discussed in Section 4.7.1.5.1, the CZMA requires identification of potential effects on storm water runoff, habitat protection, riparian buffers, RPAs, wetlands, fisheries, sustainable development, waterfront redevelopment and encroachment, septic systems, erosion and sediment control, and air pollution control. These resources, primarily storm water runoff, would be adversely affected by the proposed action. However, required mitigation for storm water management, wetland loss, and stream channel alteration as well as other efforts discussed in Section 4.7.2.4 (BMPs/Mitigation), would alleviate these concerns. Effects of the Preferred Alternative projects subject to federal consistency under the CZMA are described below.

Increases in storm water runoff would be expected due to an increase in imperviousness as described in Section 4.7.2.1.2. Temporary increases in sediment loads in construction-site runoff would be expected during construction of individual projects. A VPDES permit would be required for those projects disturbing at least 2,500 square feet, and a soil erosion and sediment control plan as well as a SWPPP would be required to provide guidance for implementing sediment-laden runoff minimization techniques during the construction process (VDEQ, 2004).

The proposed action would be expected to discharge wastewater into the Fort Belvoir sewer system, which is connected to the Fairfax County wastewater system and treated at the Noman M. Cole Jr. Pollution Control Plant (Fort Belvoir DPW ENRD, 2002). Discharge of wastewater to an existing treatment facility would be consistent with the CZMA. See Section 4.12 for information on Fort Belvoir utilities and existing deficiencies.

Wetlands could also be affected under the Preferred Alternative. Effects on wetlands are further discussed in Section 4.8 (Biological Resources). In addition, approximately 14 acres of Chesapeake Bay RPAs would be affected by several projects, as discussed under the previous section.

The CZMA requires that the following resources also be addressed: air quality, subaqueous lands, fisheries, primary sand dunes, and septic systems. As discussed in Section 4.4, effects to air quality are expected due to increases in transportation and other effects. In addition, no effects on subaqueous lands or fisheries resources would be expected as utility crossings would be expected to cross at bridges, and no primary sand dunes occur on Fort Belvoir. The proposed action would not include installation or removal of any septic tanks. The CZMA Consistency Determination is provided in Appendix C.

Floodplains

Long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. Under current National Flood Insurance Program and Fairfax County zoning limitations, no permanent dwellings are permitted to be constructed within the 100-year floodplain boundary, although roadways, athletic fields, and similar facilities are generally permitted (USACE, 2003). One project under the Preferred Alternative would affect floodplains. Approximately 2.9 acres of floodplain would fall within the footprint of the Infrastructure (Project #8) project sites. Although roadways are generally permitted in floodplains, roadways and infrastructure projects that might encroach into floodplain areas would be realigned or reconfigured where possible. No other conflicts with floodplains were identified; however, each of the individual Preferred Alternative construction projects would be evaluated for floodplain intrusion on a project-by-project basis to avoid or mitigate potential conflicts.

4.7.2.4 BMPs/Mitigation

BMPs and proposed mitigation measures are recommended as generally applicable practices that can help limit short- and long-term impacts on water resources that may be caused by site development and related activities.

4.7.2.4.1 Surface Water Quality

BMPs

- Plan and construct BMPs in accordance with all applicable storm water, erosion control, and pollutant removal requirements. Ensure detention requirements are met for the 2- and

10-year, 24-hour design storms, and outfall protection according to the 1-year, 24-hour extended detention method (re: Virginia's SWM regulations, Virginia Erosion and Sediment Control Handbook, Fairfax County PFM, and other applicable regulations).

- During and following construction activities, continue to use construction-phase, enhanced erosion and sediment control BMPs beyond specifications and requirements, including staged development, prompt stabilization of exposed soil, silt fences, sediment traps, storm drain inlet filters, and sediment basins where practicable, to minimize erosion and sedimentation until the site has stabilized. Conduct regular maintenance of the construction phase erosion and sediment control BMPs as described in the erosion and sediment control plan for each project. For erosion prone areas, such as steep slopes, and runoff that could adversely affect highly sensitive environmental habitats, employ integrated BMPs to capture sediments that could enter streams, wetlands, and RPAs.
- For each new development project protect downstream water quality by treating the majority of the site with BMPs that are at least 40% efficient at removing phosphorus. Projects that qualify as redevelopment are also required to remove phosphorus by following methodologies identified in the Fairfax County PFM.
- Wetland and stream impacts that could result from the proposed projects will be addressed by federal and state permit programs under CWA section 404/401.
- Implement post-construction BMPs that exceed state and local requirements for the management of storm water runoff. These BMPs could include the following:
    - LID management practices that seek to reduce impervious cover and control storm water runoff as close to the source as feasible, such as the following:
        - Reduce impervious cover during the design phase to narrow roads, shorten drives, and promote multiple uses of public facilities, so as to reduce the need for additional parking lots and structures
        - Disconnect imperviousness so that smaller impervious areas drain to pervious, generally vegetated, areas
        - Use permeable pavers for walkways and low-traffic areas
        - Capture runoff close to the source through the use of rain barrels, bioretention basins, pocket wetlands, grassed swales, flow spreaders and other BMPs that retain the storm water runoff from smaller, more frequent storms, thus reducing the size of regional storm water BMPs
    - Detention or retention storm water ponds
    - Man-made wetlands (runoff could not be diverted to natural wetlands for storm water management)
    - Restored riparian buffers for management of nonpoint (unconcentrated) runoff, following coordination with local regulators when within RPA
    - Site-specific controls, such as linear sand filters or biofilters for water quality management of hot spot areas such as parking lots
- Develop various scenarios that integrate storm water BMPs, including LID, and evaluate their relative effectiveness in managing storm water runoff quantity and quality control.
- Incorporate stream restoration practices into designs of BRAC projects on Main Post

- Participate in Fairfax County's Watershed Planning Process and in TMDL studies with VDEQ to identify potential sources of pollutants of concern and reduce pollutant loads as necessary to meet water quality standards. Watershed management plans will be developed for watersheds that drain Fort Belvoir in the future by Fairfax County in cooperation with local stakeholders. Also, Fort Belvoir's 2007 MS4 permit reissuance should continue to require technical review of construction projects for the evaluation of plans and design documents in accordance with Virginia's SWM regulations, the Virginia Erosion and Sediment Control Handbook, Fairfax County's PFM, and other applicable regulations.

Mitigation

Subwatersheds that would be expected to have increases in storm water runoff were identified in Section 4.7.2.1.2. The following measure could be used to mitigate potential problems.

- Develop a storm water drainage system master plan study. This study would identify current deficiencies (e.g. capacity problems, outfall problems, stream bank erosion) and determine infrastructure needs to meet BRAC requirements and long-term growth to 2030.

4.7.2.4.2 Groundwater Quality

The potential for groundwater contamination and decreased recharge would be minimized by developing BMPs and LID practices designed to reduce pollutants and increase infiltration. Plant and soil processes can help reduce pollutant concentrations in groundwater. Bioretention facilities and other storm water treatment practices would be constructed where practicable to increase groundwater recharge and provide other water quality benefits. Since mitigation and BMPs for surface water would benefit groundwater, refer to Section 4.7.2.4.1 for specific measures.

4.7.2.4.3 Water Resources Protection

Final siting of Preferred Alternative projects would be outside of designated RPAs, wetlands, and floodplains to the maximum extent practicable. BMP and LID practices would include water quality control in their design, where possible. Long-term water resource and storm water protection strategies would incorporate structural, nonstructural, and policy strategies designed to mitigate storm water effects and encroachment into environmentally sensitive areas. Since mitigation and BMPs for surface water would benefit water resources protection, refer to Section 4.7.2.4.1 for specific measures.

4.7.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

4.7.3.1 Surface Water Quality

4.7.3.1.1 Land Use Plan Update

Short- and long-term minor adverse effects to surface water quality, ground water quality, and water resources protection would be expected at the watershed scale; however, localized effects could be more pronounced. Construction of facilities and infrastructure as a result of changes in land use designations could result in increased runoff due to an overall increase in impervious surface area, increased erosion, and increased sediment and pollutant loads. A reduction in pervious area may reduce infiltration and groundwater levels which can cause increases in pollutant concentrations in surface runoff. Decreased infiltration can also lead to lower stream baseflow conditions during dry periods. RPAs and riparian buffers also extend into areas proposed for land use designation changes. Encroachment into these areas decreases the buffer between developed land and sensitive natural resources.

Table 4.7-11 presents the land use changes that could have an impact on water resources (i.e., land use change from undeveloped to developed). Section 4.7.3.1.2 provides a detailed analysis of the potential effects to surface water quality from short- and long-range development projects.

Table 4.7-11
Potential land use plan effects to water resources under the Town Center Alternative

Proposed change	Water resources present in area	Potential effects
North Post–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	RPAs, riparian areas, and flood zones along Mason Run and tributaries	Encroachment of development near RPAs and riparian areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads. Reduction in pervious surfaces would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present
Convert South Post golf course (Recreation land use) on South Post into Professional/Institutional	Apart from storm water drainage features, no notable water resources present	Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.
South Post eastern and southern areas–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	On the South Post plateau, apart from storm water drainage features, no notable water resources present	Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.

4.7.3.1.2 BRAC Implementation and Facilities Projects

Storm water

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential effects through effective storm water planning, developing adequate infrastructure, and using BMPs. Storm water requirements are addressed under the VPDES program, which includes the development of comprehensive SWPPPs that describe the BMPs to be used to minimize runoff and soil erosion from each construction site and Virginia's Erosion and Sediment Control Regulations. Fort Belvoir's storm water permits (general permits and MS4) regulate storm water discharges on the installation. The state reviews and oversees implementation of the required storm water practices. Note that, in the absence of state-required storm water management practices and erosion control measures being implemented on a watershed basis, short- and long-term effects would be much greater in severity.

Approximately 55 acres of high-intensity and 261 acres of medium-intensity development would be added to the installation by implementing the Town Center Alternative projects. High-intensity development includes areas where people work or reside in high numbers (e.g. apartment complexes and commercial/industrial areas). Medium-intensity includes a mixture of developed and nondeveloped land with impervious cover occupying 50-80 percent of the total land area. Impervious surfaces would increase substantially in Subwatersheds 1 (173 percent), 3 (36 percent), 25 (82 percent), 29 (31 percent), 30 (53 percent), and 32 (75 percent). Increased

impervious surface associated with development typically causes an increase in volume, velocity, and peak flow rates of runoff to nearby streams. Stream channels naturally attempt to accommodate the increased flows by increasing their cross-sectional area. This occurs through erosion of stream banks or down-cutting of the channel beds.

Virginia's Storm Water Management (SWM) Regulations specify evaluating storm water runoff using 2-year or 1-year storm event data in order to assess potential erosion problems and channel adequacy. These regulations also include the requirement for an adequate outfall analysis or use of 1-year, 24-hour extended detention to protect receiving waters. Increased volume might translate to flooding where the stream channel is not adequate to contain the flow. During the 10-year, 24-hour storm event, an increase in volume increases the potential for bank overtopping and flooding. Virginia's Erosion and Sediment Control Regulations (4VAC50-30-40.19) and SWM Regulations (4VAC3-20-81) require that, "downstream channels and properties be protected from erosion and damage due to increases in volume, velocity and peak flow rate." Because of this, site-specific BMPs or mitigation measures would be required for each construction site. A watershed-based approach would be implemented to evaluate upstream and downstream concerns and mitigate possible effects. As discussed above, BMPs and potential mitigation efforts were not included in the following analyses. The types of BMPs that will be implemented and other storm water control activities will depend on final site/parcel development plans.

The 1-year and the 10-year, 24-hour storm events were modeled using the Technical Release 55 (TR-55) model, developed by the NRCS (1986), to evaluate potential changes in peak flows as a result of the Town Center Alternative in each subwatershed. These storm events are identified in Virginia's Erosion and Sediment Control Regulations. These regulations require that properties and waterways be protected from damages from flooding due to increases in volume, velocity and peak flow rates. The 10-year, post-development peak discharge flow rate is not to exceed the 10-year, pre-development peak rate (4VAC50-30-40.19). The threshold used to determine potential adverse effects for this analysis was a 10 percent increase in peak flow occurring from a 1-year, 24-hour and a 10-year, 24-hour storm event. Subwatersheds 1, 3, 25, 29, 30, and 32 would all be expected to have greater than a 10 percent increase in peak flow during the 1-year storm event under the Town Center Alternative, with Subwatershed 1 experiencing the highest percent increase (131 percent). Table 4.7-12 lists the percent increase in peak flow from a 1-year, 24-hour storm event for each subwatershed and the proposed construction projects that would affect runoff. All these subwatersheds, except for Subwatershed 32 would also experience at least a 10 percent increase in peak discharge during a 10-year, 24-hour storm event, indicating there would be a moderate to high increase in flood levels (Table 4.7-12). Table F-1 in Appendix F lists the peak flow percent increase for each subwatershed if the Town Center Alternative projects were implemented.

Sediment

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential erosion and sedimentation effects through storm water planning, development of adequate infrastructure, and the use of BMPs. During the initial development phase, proper erosion and sediment controls would be used to manage construction activities that could result in an increase in the sedimentation in adjacent waterbodies. A VPDES permit would be required for construction projects disturbing at least 2,500 square feet. A soil erosion and sediment control plan as well as a SWPPP would be required to provide guidance for reducing sedimentation effects during the construction process. In the long-term, an increase in storm water volume from impervious surfaces could result in an

Table 4.7-12
Subwatersheds with greater than 10 Percent increase in 1-year or 10-year storm event peak discharge under the Town Center Alternative

Subwatershed number	Percent increase in 1-year storm event peak discharge	Percent increase in 10-year storm event peak discharge	Affecting projects
1	131%	75%	NGA, WHS, CDCs, AMC Relocatables, Infrastructure
3	22%	10%	NGA, WHS, CDCs, AMC Relocatables, Infrastructure
25	36%	16%	NGA, WHS
29	25%	13%	NGA, WHS, MDA, Hospital, Dental Clinic, NARMC HQ Bldg, Infrastructure, Network Ops–PEO EIS, PEO EIS Administrative Facility,
30	24%	10%	MDA, Hospital, Dental Clinic, NARMC HQ Bldg, Infrastructure, Network Ops–PEO EIS, Access Control Point, PEO EIS Administrative Facility, Modernize Barracks, Corps Integration Office

increase in erosion and sedimentation. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of increased sediment loads during wet-weather events.

Fort Belvoir was surveyed to characterize watershed conditions and identify erosion problem site locations in 1999, and monitoring of these sites has occurred since (Landgraf, 2003). Table 4.7-13 lists the Town Center Alternative projects that are within close proximity (150 feet) of the previously identified erosion and other problem sites in each watershed. Construction activities and impervious surfaces could increase sediment and storm water runoff into waterbodies, thereby exacerbating erosion and other stream effects at these sites. Eleven projects have existing erosion sites and other stream effects within 150 feet of their footprint. These projects could affect one or more existing problem areas due to an increase in impervious surfaces and resulting storm water from each site. Other projects have few or no erosion/problem sites in the vicinity and would have minimal or no effect on stream bank erosion and other characteristics.

Other Pollutants

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. During the initial development phase, construction activities could result in an increase in sediment loading, dissolved solids, petroleum hydrocarbons, and other pollutants in adjacent waterbodies. Measurable effects would be expected to be minimal because the installation would comply with federal, state, and installation regulations and necessary permits for storm water control would be obtained. Site-specific SWPPPs describing the BMPs to be used to minimize effects from increased runoff during site construction would be prepared.

In the long-term, an increase in storm water volume from additional impervious surfaces could result in an increase in nutrients, metals, and other potential contaminants in waterbodies. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of pollutant loading during wet-weather events. Implementing LID techniques would also be used, where possible, to manage the hydrology and quality of storm water runoff from impervious surfaces to reduce this adverse effect.

Table 4.7-13
Projects located within proximity of erosion and other problem sites under the Town Center Alternative

Project number (see Table 2-3)	Project description	Watershed number	Nearby watersheds	Erosion impacted sites within 150 feet
1	NGA	1	Trib. to Accotink Creek	2 blocked pipe, 1 corroded or corrupt pipe, 2 down-cutting low, 1 down-cutting medium, 2 gully, 3 scour hole, 2 undercut structure low
3	MDA Facility	29	Trib. to Accotink Creek	1 bank erosion medium, 1 blocked pipe, 1 down cutting low, 1 down-cutting medium, 1 down-cutting severe, 1 gully, 1 undercut structure low
4	Hospital	29, 30	Trib. to Accotink Creek, Mason Run	3 bank erosion low, 3 bank erosion medium, 4 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 6 down-cutting medium, 1 down-cutting severe, 1 gully, 1 sediment deposition, 3 undercut structure low
5	Dental Clinic	29, 30	Trib. to Accotink Creek, Mason Run	3 bank erosion low, 3 bank erosion medium, 4 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 6 down-cutting medium, 1 down-cutting severe, 1 gully, 1 sediment deposition, 2 undercut structure low
8	Infrastructure	29, 30	Trib. to Accotink Creek, Mason Run	3 bank erosion low, 3 bank erosion medium, 4 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 6 down-cutting medium, 1 down-cutting severe, 1 gully, 1 sediment deposition, 2 undercut structure low
8	Gunston Road Improvement (Infrastructure)	1, 3, 29, 30	Trib. to Accotink Creek, Mason Run	2 bank erosion severe, 4 blocked pipe, 1 corrected sites, 4 down-cutting low, 4 down-cutting medium, 2 down-cutting severe, 3 scour hole, 1 sediment deposition, 1 undercut structure low, 3 undercut structure medium, 2 undercut structure severe
10	Network Ops Center	29, 30	Trib. to Accotink Creek, Mason Run	3 bank erosion low, 3 bank erosion medium, 4 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 6 down-cutting medium, 1 down-cutting severe, 1 gully, 1 sediment deposition, 2 undercut structure low
12	Child Development Center (NGA)	1	Trib. to Accotink Creek	3 blocked pipe, 1 corroded or corrupt pipe, 3 down-cutting low, 1 down-cutting medium, 2 gully, 4 scour hole, 3 undercut structure low
13	Child Development Center	1	Trib. to Accotink Creek	2 blocked pipe, 1 corroded or corrupt pipe, 2 down-cutting low, 1 down-cutting medium, 2 gully, 3 scour hole, 2 undercut structure low
16	AMC Relocatables	1	Trib. to Accotink Creek	2 blocked pipe, 1 corroded or corrupt pipe, 2 down-cutting low, 1 down-cutting medium, 2 gully, 3 scour hole, 2 undercut structure low
17	PEO EIS Admin. Facility	29, 30	Trib. to Accotink Creek, Mason Run	3 bank erosion low, 3 bank erosion medium, 4 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 6 down-cutting medium, 1 down-cutting severe, 1 gully, 1 sediment deposition, 2 undercut structure low

Nutrients, such as TN and TP, are parameters of concern according to the Chesapeake Bay agreement. TN loading from land to streams is influenced by using fertilizers, presence of animal waste, and faulty septic systems, as well as by natural sources. Urban, agricultural, and barren land uses are the primary contributors. Nitrogen contributes to low DO levels through bacterial activity and could be toxic to aquatic life. TP loading from land to streams is influenced by using

fertilizers and the presence of animal waste, as well as by natural sources. Urban and agricultural land uses are the primary contributors. Phosphorus is typically the limiting nutrient in freshwater systems and could accelerate waterbody eutrophication.

Potential increases in nutrient loads in Fort Belvoir subwatersheds as a result of the Town Center Alternative were calculated using land use-specific loading coefficients. Loading coefficients were developed based on the watershed modeling results for Accotink Creek using the GWLF model (Haith and Shoemaker, 1987; Haith, Mandel, and Wu, 1992; Dai et al., 2000). GWLF was used to compute the nutrient loads contributed by various land uses in each of the subwatersheds that drain Fort Belvoir. A detailed description of the GWLF model and its capabilities is presented in Appendix F.

Using the land use distributions and applying the associated loading ratios, the average annual percent change in TN and TP loading was calculated for each subwatershed. Subwatersheds with greater than a 10-percent change in nitrogen and phosphorus loads as a result of the Town Center Alternative are shown in Table 4.7-14. Proposed construction projects in each subwatershed that would affect nitrogen and phosphorus loading are also shown in this table. Table F-2 in Appendix F shows the percent change for each subwatershed.

Table 4.7-14
Subwatersheds with greater than 10-percent increase in TN and TP loads under the Town Center Alternative

Subwatershed number	Percent increase in TP	Percent increase in TN	Affecting projects
1	9%	15%	NGA, WHS, CDCs, AMC Relocatables, Infrastructure

4.7.3.2 Groundwater Quality

4.7.3.2.1 Land Use Plan Update

Short- and long-term effects on groundwater quality are presented in Section 4.7.3.1.1

4.7.3.2.2 BRAC Implementation and Facilities Projects

Long-term indirect minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. Approximately 142 acres would be converted to impervious surfaces under the Town Center Alternative. Much of this acreage is on an upland plateau, which follows the I-95 corridor and serves as a groundwater recharge area. The reduction in pervious surfaces would reduce the absorption of runoff into the ground, and therefore reduce flow to existing groundwater seeps, such as the rare coastal plain/piedmont acidic seepage swamp communities scattered around the installation (Fort Belvoir DPW ENRD, 2002). Seepage swamp communities might be affected by projects within close proximity, depending on groundwater flow patterns. The Gunston Road Improvements site (part of Infrastructure, Project #8) is the only project located within 200 feet of a seepage swamp community. In addition, infiltration of increased storm water runoff into the groundwater in other areas could increase nitrogen loads and other contaminants such as soluble metals. Absorption loss and infiltration of pollutants could partially be alleviated through installing BMPs that facilitate infiltration to groundwater, such as bioretention facilities planted with native, wet-tolerant plants (Davis, 2004; Fort Belvoir

2003). Groundwater withdrawal for potable water supply would not be adversely affected by the Town Center Alternative because, although an aquifer containing potentially potable groundwater is present below Fort Belvoir, it is not used for drinking water supply. In addition, the Town Center Alternative would not include installation or removal of any septic tanks.

4.7.3.3 Water Resources Protection

4.7.3.3.1 Land Use Plan Update

Short- and long-term effects on water resources protection are presented in Section 4.7.3.1.1.

4.7.3.3.2 BRAC Implementation and Facilities Projects

Short and long-term effects on water resources regulated under Chesapeake Bay, CZMA, and floodplain protection programs would be similar to those described in Section 4.7.2.3.2. Long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. New construction would be expected to increase impervious surfaces in several subwatersheds. Approximately 7 acres of Chesapeake Bay RPAs would be encroached upon by the following projects under the Town Center Alternative (Table 4.7-15): NGA (Project #1), WHS (Project #2), Hospital (Project #4), Dental Clinic (Project #5), NARMC HQ(Project # 6), MDA (Project #3), Gunston Road Improvements (Project #8), Network Ops-PEO EIS (Project #10) Infrastructure(Project #8), and PEO EIS Admin Facility (Project # 17). Wetlands could also be affected under the Town Center Alternative. Effects on wetlands are further discussed in Section 4.8 (Biological Resources). None of the projects under the Town Center Alternative would affect floodplains.

Table 4.7-15
Affected RPAs in the Town Center Alternative

Area (Acres)	Projects affecting RPAs
4.6	Hospital, Network Ops-PEO EIS, PEO EIS Admin Facility, NARMC HQ Bldg, Infrastructure
2.7	Infrastructure (Gunston Rd. Improvements)
0.1	NGA, WHS
7.4	**Total**

4.7.3.4 BMPs/Mitigation

BMPs and proposed mitigation measures would be similar to those discussed under the Preferred Alternative (Section 4.7.2.4).

4.7.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.7.4.1 Surface Water Quality

4.7.4.1.1 Land Use Plan Update

Short- and long-term minor adverse effects to surface water quality, ground water quality, and water resources protection would be expected at the watershed scale; however, localized effects

could be more pronounced. Construction of facilities and infrastructure as a result of changes in land use designations could result in increased runoff due to an overall increase in impervious surface area, increased erosion, and increased sediment and pollutant loads. A reduction in pervious area may reduce infiltration and groundwater levels which can cause increases in pollutant concentrations in surface runoff. Decreased infiltration can also lead to lower stream baseflow conditions during dry periods. RPAs and riparian buffers also extend into areas proposed for land use designation changes. Encroachment into these areas decreases the buffer between developed land and sensitive natural resources. In addition, proposed infrastructure projects include a new bridge crossing over Accotink Creek and the replacement of existing bridges over Accotink Creek and Dogue Creek. Bridge construction and repairs will require the issuance of a Corps of Engineers Section 404 permit and a VWP permit by VDEQ.

Table 4.7-16 presents the land use changes that could have an impact on water resources (i.e., land use change from undeveloped to developed). Section 4.7.4.1.2 provides a detailed analysis of the potential effects to surface water quality from short- and long-range development projects.

Table 4.7-16
Potential land use plan effects to water resources under the City Center Alternative

Proposed change	Water resources present in area	Potential effects
Develop Administrative Center on EPG for NGA as well as hospital complex; convert land use designation from Training to Professional/Institutional and Community	RPAs and riparian areas extend into EPG east and the proposed Remote Delivery Facility on EPG west along tributaries of Accotink Creek and the creek along the eastern boundary of EPG	Encroachment of development near RPAs and riparian areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads. Reduction in pervious surfaces would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present
South Post–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	On the South Post plateau, apart from storm water drainage features, no notable water resources present	Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.
North Post–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	RPAs, riparian areas, and flood zones along Mason Run and tributaries	Encroachment of development near RPAs and riparian areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.
GSA Parcel becomes Professional/Institutional	Apart from storm water drainage features, no notable water resources present	Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.

4.7.4.1.2 BRAC Implementation and Facilities Projects

Storm water

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential effects through effective storm water planning, developing adequate infrastructure, and using BMPs. Storm water requirements are addressed under the NPDES program, which includes developing comprehensive SWPPPs that describe the BMPs to be used to minimize runoff and soil erosion from each construction site and Virginia's Erosion and Sediment Control Regulations. Fort Belvoir's storm water permits (general permits and MS4) regulate storm water discharges on the installation. The state reviews and oversees implementation of the required storm water practices. Note that in the absence of state-required storm water management practices and erosion control measures being implemented on a watershed basis, short- and long-term effects would be much greater in severity.

Approximately 86 acres of high-intensity and 173 acres of medium-intensity development would be added to the installation by implementing the City Center Alternative projects. High-intensity development includes areas where people work or reside in high numbers (e.g. apartment complexes and commercial/industrial areas). Medium-intensity includes a mixture of developed and nondeveloped land with impervious cover occupying 50-80 percent of the total land area. Impervious surfaces would increase substantially in Subwatersheds 1 (9 percent), 53 (938 percent), 54 (321 percent), 55 (328 percent), 57 (288 percent), 58 (183 percent), and 59 (135 percent). Increased impervious surface associated with development typically causes an increase in volume, velocity, and peak flow rates of runoff to nearby streams. Stream channels naturally attempt to accommodate the increased flows by increasing their cross-sectional area. This occurs through erosion of stream banks or down-cutting of the channel beds.

Virginia's Storm Water Management (SWM) Regulations specify evaluating storm water runoff using 2-year or 1-year storm event data in order to assess potential erosion problems and channel adequacy. These regulations also include the requirement for an adequate outfall analysis or use of 1-year, 24-hour extended detention to protect receiving waters. Increased volume might translate to flooding where the stream channel is not adequate to contain the flow. During the 10-year, 24-hour storm event, an increase in volume increases the potential for bank overtopping and flooding. Virginia's Erosion and Sediment Control Regulations (4VAC50-30-40.19) and SWM Regulations (4VAC3-20-81) require that, "downstream channels and properties be protected from erosion and damage due to increases in volume, velocity and peak flow rate." Because of this, site-specific BMPs or mitigation measures would be required for each construction site. A watershed-based approach would be implemented to evaluate upstream and downstream concerns and mitigate possible effects. As discussed above, BMPs and potential mitigation efforts were not included in the following analyses. The types of BMPs that will be implemented and other storm water control activities will depend on final site/parcel development plans.

The 1-year and the 10-year, 24-hour storm events were modeled using the Technical Release 55 (TR-55) model, developed by the NRCS (1986), to evaluate potential changes in peak flows as a result of the City Center Alternative in each subwatershed. These storm events are identified in Virginia's Erosion and Sediment Control Regulations. These regulations require that properties and waterways be protected from damages from flooding due to increases in volume, velocity and

peak flow rates. The 10-year, post-development peak discharge flow rate is not to exceed the 10-year, pre-development peak rate (4VAC50-30-40.19). The threshold used to determine potential adverse effects for this analysis was a 10-percent increase in peak flow occurring from a 1-year, 24-hour and a 10-year, 24-hour storm event. Subwatersheds 1, 53, 54, 55, 57, 58, and 59 would all be expected to have greater than a 10-percent increase in peak flow during the 1-year storm event under the City Center Alternative, with Subwatershed 57 experiencing the highest percent increase (93 percent). Table 4.7-17 lists the percent increase in peak flow from a 1-year, 24-hour storm event for each subwatershed and the proposed construction projects that would affect runoff. All these subwatersheds, except for Subwatersheds 1 and 54 would also experience at least a 10-percent increase in peak discharge during a 10-year, 24-hour storm event, indicating there would be a moderate to high increase in flood levels (Table 4.7-17). Table F-1 in Appendix F lists the peak flow percent increase for each subwatershed if the City Center Alternative projects were implemented.

Table 4.7-17
Subwatersheds with greater than 10 percent increase in 1-year or 10-year storm event peak discharge under the City Center Alternative

Subwatershed number	Percent increase in 1-year storm event peak discharge	Percent increase in 10-year storm event peak discharge	Affecting projects
1	10%	<10%	AMC Relocatables, Infrastructure
53	77%	22%	NGA, Infrastructure
54	14%	<10%	Infrastructure
55	53%	17%	Infrastructure
57	93%	32%	NGA, CDC (NGA), MDA, Infrastructure, Corps Integration Office
58	70%	31%	NGA, Hospital, Dental Clinic, NARMC HQ Bldg, Infrastructure, Emergency Services Center (EPG), WHS, PEO EIS Administrative Facility, Corps Integration Office
59	82%	34%	NGA, Hospital, Infrastructure, PEO EIS Administrative Facility, NARMC HQ Bldg, WHS, CDC (EPG)

Sediment

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential erosion and sedimentation effects through storm water planning, development of adequate infrastructure, and the use of BMPs. During the initial development phase, proper erosion and sediment controls would be used to manage construction activities that could result in an increase in the sedimentation in adjacent waterbodies. A VPDES permit would be required for construction projects disturbing at least 2,500 square feet. A soil erosion and sediment control plan as well as a SWPPP would be required to provide guidance for reducing sedimentation effects during the construction process. In the long-term, an increase in storm water volume from impervious surfaces could result in an increase in erosion and sedimentation. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of increased sediment loads during wet-weather events.

Fort Belvoir was surveyed to characterize watershed conditions and identify erosion problem site locations in 1999, and monitoring of these sites has occurred since (Landgraf, 2003). Table 4.7-18 lists the City Center Alternative projects that are within close proximity (150 feet) of the previously identified erosion and other problem sites in each watershed. Construction activities and impervious surfaces could increase sediment and storm water runoff into waterbodies, thereby exacerbating erosion and other stream effects at these sites. Ten City Center projects have existing erosion sites and other stream effects within 150 feet of their footprint. These projects could affect one or more existing problem areas due an increase in impervious surfaces and resulting storm water from each site. Other projects have few or no erosion/problem sites in the vicinity and would have minimal or no effect on stream bank erosion and other characteristics.

Other Pollutants

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. During the initial development phase, construction activities could result in an increase in sediment loading, dissolved solids, petroleum hydrocarbons, and other pollutants in adjacent waterbodies. Measurable effects would be expected to be minimal because the installation would comply with federal, state, and installation regulations and necessary permits for storm water control would be obtained. Site-specific SWPPPs describing the BMPs to be used to minimize effects from increased runoff during site construction would be prepared.

In the long-term, an increase in storm water volume from additional impervious surfaces could result in an increase in nutrients, metals, and other potential contaminants in waterbodies. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of pollutant loading during wet-weather events. Implementing LID techniques would also be used, where possible, to manage the hydrology and quality of storm water runoff from impervious surfaces to reduce this adverse effect.

Nutrients, such as TN and TP, are parameters of concern according to the Chesapeake Bay agreement. TN loading from land to streams is influenced by using fertilizers, presence of animal waste, and faulty septic systems, as well as by natural sources. Urban, agricultural, and barren land uses are the primary contributors. Nitrogen contributes to low DO levels through bacterial activity and could be toxic to aquatic life. TP loading from land to streams is influenced by using fertilizers and the presence of animal waste, as well as by natural sources. Urban and agricultural land uses are the primary contributors. Phosphorus is typically the limiting nutrient in freshwater systems and could accelerate waterbody eutrophication.

Potential increases in nutrient loads in Fort Belvoir subwatersheds as a result of the City Center Alternative were calculated using land use-specific loading coefficients. Loading coefficients were developed based on the watershed modeling results for Accotink Creek using the GWLF model (Haith and Shoemaker, 1987; Haith, Mandel, and Wu, 1992; Dai et al., 2000). GWLF was used to compute the nutrient loads contributed by various land uses in each of the subwatersheds that drain Fort Belvoir. A detailed description of the GWLF model and its capabilities is presented in Appendix F.

Table 4.7-18
Projects located within proximity of erosion and other problem sites under the City Center Alternative

Project number (see Table 2-3)	Project description	Watershed number(s)	Nearby watersheds	Erosion impacted sites within 150 feet
1	NGA	53, 59	Accotink Cr., trib. to Accotink Cr.	1 blocked pipe, 4 corroded or corrupt pipe, 1 gully, 1 scour hole, 2 undercut structure low
4	Hospital	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 8 down-cutting low, 3 down-cutting medium, 1 down-cutting severe, 1 scour hole, 1 sediment deposition, 1 undercut structure low, 2 undercut structure medium, 1 undercut structure severe
5	Dental Clinic	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 2 down-cutting medium, 1 down-cutting severe, 1 scour hole, 1 sediment deposition, 1 undercut structure low, 1 undercut structure medium, 1 undercut structure severe
6	NARMC Headquarters Building	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 2 down-cutting medium, 1 down-cutting severe, 1 scour hole, 1 sediment deposition, 1 undercut structure low, 1 undercut structure medium, 1 undercut structure severe
8	Infrastructure	53, 54, 55, 57, 58, 59	Accotink Creek, Field Lark Branch, trib. to Accotink Creek	3 bank erosion low, 11 bank erosion medium, 4 bank erosion severe, 5 blocked pipe, 7 corroded or corrupt pipe, 11 down-cutting low, 3 down-cutting medium, 2 down-cutting severe, 2 gully, 9 scour hole, 3 sediment deposition, 2 undercut structure medium, 1 undercut structure severe
8	Gunston Road Improvements (Infrastructure)	1, 3, 29, 30	Trib. to Accotink Creek, Mason Run	2 bank erosion severe, 4 blocked pipe, 1 corrected sites, 4 down-cutting low, 4 down-cutting medium, 2 down-cutting severe, 3 scour hole, 1 sediment deposition, 1 undercut structure low, 3 undercut structure medium, 2 undercut structure severe
9	Emergency Service Center (EPG)	58, 59	Field Lark Branch, trib. to Accotink Creek	1 bank erosion medium, 2 blocked pipe, 2 corroded or corrupt pipe, 6 down-cutting low, 2 down-cutting medium, 1 down-cutting severe, 1 scour hole, 1 sediment deposition, 1 undercut structure low, 1 undercut structure medium, 1 undercut structure severe
10	Network Ops Center	53, 59	Accotink Cr., trib. to Accotink Cr.	1 blocked pipe, 3 corroded or corrupt pipe, 1 gully, 1 scour hole, 2 undercut structure low
12	Child Development Center (NGA)	53, 59	Accotink Cr., trib. to Accotink Cr.	1 blocked pipe, 3 corroded or corrupt pipe, 1 gully, 1 scour hole, 2 undercut structure low
17	PEO EIS Admin Facility	53, 59	Accotink Cr., trib. to Accotink Cr.	1 blocked pipe, 3 corroded or corrupt pipe, 1 gully, 1 scour hole, 2 undercut structure low

Using the land use distributions and applying the associated loading ratios, the average annual percent change in TN and TP loading was calculated for each subwatershed. Subwatersheds with greater than a 10-percent change in nitrogen and phosphorus loads as a result of the City Center Alternative are shown in Table 4.7-19. Proposed construction projects in each subwatershed that would affect nitrogen and phosphorus loading are also shown in this table. Table F-2 in Appendix F shows the percent change for each subwatershed.

Table 4.7-19
Subwatersheds with greater than 10-percent increase in TN and TP loads under the City Center Alternative

Subwatershed number	Percent increase in TP	Percent increase in TN	Affecting projects
53	61%	83%	NGA, Infrastructure
54	7%	14%	Infrastructure
55	26%	39%	Infrastructure
57	11%	19%	NGA, MDA, Infrastructure, CDC (NGA), Corps Integration Office
58	13%	19%	NGA, Hospital, Dental Clinic, NARMC HQ Bldg, Infrastructure, Emergency Services Center (EPG), WHS, PEO EIS Administrative Facility, Corps Integration Office

4.7.4.2 Groundwater Quality

4.7.4.2.1 Land Use Plan Update

Short- and long-term effects on groundwater quality are presented in Section 4.7.4.1.1.

4.7.4.2.2 BRAC Implementation and Facilities Projects

Long-term indirect minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. Approximately 131 acres would be converted to impervious surfaces under the City Center Alternative. Much of this acreage is on an upland plateau, which follows the I-95 corridor and serves as a groundwater recharge area. The reduction in pervious surfaces would reduce the absorption of runoff into the ground, and therefore reduce flow to existing groundwater seeps, such as the rare coastal plain/piedmont acidic seepage swamp communities scattered around the installation (Fort Belvoir DPW ENRD, 2002). Seepage swamp communities could be affected by projects within close proximity, depending on groundwater flow patterns. The Gunston Road Improvements site (part of Infrastructure, Project #8) is the only project located within 200 feet of a seepage swamp community. In addition, infiltration of increased storm water runoff into the groundwater in other areas could increase nitrogen loads and other contaminants such as soluble metals. Absorption loss and infiltration of pollutants could partially be alleviated through installing BMPs that facilitate infiltration to groundwater, such as bioretention facilities planted with native, wet-tolerant plants (Davis, 2004; Fort Belvoir 2003). Groundwater withdrawal for potable water supply would not be adversely affected by the City Center Alternative because, although an aquifer containing potentially potable groundwater is present below Fort Belvoir, it is not used for drinking water supply. In addition, the City Center Alternative would not include installation or removal of any septic tanks.

4.7.4.3 Water Resources Protection

4.7.4.3.1 Land Use Plan Update

Short- and long-term effects on water resources protection are presented in Section 4.7.4.1.1.

4.7.4.3.2 BRAC Implementation and Facilities Projects

Short and long-term effects on water resources regulated under Chesapeake Bay, CZMA, and floodplain protection programs would be similar to those described in Section 4.7.2.3.2. Long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. New construction would be expected to increase impervious surfaces in several subwatersheds. Approximately 14 acres of Chesapeake Bay RPAs would be affected by seven projects under the City Center Alternative (Table 4.7-20). The following projects encroach into designated RPA areas: Hospital (Project #4), Dental Clinic (Project #5), Emergency Services Center (EPG) (Project #9), NARMC HQ Building (Project #6), Gunston Road Improvements (Project #8), Road and Utility Infrastructure (Project #8), and PEO EIS Admin Facility (Project #17). Wetlands could also be affected under the City Center Alternative. Effects on wetlands are further discussed in Section 4.8 (Biological Resources). In addition, one project under the City Center Alternative would affect floodplains. Approximately 2.9 acres of floodplain would be encroached upon by the Infrastructure project sites (Project # 8).

Table 4.7-20
Affected RPAs in the City Center Alternative

Area (Acres)	Projects affecting RPAs
1.0	Hospital, Emergency Svcs Center (EPG), NARMC HQ Bldg
4.9	Infrastructure (Gunston Road Improvements)
7.9	Infrastructure
0.1	PEO EIS Admin Facility
13.9	**Total**

4.7.4.4 BMPs/Mitigation

BMPs and mitigation measures would be similar to those discussed under the Preferred Alternative (Section 4.7.2.4).

4.7.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

4.7.5.1 Surface Water Quality

4.7.5.1.1 Land Use Plan Update

Short- and long-term minor adverse effects to surface water quality, ground water quality, and water resources protection would be expected at the watershed scale; however, localized effects could be more pronounced. Construction of facilities and infrastructure as a result of changes in land use designations could result in increased runoff due to an overall increase in impervious surface area, increased erosion, and increased sediment and pollutant loads. A reduction in pervious area may reduce infiltration and groundwater levels which can cause increases in pollutant concentrations in surface runoff. Decreased infiltration can also lead to lower stream baseflow conditions during dry periods. RPAs and riparian buffers also extend into areas proposed for land use designation changes. Encroachment into these areas decreases the buffer between developed land and sensitive natural resources. Table 4.7-21 presents the land use

changes that could have an impact on water resources (i.e., land use change from undeveloped to developed). Section 4.7.5.1.2 provides a detailed analysis of the potential effects to surface water quality from short- and long-range development projects.

Table 4.7-21
Potential long-range land use plan effects to water resources under the Satellite Campuses Alternative

Proposed change	Water resources present in area	Potential effects
Convert South Post Golf Course (Recreation land use) on South Post into Professional/Institutional	Apart from storm water drainage features, no notable water resources present	Encroachment of development near RPAs and riparian areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads. Reduction in pervious surfaces would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present
South Post eastern and southern areas–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	On the South Post plateau, apart from storm water drainage features, no notable water resources present	Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.
North Post–convert Environmentally Sensitive and Outdoor Recreation land uses to Professional/Institutional, Community, Training, and Residential	RPAs, riparian areas, and flood zones along Mason Run and tributaries	Encroachment of development near RPAs and riparian areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.
Davison Army Airfield (west of Fairfax County Parkway) converted from Airfield to Professional/Institutional	RPAs, riparian areas, and flood zones along Accotink Creek to north and east sides of airfield	Encroachment of development near RPAs and riparian areas; no development would occur within these areas. Increased area of impervious surfaces would increase runoff, erosion, and pollutant and sediment loads and would reduce ground absorption of runoff, thereby reducing flow to existing groundwater seeps, where present.

4.7.5.1.2 BRAC Implementation and Facilities Projects

Storm water

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential effects through effective storm water planning, developing adequate infrastructure, and using BMPs. Storm water requirements are addressed under the NPDES program, which includes developing comprehensive SWPPPs that describe the BMPs to be used to minimize runoff and soil erosion from each construction site and Virginia's Erosion and Sediment Control Regulations. Fort Belvoir's storm water permits (general permits and MS4) regulate storm water discharges on the installation. The state reviews

and oversees implementation of the required storm water practices. Note that in the absence of state-required storm water management practices and erosion control measures being implemented on a watershed basis, short- and long-term effects would be much greater in severity.

Approximately 55 acres of high-intensity and 392 acres of medium-intensity development would be added to the installation by implementing the Satellite Campuses Alternative projects. High-intensity development includes areas where people work or reside in high numbers (e.g. apartment complexes and commercial/industrial areas). Medium-intensity includes a mixture of developed and nondeveloped land with impervious cover occupying 50-80 percent of the total land area. Impervious surfaces would increase substantially in Subwatersheds 1 (121 percent), 29 (25 percent), 30 (40 percent), 32 (73 percent), 38 (116 percent), 42 (40 percent), and 43 (239 percent). Increased impervious surface associated with development typically causes an increase in volume, velocity, and peak flow rates of runoff to nearby streams. Stream channels naturally attempt to accommodate the increased flows by increasing their cross-sectional area. This occurs through erosion of stream banks or down-cutting of the channel beds.

Virginia's Storm Water Management (SWM) Regulations specify evaluating storm water runoff using 2-year or 1-year storm event data in order to assess potential erosion problems and channel adequacy. These regulations also include the requirement for an adequate outfall analysis or use of 1-year, 24-hour extended detention to protect receiving waters. Increased volume might translate to flooding where the stream channel is not adequate to contain the flow. During the 10-year, 24-hour storm event, an increase in volume increases the potential for bank overtopping and flooding. Virginia's Erosion and Sediment Control Regulations (4VAC50-30-40.19) and SWM Regulations (4VAC3-20-81) require that, "downstream channels and properties be protected from erosion and damage due to increases in volume, velocity and peak flow rate." Because of this, site-specific BMPs or mitigation measures would be required for each construction site. A watershed-based approach would be implemented to evaluate upstream and downstream concerns and mitigate possible effects. As discussed above, BMPs and potential mitigation efforts were not included in the following analyses. The types of BMPs that will be implemented and other storm water control activities will depend on final site/parcel development plans.

The 1-year and the 10-year, 24-hour storm events were modeled using the Technical Release 55 (TR-55) model, developed by the NRCS (1986), to evaluate potential changes in peak flows as a result of the Satellite Campuses Alternative in each subwatershed. These storm events are identified in Virginia's Erosion and Sediment Control Regulations. These regulations require that properties and waterways be protected from damages from flooding due to increases in volume, velocity, and peak flow rates. The 10-year, post-development peak discharge flow rate is not to exceed the 10-year, pre-development peak rate (4VAC50-30-40.19). The threshold used to determine potential adverse effects for this analysis was a 10 percent increase in peak flow occurring from a 1-year, 24-hour and a 10-year, 24-hour storm event. Subwatersheds 1, 29, 30, 32, 38, 42, and 43 would all be expected to have greater than a 10-percent increase in peak flow during the 1-year storm event under the Satellite Campuses Alternative, with Subwatershed 43 experiencing the highest percent increase (91 percent). Table 4.7-22 lists percent increase in peak flow from a 1-year, 24-hour storm event for each subwatershed and the proposed construction projects that would affect runoff. All these subwatersheds, except for Subwatersheds 32 and 42 would also experience at least a 10-percent increase in peak discharge during a 10-year, 24-hour storm event, indicating there would be a moderate to high increase in flood levels (Table 4.7-22).

Table 4.7-22
Subwatersheds with greater than 10-percent increase in 1-year or 10-year storm event peak discharge under the Satellite Campuses Alternative

Subwatershed number	Percent increase in 1-year storm event peak discharge	Percent increase in 10-year storm event peak discharge	Affecting projects
1	54%	25%	AMC Relocatables, Infrastructure
29	25%	13%	WHS, Infrastructure, CDC, AMC Relocatables
30	25%	10%	WHS, Hospital, Infrastructure, Access Control Point, Network Ops–PEO EIS, PEO EIS Administrative Facility, MDA, Modernize Barracks, Corps Integration Office
32	15%	< 10%	PEO EIS Administrative Facility
38	44%	16%	Hospital, NARMC HQ Bldg
42	17%	< 10%	NGA
43	91%	42%	NGA, CDC (NGA)

Table F-1 in Appendix F lists the peak flow percent increase for each subwatershed if the Satellite Campuses Alternative projects were implemented.

Sediment

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. To comply with federal, state, and installation requirements, Fort Belvoir would minimize potential erosion and sedimentation effects through storm water planning, developing adequate infrastructure, using BMPs. During the initial development phase, proper erosion and sediment controls would be used to manage construction activities that could result in an increase in the sedimentation in adjacent waterbodies. A VPDES permit would be required for those projects disturbing at least one acre, and a soil erosion and sediment control plan as well as a SWPPP would be required to provide guidance for reducing sedimentation effects during the construction process. In the long-term, an increase in storm water volume from impervious surfaces could result in an increase in erosion and sedimentation. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of increased sediment loads during wet-weather events.

Fort Belvoir was surveyed to characterize watershed conditions and identify erosion problem site locations in 1999, and monitoring of these sites has occurred since (Landgraf, 2003). Table 4.7-23 lists the Satellite Campuses projects that are within close proximity (150 feet) of the previously identified erosion and other problem sites in each watershed. Construction activities and impervious surfaces could increase sediment and storm water runoff into waterbodies, thereby exacerbating erosion and other stream effects at these sites. Twelve Satellite Campuses projects have existing erosion sites and other stream effects within 150 feet of their footprint. These projects could affect one or more existing problem areas due to an increase in impervious surfaces and resulting storm water from each site. Other projects have few or no erosion/problem sites in the vicinity and would have minimal or no effect on stream bank erosion and other characteristics.

Table 4.7-23
Projects located within proximity of erosion and other problem sites under the Satellite Campuses Alternative

Project number (see Table 2-3)	Project description	Watershed number	Nearby watersheds	Erosion impacted sites within 150 feet
1	NGA	42, 43, 44	Trib. to Accotink Creek	1 bank erosion low, 2 bank erosion medium, 2 bank erosion severe, 5 blocked pipe, 6 down-cutting low, 1 down-cutting medium, 1 down-cutting severe, 3 scour hole, 3 sediment deposition
2	WHS	29, 30	Trib. to Accotink Creek, Mason Run	1 corroded or corrupt pipe, 2 down-cutting low, 3 down-cutting medium, 1 undercut structure low
4	Hospital	38	Trib. to Accotink Creek	2 down-cutting low
5	Dental Clinic	38	Trib. to Accotink Creek	1 down-cutting low
6	NARMC Headquarters Building	38	Trib. to Accotink Creek	2 down-cutting low
8	Infrastructure	29, 30	Trib. to Accotink Creek, Mason Run	1 corroded or corrupt pipe, 1 down-cutting low, 3 down-cutting medium, 1 undercut structure low
8	Gunston Road Improvements (Infrastructure)	1, 3, 29, 30	Trib. to Accotink Creek, Mason Run	2 bank erosion severe, 4 blocked pipe, 1 corrected sites, 4 down-cutting low, 4 down-cutting medium, 2 down-cutting severe, 3 scour hole, 1 sediment deposition, 1 undercut structure low, 3 undercut structure medium, 2 undercut structure severe
10	Network Ops Center	30, 32	Mason Run, trib. to Dogue Creek	4 blocked pipe, 2 down-cutting low, 2 down-cutting medium, 2 down-cutting severe, 3 gully, 1 scour hole, 1 sediment deposition, 1 undercut structure medium
12	Child Development Center (NGA)	42, 43, 44	Trib. to Accotink Creek	1 bank erosion low, 2 bank erosion medium, 2 bank erosion severe, 5 blocked pipe, 6 down-cutting low, 1 down-cutting medium, 1 down-cutting severe, 3 scour hole, 3 sediment deposition
13	Child Development Center	29, 30	Trib. to Accotink Creek, Mason Run	1 corroded or corrupt pipe, 1 down-cutting low, 3 down-cutting medium, 1 undercut structure low
16	AMC Relocatables	1	Trib. to Accotink Creek	2 blocked pipe, 1 corroded or corrupt pipe, 2 down-cutting low, 1 down-cutting medium, 2 gully, 3 scour hole, 2 undercut structure low
17	PEO EIS Facility	30, 32	Mason Run, trib. to Dogue Creek	4 blocked pipe, 2 down cutting low, 3 down cutting medium, 2 down cutting severe, 3 gully, 1 scour hole, 1 sediment deposition, 1 undercut structure medium

Other Pollutants

Short- and long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. During the initial development phase, construction activities could result in an increase in sediment loading, dissolved solids, petroleum hydrocarbons, and other pollutants in adjacent waterbodies. Measurable effects would be expected to be minimal because the installation would comply with federal, state, and installation regulations, and necessary permits for storm water control would be obtained. Site-specific SWPPPs describing the BMPs to be used to minimize effects from increased runoff during site construction would be prepared.

In the long-term, an increase in storm water volume from additional impervious surfaces could result in an increase in nutrients, metals, and other potential contaminants in waterbodies. Proper storm water controls, as discussed above, would be implemented as part of the development to minimize the potential effects of pollutant loading during wet-weather events. Implementing LID techniques would also be used, where possible, to manage the hydrology and quality of storm water runoff from impervious surfaces to reduce this adverse effect.

Nutrients, such as TN and TP, are parameters of concern according to the Chesapeake Bay agreement. TN loading from land to streams is influenced by using fertilizers, presence of animal waste, and faulty septic systems, as well as by natural sources. Urban, agricultural, and barren land uses are the primary contributors. Nitrogen contributes to low DO levels through bacterial activity and could be toxic to aquatic life. TP loading from land to streams is influenced by the use of fertilizers and the presence of animal waste, as well as by natural sources. Urban and agricultural land uses are the primary contributors. Phosphorus is typically the limiting nutrient in freshwater systems and could accelerate waterbody eutrophication.

Potential increases in nutrient loads in Fort Belvoir subwatersheds as a result of the Satellite Campuses Alternative were calculated using land use-specific loading coefficients. Loading coefficients were developed based on the watershed modeling results for Accotink Creek using the GWLF model (Haith and Shoemaker, 1987; Haith, Mandel, and Wu, 1992; Dai et al., 2000). GWLF was used to compute the nutrient loads contributed by various land uses in each of the subwatersheds that drain Fort Belvoir. A detailed description of the GWLF model and its capabilities is presented in Appendix F

Using the land use distributions and applying the associated loading ratios, the average annual percent change in TN and TP loading was calculated for each subwatershed. Subwatersheds with greater than a 10-percent change in nitrogen and phosphorus loads as a result of the Satellite Campuses Alternative are shown in Table 4.7-24. Proposed construction projects in each subwatershed that would affect nitrogen and phosphorus loading are also shown in this table. Table F-2 in Appendix F shows the percent change for each subwatershed.

Table 4.7-24
Subwatersheds with greater than 10-percent increase in TN and TP loads under the Satellite Campuses Alternative

Subwatershed number	Percent increase in TP	Percent increase in TN	Affecting projects
29	12%	13%	WHS, CDC, Infrastructure, AMC Relocatables

4.7.5.2 Groundwater Quality

4.7.5.2.1 Land Use Plan Update

Short- and long-term effects on groundwater quality are presented in Section 4.7.5.1.1.

4.7.5.2.2 BRAC Implementation and Facilities Projects

Long-term indirect minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. Approximately 207 acres would be converted to impervious surfaces under the Satellite Campuses Alternative. Much of this acreage is on an upland plateau, which follows the I-95 corridor and serves as a groundwater recharge area. The reduction in pervious surfaces would reduce the absorption of runoff into the ground, and therefore reduce flow to existing groundwater seeps, such as the rare coastal plain/piedmont acidic seepage swamp communities scattered around the installation (Fort Belvoir DPW ENRD, 2002). Seepage swamp communities could be affected by projects within close proximity, depending on groundwater flow patterns. Four projects are within 200 feet of a seepage swamp community: Network Ops-PEO EIS (Project #10), Gunston Road Improvements (Project #8) and PEO EIS Admin Facility (Project #17). In addition, infiltration of increased storm water runoff into the groundwater in other areas could increase nitrogen loads and other contaminants such as soluble metals. Absorption loss and infiltration of pollutants could partially be alleviated through installing BMPs that facilitate infiltration to groundwater, such as bioretention facilities planted with native, wet-tolerant plants (Davis, 2004; Fort Belvoir 2003). Groundwater withdrawal for potable water supply would not be adversely affected by the Satellite Campuses Alternative because, although an aquifer containing potentially potable groundwater is present below Fort Belvoir, it is not used for drinking water supply. In addition, the Satellite Campuses Alternative would not include installation or removal of any septic tanks.

4.7.5.3 Water Resources Protection

4.7.5.3.1 Land Use Plan Update

Short- and long-term effects on water resources protection are presented in Section 4.7.5.1.1.

4.7.5.3.2 BRAC Implementation and Facilities Projects

Short and long-term effects on water resources regulated under Chesapeake Bay, CZMA, and floodplain protection programs would be similar to those described in Section 4.7.2.3.2. Long-term minor adverse effects would be expected at the watershed scale; however, localized effects could be more pronounced. New construction would be expected to increase impervious surfaces in several subwatersheds. Approximately 40 acres of Chesapeake Bay RPAs would be affected by nine projects under the Satellite Campuses Alternative (Table 4.7-25). The following projects encroach into designated RPA areas: NGA (Project #1), Child Development Centers (Projects #12 and #13), WHS (Project #2), Infrastructure (Project #8), Network Operations–PEO EIS (Project #10), PEO EIS Administrative Facility (Project #17), and Gunston Road Improvements (Project #8). Wetlands could also be affected under the Satellite Campuses Alternative. Effects on wetlands are further discussed in Section 4.8 (Biological Resources). In addition, three projects under the Satellite Campuses Alternative would affect floodplains (Table 4.7-26). Approximately 3.2 acres of floodplain would be encroached upon by the NGA and Child Development Center project sites (#s 12 and 13).

Table 4.7-25
Affected RPAs in the Satellite Campuses Alternative

Area (Acres)	Projects affecting RPAs
29.9	NGA, Child Dev Center – 244 (NGA)
0.1	WHS, Infrastructure, Child Dev Center – 303 (EPG)
6.0	Network Ops – PEO EIS, PEO EIS Admin Facility
0.4	NGA
2.7	Infrastructure (Gunston Road Improvements)
0.3	Child Dev Center – 244 (NGA)
39.4	**Total**

Table 4.7-26
Affected Floodplains in the Satellite Campuses Alternative

Area (Acres)	Projects affecting Floodplains
2.77	NGA, Child Dev Center – 244 (NGA)
0.44	NGA
3.21	**Total**

4.7.5.4 BMPs/Mitigation

BMPs and mitigation measures would be similar to those discussed under the Preferred Alternative (Section 4.7.2.4).

4.7.6 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

4.7.6.1 Surface Water Quality

Storm water

No effects on storm water quantity would be expected under the No Action Alternative. The percent of impervious surfaces for each subwatershed on Fort Belvoir would remain unchanged. The quantity of runoff to the surrounding receiving waterbodies would be expected to remain unchanged. The Army would continue to manage Fort Belvoir in accordance with the CWA, Virginia Stormwater Management Act, and act consistently with the Chesapeake Bay Preservation Act, and other applicable laws, regulations, and Army Policy.

Sediment

No effects would be expected. Under the No Action Alternative, natural resources and land management programs would continue to maintain vegetative cover and erosion controls as required by federal, state, local, and Army regulations. Erosion problems on the installation would continue to be identified and remediated.

Other Pollutants

No effects would be expected. During the installation's baseline aquatic survey of the five main perennial waterways, aluminum, manganese, and iron were detected. The USGS NAWQA station for the Potomac River Basin reported that it had high concentrations of nutrients and pesticides, although high levels were not found during the installation's baseline aquatic survey. Existing levels of aluminum, manganese, iron, nutrients, and pesticides would remain unchanged under the No Action Alternative.

4.7.6.2 Groundwater Quality

No effects on groundwater or sensitive seep communities would be expected. The groundwater system below Fort Belvoir is not used as a potable water supply. Effects from implementation of the proposed action on groundwater would not occur.

4.7.6.3 Water Resources Protection

Section 4.7.1.2 and Section 4.7.1.5 provide discussions of federal, state, and local regulations that help protect water resources on Fort Belvoir.

Chesapeake Bay

No effects would be expected. The Army would continue to manage Fort Belvoir in accordance with various Chesapeake Bay agreements as described in Section 4.7.1.5, as well as with federal, state, and local efforts to protect the Chesapeake Bay. No RPAs would be disturbed under the No Action Alternative.

Coastal Zone Management Act

No effects requiring a permit from the Commonwealth of Virginia regulatory programs pertinent to the CZMA would be expected.

Floodplains

No effects on floodplains would be expected under the No Action Alternative.

4.7.6.4 BMPs/Mitigation

Apart from existing mitigation in place, no mitigation measures would be implemented under the No Action Alternative.

4.7.7 SUMMARY OF COMPARISON OF ALTERNATIVES

Regardless of the land use alternative selected, the BRAC action would have minor short- and long-term adverse effects on water resources at the watershed scale, with localized effects that could be more pronounced during the implementation of proposed changes. Each alternative would have varying effects due to the siting of each of the agencies affected by the BRAC action. For example, the Preferred Alternative's land use plan concentrates most of the new development onto EPG with some increases to South Post. The Town Center Alternative's land use plan places all development on Main Post, on either side of Route 1. Thus, the effects on water resources caused by the new developments would vary to some degree by location.

Effects on water resources resulting from the BRAC action relate to the potential for increases in storm water runoff, associated physical effects, and associated pollutants from land disturbance activities. These effects would be expected to occur during construction activities and their associated land disturbance as well as for a longer term as a result of increased impervious surfaces because of development. As summarized in Table 4.7-27, the number of acres of increased high- and medium-intensity development would be greatest under the Satellite Campuses Alternative (447 acres) as compared with increases of about 348 acres under the Preferred Alternative, about 316 acres under the Town Center Alternative, and about 259 acres under the City Center Alternative. Correspondingly, the amount of land area expected to be converted from pervious to impervious surface is greatest under the Satellite Campuses Alternative (207 acres), as compared with increases of about 183 acres under the Preferred Alternative, about 142 acres under the Town Center Alternative, and about 131 acres under the City Center Alternative. Similarly, the Satellite Campuses Alternative would be expected to result in the greatest disturbance to Chesapeake Bay RPAs (40 acres) and floodplain (3 acres) as compared with 14 acres of disturbed RPAs and 3 acres disturbed floodplain under the Preferred and City Center Alternatives and 18 acres of disturbed RPAs and no disturbed floodplain under the Town Center Alternative.

Table 4.7-27
Summary of effects of BRAC implementation on water resources

Alternative	Acreage increase in high- and medium-intensity development	Acreage converted to impervious surfaces	Number of watersheds with a > 10 percent increase in total nitrogen	Number of watersheds with a > 10 percent increase in total phosphorous	Acreage of RPAs affected	Acreage of floodplains affected
Preferred	348	183	5	5	14	3
Town Center	316	142	1	1	7	0
City Center	259	131	5	5	14	3
Satellite Campuses	447	207	1	1	40	3

The greatest potential expected increases in TN and TP pollutant loading to surface waters would be expected to occur under the Preferred Alternative and the City Center Alternative, with five subwatersheds expecting to increase their loads by more than 10 percent. This compares with an expected increase of more than 10 percent in only one subwatershed under both the Town Center Alternative and the Satellite Campuses Alternative. Refer to Section 4.7.2 for a description of the methodology and assumptions used for the storm water and pollutant loading analyses.

4.8 BIOLOGICAL RESOURCES

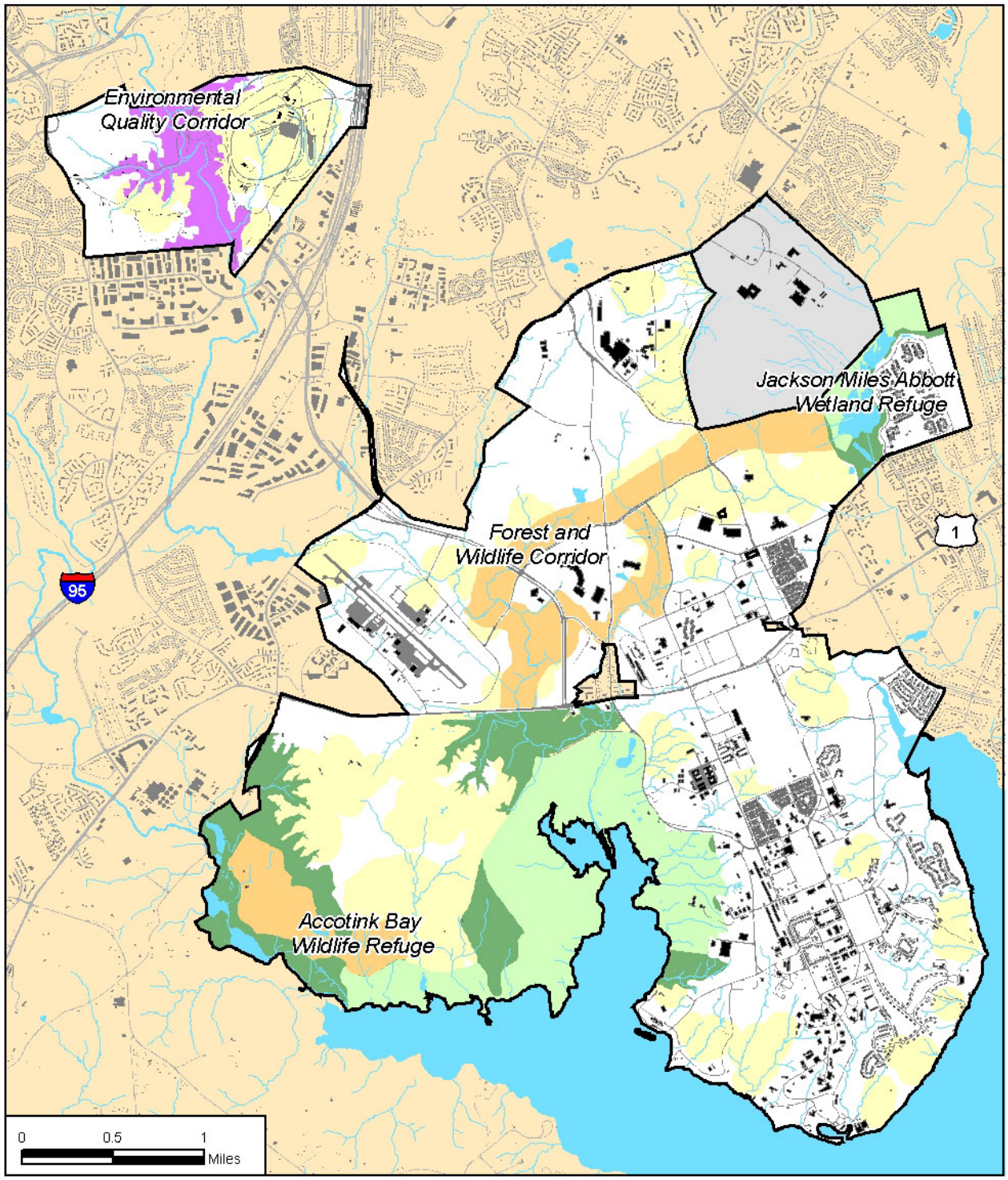
Fort Belvoir is in an ecologically complex area where three ecological subregions converge. The Outer Piedmont subregion of the Piedmont Plateau lies west of the installation, the western edge of the Coastal Plain ecoregion lies east of the installation, and the southern extent of the Upper Atlantic Coastal Plain subregion of the Eastern Broadleaf Forest (Oceanic) ecoregion lies to the north. Fort Belvoir also occupies an important location for many species of birds. The Atlantic Flyway, a major North American bird migration route, passes to the east along the Atlantic Ocean coast, and a principal migratory route from the southeastern Great Lakes region connects to the Atlantic Flyway along the Delaware River corridor. Northeast of Fort Belvoir is the Huntley Meadows Park, which is adjacent to the Jackson Miles Abbott Wetland Refuge (JMAWR) on Fort Belvoir (Figure 4.8-1). The Accotink Bay Wildlife Refuge (ABWR) borders Accotink Bay on the Southwest Area and South Post of the installation. The ABWR contains foraging habitat for the state-threatened American peregrine falcon (*Falco peregrinus anatum*), the federally threatened bald eagle (*Haliaeetus leucocephalus*), habitat for the state-threatened North American wood turtle (*Clemmys insculpta*), and Partners in Flight (PIF) priority bird species habitat. Huntley Meadows Park also has a population of wood turtles. A Forest and Wildlife Corridor extends from the installation's boundary with the Huntley Meadows Park to the installation's Southwest Area. The corridor provides a connection between the two refuges. Together, the JMAWR, the ABWR, and the Forest and Wildlife Corridor are Fort Belvoir's three designated *Special Natural Areas* (SNA), all of which are protected from development so that the ecological integrity of the areas is maintained.

EPG also has habitat for PIF species, and it is the only location in Fairfax County where the federally and state-listed species, the small whorled pogonia (*Isotria medeoloides*) has been found. On EPG, Fairfax County's Comprehensive Plan recommends for preserving and protecting the Accotink Creek Environmental Quality Corridor (EQC) from development. The *Environmental Quality Corridor System*, as defined by the Fairfax County Comprehensive Plan, is an open space system designed to link and preserve natural resource areas and provide passive recreation. The core of the EQC is the county's stream valleys, but the EQC also includes the following:

- 100-year floodplains
- Areas of 15 percent or greater slope adjacent to the floodplain (or, if no floodplain is present, 15 percent or greater slopes beginning within 50 feet of the stream channel)
- Wetlands connected to the stream valleys

EQC protection and enhancement is not a regulation but a policy that is triggered when the county has a development review (though federal projects do not go through development review).

As a consequence, management of the biological resources of Fort Belvoir requires consideration of migrating birds, threatened and endangered species, rare species and habitats, and both terrestrial and aquatic species and habitats. This section provides descriptions of the biological resources of the installation that are pertinent to the proposed action analyzed in this EIS. The 2001 Fort Belvoir INRMP (Horne, 2001) contains detailed descriptions and information about the biological resources of Fort Belvoir, and it is incorporated by reference into this EIS.



LEGEND

- Installation Property
- Wildlife Refuge
- Wildlife Management Area
- Environmental Quality Corridor
- Forest and Wildlife Corridor
- PIF Priority Bird Habitat

Sensitive Environmental Areas

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.8-1

4.8.1 AFFECTED ENVIRONMENT

4.8.1.1 Plant Communities

Main Post. Sixteen native plant community types have been identified on the undeveloped parts of Fort Belvoir's Main Post. Table 4.8-1 lists the plant communities in order of their abundance and provides information about the general distribution of the community types. Land cover on the Main Post is shown in Figure 4.2-2. The most abundant plant *community type* on the installation is urban land. Three types of hardwood forest, each with nearly 1,000 acres or more, are the most abundant natural plant communities. Some of the communities, such as the Oak/Ericad Forest, occur as relatively large, contiguous areas, while others occur as smaller areas intermixed with other community types. A few plant communities have been planted (loblolly pine, white pine), while the majority occur according to natural constraints of soil type, topography, and moisture. The intermixing of habitats is an important natural aspect that is partially responsible for the richness of the biotic resources that occur on the installation.

Table 4.8-1
Plant communities of Fort Belvoir

Plant community	Acreage		Distribution
	Main Post	EPG	
Urban land	2,809	121	All developed areas, including improved and semi-improved grounds
Oak/Ericad (Heath family) forest	1,253	227	Upland areas of gravelly ridges and dry slopes
Beech mixed oak forest	1,146	12	Upland areas of gradual, well-drained ravine slopes
Tulip poplar mixed hardwood forest	987	75	Moist, fertile ravine slopes and ravine bottoms
Virginia pine forests	425	185	Previously-disturbed areas in mid-succession
Poorly drained floodplain hardwood forest	422	13	Somewhat poorly drained to very poorly drained floodplain bottomlands and sloughs
Loblolly pine forest	245	11	Planted stands
Old field grassland	233	53	Previously disturbed areas in early successional stages
Mixed pine hardwood forest	196	49	Previously disturbed areas in late succession
Moderately well-drained floodplain hardwood forest	173	40	Moderately well-drained to somewhat poorly-drained floodplain bottomland
Nontidal marsh/beaver pond	131	3	Above tidal limits of Accotink, Pohick, and Dogue Creeks
Tidal marsh	96	0	Shallow tidal areas of Accotink and Pohick Creeks and at the mouths of several small streams
Freshwater tidal swamp forest	45	0	Tidally influenced palustrine areas
Seep forest	39	1	Groundwater-saturated flats and slopes
Tidal scrub/shrub wetland	16	0	Edges of tidal swamp forests near the transition to tidal marsh
White pine forest	6	0	Planted stands

Source: Horne, 2001.

EPG. Table 4.8-1 lists the acreages of plant communities at EPG. A vegetation survey of EPG conducted in 1999 identified 12 plant community types on EPG (Paciulli, Simmons and Associates, Ltd., 1999). Oak forests, the most common plant community type on EPG, occur primarily on the steep slopes abutting Accotink Creek and its tributaries. Beech-mixed-oak forest occurs on gradual ravine slopes adjoining Accotink Creek, and tulip poplar-mixed-hardwood forest is found on moist fertile ravine slopes and in ravine bottoms; substantial areas of tulip poplar-mixed-hardwood forest occur in the western and southern areas of EPG. Most land near the outer perimeter of Heller Loop and on the former airstrip north of the loop supports dense, nearly pure stands of Virginia pine saplings. Mixed stands of Virginia Pine and upland hardwoods occupy areas outside the Heller Loop and in the western part of EPG. Most old field grassland is on the former training ranges in the western part of EPG, but some open areas in Heller Loop still support grassland that has not yet been encroached upon by Virginia pine. Floodplain hardwood forest occurs primarily in narrow strips of low land separating the banks of Accotink Creek from the toe of steep slopes to the east and west in the central part of EPG.

GSA Parcel. The GSA Parcel is nearly entirely developed except for the occasional landscaping features.

4.8.1.2 Wetlands

Main Post. Baseline wetland inventories have identified approximately 1,245 acres of wetlands on Fort Belvoir's Main Post, which is approximately 12 percent of the land area (Table 4.8-2). The predominant wetland type on Fort Belvoir is palustrine forested, which tends to occur in association with the riparian areas of Accotink, Dogue, and Pohick Creeks. Wetlands generally occur along permanent and intermittent streams, which are drainages of these creeks.

EPG. EPG supports approximately 26 acres of wetlands. Table 4.8-2 lists the acreages of wetlands at EPG. As on the Main Post, wetlands on EPG generally occur along permanent and intermittent streams associated with Accotink Creek. EPG wetlands provide for flood flow alteration, sediment and shoreline stabilization, wildlife habitat, recreational opportunities. The preservation of adjoining forested slopes and stream channels are important to the continuation of these wetland functions.

GSA Parcel. No wetlands are present on the GSA Parcel.

Table 4.8-2
Wetlands of Fort Belvoir

Wetland type	Main Post acreage	EPG acreage
Palustrine emergent	141.9	0.8
Palustrine forested	855.6	13.5
Palustrine open water	31.9	0.2
Palustrine scrub-shrub	0.1	6.0
Riverine tidal	165.4	0.0
Riverine, lower perennial, open water, permanent-tidal	23.7	5.3
Riverine emergent, permanently flooded	26.5	0.0

Source: Horne, 2001.

4.8.1.3 Rare Plant Communities

Main Post. A recent ecological communities assessment identified 17 community types on Fort Belvoir Main Post. Four of the communities are ranked *very rare* or *extremely rare*, and three are ranked as *rare to uncommon*. The rare communities are listed below.

- Tidal Freshwater Marsh: Spikerush—Golden-club: extremely rare
- Tidal Freshwater Marsh—Mixed: extremely rare
- Coastal Plain/Piedmont Acidic Seepage Swamp: very rare
- Tidal Shrub Swamp: very rare
- Tidal Freshwater Marsh—Wild Rice-Smartweed: rare to uncommon
- Tidal Freshwater Marsh—Mud Flat: rare to uncommon
- Tidal Hardwood Swamp: rare to uncommon

The most significant threat to the communities arises from invasive and exotic species. Wetlands are also vulnerable to storm water-related problems (e.g., sedimentation), which could be exacerbated by development near watercourses when adequate mitigation is not used.

EPG. An ecological communities survey performed on EPG did not identify any of the communities listed above, primarily because EPG is outside the tidal zone (Tetra Tech, 2006a). Rare or protected species supported on EPG are presented in Section 4.8.1.5).

GSA Parcel. No rare plant communities are known to exist on the GSA Parcel.

4.8.1.4 Animals

4.8.1.4.1 Mammals

Main Post. A series of baseline small mammal field surveys that covered representative areas of all habitat types on-post was conducted from 1987 through 1994. Mammal surveys have given the installation a good idea of the mammal species on the installation. The surveys provided general information regarding the abundance and habitat usage of each species on-post, but not population levels and trends. Forty-three species—those typical of what would be expected for the habitat mix and abundance of the installation—have been identified as occurring or potentially occurring on Fort Belvoir. Within the mix of species are those that could be found in a variety of habitats (e.g., the northern short-tailed shrew [*Blarina brevicauda*]), and those that prefer habitat types that the installation provides (e.g., the woodland vole [*Microtus pinetorum*] in undisturbed mature forest and the meadow vole [*Microtus pennsylvanicus*] of grassy old fields).

Some mammal species present management concerns. Beaver (*Castor canadensis*) can significantly alter habitat conditions through tree removal and dam building, and their impoundments can be responsible for the presence of extensive areas of palustrine wetland along Dogue Creek and within drainages to Accotink and Pohick Creeks. The river otter (*Lutra canadensis*) is a state species of concern and a management concern because of habitat loss and water pollution, which are the major threats to the species' survival. River otter have not been seen frequently on Fort Belvoir, though there is some evidence that their abundance is increasing along Fort Belvoir waterways. White-tailed deer (*Odocoilus virginiana*) is the installation's largest mammal and it is found throughout the installation in nearly all habitats. The population is dense, which is of concern to management because of the potential for disease in the herd, habitat loss through overbrowsing, and the increased chance of collisions with vehicles.

EPG. A wildlife survey was conducted on EPG in 2006. Mammals at EPG were described as consisting predominantly of white-tailed deer, Virginia opossums (*Didelphis marsupialis*), and gray squirrels (*Sciurus carolinensis*) (Tetra Tech, 2006b; USATHAMA, 1990). The brushy, open areas surrounding the abandoned Heller Loop buildings might have recently provided habitat for grassland species, but establishment and growth of Virginia pine trees has converted much of this area to habitat for mammal species favoring old fields such as eastern cottontails (*Sylvilagus floridanus*), field mice (*Peromyscus* sp.), opossums, and groundhogs (*Marmota monax*). Acorns from the dominant oaks in hardwood and mixed-hardwood forests provide a food source for mammals such as gray squirrels, whose diets depend on mast (heavy nutlike seeds).

4.8.1.4.2 Birds

Main Post. The surveys conducted on the installation have identified 275 bird species including resident, temperate migrant, and neotropical migrants. Ninety-nine species are common or abundant on the installation during the seasons when they occur on-post, indicating that the mix of habitats on the installation and the extensive areas of natural habitat provide suitable habitat for many bird species. Habitat features on Fort Belvoir that support so many bird species include the large, contiguous areas of undeveloped land; the variety of ecological communities; and abundance of food sources (e.g., insects, seeds, berries, aquatic invertebrates).

Bird species of management concern include those considered by the VDCR-NHP to be rare in Virginia and the PIF priority species for conservation that exist on Fort Belvoir. Fort Belvoir's ENRD intends to actively preserve and enhance habitat for some of these species, and it is in the process of preparing a Bird Conservation Plan for the installation. The PIF program is discussed above. High-priority PIF species that have been known to breed on Fort Belvoir include the American black duck (*Anas rubripes*), American woodcock (*Philohela minor*), whip-poor-will (*Caprimulgus vociferus*), yellow-throated vireo (*Vireo flavifrons*), wood thrush (*Hylocichla mustelina*), hooded warbler (*Wilsonia citrina*), prairie warbler (*Dendroica discolor*), worm-eating warbler (*Helmitheros vermivorus*), prothonotary warbler (*Protonotaria citrea*), Kentucky warbler (*Opororins formosus*), scarlet tanager (*Piranga olivacea*), and field sparrow (*Spizella pusilla*).

The brown-headed cowbird (*Molothrus ater*) is a nest parasite that poses a significant threat to nesting migrants, including several of the PIF priority species breeding on Fort Belvoir. It occurs throughout the installation and extends into all forest tracts on-post. Cowbirds benefit from habitat fragmentation. Installation bird surveys have recommended minimizing fragmentation to control cowbird intrusion into the installation's forest tracts and to protect vulnerable migratory bird species from nest predation.

EPG. The Fairfax Audubon Society reported numerous bird species in forested land in Wakefield Park, on Accotink Creek upstream of EPG, in 1998 and 1999, including many species of warbler, Philadelphia vireo (*Vireo philadelphicus*), black-billed cuckoo (*Coccyzus erythropthalmus*), Lincoln's sparrow (*Melospiza lincolnii*), sedge wren (*Cistothorus platensis*), sora (*Porzana carolina*), red-headed woodpecker (*Melanerpes erythrocephalus*), and bald eagle (*Haliaeetus leucocephalus*) (Collins, 2000). The forest clearings associated with former training ranges west of Accotink Creek appear to provide good habitat for bird species favoring grassland and old field habitats such as the prairie warbler and field sparrow. The oak-heath forest and other mature upland forests on the slopes adjoining Accotink Creek probably provide good habitat for bird species favoring forest interior habitat such as cerulean warblers (*Dendroica cerulea*), American redstarts (*Setophaga ruticilla*), hooded warblers, red-eyed vireos (*Vireo olivaceus*), ovenbirds (*Seiurus aurocapillus*), wood thrushes, scarlet tanagers, and pileated woodpeckers

(*Dryocopus pileatus*). Establishment and growth of Virginia pine seedlings has converted much of the brushy, open areas surrounding Heller Loop buildings to habitat for species favoring old fields such as mourning doves (*Zenaida macroura*), northern mockingbirds (*Mimus polyglottos*), American robins (*Turdus migratorius*), and brown thrashers (*Toxostoma rufum*). The dense Virginia pine saplings around the perimeter of Heller Loop and other scattered locations on EPG might provide some of the best habitat in the region for species favoring coniferous forests, such as Carolina wrens (*Thryothorus ludovicianus*), red-breasted nuthatches (*Sitta canadensis*), prairie warblers, and field sparrows.

4.8.1.4.3 Reptiles

Main Post. Numerous field surveys of reptile species have been conducted on Fort Belvoir, providing data on those species that either occur or are potentially occurring on the installation, although not on their individual abundances or distributions. Thirty-two species of reptiles have been identified as occurring or likely to occur on Fort Belvoir, including 10 species of turtle, 18 species of snake, and 4 species of lizard. All the species are typical of the northern Virginia, upper-Coastal Plain, although several are at the limits of their ranges (e.g., the North American wood turtle, more on which is given in Section 4.8.1.5.1). The 10 species of turtles occur in association with shallow, slow-moving waters with mud bottoms. The most common turtle on-post is the snapping turtle (*Chelydra serpentina*). The snake species occur in all habitat types at Fort Belvoir, including aquatic species such as the northern water snake (*Nerodia sipedon*). The only venomous snake endemic to Fort Belvoir is the copperhead (*Agkistrodon contortix*), which occurs in moist deciduous/mixed woods. Three of the four lizard species occur in mesic, deciduous, or deciduous/mixed woods; the fourth occupies dry, open areas.

EPG. The upland and wetland habitats on EPG provide good habitat for many reptile species. The former ranges and the old-field habitat provide good habitat for snakes common to brushy upland areas such as eastern garter snakes (*Thamnophis sirtalis*), and black racers (*Coluber constrictor constrictor*), and for turtles common to upland areas, such as the eastern box turtle (*Terrapene carolina carolina*). The dry, rocky slopes adjoining Accotink Creek and the remains of abandoned buildings might provide habitat for copperheads.

4.8.1.4.4 Amphibians

Main Post. Twenty-seven amphibian species have been identified as occurring or potentially occurring on Fort Belvoir, including 11 species of frog, 3 species of toad, and 13 species of salamander. They are all typical of the northern Virginia, upper-Coastal Plain, and several are at the limits of their range. The varied aquatic and terrestrial habitats on the installation, including the wetland areas, wooded drainage areas, and ephemeral ponds, provide extensive areas of suitable amphibian habitat. Development, loss of cover, loss of surface waters, habitat fragmentation, and disruption of natural travel corridors are threats to the amphibian populations on the installation.

EPG. The small and narrow areas of wetlands on EPG adjoining Accotink Creek and its tributaries provide favorable habitat for amphibians such as spring peepers (*Pseudacris crucifer*), chorus frogs (*Pseudacris* sp.), American toads (*Bufo americanus*), Fowler's toads (*Bufo woodhousii fowleri*), and bullfrogs (*Rana catesbeiana*). The EPG wetlands are surrounded by undeveloped forested uplands, making them better amphibian habitat than wetlands outside EPG that lie in close proximity to developed areas.

4.8.1.5 Rare, Threatened, and Endangered Species

Main Post. Fort Belvoir supports habitat for the federally listed bald eagle and small whorled pogonia. Additionally, inventories conducted by VDCR-NHP identified seven Virginia state rare animal species and four Virginia state rare plant species on the installation. The inventory also identified 16 state watchlist animal species and 3 state watchlist plant species on Fort Belvoir. Each of these species was documented as occurring in aquatic or wetland habitats on Fort Belvoir. Numerous other species of birds, mammals, reptiles, and amphibians that have been documented as occurring on the installation and that have been designated as a Virginia state-rare species with a state rarity rank of S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable). Figure 4.8-2 depicts the locations of habitats on Fort Belvoir. A complete listing of rare species can be found in the Fort Belvoir INRMP. Fort Belvoir's location at the intersection of three ecoregion subtypes and the variety of habitats that its location, topography, and water resources provide, as well as the protection afforded to the land by the military presence in an otherwise rapidly-developing area, make it possible for these species to exist on the installation.

EPG. The inventories mentioned above include EPG. Only two rare or protected species are considered to occur or potentially occur on EPG. Details are provided below.

GSA Parcel. No rare or protected species are known to exist on the GSA Parcel.

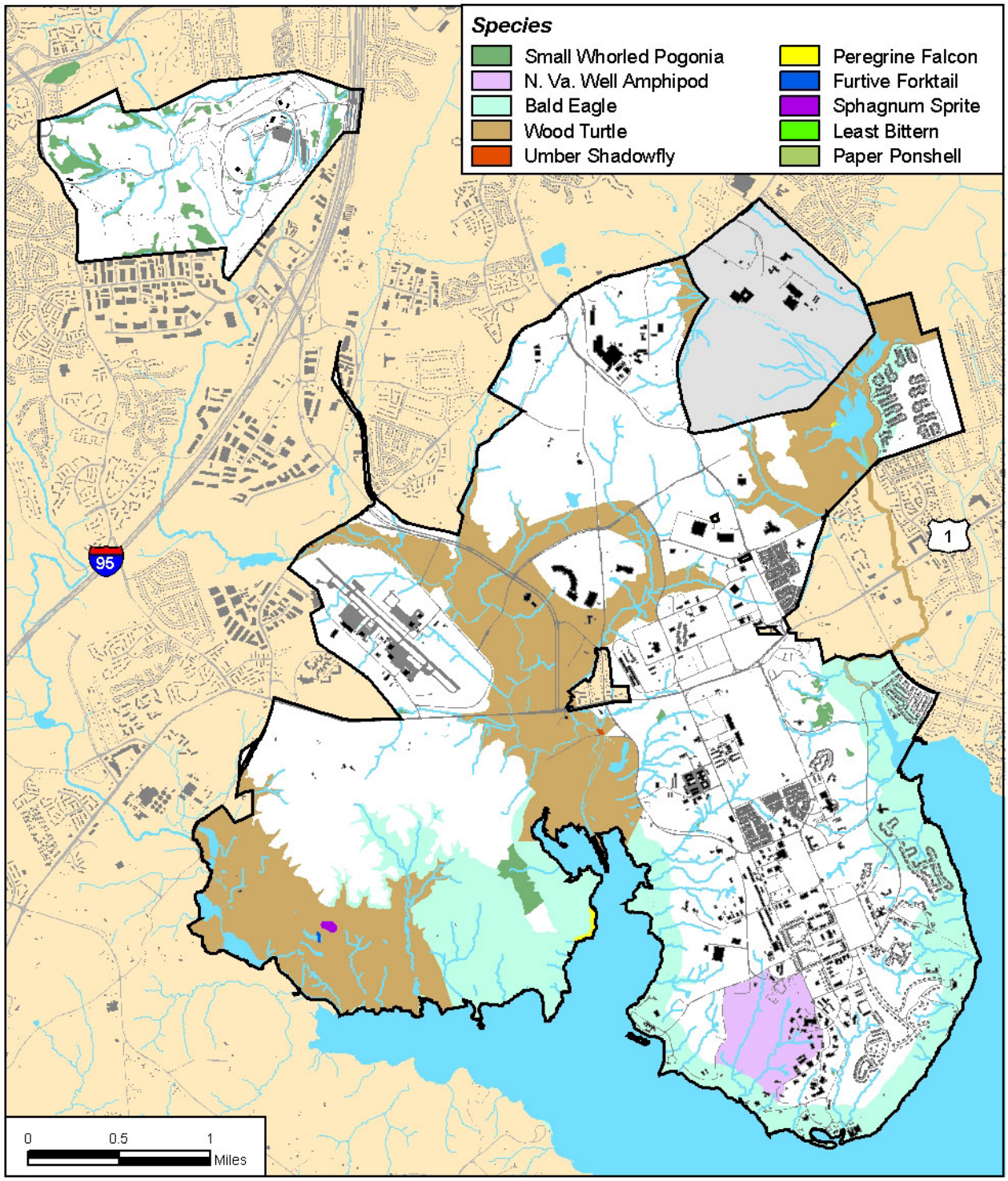
4.8.1.5.1 Wood Turtle

Main Post. The North American wood turtle, a state-listed threatened species, has been observed at Fort Belvoir at various locations along the Dogue Creek and Accotink Creek drainages, which indicates an on-post population and that the wooded streams of the installation provide habitat for the species. The species occurs in a relatively small area of eastern Canada and the northeastern United States. Its geographic range extends from Nova Scotia and New Brunswick south to northern Virginia and west to eastern Minnesota. At Fort Belvoir, the species is near the southeastern extent of its range. Within its range, the turtle is generally uncommon to rare (Harding, 2002). Wood turtles are generally found near moving water, though they would use areas at considerable distances from water, and in some places they appear to use riparian woods, shrub or berry thickets, swamps, and open, grassy areas. Some unvegetated or sparsely vegetated patches are needed for nesting. The turtles use stream valleys as dispersal corridors. Wood turtles are a conservation concern because their populations have been depleted from collecting for the pet trade and habitat destruction. A naturally low reproductive rate and continued habitat loss keep turtle populations from recovering.

EPG. An installation-wide field survey for wood turtles was performed for Fort Belvoir, including EPG, from April to June in 2002 (Paciulli, Simmons, and Associates, Ltd., and Mitchell Ecological Research, LLC, 2002). The survey included 8 days of visual encounter survey work and 46 days of turtle trapping activities along Accotink Creek, including the reach crossing EPG. No wood turtles were found. The survey noted that some areas on Accotink Creek within EPG possess physical characteristics similar to suitable wood turtle habitat in more rural settings, but it concluded that those areas are not optimal wood turtle habitat because of the narrow floodplain, presence of exotic riparian vegetation, and runoff from dense, upstream development.

4.8.1.5.2 Bald Eagle

Main Post. The bald eagle is listed federally and in Virginia as threatened. Fort Belvoir has active nests and designated bald eagle habitat and nest buffer areas on the southeastern part of the



LEGEND

Installation Property

Rare, Threatened or Endangered Species Habitat

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.8-2

Southwest Area and along Dogue Creek on the South Post. Bald eagles require nest trees, roosts, and feeding grounds. The installation shoreline along Pohick Creek, Pohick Bay, Accotink Bay, Accotink Creek, Gunston Cove, the Potomac River, and Dogue Creek is designated as foraging and resting habitat for the birds and is used year-round by bald eagles. Bald eagles also forage in the JMAWR. The shoreline extending from Pohick Creek and around Accotink Creek within the ABWR is a high-use foraging area where eagle activity is concentrated in the winter. Bald eagles feed primarily on fish, though they would also take small mammals, seabirds, and waterfowl, and they are opportunistic in that they would steal the prey of other animals (Harris, 2002).

EPG. As noted above, the Fairfax Audubon Society reported sighting bald eagles in forested land on Accotink Creek upstream of EPG. The creek can provide habitat for bald eagles where it passes through EPG. Bald eagles historically nested on EPG in the Accotink Creek riparian corridor.

4.8.1.5.3 American Peregrine Falcon

Main Post. The American peregrine falcon is a state-listed threatened species that also occurs seasonally at Fort Belvoir but is not considered a resident species. Falcons forage along the Accotink Creek/Accotink Bay stream corridor and JMAWR during fall migration.

EPG. The peregrine falcon has been recorded on Fort Belvoir during migration, when the birds take advantage of foraging habitat along the Accotink Creek corridor (U.S. Army, 2001). The Accotink Creek corridor crosses the central part of EPG, and the species can occur transiently on EPG, especially in trees on the forested slopes.

4.8.1.5.4 Small Whorled Pogonia

Main Post. The small whorled pogonia, a perennial terrestrial orchid, is a federally listed threatened species and Virginia state-listed endangered species. Although it has not been recorded on the Main Post, the U.S. Fish and Wildlife Service (USFWS) considers the installation to possess potential habitat for this species. The species is generally known from open, dry, deciduous woods with acid soil (USFWS, 1996). Surveys for the species have been conducted on Fort Belvoir, including on the proposed sites for the new hospital, the PX expansion, the INSCOM Information Dominance Center, and the DCEETA T-Block on the North Post (Bedker, 2005).

EPG. The small whorled pogonia was observed in the summer of 2005 on steep, oak-dominated forested slopes on a first order tributary of Accotink Creek in the southwestern part of EPG. EPG is the only location in Fairfax County where the species has been found. Areas of EPG that have been rated as high-, medium-, and low-quality habitat for the small whorled pogonia are along the western and southern boundaries of EPG. The plant is herbaceous and orchid-like and typically occurs in oak-dominated upland hardwood forests with a relatively open understory and sparse groundcover or in shaded openings in mixed hardwood-pine woods (WSSI, 2005; 2006).

4.8.1.5.5 Northern Virginia Well Amphipod

Main Post. The northern Virginia well amphipod (*Stygobromus phreaticus*) is a federal *species of concern*, is under consideration by the USFWS for listing under the ESA, and is listed by Virginia as *extremely rare*; it is considered to be globally rare. It is a shrimp-like crustacean that lives in groundwater. It has been found in T-17 training area ravine seeps on the South Post (VDGIF, 2002), and the T-17 training area is the only location where the species has been

documented to occur (Culver, personal communication, 2007; Hobson, personal communication, 2007).

EPG. The northern Virginia well amphipod is not known to occur on EPG. Seep habitat suitable to the species occurs on EPG in the Accotink Creek riparian corridor, and specimens of the genus *Stygobromus* have been found in the seeps.

4.8.1.5.6 Shortnose Sturgeon

Main Post. The only fish identified in the Fort Belvoir region that has federal or state threatened or endangered designation is the federally endangered shortnose sturgeon (*Acipenser brevirostrum*), which has been documented in the Potomac River in recent years (FHWA, 2003). According to the National Marine Fisheries Service (NMFS), the farthest north on the Potomac River that the shortnose sturgeon has been sighted is approximately 25 miles south of the installation (Mangold, 2005). Between 1998 and 2004, seven shortnose sturgeon were captured in the Potomac River as a result of the USFWS Atlantic Sturgeon Reward Program (FHWA, 2003; Mangold, 2005), and a prespawning female was captured at Craney Island in September 2005. While sturgeon populations were abundant and stable in the past, overfishing depleted local stocks in the late 19th century, and the remnant population in the Chesapeake Bay estuary is small (Secor, 2002). NMFS developed a Fisheries recovery plan in 1998 indicating that shortnose sturgeon found in the Chesapeake Bay and its tributaries (including the Potomac River) are considered part of the Chesapeake Bay distinct population segment. A Fisheries Recovery Plan aims to restore the species to its historic range in the Potomac River.

EPG. EPG does not support habitat for the shortnose sturgeon.

4.8.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

4.8.2.1 Vegetation

4.8.2.1.1 Land Use Plan Update

All areas designated as Environmentally Sensitive or Outdoor Recreation under the 1993 land use plan—the land use areas of most concern to natural resource management—would be redesignated under the Preferred Alternative, as listed in Table 4.8-3. Note, however, that the three SNAs on the Main Post (the JMAWR, the ABWR, and the Forest and Wildlife Corridor) are protected from development regardless of their land use designation in the Fort Belvoir Master Plan.

Long-term moderate adverse effects would be expected. While changes in land use designation alone would not have consequences for vegetation, areas previously designated as Environmentally Sensitive or Outdoor Recreation could potentially be used for purposes incompatible with natural resources management goals under the new land use designations. For instance, the Community land use designation under the Preferred Alternative land use plan is the land use designation for outdoor recreation areas and buffer areas, but the Community land use designation also includes use for retail stores, libraries, PX, clubs, and town centers. Areas designated Outdoor Recreation or Environmentally Sensitive under the 1993 land use plan (except for the SNAs), if changed to Community, might remain as outdoor recreation areas or environmentally protected buffer areas but could be used for purposes less protective of natural vegetation. Other land use designation changes from the 1993 land use plan to the Preferred

Alternative land use plan that could create vegetation management issues similar to the above example are discussed below.

- *Environmentally Sensitive redesignated as Range/Training*. Range/Training land use includes use of land for ranges, maneuver areas, and vehicle maneuver areas. While areas designated as Environmentally Sensitive in the land use plan have always been operational training areas or closed training areas, the redesignation as Range/Training could be less protective of natural vegetation than a specific Environmentally Sensitive land use designation.
- *Environmentally Sensitive or Outdoor Recreation redesignated as Professional/ Institutional or Residential*. Professional/Institutional and Residential land use designations support development. Development could be designed to protect natural vegetation, but some vegetation clearing and effects to vegetative community functioning would result from any development in a previously undeveloped area. Development in an environmentally sensitive area would be expected to have a level of adverse consequence on vegetation.
- *Environmentally Sensitive or Outdoor Recreation redesignated as Airfield*. This land use designation change would probably be of the least concern on Fort Belvoir. Areas surrounding Davison Army Airfield that are currently designated as Environmentally Sensitive and Outdoor Recreation serve as safety and noise buffer areas between other land use areas and the airfield where constraints on development would still be necessary. It would be anticipated that these buffer areas would continue to be necessary and protected under the Preferred Alternative land use plan.

Table 4.8-3
Environmentally sensitive and outdoor recreation land use designation changes under the Preferred Alternative land use plan

General area of Post	1993 land use designations and Preferred Alternative land use designations	
	1993 Land Use designation changed to:	1993 outdoor recreation, land use designation changed to:
EPG	n/a	n/a
Davison Army Airfield (West of Fairfax County Parkway)	Airfield	Airfield
Central and Western Southwest area	Training	n/a
Eastern Southwest area (bordering Accotink Creek)	Community	n/a
Fort Belvoir North Post Golf Course (north of Kingman Road and west of HEC)	Community	Community
Northeast North Post and North Post areas near Route 1	Professional/Institutional, Community, Training, Residential	Professional/Institutional, Community
South Post bordering Accotink Bay	Professional/Institutional, Community	Community
South Post golf course	n/a	Professional/Institutional, Community
South Post Eastern and Southern areas	n/a	Community, Residential

Changes in the land use designation of areas adjoining Environmentally Sensitive and Outdoor Recreation areas would not have an effect on vegetation. Areas with all other land use designations under the 1993 land use plan currently adjoin Environmentally Sensitive and Outdoor Recreation areas and are therefore subject to development. The situation would not change under the Preferred Alternative land use plan.

4.8.2.1.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Areas of the Main Post that would be disturbed by the construction are largely in previously developed areas and not within areas specifically managed for natural resources conservation, such as the Forest and Wildlife Corridor. Most of the area proposed for development on EPG under the Preferred Alternative is also previously disturbed. Table 4.8-4 identifies the types of vegetative communities that would be disturbed under the Preferred Alternative and the total area of projects proposed for different areas of the Post. The hardwood and mixed pine-hardwood stands are more representative of the natural vegetation of the region. This type of vegetation is found in areas proposed for development on EPG that are nearest to the EQC and the eastern boundary of EPG and on the Main Post at the southern end of the South Post area. Loss of the vegetation would reduce the amount of hardwood and mixed forest on the installation but would not substantially reduce the amount of the vegetative community types.

Nevertheless, the large amount of development associated with the Preferred Alternative would require the conversion of much vegetated area on the Main Post and EPG to developed areas, would increase habitat fragmentation and reduce habitat connectivity, would be expected to increase the occurrence of invasive species in fragmented habitats, and could reduce the overall ecological integrity of the installation's natural habitats. Implementation of BRAC at Fort Belvoir would further reduce the quantities of a variety of vegetative communities in a region that has already lost a large quantity of its natural landscape.

Table 4.8-4
Vegetative community types potentially impacted by projects proposed under the Preferred Alternative

Area of Post	Vegetative community types potentially affected	Total approximate acres of projects proposed in area
EPG	Virginia pine, old field, hardwood, mixed pine-hardwood	108
North Post	Hardwood	11
South Post–golf course	White pine, hardwood, loblolly pine	28
South Post–other areas	Hardwood	17

4.8.2.2 Wildlife

4.8.2.2.1 Land Use Plan Update

Long-term minor adverse effects would be expected. Impacts of the land use plan update on wildlife would generally be similar to those on vegetation—that is, areas previously designated as Environmentally Sensitive or Outdoor Recreation (except the SNAs) could potentially be used for purposes incompatible with natural resources management goals under the new land use

designations. Protection of the most important wildlife areas on the Main Post, however—the three SNAs on Fort Belvoir—and the limited amount of development in the Southwest Area and shoreline zones of the South Post, would be expected to limit the impact of land use designation changes on wildlife species.

4.8.2.2.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Effects on wildlife species—not including endangered, threatened, or sensitive species (which are discussed below)—of the implementation of BRAC projects would largely parallel changes to natural vegetation. Loss of natural vegetation would impact wildlife as a loss of habitat and the potential negative consequences of BRAC implementation on vegetative communities (i.e., fragmentation, loss of connectivity, increases of invasive species) would also adversely affect wildlife species. Restricted wildlife movements between areas that provide different life-history necessities can limit a population's viability, and isolated populations of a species can suffer from reduced genetic interchange. Projects proposed under the Preferred Alternative would not directly affect critical wildlife management areas such as the Forest and Wildlife Corridor and areas bordering Accotink Bay. The most important effects of BRAC development on wildlife, therefore, would predominantly be the impacts from losses of habitat on the eastern half of EPG and the southern extent of the South Post.

4.8.2.3 Endangered, Threatened, and Sensitive Species

4.8.2.3.1 Land Use Plan Update

Long-term minor adverse effects would be expected. A change in land use designation from Environmentally Sensitive or Outdoor Recreation to any land use designation under the Preferred Alternative land use plan could have adverse consequences for protected or sensitive species. Other land use designation changes under the Preferred Alternative land use plan would not be expected to affect sensitive or protected species because development is already a potential on land designated as anything other than Environmentally Sensitive. No effects on sensitive or protected species from a change in land use designation would occur on EPG because all areas of EPG are available for some type of development under both the 1993 land use plan and the Preferred Alternative land use plan.

4.8.2.3.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed under the Preferred Alternative could have an impact on fauna and flora special species areas on EPG and on fauna special species areas on the South Post. Projects proposed on EPG could reduce the quantity of habitat for the following PIF species: field sparrow, prairie warbler, wood thrush, and worm-eating warbler. A total of 179 acres of PIF habitat, 8 acres of sensitive flora habitat, and 6 acres of sensitive fauna habitat would be lost under the alternative. Additionally, the small whorled pogonia has been found on the western portion of EPG and it is the only known location of the species in Fairfax County (WSSI, 2005). The west EPG parcel has numerous areas rated as medium- and high-quality small whorled pogonia habitat and could harbor the species in a dormant state in the soil or serve as an expansion area for the species' recovery. Small whorled pogonias can remain dormant for several years in the soil between aboveground appearances of the plant (WSSI, 2006). A project for the South Post, a family travel camp, is proposed for areas identified as *occasional-use foraging areas* for bald eagles. This occasional-use foraging area extends from the mouth of Accotink Bay to Dogue Creek. Additionally, the family travel camp

would be constructed in an area designated as habitat for the worm-eating warbler, a PIF species. The family travel camp project area is also an area where seeps of the type that support the northern Virginia well amphipod occur, and indirect impacts on that species could occur from development. Finally, road improvement projects pass through wood turtle habitat.

4.8.2.4 Sensitive Natural Areas

4.8.2.4.1 Land Use Plan Update

Long-term moderate adverse effects would be expected. Sensitive natural areas on Fort Belvoir include the three SNAs, grassland management areas, wetlands, riparian buffers, and the EQC on EPG. Under the 1993 land use plan, these areas occur under several land use designations. As with vegetation, wildlife, and protected and sensitive species, only sensitive natural areas (other than the three SNAs) that occur on land designated as Environmentally Sensitive or Outdoor Recreation under the 1993 land use plan would potentially be affected under the Preferred Alternative land use plan. Adverse effects on all types of sensitive natural areas on Fort Belvoir, therefore, are possible under the Preferred Alternative land use plan.

4.8.2.4.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed for EPG are in or near the EQC and in areas with wetlands; projects proposed for the South Post could affect wetlands, riparian buffers, and RPAs; and projects in the North Post could indirectly encroach upon the Forest and Wildlife Corridor and create additional edge effect and invasive species incursions. Approximate acreages of natural resources that could be directly affected under the proposed action are 21 acres of the EQC, 2 acres of wetlands, 6 acres of riparian buffers, and 14 acres of RPAs.

4.8.2.5 BMPs/Mitigation

BMPs. Measures that the Army can consider to reduce the impacts of the Preferred Alternative on biological resources include:

- Ensure no development occurs in SNAs
- Adhere to Fort Belvoir Natural Resources management policies and goals, as specified in the INRMP
- Replace habitat lost to development with native community habitat
- Avoid construction during breeding bird nesting seasons
- Place signage identifying the EQC, SNAs, endangered and threatened species habitats and use areas, and riparian corridors in newly developed areas near these sensitive natural areas
- Use low-impact development techniques to limit the loss of natural vegetation
- Enforce no-entry zones around bald eagle nest buffers
- Identify and mark bald eagle perch trees to avoid their being removed for development
- Create through habitat manipulation new areas suitable for PIF species whose habitat areas are reduced by BRAC development

Mitigation. No specific mitigation measures are identified.

4.8.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

4.8.3.1 Vegetation

4.8.3.1.1 Land Use Plan Update

Long-term moderate adverse effects would be expected. The discussion in Section 4.8.2.1.1 applies equally to a change from the 1993 land use plan to the Town Center Alternative land use plan. In terms of the potential effect on vegetation, the differences between the Preferred Alternative land use plan and the Town Center Alternative land use plan are negligible. All areas designated as Environmentally Sensitive or Outdoor Recreation—the land use areas of most concern to natural resource management—under the 1993 land use plan would be redesignated under the Town Center Alternative land use plan, as listed in Table 4.8-5.

Table 4.8-5
Environmentally Sensitive and Outdoor Recreation land use designation changes under the Town Center Alternative land use plan

	1993 land use designations and Town Center Alternative land use designations	
General area of Post	**1993 Environmentally Sensitive land use designation changed to:**	**1993 Outdoor Recreation, land use designation changed to:**
EPG	n/a	n/a
Davison Army Airfield (west of Fairfax County Parkway)	Airfield, Professional/Institutional	Airfield
Central and Western Southwest area	Range/Training	n/a
Eastern Southwest area (bordering Accotink Creek)	Community	n/a
Fort Belvoir North Post Golf Course (north of Kingman Road and west of HEC)	Community	Community
Northeast North Post and North Post areas Near Route 1	Professional/Institutional, Community, Residential	Professional/Institutional, Community
South Post bordering Accotink Bay	Professional/Institutional, Community	Community
South Post golf course	n/a	Professional/Institutional, Community, Residential
South Post Eastern and Southern areas	n/a	Community, Residential

4.8.3.1.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Effects on vegetation of the BRAC construction proposed under the Town Center Alternative would be similar to those for the Preferred Alternative (see Section 4.8.2.1.2). Compared to the Preferred Alternative, the Town Center Alternative would potentially result in fewer adverse effects on natural vegetation because less mixed and hardwood forest would be disturbed at the southern end of the South Post on the Main Post. Development would be concentrated on the North Post and the South Post golf course area. Table 4.8-6 identifies the types of vegetative communities that would be disturbed under the

Town Center Alternative and the total area of projects proposed for different areas of the Post. Nevertheless, the amount of development that would occur under BRAC would, as under the Preferred Alternative, convert a substantial amount of vegetated area to developed land.

Table 4.8-6
Vegetative community types potentially affected by projects proposed under the Town Center Alternative

Area of Post	Vegetative community types potentially affected	Total approximate acres of projects proposed in area
North Post	Hardwood	37
South Post–golf course	White pine, hardwood, loblolly pine	113
South Post–other areas	Hardwood	5

4.8.3.2 Wildlife

4.8.3.2.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.2.1 applies equally to a change from the 1993 land use plan to the Town Center Alternative land use plan. In terms of the potential effect on wildlife, the differences between the Preferred Alternative land use plan and Town Center Alternative land use plan are negligible.

4.8.3.2.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. As with the Preferred Alternative, projects proposed under the Town Center Alternative would not affect critical wildlife management areas such as the SNAs and areas bordering Accotink Bay, but the Town Center Alternative would result in the loss of more than 150 acres of pine and hardwood vegetated areas that support wildlife species. Indirect effects on wildlife such as habitat loss and fragmentation and could adversely affect some wildlife species. Most habitats directly affected under the Town Center Alternative would be in or near previously disturbed areas.

4.8.3.3 Endangered, Threatened, and Sensitive Species

4.8.3.3.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.3.1 applies equally to a change from the 1993 land use plan to the Town Center Alternative land use plan. In terms of the potential effect on protected and sensitive species, the differences between the Preferred Alternative land use plan and the Town Center Alternative land use plan are negligible.

4.8.3.3.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects would be expected. Projects proposed under the Town Center Alternative could have a minor effect on fauna special species areas on the South Post. One project proposed on the South Post, a family travel camp, is proposed for an area that is occasionally used by bald eagles for foraging and that is in an area designated as habitat for the worm-eating warbler, another PIF species. A total of 30 acres of PIF habitat, 2 acres of sensitive fauna habitat, and 2 acres of grassland management areas would be lost under the alternative. The

proposed projects would not affect the habitats of other protected or sensitive species on the South Post or any protected or sensitive species on the North Post, Southwest Area, or EPG.

4.8.3.4 Sensitive Natural Areas

4.8.3.4.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.4.1 applies equally to a change from the 1993 land use plan to the Town Center Alternative land use plan. In terms of the potential effect on sensitive natural areas, the differences between the Preferred Alternative land use plan and the Town Center Alternative land use plan are negligible.

4.8.3.4.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed for the North Post and South Post would be near wetlands, riparian buffers, and RPAs. Approximate acreages of natural resources that could be affected under the Town Center Alternative are one acre of wetlands, 11 acres of riparian buffers, and 18 acres of RPAs.

4.8.3.5 BMPs/Mitigation

The BMPs listed for the Preferred Alternative apply equally to the Town Center Alternative to reduce the adverse effects of the Town Center Alternative on biological resources.

4.8.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.8.4.1 Vegetation

4.8.4.1.1 Land Use Plan Update

Long-term moderate adverse effects would be expected. The discussion in Section 4.8.2.1.1 applies equally to a change from the 1993 land use plan to the City Center Alternative land use plan. In terms of the potential effect on vegetation, the differences between the Preferred Alternative land use plan and the City Center Alternative land use plan are negligible. All areas designated as Environmentally Sensitive or Outdoor Recreation—the land use areas of most concern to natural resource management—under the 1993 land use plan would be redesignated under the City Center Alternative land use plan, as listed in Table 4.8-7.

Table 4.8-7
Environmentally Sensitive and Outdoor Recreation land use designation changes under the City Center Alternative land use plan

General area of Post	1993 land use Designations and City Center Alternative land use designations	
	1993 Environmentally Sensitive land use designation changed to:	1993 Outdoor Recreation land use designation changed to:
EPG	n/a	n/a
Davison Army Airfield (west of Fairfax County Parkway)	Airfield, Professional/Institutional	Airfield
Central and Western Southwest area	Range/Training	n/a
Eastern Southwest Area (bordering Accotink Creek)	Community	n/a
Fort Belvoir North Post golf course (north of Kingman Road and west of HEC)	Community	Community
Northeast North Post and North Post Areas Near Route 1	Professional/Institutional, Community, Residential	Professional/Institutional, Community
South Post bordering Accotink Bay	Professional/Institutional, Community	Community
South Post golf course	n/a	Professional/Institutional, Community, Residential
South Post Eastern and Southern areas	n/a	Community, Residential

4.8.4.1.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Effects on vegetation of the BRAC construction proposed under the City Center Alternative would be similar to those for the Preferred Alternative (see Section 4.8.2.1.2). The following differences distinguish the two alternatives: compared to the Preferred Alternative, the City Center Alternative would result in more adverse effect on natural vegetation on EPG. The City Center Alternative concentrates development on the eastern half of EPG, which would result in more loss of hardwood and mixed forest vegetative areas than under the Preferred Alternative. The eastern half of EPG is where most previously disturbed areas are, but EPG does represent an isolated area of semi-natural and natural land in a heavily developed region, and implementing the City Center Alternative could result in the loss of a substantial amount of its natural vegetation.

Disturbance of natural vegetation on the Main Post under this alternative would be less than that under the Preferred Alternative, primarily because less vegetation would be disturbed on the South Post. The City Center Alternative in general concentrates development on previously developed and undeveloped areas on EPG and avoids the loss of naturally vegetated areas on the Main Post. Table 4.8-8 identifies the types of vegetative communities that would be disturbed under the City Center Alternative and the total area of projects proposed for different areas of the Post.

No impacts on vegetation at the GSA parcel would be expected, as the area does not support natural vegetative communities.

Table 4.8-8
Vegetative community types potentially affected by projects proposed under the City Center Alternative.

Area of Post	Vegetative community types potentially affected	Total approximate acres of projects proposed in area
EPG	Virginia pine, loblolly pine, old field, hardwood, mixed pine-hardwood	95
North Post	Hardwood	11
South Post–golf course	Hardwood	5
South Post–other areas	Hardwood	5

4.8.4.2 Wildlife

4.8.4.2.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.2.1 applies equally to a change from the 1993 land use plan to the City Center Alternative land use plan. In terms of the potential effect on wildlife, the differences between the Preferred Alternative land use plan and the City Center Alternative land use plan are negligible.

4.8.4.2.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed under the City Center Alternative would result in the loss of a substantial amount of PIF habitat on eastern EPG and could affect the habitats of the EQC, and would result in the loss of more than 110 acres of pine and hardwood vegetated areas that support wildlife species. Indirect effects on wildlife such as habitat loss and fragmentation and could adversely affect some wildlife species. Critical wildlife management areas such as the SNAs and areas bordering Accotink Bay would not be affected.

No impacts on wildlife at the GSA parcel would be expected, as the area does not support natural wildlife habitats.

4.8.4.3 Endangered, Threatened, and Sensitive Species

4.8.4.3.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.3.1 applies equally to a change from the 1993 land use plan to the City Center Alternative land use plan. In terms of the potential impact on protected and sensitive species, the differences between the Preferred Alternative land use plan and the City Center Alternative land use plan are negligible.

4.8.4.3.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed under the City Center Alternative could affect fauna special species areas on EPG and the South Post. Projects proposed on EPG would affect the habitats of the following PIF species: field sparrow, prairie warbler, wood thrush, and worm-eating warbler. A project proposed on the South Post, a family travel camp, is proposed for an area occasionally used by bald eagles for foraging and that is designated as habitat for the worm-eating warbler, another PIF species. The family travel camp project area is also an area where seeps of the type that support the northern Virginia well amphipod occur,

and indirect impacts on that species could occur from development. Of all the alternatives, the City Center Alternative would have the greatest adverse effect on PIF species. A total of 180 acres of PIF habitat, 8 acres of sensitive flora habitat, and 6 acres of sensitive fauna habitat would be lost under the alternative. The proposed projects would not affect the habitats of other protected or sensitive species on the South Post or any protected or sensitive species on the North Post or Southwest Area.

No impacts on endangered, threatened, or sensitive species at the GSA parcel would be expected, as the area does not support such species.

4.8.4.4 Sensitive Natural Areas

4.8.4.4.1 Land Use Plan Update

Long-term moderate adverse effects would be expected. The discussion in Section 4.8.2.4.1 applies equally to a change from the 1993 land use plan to the City Center Alternative land use plan. In terms of the potential impact on sensitive natural areas, the differences between the Preferred Alternative land use plan and the City Center Alternative land use plan are negligible.

4.8.4.4.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed for EPG are in areas with wetlands, and projects proposed for the South Post could affect wetlands, riparian buffers, and resource protection areas. Approximate acreages of natural resources that could be affected under the City Center alternative include 2 acres of wetlands, 4 acres of riparian buffers, and 14 acres of RPAs.

No impacts on sensitive natural areas at the GSA parcel would be expected, as the area does not support such areas.

4.8.4.5 BMPs/Mitigation

The BMPs listed for the Preferred Alternative apply equally to the City Center Alternative to reduce the adverse effects of the City Center Alternative on biological resources.

4.8.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

4.8.5.1 Vegetation

4.8.5.1.1 Land Use Plan Update

Long-term moderate adverse effects would be expected. The discussion in Section 4.8.2.1.1 largely applies to a change from the 1993 land use plan to the Satellite Campuses Alternative land use plan. In terms of the potential effect on vegetation, the differences between the Preferred Alternative land use plan and the Satellite Campuses Alternative land use plan are negligible, with one exception: under the Satellite Campuses Alternative land use plan the designation of the entire Davison Army Airfield and its buffer area as Professional/Institutional could lead to a loss of natural vegetation in the area in the future if, without the need for airfield buffer areas, development were to occur in the area. All areas designated as Environmentally Sensitive or Outdoor Recreation—the land use areas of most concern to natural resource management—under

the 1993 land use plan would be redesignated under the Satellite Campuses Alternative land use plan, as listed in Table 4.8-9

Table 4.8-9
Environmentally Sensitive and Outdoor Recreation land use designation changes under the Satellite Campuses Alternative land use plan

General area of post	1993 land use designations and Satellite Campuses Alternative land use designations	
	1993 Environmentally Sensitive land use designation changed to:	1993 Outdoor Recreation land use designation changed to:
EPG	n/a	n/a
Davison Army Airfield (west of Fairfax County Parkway)	Professional/Institutional	Professional/Institutional
Central and Western Southwest area	Range/Training	n/a
Eastern Southwest area (bordering Accotink Creek)	Community	n/a
Fort Belvoir North Post golf course (north of Kingman Road and west of HEC)	Community	Community, Professional/Institutional
Northeast North Post and North Post areas Near Route 1	Professional/Institutional, Community, Residential	Professional/Institutional, Community
South Post bordering Accotink Bay	Community, Industrial, Troop	Community
South Post golf course	n/a	Professional/Institutional, Community, Residential
South Post Eastern and Southern areas	n/a	Community, Residential

4.8.5.1.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Effects on vegetation of the BRAC construction proposed on the South Post under the Satellite Campuses Alternative would be slightly less than those under the City Center Alternative (see Section 4.8.4.1.2). Projects on the North Post that are south of Kingman Road are in currently developed areas, and development under the Satellite Campuses Alternative on the Davison Army Airfield and the North Post golf course would be concentrated on previously developed areas. Overall, the Satellite Campuses Alternative disperses development on the Main Post and would directly disturb less area of natural vegetative community on the post than would the Preferred Alternative, but dispersing the loss of vegetated areas could have the indirect effect of causing more habitat fragmentation and more invasive species incursions. Table 4.8-10 identifies the types of vegetative communities that would be disturbed under the Satellite Campuses Alternative and the total area of projects proposed for different areas of the Post.

Table 4.8-10
Vegetative community types potentially affected by projects proposed under the Satellite Campuses Alternative

Area of Post	Vegetative community types potentially affected	Total approximate acres of projects proposed in area
Davison Army Airfield	(urban areas only)	56
North Post golf course	White pine	23
Other North Post	Hardwood, Virginia pine, loblolly pine	76
South Post–golf course	Hardwood	5
South Post–other areas	Hardwood	5

4.8.5.2 Wildlife

4.8.5.2.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.2.1 applies equally to a change from the 1993 land use plan to the Satellite Campuses Alternative land use plan. In terms of the potential effect on wildlife, the differences between the Preferred Alternative land use plan and the Satellite Campuses Alternative land use plan are negligible.

4.8.5.2.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed under the Satellite Campuses Alternative would result in the loss of more than 100 acres of pine and hardwood vegetated areas that support a variety of wildlife species. Indirect effects on wildlife such as habitat loss and fragmentation and could also adversely affect wildlife species. Critical wildlife management areas such as the SNAs and areas bordering Accotink Bay would not be affected.

4.8.5.3 Endangered, Threatened, and Sensitive Species

4.8.5.3.1 Land Use Plan Update

Long-term minor adverse effects would be expected. The discussion in Section 4.8.2.3.1 applies equally to a change from the 1993 land use plan to the Satellite Campuses Alternative land use plan. In terms of the potential effect on protected and sensitive species, the differences between the Preferred Alternative land use plan and the Satellite Campuses Alternative land use plan are negligible.

4.8.5.3.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects would be expected. Projects proposed under the Satellite Campuses Alternative could affect fauna special species areas on EPG and the South Post. The effect of implementing the Satellite Campuses Alternative on sensitive and protected species would be nearly identical to the effect under the Town Center Alternative. Projects proposed on EPG could affect habitat of the prairie warbler, a PIF species, and a project on the South Post is proposed for an area that is occasionally used by bald eagles for foraging and that is designated as habitat for the worm-eating warbler, another PIF species. A total of 38 acres of PIF habitat, 2 acres of sensitive fauna habitat, and 2 acres of grassland management areas would be lost under the alternative. The proposed projects would not affect the habitats of other protected or sensitive

species on the South Post or any protected or sensitive species on the North Post or Southwest Area.

4.8.5.4 Sensitive Natural Areas

4.8.5.4.1 Land Use Plan Update

Long-term moderate adverse effects would be expected. The discussion in Section 4.8.2.4.1 applies equally to a change from the 1993 land use plan to the Satellite Campuses Alternative land use plan. In terms of the potential effect on sensitive natural areas, the differences between the Preferred Alternative land use plan and the Satellite Campuses Alternative land use plan are negligible.

4.8.5.4.2 BRAC Implementation and Facilities Projects

Long-term moderate adverse effects would be expected. Projects proposed for the North Post and South Post are in areas with wetlands, riparian buffers, and RPAs. Approximate acreages of natural resources that could be affected under the Satellite Campuses Alternative are 3 acres of wetlands, 24 acres of riparian buffers, and 44 acres of RPAs.

4.8.5.5 BMPs/Mitigation

The BMPs listed for the Preferred Alternative apply equally to the Satellite Campuses Alternative to reduce the adverse effects of the Satellite Campuses Alternative on biological resources.

4.8.6 NO ACTION ALTERNATIVE

Under the No Action Alternative, no effects would be expected on the biological resources of the installation.

4.8.7 SUMMARY OF COMPARISON OF ALTERNATIVES

Table 4.8-11 summarizes the overall impact of the Preferred Alternative and the other alternatives relative to each other on natural resources.

Main Post. The primary areas of biological resources concentration on the Main Post are the Southwest Area, land bordering the shores of the South Post, and the SNAs. All alternatives were conceived to avoid substantial development encroachment in the Southwest Area and the SNAs are protected from development, so it is the amount of development in the shoreline areas of the South Post that primarily determines the severity of the impact of each alternative on biological resources of the Main Post. Apart from the family travel camp (see Section 4.8.2.3.2), none of the alternatives have concentrations of development in the South Post shoreline zones. The alternatives would all reduce vegetated areas on the post by a substantial amount and could indirectly affect vegetative communities and wildlife through habitat fragmentation and isolation and increased occurrences of invasive species, which would result in a loss of ecological integrity.

EPG. Natural habitat on EPG has been re-establishing itself since the 1970s, when intensive training activities on EPG ceased. West of Accotink Creek, development has been minimal, and east of Accotink Creek, the developed areas have not been used intensively in recent years. Natural aspects of the area east of Accotink Creek—such as woody growth and the use of

undisturbed open areas by breeding birds—have increased. The Preferred and City Center Alternatives have the greatest adverse effects on the biological resources on EPG because they have more project development in EPG, while the Town Center and Satellite Campuses Alternatives have less development occurring on EPG.

Overall, therefore, the City Center Alternative would have the greatest adverse effect on the biological resources of Fort Belvoir, followed by the Preferred Alternative. The Town Center and Satellite Campuses Alternatives would have fewer impacts on biological resources than the other two alternatives. Non-BRAC projects, discussed in Section 5, Cumulative Effects, increase the effects on biological resources under all alternatives equally.

Table 4.8-11
Potential effects (in acres) on natural resources of BRAC projects under all alternatives

Natural Resource	Preferred Alternative	Town Center Alternative	City Center Alternative	Satellite Campuses Alternative
Wetlands	2	1	2	3
RPAs	14	18	14	44
Riparian buffers	6	11	4	24
Wildlife corridor	0	0	0	0
Grassland management areas	0	2	0	2
PIF breeding bird habitat	179	30	180	38
Sensitive flora habitat	8	0	8	0
Sensitive fauna habitat	6	2	6	2
EPG EQC	21	0	21	0

4.9 CULTURAL RESOURCES

Cultural resources are aspects of the physical environment that relate communities to their culture and history. They provide definition for communities and link them to their surroundings. Cultural resources include tangible remains of past activities that show use or modification by people. This type of cultural resource can include prehistoric and historic archaeological sites, buildings, structures, objects, or districts. Cultural resources can also include aspects of the natural environment, such as landscapes, specific places, topographic features, or biota, which are part of traditional lifeways and practices and are associated with community values and institutions.

4.9.1 AFFECTED ENVIRONMENT

4.9.1.1 Prehistoric and Historic Contexts of Fort Belvoir

The importance or significance of a cultural resource can be explained only when it is evaluated within its prehistoric or historic context. Contexts are those patterns or trends in history by which a specific resource is understood and its meaning (and ultimately its significance) within prehistory and history is made clear (NPS, 1997). The following section describes the major patterns of prehistory and history for Fort Belvoir and its vicinity.

4.9.1.1.1 Prehistoric Period

The Paleoindian Period represents the earliest known human occupation of North America, in the Mid-Atlantic region dating from 12,000 to 8,000 B.C., thus artifacts and sites from this time period are rare and very important. A fluted projectile point from this period has been found near Davison Army Airfield on Fort Belvoir (Fort Belvoir, 2006b). The Archaic Period dates from 8,000 to 1,000 B.C. and is noted by a shift to a heavier reliance on small game and an increased emphasis on plant foods compared to the Paleoindian Period. The Woodland Period dates from 1,000 B.C. to A.D. 1,600. Greater sedentism continued to develop, with two prominent site types—large base camps and small, briefly occupied foray camps. Artifacts from the Early Archaic through Woodland Period have been recovered at Fort Belvoir, including identifiable projectile points and ceramic fragments. The most common type of prehistoric site identified at Fort Belvoir is the lithic artifact scatter, but no diagnostic tools or ceramics have been recovered from these sites (Goodwin & Associates, 2001). Most of these sites were found on upland terraces and bluffs overlooking the three creeks (Accotink, Dogue, Pohick) and the Potomac River.

4.9.1.1.2 Historic Period

European Contact

Native Americans who lived in the region in which Fort Belvoir is located during the historical period include the Doeg (also spelled as Dogue) Indians, who controlled the middle portion of the Potomac River. The earliest Europeans to visit the area were Captain John Smith and his crew, whose expedition sailed up the Potomac River in 1608 as far as what is now Arlington County. Smith's famous map shows the main Doeg town of Tauxenent located on the Occoquan River, south of Fort Belvoir (Goodwin & Associates, 2001; Fort Belvoir, 2006b).

17th through 19th Centuries

European settlers arrived in present-day Fairfax County around 1664. Much of Northern Virginia, including the present location of Fort Belvoir, came under the ownership of a single family, the Fairfaxes, after whom Fairfax County, Virginia, was named. By the mid 18th century, multiple estates were established within and adjacent to present-day Fort Belvoir, including: Dennis McCarty's Cedar Grove and Mount Air (ca. 1718); William Fairfax's Belvoir (1741); George Washington's Mount Vernon (1742; 1757; 1787); and George Mason's Gunston Hall (1755) (Fort Belvoir, 2006b). Churches also were built in the area, including Pohick Church, which was constructed between 1769−1774 by the Anglican Truro Parish at the present-day intersection of U.S. Route 1 and Old Colchester Road. Industrial enterprises, such as George Washington's grist mill, were established in the area during the late 18th century, indicating that the surrounding population was substantial enough to require these services.

In 1783 the Belvoir estate was destroyed by fire. During the War of 1812, it was devastated again by British forces. By the 1820s, the estate had moved out of Fairfax family ownership. McCarty's Cedar Grove and Mount Air estates similarly changed hands and declined in those years. During this period, however, George Washington's nephew constructed Woodlawn Plantation (1800−1805) on a site that overlooked the Potomac River, near present-day Fort Belvoir. At about the same time, the village of Accotink developed around a grist mill near the intersection of Accotink Creek and Colchester Road (Fort Belvoir, 2006b).

In the mid 19th century, as large tobacco-producing manors worked by slaves were becoming a thing of the past, a new era began, during which settlers hailing from northern states moved to the area of present-day Fort Belvoir. The Society of Friends, or Quakers, was among these. The Society created a thriving community near Woodlawn, which had fallen on hard times. The Quakers were committed to nonviolence, education, and the use of progressive farming methods, and they opposed slavery. Before the Civil War, they established the Woodlawn Friends Meeting House and Burial Ground along present-day U.S. Route 1.

During the Civil War, the Belvoir area, removed from the major theater of operations, continued to develop in relative stability (Fort Belvoir, 2006b). The subdivision of some tobacco plantations, coupled with poor soil conditions and difficult economic times affected settlement patterns in the region. In the post-Civil War era, black and white communities developed strong social and cultural institutions in the area, including churches, schools, and clubs (Goodwin & Associates, 2001).

4.9.1.1.3 Federal Acquisition of Fort Belvoir

In 1910 the federal government acquired a 1,500-acre tract on the Belvoir peninsula. The property eventually came under control of the War Department for use by the U.S. Army as a training site for the U.S. Army Engineer School. Following the U.S. entry into World War I in 1917, a temporary cantonment, named Camp A.A. Humphreys in honor of Civil War Commander and former Chief of Engineers, Andrew A. Humphreys, was established in 1918 in the general vicinity of the present-day South Post. At that time, additional parcels were purchased, resulting in a dramatic transformation for this traditionally agrarian area (Fort Belvoir, 2006b).

To make the area suitable for military activity, roads, railroads, temporary buildings, and a water system were built. A water filtration plant, known as Camp A.A. Humphreys Pump Station and Filter Building, was erected on the site of the former Accotink Mill and survives today. By the end of World War I, nearly 55,000 personnel had been trained at the camp's multiple schools,

including the Engineer Replacement and Training Camp, the Engineer Officers' Training Center, the Army Gas School and the School of Military Mining. At the conclusion of the war, the camp became a demobilization center for troops making their way home. By 1919 the camp encompassed 6,000 acres, including the newly acquired area comprising the present-day North Post and Davison Army Airfield, and became the permanent home of the U.S. Army Corps of Engineers, relocated from present-day Fort McNair in Washington, DC (Fort Belvoir, 2006b).

4.9.1.1.4 Interwar Period

In 1922 the camp was designated a permanent post and renamed Fort Humphreys. The Engineers School offered training in a variety of fields, including forestry, road and railroad construction, camouflage, mining, surveying, pontoon construction, photography, printing, and cooking, and included the Reserve Officers Training Corps (ROTC) programs. The Engineer Board, a forerunner to the research and development (R&D) center at Fort Belvoir, was relocated to Fort Humphreys during this period (Fort Belvoir, 2006b). At this time, *temporary*, Craftsman-style, wood-frame houses (commonly referred to as *T-400s* housing) were designed and constructed (USACE, 2003).

During the interwar years, Fort Humphreys further evolved as it became the focus of an intense Army-wide building program designed to replace the majority of temporary buildings hastily constructed during World War I. Around 1926, the U.S. Army Quartermaster Corps developed standardized architectural plans for installations throughout the nation. The plans were adapted to local climatic and building traditions. In the Mid-Atlantic region, where Fort Humphreys was located, they included red brick, Georgian-Colonial-Revival-style buildings (Fort Belvoir, 2006b).

From the mid 1920s to the mid 1930s, most, but not all, of Fort Humphrey's temporary buildings were replaced with permanent construction, including officers' housing, barracks, and a hospital designed in the Colonial Revival style. The site plan of the installation was redesigned, creatively combining contemporary design philosophies of City Beautiful and Garden City influences with a more traditional collegiate approach, resulting in a landscape that maintained practicality while responding to natural surroundings in a flexible and aesthetic manner. Designed by George Ford and Howard Nurse, the layout focused on a structured, hierarchical collegiate center surrounded by residential areas with curvilinear streets. Support buildings were placed at the edge of the post plan. The Long Parade Field served as the anchor of the site, with administrative and classroom buildings along the east side, and barracks, a theater, gym, exchange, and post office on the west side (Fort Belvoir, 2006b). A cluster of two-story Colonial Revival-Style administrative and service buildings, originally constructed as barracks, separated the parade ground from the noncommissioned officers' housing. The park-like Belvoir Village, Gerber Village, Rossell Loop Village, and Jadwin Loop Village were characterized by curving streets and cul-de-sacs that limited traffic flow and promoted a secluded atmosphere. These residential areas, evocative of an early 20th-century garden suburb, included common green spaces and took advantage of natural landscape features and vistas.

In 1935 following a period of renewed interest in the history of the area, Fort Humphreys was officially renamed Fort Belvoir in reference to its historic association with William Fairfax's Belvoir Manor (Fort Belvoir, 2006b). The majority of the 1930s-era buildings at Fort Belvoir survives today, and forms the core of the Fort Belvoir Historic District (USACE, 2003), which is eligible to the National Register of Historic Places (NRHP). Despite significant expansion

throughout the 20th century, particularly in the northern portion of the installation, the historic landscape plan of the southern core has remained intact.

World War II

During the early 1940s, as the US was gearing up for entry into World War II, Fort Belvoir was expanded again through the acquisition of 3,000 acres north of U.S. Route 1 for the Engineer Replacement Training Center (ERTC). This expansion displaced the small, historic African-American community at Woodlawn (Fort Belvoir, 2006b). ERTC provided basic military engineer training to draftees. By 1942 when the United States had officially entered the war, it trained personnel to construct and operate Army installations and weapon operations, and an officer candidate school was established at Fort Belvoir.

As the nation approached involvement in World War II, the Corps' Engineer Board at Fort Belvoir coordinated a program of specialized equipment development and then led an effort to increase the number of laboratories and proving grounds available to test modern military equipment. By 1940 the Engineer Board secured Fort Belvoir's EPG property from local landowners. EPG's facilities started with ranges and buildings for landmine deployment and detection; however, during the war years, these facilities expanded to include vehicle testing buildings and structures, an airfield, laboratories and offices, range observation buildings, and ammunition storage magazines (New South Associates, 2006).

During World War II, another wave of temporary construction accommodated the massive influx of male and female inductees. Wood-frame housing was constructed for approximately 24,000 men and officers. Unlike their World War I era counterparts, these units were equipped with indoor plumbing, central heating, and electricity. At the conclusion of World War II in 1945, Fort Belvoir reprised its role as a demobilization center for the troops. After 1945 activity waxed and waned in accordance with peacetime policies (Fort Belvoir, 2006b).

1946–Present

During the height of the Cold War in the 1950s, Fort Belvoir became heavily involved in R&D, to complement its original training mission. Many R&D activities were undertaken by the Engineer Research & Development Laboratories (ERDL), which became involved in a wide range of activities, including testing new techniques for electric power generation, camouflage and deception, fuel and materials handling, mine detection, and other projects.

Cold War-era innovation was reflected in numerous aspects of the built environment at Fort Belvoir. For example, in 1948–49, Albert Kahn & Associates, the Detroit-based architecture firm well known for its U.S. auto industry work, designed the prototype Thermo-Con House, a building that employed chemically treated concrete that rose from its foundation. The house, which survives today on Fort Belvoir's South Post, was touted as a demonstration of a method to rapidly construct low-cost, mass-produced housing (Fort Belvoir, 2006b).

During this period, Fort Belvoir experienced another housing construction boom following congressional passage of military housing construction bills sponsored by Senator Wherry and Congressman Capehart in 1949 and 1955, respectively. The purpose of the legislation was to provide federal funding to upgrade the living conditions of military personnel through the creation of additional Army family housing units. Other developments at Fort Belvoir during those years included the construction of the U.S. Army Package Power Reactor in 1957. Designed as the Army's first prototype nuclear generating plant, SM-1 (Stationary, Medium

Power–First Prototype) Nuclear Plant was used to generate electricity for commercial use and cut back on fossil fuel consumption. The plant was the first nuclear training facility for military personnel. The plant, which is still extant, operated from 1957 to 1973 (Fort Belvoir, 2006b) when the reactor was deactivated and the nuclear fuel removed. The plant was decommissioned in 1998.

Fort Belvoir's mission continued to expand during the Cold War with the establishment of multiple Army and DoD entities including DeWitt Hospital (1957), the Defense Systems Management College (1971) and the Defense Mapping School (1972). In 1988 the U.S. Army Engineer School transferred to Fort Leonard Wood. The MDW assumed operational control of Fort Belvoir. Since the conclusion of the Cold War in 1989, Fort Belvoir has continued to function as a key U.S. Army installation, hosting multiple tenants that support the Army's mission and providing essential administrative and basic operations support to these tenant organizations (Fort Belvoir, 2006b).

Development of ranges and facilities at EPG was most heavy from 1940 through the 1960s. The munitions-testing facility at EPG followed the U.S. Army Engineer School that left Fort Belvoir and transferred to Fort Leonard Wood, Missouri, in 1988, leaving the EPG largely unused since that time. Currently the only tenant at EPG is the U.S. Army Nuclear and Chemical Agency (USANCA), which occupies one building. The EPG landscape is gradually being reclaimed by nature (New South Associates, 2006).

4.9.1.2 Cultural Resources Compliance at Fort Belvoir

4.9.1.2.1 Statutes, Regulations, and Policy

A number of federal statutes address cultural resources and federal responsibilities regarding them. The long history of legal jurisdiction over cultural resources, dating back to the 1906 passage of the Antiquities Act (16 U.S.C. 431-433), demonstrates a continuing concern on the part of Americans for their cultural resources. Cultural resources include historic properties, as defined in the National Historic Preservation Act (NHPA); cultural items, as defined in the Archaeological and Historic Preservation Act (AHPA) and the Native American Graves Protection and Repatriation Act (NAGPRA); archaeological resources, as defined by the Archeological Resources Protection Act (ARPA); Indian-sacred sites to which access is provided under the American Indian Religious Freedom Act (AIRFA), as defined in Executive Order (EO) 13007; and collections and associated records, as defined at 36 CFR Part 79, *Curation of Federally Owned and Administered Collections*. Requirements set forth in this legislation, and their implementing regulations, define Fort Belvoir's responsibilities for management of cultural resources. Regulations applicable to the management of cultural resources include those promulgated by the Advisory Council on Historic Preservation (ACHP) and the National Park Service (NPS).

Foremost among these statutes is the NHPA of 1966, as amended (16 U.S.C. 470). Section 106 of the NHPA requires federal agencies to take into account the effect of federal undertakings on historic properties. Historic properties are cultural resources that are included in or eligible for inclusion in the NRHP. To be eligible for inclusion in the NRHP, a cultural resource must demonstrate a significant degree of physical integrity and meet one or more of the NRHP criteria for significance with respect to historical associations, cultural characteristics, and future research potential. The regulations that implement Section 106 (36 CFR Part 800) describe the process for identifying and evaluating cultural resources; assessing effects of federal actions on historic

properties; and consulting to avoid, reduce, or mitigate adverse effects. The NHPA does not require preservation of historic properties, but it does ensure that federal agency decisions concerning the treatment of these resources result from meaningful consideration of cultural and historic values, and identification of options available to protect the resources.

In addition, Army Regulation (AR) 200-4, *Cultural Resources Management*, and Department of the Army Pamphlet (PAM) 200-4, *Cultural Resources Management*, delineate the Army's policy for managing cultural resources to meet legal compliance requirements and to support the military mission. Fort Belvoir complies with these regulations as well.

4.9.1.2.2 Integrated Cultural Resources Management Plan (ICRMP)

In February 2001, Fort Belvoir adopted its ICRMP in compliance with AR 200-4, which requires that installations prepare plans, every 5 years, to assist them in appropriately managing and maintaining archaeological and historic architectural resources (Goodwin & Associates, 2001). The goals of the 2001 ICRMP include the following:

- Integrate cultural resources management into Fort Belvoir's operations and mission, consistent with federal, DoD, and Army regulations
- Develop programs to enhance project coordination, planning, and compliance
- Provide a basis for Programmatic Agreements (PAs) developed in compliance with Section 106 of NHPA
- Provide installation-specific procedures and recommendations for cultural resources management

The ICRMP establishes management strategies and standard operating procedures to assist Fort Belvoir in complying with federal laws and regulations concerning cultural resources management. The standards set forth procedures for dealing with archaeological and historic architectural resources largely based on Section 106 of NHPA and other Federal laws and regulations protecting cultural resources.

4.9.1.2.3 Fort Belvoir Historic District Maintenance Plan

In April 2001, a maintenance plan was prepared to provide proper maintenance guidance for multiple barracks, administrative, institutional, and recreational buildings in the Fort Belvoir Historic District. The maintenance plan includes existing conditions surveys. It outlines building maintenance issues and recommends historically appropriate repair schemes with their costs, in accordance with the *Secretary of Interior's Standards for Treatment of Historic Properties.*

4.9.1.2.4 Programmatic Agreements

A program-specific PA was signed by Fort Belvoir and the Virginia State Historic Preservation Officer (SHPO) in August 2003 to mitigate the adverse effects that implementing RCI would have on important historic resources both on and near the Main Post. The PA stipulates incorporation of multiple mitigation measures into the RCI development plans, including: context-sensitive design within and adjacent to National Register-eligible and -listed resources; historic property management procedures; alternatives to demolition; archaeological survey procedures; and documentation of historic resources.

A PA that addresses assessment and mitigation of potential adverse effects to historic properties from undertakings at Fort Belvoir is being developed for signature by Fort Belvoir, the USACE,

the Virginia SHPO, and the ACHP. The proposed BRAC action and land use plan update will fall under this PA. This PA will de developed in consultation with interested parties.

4.9.1.2.5 Status of Cultural Resource Identification Efforts at Fort Belvoir

Archaeological Investigations

Archaeological surveys have been completed for the entire installation at the Main Post and EPG, except for areas that have been identified as disturbed and thereby not likely to contain such resources. In 1994 the Virginia SHPO concurred that all required archaeological identification studies had been satisfactorily completed at the Main Post and EPG (Goodwin & Associates, 2001). More than 47 archaeological surveys and excavations had been conducted within the Main Post since the 1930s (Goodwin & Associates, 2001), including compliance surveys and excavations to comply with NHPA Sections 106 and 110. One comprehensive archaeological survey was conducted at EPG to comply with NHPA Section 110 (MAAR Associates, 1993). No archaeological studies have been completed at the GSA Parcel, which has been completely disturbed by construction activities.

Architectural Investigations

More than 16 architectural studies and evaluations have been conducted of buildings and structures at the Main Post. Reconnaissance-level survey of all pre-1946 properties has occurred, as well as recording and evaluation of 245 resources (Goodwin & Associates, 2001). A historic resource survey and evaluation was also conducted in 2006 (Milner & Associates, 2006). One comprehensive architectural survey has recently been conducted at EPG; this survey includes recording and evaluation of all extant properties (New South Associates, 2006). This report is under review by Fort Belvoir and will be submitted to the Virginia SHPO for consultation. No architectural studies have been completed at the GSA Parcel.

Cultural Landscape and Viewshed Investigations

In compliance with the RCI PA, a cultural landscape survey of the Main Post was recently completed and has received concurrence from the Virginia SHPO (Gray & Pape, 2004). Two viewshed impact studies have been conducted at Fort Belvoir, one of the Woodlawn Friends Meeting House (Fort Belvoir DPW ENRD, 2005b) and one for placement of equipment on top of the DeWitt Hospital (Fort Belvoir, 2005b). No landscape or viewshed studies have been conducted at the EPG or the GSA Parcel.

Future Planned Investigations

Survey and cultural resources documentation efforts outlined in the RCI PA and planned for future implementation include

- Historic American Buildings Survey (HABS) documentation of each type of National Register-eligible housing resource to be affected by implementation of RCI, including setting and surrounding landscape features
- Existing conditions survey of National Register-eligible housing, including interiors, exteriors and landscape features in historic housing areas
- Creation of an Internet-ready, multimedia presentation on the history of Army Family Housing at Fort Belvoir

In addition, Fort Belvoir also plans the following cultural resources initiatives over the next few years:

- Ongoing evaluation of resources that attain the National Register 50-year age criterion to be considered for inclusion in the NRHP-eligible Fort Belvoir Historic District
- Ongoing archaeological investigations to determine the significance of known sites, as appropriate, in accordance with NHPA Section 106 regulations and other authorities
- Historic building and district evaluation of approximately 50 buildings in the 300 Area in the southwest portion of the South Post

4.9.1.3 Archaeological Resources

The Area of Potential Effect (APE) under the NHPA is equivalent to the ROI under NEPA. For the proposed project and alternatives, the APE for archaeological resources includes areas within the external boundaries of the Main Post, EPG, and the GSA Parcel. The following sections present information on archaeological resources on these three parcels.

4.9.1.3.1 Known Archaeological Sites

A total of 301 archaeological sites, both prehistoric and historic, have been identified at the Main Post. Only one archaeological resource, an isolated prehistoric artifact evaluated as not eligible to the NRHP, has been discovered at EPG. Table 4.9-1 provides a summary of the sites' National Register status. A complete list of the sites is provided in the ICRMP (Goodwin & Associates, 2001).

Table 4.9-1
Eligibility status of known archaeological sites at the Main Post and EPG

NRHP status	Number	Percent
Not eligible	113	37%
Potentially eligible; not evaluated	177	59%
Determined eligible	11	3.5%
NRHP listed	1	0.5%
Total	**302**	**100%**

Source: Goodwin & Associates, 2001.

Both prehistoric and historic archaeological sites are throughout the Main Post with the most intensive concentration on Pohick Neck. Archaeological sites are most often along watercourses including creeks and larger rivers like those that run through or border Fort Belvoir.

One site, 44FX4, is listed on the NRHP. This site is the Fairfax plantation complex, which includes the Belvoir Mansion Ruins and adjacent Fairfax Grave Site. Phase II archaeological excavations were completed at the site in 1976 and additional excavations were completed in 1994 (Goodwin & Associates, 2001). The site consists of remnants of the main plantation house, associated outbuildings, and the gravesite.

Although the GSA Parcel has not been surveyed for archaeological resources, the parcel has been heavily disturbed by construction of the buildings (all warehouses) and parking areas, and by construction of the adjacent I-95 corridor. There are no recorded archaeological resources there, and because of the extent of disturbance, it is unlikely that intact archaeological resources are present.

4.9.1.3.2 Cemeteries

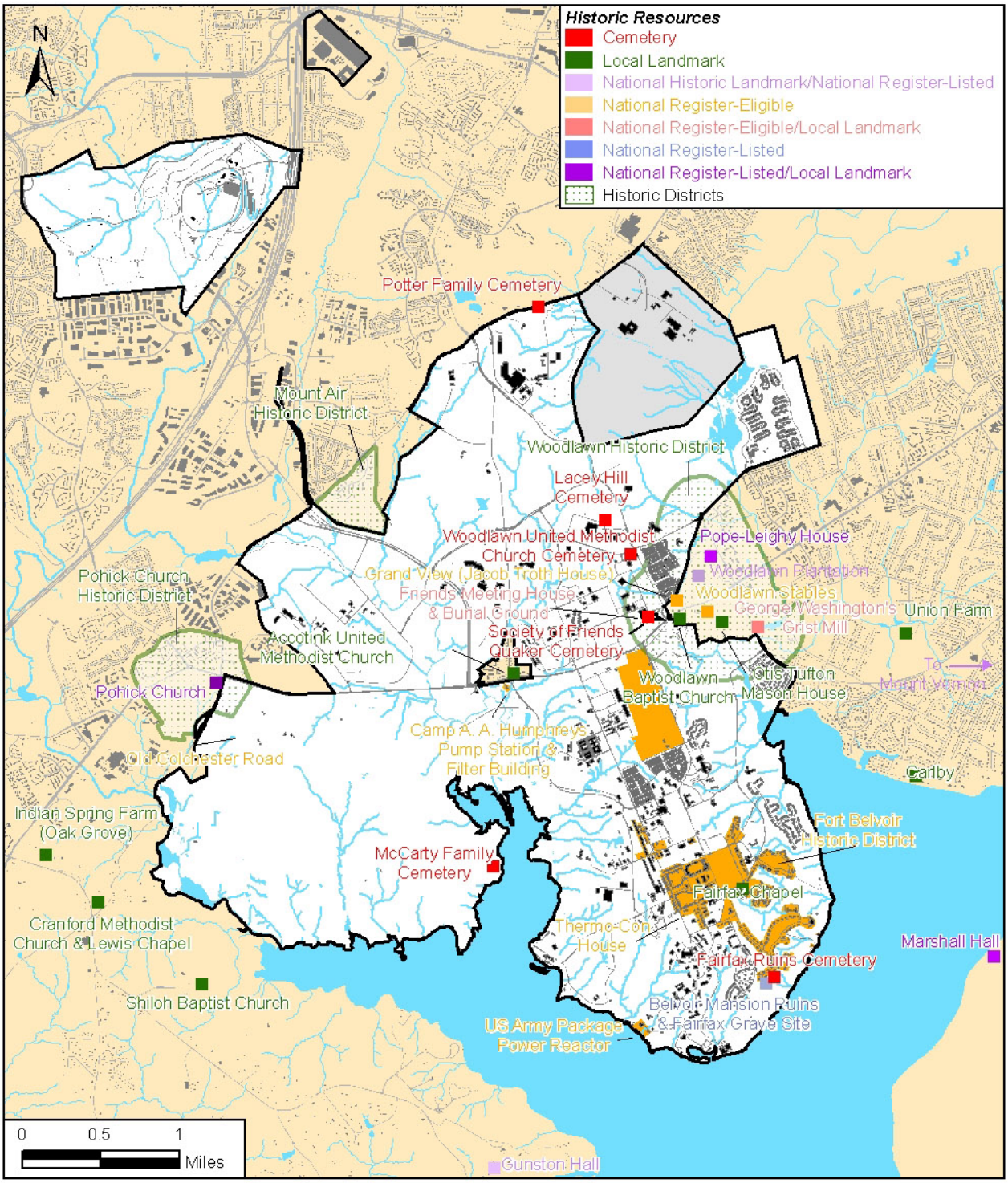
Six historic cemeteries are within the external boundaries of the Main Post. They are listed in Table 4.9-2 and shown on Figure 4.9-1. No cemeteries are at EPG or the GSA Parcel. Three of the cemeteries, Woodlawn United Methodist, Lacey Hill, and Society of Friends Quaker, are located on outgrants and not on land administered by Fort Belvoir.

Three archaeological investigations have been completed at three of the cemeteries. One study, completed in 1997, assessed the Lacey Hill and Woodlawn United Methodist cemeteries and concluded that although neither of the cemeteries was individually eligible for the National Register, they might contribute to a future Woodlawn African-American historic district (Goodwin & Associates, 2001). Another survey was completed at the Lacey Hill Cemetery, during the course of which 22 grave shafts were identified. The cemetery was identified as having been used until the late 1800s (Fort Belvoir DPW ENRD, 2002). Testing excavations were conducted at the Potter Family cemetery in 2005 and concluded that the cemetery is not eligible for the National Register. The Fairfax Ruins Cemetery is part of the National Register listing for Belvoir Mansion Ruins. The Quaker Cemetery is part of the Woodlawn Friends Meeting House property, which is a contributing resource to the National Register-eligible Woodlawn Historic District. The McCarty Family Cemetery has not been evaluated, and as such, is treated as potentially eligible until it is formally evaluated.

Table 4.9-2
Historic cemeteries at Fort Belvoir

Cemetery	Site number	Location	Ownership/ responsibility	National Register status
Woodlawn United Methodist Cemetery	44FX1210	Adjacent to North Post	Private congregation, out-grant	Not eligible individually; may be part of future historic district
Lacey Hill Cemetery	44FX1208	Adjacent to North Post	Private, out-grant	Not eligible individually; may be part of future historic district
Society of Friends Quaker Cemetery	44FX1211	Adjacent to North Post	Private congregation, out-grant	Contributes to the National Register-eligible Woodlawn Historic District
Potter Family Cemetery	44FX459	North Post	Fort Belvoir	Not eligible
Fairfax Ruins Cemetery	44FX4	South Post	Fort Belvoir	Listed as part of Belvoir Mansion Ruins property
McCarty Family Cemetery	44FX680	Southwest Area	Fort Belvoir	Not evaluated; potentially eligible

Sources: Goodwin & Associates, 2001; Fort Belvoir, GIS, 2006.



LEGEND

Installation Property

Historic Resources

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 4.9-1

4.9.1.4 Architectural Resources

For the proposed project and alternatives, the APE for architectural resources includes those resources within the external boundaries of the Main Post, EPG, and the GSA Parcel that are listed, eligible for listing, or potentially eligible for listing on the National Register. Also included are resources in close proximity to the Main Post, EPG, and the GSA Parcel that are listed, eligible for listing, or potentially eligible for listing on the National Register and have been designated at the federal, state, or local levels (e.g.., National Register, Virginia Landmarks Register, Fairfax County Inventory of Historic Sites, or Fairfax County Historic District Overlays). Close proximity is defined as properties that are located near enough to the Fort Belvoir boundaries that they could possibly be affected by the proposed land use changes or BRAC projects.

The Main Post contains a number of historic architectural resources and additional resources in close vicinity. Table 4.9-3 lists these resources and Figure 4.9-1 shows the location of each resource. Not all Main Post architecture has been evaluated, thus there is the potential for additional resources to be found eligible for listing on the National Register. Pending completion of formal evaluation, Fort Belvoir is treating approximately 50 buildings in the 300 Area (southwest portion of the South Post) as potentially eligible until a formal evaluation can be conducted. These buildings are potentially eligible because of their role in Army research and development during the Cold War-era. There is the potential for a historic railway corridor with scattered associated railway resources that could form a multiple property resource eligible for listing on the National Register. And resources associated with Davison Army Airfield could be potentially eligible individually or as a district.

All extant properties within EPG have been recorded and evaluated. None are considered eligible for the National Register and none are designated on any state or local registers (New South Associates, 2006). A review of the Fairfax County Inventory of Historic Sites, current Fairfax County Historic District Overlays, the Virginia Landmarks Register, and the National Register shows that no listed resources or overlay districts are in close proximity to EPG.

The buildings and structures on the GSA Parcel are warehouses with small administrative offices and were constructed in 1953. None of these buildings has been evaluated for eligibility for listing on the National Register. Because of their age (54 years), these buildings would need to be evaluated before conducting any activities that would affect them. A review of the Fairfax County Inventory of Historic Sites, current Fairfax County Historic District Overlays, the Virginia Landmarks Register, and the National Register shows that no listed resources or overlay districts are in close proximity to the GSA Parcel.

Table 4.9-3
Historic architectural resources within and near Fort Belvoir, Virginia

Resource name	Location	Designation status	Virginia Department of Historic Resources (VDHR) /Fairfax County tax parcel number
Historic Resources within Fort Belvoir			
Fort Belvoir Historic District	South Post	National Register-eligible District; Virginia Landmarks Register; Fairfax County Historic Site	VDHR # 029-0209 Fairfax County Tax Parcel # 109-1,2,3,4
Army Family Housing at Rossell Loop, Jadwin Loop, and Park villages	South Post	Contributes to National Register-eligible /Virginia Landmarks Register-listed Fort Belvoir Historic District	VDHR # 029-0209-0312 (Rossell Loop Village) VDHR # 029-0209-311 (Jadwin Loop Village) VDHR # 029-0209-310 (Park Village)
Capehart-Wherry Era Army Family Housing	South Post: Dogue Creek Village Colyer Village George Washington Village River Village Fairfax Village North Post: Lewis Heights Village	National Register-eligible in accordance with Program Comment for Capehart-Wherry-Era Family Housing and Associated Structures and Landscape Features (1949–62) adopted by Advisory Council on Historic Preservation, May 31, 2002 Program comment fulfills Fort Belvoir's compliance obligations under Section 106 of NHPA for all actions that may affect Capehart-Wherry-Era housing at Fort Belvoir	Not applicable
Camp A.A. Humphreys Pump Station and Filter Building	South Post	National Register-eligible; Virginia Landmarks Register	VDHR # 029-0096
U.S. Army Package Power Reactor Multiple Property	South Post	National Register-eligible; Virginia Landmarks Register	VDHR # 029-0193
Thermo-Con House	South Post	National Register-eligible; Virginia Landmarks Register	VDHR # 029-5001
Belvoir Mansion Ruins and Fairfax Grave Site	South Post	National Register-listed; Virginia Landmarks Register	VDHR # 029-0041
Fairfax Chapel	South Post	Contributes to National Register-eligible/Virginia Landmarks Register-listed Fort Belvoir Historic District; Individually-designated Fairfax County Historic Site	VDHR # 029-0209 Fairfax County Tax Parcel # 115-2 ((1)) 1
Historic districts in close proximity to Fort Belvoir			
Mount Air historic overlay district			
Mount Air	North of North Post, bounded by Telegraph Road to the north, Fort Belvoir Military Railroad to the south and Accotink Road (Highway 637) to the east	Fairfax County Mount Air Historic Overlay District	Fairfax County Tax Parcel # 099-4 ((9)) A

Table 4.9-3
Historic architectural resources within and near Fort Belvoir, Virginia *(continued)*

Resource name	Location	Designation status	Virginia Department of Historic Resources (VDHR) /Fairfax County tax parcel number
Pohick Church historic overlay district			
Pohick Church	West of Fort Belvoir Southwest Area at junction of U.S. Route 1 and Old Colchester Road	National Register-listed; Virginia Landmarks Register; Fairfax County Pohick Church Historic Overlay District	VDHR # 029-0046 Fairfax County Tax Parcel # 108-1 ((1)) 27
Woodlawn historic district and overlay district			
Woodlawn Plantation	East of North Post, at junction of U.S. Route 1 and VA 235, Mount Vernon, VA	National Historic Landmark; National Register-listed; Contributes to National Register-eligible Woodlawn Historic District; Virginia Landmarks Register; Contributes to Fairfax County Woodlawn Historic Overlay District	VDHR # 029-0056 VDHR # 029-5181 (Historic District) Fairfax County Tax Parcel # 109-2 ((1)) 4
Pope-Leighy House	On grounds of Woodlawn Plantation (see above)	National Register-listed; Contributes to National Register-eligible Woodlawn Historic District; Virginia Landmarks Register; Contributes to Fairfax County Woodlawn Historic Overlay District	VDHR # 029-0058 VDHR # 029-5181 (Historic District) Fairfax County Tax Parcel # 109-2 ((1)) 4
George Washington Grist Mill	East of South Post, on east side of VA 235 Mount Vernon, VA	Contributes to National Register-eligible Woodlawn Historic District; Virginia Landmarks Register; Contributes to Fairfax County Woodlawn Historic Overlay District	VDHR # 029-0330 VDHR # 029-5181 (Historic District)
Alexandria (Woodlawn) Friends Meeting House and Burial Ground	Surrounded by North Post, at southwestern corner of Woodlawn Road and Lampert Road	Contributes to National Register-eligible Woodlawn Historic District; Contributes to Fairfax County Woodlawn Historic Overlay District	VDHR # 029-0172 VDHR # 029-5181 (Historic District) Fairfax County Tax Parcel # 109-2 ((1)) 38
Woodlawn Baptist Church	East of South Post, on southeastern corner of Woodlawn Road and Richmond Highway	Contributes to Fairfax County Woodlawn Historic Overlay District; Individually-designated Fairfax County Historic Site.	Fairfax County Tax Parcel # 109-2 ((1)) 1 VDHR # 029-5181 (Historic District)
Woodlawn Stables	East of South Post, on southern side of U.S. Route 1	Contributes to National Register-eligible Woodlawn Historic District; Contributes to Fairfax County Woodlawn Historic Overlay District	VDHR # 029-5181 (Historic District)
Grandview (Jacob Troth House)	On grounds of Woodlawn Plantation (see above)	Contributes to National Register-eligible Woodlawn Historic District	VDHR # 029-0062 VDHR # 029-5181 (Historic District)
Individual historic resources in close proximity to Fort Belvoir			
Accotink United Methodist Church	9401 Backlick Road; surrounded by North Post	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 100-1 ((1)) 25
Carlby	4509 Carlby Lane; Alexandria, east of South Post	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 110-3 ((1)) 10

Table 4.9-3
Historic architectural resources within and near Fort Belvoir, Virginia *(continued)*

Resource name	Location	Designation status	Virginia Department of Historic Resources (VDHR) /Fairfax County tax parcel number
Cranford Methodist Church & Lewis Chapel	9912 Old Colchester Road, Lorton; west of Southwest Area	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 114-1 ((1)) 1
Gunston Hall	10709 Gunston Road, Lorton; southwest of South Post	National Historic Landmark; National Register-listed; Virginia Landmarks Register; Fairfax County Historic Site	VDHR # 029-0050 Fairfax County Tax Parcel #119-1 ((1)) 1
Indian Spring Farm (Oak Grove)	9829 Gunston Road, Lorton; west of Southwest Area	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 113-2 ((1)) 11, 11A
Marshall Hall	5 mi north of MD 210 and MD 227, Bryan's Road, MD; east of South Post	National Register-listed Maryland Inventory of Historic Properties (MIHP)	MIHP # CH-54 (A, B, C)
Mount Vernon	East of Fort Belvoir on Potomac River; 3200 Mount Vernon Memorial Highway, Mount Vernon, VA	National Historic Landmark; National Register-listed; Virginia Landmarks Register; Fairfax County Historic Site	VDHR # 029-0054 Fairfax County Tax Parcel # 110-2 ((1)) 12
Old Colchester Road	Borders western side of Southwest Area	National Register-eligible	VDHR # 029-0953
Otis Tufton Mason House	8907 Richmond Highway, on grounds of Woodlawn Plantation	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 109-2 ((1)) 2
Shiloh Baptist Church	10226 Gunston Road, Lorton; west of Southwest Area	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 114-3 ((1)) 2
Union Farm	9150 Union Farm Road, Lorton; east of Fort Belvoir	Fairfax County Historic Site; potentially eligible to NRHP (not yet evaluated for NRHP eligibility)	Fairfax County Tax Parcel # 110-1 ((1)) 10

4.9.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

Section 106 of NHPA requires federal agencies to take into account the effects of their actions on any district, site, building, structure or object included in, or eligible for inclusion in, the NRHP. AR 200-4 also requires the Army to adhere to Section 106 of NHPA for all federal undertakings. Implementing regulations for Section 106 established by the ACHP are contained in 36 CFR Part 800; Protection of Historic Properties, as amended in 2004. These regulations provide specific criteria for identifying effects on historic properties. Effects to cultural resources listed in, or eligible for listing in, the National Register are evaluated with regard to the Criteria of Adverse Effect set forth in 36 CFR 800.5(a)(1) (Table 4.9-4). The Fort Belvoir ICRMP provides further guidance in assessing effects of undertakings on cultural resources as shown in Table 4.9-5. The

PA being developed for Fort Belvoir would stipulate the procedures to be followed in assessing any adverse effects of the proposed BRAC projects and in determining appropriate mitigation.

There are 302 known archaeological sites in the APE. Of these, 189 sites are either listed on, eligible for, or potentially eligible for the National Register, and thereby fall under the purview of Section 106 of the NHPA and 36 CFR Part 800. There are six cemeteries in the APE; one is listed on the National Register, one is eligible for listing, and three are potentially eligible for listing. These five cemeteries are considered as archaeological sites under Section 106 of the NHPA. All the architectural resources in the APE and discussed in Section 4.9.1.4 fall under the purview of Section 106 of the NHPA. All NHL properties are listed on the National Register; all the Virginia Landmarks Register properties are National Register-eligible; and properties listed on the Fairfax County Inventory of Historic Sites qualify as potentially eligible, though formal evaluation is yet to be completed in consultation with the Virginia SHPO. The three Fairfax County Historic District Overlays are centered on historic district cores that are listed on, eligible for, or potentially eligible for the National Register and are designed to protect the settings of their associated historic properties.

Table 4.9-4
Criteria of adverse effect

Definition
"An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative." (36 CFR 800.5[a][1])
Examples of adverse effects
Adverse effects on historic properties include, but are not limited to the following • Physical destruction of or damage to all or part of the property • Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's *Standards for the Treatment of Historic Properties* (36 CFR Part 68) and applicable guidelines • Removal of the property from its historic location • Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance • Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features • Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization • Transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance (36 CFR 800.5[a][2])

Before initiating projects in accordance with the Preferred Alternative, Fort Belvoir would determine if any eligible or potentially eligible archaeological sites would be adversely affected by the project, in accordance with Section 106 of the NHPA and 36 CFR Part 800. Fort Belvoir would consult with the Virginia SHPO on its determination. If adverse effects would occur, Fort Belvoir would continue consultation with the Virginia SHPO and other interested parties to develop mitigation measures to avoid, minimize, or mitigate any adverse effects.

NHPA also includes provisions that specifically address lead agencies responsibilities when their activities involve NHL properties, a few of which are near Fort Belvoir. Section 110(f) of NHPA

outlines specific action that these agencies must take when NHLs could be directly and adversely affected by an undertaking. Section 110(f) states:

> Prior to the approval of any Federal undertaking which may directly and adversely affect any National Historic Landmark, the head of the responsible Federal agency shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such landmark, and shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking.

ACHP must be included in any consultation following a determination by the lead agency that the undertaking would have an adverse effect on an NHL (36 CFR 800.10(c)). ACHP must notify the Secretary of the Interior and may request the Secretary of the Interior to provide a report to ACHP detailing the significance of the affected NHL under Section 213 of the NHPA, including measures to avoid, minimize, or mitigate adverse effects. ACHP would report the outcome of the Section 106 process to the Secretary of the Interior and the head of the agency responsible for the undertaking.

Table 4.9-5
Potential effects on cultural resources

Type of undertaking	Potential effect on architectural	Potential effect on archaeological
Building demolition	Demolition of a historic property is, by definition, an adverse effect.	Building demolition could adversely affect subsurface archaeological features and deposits through related actions, such as utility line removal and heavy machinery traffic.
New construction	New construction could introduce architectural, visual, audible or atmospheric elements that are out of character with adjacent or surrounding historic properties.	New construction generally involves site grading and excavation to accommodate the building and any ancillary utilities, parking areas, and other associated infrastructure. Any undertaking involving surface or subsurface disturbance of archaeological historic properties constitutes an adverse effect.
Building maintenance/repair	Maintenance and repair work on interiors generally would have no adverse effect. Repairs to exteriors of historic buildings generally would have no adverse effect if the *Secretary of the Interior's Standards for Rehabilitation* and other design guidelines are followed.	Grounds maintenance that involves surface or subsurface disturbance could affect archaeological resources.
Rehabilitation/major repair	Rehabilitation or major repairs would have an effect on historic buildings; however, that effect generally is not adverse if the *Secretary of the Interior's Standards for Rehabilitation* are followed.	Excavation or other activity in connection with building rehabilitation could affect archaeological resources if it involves subsurface disturbance.

Table 4.9-5
Potential effects on cultural resources *(continued)*

Ground disturbance/cleanup	Could adversely affect historic landscapes or introduce visual elements that are out of character with adjacent or surrounding historic properties.	Excavation or other activity involving surface or subsurface disturbance could affect archaeological resources. Examples of potentially harmful undertakings include utility line replacement or construction; fuel tank or other removal of environmental contaminants; parking lot construction; building construction.
Training activities	Could adversely affect historic landscapes by introducing visual or audible elements out of character with surrounding historic properties.	Depending on nature of activity, training could impact archaeological resources.

Source: Goodwin & Associates, 2001.

4.9.2.1 Land Use Plan Update

Long-term minor adverse and beneficial effects could occur to historic properties as a result of implementing the Preferred Alternative land use plan. The determination of these effects is detailed below. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual or noise effects to their setting. These adverse effects would arise from changing land use designations from nondevelopment to development and subsequent implementation of projects in accordance with the new land use designations. Historic properties that could be adversely affected include eligible and potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, the Mount Air Historic District, a potentially eligible railroad multiple property resource, the Friends Meeting House and Burial Ground, Woodlawn Historic District, the potentially eligible South Post golf course, and the eligible Fort Belvoir Historic District.

The potential beneficial effects to historic properties would include prevention of direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. This protection would arise from changing land use designations from development to nondevelopment and subsequent restriction of projects in accordance with the new land use designations. Historic properties that could be beneficially affected include potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, potentially eligible airfield historic resources, the Friends Meeting House and Burial Ground, Woodlawn Historic District, Carlby, Union Farm, and Mount Vernon.

Under the Preferred Alternative, the Troop Housing on the North Post would change to Professional/Institutional uses and an Industrial area on the South Post would be converted to Troop uses. However, implementation of these changes could be delayed because of funding concerns, resulting in the current uses of these areas being continued indefinitely. The following analysis of the adverse and beneficial effects of the Preferred Alternative includes both situations.

4.9.2.1.1 EPG

There are no historic properties within or near the EPG; therefore, changes in planned land use would have no effect on historic properties.

4.9.2.1.2 Southwest Area

Adverse Effects. A portion of the area designated as Environmentally Sensitive in 1993 would be changed to Training. This area contains potentially eligible archaeological sites. Although the proposed designation would not allow development, training use of the area could result in direct and indirect adverse physical effects to the potentially eligible sites. Training in this area could also result in direct adverse auditory effects to Pohick Church, Pohick Church Historic District, and Old Colchester Road.

Beneficial Effects. Areas designated as Industrial and Administration & Education in 1993 would be changed to Training. These areas are adjacent to Pohick Church, Pohick Church Historic District, and Old Colchester Road. The proposed change would prevent development near these historic properties, protecting them from direct adverse visual effects. Also, these areas contain potentially eligible archaeological sites. While training use of the areas could result in adverse effects to these sites, the Training designation would prevent development in these areas. Both of these would be beneficial effects.

4.9.2.1.3 Davison Army Airfield

Adverse Effects. Areas designated as Environmentally Sensitive in 1993 would be changed to Airfield. The area includes three potentially eligible archaeological sites. The new designation would allow for development, thus making direct and indirect adverse physical effects to these sites possible. Also, lack of development along the Fort Belvoir Military Railroad has maintained the potentially eligible status of a railroad-themed multiple property resource. However, changing the designation to Airfield would allow for development and direct visual adverse effects to this resource. The Mount Air Historic District lies adjacent to the airfield. The change to Airfield would allow for development and direct visual adverse effects to this resource.

Beneficial Effects. The Davison Army Airfield would maintain its designation and use as an airfield. By maintaining the historic use of Airfield, these potentially eligible resources are likely to be used for their original purposes and are less likely to undergo major renovations.

4.9.2.1.4 North Post

Adverse Effects. The proposed southernmost Professional/Institutional area would contain an area previously designated in 1993 as Environmentally Sensitive. This area contains a potentially eligible archaeological site. With the Professional/Institutional designation, this area would be open for development, making direct and indirect adverse physical effects to this site possible. The area northwest of Fort Belvoir Elementary School would be redesignated from Environmentally Sensitive to Residential, taking a protected area and opening it up for possible development. This area contains an eligible archaeological site, and redesignation would make direct and indirect adverse physical effects to this site possible. The area to the east of the school would also change from Environmentally Sensitive to Residential. This area is adjacent to the Woodlawn Historic District and development here could result in direct adverse visual effects to the district.

Beneficial Effects. The northeast portion of the North Post has a 1993 designation of two Family Housing areas with a total of four potentially eligible archaeological sites. Under the Preferred Alternative, these areas would be redesignated as Community, which is less likely to be developed. Thus, the four sites are less likely to be adversely effected. This change would also make less likely the potential for direct adverse visual effects to the Woodlawn Historic District

from developments in these areas. A very small area just north of the Friends Meeting House and Burial Ground and surrounding the Center for Army Analysis would be changed from Administration & Education to Community. This change would make development less likely in this area and protect this historic property, and the Woodlawn Historic District of which it is a part, from direct adverse visual effects.

4.9.2.1.5 South Post

Adverse Effects. The South Post golf course would be redesignated as Professional/Institutional, opening this open space to development. Development here could result in direct and indirect adverse physical effects to one potentially eligible archaeological site and to the potentially eligible golf course, which is a contributing resource to the Fort Belvoir Historic District. Development in this area along Route 1 could also result in direct adverse visual effects to the Friends Meeting House and Burial Ground, a contributing property to the Woodlawn Historic District. East of Jadwin Loop along the river shore, an area designated in 1993 as Outdoor Recreation would be redesignated as Residential. This area contains a potentially eligible archaeological site, and with the proposed designation, this site would be at risk for direct and indirect adverse physical effects from development. In the southwest portion of the South Post, an area currently designated as Outdoor Recreation and Environmentally Sensitive would be changed to Community, opening this area to development. This could have an adverse visual effect on the viewshed of Gunston Hall.

Beneficial Effects. The eastern portion of the South Post would be redesignated from Administration & Education to Residential. The types of development likely under Residential are much less likely to be visible from historic properties across Dogue Creek and the Potomac River (such as Carlby, Union Farm, and Mount Vernon) than the types of construction likely under the 1993 designation. Also, landscaping and open spaces associated with residential developments could mimic natural open spaces, thereby disguising developments. The area adjacent to the southern end of Woodlawn Historic District is one of the areas that would be redesignated as Residential. Residential developments in this location would be easier to screen from view from the district. This change could result in protection of these historic properties from direct adverse visual effects. The area north of the proposed Troop area would be redesignated from Industrial to Community. This area contains one potentially eligible archaeological site, which could be more easily protected from development and direct adverse physical effects under the proposed designation.

4.9.2.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects could occur to historic properties as a result of some of the 20 proposed projects under the Preferred Alternative. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. Historic properties that could be adversely affected include the Fort Belvoir Historic District, one eligible and one potentially eligible archaeological sites, and the Friends Meeting House and Burial Ground.

Assessment of adverse effects depends on the exact location of the proposed projects and the specific design details of the projects. These details include such things as building materials, construction footprint, height of buildings, and building design. Many of these project details cannot be determined until Fort Belvoir initiates the project design process. Until these details are developed, the exact nature and extent of adverse effects cannot be determined. However, on the

basis of general locations and characteristics of the proposed projects, as compared with information on historic property locations, a broad assessment of potential effects could be made. The results of this assessment are presented in Table 4.9-6, which lists those proposed projects that have a potential to adversely affect cultural resources.

Table 4.9-6
Proposed projects with potential adverse effects to cultural resources under the Preferred Alternative

Project number	Project description	Description of potential effects
3	MDA Facility	Potential adverse visual effect to Fort Belvoir Historic District from construction of new building
4	Hospital	Potential adverse direct effect to Fort Belvoir Historic District (specifically the South Post golf course, which is a contributing property), and potential adverse direct and indirect effects to a potentially eligible archaeology site from construction of new building and ancillary facilities
6	NARMC HQ Building	Potential adverse direct effect to Fort Belvoir Historic District (specifically the South Post golf course, which is a contributing property) from construction of new building
10	Network Operations Center	Potential adverse visual effect to Fort Belvoir Historic District from construction of new building, storage, and satellite yard
11	USANCA Support Facility	Potential adverse visual effect to Fort Belvoir Historic District from building renovation
14	Administrative Facility	Potential adverse direct and visual effects to Fort Belvoir Historic District from renovation of four existing buildings
15	Access Control Point	Potential adverse visual effect to Friends Meeting House and Burial Ground from new construction
17	PEO EIS Administrative Facility and Network Enterprise Communications Facility	Potential adverse visual effect to Fort Belvoir Historic District from construction of three new buildings and two parking garages
18	Structured Parking Facility, 200 Area	Potential adverse visual effect to Fort Belvoir Historic District from construction of parking garage
20	MWR Family Travel Camp	Potential adverse direct and indirect effects to nearby eligible archaeology site from construction of family camp and associated infrastructure and increased access to the site by the public

There are no historic properties, architectural or archaeological, on the EPG. There are no historic properties listed on national, state, or county registers in close proximity to the EPG boundaries. Although proposed projects 1, 2, 7, 8, 9, 12, and 13 are the types of projects that could affect cultural resources, because they are on the EPG, they would have no potential to effect cultural resources. Proposed projects 5, 16, and 19 are either not activities that could affect cultural resources, or are in an area removed from historic properties. However, when conducting ground-disturbing activities, there is always the possibility that buried archaeological resources could be discovered.

Projects 3, 10, 11, 14, 17, and 18 would include construction of buildings, parking structures, and a satellite yard and renovation of existing buildings, all in the administrative area of the Fort Belvoir Historic District. Although the types of new facilities would fit within the current and

historic administrative use of this area, the introduction of new buildings and especially parking structures and a satellite yard could adversely affect the setting of the district. Renovation of existing buildings could adversely affect those buildings and could affect the district if the exteriors of the buildings are changed; however, because the use of the buildings would stay administrative, it is possible the changes could be minimal, thereby minimizing those effects.

Projects 4 and 6 would include construction of new medical and dental services buildings and associated parking and access, all on the current South Post golf course. The golf course is a contributing property to the Fort Belvoir Historic District, and there is a potentially eligible archaeological site located within the golf course property. Construction of the new buildings would directly affect the golf course and the Historic District. Depending on the specific locations of the new buildings, one potentially eligible archaeology site also could be adversely affected through construction, changes in erosion patterns, and inadvertent construction effects.

Project 15 would include construction of a controlled access point, with a small building, inspection station, addition of turning lanes, and other ancillary improvements. Although the development would be small, it would be very close to the Friends Meeting House and Burial Ground and would introduce potential adverse visual effects. Project 20 would include RV campsites, cabins, tent sites, a support facility, relocation of Johnson Road, and utility upgrades. This project would introduce potential direct and indirect effects to a nearby eligible archaeological site.

4.9.2.3 BMPs/Mitigation

Implementing the Preferred Alternative and the 20 proposed projects would have long-term minor adverse and beneficial effects on cultural resources. There are a number of measures that would be implemented in compliance with Section 106 of the NHPA and 36 CFR Part 800 that would avoid the adverse effects, or mitigate the adverse effects and reduce them to a minor level. These measures would be implemented through the PA being developed for Fort Belvoir. These measures are discussed below.

4.9.2.3.1 General BMPs

Certain standard BMPs are considered to be part of all projects conducted under this alternative. The BMPs that relate specifically to protecting cultural resources from adverse effects include the following:

- All National Register listed, eligible, and potentially eligible archaeological sites that are near proposed construction areas would be fenced during construction activities to prevent inadvertent effects.
- All National Register listed, eligible, and potentially eligible archaeological sites that are near proposed construction areas would undergo periodic monitoring to ensure fencing and avoidance measures are adequate in protecting the sites.
- Inadvertent discoveries of archaeological materials, human remains, or associated funerary objects would be treated in accordance with the NHPA, 36 CFR 800, and NAGPRA. Requirements for notification and security and protection of any discoveries would be included in construction contractors' contracts.

4.9.2.3.2 BMPs for Potential Adverse Effects to Archaeological Resources

Before initiating projects in accordance with the Preferred Alternative, Fort Belvoir would determine if any eligible or potentially eligible archaeological sites would be adversely affected by the project, in accordance with Section 106 of the NHPA and 36 CFR Part 800. Fort Belvoir would consult with the Virginia SHPO on its determination. If adverse effects would occur, Fort Belvoir would continue consultation with the Virginia SHPO and other interested parties to develop measures to avoid, minimize, or mitigate any adverse effects.

Facility construction usually causes ground disturbance to much more area than just the building footprint. These additional areas could include construction zones surrounding the facility, staging areas for equipment and machinery storage, parking areas, and rights-of-way for utilities including gas, electric, telephone, fiber optic, water, and sewer. Construction and use of these additional areas could cause direct and indirect adverse physical effects to archaeological sites. Any such areas would be included in project reviews and determinations conducted by Fort Belvoir in accordance with Section 106 of the NHPA and 36 CFR Part 800, as described above.

Potential adverse effects to archaeological resources that are identified for the proposed projects include direct physical effects from construction activities, and indirect physical effects from increased access by the public. The following measures would address these potential adverse effects and reduce them to a minor level.

- If avoidance and protection of archaeological sites are not feasible, measures would be implemented to mitigate the adverse effects, per the PA being developed between Fort Belvoir, the USACE, the Virginia SHPO, and the ACHP. The PA would be developed in consultation with interested parties. Measures could include the following:
  - Conducting data recovery excavation of prehistoric and historic deposits
  - Including a process in the PA to be followed for any inadvertent discoveries of archaeological materials, human remains, or associated funerary objects.
  - Developing public interpretation materials regarding cultural resources of the installation or region

When conducting ground-disturbing activities, there is always the possibility that buried archaeological resources would be discovered or unanticipated adverse effects would occur on sites that were to be avoided. All contracts for construction activities would include a process to be followed for any inadvertent discoveries of archaeological materials, human remains, or associated funerary objects. Although unanticipated adverse effects on historic properties from implementation of the Preferred Alternative are possible, compliance with Section 106 of the NHPA, 36 CFR Part 800, the installation's ICRMP, and the PA would be expected to mitigate any unanticipated effects.

4.9.2.3.3 BMPs for Potential Adverse Effects to Architectural Resources

Potential adverse effects to architectural resources that are identified for the Preferred Alternative and its 20 proposed projects include direct physical effects from construction, demolition, and renovation activities, and direct visual effects from renovation and construction within historic property settings and viewsheds. The following measures would address these potential adverse effects and reduce them to a minor level.

Fort Belvoir would complete compliance with Section 106 of the NHPA and 36 CFR Part 800. Historic building surveys and evaluations would be conducted in proposed project areas where no

such studies have been conducted, to determine if historic properties are in the APE of the proposed projects. This process would use more detailed project information and would result in a determination of any adverse effects. If there are adverse effects, project-specific measures would be developed to avoid or mitigate the adverse effects. This process would be conducted in consultation with the Virginia SHPO and interested parties. The PA being developed between Fort Belvoir, the USACE, the Virginia SHPO, and the ACHP would define the measures to be implemented. Development of the PA also would include consultation with interested parties. Measures could include the following:

- Conducting renovation activities in a manner that preserves the historical and architectural value of the property through compliance with the Secretary of the Interior's *Standards for Rehabilitation* and *Guidelines for Rehabilitating Historic Buildings*
- Using context-sensitive design for new buildings to match the style and appearance of surrounding historic buildings
- Designing landscapes, streetscapes, lighting, and signage to minimize visual intrusion
- Using vegetation, topography, and other methods to screen the views of new buildings from historic properties
- Conducting detailed recording of adversely affected historic properties in accordance with the Secretary of the Interior's *Standards and Guidelines for Architectural and Engineering Documentation* to include detailed historic contexts, plans, drawings, and photographs

4.9.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

4.9.3.1 Land Use Plan Update

Long-term minor adverse and beneficial effects could occur to historic properties as a result of implementing the Town Center Alternative land use plan. The determination of these effects is detailed below. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual or noise effects to their setting. These adverse effects would arise from changing land use designations from nondevelopment to development and subsequent implementation of projects in accordance with the new land use designations. Historic properties that could be adversely affected include eligible and potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, the Mount Air Historic District, a potentially eligible railroad multiple property resource, Woodlawn United Methodist Church Cemetery, the Friends Meeting House and Burial Ground, Woodlawn Historic District, the potentially eligible South Post golf course, and the eligible Fort Belvoir Historic District.

The potential beneficial effects to historic properties would include prevention of direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. This protection would arise from changing land use designations from development to nondevelopment and subsequent restriction of projects in accordance with the new land use designations. Historic properties that could be beneficially affected include potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, potentially eligible airfield historic resources, the Friends Meeting House and Burial Ground, Woodlawn Historic District, Carlby, Union Farm, and Mount Vernon.

Under the Town Center Alternative, the Troop Housing on the North Post would change to Professional/Institutional uses, and an Industrial area on the South Post would be converted to Troop uses. However, implementation of these changes could be delayed because of funding

concerns, resulting in the current uses of these areas being continued indefinitely. The following analysis of the adverse and beneficial effects of the Town Center Alternative includes both situations.

4.9.3.1.1 EPG

There are no historic properties within or near the EPG; therefore, changes in planned land use would have no effect on historic properties.

4.9.3.1.2 Southwest Area

Adverse Effects. A portion of the area designated as Environmentally Sensitive in 1993 would be changed to Training. This area contains potentially eligible archaeological sites. Although the proposed designation would not allow development, training use of the area could result in direct and indirect adverse physical effects to the potentially eligible sites. Training in this area could also result in direct adverse auditory effects to Pohick Church, Pohick Church Historic District, and Old Colchester Road.

Beneficial Effects. Areas designated as Industrial and Administration & Education in 1993 would be changed to Training. These areas are adjacent to Pohick Church, Pohick Church Historic District, and Old Colchester Road. The proposed change would prevent development near these historic properties, protecting them from direct adverse visual effects. Also, these areas contain potentially eligible archaeological sites. While training use of the areas could result in adverse effects to these sites, the Training designation would prevent development in these areas. Both of these would be beneficial effects.

4.9.3.1.3 Davison Army Airfield

Adverse Effects. Areas designated as Environmentally Sensitive in 1993 would be changed to Airfield. The area includes three potentially eligible archaeological sites. The new designation would allow for development, thus making direct and indirect adverse physical effects to these sites possible. Also, lack of development along the Fort Belvoir Military Railroad has maintained the potentially eligible status of a railroad-themed multiple property resource. However, changing the designation to Airfield would allow for development and direct visual adverse effects to this resource. The Mount Air Historic District lies adjacent to the airfield. The change in designation to Airfield would allow for development and direct visual adverse effects to this resource.

Beneficial Effects. The Davison Army Airfield would maintain its designation and use as an airfield. By maintaining the historic use of the airfield, these potentially eligible resources are likely to be used for their original purposes and are less likely to undergo major renovation.

4.9.3.1.4 North Post

Adverse Effects. The proposed southernmost Professional/Institutional area would contain an area previously designated in 1993 as Environmentally Sensitive. This area contains a potentially eligible archaeological site. With the Professional/Institutional designation, this area would be open for development, making direct and indirect adverse physical effects to this site possible. The area surrounding Woodlawn United Methodist Church Cemetery would be changed from Community to Professional/Institutional. This change would make development around the cemetery more likely, thereby increasing the risk for direct adverse visual effects. The area northwest of Fort Belvoir Elementary School would be redesignated from Environmentally Sensitive to Residential, taking a protected area and opening it up for possible development. This

area contains an eligible archaeological site, and redesignation would make direct and indirect adverse physical effects to this site possible. The area to the east of the school would also change from Environmentally Sensitive to Residential. This area is adjacent to the Woodlawn Historic District, and development here could result in direct adverse visual effects to the district.

Beneficial Effects. In the 1993 land use plan, the northeast portion of the North Post has a Family Housing area that has not been developed. This area contains one potentially eligible archaeological site. Under the Town Center Alternative, this area would be redesignated as Community, which is less likely to be developed; thus, the site would be less likely to be adversely effected. This change would also make less likely the potential for direct adverse visual effects to the Woodlawn Historic District from developments in this area. An area north of the Friends Meeting House and Burial Ground would be changed from Administration & Education to Community. This change would make additional development less likely in this area and protect this historic property, and the Woodlawn Historic District of which it is a part, from direct adverse visual effects.

4.9.3.1.5 South Post

Adverse Effects. The South Post golf course would be redesignated as Professional/Institutional, opening this open space to development. Development here could result in direct and indirect adverse physical effects to one potentially eligible archaeological site and to the potentially eligible golf course, which is a contributing resource to the Fort Belvoir Historic District. Development in this area along Route 1 could also result in direct adverse visual effects to the Friends Meeting House and Burial Ground, a contributing property to the Woodlawn Historic District. East of Jadwin Loop along the river shore, an area designated in 1993 as Outdoor Recreation would be redesignated as Residential. This area contains a potentially eligible archaeological site, and with the proposed designation, this site would be at risk for direct and indirect adverse physical effects from development. . In the southwest portion of the South Post, an area currently designated as Outdoor Recreation and Environmentally Sensitive would be changed to Community, opening this area to development. This could have an adverse visual effect on the viewshed of Gunston Hall.

Beneficial Effects. The eastern portion of the South Post would be redesignated from Administration & Education to Residential. The types of development likely under Residential are much less likely to be visible from historic properties across Dogue Creek and the Potomac River (such as Carlby, Union Farm, and Mount Vernon) than the types of construction likely under the 1993 designation. Also, landscaping and open spaces associated with residential developments could mimic natural open spaces, thereby disguising developments. The area adjacent to the southern end of Woodlawn Historic District is one of the areas that would be redesignated as Residential. Residential developments in this location would be easier to screen from view from the district. This change could result in protection of these historic properties from direct adverse visual effects. The area north of the proposed Troop area would be redesignated from Industrial to Community. This area contains one potentially eligible archaeological site, which could be more easily protected from development and direct adverse physical effects under the proposed designation.

4.9.3.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects could occur to historic properties as a result of some of the 19 proposed projects under the Town Center Alternative. The potential adverse effects to historic

properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. Historic properties that could be adversely affected include the Fort Belvoir Historic District, Friends Meeting House and Burial Ground, and one eligible and one potentially eligible archaeological site.

On the basis of general locations and characteristics of the proposed projects, as compared with information on historic property locations, a broad assessment of potential effects could be made. The results of this assessment are presented in Table 4.9-7, which lists those proposed projects that have a potential to adversely affect cultural resources.

Table 4.9-7
Proposed projects with potential adverse effects to cultural resources under the Town Center Alternative

Project number	Project description	Description of potential effects
2	Secure Administration Facility	Potential adverse direct effect to Fort Belvoir Historic District (specifically the South Post golf course, which is a contributing property) from construction of new building
4	Hospital	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of new building
6	NARMC HQ Building	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of new building
8	Infrastructure	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of new buildings
11	USANCA Support Facility	Potential adverse visual effect to Fort Belvoir Historic District from building renovation
13	Child Development Center	Potential adverse direct effect to Fort Belvoir Historic District (specifically the South Post golf course, which is a contributing property) and potential adverse direct and indirect effects to one potentially eligible archaeological site from construction of new building
14	Administrative Facility	Potential adverse direct and visual effects to Fort Belvoir Historic District from renovation of four existing buildings
15	Access Control Point	Potential adverse visual effect to Friends Meeting House and Burial Ground from new construction
17	PEO EIS Administrative Facility and Network Enterprise Communications Facility	Potential adverse visual effect to Friends Meeting House and Burial Ground from new construction
18	Structured Parking Facility, 200 Area	Potential adverse visual effect to Fort Belvoir Historic District from construction of parking facility
20	MWR Family Travel Camp	Potential adverse direct and indirect effects to nearby eligible archaeology site from construction of family camp and associated infrastructure and increased access to the site by the public

Proposed projects 1, 3, 5, 7, 10, 12, 16, and 19 either are not activities that could affect cultural resources, or are in an area removed from historic properties. However, when conducting ground-disturbing activities, there is always the possibility that buried archaeological resources could be discovered.

4.9.3.3 BMPs/Mitigation

Implementing of the Town Center Alternative and the 19 proposed projects would likely result in long-term minor adverse and beneficial effects on cultural resources. The nature of the potential adverse effects is the same as that identified for the Preferred Alternative; thus, the BMPs that would be implemented to address the adverse effects would be the same as those described for the Preferred Alternative (see Section 4.9.2.3). These measures would be implemented in compliance with Section 106 of the NHPA, 36 CFR Part 800, and the PA to avoid or mitigate the adverse effects and reduce them to a minor level.

4.9.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.9.4.1 Land Use Plan Update

Long-term minor adverse and beneficial effects could be expected to historic properties as a result of implementing the City Center Alternative land use plan. The determination of these effects is detailed below. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual or noise effects to their setting. These adverse effects would arise from changing land use designations from nondevelopment to development and subsequent implementation of projects in accordance with the new land use designations. Historic properties that could be adversely affected include eligible and potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, the Mount Air Historic District, a potentially eligible railroad multiple property resource, Woodlawn Historic District, and the eligible Fort Belvoir Historic District.

The potential beneficial effects to historic properties would include prevention of direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. This protection would arise from changing land use designations from development to nondevelopment and subsequent restriction of projects in accordance with the new land use designations. Historic properties that could be beneficially affected include potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, potentially eligible airfield historic resources, the Friends Meeting House and Burial Ground, Woodlawn Historic District, Carlby, Union Farm, and Mount Vernon.

Under the City Center Alternative, the Troop Housing on the North Post would change to Professional/Institutional uses and an Industrial area on the South Post would be converted to Troop uses. However, implementing these changes could be delayed due to funding concerns, resulting in the current uses of these areas being continued indefinitely. The following analysis of the adverse and beneficial effects of the City Center Alternative includes both situations.

4.9.4.1.1 GSA Parcel

There is no potential for archaeological resources on the GSA Parcel, and there are no historic properties listed on national, state, or county registers near the GSA Parcel boundaries. Formal evaluation of the buildings on the GSA Parcel would need to be completed before initiating any projects; thus, the buildings are treated as potentially eligible in this EIS. The GSA Parcel was not included in the 1993 land use plan. Designation of the GSA Parcel as Professional/Institutional would allow for development, making direct adverse physical effects to these properties likely.

4.9.4.1.2 EPG

There are no historic properties within or near the EPG; therefore, changes in planned land use would have no effect on historic properties.

4.9.4.1.3 Southwest Area

Adverse Effects. A portion of the area designated as Environmentally Sensitive in 1993 would be changed to Training. This area contains potentially eligible archaeological sites. Although the proposed designation would not allow development, training use of the area could result in direct and indirect adverse physical effects to the potentially eligible sites. Training in this area could also result in direct adverse auditory effects to Pohick Church, Pohick Church Historic District, and Old Colchester Road.

Beneficial Effects. Areas designated as Industrial and Administration & Education in 1993 would be changed to Training. These areas are adjacent to Pohick Church, Pohick Church Historic District, and Old Colchester Road. The proposed change would prevent development near these historic properties, protecting them from direct adverse visual effects. Also, these areas contain potentially eligible archaeological sites. While training use of the areas could result in adverse effects to these sites, the Training designation would prevent development in these areas. Both of these would be beneficial effects.

4.9.4.1.4 Davison Army Airfield

Adverse Effects. Areas designated as Environmentally Sensitive in 1993 would be changed to Airfield. The area includes three potentially eligible archaeological sites. The new designation would allow for development, thus making direct and indirect adverse physical effects to these sites possible. Also, lack of development along the Fort Belvoir Military Railroad has maintained the potentially eligible status of a railroad-themed multiple property resource. However, changing the designation to Airfield would allow for development and direct visual adverse effects to this resource. The Mount Air Historic District lies adjacent to the airfield. The change to Airfield would allow for development and direct visual adverse effects to this resource.

Beneficial Effects. The Davison Army Airfield would maintain its designation and use as an airfield. By maintaining the historic use of the airfield, these potentially eligible resources are likely to be used for their original purposes and are less likely to undergo major renovation.

4.9.4.1.5 North Post

Adverse Effects. The proposed southernmost Professional/Institutional area would contain an area previously designated in 1993 as Environmentally Sensitive. This area contains a potentially eligible archaeological site. With the Professional/Institutional designation, this area would be open for development, making direct and indirect adverse physical effects to this site possible. The area northwest of Fort Belvoir Elementary School would be redesignated from Environmentally Sensitive to Residential, taking a protected area and opening it up for possible development. This area contains an eligible archaeological site, and redesignation would make direct and indirect adverse physical effects to this site possible. The area to the east of the school would also change from Environmentally Sensitive to Residential. This area is adjacent to the Woodlawn Historic District, and development here could result in direct adverse visual effects to the district.

Beneficial Effects. In the 1993 land use plan, the northeast portion of the North Post has a Family Housing area that has not been developed. This area contains one potentially eligible archaeological site. Under the City Center Alternative, this area would be redesignated as Community, which is less likely to be developed; thus, the site would be less likely to be adversely effected. This change would also make less likely the potential for direct adverse visual effects to the Woodlawn Historic District from developments in this area. A very small area just north of the Friends Meeting House and Burial Ground and surrounding the Center for Army Analysts would be changed from Administration & Education to Community. This change would make development less likely in this area and protect this historic property, and the Woodlawn Historic District of which it is a part, from direct adverse visual effects.

4.9.4.1.6 South Post

Adverse Effects. An area just north of Gerber Village would be redesignated from Community to Residential. This change would make development in this area likely. Because the area is adjacent to the Fort Belvoir Historic District, potential adverse visual effects could occur. East of Jadwin Loop along the river shore, an area designated in 1993 as Outdoor Recreation would be redesignated as Residential. This area contains a potentially eligible archaeological site, and with the proposed designation, this site would be at risk for direct and indirect adverse physical effects from development. . In the southwest portion of the South Post, an area currently designated as Outdoor Recreation and Environmentally Sensitive would be changed to Community, opening this area to development. This could have an adverse visual effect on the viewshed of Gunston Hall.

Beneficial Effects. The eastern portion of the South Post would be redesignated from Administration & Education to Residential. The types of development likely under Residential are much less likely to be visible from historic properties across Dogue Creek and the Potomac River (such as Carlby, Union Farm, and Mount Vernon) than the types of construction likely under the 1993 designation. Also, landscaping and open spaces associated with residential developments could mimic natural open spaces, thereby disguising developments. The area adjacent to the southern end of Woodlawn Historic District is one of the areas that would be redesignated as Residential. Residential developments in this location would be easier to screen from view from the district. This change could result in protection of these historic properties from direct adverse visual effects. The area north of the proposed Troop area would be redesignated from Industrial to Community. This area contains one potentially eligible archaeological site, which could be more easily protected from development and direct adverse physical effects under the proposed designation.

4.9.4.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects could be expected to historic properties as a result of some of the 20 proposed projects under the City Center Alternative. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. Historic properties that could be adversely affected include the Fort Belvoir Historic District, Friends Meeting House and Burial Ground, potentially eligible buildings in the GSA Parcel, and one eligible archaeological site.

On the basis of general locations and characteristics of the proposed projects, as compared with information on historic property locations, a broad assessment of potential effects could be made.

The results of this assessment are presented in Table 4.9-8, which lists those proposed projects that have a potential to adversely affect cultural resources.

There are no historic properties, architectural or archaeological, on the EPG. There are no historic properties listed on national, state, or county registers near the EPG boundaries. Although proposed projects 1, 3, 4, 6 through 10, 12, and 17 are the types of project that could affect cultural resources, because they are on the EPG, they would have no potential to effect cultural resources. Proposed projects 5, 16, and 19 are either not activities that could affect cultural resources, or are in an area removed from historic properties. However, when conducting ground-disturbing activities, there is always the possibility that buried archaeological resources could be discovered.

There is no potential for archaeological resources on the GSA Parcel, and there are no historic properties listed on national, state, or county registers near the GSA Parcel boundaries. Formal evaluation of the buildings on the GSA Parcel would need to be completed before demolition; thus, they are treated as potentially eligible in this EIS. It is likely that these warehouses are not eligible, and in this case, projects 2 and 13 would not adversely affect any historic properties.

Table 4.9-8
Proposed projects with potential adverse effects to cultural resources under the City Center Alternative

Project number	Project description	Description of potential effects
2	Secure Administrative Facility	Potential adverse direct effect to potentially eligible buildings in GSA Parcel from demolition of all existing structures
11	USANCA Support Facility	Potential adverse visual effect to Fort Belvoir Historic District from building renovation
13	Child Development Center	Potential adverse direct effect to potentially eligible buildings in GSA Parcel from demolition of all existing structures
14	Administrative Facility	Potential adverse direct and visual effects to Fort Belvoir Historic District from renovation of four existing building
15	Access Control Point	Potential adverse visual effect to Friends Meeting House and Burial Ground from new construction
18	Structured Parking Facility, 200 Area	Potential adverse visual effect to Fort Belvoir Historic District from construction of parking facility
20	MWR Family Travel Camp	Potential adverse direct and indirect effects to nearby eligible archaeology site from construction of family camp and associated infrastructure and increased access to the site by the public

4.9.4.3 BMPs/Mitigation

Implementing the City Center Alternative and the 20 proposed projects would likely result in long-term minor adverse and beneficial effects on cultural resources. The nature of the potential adverse effects is the same as that identified for the Preferred Alternative; thus, the BMPs that would be implemented to address the adverse effects would be the same as those described for the Preferred Alternative (see Section 4.9.2.3). These measures would be implemented in compliance with Section 106 of the NHPA, 36 CFR Part 800, and the PA to avoid or mitigate the adverse effects.

4.9.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

4.9.5.1 Land Use Plan Update

Long-term minor adverse and beneficial effects could be expected to historic properties as a result of implementing the Satellite Campuses Alternative land use plan. The determination of these effects is detailed below. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual or noise effects to their setting. These adverse effects would arise from changing land use designations from nondevelopment to development and subsequent implementation of projects in accordance with the new land use designations. Historic properties that could be adversely affected include eligible and potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, the Mount Air Historic District, a potentially eligible railroad multiple property resource, potentially eligible airfield historic resources, the Woodlawn United Methodist Church Cemetery, and Woodlawn Historic District.

The potential beneficial effects to historic properties would include prevention of direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. This protection would arise from changing land use designations from development to nondevelopment and subsequent restriction of projects in accordance with the new land use designations. Historic properties that could be beneficially affected include potentially eligible archaeological sites, Pohick Church, Pohick Church Historic District, Old Colchester Road, the Friends Meeting House and Burial Ground, Woodlawn Historic District, Carlby, Union Farm, and Mount Vernon.

Under the Satellite Campuses Alternative, the Troop Housing on the North Post would change to Professional/Institutional uses and an Industrial area on the South Post would be converted to Troop uses. However, implementing these changes could be delayed due to funding concerns, resulting in the current uses of these areas being continued indefinitely. The following analysis of the adverse and beneficial effects of the Satellite Campuses Alternative includes both situations.

4.9.5.1.1 EPG

There are no historic properties within or near the EPG; therefore, changes in planned land use would have no effect to historic properties.

4.9.5.1.2 Southwest Area

Adverse Effects. A portion of the area designated as Environmentally Sensitive in 1993 would be changed to Training. This area contains potentially eligible archaeological sites. Although the proposed designation would not allow development, training use of the area could result in direct and indirect adverse physical effects to the potentially eligible sites. Training in this area could also result in direct adverse auditory effects to Pohick Church, Pohick Church Historic District, and Old Colchester Road.

Beneficial Effects. Areas designated as Industrial and Administration & Education in 1993 would be changed to Training. These areas are adjacent to Pohick Church, Pohick Church Historic District, and Old Colchester Road. The proposed change would prevent development near these historic properties, protecting them from direct adverse visual effects. Also, these areas contain potentially eligible archaeological sites. While training use of the areas could result in adverse

effects to these sites, the Training designation would prevent development in these areas. Both of these would be beneficial effects.

4.9.5.1.3 Davison Army Airfield

Adverse Effects. Areas designated as Environmentally Sensitive in 1993 would be changed to Professional/Institutional. The area includes three potentially eligible archaeological sites. The new designation would allow for development, thus making direct and indirect adverse physical effects to these sites possible. Also, lack of development along the Fort Belvoir Military Railroad has maintained the potentially eligible status of a railroad-themed multiple property resource. However, changing the designation to Professional/Institutional would allow for development and direct visual adverse effects to this resource. Changing the Airfield to a designation of Professional/Institutional would allow for incompatible development and risk direct adverse physical and visual effects to the potentially eligible airfield historic resources. The Mount Air Historic District lies adjacent to the airfield. The change to Professional/Institutional would allow for development near this historic property and direct adverse visual effects to this resource.

Beneficial Effects. There would be no beneficial effects to cultural resources from the land use change at Davison Army Airfield.

4.9.5.1.4 North Post

Adverse Effects. The proposed southernmost Professional/Institutional area would include an area previously designated in 1993 as Environmentally Sensitive. This area contains a potentially eligible archaeological site. With the Professional/Institutional designation, this area would be open for development, making direct and indirect adverse physical effects to this site possible. The area surrounding Woodlawn United Methodist Church Cemetery would be changed from Community to Professional/Institutional. This change would make development around the cemetery more likely, thereby increasing the risk for direct adverse visual effects. The area northwest of Fort Belvoir Elementary School would be redesignated from Environmentally Sensitive to Residential, taking a protected area and opening it up for possible development. This area contains an eligible archaeological site, and redesignation would make direct and indirect adverse physical effects to this site possible. The area to the east of the school would also change from Environmentally Sensitive to Residential. This area is adjacent to the Woodlawn Historic District, and development here could result in direct adverse visual effects to the district.

Beneficial Effects. In the 1993 land use plan, the northeast portion of the North Post has a Family Housing area that has not been developed. This area contains one potentially eligible archaeological site. Under the Satellite Campuses Alternative, this area would be redesignated as Community, which is less likely to be developed; thus, the site would be less likely to be adversely effected. This change would also make less likely the potential for direct adverse visual effects to the Woodlawn Historic District from developments in this area. A very small area just north of the Friends Meeting House and Burial Ground, and surrounding the Center for Army Analysis would be changed from Administration & Education to Community. This change would make development less likely in this area and protect this historic property, and the Woodlawn Historic District of which it is a part, from direct adverse visual effects.

4.9.5.1.5 South Post

Adverse Effects. East of Jadwin Loop along the river shore, an area designated in 1993 as Outdoor Recreation would be redesignated as Residential. This area contains a potentially eligible

archaeological site, and with the proposed designation, this site would be at risk for direct and indirect adverse physical effects from development. . In the southwest portion of the South Post, and area currently designated as Outdoor Recreation and Environmentally Sensitive would be changed to Community, opening this area to development. This could have an adverse visual effect on the viewshed of Gunston Hall.

Beneficial Effects. The eastern portion of the South Post would be redesignated from Administration & Education to Residential. The types of development likely under Residential are much less likely to be visible from historic properties across Dogue Creek and the Potomac River (such as Carlby, Union Farm, and Mount Vernon) than the types of construction likely under the 1993 designation. Also, landscaping and open spaces associated with residential developments could mimic natural open spaces, thereby disguising developments. The area adjacent to the southern end of Woodlawn Historic District is one of the areas that would be redesignated as Residential. Residential developments in this location would be easier to screen from view from the district. This change could result in protection of these historic properties from direct adverse visual effects. The area north of the proposed Troop area would be redesignated from Industrial to Community. This area contains one potentially eligible archaeological site, which could be more easily protected from development and direct adverse physical effects under the proposed designation.

4.9.5.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects could occur to historic properties as a result of some of the 19 proposed projects under the Satellite Campuses Alternative. The potential adverse effects to historic properties would include direct and indirect effects to their integrity (i.e., physical harm or change) and direct visual effects to their setting. Historic properties that could be adversely affected include the Fort Belvoir Historic District, Friends Meeting House and Burial Ground, potentially eligible buildings in Davison Army Airfield, one eligible archaeological site, Lacey Hill Cemetery, and Woodlawn United Methodist Church Cemetery.

On the basis of general locations and characteristics of the proposed projects, as compared with information on historic property locations, a broad assessment of potential effects could be made. The results of this assessment are presented in Table 4.9-9, which lists those proposed projects that have a potential to adversely affect cultural resources.

Proposed projects 4, 5, 6, 7, 16, and 19 are either not activities that could affect cultural resources, or are in an area removed from historic properties. However, when conducting ground-disturbing activities, there is always the possibility that buried archaeological resources could be discovered.

Projects 1 and 12 would include construction of two new buildings at Davison Army Airfield. The buildings at the airfield have not been formally evaluated for historic significance. The introduction of new buildings could adversely affect the setting of any potentially eligible properties.

Table 4.9-9
Proposed projects with potential adverse effects to cultural resources under the Satellite Campuses Alternative

Project number	Project description	Description of potential effects
1	NGA Administrative Facility	Potential adverse visual effect to potentially eligible buildings in Davison Army Airfield from construction of new building
2	Secure Administrative Facility	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of a new building
3	MDA Facility	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of a new building
8	Infrastructure	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of new buildings and bridge
10	Network Operations Center	Potential adverse visual effect to Lacey Hill Cemetery and Woodlawn United Methodist Church Cemetery from construction of new building, storage center, and satellite yard
11	USANCA Support Facility	Potential adverse visual effect to Fort Belvoir Historic District from building renovation
12	Child Development Center	Potential adverse visual effect to potentially eligible buildings in Davison Army Airfield from construction of new building
13	Child Development Center	Potential adverse visual effect to Friends Meeting House and Burial Ground from construction of a new building
14	Administrative Facility	Potential adverse direct and visual effects to Fort Belvoir Historic District from renovation of four existing building
15	Access Control Point	Potential adverse visual effect to Friends Meeting House and Burial Ground from new construction
17	PEO EIS Administrative Facility and Network Enterprise Communications Facility	Potential adverse visual effects to Lacey Hill Cemetery and Woodlawn United Methodist Church Cemetery from construction of three new buildings and two parking garage
18	Structured Parking Facility, 200 Area	Potential adverse visual effect to Fort Belvoir Historic District from construction of parking facility
20	MWR Family Travel Camp	Potential adverse direct and indirect effects to nearby eligible archaeology site from construction of family camp and associated infrastructure, and increased access to the site by the public

4.9.5.3 BMPs/Mitigation

Implementing the Satellite Campuses Alternative and the 19 proposed projects would likely result in long-term minor adverse effects and beneficial effects on cultural resources. The nature of the potential adverse effects is the same as that identified for the Preferred Alternative; thus, the BMPs that would be implemented to address the adverse effects would be the same as those described for the Preferred Alternative (see Section 4.9.2.3). These measures would be implemented in compliance with Section 106 of the NHPA, 36 CFR Part 800, and the PA to avoid or mitigate the adverse effects.

4.9.6 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, future development at the installation would be conducted in accordance with the 1993 master plan, as amended in 2002. No adverse effects to cultural

resources would occur if the BRAC action was not implemented. The Fort Belvoir ICRMP would continue to provide strategic guidance for development of real property assets to ensure potential effects to historic properties are identified and mitigated.

4.9.7 SUMMARY OF COMPARISON OF ALTERNATIVES

4.9.7.1 Comparison of Land Use Plan Alternatives

Each alternative discussed above was analyzed to identify potential effects arising from changing the land use plan from the 1993/2002 plan to the proposed plan. Analysis focused on changes from nondevelopment designations to development, and vice versa. Table 4.9-10 compares each alternative to the Preferred Alternative with regard to the identified potential effects.

Minor adverse effects, including direct and indirect physical effects and direct visual and noise effects, could occur to both archaeological sites and historic resources under each of the alternatives. The nature of the effects is the same from one alternative to the next. Mitigation measures common to all the alternatives would avoid or reduce the adverse effects. Thus, from

Table 4.9-10
Potential effects to cultural resources from land use plan alternatives

Area	Town Center Alternative	City Center Alternative	Satellite Campuses Alternative
GSA Parcel	Not applicable	Adverse effects to potentially eligible historic buildings	Not applicable
EPG	Same as Preferred	Same as Preferred	Same as Preferred
Southwest Area	Same as Preferred	Same as Preferred	Same as Preferred
Davison Army Airfield	Same as Preferred	Same as Preferred	Same as Preferred except: (1) potentially eligible airfield historic structures could be adversely affected; (2) there would be no beneficial effects
North Post	Same as Preferred except: (1) Woodlawn United Methodist Church Cemetery could have adverse visual effects; (2) three fewer potentially eligible sites would be protected	Same as Preferred except: (1) three fewer potentially eligible sites would be protected	Same as Preferred except: (1) Woodlawn United Methodist Church Cemetery could have adverse visual effects; (2) three fewer potentially eligible sites would be protected
South Post	Same as Preferred	Same as Preferred except: (1) the potentially eligible site, the potentially eligible golf course, and Fort Belvoir Historic District would not have adverse physical effects; (2)Friends Meeting House and Burial Ground would not have adverse visual effects; (3) Fort Belvoir Historic District would have adverse visual effects	Same as Preferred except: (1) the potentially eligible site, the potentially eligible golf course, and Fort Belvoir Historic District would not have adverse physical effects; (2)Friends Meeting House and Burial Ground would not have adverse visual effects

Note: The No Action Alternative has no potential effects; thus, it is not included in this table.

a general perspective, the alternatives are very similar. Specific comparison of the land use alternatives at an impact-by-impact level is not possible until certain planned studies have been completed, including historic resource surveys in areas proposed for development.

4.9.7.2 Comparison of BRAC Project Alternatives

Assessment of specific adverse effects to historic properties from the proposed BRAC projects depends on the exact location of the proposed projects and the specific design details of the projects. These details include such things as building materials, construction footprint, height of buildings, and building design. Many of these project details cannot be determined until Fort Belvoir initiates the project design process. Until these details are developed, the exact nature and extent of adverse effects cannot be determined. However, for each of the alternatives, a broad assessment of potential effects was based on general locations and characteristics of the proposed projects, as compared with information on historic property locations.

A simple tally of the number of proposed projects under each alternative that could result in adverse effects shows that the Preferred Alternative has 10 such projects, Town Center Alternative has 11, City Center Alternative has 7, and Satellite Campuses Alternative has 13. However, this tally alone does not provide information on the number of resources that could be affected by each project or the type or extent of effects. A more detailed comparison of BRAC project alternatives is provided in Table 4.9-11 (next page).

Minor adverse effects could occur to archaeological sites and historic resources under all the BRAC project alternatives. The nature of the effects is the same between alternatives, and the same mitigation measures would be applied to avoid or reduce the effects. As such, like the land use plan alternatives, the BRAC project alternatives are also very similar.

Table 4.9-11
Potential effects to cultural resources from BRAC project alternatives

Cultural Resource	Preferred Action	Town Center Alternative	City Center Alternative	Satellite Campuses Alternative
Fort Belvoir Historic District (eligible)	3v, 10v, 11v, 14d, 14v, 17v, 18v	11v, 14d, 14v, 18v	11v, 14d, 14v, 18v	11v, 14d, 14v, 18v
Fort Belvoir Historic District golf course (potentially eligible)	4d, 6d	2d, 13d		
Friends Meeting House and Burial Ground (eligible)	15v	4v, 6v, 8v, 15v, 17v	15v	2v, 3v, 8v, 13v, 15v
Lacey Hill Cemetery (potentially eligible)				10v, 17v
Woodlawn United Methodist Cemetery (potentially eligible)				10v, 17v
archaeological site 44FX1328 (eligible)	20d, 20i	20d, 20i	20d, 20i	20d, 20i
archaeological site 44FX1933 (potentially eligible)	4d, 4i,	13d, 13i,		
GSA buildings (potentially eligible)			2d, 13d	
Davison Army Airfield buildings (potentially eligible)				1v, 12v

Note: The number refers to the Project Number and the letter refers to the type of effect as listed here:
d = direct physical effects
i = indirect physical effects
v = visual effects

4.10 SOCIOECONOMICS

4.10.1 AFFECTED ENVIRONMENT

This section describes the contribution of Fort Belvoir to the economy and the social conditions in the region, including environmental justice and protection of children. The socioeconomic indicators used for this study include regional economic activity (employment and income), population, housing, and quality of life (availability of public and social services, recreational opportunities, community facilities). These indicators characterize the region of influence (ROI) that would be most affected by the proposed action at Fort Belvoir.

An ROI is a geographic area selected as a basis on which economic and social impacts of the proposed action are analyzed. The criteria used to determine the ROI are the residency distribution of Fort Belvoir employees; the commuting patterns, distances, and times; and the location of businesses providing goods and services to Fort Belvoir, its personnel, and their dependents. Fort Belvoir is in Fairfax County, Virginia, which is part of the National Capitol Region (NCR). Fort Belvoir functions as an administrative support center for the NCR. Washington, DC and the adjacent communities have a high degree of economic and social integration. The federal government is the core of the region, providing jobs and procuring goods and services throughout the area, of which Fort Belvoir is a part. Employees of Fort Belvoir and the other federal agencies that would relocate to Fort Belvoir because of the BRAC action reside throughout the NCR. On the basis of these criteria, the ROI for the socioeconomic environment is composed of the following counties and cities: Alexandria City, Arlington County, Fairfax City, Fairfax County, Falls Church City, Loudoun County, Manassas City, Manassas Park City, Prince William County, and Stafford County, Virginia; Calvert, Charles, Frederick, Montgomery, and Prince George's Counties in Maryland; and Washington, DC. The ROI is a large land area encompassing 2,782 square miles, and is shown in Figure 1-3.

The baseline year for socioeconomic data is 2005, the date of the BRAC Commission's announcement of the Fort Belvoir realignment. Where 2005 data are not available, the most recent data available are presented. Projections beyond 2005 are also provided, as appropriate, to illustrate trends.

4.10.1.1 Economic Development

4.10.1.1.1 Employment and Industry

The Fort Belvoir installation supports a working population of approximately 22,000, of which about 6,400 are military personnel, and the remainder is civilians and contractors. Fort Belvoir is home to two Army major command headquarters and elements of 10 others; 19 different agencies and direct reporting units of the Army; 8 elements of the U.S. Army Reserve and the Army National Guard; 26 DoD agencies; a Marine Corps detachment; a U.S. Air Force activity; and a Department of the Treasury agency (Fort Belvoir, 2006c).

The ROI supports a working population of more than 2.7 million. The number of jobs in the ROI increased by about 119,000 between 2001 and 2005 (Table 4.10-1). The largest employment sectors in the ROI are the professional and business services sector, which accounts for 23 percent of total ROI employment, and the government sector (federal, state, and local), which accounts for 22 percent of total ROI employment. Of that 22 percent, 12 percent are federal civilian jobs and 9 percent are state and local government jobs. While direct federal government

jobs have fallen from about 22 percent of total employment in 1980, sharp increases in federal government contracting has more than offset this decline in direct employment and helped push up ROI wages, home prices, and cost of living (McMillion, 2006).

Table 4.10-1
ROI Employment by Industry

NAICS Industry	Year 2001	Year 2005	Change 2001–2005	
			Number	Percent
Natural Resources & Mining	1,406	1,671	265	19%
Manufacturing	70,083	59,622	(10,461)	-15%
Construction	152,561	168,598	16,037	11%
Trade, Transport, & Utilities	361,180	366,652	5,472	2%
Information	128,118	97,224	(30,894)	-24%
Financial Activities	143,313	153,396	10,083	7%
Professional and Business Services	558,579	611,099	52,520	9%
Educational & Health Services	256,776	275,852	19,076	7%
Leisure & Hospitality	209,201	233,742	24,541	12%
Other Services	138,789	145,617	6,828	5%
Government	571,587	599,543	27,956	5%
Federal	324,842	336,969	12,127	4%
State	68,510	67,353	(1,157)	-2%
Local	178,235	195,221	16,986	10%
Unclassified/Other	2,954	873	(2,081)	-70%
Total	2,594,547	2,713,889	119,342	5%

Source: MWCOG, 2006a

Employment forecasts estimate ROI employment would increase by almost 322,000 jobs or 11 percent between 2005 and 2010, and by about 1,186,000 jobs or 39 percent between 2005 and 2030 (Table 4.10-2). Jurisdictions projected to have the highest percentage growth are Loudoun County, Falls Church City, Stafford County, and Prince William County. The highest increases in the number of jobs are forecast for Fairfax County, Prince George's County, Montgomery County, and Loudoun County.

The ROI 2005 annual unemployment rate was 3.4 percent (or about 93,000 persons unemployed)—lower than the national unemployment rate of 5.1 percent (BLS, 2006). The ROI's unemployment rate was relatively stable between 2001 and 2005, averaging a low 3.7 percent. The presence of the federal government provides some stability to the ROI during periods or economic recession, resulting in less fluctuation in unemployment than may be experienced in other regions or on a national level.

Table 4.10-2
Employment forecast

	Number of jobs			Change 2005–2010		Change 2005-2030	
	Year 2005	Year 2010	Year 2030	Number	Percent	Number	Percent
Alexandria City, VA	105,600	113,300	148,000	7,700	7%	42,400	40%
Arlington County, VA	195,200	217,800	275,800	22,600	12%	80,600	41%
Fairfax City, VA	29,200	31,300	39,300	2,100	7%	10,100	35%
Fairfax County, VA	600,500	683,900	844,600	83,400	14%	244,100	41%
Falls Church City, VA	9,500	11,800	20,300	2,300	24%	10,800	114%
Loudoun County, VA	122,700	153,700	271,200	31,000	25%	148,500	121%
Manassas City, VA	23,300	24,600	26,800	1,300	6%	3,500	15%
Manassas Park City, VA	3,000	4,500	4,900	1,500	50%	1,900	63%
Prince William County, VA	111,600	128,600	186,000	17,000	15%	74,400	67%
Stafford County, VA	38,300	46,100	73,400	7,800	20%	35,100	92%
Calvert County, MD	29,400	32,900	35,600	3,500	12%	6,200	21%
Charles County, MD	56,500	62,900	69,100	6,400	11%	12,600	22%
Frederick County, MD	122,200	142,400	167,300	20,200	17%	45,100	37%
Montgomery County, MD	500,000	545,000	670,000	45,000	9%	170,000	34%
Prince George's County, MD	358,700	390,000	544,700	31,300	9%	186,000	52%
Washington, DC	745,000	783,600	860,000	38,600	5%	115,000	15%
ROI	3,050,700	3,372,400	4,237,000	321,700	11%	1,186,300	39%

Source: MWCOG, 2006a

4.10.1.1.2 Income

The ROI had a per capita personal income (PCPI) of about $47,500 in 2004, one of the highest in the nation. This PCPI ranks in the top 5 in the United States and was 144 percent of the national average of $33,050. The ROI 2004 PCPI reflects an increase of 6.6 percent from 2003, compared to the national change of 5.0 percent. The 1994–2004 average annual growth rate of the ROI PCPI was 4.4 percent. The national average annual PCPI growth rate for the same time period was 4.1 percent (BEA, 2006).

4.10.1.1.3 Population

Table 4.10-3 presents population statistics for the ROI. Fort Belvoir is in a densely populated and robust region. In 2005 the ROI population was more than 4.9 million (Table 4.10-3), a 9 percent increase over the 2000 population of about 4.5 million. Fairfax County population alone exceeds one million. ROI population density is about 1,600 persons per square mile; the population density of the United States is about 80 persons per square mile (U.S. Census Bureau, 2006b). Three counties in the ROI were among the fastest-growing counties in the nation between 2000 and 2005: Loudoun, Stafford, and Prince William Counties, Virginia (U.S. Census Bureau, 2006a). Strong population growth is expected through 2030 (MWCOG, 2005a). This projected population growth is based on the anticipated long-term strength of the region's economy, high rates of inmigration and international migration, and declines in average household size less rapid than previously expected (MWCOG, 2005a).

Fort Belvoir is in Fairfax County and Northern Virginia's I-95 corridor. Fairfax County's population (including Fairfax City and Falls Church City) is forecast to increase by about 95,000

persons (9 percent) between 2005 and 2010. Northern Virginia's I-95 corridor (including Fairfax County, Fairfax City, Falls Church City, Prince William County, Manassas and Manassas Park City, and Stafford County) is forecast to increase its population by about 177,000 persons (11 percent) by 2010.

Table 4.10-3
Population projections

	Number of persons			Change 2005–2010		Change 2005-2030	
	Year 2005	Year 2010	Year 2030	Number	Percent	Number	Percent
Alexandria City, VA	135,900	143,900	169,400	8,000	6%	33,500	25%
Arlington County, VA	198,300	212,200	249,600	13,900	7%	51,300	26%
Fairfax City, VA	22,100	23,500	26,500	1,400	6%	4,400	20%
Fairfax County, VA	1,040,900	1,132,500	1,330,900	91,600	9%	290,000	28%
Falls Church City, VA	10,600	12,300	15,400	1,700	16%	4,800	45%
Loudoun County, VA	247,300	318,100	480,600	70,800	29%	233,300	94%
Manassas City, VA	37,600	38,600	41,900	1,000	3%	4,300	11%
Manassas Park City, VA	12,900	15,000	16,800	2,100	16%	3,900	30%
Prince William County, VA	352,100	416,800	556,300	64,700	18%	204,200	58%
Stafford County, VA	107,100	121,700	195,800	14,600	14%	88,700	83%
Calvert County, MD	82,800	91,000	101,400	8,200	10%	18,600	22%
Charles County, MD	138,000	147,400	204,200	9,400	7%	66,200	48%
Frederick County, MD	220,900	243,200	339,700	22,300	10%	118,800	54%
Montgomery County, MD	942,000	1,000,000	1,155,800	58,000	6%	213,800	23%
Prince George's County, MD	852,900	872,600	993,100	19,700	2%	140,200	16%
Washington, DC	577,500	608,700	733,800	31,200	5%	156,300	27%
ROI	4,978,700	5,397,600	6,609,900	418,900	8%	1,632,600	33%

Source: MWCOG, 2005b

4.10.1.2 Sociological Environment

4.10.1.2.1 Housing

On-post Housing. Fort Belvoir has 2,070 family-housing units. The housing units are mainly at the southern edge of the South Post, except Lewis Heights and Woodlawn Village, which are at the North Post's eastern edge. The installation has barracks that house about 1,200 single enlisted personnel and 462 temporary units for visitors and new arrivals (USACE, 2002).

Off-Post Housing. There were about 1,920,000 housing units in the ROI in 2005 (Table 4.10-4). Of these units, about 1,808,000 (94 percent) were occupied. Of the vacant housing units, about 31,000 were identified as available to rent and about 11,000 were for sale (U.S. Census Bureau, 2006c).

Table 4.10-4
Number of housing units

City or county	Year 2000	Year 2005	Change in number of units	Percent change
ROI	1,790,464	1,920,723	130,259	7%
Alexandria City, VA	64,251	68,406	4,155	6%
Arlington County, VA	90,426	92,622	2,196	2%
Fairfax County, VA	359,411	386,856	27,445	8%
Loudoun County, VA	62,160	93,374	31,214	50%
Prince William County, VA	98,052	125,667	27,615	28%
Stafford County, VA	31,405	40,220	8,815	28%
Calvert County, MD	27,576	31,652	4,076	15%
Charles County, MD	43,903	50,154	6,251	14%
Frederick County, MD	73,017	83,173	10,156	14%
Montgomery County, MD	334,632	356,603	21,971	7%
Prince George's County, MD	302,378	314,221	11,843	4%
Washington, DC	274,845	277,775	2,930	1%

Source: U.S. Census Bureau, 2006c
Notes:
Fairfax County includes Fairfax City and Falls Church City.
Prince William County includes Manassas City and Manassas Park City.

The number of housing units in the ROI increased by 7 percent (about 130,300 units) between 1990 and 2000. The largest numbers of housing units were built in Fairfax, Loudoun, Prince William, and Montgomery Counties. More than 30,000 housing units were constructed in Loudoun County and about 27,000 were built in Fairfax and Prince William Counties.

Housing costs in the ROI are considerably higher than the national averages. The median value of owner-occupied housing units in the region was about $388,000, or 232 percent of the national average of $167,500. Median rent was about $862, or 143 percent of the national median rent of $602 (U.S. Census Bureau, 2006c). The average sales price for homes in the ROI increased significantly between during the past 6 years. Since 1999, the region's average home sales price has more than doubled, appreciating by 119 percent, equating to almost a $250,000 increase in price. The average home sales price in 2005 for all types of housing units in the metropolitan Washington, DC area was $454,000. Demand for housing is forecast to grow through 2010, although not at the rates experienced in the first half of the decade. The key factor in housing demand is job growth (GMU, 2006), and the ROI would grow by about 321,000 jobs between 2005 and 2010 (see Table 4.10-2).

The number of homes sold in the region jumped dramatically between 2001 and 2005, from 86,966 in 2001 to 106,920 units in 2005 (MWCOG, 2006a). Fairfax County had the most homes sold in the region in 2005, with 23,114, followed by Montgomery, Prince George's, and Prince William counties (Table 4.10-5) (MWCOG, 2006a).

The number of new, privately owned housing units (single family and multi-unit) construction permits authorized in the region decreased from 34,646 in 2004 to 32,849 in 2005 (MWCOG, 2006a). The average number of permits issued between 2001 and 2005 was 33,387. Of the construction permits that were issued in 2005, 59 percent were issued in the Virginia counties of the ROI, 33 percent were issued in the Maryland counties, and 9 percent were in Washington,

DC. Fairfax County (including Fairfax City and Falls Church City), Prince William County, and Stafford County had a total of 11,471 permits issued (Table 4.10-6). In the first quarter of 2006, 6,909 residential construction permits were issued in the ROI (MWCOG 2006d).

Table 4.10-5
Net home sales in 2001 and 2005

Jurisdiction	2001	2005
ROI	86,966	106,920
Alexandria City, VA	2,975	3,256
Arlington County, VA	3,086	3,490
Fairfax City, VA	332	424
Fairfax County, VA	21,205	23,114
Falls Church City, VA	172	196
Loudoun County, VA	6,190	9,123
Manassas City, VA	890	1,194
Manassas Park City, VA	270	480
Prince William County, VA	7,687	11,920
Stafford County, VA	2,035	2,962
Calvert County, MD	1,620	1,675
Charles County, MD	2,201	3,157
Frederick County, MD	3,807	4,672
Montgomery County, MD	15,543	17,011
Prince George's County, MD	11,270	15,067
Washington, DC	7,683	9,179

Source: MWCOG, 2006a.

Table 4.10-6
New privately owned housing units authorized in 2005

Jurisdiction	Total	Single family
ROI	32,849	22,145
Alexandria City, VA	1,017	195
Arlington County, VA	1,275	166
Fairfax City, VA	28	28
Fairfax County, VA	4,353	2,276
Falls Church City, VA	24	24
Loudoun County, VA	5,199	4,716
Manassas City, VA	154	154
Manassas Park City, VA	188	81
Prince William County, VA	5,427	5,140
Stafford County, VA	1,639	1,452
Calvert County, MD	488	488
Charles County, MD	1,309	931
Frederick County, MD	1,872	1,414
Montgomery County, MD	3,591	1,700
Prince George's County, MD	3,425	3,255
Washington, DC	2,860	125

Source: MWCOG, 2006a.

4.10.1.2.2 Law Enforcement, Fire Protection, and Medical Services

The Fort Belvoir Directorate of Emergency Services (DES) oversees professional law enforcement and fire protection and response for the installation. Law enforcement is provided by the 212th Military Police (MP) Detachment. The MP provide physical security and perform community law enforcement operations including specialized traffic, canine, and investigation operations (Fort Belvoir, PAO 2004). Fort Belvoir has three fire stations: No. 465 on the South Post, No. 463 on the North Post, and No. 466 at Davison Army Airfield. These stations are staffed by five fire companies (three engine companies, one ladder truck company, and one airport crash company) with a total staff of about 65 firefighters (Fort Belvoir DPW ENRD, 2002). The South Post fire station has been identified as inadequate in terms of configuration and condition and needs to be renovated or replaced. The Fort Belvoir Fire Department is in need of one additional engine company (Sullivan, personal communication, 2007). There are no police, fire, or emergency services on EPG. Because of the physical separation, Main Post facilities are not adequate to support EPG because they cannot meet adequate emergency response times. Fort Belvoir's Fire Station 463 takes about 10 minutes to respond to EPG. The closest fire station to EPG is Fairfax County's Station 422 on Backlick Road, which can respond to EPG in about 3 to 5 minutes (Sullivan, personal communication, 2007).

Fort Belvoir has automatic and mutual aid police- and fire-service agreements with Fairfax County. Fort Belvoir is also a party to the Northern Virginia Emergency Services Mutual Response Agreement. This memorandum of agreement provides for the automatic mutual response of fire, rescue, and emergency services among Northern Virginia jurisdictions including Arlington County, City of Alexandria, City of Fairfax, Fairfax County, Fort Belvoir, Metropolitan Washington Airports Authority, and Loudoun County (Northern Virginia Emergency Services, no date). The closest civilian fire stations to Fort Belvoir are Fairfax County Fire Stations 424 on Lukens Lane, 437 off of Telegraph Road, and 419 in Lorton. Their response time to Fort Belvoir is about 5 to 8 minutes (Sullivan, personal communication, 2007).

City, county, and state police departments from other agencies provide law enforcement in the ROI. The ROI had more than 20,000 law enforcement employees (about 15,000 officers and 5,000 civilians) as of 2004 (DOJ–FBI, 2006). Fire protection in the ROI is provided by 111 career or volunteer fire departments with a total of 501 fire stations. The majority of the fire departments (86 departments or 77 percent) are volunteer and the remaining 25 departments are staffed by career or mostly career firefighters (NFPA, 2005; USFA, 2006).

The DeWitt Army Community Hospital on Fort Belvoir provides health care services to active and retired military personnel and their families residing in Northern Virginia. DeWitt Hospital is a 43-bed facility with an intensive care unit, medical/surgical ward, labor and delivery, mother/baby ward, a pharmacy and a pharmacy refill annex at the main PX on-post, and an emergency room. It is the only military inpatient facility in Northern Virginia and operates a 24-hour emergency room. However, DeWitt Hospital does not meet the requirements of a modern medical treatment facility. The hospital's utility systems require renovation, and there are patient privacy issues throughout the facility. Dental care on Fort Belvoir is provided at the on-post dental clinic, Building 1099. This facility is considered substandard because of poor facility conditions.

The DeWitt Health Care Network is recognized as the primary care base for the Walter Reed Health Care System. The DeWitt Health Care Network operates two Family Health Care Clinics on military installations, at Fort Belvoir and Fort Myer, as well as two off-post Family Health

Care Clinics in Fairfax and Woodbridge, Virginia. Adult inpatient and partial programs are provided through Walter Reed Army Medical Center. The National Naval Medical Center in Bethesda, Maryland, provides adolescent inpatient services. Malcolm Grow Medical Center at Andrews Air Force Base offers substance abuse inpatient and partial hospitalization programs.

There are more than 50 medical facilities in the ROI, including hospitals, medical centers, and special care facilities such as hospices and mental health institutes, and more than 9,000 patient beds (AHD, 2006; GUH, 2007; WHS, 2007). Virtually all modern medical services are available in the ROI. The civilian hospital nearest Fort Belvoir is the Inova Mount Vernon Hospital, a 140-bed facility about 5 miles northeast of the installation.

4.10.1.2.3 Schools

The U.S. Department of Education provides federal impact aid to school districts that have federal lands within their jurisdiction as authorized under Public Law 103-282. When military children attend public schools, enrollment is increased, but local tax revenue is not generated because military families live or shop on federal property, which is not taxed. The federal government acts as the local taxpayer by funding the Federal Impact Aid program for local school districts (DoD, 2005a). Total federal impact aid varies year by year according to congressional appropriations for the program. In FY 2004 federal impact aid ranged from $450 to $2,200 per student (DoD, 2005a).

Children living on Fort Belvoir attend schools that are part of the Fairfax County Public School System (FCPS). The FCPS has a total of 228 schools including elementary, middle, and high schools; alternative high schools; and special education, alternative program, and alternative learning centers. Student enrollment is about 166,500, making it the largest school system in Virginia and the 13th largest in the United States (FCPS, 2006). FCPS has been challenged to meet the demand for new schools and additional classroom space generated by the county's continuing population growth. Consequently, many schools are operating at or near full capacity. Mobile classrooms are used to provide additional classroom space.

As of the 2000 Census, 87 percent of school-aged children living on Fort Belvoir (Census tracts 4162 and 4219) attended public schools. From Fairfax County enrollment data, about 74 percent of students from Fort Belvoir were in grades kindergarten through sixth grade (elementary school) (USACE, 2003).

The Fort Belvoir Elementary School, located on the installation, is one of the largest elementary school in FCPS, serving more than 1,200 students from kindergarten through sixth grade (FCPS, 2006). Projected enrollment for September 2006 is 1,258 students (FCPS, 2006). Like many schools in Fairfax County, Fort Belvoir Elementary has experienced an effective reduction in capacity because of reduced class sizes and the space needed by special programs. As a result, although the design capacity of the school was for 1,500 students, the school is functionally over capacity and mobile classrooms are used to provide necessary extra space (USACE, 2003).

Fort Belvoir middle and high school students attend off-post FCPS schools. Fort Belvoir Elementary feeds into the Mount Vernon High School pyramid, and students attend the Whitman Middle School. Total enrollment projected for September 2006 is 933 for Whitman Middle School and 1,769 students for Mount Vernon High School. Both of these schools are close to Fort Belvoir, and students are bused to the schools. Students living on Fort Belvoir also have access to

other Fairfax County schools through countywide programs and authorized transfers, as well as private and religious schools in the area (USACE, 2003).

Children of military personnel residing off-post attend the school district for the area in which they live. In addition to FCPS, the following public school districts serve the ROI: Alexandria City School District, Arlington County Public Schools, Falls Church City Public Schools, Loudoun County Public Schools, Manassas City Public Schools, Manassas Park City Public Schools, Prince William County Public Schools, Stafford County Public Schools, Calvert County Public Schools, Charles County School District, Frederick County School District, Montgomery County Public Schools, Prince George's County Public Schools, and the District of Columbia Pubic Schools. Together these school districts have more than 1,100 schools, and total enrollment was almost 758,000 students (NCES, 2005). The median student-to-teacher ratio was 13.5:1, lower than the U.S. average of 15.9:1 (NCES, 2005). Some of these school districts, in particular those in counties experiencing strong population growth, have schools operating at or above capacity. Portable classrooms are used to house the students to maintain low student-to-teacher ratios and small class sizes. Having sufficient funding to meet the needs of enrollment growth, building new schools, hiring new teachers and other support staff such as guidance counselors, teacher salary agreements, and instructional materials continues to be a challenge because of budget constraints and the rising cost of education.

4.10.1.2.4 Family Support and Social Services

Army Morale, Welfare and Recreation (MWR) is a comprehensive network of support and leisure services designed to enhance the lives of Soldiers (active, Reserve, and Guard), their families, civilian employees, military retirees, and other eligible participants. MWR contributes to the Army's strength and readiness by offering services to support Soldiers and their families, which helps Army recruitment and retention (U.S. Army MWR, 2007). MWR is financed through Nonappropriated Funds (NAF); that is, MWR is not funded by Congress through taxpayer dollars, but by revenues earned from the purchase of MWR services.

MWR provides programs and services at each installation including family, child, and youth programs. MWR family support programs at Fort Belvoir are Army Community Service (ACS); Army Family Action Plan; Army Family Team Building; Family Advocacy Program; and Child and Youth Services. Fort Belvoir's ACS program provides a variety of Soldier and family support services programs, including relocation assistance; the Exceptional Family Member Program; the Consumer Affairs/Financial Assistance Program; and newcomer Orientation (Fort Belvoir PAO, 2004). Fort Belvoir's personnel and social service activities are in two buildings on-post, causing customers to travel to different locations to receive services, which has a negative impact on customer service and Soldier and family morale. Current space is also inadequate to support the required ACS programs, and parking is insufficient to allow clients, especially Exceptional Family Member clients, easy access to services.

Child and youth services are available through MWR for military families that require child care and preschool educational services. The North Post Child Development Center (CDC) offers about 200 full-day care spaces (including kindergarten) and 60 part-day preschool spaces and the South Post CDC offers 190 full-day care spaces and about 25 hourly care spaces. The existing CDCs are at or near capacity, with waiting lists for some categories of service. The ROI has many child day care facilities as well as in-home child care options.

The region has a number of shelters and assistance programs for individuals and families in need of the following: temporary placement because of a lack of fixed, regular, or adequate residence; financial assistance; protection from abuse or neglect; and assistance to persons with disabilities. The Virginia Department of Social Services operates through the county or city local social service departments and provides assistance to all citizens of Virginia, including active duty military personnel stationed in the state and their families. Virginia Department of Social Service programs include adult and child protective services, child care, adult day care, assisted living facilities, financial assistance, food stamps, low-income energy assistance, support for adults and children with special health care needs or disabilities, domestic violence, and substance abuse counseling (VDSS, 2006).

4.10.1.2.5 Shops, Services, and Recreation

Fort Belvoir's primary shopping area is the PX Mall on North Post, a discount retail store run by the Army and Air Force Exchanges Services (AAFES) that provides goods and services to active duty military, their families, retirees, and reservists (ALA, 2007). The AAFES is self-funded (NAFs), paying operating costs from revenues. AAFES earnings are also used to fund MWR programs, build new stores, or renovate existing facilities without expense to the Federal government (AAFES 2007). The AAFES oversees operation of all other retail establishments on the installation, including shopettes, Class VI, tailor shop, military clothing store, service stations (gasoline and automobile maintenance), dry cleaner, and barber and beauty shops, with the exception of the Commissary. The Fort Belvoir Commissary, operated by the Defense Commissary Agency (DeCA), sells groceries and health and beauty aids. DeCA is funded with appropriated (tax-payer) dollars (ALA, 2007).

Other shop and service establishments on Fort Belvoir are SunTrust Bank, the Fort Belvoir Credit Union, the Religious Education Center, the Chaplain Family Life Center, the Joint Personal Property Shipping Office, the Barden Education Center, the Van Noy Library, the Veterinary Clinic, and the Self-Help Center (USACE, 2003).

Fort Belvoir's MWR program also provides many recreation, sports, entertainment, travel, and leisure activities for Soldiers, their families, retirees, and civilians. Facilities include an officer's club, community club, 45-hole golf complex (a 9-hole golf course on the South Post with club house and snack bar, and a 36-hole golf course on the North Post with full service golf club and dining facilities), tennis courts, swimming pools, athletic fields, archery range, picnic areas, playgrounds, soccer fields, football fields, softball fields, walking and running trails, youth services center, a 24-lane bowling center with snack bar, and the Sosa Community Center. The Fort Belvoir Marina has wet slips and dry-storage facilities that can be rented on an annual basis. Some of Fort Belvoir's undeveloped areas are open to recreational use for fishing, bow hunting, bird watching, nature hiking, and environmental education programs (Fort Belvoir DPW ENRD, 2002). As noted earlier, revenues from the use of these facilities provides for the continued operation of MWR and its programs.

The ROI has ample opportunity for shopping, sightseeing, and recreation. There are numerous museums and historic sites in the DC area, including the Smithsonian Institution and its many museums; historic buildings and monuments; parks and recreation centers; and many performing arts centers such as the Kennedy Center. Boating, kayaking, and sightseeing tours are conducted on the Potomac River. Washington, DC has professional baseball, basketball, football, hockey, and soccer teams. . Financial, real estate, automotive, travel, and other service establishments are

readily available. There are many plazas, malls, and downtown shopping areas. The Springfield Mall and Landmark Mall are the closest shopping malls to Fort Belvoir.

4.10.1.3 Environmental Justice

Environmental justice addresses race, ethnicity, and the poverty status of populations within the ROI. On February 11, 1994, the President issued EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* The order is designed to focus the attention of federal agencies on the human health and environmental conditions in minority and low-income communities. Environmental justice analyses are performed to identify potential disproportionately high and adverse effects from proposed actions and to identify alternatives that might mitigate these effects.

To identify potential environmental-justice areas, data was collected on minority and low-income populations for Census block groups in the ROI. Block groups are subdivisions of a census tract and represent the level at which disproportionate impacts would be most noticeable. Table 4.10-7 lists the block groups that correspond to the Fort Belvoir, EPG, or GSA Parcel and block groups that are contiguous with the boundaries of those three areas. Census block groups 4219-1 and 4162-1 coincide with the land area of the Fort Belvoir installation. Block group 4220-2 coincides with Accotink Village, an enclave within Fort Belvoir.

Minority populations should be identified for environmental justice analyses where either the minority population of the affected area exceeds 50 percent or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ, 1997). The latter guidance was used for this analysis, identifying Census block groups with minority or low-income population percentages exceeding the state levels, which has a lower threshold than the 50 percent threshold (the percentage of minority populations in the state is 30 percent, and the percentage of persons below poverty level is 9.6 percent). Table 4.10-7 lists minority-population and low-income statistics for these block groups and for Virginia. Figure 4.10-1 depicts the minority and low-income block groups.

Of the 16 block groups identified in the Fort Belvoir affected area, 9 of them, or 56 percent, had a higher percentage of minority residents compared to the state, and 1 of the block groups, or 6 percent, had a higher percentage of low-income residents, compared to the state of Virginia.

Of the 5 block groups identified for EPG affected area, 4 of them, or 80 percent, had a higher percentage of minority residents compared to the state. None of the block groups exceeded the state poverty rate.

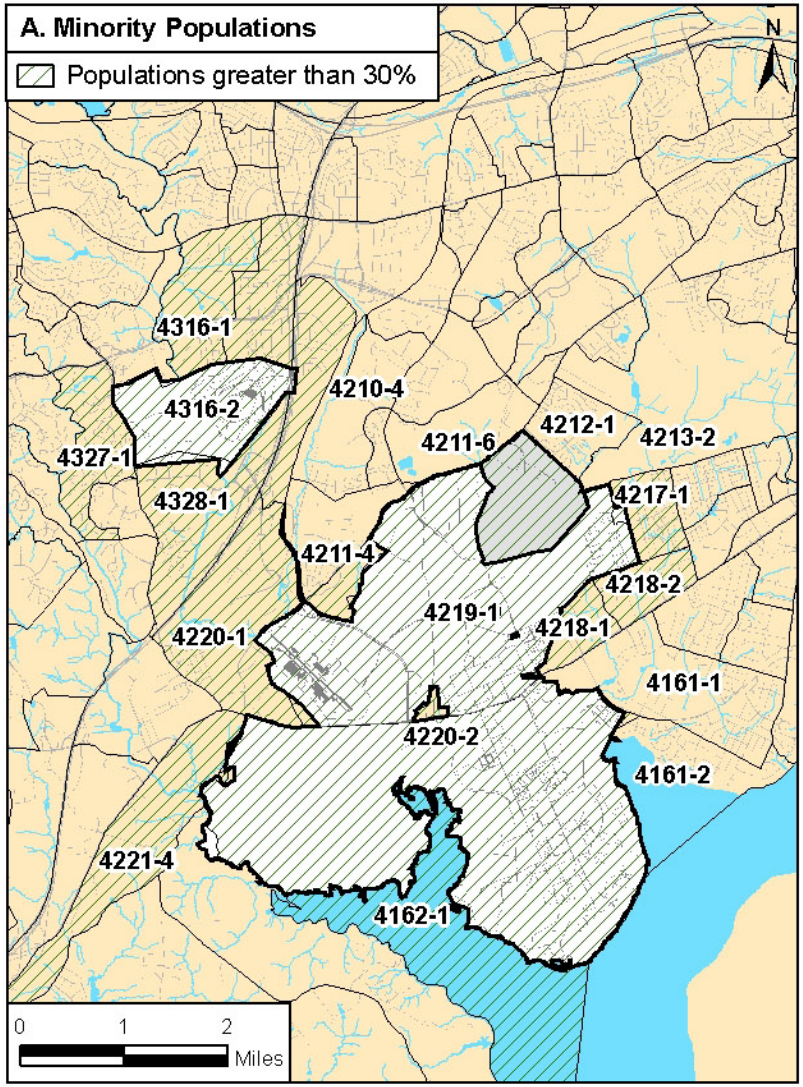
Of the two block groups identified for the GSA Parcel affected area, both had a higher percentage of minority residents compared to the state. Neither of the block groups exceeded the state poverty rate.

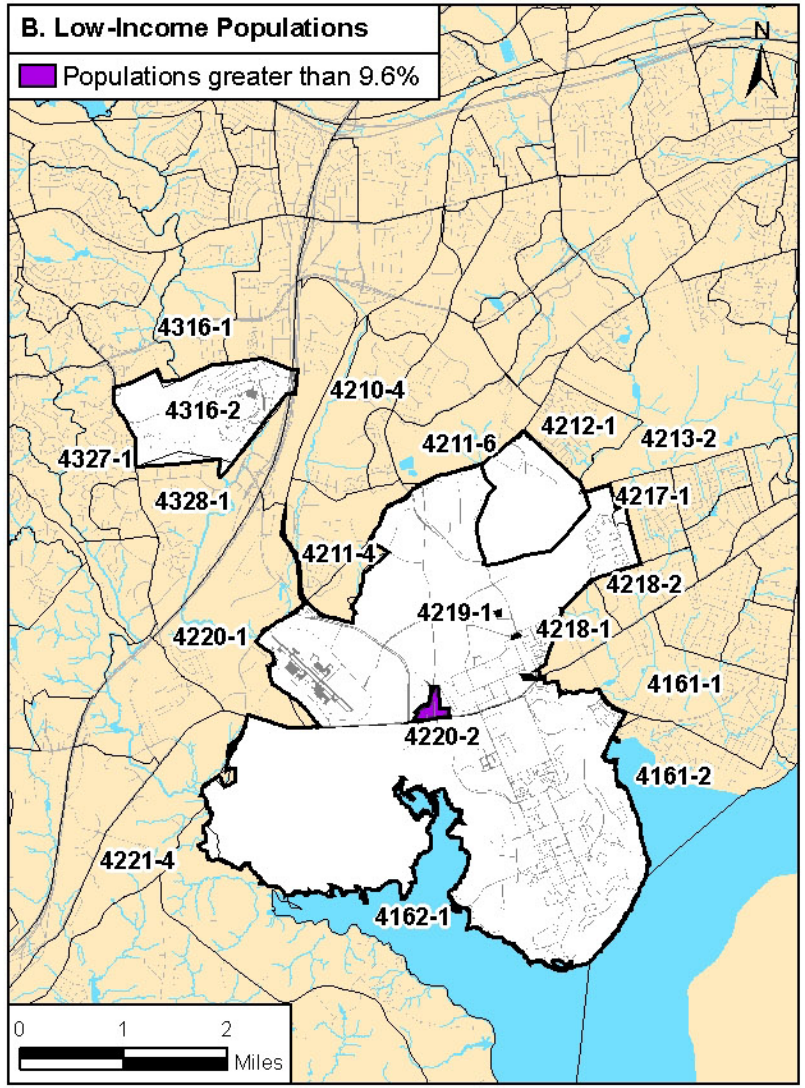
In summary, on the basis of Census data, there are areas with high percentages of minority or low-income populations that could potentially be affected by the proposed action. Potential disproportionate effects on minority or low-income populations are identified and addressed in Section 4.10.2 of this EIS.

Table 4.10-7
Minority or low-income population

	Minority		Low-income	
Corresponding land area	**Census tract-block group**	**Percent minority**	**Census tract-block group**	**Percent below poverty level**
Fort Belvoir	4161-1	13%	4161-1	1%
Fort Belvoir	4161-2	12%	4161-2	2%
Fort Belvoir	4162-1	46%	4162-1	5%
Fort Belvoir	4163-1	8%	4163-1	4%
Fort Belvoir	4211-4	30%	4211-4	3%
Fort Belvoir	4211-6	30%	4211-6	0%
Fort Belvoir	4211-7	32%	4211-7	6%
Fort Belvoir	4212-1	20%	4212-1	0.2%
Fort Belvoir	4213-2	29%	4213-2	0.8%
Fort Belvoir	4217-1	45%	4217-1	6%
Fort Belvoir	4218-1	55%	4218-1	6%
Fort Belvoir	4218-2	67%	4218-2	6%
Fort Belvoir	4219-1	53%	4219-1	8%
Fort Belvoir	4220-1	44%	4220-1	4%
Fort Belvoir	4220-2	56%	4220-2	16%
Fort Belvoir	4221-4	46%	4221-4	6%
EPG	4315-2	26%	4315-2	1%
EPG	4316-1	42%	4316-1	5%
EPG	4316-2	68%	4316-2	9%
EPG	4327-1	33%	4327-1	0%
EPG	4328-1	40%	4328-1	5%
GSA Parcel	4210-1	39%	4210-1	4%
GSA Parcel	4210-4	47%	4210-4	3%
Virginia	Virginia	30%	Virginia	9.6%

Source: U.S. Census Bureau, 2000.





LEGEND

Installation Property

Census Block Group Boundary

Minority and Low-Income Block Groups

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006; U.S. Census Bureau 2006.

Figure 4.10-1

4.10.1.4 Protection of Children

On April 21, 1997, the President issued EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. This EO directs each federal agency to ensure that its policies, programs, activities, and standards address disproportionate environmental health or safety risks to children that may result from their actions. EO 13045 recognizes that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health and safety risks. These risks arise because of the following facts:

- Children's neurological, immunological, digestive, and other bodily systems are still developing
- Children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults;
- Children's size and weight may diminish their protection from standard safety features
- Children's behavior patterns make them more susceptible to accidents because they are less able to protect themselves

Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, the President directed each federal agency to (1) make it a high priority to identify and assess environmental health risks and safety risks that might disproportionately affect children; and (2) ensure that the agency's policies, programs, and standards address disproportionate environmental health risks or safety risks to children. Examples of risks to children include increased traffic volumes and industrial- or production-oriented activities that would generate substances or pollutants that children could come into contact with or ingest.

Historically, children have been present at Fort Belvoir as residents and visitors (e.g., living in family housing, attending schools, using recreational facilities). The Army has taken precautions for their safety by a number of means, including using fencing, limiting access to certain areas, and providing adult supervision. Potentially disproportionate risks to children are be identified and addressed in Section 4.10.2 of this EIS.

4.10.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

4.10.2.1 Economic Development (Employment, Industry, Income, Population)

4.10.2.1.1 Land Use Plan Update

Short- and long-term minor beneficial effects could occur. The Preferred Alternative land use plan would increase the number of acres on Fort Belvoir and EPG designated as Professional/Institutional, Community, Residential, and Troop Housing, providing the opportunity for development (or redevelopment) of this land. If construction or renovation of facilities occurs on the land, it would generate short-term construction employment, income, and increased spending in the region from the purchase of construction and other materials. In the long-term, operation of new facilities would result in an increase in the numbers of maintenance, administrative, and professional personnel working at Fort Belvoir.

Table 4.10-8 presents impacts of each of the proposed BRAC action projects on economic and sociological resources.

Table 4.10-8
Effects from proposed BRAC projects on economic and social resources under the Preferred Alternative

Project #	BRAC project	Economic Change	Social change
1	NGA Administrative Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
2	WHS Administrative Facility		
3	MDA		
4	Hospital	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries due to availability of new, state-of-the-art hospital; long-term significant adverse effects due to loss of South Post Golf Course which would be closed to accommodate hospital and NARMC
5	Dental Clinic	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries from availability of expanded dental clinic
6	NARMC HQ Bldg.	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to loss of South Post Golf Course which would be closed to accommodate hospital and NARMC
7	COE Integration Offices	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
8	Infrastructure	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
9	Emergency Services Center (EPG)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to center which would provide rapid response to structural fires and medical emergencies in support of the agencies and activities on EPG

Table 4.10-8
Effects from proposed BRAC projects on economic and social resources under the Preferred Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
10	Network Operations Center	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
11	USANCA Support Facility		
12	Child Development Center (NGA)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects from additional child day care facility
13	Child Development Center		
14	Admin Facility (211, 214, 215, 220)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
15	Access Road/Control Point	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to impact on recreational fields and loss of revenue to MWR
16	AMC Relocatables	No effect	No effect
17	PEO EIS Admin Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand

Table 4.10-8
Effects from proposed BRAC projects on economic and social resources under the Preferred Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
18	Structured Parking, 200 Area	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
19	Modernize Barracks	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to new barracks for Soldiers
20	MWR Facility Travel Camp	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on quality of life from new travel camp

Methodology. Economic effects of Fort Belvoir's proposed BRAC implementation and other facilities projects have been estimated using the Economic Impacts Forecast System (EIFS) model. The EIFS model is a computer-based economic tool that calculates multipliers to estimate the direct and indirect effects of a given action. Changes in installation employment and expenditures represent the direct effects of the action. On the basis of the input data and the model's calculated multipliers, the model estimates ROI changes in sales volume, income, employment, and population for the direct and indirect effects of the action. Note that the model does not project a specific distribution of population by age, it does not project a specific distribution of the population among the counties and cities composing the ROI, and it does not project distribution of employees among occupational categories. The model projects estimated total changes in sales volume, income, employment, and population for the ROI as a whole.

For purposes of the EIFS analysis, a change is considered significant if it falls outside the historical range of ROI economic variation. To determine the historical range of economic variation, the EIFS model calculates a rational threshold value (RTV) profile for the ROI. This analytical process uses historical data for the ROI and calculates fluctuations in sales volume, income, employment, and population patterns. The positive and negative historical extremes for the ROI become the thresholds of significance (i.e., the RTVs) for economic change. If the estimated effect of an action falls above the positive RTV or below the negative RTV, the effect could be considered significant. Appendix G.1 discusses this methodology in more detail and presents the RTV's for the ROI and the model input and output tables developed for this analysis.

Note that, the EIFS model output assumes that changes occur at one time, when in fact the effects of the proposed Fort Belvoir BRAC action would be spread out over several years. Therefore, the multiyear activity was modeled using EIFS by determining the changes in amount of construction spending and employment in each year of the project cycle (2007 through 2011), and a separate EIFS model run was completed for each year. Fort Belvoir's expected construction spending for the BRAC action and associated other facility projects were input into the model as the change in

local expenditures. The estimated number of separated or newly added military or civilian jobs to the ROI were entered in the model as the changes in employment. Jobs that represent employees shifted from one location to another within the same geographic area (i.e., the ROI) are not included because they do not result in change in ROI employment. Only jobs that are coming into or leaving the ROI because of the Fort Belvoir BRAC action are entered in the EIFS model. Appendix G.1 discusses further the inputs and outputs of the EIFS model for this proposed action.

Economic impacts (employment, industry, income, population). Short-term minor beneficial effects would be expected. The installation would construct about 6.2 million square feet of new built space and renovate about 320,000 square feet of existing space between 2007 and 2011 (see Table 2-3 in Section 2.2.2.3). These facilities would be new work space for the incoming personnel and general support facilities to meet the needs of the larger working population. The construction and renovation expenditures would result in beneficial increases in ROI sales volume, income, and employment. The EIFS model outputs for each project year are presented in Appendix G.1 and Table 4.10-9. Although the proposed action's expenditures would be quite substantial, Fort Belvoir is in such an economically large and robust region that the magnitude of the expenditures relative to the regional demographic and economic forces would still fall within historical fluctuations for the ROI and therefore be considered minor. For each project year, the proposed action would result in minor economically beneficial increases in sales volume, income, and employment for the ROI. Because construction projects are, by nature, temporary, the economic stimulus from construction of the proposed BRAC and associated facilities would diminish over time as the projects reach completion in 2011.

The peak year of expenditures would be 2008, when sales volume increases directly attributable to the proposed action would be more than $2.1 billion (Table 4.10-9). Indirect sales volume would be about $3.7 billion, for a total sales volume increase of about $5.8 billion. About 9,200 jobs would be created as a result of direct expenditures associated with the BRAC action. About 16,000 indirect jobs would be created, for a total increase in ROI employment of about 25,000. ROI income would increase by about $453 million because of the creation of direct jobs, and indirect expenditures would increase income by about $797 million, for a total increase in ROI income (direct and indirect) of about $1.25 billion.

Direct employment generated by the proposed action's construction projects would peak at about 9,200 in 2008 (Table 4.10-9). The proposed action would increase demand for construction workers. The types of direct jobs that would be created include construction managers, laborers, surveyors, electricians, painters, heavy equipment operators, and brick masons, along with a variety of other trades. The ROI has a civilian labor force of about 2,700,000 individuals, with about 2,600,000 employed and 93,000 unemployed (BLS, 2006). The construction industry employs about 168,000 people in the ROI and is a growing industry. ROI employment forecasts project about 11 percent job growth (or about 321,700 jobs) between 2005 and 2010. During the peak year of 2008 (Table 4.10-9) about 9,300 direct jobs would be created, primarily in construction; this equates to about 5 percent of the 168,000 persons currently employed in the ROI construction industry. Although the construction industry is projected to grow, current ROI construction labor force might not be sufficient to fill the jobs. Employment growth is beneficial to an economy, and expansion of the industry base confers economic benefits on the region. The primary socioeconomic concerns would materialize if expansion occurs in a short time frame, or if other aspects of the economy also undergo a rapid expansion during the same time period. Possible labor shortages could occur, resulting in a rise in labor costs and ultimately a rise in overall project cost. The market would respond to a shortage with new workers entering the

construction industry from other industries, or new workers coming from outside the region to fill available jobs.

In addition to direct employment, construction activity also generates indirect and induced jobs. This is employment generated by increased business activities associated with the construction of the facilities on Fort Belvoir (business to business transactions) and consumer spending by the workforce. Table 4.10-9 (and Appendix G.1) shows estimates of secondary employment generated by the construction activity for each year, listed as induced employment in the table. In the peak year of 2008, and there would be an estimated 16,000 indirect jobs. These jobs, unlike the construction jobs, would be less specialized and would be generated in a variety of sectors including, but not limited to, services, retail trade, and transportation. Given the size of the workforce in the ROI (about 2.7 million), the unemployed labor pool of about 93,000, and the projected growth of the population and workforce, it is anticipated that these jobs would be filled by persons in the ROI.

Table 4.10-9
EIFS model output for the proposed BRAC Action at Fort Belvoir

	Projected Change				
Indicator	**2007**	**2008**	**2009**	**2010**	**2011**
Direct sales volume	$161,337,500	$2,134,221,000	$655,818,800	$578,870,800	$194,528,500
Induced sales volume	$283,954,000	$3,756,228,000	$1,154,241,000	$1,018,813,000	$342,370,200
Total sales volume	$445,291,500	$5,890,449,000	$1,810,060,000	$1,597,683,000	$536,898,700
Direct income	$34,259,020	$453,188,500	$139,259,000	$122,919,600	-$22,554,060
Induced income	$60,295,860	$797,611,700	$245,095,900	$216,338,500	$72,700,180
Total income	$94,554,870	$1,250,800,000	$384,354,900	$339,258,100	$50,146,120
Direct employment	702	9,286	2,853	2,519	-924
Induced employment	1,235	16,343	5,022	4,433	1,490
Total employment	1,937	25,628	7,875	6,951	566
Local population	0	0	0	0	-2,465

The BRAC Commission's recommendations would generate a net increase of 22,000 people in the workforce on Fort Belvoir. Most of these personnel reside within a one-hour's drive to Fort Belvoir. These personnel represent jobs that would be shifted from one location to another within the ROI (e.g., personnel at NGA in Bethesda, Walter Reed in Washington, DC, and leased space in Crystal City that would be transferred to Fort Belvoir), and would therefore not result in a change in ROI employment. It is probable that some of the affected personnel would change their home residence within the ROI to improve their commute to Fort Belvoir. The transportation model used for the proposed Fort Belvoir BRAC action estimated how population (and therefore traffic) would shift within the ROI because of the proposed Fort Belvoir BRAC action (see Section 4.3, Transportation). In keeping with the transportation model, it was assumed that 50 percent of the existing WHS, other DoD, and NGA employees would change their home residence because their job would be transferred to Fort Belvoir, and it was further assumed that these employees would be redistributed within the region as the current Fort Belvoir employees are distributed (see Figures 4.3-5, 4.3-16, and 4.3-17 in Section 4.3, Transportation). These assumptions were used to determine the redistribution of the population within the ROI. An employee's decision to move

could depend on factors such as the location of a spouse's place of employment, changing a child's school district, proximity to family and friends, or cost of housing.

WHS and other DoD agencies that would be realigned to Fort Belvoir employ about 9,200 people, and the NGA employs about 8,500. Applying the assumption that 50 percent would move because of the Fort Belvoir realignment, about 4,600 of the WHS and DoD employees and about 4,200 of the NGA employees would relocate within the ROI (see Appendix G.2 for additional data and calculations). Table 4.10-10 lists the projected redistribution of these employees within the region on the basis of the distribution of the current Fort Belvoir employees. These projections indicate that many of the employees would relocate to the Northern Virginia I-95 corridor including Fairfax County, Prince William County, and Stafford County and the city of Fredericksburg.

Table 4.10-10
Redistribution of WHS, other DoD, and NGA employees by location

District [a]	Location	Fort Belvoir % number of employees by ROI location [b]	Redistribution of 50% of WHS and other DoD employees by location [c]	Redistribution of 50% of the NGA employees by location [c]	Total employees redistributed [c]
A	Arlington/Alexandria	4%	205	165	370
B	Northern Fairfax County/Loudoun County	7%	330	290	620
C	Southern Fairfax County	38%	1,770	1,590	3,360
D	Prince William County	23%	1,050	965	2,015
E	Near South (Fredericksburg/Stafford County)	9%	425	380	805
F	Remainder of Virginia	7%	330	295	625
G	District of Columbia	1%	55	40	95
H	Prince Georges County	5%	215	210	425
I	Montgomery County	1%	50	40	90
J	Remainder of Maryland	4%	195	170	365
	Total		**4,625**	**4,145**	**8,770**

Source: VHB, 2006

Notes:

[a]District corresponds to districts shown in Section 4.3, Transportation, Figures 4.3-5, 4.3-16, and 4.3-17.

[b]About 1 percent of the Fort Belvoir employees work offsite outside the ROI.

[c]Numbers are rounded.

Demographic characteristics from the U.S. Census Bureau 2005 American Community Survey for the Washington, DC Metropolitan Statistical Area on family and non family households and average family size were used to estimate the total population relocation within the ROI (Table 4.10-11 and Appendix G.2). The BRAC action could result in the relocation of about 21,600 persons within the ROI (employees and their families; see Appendix G.2 for calculations), of which about 10,200 would be children (under the age of 18). Southern Fairfax County would be expected to receive the largest share of the population (about 9,200), followed by Prince William County (about 5,000 people), then Stafford County and the city of Fredericksburg (about 1,900 people). The BRAC actions at Fort Belvoir must be initiated no later than September 15, 2007, and completed no later than September 15, 2011, so the population shift would be expected to

occur around that same time frame, as employees would decide whether to relocate relative to their new place of employment. Population projections were available for the year 2010. Table 4.10-12 shows a comparison between the anticipated population increase from 2005 to 2010 with and without the BRAC action. The estimated population increases with the Fort Belvoir BRAC action would be slightly above current projected levels. Most jurisdictions within the ROI would experience about a 1 percent increase or less in population over the original projection. The effects of the population increase would be diminished by time; the population shift would not be expected to occur all at once, but gradually, so there would not be a sudden influx of people into one jurisdiction.

The ability of the ROI to accommodate this economic and population growth would depend on many factors, including the degree to which local infrastructure—including roads, environmental management systems, and public services—is also enhanced to meet the demand of the additional population. As mentioned previously, the ROI is an economically robust region that has experienced strong growth in the past 5 years and, on the basis of current population and employment projections, is anticipated to continue to grow. Growth is largely beneficial to the economy; however, labor, material, and housing shortages could result if expansion occurred too rapidly or if increases in infrastructure investment, including housing, lagged behind employment and population growth. Because the shift of ROI population caused by the proposed Fort Belvoir BRAC action would occur over a period of time, and the population increases would not greatly exceed current projections, the ROI economy would have time to respond to the new demands by increasing the labor force and supply of goods and services and housing, as is currently occurring in the ROI.

Table 4.10-11
Redistribution of Population by Location

District[a]	Location	Number of Adults[b]	Number of Children[b]	Total
A	Arlington/Alexandria	460	410	870
B	Loudoun County[c]	320	290	610
C	Fairfax County	4,865	4,340	9,205
D	Prince William County	2,650	2,365	5,015
E	Near South (Fredericksburg/Stafford County)	1,040	925	1,965
F	Remainder of Virginia	805	720	1,525
G	District of Columbia	115	105	220
H	Prince Georges County	575	515	1,090
I	Montgomery County	115	105	220
J	Remainder of Maryland	460	410	870
	Total	**11,405**	**10,185**	**21,590**

Notes:

[a]District corresponds to districts shown in Section 4.3, Transportation, Figures 4.3-5, 4.3-16, and 4.3-17.

[b]Numbers are rounded.

[C]Loudoun County was broken out from Fairfax County. It was assumed that 40% of the projected Northern Fairfax County/Loudoun County redistributed population would live in Loudoun, and 60% would live in Northern Fairfax County.

Table 4.10-12
Comparison of projected population growth by location

District[a]	Location	Projected 2005 to 2010 population percentage change, without BRAC	Projected 2005 to 2010 population percentage change, with BRAC redistribution	Difference
A	Arlington/Alexandria	6.6	6.8	0.20
B	Loudoun County	28.6	28.9	0.30
C	Fairfax County	8.8	9.7	0.90
D	Prince William County	16.8	18.1	1.30
E	Near South (Fredericksburg/Stafford County)	13.6	15.5	1.90
F	Remainder of Virginia	11.6	12.4	0.80
G	District of Columbia	5.4	5.4	--
H	Prince Georges County	2.3	2.4	0.10
I	Montgomery County	6.2	6.2	--
J	Remainder of Maryland	9.0	9.2	0.20

Notes:
[a]District corresponds to districts shown in Section 4.3, Transportation, Figures 4.3-5, 4.3-16, and 4.3-17.
[b]Numbers are rounded.

4.10.2.2 Sociological Environment

Under the proposed Fort Belvoir BRAC action, the region would require additional infrastructure investment to maintain the current level of public services, including teacher-student ratios, per capita hospital beds, and number of fire and police personnel per resident. Historically, public services such as schools, law enforcement, fire protection, and health care facilities have expanded to meet the needs of the region's growing population. For counties and cities in the ROI, keeping up with growth has been a major challenge; however, public services were able to accommodate the needs of the rapidly growing region. School districts in the ROI are continually constructing new facilities or expanding capacity at existing facilities. Police and fire departments have also expanded their programs and increased their personnel and their vehicle inventory to accommodate population growth. Property and sales taxes provide funding for these public services. The following identify the anticipated effects for each of the key components of the sociological environment.

4.10.2.2.1 Land Use Plan Update

Housing. Long-term beneficial effects would be expected for on-post Unaccompanied Personnel Housing. Under the Preferred Alternative land use plan, a new Troop land use area would be designated on South Post, west of Gunston Road. However, current land uses, with Troop housing in the 2100 Area on the North Post, would continue until such time as the Army could construct and occupy troop facilities in the new area on South Post. An eventual relocation of the Troop area to the South Post would be beneficial to the troops, placing them in close proximity to installation services such as healthcare, shopping, service, and recreation facilities.

Police, Fire, Medical. Short-term minor beneficial effects would be expected on-post. The land use plan designates acreage as Professional/Institutional land use on the South Post. New medical facilities could be constructed on this land area. Land on EPG also would be designated as Professional/Institutional. Police, fire, or medical emergency facilities could be constructed on this land.

Schools. No effects would be expected.

Family Support, Shops, Services, and Recreation. Long-term beneficial and adverse effects would be expected. The land use plan would reduce the number of acres designated as Outdoor Recreation, resulting in long-term adverse effects. Fort Belvoir would lose a significant amount of valuable recreational acreage. Although some of the acreage would be incorporated into Community and Open Space, the proposed land use plan would change a portion of the land use designation of the South Post golf course from Outdoor Recreation to Professional/Institutional. Also, the North Post playing field along Route 1 across from Pence Gate would change from Outdoor Recreation to Community, and hunting grounds on EPG would be lost because the land use designation would change to Professional/Institutional. The four McNaughton ballfields along Pole Road on the South Border of Woodlawn Village for the Berman Tract immediately east of Woodlawn Village would be designated as Community land use.

The proposed land use plan does include Community land use designation on the South Post, where the development of a town center could occur. A town center could consist of mixed-use development that could include recreational facilities such as a fitness center and ballfields.

4.10.2.2.2 BRAC Implementation and Facilities Projects

Housing. Long-term minor beneficial effects would be expected on Unaccompanied Personnel Housing. The troop housing on the North Post would be replaced with a new facility in the newly designated Troop area on the South Post. The new barracks would provide quality, affordable housing accommodations for Soldiers that would be in close proximity to installation services such as healthcare, shopping, service, and recreation facilities.

No effects would be expected to off-post housing. It was estimated that about 8,800 employees would change their home residence within the ROI because their job would be transferred to Fort Belvoir (see Table 4.10-10). As of 2005, the ROI housing stock had an estimated 42,000 vacant housing units, of which about 31,000 were available for rent and about 11,000 units were available for sale (U.S. Census Bureau, 2006c). Data was not yet available for several of the counties in the ROI. The number of housing units in the ROI available for sale or rent would be greater than the listed 42,000 units. The ROI experienced a surge in the housing market between 2000 and 2005, with an average of 33,000 permits issued per year for new residential housing construction. More than 100,000 home sales transactions occurred in 2005 (Table 4.10-5). Housing and rental property in the ROI are market driven. The housing stock is forecast to continue to increase with demand and would be anticipated to be able to support the projected housing demand under the proposed alternative. In addition, the resulting population shift under BRAC would not be expected to occur all at once, but gradually. The sale and purchase of homes by the relocating Fort Belvoir employees would occur over time.

The highest percentage of employees is expected to relocate along Virginia's I-95 corridor in Fairfax, Prince William, and Stafford Counties. As shown in Table 4.10-10, about 3,300 employees would relocate to Southern Fairfax County, about 2,000 in Prince William County,

and about 800 in Stafford County (assuming each employee represents one household). Between 2000 and 2005, Prince William County's and Stafford County's housing stock increased by more than 25 percent, and Fairfax County's increased by 8 percent (Table 4.10-4). Fairfax County had more than 23,000 net home sales in 2005, with a housing inventory of more than 386,000 units, and more than 4,300 new housing units permitted. As of 2005 Prince William County had almost 12,000 net home sales, a housing inventory of more than 125,000 housing units, and about 5,400 new units permitted. Stafford County had almost 3,000 home sales in 2005, a housing inventory of about 40,000, and more than 1,600 new homes authorized. As stated earlier, the BRAC-related housing transactions would be dispersed over time, so a sudden, short-term increase in housing demand in these areas would not be anticipated.

Police, Fire, Medical. Long-term beneficial effects and short-term minor adverse effects on on-post police, fire, or medical services would be expected. The proposed action would result in about 6.3 million square feet of additional built space and 22,000 additional people working on the installation. Fort Belvoir plans to construct additional emergency and medical facilities, purchase the appropriate equipment, and bring on additional personnel to provide sufficient police, fire, and medical emergency response to the new structures and to support the installation's increased population under the BRAC action.

As part of the BRAC action, a new emergency services center would be constructed on EPG. This center would provide required military police, Enhanced 911, hazardous materials response, and fire prevention and protection services for the proposed facilities that would be constructed on EPG and for the associated personnel that would be stationed at EPG. The emergency services center would provide a combined police and fire station to provide traffic control, law enforcement, and provide rapid response to structural fires and medical emergencies in support of the agencies and activities on EPG.

A new hospital would be built on the South Post to replace the Dewitt Army Community Hospital. This project would provide a hospital to support BRAC 2005 restationing actions within the ROI affecting WRAMC, National Naval Medical Center (NNMC), Malcolm Grow Medical Center (MGMC), and Dewitt Army Community Hospital at Fort Belvoir. The NCR Medical Service Market supports care for more than 439,000 beneficiaries. A larger Dewitt Community Hospital is required to support the relocation of nontertiary patient care functions consequent to the BRAC 2005 restationing actions, which includes the closure of WRAMC and closure of inpatient care at MGMC. In addition, an expanded dental clinic and a NARMC HQ building would be sited on the South Post. Locating these medical facilities in close proximity with one another would provide convenience for patients and staff. These facilities would be necessary under the proposed BRAC action to support the increase in medical and dental workload generated by the projected increase of active-duty Soldiers and civilians eligible for medical benefits at Fort Belvoir.

Short-term minor adverse effects would be expected on on-post fire and police services. The South Post Fire Station is inadequate and needs to be replaced. The existing fire station, Building 191, is inadequate for provision of fire protection for training, research and development, family housing, and administrative buildings on South Post. Continued use of this inadequate pre-WWII facility would degrade response times and quality of fire protection for Soldiers, DA civilians, and family members who live and work on Fort Belvoir's South Post. The MP station is also in need of expansion to adequately serve the incoming BRAC population. The ability to provide proper service fire protection and law enforcement would continue to degrade because of continued use of inadequate facilities and increased demand from the additional population.

However, future Master planning actions (non-BRAC) provide for the construction and staffing of new fire stations on the South Post and EPG and an expanded MP station. These actions are addressed under cumulative effects.

Short-term minor adverse effects would be expected on off-post police, fire, and medical services. The population shift under the BRAC action would result in minor increases in the forecast population of the counties and cities composing the ROI (see Table 4.10-12). The ROI is already a densely populated area that is projected to continue to experience strong population growth. Additional public safety personnel and new facilities (e.g., fire stations, police stations, healthcare clinics, hospitals) are needed to accommodate future population levels. The population increases in each jurisdiction due to the Fort Belvoir BRAC action would be minor relative to the already projected population growth (about 21,000 people within the ROI would relocate because of BRAC; the ROI population is expected to increase by about 419,000 persons between 2005 and 2010). Over time, public support services adapt to the demands of the increased population base, funded by new tax revenues. Expansion of law enforcement, fire-fighting, and medical services (i.e., increasing staff or acquiring new facilities or equipment) would be necessary to maintain service levels and emergency response times. To accommodate the sustained increase in demand that would occur under the proposed action, coordination with ROI planning officials would need to be implemented so adequate and timely planning could be conducted to ensure that public sector capacity is not exceeded.

Schools. Short- and long-term minor adverse effects would be expected on off-post schools. The population that would relocate within the ROI because of the proposed Fort Belvoir BRAC action would increase the number of primary and secondary school-age children in each jurisdiction (Table 4.10-11 and Appendix G.2). However, these estimated population increases from the BRAC action translate into minor population increases over current population projections. School districts are already planning on how to accommodate the projected 2010 population. Table 4.10-13 lists the estimated number of new children by location and school age. On the basis of Census data, the population under age 18 is about evenly divided between four age groups: nursery/preschool (25 percent); elementary school (25 percent); middle school (25 percent); and high school (25 percent) (U.S. Census Bureau, 2006c). Fairfax County and Prince William County would be expected to receive the highest number of children. Fairfax County would receive about 4,300 children (about 1,000 each in preschool, elementary, middle, and high school), which would be about a 3 percent increase over the current total FCPS student enrollment of about 166,500. Prince William County would receive about 2,300 children (about 600 each in preschool, elementary, middle, and high school), also about 3 percent more than the current enrollment of 72,500 students. The impact of these additional students would depend on how they are distributed among the schools. An increase of 20 to 30 students in a school could mean a new classroom, and an increase of 300 students could mean a new school (DoD, 2005b). If a school is operating at or above capacity, portable classrooms or other accommodations would be needed until schools can be expanded or new schools can be constructed. However, as discussed earlier, the population relocation because of BRAC would not occur at one time. The BRAC actions at Fort Belvoir must be initiated no later than September 15, 2007, and completed no later than September 15, 2011, so the population shift would be expected to occur around that same time frame, as employees would decide whether to relocate relative to their new place of employment, which would reduce the impact on schools.

Table 4.10-13
Estimated redistribution of children

District[a]	Location	Number of children redistributed by location[b]	Nursery or preschool age[b]	Elementary school[b]	Middle school[b]	High school[b]
A	Arlington/Alexandria	410	103	103	103	103
B	Loudoun County[c]	290	73	73	73	73
	Northern Fairfax County	430	108	108	108	108
C	Southern Fairfax County	3,910	978	978	978	978
D	Prince William County	2,365	591	591	591	591
E	Near South (Fredericksburg/Stafford County)	925	231	231	231	231
F	Remainder of Virginia	720	180	180	180	180
G	District of Columbia	105	26	26	26	26
H	Prince George's County	515	129	129	129	129
I	Montgomery County	105	26	26	26	26
J	Remainder of Maryland	410	103	103	103	103
	Total	**10,185**	**2,546**	**2,546**	**2,546**	**2,546**

Notes:

[a]District corresponds to districts shown in Section 4.3, Transportation, Figures 4.3-5, 4.3-16, and 4.3-17.

[b]Numbers are rounded.

[c]Loudoun County was broken out from Fairfax County. It was assumed that 40 percent of the projected Northern Fairfax County/Loudoun County redistributed population would live in Loudoun County, and 60 percent would live in Northern Fairfax County.

In the long-term, public schools would adapt to the demands of the increased population base, funded by new property tax revenues. The Federal Impact Aid Program would continue to provide some funding to local schools. However, Federal Impact Aid only pays a portion of a child's education cost and does not provide for school construction costs. In the National Defense Authorization Act for Fiscal Year 2006 (Public Law 109–163, January 6, 2006, Section 572), Congress approved $7 million to be dispensed by the DoD to the school districts that are most heavily impacted by an increase (or reduction) in military students due to BRAC (and other Army initiatives) (DoD 2005a). The law provides for financial assistance through September 30, 2010 to local education agencies that meet the eligibility requirements (eligibility depends on the number of military dependent students). In the National Defense Authorization Act for Fiscal Year 2007 (Public Law 109–364, October 17, 2006, Section 574), Congress required that the Secretary of Defense to prepare a report to Congress with a plan to provide assistance to local educational agencies that experience growth in the enrollment of military dependent students as a result of base realignment or closures, force structure changes, or the relocation of a military unit. The report will identify the military installations affected by the above listed events, the total number of military students arriving or departing from these military installations, and when they will be arriving or departing. The report also will include recommendations to provide funding assistance and outreach to affected local educational agencies (Public Law 109–364, Section 574, 2006).

The Army would continue to confer with the potentially affected school districts on potential student increases that could occur under the Preferred Alternative. Advance notice would give

the schools time to secure funding, add facilities, and hire new teachers, as necessary. Although the local school districts receive additional funding for each military dependents attending public school, school districts would bear some of the costs for additional teachers and physical space, if needed.

No effects would be expected on-post schools. The BRAC action would not change the number of on-post family housing units, and therefore would not change the on-post population or student enrollments.

Family Support and Social Services. Long-term significant adverse and long-term minor beneficial effects would occur. The proposed action would increase the on-post population resulting in a significant increase in demand for MWR family support and social services, while at the same time causing financial losses to MWR due to the loss of revenue-generating recreational facilities (e.g., the South Post golf course would be closed to accommodate the new hospital and NARMC headquarters). Adverse effects would occur because Fort Belvoir MWR would not have sufficient funds, facilities, or staff to support required MWR programs. The ability to provide proper service and meet customer demands would degrade because of continued use of inadequate facilities, continued fragmentation of services, and increased demand from the additional population. Future Master planning actions (non-BRAC) provide for the construction and staffing of a consolidated Soldier Support Center (this action is addressed under cumulative effects), but MWRs ability to build the facility would depend on their available NAF, which would be reduced by BRAC actions.

Long-term minor beneficial effects would occur from additional child day care facilities. The BRAC action includes the addition of 2 CDCs on EPG. Existing facilities would not be able to support the children of the incoming population. The new childcare facilities would be sufficient to accommodate children of the additional military and civilian personnel that would be stationed at Fort Belvoir as a consequence of BRAC. Off-post, there are many child day care facilities and in-home child care options, as well as potential future facilities that would be market driven.

Short-term minor adverse effects would be expected on off-post family and social services. The population shift under the BRAC action would result in minor increases in the forecast population of some of the counties and cities composing the ROI (see Table 4.10-12). Expansion of social services would be necessary to maintain service levels. However, the population changes due to BRAC would be minor relative to the ROI's current projected population growth. Over time, social services would adapt to the demands of the increased population base, funded by new tax revenues.

Shops, Services, and Recreation. Long-term minor beneficial and long-term significant adverse effects would be expected. A new family travel camp would be established on the South Post in a Community land use area. Currently, there are no family travel campgrounds on-post. This project would provide some outdoor camping facilities for the high demand within DoD for RV campsites and cabin sites. This project would be financed through MWR NAF.

Long-term significant adverse would occur from the loss of recreational facilities, which would impact MWR NAF in several ways: loss of assets, revenues, and staff. Facilities affected would include the South Post golf course, the walking trail surrounding the course, and the playing field on Route 1 across from Pence Gate. Proposed BRAC construction projects would site the new hospital and NARMC headquarters on the South Post golf course. MWR would have a one-time bottom-line income loss due to the loss of the South Post golf course's undepreciated fixed assets

of about $1.5 million. Loss of golf course revenue is estimated at about $500,000 annually beginning in FY08, with more than $2.6 million projected over 5 years. Theses losses could result in layoffs, with an estimated one-time severance pay for current employees of about $70,000. In addition to the loss of the South Post golf course, the Access Control Point would affect Fort Belvoir's single largest playing field area on North Post (across from the Pence Gate). The field is used for community wide celebrations (such as the 4th of July and Oktoberfest) and sporting events. No alternate location has been identified for these events. If these events would no longer be held, it would also reduce MWR revenue (MWR, 2007).

Loss of these MWR facilities also would adversely impact quality of life. The South Post golf course attracts inexperienced golfers, families, and seniors because it is a flat, relatively easy course compared to the North Post golf courses. About 20 percent of the Fort Belvoir golf course members exclusively play the South Post course, and would not play the North courses due to its level of difficulty. Closure of the South Post course would result in a 30 percent reduction in overall rounds played at Fort Belvoir's 45-hole golf complex. The increase in use of the North Post courses would cause peak period tee-time competition, frustrating patrons and reducing their opportunity to play golf. Loss of the playing field and its events would adversely impact quality of life for on-post Soldiers and their families, as well as the installation's opportunity to enhance positive community relations with off-post neighbors (MWR, 2007).

The impact of BRAC on the demand for services and the MWR NAF would adversely affect many other on-post MWR service and recreation facilities. The existing Religious Education Center is inadequate to serve the anticipated population increase. Additional physical fitness centers and outdoor recreation fields also would be required. The Main Post library would need to be expanded, as well as the Community Recreation Center, the arts and crafts and automotive centers, the bowling center, the North Post golf club house, and the Veterinary Clinic. All these facilities would be inadequate to accommodate the incoming BRAC workforce. Levels of service would decrease, causing customers to have long wait times or to return at other times. Future Master planning actions (non-BRAC) plan for the construction and staffing of these facilities (these actions are addressed under cumulative effects in Section 5.0), but MWR's ability to build and operate these facilities depends on their available NAF, which would be significantly reduced by BRAC actions.

Currently, there are no sites identified to relocate or rebuild, replace, or refit impacted MWR services and recreational areas. The estimated worst-case scenario impact of BRAC on MWR NAF is about $5 million during the first year (this includes expenses such as program closure, disposal and termination of assets, personnel severance pay, losses on undepreciated NAF assets, and lost revenue) which in turn decreases funding for capital reinvestments on Fort Belvoir (MWR, 2007).

Short-term minor adverse effects would be expected to off-post shopping and services. The increased Fort Belvoir work force would create a demand for additional shopping and services in the immediate vicinity of the installation (e.g., restaurants, gas stations, convenience stores, grocery stores, dry cleaning). Service levels would be expected to decrease as population increased, causing customers to have long wait times or to return at other times. The number and type of shopping and service businesses in proximity to Fort Belvoir would be expected to increase with demand as they would be market driven.

4.10.2.3 Environmental Justice

4.10.2.3.1 Land Use Plan Update

No effects would be expected. Implementing the Preferred Alternative land use plan would not result in disproportionately high or adverse human health or environmental effects on minority or low-income populations. The action would not be an action that has the potential to substantially affect human health or the environment by excluding persons, denying persons benefits, or subjecting persons to discrimination because of their race, color, national origin, or income level.

4.10.2.3.2 BRAC Implementation and Facilities Projects

No effects would be expected. The proposed BRAC action at Fort Belvoir would not result in disproportionately high or adverse human health or environmental effects on minority or low-income populations. Although the proposed action would create additional traffic concerns, these effects would be felt throughout the region; the minority and low-income communities would not bear a disproportionate share of negative environmental consequences resulting from the action. Low-income populations could benefit from the creation of new jobs associated with implementing this alternative.

4.10.2.4 Protection of Children

4.10.2.4.1 Land Use Plan Update

No effects would be expected. Implementing the Preferred Alternative land use plan would not result in environmental health and safety risks that might disproportionately affect children.

4.10.2.4.2 BRAC Implementation and Facilities Projects

Long-term minor adverse effects on the protection of children would be expected to occur. During the development period (2007 through 2011) there would be many construction sites in the installation cantonment area. Because construction sites can be enticing to children, construction activity could pose an increased safety risk. During construction, safety measures stated at 29 CFR Part 1926, *Safety and Health Regulations for Construction, and Army Regulation 385-10, Army Safety Program*, would be followed to protect the health and safety of on- and off-post resident, as well as construction workers. It is recommended that barriers and "No Trespassing" signs be placed around construction sites to deter children from playing in these areas and that construction vehicles and equipment be secured when not in use.

4.10.2.5 BMPs/Mitigation

4.10.2.5.1 Economic Development (Employment, Industry, Income, Population)

No BMPs or mitigation would be required.

4.10.2.5.2 Sociological Environment (Housing, Police, Fire, Medical, Schools, Family Support and Social Services, and Shops Services and Recreation)

BMP (Liaison). The relocation of personnel to Fort Belvoir would be expected to result in the movement of some of these employees, and their families, to communities closer to the installation. This would affect enrollment in primary and secondary schools. The Army should

confer with potentially affected school districts on estimated student enrollment increases that could occur if the Preferred Alternative is implemented.

4.10.2.5.3 Environmental Justice

No BMPs or mitigation would be required.

4.10.2.5.4 Protection of Children

BMPs. Secure construction vehicles and equipment when not in use and place barriers and "No Trespassing" signs around construction sites.

4.10.3 ENVIRONMENTAL CONSEQUENCES OF TOWN CENTER ALTERNATIVE

4.10.3.1 Economic Development (Employment, Industry, Income, Population)

4.10.3.1.1 Land Use Plan Update

Short- and long-term minor beneficial effects would be expected to occur. The Town Center Alternative land use plan would redesignate acreage on Fort Belvoir North and South Posts as Professional/Institutional, Community, Residential, and Troop, providing the opportunity for development (or redevelopment) of this land. If construction or renovation of facilities occurs on the land, it would generate short-term construction jobs, income, and increased spending in the region from the purchase of construction and other materials. In the long-term, operation of new facilities would result in an increase in employment, income, and spending from personnel working at the new facilities, including maintenance, administrative, and professional staff.

4.10.3.1.2 BRAC Implementation and Facilities Projects

Effects would be the same as or similar to those stated in Section 4.10.2.1.2. Under the Town Center Alternative, the siting of the BRAC facilities on Fort Belvoir would vary from the Preferred Alternative, but the economic effects from construction expenditures and the increase of Fort Belvoir personnel would be the same. Table 4.10-14 presents impacts of each of the proposed BRAC action projects on economic and sociological resources.

Table 4.10-14
Effects from proposed BRAC projects on economic and social resources under the Town Center Alternative

Project #	BRAC project	Economic Change	Social change
1	NGA Administrative Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
2	WHS Administrative Facility		
3	MDA		

Table 4.10-14
Effects from proposed BRAC projects on economic and social resources under the Town Center Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
4	Hospital	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries due to availability of new, state-of-the-art hospital; long-term significant adverse effects due to loss of South Post Golf Course which would be closed to accommodate hospital and NARMC
5	Dental Clinic	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries from availability of expanded dental clinic
6	NARMC HQ Bldg.	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to loss of South Post Golf Course which would be closed to accommodate hospital and NARMC
7	COE Integration Offices	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
8	Infrastructure	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
9	Emergency Services Center (EPG)	No effect	No effect
10	Network Operations Center	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
11	USANCA Support Facility		
12	Child Development Center (NGA)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects from additional child day care facility
13	Child Development Center		

Table 4.10-14
Effects from proposed BRAC projects on economic and social resources under the Town Center Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
14	Admin Facility (211, 214, 215, 220)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
15	Access Road/Control Point	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to impact on recreational fields and loss of revenue to MWR
16	AMC Relocatables	No effect	No effect
17	PEO EIS Admin Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
18	Structured Parking, 200 Area	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
19	Modernize Barracks	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to new barracks for Soldiers
20	MWR Facility Travel Camp	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on quality of life from new travel camp

4.10.3.2 Sociological Environment

4.10.3.2.1 Land Use Plan Update

Housing. Long-term beneficial effects would be expected for on-post Unaccompanied Personnel Housing. Under the Town Center land use plan, a new Troop land use area would be designated on South Post, west of Gunston Road. However, current land uses, with Troop housing in the 2100 Area on the North Post, would continue until such time as the Army could construct and occupy troop facilities in the new area on South Post. An eventual relocation of the Troop area to the South Post would be beneficial to the troops, placing them in close proximity to installation services such as healthcare, shopping, service, and recreation facilities.

Police, Fire, Medical. Long-term minor beneficial effects would be expected on-post. The Town Center Alternative land use plan designates acreage on the North Post as Professional/Institutional. New medical facilities could be constructed in this land area, which would provide improved facilities and service to beneficiaries.

Schools. No effects would be expected.

Family Support, Shops, Services, and Recreation. Long-term minor beneficial and adverse effects would be expected. The land use plan would reduce the number of acres designated as Outdoor Recreation, resulting in long-term adverse effects. Fort Belvoir would lose a significant amount of valuable recreational acreage. Although some of the acreage would be incorporated into Community and Open Space, the proposed land use plan would change a majority of the land use designation to non-recreational land uses. For example, the land use of the South Post golf course would change from Outdoor Recreation to Professional/Institutional. The North Post playing field across from Pence Gate would change from Outdoor Recreation to Community.

4.10.3.2.2 BRAC Implementation and Facilities Projects

Effects on the sociological environment would be the same or similar to those stated in Section 4.10.2.2.2. Under the Town Center Alternative, the siting of the BRAC facilities on Fort Belvoir would vary from the Preferred Alternative; however, the effects on sociological resources from BRAC implementation and the effect on population and demand for housing and public services would be similar. The significant adverse impact on MWR facilities and funds (and therefore Soldier's quality of life) also would occur under the Town Center Alternative, with the loss of the South Post golf course to accommodate the NGA and WHS administrative and parking facilities, and the impact on the North Post playing field across from Pence Gate to accommodate the Access Control Point. In addition, the Town Center Alternative also would result in the possible loss of 4 tennis courts, 3 basketball courts, picnic and park site, the Better Opportunities for Single Soldiers building, and a physical fitness facility with softball and football fields. Future Master planning actions (non-BRAC) plan for the construction and staffing of new or replacement MWR recreational and service facilities (these actions are addressed under cumulative effects in Section 5.0).

4.10.3.3 Environmental Justice

Effects on environmental justice would be the same as those stated in Section 4.10.2.3.

4.10.3.4 Protection of Children

Effects on protection of children would be the same as those stated in Section 4.10.2.4.

4.10.3.5 BMPs/Mitigation

BMPs or mitigation measures would be the same as those stated in Section 4.10.2.5.

4.10.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.10.4.1 Economic Development (Employment, Industry, Income, Population)

4.10.4.1.1 Land Use Plan Update

Short- and long-term minor beneficial effects would be expected. The City Center Alternative land use plan would redesignate acreage on Fort Belvoir, EPG, and the GSA Parcel as Professional/Institutional, Community, Residential, and Troop, providing the opportunity for development (or redevelopment) of this land. If construction or renovation of facilities would occur on the land, it would generate short-term construction jobs, income, and increased spending in the region from the purchase of construction and other materials. In the long-term, operation of new facilities would result in an increase in employment, income, and spending from personnel working at the new facilities, including maintenance, administrative, and professional staff.

4.10.4.1.2 BRAC Implementation and Facilities Projects

Effects would be the same as or similar to those stated in Section 4.10.2.1.2. Under the City Center Alternative, the siting of the BRAC facilities on Fort Belvoir would vary from the Preferred Alternative, but the economic effects from construction expenditures and the increase of Fort Belvoir personnel would be the same. . Table 4.10-15 presents impacts of each of the proposed BRAC action projects on economic and sociological resources.

Table 4.10-15
Effects from proposed BRAC projects on economic and social resources under the City Center Alternative

Project #	BRAC project	Economic Change	Social change
1	NGA Administrative Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
2	WHS Administrative Facility		
3	MDA		
4	Hospital	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries due to availability of new, state-of-the-art hospital

Table 4.10-15
Effects from proposed BRAC projects on economic and social resources under the City Center Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
5	Dental Clinic	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries from availability of expanded dental clinic
6	NARMC HQ Bldg.	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to new facility
7	COE Integration Offices	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
8	Infrastructure	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
9	Emergency Services Center (EPG)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to center which would provide rapid response to structural fires and medical emergencies in support of the agencies and activities on EPG
10	Network Operations Center	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
11	USANCA Support Facility		
12	Child Development Center (NGA)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects from additional child day care facility
13	Child Development Center		

Table 4.10-15
Effects from proposed BRAC projects on economic and social resources under the City Center Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
14	Admin Facility (211, 214, 215, 220)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
15	Access Road/Control Point	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to impact on recreational fields and loss of revenue to MWR
16	AMC Relocatables	No effect	No effect
17	PEO EIS Admin Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
18	Structured Parking, 200 Area	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
19	Modernize Barracks	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to new barracks for Soldiers
20	MWR Facility Travel Camp	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on quality of life from new travel camp

4.10.4.2 Sociological Environment

4.10.4.2.1 Land Use Plan Update

Housing. Long-term beneficial effects would be expected for on-post Unaccompanied Personnel Housing. Under the City Center land use plan, a new Troop land use area would be designated on South Post, west of Gunston Road. However, current land uses, with Troop housing in the 2100 Area on the North Post, would continue until such time as the Army could construct and occupy troop facilities in the new area on South Post. An eventual relocation of the Troop area to the South Post would be beneficial to the troops, placing them in close proximity to installation services such as healthcare, shopping, service, and recreation facilities.

Police, Fire, Medical. Long-term minor beneficial effects would be expected on-post. EPG land use would change from Training Ranges to Professional/Institutional. New emergency and medical service facilities could be constructed on EPG in this land area., which would provide improved facilities and services to beneficiaries.

Schools. No effects would be expected.

Family Support, Shops, Services, and Recreation. Long-term minor beneficial and adverse effects would be expected. The land use plan would redesignate acreage on the North Post that is identified as Outdoor Recreation. Some of the acres would change to Professional/Institutional, but most would be incorporated into Community land use. For example, the North Post playing field across from Pence Gate would change from Outdoor Recreation to Community, which could adversely impact recreational use of that field. Long-term beneficial effects from the City Center land use plan would result from the designation of Community land use on Main Post, which could allow for the development of new service, shopping, or recreational facilities, which would provide improved facilities and services to beneficiaries.

4.10.4.2.2 BRAC Implementation and Facilities Projects

Effects on the sociological environment would be the same as or similar to those stated in Section 4.10.2.2.2. Under the City Center Alternative, the siting of the BRAC facilities on Fort Belvoir would vary from the Preferred Alternative; however, the effects on sociological resources from BRAC implementation and the effect on population and demand for housing and public services would be similar. The adverse impact on MWR under the City Center Alternative would not be as severe as under the Preferred or Town Center Alternative because the majority of the proposed BRAC facilities would be sited on EPG and GSA, and would not impact North and South Post facilities, such as the golf courses.

4.10.4.3 Environmental Justice

Effects on environmental justice would be the same as that stated in Section 4.10.2.3.

4.10.4.4 Protection of Children

Effects on protection of children would be the same as that stated in Section 4.10.2.4.

4.10.4.5 BMPs/Mitigation

BMPs or mitigation measures would be the same as that stated in Section 4.10.2.5.

4.10.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

4.10.5.1 Economic Development (Employment, Industry, Income, Population)

4.10.5.1.1 Land Use Plan Update

Short- and long-term minor beneficial effects would be expected. The Satellite Campuses land use plan would redesignate acreage on Fort Belvoir as Professional/Institutional, Community, Residential, and Troop, providing the opportunity for development (or redevelopment) of this land. If construction or renovation of facilities on the land occurs, it would generate short-term construction jobs, income, and increased spending in the region from the purchase of construction and other materials. In the long-term, operation of the facilities would result in an increase in employment, income, and spending from personnel working at the new facilities, including maintenance, administrative, and professional staff.

4.10.5.1.2 BRAC Implementation and Facilities Projects

Effects would be the same as or similar to those stated in Section 4.10.2.1.2. Under the Satellite Campuses Alternative, the siting of the BRAC facilities on Fort Belvoir would vary from the Preferred Alternative, but the economic effects from construction expenditures and the increase of Fort Belvoir personnel would be the same. . Table 4.10-16 presents impacts of each of the proposed BRAC action projects on economic and sociological resources.

Table 4.10-16
Effects from proposed BRAC projects on economic and social resources under the Satellite Campuses Alternative

Project #	BRAC project	Economic Change	Social change
1	NGA Administrative Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
2	WHS Administrative Facility		
3	MDA		
4	Hospital	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries due to availability of new, state-of-the-art hospital; long-term significant adverse effects due to loss of part of North Post Golf Course which would be closed to accommodate hospital and NARMC
5	Dental Clinic	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on beneficiaries from availability of expanded dental clinic

Table 4.10-16
Effects from proposed BRAC projects on economic and social resources under the Satellite Campuses Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
6	NARMC HQ Bldg.	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to loss of part of North Post Golf Course which would be closed to accommodate hospital and NARMC
7	COE Integration Offices	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
8	Infrastructure	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
9	Emergency Services Center (EPG)	No effect	No effect
10	Network Operations Center	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
11	USANCA Support Facility		
12	Child Development Center (NGA)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects from additional child day care facility
13	Child Development Center		
14	Admin Facility (211, 214, 215, 220)	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand

Table 4.10-16
Effects from proposed BRAC projects on economic and social resources under the Satellite Campuses Alternative *(continued)*

Project #	BRAC project	Economic Change	Social change
15	Access Road/Control Point	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term significant adverse effects due to impact on recreational fields and loss of revenue to MWR
16	AMC Relocatables	No effect	No effect
17	PEO EIS Admin Facility	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Short-term minor adverse effects on on-and off-post police, fire, and medical services and shopping and other services due to increased demand; short- and long-term minor adverse effects on off-post schools from increased student enrollments; long-term significant adverse effects on on-post social services and recreational facilities due to a significant increase in demand; short-term minor adverse effects on off-post family and social services due to increased demand
18	Structured Parking, 200 Area	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	No effect
19	Modernize Barracks	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects due to new barracks for Soldiers
20	MWR Facility Travel Camp	Short-term minor beneficial effects due to construction expenditures that would result in beneficial increases in ROI sales volume, income, and employment	Long-term minor beneficial effects on quality of life from new travel camp

4.10.5.2 Sociological Environment

4.10.5.2.1 Land Use Plan Update

Housing. Long-term beneficial effects would be expected for on-post Unaccompanied Personnel Housing. Under the Satellite Campuses land use plan, a new Troop land use area would be designated on South Post, west of Gunston Road. However, current land uses, with Troop housing in the 2100 Area on the North Post, would continue until such time as the Army could construct and occupy troop facilities in the new area on South Post. An eventual relocation of the Troop area to the South Post would be beneficial to the troops, placing them in close proximity to installation services such as healthcare, shopping, service, and recreation facilities.

Police, Fire, Medical. Long-term minor beneficial effects would be expected on-post. The Satellite Campuses Alternative land use plan designates acreage as Professional/Institutional on the North Post. New medical facilities could be constructed on this land area, which would provide improved facilities and service to beneficiaries.

Schools. No effects would be expected.

Family Support, Shops, Services, and Recreation. Long-term minor beneficial and adverse effects would be expected. The land use plan would reduce the number of acres designated as Outdoor Recreation, resulting in long-term adverse effects. Fort Belvoir would lose a significant amount of valuable recreational acreage. Although some of the acreage would be incorporated into Community and Open Space, the proposed land use plan would change at least half of the land use designation of the North Post golf course from Outdoor Recreation to Professional/Institutional. Long-term beneficial effects from the Satellite Campus land use plan could result from the designation of land on the North and South Post as Community, where new or expanded service, shopping, or recreational facilities could be constructed or established, which would provide improved facilities and service to beneficiaries.

4.10.5.2.2 BRAC Implementation and Facilities Projects

Effects on the sociological environment would be the same as or similar to those stated in Section 4.10.2.2.2. Under the Satellite Campuses Alternative, the siting of the BRAC facilities on Fort Belvoir would vary from the Preferred Alternative; however, the effects on sociological resources from BRAC implementation and the effect on population and demand for housing and public services would be similar. The significant adverse impact on MWR facilities and funds (and therefore Soldier's quality of life) also would occur under the Satellite Campus Alternative, with the loss of at least half of the North Post golf course to accommodate the new hospital and NARMC headquarters. The North Post playing field across from Pence Gate would be impacted to accommodate the Access Control Point. Future Master planning actions (non-BRAC) plan for the construction and staffing of new or replacement MWR recreational and service facilities (these actions are addressed under cumulative effects in Section 5.0), but MWR's ability to build these facilities depends on their available NAF, which would be significantly reduced by BRAC actions.

4.10.5.3 Environmental Justice

Effects on environmental justice would be the same as that stated in Section 4.10.2.3.

4.10.5.4 Protection of Children

Effects on protection of children would be the same as that stated in Section 4.10.2.4.

4.10.5.5 BMPs/Mitigation

BMPs or mitigation measures would be the same as that stated in Section 4.10.2.5.

4.10.6 NO ACTION ALTERNATIVE

4.10.6.1 Economic Development (Employment, Industry, Income, Population)

4.10.6.1.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.10.6.1.2 BRAC Implementation and Facilities Projects

No effects would be expected. The changes in population and economic activity that would occur under the proposed action would not be implemented under the No Action Alternative. The housing market and public services (e.g., schools, police, fire, medical, social services) would continue to respond as they have in the past to ROI population changes as needed.

4.10.6.2 Sociological Environment

4.10.6.2.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.10.6.2.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. The housing supply and public services (e.g., schools, police, fire, medical, social services) would continue to respond to market demand.

4.10.6.3 Environmental Justice

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative.

4.10.6.4 Protection of Children

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative.

4.10.6.5 BMPs/Mitigation

No BMPs or mitigation measures would be required. The BRAC action would not be implemented under the No Action Alternative.

4.10.7 SUMMARY OF COMPARISON OF ALTERNATIVES

The BRAC action would have minor beneficial economic effects, regardless of the land use alternative selected. The BRAC action, in general, would have the same economic effects under each alternative from construction expenditures and the increase of Fort Belvoir personnel. Estimated construction expenditures would be similar under each alternative, with variations among the alternatives for demolition and infrastructure. The construction and renovation expenditures would result in beneficial increases in ROI business sales volume, income, and

employment. Although the proposed action's expenditures would be quite substantial, Fort Belvoir is in such an economically large and robust region that the magnitude of the expenditures relative to the regional demographic and economic forces would be considered minor. Because construction projects are, by nature, temporary, the economic stimulus from construction of the proposed BRAC and associated facilities would diminish over time as the projects reach completion in 2011.

The social effects of the BRAC action would range from short-term minor adverse to long-term significant adverse and long-term minor beneficial effects, regardless of the land use alternative selected. The siting of the BRAC facilities on Fort Belvoir would vary with each land use alternative; however, the effects on sociological resources from BRAC implementation and the effect on population and demand for housing and public services would be similar. On-post facilities would be inadequate to accommodate the incoming BRAC workforce. Additional police, fire, medical, shopping, and MWR sponsored programs and facilities would be needed. If facilities were not improved, levels of service would decrease. The ability to provide proper service and meet customer demands would degrade because of continued use of inadequate facilities, continued fragmentation of services, and increased demand from the additional population. Long-term significant adverse effects would be expected on MWR sponsored programs, such as Soldier and family support and recreational facilities and activities, because Fort Belvoir's MWR would not have sufficient funds, facilities, or staff to support required MWR programs. Additional Fort Belvoir actions (BRAC and non-BRAC) plan for the construction and staffing of on-post facilities such as a new hospital, new emergency services center, CDCs, pool (water park), relocated/new sports fields, physical fitness centers, and Family Travel Camp area. These new or expanded facilities would be designed to adequately serve the incoming BRAC population, resulting in long-term beneficial effects. However, MWR's ability to build and operate these new recreational facilities depends on their available NAF, which would be significantly reduced by BRAC actions.

From a regional perspective, the social effects of the BRAC action would have short- and long-term minor adverse effects on regional services. The BRAC Commission's recommendations would generate a net increase of 22,000 people in the workforce on Fort Belvoir. Most of these personnel already reside within a one-hour drive to Fort Belvoir. It is probable that some of the affected personnel would change their home residence within the ROI to improve their commute to Fort Belvoir, in particular moving to areas along the Northern Virginia I-95 corridor including Fairfax County, Prince William County, and Stafford County, and the city of Fredericksburg. This would increase the population in these jurisdictions and the demand for services such as police, fire, and medical care; schools; social services; and shopping facilities. In the short-term, services would be expected to decrease as population increased. Expansion of services would be necessary to maintain levels of service. However, the population increases because of the BRAC action would be minor relative to projected regional population growth. In addition, population changes would occur over a number of years. The BRAC action would not be fully implemented until 2011. Over time, services (police, fire, medical, schools, social services) would adapt to the demands of the increased population base, funded by new tax revenues. The number and type of shopping and service businesses and community support morale, welfare, and recreation facilities and services would be expected to increase with demand as they would be market driven.

4.11 AESTHETICS AND VISUAL RESOURCES

Aesthetics and visual resources are the natural and man-made features of a landscape. They include cultural and historic landmarks, landforms of particular beauty or significance, water surfaces, and vegetation. Together these features form the overall impression that a viewer receives of an area or its landscape.

Visual environments are key contributors to people's daily experiences and life styles and can significantly affect moods and feelings of well-being. Major public improvement projects and facilities can have varying degrees and types of effects on the visual environments. The effects can range from very significant to hardly noticeable. Visual environments could be viewed as negative, or they could improve and contribute in a positive way to the appearance and image of communities. Although there is an inherent subjective nature to aesthetic evaluation, this section aims to qualify change by looking at noticability, level of upkeep of structures, and integration into the natural environment.

Visual effects on historic resources are protected under federal law through section 106 of the National Historic Preservation Act of 1966, as amended, and implementing regulations at 36 CFR 800.

4.11.1 AFFECTED ENVIRONMENT

Fort Belvoir consists of two geographically separate areas, the Main Post and the EPG, which are both along the western shore of the Potomac River, approximately 85 miles upstream of the Chesapeake Bay. Main Post is bisected by U.S. Route 1 creating two large areas that are referred to as North Post (north of Route 1) and the South Post (south of Route 1).

Main Post is characterized by a diverse topography, which includes uplands and plateaus, lowlands, and steeply sloped terrain. The uplands and plateaus make up approximately 40 percent of the installation. The predominant lowland areas on Fort Belvoir, approximating 40 percent of Fort Belvoir land, are associated with the floodplains of Accotink Creek, Pohick Creek, and Dogue Creek. Steeply sloped terrain is the primary component of the remaining 20 percent of the land of the Main Post. (U.S. Army, 1989) (for additional information on Topography, Geology and Soils see Section 4.6).

Installation-wide Family Housing is being upgraded under the U.S. Army's Residential Communities Initiative (RCI). Plans include the demolition and replacement of 1,900 homes and the renovation of 170 historically significant homes on Fort Belvoir. The final vision replaces or renovates 2,070 homes on 576 acres of Fort Belvoir developed and operated by a private entity known as Fort Belvoir Residential Communities Limited Liability Company (Clark Pinnacle, 2006). The family housing areas are landscaped to create visual enhancement to entries and provide visual screens between units. Fort Belvoir's troop housing occupies 72 acres (Landgraf, 2000). Landscaping around troop housing areas creates visual enhancement and visual transition to surrounding structures.

Even though Fort Belvoir was used for training purposes starting in 1915, the majority of the original structures were built in response to World Wars I and II. Remnants of these historic landscapes with a variety of cultural/historic structures still remain on-post. Additional development over the decades on the installation reflects various architectural styles that were current for the period in which they were built. Historic sites are further described under Cultural

Resources, section 4.9. For Belvoir and its related properties can be divided into six planning areas: South Post, North Post, Southwest Area, Davison Army Airfield, Engineer Proving Ground (EPG), and General Services Administration (GSA). These areas will serve as a guide for the description of Fort Belvoir.

4.11.1.1 South Post

The South Post is bounded by U.S. Route 1 to the north; the Noman M. Cole, Jr. Pollution Control Plant (formerly the Lower Potomac Pollution Control Plant), the Woodrow Wilson Boy Scout Reservation, and private development to the west; and waterways related to the Potomac River to the south and east. The South Post is broken into two areas for planning purposes: the South Post and the South Post Core Area.

The South Post contains research and development facilities, family housing, community facilities, recreation, administrative/education, supply/storage and maintenance facilities. The South Post peninsula is separated from the Southwest Area by Accotink Bay and Accotink Creek. The peninsula borders Accotink Bay, Dogue Creek, Gunston Cove, and the Potomac River. The central section of South Post contains the Core Area planning district with the highest density of buildings and includes most of the Fort Belvoir historic district. The parade grounds, as the largest open space with mature trees along the edges, serve as the focal point for the historic district. Administrative buildings in the Core Area planning district are separated with landscaping or lawns. The community and administrative area is usually viewed only by personnel and family members stationed at Fort Belvoir, students and other temporary personnel, and federal employees. These are generally people accustomed to the aesthetics of a military installation.

The family housing units surround the core planning district on the east. These vary from single family homes with landscaped entries and visual screens between properties to modern connected row houses with integrated shops and community areas. The Belvoir Ruins Trail is in the vicinity of the Fairfax Mansion Ruins and allows public enjoyment of the cultural resources and numerous trails through open spaces and natural areas. The Dogue Creek Marina is south of the Mount Vernon Road bridge. The marina has 105 wet slips and 300 dry-storage facilities and offers basic marina services except for fueling (King, 1999). All marina facilities are open to active and retired military and their families, and civilian personnel. The South Post golf course—a nine-hole course—tennis courts, and baseball fields are to the north of the core planning district.

The peninsula also contains a third of the 1,360 acre Accotink Bay Wildlife Refuge, which is accessed through the Tompkins Basin area. The Basin Trail, starting in the Tompkins Basin area, connects to approximately 9 miles of wildlife viewing trails through the Accotink Bay Wildlife Refuge. The trail is open to public access for hiking, bird watching, wildlife/nature watching and fishing. Tompkins Basin area is a recreation area bordering Gunston Cove, Accotink Bay, and the Potomac River allowing shoreline fishing and picnicking for public and installation residents. The recreation area has picnic pavilions, archery ranges, and an outdoor recreation facility. Access to ABWR along Pohick Road includes the main entrance and the 0.5-mile Pohick Loop Trail.

The Fairfax County Lower Potomac Planning District connects Fort Belvoir's open space to other sensitive areas in Fairfax County such as floodplains, stream influence zones, and tidal and nontidal wetlands associated with major watercourses, including the Potomac River. Significant

portions of the Mason Neck peninsula immediately south of Fort Belvoir are held in public ownership and are managed for the protection of important wildlife habitats and wetlands, with public recreation as a secondary use. Fort Belvoir's water resources are further described under, Water Resources, Section 4.7.

4.11.1.2 Southwest Area

The Southwest Area borders Accotink Bay, Pohick Bay, and Pohick Creek. The Southwest Area is undeveloped land composed of woodland, wetland, and riparian ecosystems. This area encompasses training areas, most of the 1,360-acre Accotink Bay Wildlife Refuge, and a portion of Fort Belvoir's Forest and Wildlife Corridor. The natural areas designated as the Accotink Bay Wildlife Refuge serve as a buffer for the training areas adjacent to them. Wildlife viewing trails through the Refuge (approximately 9 miles total) are open to the public for hiking, bird watching, wildlife/nature watching, and fishing. The hunting program for white-tailed deer, turkey, and waterfowl uses natural areas found on North and South Post and includes areas designated as training or wildlife refuge. Military personnel and civilian employees associated with Fort Belvoir access training areas through a network of gravel maintenance and access roads for activities including land-navigation training, explosive ordnance disposal, or management of natural resources. There is a gated access point on Poe Road to training areas and the Accotink Bay Wildlife Refuge for maintenance or special projects.

4.11.1.3 North Post

The North Post is bounded by Telegraph Road to the north and northwest; U.S. Route 1 to the south; and Huntley Meadows Park, Woodlawn Plantation, Pole Road Park, and private development to the east. For planning purposes, North Post can be separated into two areas: Lower North Post and Upper North Post. The two areas are divided by Kingman Road, which generally runs northeast to southwest.

Upper North Post is the least developed area and contains large pockets of undeveloped land. The Forest and Wildlife Corridor separates the two largest tenant organizations, HEC and DCEETA, which form distinct communities through fencing, building orientation, parking areas, and landscaping in the Upper North Post area. The Upper North Post contains the 146-acre Jackson Miles Abbott Wetland Refuge (JMAWR) and the majority of the 740-acre Forest and Wildlife Corridor, which connects the forested areas in the north to those in the south. Public access at JMAWR provides a half-mile, handicap-accessible trail for freshwater fishing and wildlife viewing around Mulligan Pond.

The Lower North Post (east of Fairfax County Parkway and south of John J. Kingman Road) is the most developed segment with administrative buildings, fire department, gas station, dining facility and the largest commissary in the continental United States. These areas are landscaped to provide visual screens. The developed areas are usually viewed only by personnel and family members stationed at Fort Belvoir, retirees, students and other temporary personnel, and federal employees who are accustomed to the aesthetics of a military installation. Fort Belvoir maintains a 36-hole golf course on the North Post. The north and south golf courses require 437 acres of vegetation maintained as turf, interspersed with patches of natural vegetation and landscape plantings (Horne, 2001). Fort Belvoir contains 13.3 miles of multiuse trails designed to complement the various roads on the post to accommodate such activities as biking, jogging, and walking (Landgraf, 2000). Improved surface trails parallel many of the roads and developments on the post. (Woolpert, 1993a).

4.11.1.4 Davison Army Airfield

Davison Army Airfield occupies roughly 740 acres. The airfield facility, which takes up about 400 acres is made up of a main runway, hangers, administration buildings, and cleared fields. It is located on the western portion of the Main Post (Landgraf, 2000). Davison Army Airfield is a Class A Army airfield providing support facilities for both fixed- and rotary-wing aircraft. This area contains a portion of Fort Belvoir's Forest and Wildlife Corridor.

4.11.1.5 EPG

The EPG is approximately 1.5 miles northwest of Main Post. It is bounded on the west by Rolling Road, on the east by Backlick Road/I-95, on the south by an industrial park, and on the north by various residential developments. EPG is largely an undeveloped area with gently rolling land ranging from 100- to 300-foot elevations, with the highest elevations in the northwest corner. The outer boundary of EPG and the majority of the west side are characterized by mixed age hardwood forests. The inner east side is characterized by younger pines and brushy areas. There are also several old ranges on the west side that are covered by younger pines and brushy areas. These areas are currently being cleared and grubbed in order to carry out UXO clearance. This process leaves the ranges with the larger pines, but removes all small trees and underbrush. The area is bisected by the narrow, steep-sloped streambed of Accotink Creek and intermittent streams flowing into Accotink Creek.

Within the 807 acres of EPG there are several roads in the northern portions. Roads, including one bridge crossing Accotink Creek, are in poor condition because of lack of maintenance. There are 44 structures at EPG, including 24 buildings and 11 explosives magazines and barricades (Bland, 1999). The majority of the buildings are abandoned and in poor condition because of lack of maintenance and salvage activities. The one building in use is accessed from Backlick Road and is occupied by USANCA. Although there are many pockets of land that have different level of disturbance due to various past uses, the majority of the area has the appearance of natural forest.

4.11.1.6 GSA Parcel

The GSA parcel is a 70.6-acre storage facility that sits three-quarters of a mile northeast of EPG. It is bounded on the west by I-95, by Franconia Springfield Parkway to the north, and by forested and residential areas to the east and south. The area is fully developed and made up entirely of architecturally basic storage facilities and parking lots.

4.11.1.7 Off-Post

Local land uses outside the installation are predominantly residential. Scattered commercial and industrial development, such as the Newington Industrial Park and a number of retail shopping malls, occur along U.S. Route 1, as well as near I-95 (Horne, 2001). There are several local, publicly owned tracts, including Huntley Meadows County Park, Pohick Bay Regional Park, Washington Grist Mill, Mount Vernon Estate and Mount Vernon Parkway, Gunston Hall Plantation, Mason Neck National Wildlife Refuge, and Mason Neck State Park. Many of these tracts occur along the Potomac River, forming a band of riparian habitat along the river and its tributaries. Pohick Church, Woodlawn Plantation, The Alexandria Society of Friends Meeting House and Woodlawn Baptist Church are a few historic resources of Fairfax County found near Fort Belvoir (Fairfax County 2002, 2003).

The view of Main Post seen by the public from U.S. Route 1 varies as one moves from west to east. The viewshed from Route 1 west of Accotink Village is of forested areas. The viewshed around Accotink Village consists of less developed Community and Residential areas. The remaining western portion of the Route 1 viewshed is partially obstructed due to the road sitting lower than surrounding land. The visible areas consist of athletic fields, forested areas, and scattered community areas.

From eastern boundaries along Old Colchester Road, private property, and Pohick Bay Regional Park, and from western boundaries along Pole Road and Mount Vernon Memorial Highway, the public sees a view of Main Post composed of buffer areas consisting of natural scenic views of woods, wetlands and riparian areas.

The view of Main Post the public sees from the northern boundary along Telegraph Road and various residential communities is of woodlands and wetlands.

The view of Main Post the public sees from the southern boundary is of marsh, wetlands, and woodlands, with a few residential or recreational pockets viewed from across the Potomac River, Accotink Bay, Gunston Cove or Dogue Creek from Pohick Bay Regional Park, Mason Neck residential communities, Piscataway Park, and Yacht Haven residential area.

The view of EPG the public sees from all vantage points is of wooded areas, providing a natural scenic view containing mature trees and riparian areas.

4.11.1.8 Fort Belvoir Scenic Integrity

Scenic integrity considers how well a man-made alteration integrates into the original landscape. The less an alteration changes the size, shape, edge effect, and pattern of a natural landscape, the more scenic integrity it possesses. The different grades of scenic integrity are explained in Table 4.11-1.

The proposed land use designations for the Fort Belvoir area include Airfields, Community, Industrial, Professional/Institutional, Residential, Training, and Troop.

Airfields. Airfields are surrounded by large structures in constant use. These include hangers, control towers, and fuel containers that are surrounded by large-scale paving and unforested areas. These areas hold very few of the characteristics of the original landscape and are characterized as having low scenic integrity.

Industrial. The lands designated for Industrial use are characterized by large structures in constant use and surrounded by paved parking and loading areas. These areas greatly dominate the natural features of the land and, thus, fall under the designation of low scenic integrity.

Professional /Institutional. The Professional/Institutional areas of Fort Belvoir vary slightly in their scenic integrity. Some of the older structures are currently in varying states of disrepair and lack aesthetic value. The newer buildings would have more aesthetic value, although it would take time before their landscaping matures enough to better integrate them with the natural landscape. They could be categorized as having moderate to low scenic integrity.

Table 4.11-1
Scenic integrity definitions

High **(Unaltered/Appears Unaltered)** Landscapes where the valued landscape character "is intact" with only minute, if any, deviations. The existing landscape character and sense of place are expressed at the highest possible level.
Moderate **(Slightly to Moderately Altered)** Landscapes where the valued landscape "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed. Landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should appear only as valued character outside the landscape being viewed but compatible or complementary to the character within.
Low **(Heavily Altered)** Landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles within or outside the landscape being viewed.

Source: USFS, 1995.

Community. The developed portions of the Community areas are characterized by large structures in frequent use that are surrounded by paved parking areas. The developed areas are generally well landscaped to integrate them into the landscape. Community areas also include open areas such as parade grounds and undeveloped areas. Community areas are, therefore, designated as having moderate to high scenic integrity.

Residential. These areas all have structures that begin to dominate the natural landscape. Small pockets of forested areas coupled with integrated landscaping allow these areas to continue to share some of the attributes of the land; therefore, these areas all remain characterized with moderate scenic integrity.

Training. The training lands have very little deviations from the original character of the land. They remain largely forested, and the areas where larger alterations have been made are obscured from public view. Some localized heavy training activities may have altered the natural landscape, however. Therefore, Training is categorized as having moderate to high scenic integrity.

Troop. The Troop areas consist of large structures in constant use. Some of the structures have been present for some time and are in a state of disrepair. The area is landscaped, which moderates the impact on scenic integrity. The areas are categorized as having low to moderate scenic integrity.

Photographs of representative scenic integrity classes for each of the land use categories are shown in Figure 4.11-1.

Airfield Area: Low Scenic Integrity
Davison Army Airfield

Community Area: High Scenic Integrity
North Post

Community Area: Low Scenic Integrity
North Post

Community Area: Moderate Scenic Integrity
North Post

Industrial Area: Low Scenic Integrity
South Post

Industrial Area: Low Scenic Integrity
EPG

Scenic Integrity of Fort Belvoir Land Use Categories

Fort Belvoir, Virginia

Figure 4.11-1

Training Area: High Scenic Integrity
North EPG

Training Area: Low Scenic Integrity
South Post

Troop Area: High Scenic Integrity
South Post Parade Grounds

Troop Area: Low Scenic Integrity
North Post Barracks

Professional/ Institutional Area: High Scenic Integrity South Post

Professional/ Institutional Area: Moderate Scenic Integrity North Post

Scenic Integrity of Fort Belvoir Land Use Categories

Fort Belvoir, Virginia

Figure 4.11-1 (Cont.)

Residential Area: High Scenic Integrity
South Post

Residential Area: Moderate Scenic Integrity
South Post

Scenic Integrity of Fort Belvoir Land Use Categories

Fort Belvoir, Virginia

Figure 4.11-1 (Cont.)

4.11.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

The proposed action would be expected to have short-term minor adverse effects and both minor adverse and beneficial long-term effects. Compared to the existing land use plan, the proposed plan would have several different effects on the Fort Belvoir resources. Most notably, there would be a substantially greater amount of development on EPG and the addition of a medical campus on the South Post golf course under the Preferred Alternative land use plan.

4.11.2.1 Land Use Plan Update

Both the development of EPG and the new medical campus would transform the aesthetic view of their respective areas to that of a professional campus. The medical campus would have a greater effect on the aesthetics of the installation because of its location near the center of Main Post. Although large in their size and extent the buildings would be integrated using the landscaping standards of the installation. Construction would also be expected to produce an aesthetic effect. For each BRAC activity that involves building a new structure, road, or improvement of existing structure, there would be expected to be an adverse short-term effect due to construction. The adverse effect would be larger for a larger structure or cluster of structures. Also, construction on North and South Posts would be expected to have a greater effect because of a larger number of people who would view it regularly. Any construction on EPG would be expected to have a minimal effect because of the low level of current activity.

4.11.2.2 BRAC Implementation and Facilities Projects

4.11.2.2.1 North Post

Under the Preferred Alternative there would be two construction projects on North Post—modernizing the McRee barracks and installing an access control point off of Route 1. All activities would occur south of Kingman Road on Lower North Post where there has already been a large amount of development, thereby reducing the impact of new construction on aesthetics. Each of these changes would only entail expanding or modernizing existing buildings or roads. A detailed look at each activity is listed in Table 4.11-2.

Table 4.11-2
Aesthetic effects from proposed BRAC projects on the North Post under the Preferred Alternative

Project #	BRAC facility	Facility size	Nearby visual characteristics	Aesthetic change
15	Access Control Point	Construct entrance road and security check point	Sited on athletic fields with U.S. Route 1 to the south; athletic fields in all other directions	Minor long-term effect because of small scale and proximity to Route 1
19	Modernize Barracks	Renovate existing Barracks	Sited on existing barracks with Professional/Institutional areas to the north and west, athletic fields to the east, vehicle storage to the south	Minor long-term beneficial effect because of renovations

4.11.2.2.2 South Post

Under the Preferred Alternative, several areas in South Post would undergo change. The most significant visual change would occur on the site of the Fort Belvoir South golf course. This area would be used to construct the new Hospital and NARMC headquarters building. These structures would total about 1 million square feet, which would result in a major aesthetic change. The landscape would change from a golf course with stately oak trees lining the fairways to that of a developed medical campus. While alignment with the natural environment would be an important in planning the new facilities, the landscape would be expected to diminish in visual integrity because of the increased amount of development.

However, the plans call for modern buildings with integrated landscaping. This would create a developed Professional/Institutional area that has a moderate visual integrity. A large portion of the remaining South Post BRAC activities involve new organizations moving into existing buildings. These actions would be expected to have a negligible effect on aesthetic integrity. A detailed look at each activity is listed in Table 4.11-3.

4.11.2.2.3 EPG

Under the Preferred Alternative, EPG would have the largest amount of new facilities, over 4.5 million square feet of building space. The majority of this would be divided between the NGA and WHS buildings. Because of their size, these buildings would dominate the viewshed of the area. A hardwood tree buffer, which should remain around EPG, would obscure most of the view of these buildings; although, the roofs of the buildings would be expected to still be visible from the north, south, and east. Because of the security required for the buildings on the eastern half of EPG, only security-cleared staff, people accustomed to the aesthetics of a military installation, would encounter the altered landscapes within EPG. These buildings would dominate the view from the interior of EPG. AT/FP would be incorporated with integrated landscaping techniques to create an open, campus-like atmosphere. A detailed look at each activity is listed in Table 4.11-4.

4.11.2.2.4 Davison Army Airfield

Under the Preferred Alternative, Davison Army Airfield would not have a discernable change in land use. It would remain in a state of low scenic integrity with its continued airfield land use designation.

4.11.2.2.5 Southwest Area

Under the Preferred Alternative, there would be no discernable change to the Southwest Area. Continued training activities would continue in the areas where they already take place. These would have a minor detrimental visual effect on specific locations because the activities cause continued erosion and trampling of vegetation. This would be a minor effect that would not be expected to change the scenic integrity of the land.

Table 4.11-3
Aesthetic effects from proposed BRAC projects on the South Post under the Preferred Alternative

Project #	BRAC facility	Facility size	Nearby visual characteristics	Aesthetic change
4	Hospital	Construct 868,800 ft^2 building	Sited on Fort Belvoir South golf course with Route 1 to the north, Belvoir Road and forested buffer to the east, Wetland and Community areas to the south, Professional/Institutional to the west	Moderate long-term adverse effect due to large size of structure and high aesthetic integrity of current land
5	Dental Clinic	16,000 ft^2 expansion to existing building		Minor long-term adverse effect due to small size of building
6	NARMC HQ Building	Construct 50,000 ft^2 building		Minor long-term adverse effect due to small size of building
16	Purchase AMC Relocatables	Move into 230,000 ft^2 of buildings	Sited on existing Professional/ Institutional Building with Route 1 to the north, Belvoir Road and forested buffer to the east, Wetland and Community areas to the south, Professional/ Institutional to the west	No change
3	MDA Facility	Move into 107,000 ft^2 building	Sited on existing Professional/ Institutional Building with Professional/Institutional and athletic field to the north, parade grounds to the east, Professional/ Institutional area to the south, residential area to the west	No change
14	Modernize Bldgs. 211, 214, 215, 220	Modernize 133,000 ft^2 building		Minor long-term beneficial effect due to renovations
17	PEO EIS Administrative Facility	Move into 447,400 ft^2 building		No change
10	Network Ops - PEO EIS	Expand building by 15,000 ft^2	Sited on forested area with Professional/Institutional to the north, south, and west, forested area to the east	Minor long-term adverse effect due to small size of building
18	Structured Parking Facility, 200 Area	Construct parking garage	Sited on existing parking lot with historic Professional/Institutional buildings in all directions	Minor long-term adverse effect due to buffer by 200 bldgs.
8	Infrastructure	Widen Gunston Road	Sited on existing roadway that runs north and south between Community, Residential, Professional/Institutional, Troop, and forested areas	Minor long-term adverse effect due to presence of existing road
11	USANCA Replacement	Renovate 20,000 ft^2 building	Surrounded by Professional/ Institutional buildings, including historic buildings to the south	No effect
20	MWR Family Travel Camp	Construct camper trailer loop and small cabins	Sited on forested area with forested area to the north, south, and east; river shore and community area to the west	Minor long-term adverse effect due to addition of small buildings

Table 4.11-4
Aesthetic effects from proposed BRAC projects on EPG under the Preferred Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
1	NGA	Construct 2,419,000 ft^2 building	Sited on forested area with mature hardwoods and young pines, scattered cleared areas, one active Professional/ Institutional building and several abandoned buildings with tree buffer and residential area to the north, I-95 to the east, forested area to the west, forested area and Industrial area to the south	Moderate long-term adverse effect due to large size of building, and minor long-term beneficial effect due to elimination of dilapidated buildings
2	WHS	Construct 2,219,000 ft^2 building		Moderate long-term adverse effect due to large size of building, and minor long-term beneficial effect due to elimination of dilapidated buildings
8	Infrastructure	Add 80 acres of pavement and infrastructure and 25,000 ft^2 of buildings		Minor long-term adverse effect due to small power station and buried lines
9	Emergency Services Center (EPG)	Construct 14,700 ft^2 building		Minor long-term adverse effect due to small size of building
12	Child Development Center–244	Construct 19,590 ft^2 building		Minor long-term adverse effect due to small size of building
13	Child Development Center–303	Construct 24,036 ft^2 building		Minor long-term adverse effect due to small size of building
7	Corps of Engineers Integration Office (Temporary)	Construct 22,500 ft^2 building		Minor long-term adverse effect due to small size of building

4.11.2.3 BMPs/Mitigation

BMPs. Construction activities on Fort Belvoir would adhere to the following state and installation guidelines thus alleviating the need for any mitigation measures. Planning and construction of BRAC facilities would be expected to follow the guidelines set forth in the *Fort Belvoir Installation Design Guide* (Rhodeside and Harwell, 1995). This would allow any new additions to remain consistent with the existing landscape and architectural character of the installation. Building design for larger structures would include varying profiles to blend them into their surroundings. During construction, the Army would retain as many older trees as possible because their presence dramatically enhances visual aesthetics. After completion of construction, the Army would install integrated landscaping in accordance with the *Fort Belvoir Installation Design Guide*. This would lessen the impact of the new buildings. In areas where existing trees cannot be preserved, it would be beneficial to plant stands of trees that would obstruct the view of buildings from high-traffic areas in the long-term.

Mitigation. No specific mitigation measures are identified.

4.11.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

The Town Center Alternative would focus the majority of the BRAC activities to North and South Posts, specifically to the areas bordering the north and south sides of Route 1.

4.11.3.1 Land Use Plan Update

Although both the north and south areas of the installation would receive new structures, the South Post sites would see a larger amount of aesthetic change because of their current high aesthetic value. Short-term adverse effects due to construction would be expected to be similar to that of the Preferred Alternative.

4.11.3.2 BRAC Implementation and Facilities Projects

4.11.3.2.1 North Post

Under the Town Center Alternative land use plan, the North Post would gain a large amount of new buildings. The addition of these structures would not be as dramatic as those on South Post because of the present level of development in the area just north of Route 1. With the addition of the medical campus, MDA building, and the PEO EIS, the area from Route 1 to just north of Abbott Road would become a highly developed Professional/Institutional area. The size of some of the larger buildings would be expected to make them visible from some of the surrounding community areas on North Post, namely the area east of Woodlawn Road. Under this plan, there would be no development on the northern half of North Post, where there is a high level of aesthetic integrity. For the Access Control Point and Modernizing Barracks, the aesthetic change would be the same as the Preferred Alternative. Detailed looks at each unique activity for this alternative are listed in Table 4.11-5.

4.11.3.2.2 South Post

Under the Town Center Alternative, the bulk of the South Post activity would occur on and around the current location of the Fort Belvoir South golf course. The new aesthetic look of the landscape would be dominated by the addition of the NGA and WHS buildings, which would total over 4.5 million square feet. The change from a landscaped golf course with large trees to a large Professional/Institutional campus landscape would be expected to cause a dramatic aesthetic change. The size of these two buildings would affect the viewscape around the upper portion of South Post. For Modernizing Buildings 211, 214, 215, 220, Purchasing AMC Relocatables, infrastructure improvements to Gunston Road, Structured Parking Facility, and Family Travel Camp projects, the aesthetic change would be the same as under the Preferred Alternative. Detailed looks at each unique activity for this alternative are listed in Table 4.11-6.

4.11.3.2.3 EPG

Under the Town Center Alternative EPG would have no change as described under the No Action Alternative.

4.11.3.2.4 Davison Army Airfield

With the Town Center Alternative, Davison Army Airfield would have no discernable change. It would remain in a state of low scenic integrity with its current maintenance schedule.

4.11.3.2.5 Southwest Area

Under the Town Center Alternative, the Southwest Area would have no aesthetic change.

Table 4.11.5
Aesthetic effects from proposed BRAC projects on North Post under the Town Center Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
3	MDA	Construct 107,000 ft^2 building	Sited on forested area with Gunston Road and forested areas to the north and west, Professional/ Institutional buildings to the east, community amphitheatre to the south	Moderate long-term adverse effect due to size of building and proximity to amphitheatre
10	Network Ops – PEO EIS	Expand building by 15,000 ft^2	Sited on existing Professional/ Institutional building and fields with forested areas to the north, Professional/Institutional areas to the east and west, barracks to the south	Minor long-term adverse effect due to small size of expansion
17	PEO EIS Admin Facility	Construct 447,400 ft^2 building	Sited on forested area and landscaped fields with forested area to the north, fields and residential areas to the east, community areas to the south, forested area and Professional/ Institutional to the west	Moderate long-term adverse effect due to larger size of building
8	Infrastructure	Add 80 acres of pavement and infrastructure and 25,000 ft^2 of buildings	Sited on athletic fields with athletic fields to the north, west, and south, Professional/Institutional to the east and southwest	Minor long-term adverse effect due to small power station and buried lines
4	Hospital	Construct 868,800 ft^2 building	Sited on vehicle storage area and landscaped semi-forested area with barracks to the north, Professional/ Institutional areas to the east, tree buffer and Route 1 to the south, vehicle storage to the west	Minor long-term adverse effect due low aesthetic integrity of existing land
5	Dental Clinic	16,000 ft^2 expansion to existing building		Minor long-term adverse effect due low aesthetic integrity of existing land and small size
6	NARMC HQ	Construct 50,000 ft^2 building	Sited on landscaped semi-forested area with athletic fields to the north and east, forested buffer zone and Route 1 to the south, Professional/ Institutional area to the west	Minor long-term adverse effect due to small size of building
7	Corps of Engineers Integration Office	Construct 22,500 ft^2 temporary building	Sited on landscaped semi-forested area with fields to the north and south, Residential area to the East, Professional/Institutional area to the west	Minor long-term adverse effect due to small size of building

Table 4.11.6
Aesthetic effects from proposed BRAC projects on South Post under the Town Center Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
1	NGA	Construct 2,419,000 ft^2 building	Sited on Fort Belvoir South golf course and landscaped forested area with Professional/Institutional area to the north, athletic fields to the northwest, forested areas to the east, Community areas to the south, Troop and Community areas to the west	Major long-term effect due to large size of building and high aesthetic integrity of existing land
2	WHS	Construct 2,219,000 ft^2 building		Major long-term effect due to large size of building and high aesthetic integrity of existing land
12	Child Development Center–244	Construct 19,590 ft^2 building		Minor long-term adverse effect due to size of building
13	Child Development Center–303	Construct 24,036 ft^2 building		Minor long-term adverse effect due to size of building

4.11.3.3 BMPs/Mitigation

BMPs would be similar to those for the Preferred Alternative (Section 4.11.2.3).

4.11.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

The City Center Alternative would focus most of the BRAC additions on EPG. This would create a very developed city-like aesthetic for the eastern side of EPG. Fort Belvoir Main Post would remain relatively unchanged.

4.11.4.1 Land Use Plan Update

The high concentration of large buildings on EPG—4,050,490 square feet of building space—would create a dense city area. This would greatly change the aesthetics of the area. The GSA parcel would also be used under this alternative. Although also receiving a large building, its aesthetic integrity would be expected to improve because of its current use as a warehouse area. The remainder of the installation would see very little visual change. Short-term adverse effects from construction would be expected to be similar to that of the Preferred Alternative.

4.11.4.2 BRAC Implementation and Facilities Projects

4.11.4.2.1 North Post

Under the City Center Alternative, North Post would undergo a relatively small amount of change. These changes would be limited to the Access Control Point the Barracks Modernization, and the U.S. Army Corps of Engineers Integration Office. The aesthetic change for these would be the same as under the Preferred Alternative. There would be no unique aesthetic changes for North Post under this alternative.

4.11.4.2.2 South Post

Under the City Center Alternative, there would be expected to be very little aesthetic change to South Post. The majority of the BRAC activities would involve occupying or renovating existing structures. The only new buildings would be the Structured Parking Facility and the buildings associated with the Family Center Camp, which would all be relatively small. For Modernizing Buildings 211, 214, 215, and 220, Purchasing AMC Relocatables, Network Enterprise Comm. Facility (AKO), infrastructure improvements to Gunston Road, Structured Parking Facility, the USANCA building, and Family Travel Camp projects, the aesthetic change would be the same as under the Preferred Alternative. There would be no unique aesthetic changes for South Post under this alternative.

4.11.4.2.3 EPG

Under the City Center Alternative, the vast majority of new structures at Fort Belvoir would be sited on EPG. Ten structures would be placed on the eastern side of EPG. This would drastically change the appearance of the landscape. The new viewscape would be of a dense Professional/ Institutional area. Although, the only people viewing the new structures from within EPG would be those used to the aesthetics of an Army installation; the tree buffer that would be left would not be adequate to conceal these structures from outside residents and motorists. For the NGA Emergency Services Center and the Child Development Center–244, the aesthetic change would be the same as under the Preferred Alternative. Detailed looks at each unique activity for this alternative are listed in Table 4.11-7.

Table 4.11-7
Aesthetic effects from proposed BRAC projects on EPG under the City Center Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
3	MDA	Construct 107,000 ft^2 building	Sited on forested area with mature hardwoods and young pines, scattered cleared areas, one active Professional/institutional building and several abandoned buildings with tree buffer and Residential area to the north, Newly constructed Professional/ Institutional buildings and I-95 to east, Forested area and newly constructed Professional/Institutional buildings to the south, Forested land to the west	Minor long-term adverse effect due to smaller size of building
10	Network Ops–PEO EIS	Construct 15,000 ft^2 building		Minor long-term adverse effect due to small size of building
17	PEO EIS Admin Facility	Construct 447,400 ft^2 building		Moderate long-term adverse effect due to large size of building, and minor long-term beneficial effect due to elimination of dilapidated buildings
6	NARMC HQ Bldg	Construct 50,000 ft^2 building	Sited on forested area with mature hardwoods and young pines, scattered cleared areas, one active Professional/Institutional building and several abandoned buildings with newly constructed Professional/ Institutional buildings to the north and west, I-95 to the east, thin forested buffer and industrial area to the south	Minor long-term adverse effect due to small size of building
4	Hospital	Construct 868,800 ft^2 building		Moderate long-term adverse effect due to large size of building, and minor long-term beneficial effect due to elimination of dilapidated buildings
5	Dental Clinic	16,000 ft^2 expansion to existing building		Minor long-term adverse effect due to small size of building

4.11.4.2.3 GSA Parcel

The City Center Alternative would include development on the GSA Parcel, which lies to the northeast of EPG. This area is used as a storage facility. Development of the WHS complex on the GSA parcel would be expected to increase the visual integrity from that of low Industrial to moderate Professional/Institutional. A detailed look at each activity is listed in Table 4.11-8.

4.11.4.2.4 Davison Army Airfield

With the City Center Alternative, Davison Army Airfield would have no discernable change. It would remain in a state of low scenic integrity with its current maintenance schedule.

4.11.4.2.5 Southwest Area

Under the City Center Alternative, the Southwest Area would have no aesthetic change.

4.11.4.3 BMPs/Mitigation

BMPs would be similar to those for the Preferred Alternative.

Table 4.11-8
Aesthetic effects from proposed BRAC projects on the GSA Parcel under the City Center Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
2	WHS	Construct 2,219,000 ft^2 building	Sited on Industrial area with Springfield Parkway to the north, residential and forested areas to the east and south, I-95 to the west	Minor long-term beneficial effect due to low aesthetic value of existing land
13	Child Dev Center–303	Construct 24,036 ft^2 building		Minor long-term beneficial effect due to low aesthetic value of existing land

4.11.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

The Satellite Campuses Alternative would spread out the BRAC activities over Fort Belvoir proper and leave EPG unchanged. The largest concentration of new buildings would be found on North Post on the North Post Golf Course and the area around Route 1.

4.11.5.1 Land Use Plan Update

This alternative would have the greatest effect on North Post. This effect would be expected to be enhanced by the present high aesthetic integrity of the area north of Kingman Road. Under this plan, NGA would be placed on Davison Airfield. This would improve the aesthetic integrity of the airfield by changing it to a Professional/Institutional area. The remaining portion of the installation would be expected to have very little aesthetic change. Short-term adverse effects due to construction would be expected to be similar to that of the Preferred Alternative.

4.11.5.2 BRAC Implementation and Facilities Projects

4.11.5.2.1 North Post

Under the Satellite Campuses Alternative there would be two main development areas on North Post. The first would center around the construction of the WHS and MDA buildings on the already developed area just north of Route 1. The addition of these large buildings, which total more than 2.3 million square feet, would have a moderate adverse impact on the area. The second development area includes the construction of the hospital campus on the location of the Fort Belvoir Golf Club. Although this development would be roughly half the square footage of the WHS and MDA facilities, it would have a greater impact on aesthetic value due to the high-level aesthetic value of the golf course. For the Access Control Point, Modernizing Barracks, and the U.S. Army Corps of Engineers Integration Office, the aesthetic change would be the same as under the Preferred Alternative. For the Infrastructure project, the aesthetic change would be the same as for the Town Center Alternative. Detailed looks at each unique activity for this alternative are listed in Table 4.11-9.

Table 4.11-9
Aesthetic effects from proposed BRAC projects on North Post under the Satellite Campuses Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
6	NARMC HQ Bldg	Construct 50,000 ft^2 building	Sited on Fort Belvoir golf course with Snyder Road and landscaped golf course to the north, Beulah Street and forested area to the east, forested area and Kingman Road to the south, forested area and community area to the west	Minor long-term effect due to small size of building
4	Hospital	Construct 868,800 ft^2 building		Major long-term effect due to large size of building and high aesthetic integrity of existing land
5	Dental Clinic	16,000 ft^2 expansion to existing building		Minor long-term effect due to small size of building
10	Network Ops – PEO EIS	Expand building by 15,000 ft^2	Sited on forested area with Kingman Road and forested area to the north, Commissary/PX to the east, commercial area with scattered forests to the south, Gunston Road forested area and new Professional/ Institutional building to the west	Minor long-term effect due to small size of building
17	PEO EIS Admin Facility	Construct 447,400 ft^2 building		Moderate long-term effect due to smaller size of building
13	Child Dev Center–303	Construct 24,036 ft^2 building	Sited on vehicle storage, athletic fields, and landscaped semi-forested area with barracks and forested area to the north, Professional/ Institutional areas to the east, tree buffer and Route 1 to the south, vehicle storage to the west	Minor long-term beneficial effect due to small size of building and low aesthetic value of existing land
3	MDA	Construct 107,000 ft^2 building		Minor long-term adverse effect due to moderate size of building
2	WHS	Construct 2,219,000 ft^2 building		Moderate long-term adverse effect due to large size of building

4.11.5.2.2 South Post

Under the Satellite Campuses Alternative, there would be expected to be very little aesthetic change to South Post. The majority of the BRAC activities would involve occupying or renovating existing structures. The only new buildings would be a structured parking facility and the buildings associated with the Family Center Camp, which would all be relatively small. For Modernizing Buildings 211, 214, 215, and 220, Purchasing AMC Relocatables, infrastructure improvements to Gunston Road, Structured Parking Facility, and Family Travel Camp projects, the aesthetic change would be the same as under the Preferred Alternative. There would be no unique aesthetic changes for South Post under this alternative.

4.11.5.2.3 EPG

Under the Satellite Campuses Alternative, EPG would have no change as described under the No Action Alternative.

4.11.5.2.4 Davison Army Airfield

The Satellite Campuses Alternative would include new structures on the site of Davison Army Airfield. Although the construction of this large new building would have a significant effect on the viewscape, it would have an overall beneficial effect due to the current low level of aesthetic value of the airfield. A detailed look at each activity is listed in Table 4.11-10.

4.11.5.2.5 Southwest Area

Under the Satellite Campuses alternative, the aesthetic effect on the Southwest Area would be similar to that in the Proposed Action plan.

4.11.5.3 BMPs/Mitigation

BMPs would be similar to those for the Preferred Alternative.

Table 4.11-10
Aesthetic effects from proposed BRAC projects on Davison Army Airfield under the Satellite Campuses Alternative

Project #	BRAC facility	Facility size	Site placement and nearby landscapes	Aesthetic change
1	NGA	Construct 2,419,000 ft^2 building	Sited on Airfield with forested buffer zone to the north and east with Fairfax County Parkway on other side, forested areas community areas and Route 1 to the south, forested area and commercial buildings to the west	Minor short-term adverse effect, minor long-term beneficial effect
12	Child Dev Center–244	Construct 19,590 ft^2 building		Minor long-term beneficial effect

4.11.6 NO ACTION ALTERNATIVE

Under the No Action Alternative, no effects would be expected on the aesthetics of the installation.

4.11.6.1 North Post

Under the No Action Alternative, North Post would have no discernable change in appearance. Under the current maintenance plan, the various land use types would retain their level of visual quality.

4.11.6.2 South Post

Under the No Action Alternative, South Post would have no discernable change in appearance. Under the current maintenance plan, the various land use types would retain their level of visual quality.

4.11.6.3 EPG

Under the No Action Alternative, there would be no change to EPG. USANCA would remain in their facility on the northeast area and the remainder of EPG would remain under the present maintenance plan, where the majority of the buildings and roads would continue to slowly deteriorate, retired ranges would continue to be cleared and grubbed, and the remainder of the forested land would remain uncut. Allowing parts of EPG to be sold or leased on a long-term basis would be explored under this scenario.

4.11.6.4 Davison Army Airfield

Under the No Action Alternative, Davison Army Airfield would have no discernable change. It would remain in a state of low scenic integrity with its current maintenance schedule.

4.11.6.5 Southwest Area

Under the No Action Alternative, the Southwest Area would have no aesthetic change.

4.11.6.6 Mitigation

No mitigation is required for the No Action Alternative.

4.11.7 SUMMARY OF COMPARISON OF ALTERNATIVES

The BRAC actions would be expected to have a minor to moderate impact on the aesthetic and visual resources of Fort Belvoir. There would be some difference in the effects the four alternatives have on aesthetics, with the City Center having the least impact and the other three alternatives having similar slightly larger impacts.

Throughout its history and development, Fort Belvoir has strived to take advantage of the natural topography and vegetation of the area. For this reason, it has been able to preserve a relatively high amount of aesthetic value. Potential effects on the installation's aesthetic value depend on how proposed actions affect those signature areas of the installation having high aesthetic integrity. These areas include the traditional buildings of Fort Belvoir and the landscaping that

takes advantage of natural features and mature hardwoods, which are found primarily on South Post and to a lesser extent on North Post; the undisturbed areas of Fort Belvoir found in the Southwest Area; the wildlife corridors on North Post and western EPG; the golf courses on North and South Post; and the many vistas of the Potomac. The four proposed alternatives differ slightly on how they affect these areas.

The City Center Alternative, which concentrates the majority of its actions on eastern EPG and the GSA site, would have the least aesthetic impact because of the lack of major construction on either North or South Post. The eastern portion of EPG, especially the area inside of Heller Loop, has low aesthetic value because of training and testing activities that have occurred there over the years. This area also contains several abandoned structures that have progressed to an advanced state of dilapidation. Both the City Center Alternative and, to a lesser extent, the Preferred Alternative make use of this area. The Preferred, Town Center, and Satellite Campuses Alternatives all have a greater impact because of having developments on or near aesthetically sensitive areas of Main Post. The Preferred and Town Center Alternatives would have more of an impact as a result of the hospital campus being sited on the South Post golf course. The Town Center Alternative also would situate a large amount of development on North Post above U.S. Route 1. Similarly, the Satellite Campuses Alternative places new structures in this area north of U.S. Route 1. Although it does not impact the South Post golf course, it would site buildings on the North Post golf course. Despite their slight differences, none of the proposed alternatives would have a significant effect on aesthetics and visual resources of the installation.

4.12 UTILITIES

Utilities at Fort Belvoir consist of potable water supply and distribution, sanitary sewage collection, electric power distribution, natural gas distribution, steam supply, communications network, and solid waste collection. Washington Gas owns and operates Fort Belvoir's natural gas system. Electric distribution system at Fort Belvoir will be managed by Dominion Virginia Power under a 50-year contract with Fort Belvoir effective March 2007. By the end of 2008, the Army plans to privatize water distribution, and wastewater collection systems at Fort Belvoir. The existing Fort Belvoir storm water system is described in Section 4.7.

Utility services at the Davison Army Airfield (DAAF) are similar to services available at the Main Post. These include potable water supply and distribution, sanitary sewage collection, electricity, natural gas, steam, communication and solid waste. Utility service providers and service lines are the same for both Fort Belvoir and DAAF. However, due to the proposed location, under one of the considered alternatives, of BRAC tenants with built-in space in excess of 2.4 million square-feet, specific details, when available, of existing utility services such as pipe sizes and potable water storage capacity etc., at DAAF are presented separately in this EIS. Utility services at the Southwest area and Humphrey Engineering Center of Fort Belvoir are not discussed in this EIS.

EPG has minimal on-site utility infrastructure in place. However, it is in close proximity to public utility systems. Utility services available at EPG include potable water supply and distribution, sanitary sewage collection, electricity and solid waste collection. These services are provided by public and private utility companies operating in the area. Though natural gas services are not available at the EPG site, the provider of natural gas in the vicinity of EPG has the ability to provide this service to EPG in the future.

Utility services available at the GSA Franconia Warehouse Complex (GSA Parcel) include potable water supply and distribution, sanitary sewage collection, electricity, natural gas, communications and solid waste collection.

Unless otherwise specified, the primary sources for this section are Fort Belvoir's *Integrated Natural Resources Management Plan* (Horne, 2001), the Solicitation Notice for Utilities Privatization of Electric, Water and Wastewater Systems at Fort Belvoir, (DLA, 2005) and the Fort Belvoir DPW GIS Department.

4.12.1 AFFECTED ENVIRONMENT

4.12.1.1 Potable Water Supply and Distribution

Main Post. Fairfax Water provides potable water to Fort Belvoir as a wholesale customer via two separately metered vaults/pump stations connected to a 30-inch main on Telegraph Road and a 24-inch Fairfax Water line on Pole Road. Water supply to the post is master metered. The Fredrick P. Griffith Water Treatment Plant in Lorton, Virginia supplies water to the post. This plant was opened for operation in May 2006, with production capacity of 120 mgd. The Griffith Plant is one of two supply points that feed the overall Fairfax Water system providing redundancy and reliability to Fort Belvoir from a water supply standpoint.

Current total consumption of potable water at Fort Belvoir ranges from approximately 1.8 to 2.2 mgd (based on Year 2005 and 2006 total annual consumption of 645.81 million gallons and

812.88 million gallons, respectively). The peak demand was recorded as 3.044 mgd (Betts, 2007). Current contracted capacity for potable water with Fairfax Water is 4.4 mgd (Guerra, 2005). The rated (or licensed) capacity of the potable water system as designed and permitted is 4.75 mgd according to storage capacity at Fort Belvoir. When the demand reaches 80 percent of the rated (or licensed) capacity, the corresponding regulating authority, the Virginia Department of Health requires submission of a plan for system upgrade. The contracted capacity covers the Main Post, DCEETA, EPG, and part of HEC. About 1.0 million gallons are held in emergency storage in government-owned tanks.

There are no active potable water wells on the installation, and all abandoned wells have been closed and filled. There are four groundwater wells used for irrigation, three of which are on the North Post golf course, the fourth at the DLA (Bolton, 2002).

Although privatization of the water system is planned by the end of 2008, Fort Belvoir owns, operates, and maintains the entire on-post distribution system. The distribution system provides looped service to the post and includes three pumping stations, three elevated storage tanks, one ground-level storage tank, and a chlorination system. The service lines on the post are made of a variety of materials, including cast iron, ductile iron, and polyvinyl chloride (PVC). An analysis of the system prepared in 1996 showed that more than 70 percent of the potable water system was built in the 1940s and another 7 percent was constructed in the 1950s (USACE, 2002).

Water pressure is aided by a pump station near the Telegraph Road connection and by three elevated water storage tanks. In combination, the three elevated tanks and one ground-level emergency storage tank provide a total of 2.3 million gallons of storage capacity; the tanks and their locations and capacities are listed in Table 4.12-1. The storage tanks are old, and might need to be replaced or supplemented by additional tanks. The valves and piping at the tanks were upgraded in 1994, and the tanks were stripped of lead paint and repainted in 1995 and 1996. The chlorination system (VA DOH Permit Number 6059450) is on Telegraph Road and is operated on an as-needed basis (DLA, 2005). There are no other water treatment facilities on-post.

The government-owned system consists of approximately 525,000 linear feet of distribution piping that includes approximately 81,000 feet of service laterals, 1,100 main line valves, 68 sampling stations, and 641 hydrants. The majority of the distribution system was installed in 1940 and is approaching the end of its design life.

Davison Army Airfield. Potable water for the Davison Army Airfield is supplied from a 24-inch main through Davison Army Airfield. The 24-inch main connects to a 30-inch Fairfax Water main which runs along Telegraph Road.

EPG. Potable water for EPG is purchased by Fort Belvoir from Fairfax Water. Two 24-inch main water supply lines provide potable water to EPG along its perimeter. One supply line is along Backlick Road and another is toward the northwest part of the site along Rolling Road.

GSA Parcel. Fairfax Water provides potable water for the GSA Parcel via a 6-inch main along Loisdale Road. Distribution network pipes of varying sizes provide potable water for the different buildings of the parcel. No storage capacity is available for potable water at the site (Donatone, 2006).

Table 4.12-1
Fort Belvoir potable water storage tanks

Facility no.	Location	Capacity (gallons)	Type	Installed/upgrade
188	16th Street	300,000	Elevated	1918/1996
591	23rd Street	500,000	Elevated	1937/1996
2428	Gorgas Road	500,000	Elevated	1948/1995
2429	Gorgas Road	1,000,000	Ground	1948/1995

4.12.1.2 Sanitary Sewage Collection and Treatment

Main Post. Fort Belvoir owns and maintains the on-post sanitary sewer system, which includes 389,122 feet of service laterals, collection pipes, and mains; 40 sewage pumping/lift stations; 1,173 manholes; and two main pumping stations (Jones, 2005). The two main pumping stations, which were treatment stations until the 1970s, are at Building 97 (southern end of Jadwin Loop) and Building 687 (southern end of Tompkins Basin). In addition, Fairfax County owns and operates two major pumping stations in close proximity to the base and large-diameter force main running generally parallel to Route 1 to the south. Design for replacement of the Dogue Creek force main is underway due to prematurely failing pipes. The alignment of the new pipe runs generally parallel with the existing pipe but does encroach into the parcel south of the Parade Grounds. The government-owned collection system ties to the Fairfax County system at several points along the Dogue Creek trunk line.

The post also owns and operates two ferrous sulfate sewage treatment facilities (USACE, 2003). Like the potable water supply system, Fort Belvoir's sewer system will be privatized in the near future.

Pipes are made of clay, PVC, mixed concrete, cast iron, terra cotta, or asbestos, with PVC pipe and clay predominating. The pipe ranges in size from 24 inches to less than 4 inches, with 8 inches being the most common size. Like the other utility systems at Fort Belvoir, most of the wastewater collection system was built in the 1940s with only replacement and upgrade work being completed since 1997. The upgrade work included relining pipes, upgrading manholes, replacing some pipe (DLA, 2005).

For fiscal years 2001 through 2003, the installation discharged an average of between 1.1 and 1.4 mgd of wastewater to the Fairfax County system. The daily average flow limit specified in the contract with Fairfax County is 3.0 mgd, and the maximum daily peak flow to the Fairfax County system is 6.0 mgd. The Fort Belvoir system ultimately discharges to Fairfax County's Norman M. Cole, Jr. Pollution Control Plant (formerly the Lower Potomac Pollution Control Plant), connecting to the county system through six connection points with separately metered flows. The plant has been upgraded three times in the past 28 years (1978, 1995, and 2004), and now has a maximum daily sewage treatment capacity of 67 mgd (Jones, 2005). The Norman Cole, Jr. Plant receives an average of 45 mgd from all dischargers to the system. This plant discharges its effluent into Pohick Creek, which flows into the Potomac River Permit Number VA0025364).

There is also a 6,300-gallon septic tank at the Golf Course Maintenance Facility on Telegraph Road. This tank does not have a septic field (USACE, 2003).

Davison Army Airfield. Sanitary waste from Davison Army Airfield is collected through an existing 8-inch sanitary sewer and lift station and discharged to the Fairfax County treatment system.

EPG. Sanitary wastewater from EPG is treated by the Norman M. Cole Jr. Pollution Control Plant. There is an existing 54-inch gravity trunk sewer line along Accotink Creek that could provide service to EPG.

GSA Parcel. There is an existing 12-inch gravity trunk sewer line along Loisdale Road behind Building A at the GSA Parcel. Sanitary waste from the site is treated at the Norman M. Cole Jr. Pollution Control Plant (Donatone, 2006).

4.12.1.3 Electricity

Main Post. Dominion Virginia Power (Dominion) provides electrical power to Fort Belvoir from two 34.5-kilovolt (kV) three-phase distribution circuits. Each of these circuits is rated for 62 megavolt amperes (MVA). There are two 84 MVA, 230/34.5 kV transformers at the Fort Belvoir substation near HEC. Transformer #1 feeds circuit 464 and two other circuits, 786 (2,241 customers) and 788 (DCEETA). Transformer #2 feeds circuit 463 and one other circuit, 787 (2,429 customers). Dominion owns the substation, and Fort Belvoir currently owns and maintains all other system components, including electrical lines, on-post substations, transformers, and grounding points. However, electric distribution system at Fort Belvoir will be managed by Dominion Virginia Power under a 50-year contract with Fort Belvoir effective March 2007. The maximum load recorded on the two transformers during the past 3 years was approximately 79 MVA on July 29, 2002 (Smith, 2004). Power is transferred from the substation to a post-owned switching station and distributed to the post at 34.5 kilovolts. Four 34.5-kV distribution circuits emanate from the Humphreys switching station. Power is distributed through approximately 78 miles of overhead lines and 83 miles of underground lines. Several overhead feeder lines serve the various areas of the installation, with some lines being interconnected to form looped feeder areas. Power is stepped down to lower voltages for local use throughout the installation using additional substations. A total of 10 substations are located throughout the installation to transform power to lower voltage. Fort Belvoir also uses one combination substation/switching station and three switching stations. The common utilization voltages are 120/208-volt three-phase, 277/480-volt three-phase, and 120/240-volt single phase. Auxiliary generators are used as backup for critical functions.

The Main Post consumes approximately 157 million kilowatt hours of electricity annually. Average daily consumption is approximately 800,000 kilowatt hours. Meter information from Dominion indicates that the incoming feeders are operating at about 50 percent of capacity. Connected load data indicate that the main 34.5-kV circuits are operating at 50 to 70 percent of capacity (USACE, 2003).

Effective March 2007, as the owner of the electric distribution system, Dominion Virginia Power would be required to substantially upgrade the system by converting all electric distribution system facilities to a uniform 34.5-kV line. Also included in the upgrade would be the demolition of existing substations, burial of overhead lines at some locations and blanket system improvements, consisting of conductor changeouts, tie lines, miscellaneous equipment, and other various items incidental to replacement. Overhead lines would be designed and constructed to eliminate electrocution hazards to the extent possible for owls, hawks, eagles and ospreys (DLA, 2005).

Davison Army Airfield. Dominion provides electricity to the airfield. In addition, a small, separate service line through the Davison Army Airfield provides electricity for the Southwest Area of Fort Belvoir.

EPG. EPG is served by medium voltage (above 1 kV to 99.9 kV) to a location along Backlick Road. The Franconia substation, operated by Dominion less than a mile south of EPG, feeds the distribution main along Backlick Road. High voltage (equal or greater than 100,000 V) electrical service is available along Backlick Road for the eastern side of this site and along Rolling Road for the western side of this site (Fort Belvoir, 2000).

GSA Parcel. Electricity for the GSA Parcel is supplied by Dominion. The electric line runs from Loisdale Road into the complex and is distributed from power pole to power pole and supplied to individual buildings (Donatone, 2006).

4.12.1.4 Natural Gas

Main Post. Washington Gas owns and operates Fort Belvoir's natural gas system. As of 2000, natural gas was distributed to the installation through 25 miles of main lines and 11 miles of service lines, mostly servicing the family-housing areas. Fort Belvoir's natural gas supply system has been upgraded numerous times since 1993, and upgrades would continue over the next few years. Improvements include converting facilities from Number 2 and Number 6 fuel oil to natural gas, replacing old piping, and placing new lines and meters. The total capacity rating for the entire post is approximately 160 million cubic feet (MMcf) per day with two delivery points to Fort Belvoir. Approximately 90 MMcf/day is deliverable along U.S. Route 1 and approximately 70 MMcf/day is deliverable at Woodlawn Road (Smith, 2004).

Davison Army Airfield. The natural gas system at the Davison Army Airfield is owned and operated by Washington Gas as part of the service provided to the Main Post.

EPG. No natural gas services are available on EPG. Washington Gas has transmission lines on Backlick Road along the eastern side adjacent EPG. The closest gas main for the western side EPG is along Rolling Road (Fort Belvoir, 2000). Heating and air conditioning on EPG is provided by self-contained systems adequate to support only the 13,000-square-foot facility occupied by U.S. Army Chemical and Nuclear Agency.

GSA Parcel. Natural gas is provided to the GSA Parcel by Washington Gas from a transmission line along Loisdale Road. One main meter and seven submeters installed by Washington Gas monitors the quantity of gas provided (Donatone, 2006).

4.12.1.5 Steam

Main Post. The existing DeWitt Army Community Hospital, Davison Army Airfield, and the larger buildings on Fort Belvoir use steam to provide heat and hot water. Recently constructed facilities (such as the McNamara headquarters building) and smaller buildings (such as residential units) use individual boilers.

Fort Belvoir has four high-pressure and six low-pressure steam plants. The Viron/Pepco Services Partnership maintains and operates the Building 1422 steam plant under the Military District of Washington Energy Savings Performance Contract. DynCorp maintains and operates the other steam plants and all steam lines. Steam is distributed to the installation through 13 miles of steam

and condensate lines. Most of the piping associated with each central boiler runs underground. Fort Belvoir owns and maintains the entire system (USACE, 2003).

Davison Army Airfield. Davison Army Airfield uses steam to provide heat and hot water. Fort Belvoir owns and maintains the entire steam utility system.

EPG. No steam utility services are provided at the EPG site.

GSA Parcel. No steam utility services are available at the GSA Parcel (Donatone, 2006).

4.12.1.6 Communications

Main Post. Telecommunication and information services on Fort Belvoir consist of a copper and fiber-optic data-distribution network. The network backbone is an asynchronous transfer mode (ATM) and the telephone switch is integrated services digital network (ISDN)-capable. Most of the distribution cable is carried through an underground ductbank. The installation owns the entire system, including copper and fiber-optic cables, utility poles, and computerized switchboard systems associated with inter-post and DoD applications. As of 1997, the main telephone switch handled 18,000 telephone lines and has a capacity of 45,000 telephone lines.

Telephone service at Fort Belvoir is provided by Verizon Communications. The system is a mainframe interconnecting facility owned and operated by Verizon (USACE, 2002). The cable television provider is Comcast Cable (USACE, 2002).

Davison Army Airfield. The communication system at the airfield is owned and operated by Fort Belvoir.

EPG. There is minimal or no telephone and internet infrastructure services provided at present on EPG. However, communication lines are located along Backlick Road for the eastern side of EPG and along Rolling Road for the western side of EPG (Fort Belvoir, 2000).

GSA Parcel. Communication services are provided Verizon for the GSA Parcel (Donatone, 2006).

4.12.1.7 Solid Waste

Main Post. Fort Belvoir generates about 6,694 tons of municipal solid waste (MSW) annually that are disposed of off-post by a contract hauler Brooks, M.J. Personal communication, February 2007). Approximately 2,719 tons of the total municipal solid waste is recycled (Brooks, M.J. Personal communication, February 2007). Household and office building trash is disposed of off-post by a contract hauler to the I-95 Energy/Resource Recovery Facility managed by Covanta Fairfax, Inc., owned and operated by Covanta Energy. Fairfax County disposes of the ash generated from the facility in an adjacent landfill complex. A letter of agreement between the Division of Solid Waste Disposal and Resource Recovery of Fairfax County and Fort Belvoir has a cap of 100 tons per day of MSW (Meoli, 2007). Disposal capacity of the Resource Recovery Facility is 3,000 tons per day with an air permit limit of 1.095 million tons per year (Meoli, 2007). The County expects the Resource Recovery Facility to have sufficient capacity to handle disposal needs through 2025 (Fairfax County, 2005). Items such as tires and fluorescent lighting go to the Defense Reutilization and Marketing Office for recycling. Scrap metal is recycled through the Qualified Recycling Program. Woody waste, grass clippings left on-site as mulch,

and leaves are composted at the post's compost site. Approximately 3,000 tons of yard waste was composted on the post in Fiscal Year 2006 (Brooks, M.J. Personal communication, February 2007).

Other bulky waste, such as appliances and furniture, as well as construction and demolition debris, is disposed of at Hilltop Landfill in Fairfax County. This landfill has been estimated to have 9 years of capacity remaining, on the basis of expected county construction/demolition debris (CDD) rates (Fairfax County, 2005).

The installation has a mandatory installation-wide recycling program that collects white paper, colored paper, newspaper, aluminum cans, tin/steel cans, scrap metal, cardboard, glass bottles, plastic containers, used oil, and toner cartridges at the Building 1089 Recycling Facility. Fort Belvoir also has a 10-year Integrated Solid Waste Management Plan, last updated in 1999. In general, the planning goal is to reduce solid waste management costs and environmental effects by reducing the quantity of materials that must be disposed of by incineration or landfilling. Fort Belvoir has met its recycling goals for solid wastes and now recycles more than 50 percent of its solid waste (USACE, 2003). During period June 2006 to January 2007, Fort Belvoir disposed approximately an average of 450 tons of MSW per month (Meoli, 2007).

Davison Army Airfield. Solid waste generated from the Davison Army Airfield is collected and disposed of through the solid waste disposal system at the Main Post.

EPG. Nonhazardous municipal solid waste collected EPG is hauled for disposal through the existing solid waste disposal system at Fort Belvoir.

GSA Parcel. Solid waste is collected from the GSA Parcel by Urban Services and disposed of at the Prince William County landfill site in Virginia. The warehouse complex also has a recycle program and recycled waste is collected by Recycle America (Donatone, 2006).

4.12.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

Under the proposed BRAC action, there would be a net increase of 22,000 personnel at Fort Belvoir and connected sites. Demand on all utility systems would increase as a result of the BRAC action. This would require additional buildings with new and efficient utility systems for providing the required level of utility services. In the long-term, Fort Belvoir would minimize demand increases on the systems by installing water-conserving devices such as low-flow showerheads, faucets, and toilets in new facilities. In addition, all vertical building construction projects, with the exception of major hospitals (USACE Medical Facilities Mandatory Center of Expertise, 2006) starting with FY 2008 are required to achieve the SILVER level of Leadership in Energy and Environmental Design (LEED) of the U.S. Green Building Council (Deputy Assistant Secretary of the Army. 2006. *Sustainable Design and Development Policy Update—SpiRiT to LEED Transition*. Memorandum dated January 5).

This rating system is based on sustainable design and development concepts and assesses the degree to which the design of a building successfully incorporates consideration of matters such as sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality. Major hospital buildings must be LEED certifiable at a minimum with the goal of achieving LEED Silver (USACE Medical Facilities Mandatory Center of Expertise, 2006). Using the LEED rating system improves the environmental and economic performance of

facilities by using established and advanced industry principles, practices, materials, and standards.

Installing fixtures and heating systems in compliance with the Energy Policy Act of 2005 (Public Law 109-58—August 2005) with specified goals for increased use of renewable energy sources, advanced utility metering and procurement of energy efficient equipment and building systems in all applicable contracts would have beneficial effects by reducing the per capita consumption of natural gas and other sources of energy.

In addition, upgrades and new utility lines would be confined to the 121 outgrants at Fort Belvoir, as much as possible and would avoid the EQC on EPG with the exception of utility crossings required to cross Accotink Creek, in which case utility crossings would occur at road bridge crossings. Appropriate wetland and subaqueous stream bed permits would also be obtained as required for utility corridors.

4.12.2.1 Potable Water Supply and Distribution

4.12.2.1.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the Preferred Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. Hence, the potable water consumption would increase from additional workers locating to these new and renovated buildings. Substantial additions and upgrades for the potable water infrastructure would occur at the Main Post and EPG to provide adequate supply of potable water. In addition to upgrades to existing water supply lines at the Main Post, new distribution and storage capacity for potable water might be necessary to accommodate specific needs of users such as hospital and other related services. New supply and distribution lines for potable water and storage capacity to ensure reliable service would be necessary at EPG under the Preferred Alternative land use plan.

In the long-term, because new buildings would use efficient water conserving devices, the proposed development would reduce the per capita demand for potable water. However, minor long-term adverse effects would occur due to the increase in overall total demand on potable water infrastructure from additional personnel occupying the newly constructed or renovated buildings. Minor short-term adverse effects also would be expected. Implementing the Preferred Alternative would result in short-term disconnections and reconnections of existing potable water utility systems during the construction phase.

4.12.2.1.2 BRAC Implementation and Facilities Projects

Under the Preferred Alternative, there would be a net increase of 22,000 personnel distributed between EPG and the South and North Posts. In addition, 146 personnel involved from five discretionary moves proposed by the Army would be located at Fort Belvoir. Existing utility systems on EPG are sized to support a few hundred personnel. Similarly, existing utility systems near the proposed construction sites at the South Post under the Preferred Alternative are at or near their design capacity.

Many of the personnel proposed to move to various office locations at EPG and the South Post already live and work in the surrounding areas. As such, their demand on utilities would be limited to use of services during office hours and not based on residential levels of demand.

Of the net increase of 22,000 personnel at various locations on Fort Belvoir from the BRAC action, approximately 18,000 personnel would be assigned to the agencies proposed to be located at EPG. Miscellaneous building space amounting to approximately 6.2 million square feet would be added at various locations of the above sites, including more than 4.7 million square feet of additional building space constructed on EPG.

Using a per capita water consumption of 75 gpd, the proposed increase in personnel under the Preferred Alternative would increase the demand for potable water by 1.34 mgd at EPG. The demand for potable water at the South Post would increase by 0.39 mgd, estimated for approximately 140 hospital beds at 600 gallons per bed per day, and water use by hospital employees and visitors to the hospital. A substantial increase in outpatient visits to the hospital could increase the demand for potable water. The above estimated total increase in potable water demand of 1.73 mgd, together with the current average demand of 1.8 to 2.2 mgd would result in an overall demand of 3.53 to 3.93 mgd. The water storage requirements for fire fighting and water needs during construction phase would also be considered during the design stages.

The anticipated future average demand is between 74 and 83 percent of the current rated capacity of 4.75 mgd the post has with Fairfax Water. If the demand for potable water reaches 80 percent of rated capacity, as required by the regulating authority, Fort Belvoir must submit a plan for upgrading the system and negotiate for additional contracted capacity with Fairfax Water for potable water.

Fairfax Water's existing 24-inch mains along Backlick Road on the east side and along Rolling Road on the west side could be linked with a new water line and be tapped at various locations to provide potable water for the various proposed office buildings at EPG. In addition, storage tanks with sufficient capacity would be necessary to ensure reliability of supply and for emergency use. An 8-inch main provides potable water to existing buildings at EPG. In view of the age of the existing distribution system and to meet the demand of additional workers moving to EPG, new distribution lines would be necessary. Under the Preferred Alternative, most of the additional buildings and workers proposed to be located at the Main Post would be in the South Post. Existing off-post potable water infrastructure in the vicinity of the South Post is adequate to handle the increased demand for potable water. However, upgrades to the existing distribution network and construction of a dedicated storage tank for the exclusive use of the proposed hospital would be necessary to ensure reliability of service.

4.12.2.2 Sanitary Sewage Collection and Treatment

4.12.2.2.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the Preferred Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. Wastewater generation would increase from additional office workers at new and renovated offices, administrative and residential buildings, hospital and related medical services.

Substantial additions and upgrades would occur on the Main Post and EPG to provide adequate level of sanitary sewer services. In addition to upgrades to existing sanitary sewer lines, new collection and conveyance systems would be necessary to provide adequate level of services because of an increased numbers of users under the Preferred Alternative land use plan. Substantial investments for a new collection and conveyance system would be necessary at EPG under the Preferred Alternative land use plan.

In the long-term, because new buildings would use efficient water conserving devices, the proposed development would reduce the *per capita discharge* of sanitary wastewater. However, minor long-term adverse effects would occur due to the additional demand on sanitary wastewater infrastructure. Minor short-term adverse effects also would be expected. Implementing the Preferred Alternative would result in short-term disconnections and reconnections of existing sanitary sewer utility systems during the construction phase.

4.12.2.2.2 BRAC Implementation and Facilities Projects

Under the Preferred Alternative, the demand for sanitary sewer services would increase by 1.07 mgd at EPG and by 0.31 mgd at the South Post. This increase is based on a per capita discharge of 60 gallons per day and 480 gallons of sanitary sewer per hospital bed per day for approximately 140 beds. A substantial increase in outpatient visits to the hospital could increase the quantity of sanitary waste. The additional estimated wastewater flow of 1.38 mgd would bring the total discharge from the Main Post and EPG between 2.48 to 2.78 mgd from its current range of 1.1 to 1.4 mgd. Though this estimate is below the 3.0 mgd average flow limit and 6.0 mgd maximum daily peak flow limit the post has with the Fairfax County, if flows increase above the contracted amount, it would be necessary for Fort Belvoir to negotiate a new contract with the Fairfax County for discharge of additional volume of wastewater to the county sewer system.

The existing 54-inch gravity trunk main along Accotink Creek could be tapped to discharge sanitary waste from various buildings proposed at EPG. New collections system pipes, interceptors and appurtenances would be required to convey the sanitary waste to the existing trunk main along Accotink Creek. The existing on- and off-post sanitary sewer collection infrastructure in the vicinity of the South Post could handle the additional flow of 0.31 mgd with appropriate upgrades to the existing collection system.

4.12.2.3 Electricity

4.12.2.3.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the Preferred Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. Substantial additions and upgrades would occur on the Main Post and EPG to provide adequate level of electricity at these two locations. In addition to upgrades to existing distribution lines at Fort Belvoir, new supply grid and distribution system would be necessary at EPG under the Preferred Alternative land use plan. These additions and upgrades would be designed and built to use energy-efficient devices, thus reducing the consumption of electricity.

4.12.2.3.2 BRAC Implementation and Facilities Projects

Dominion, which supplies electricity to Fort Belvoir and would own the on-post distribution network from March 2007, would be required to make substantial upgrades to the electrical transmission and distribution systems to provide power to the BRAC tenants proposed to move to EPG. These upgrades could potentially take several years to plan and construct due to right-of-way acquisition and State Corporation Commission permitting requirements.

In addition to normal demands, new mission-critical users such as NGA require separate feeds from independent substations as well as buried primary service in lieu of overhead lines because of Unified Facilities Criteria (UFC) security and reliability standards. These requirements would add to the cost and complexity of the necessary improvements.

The BRAC demands at EPG would require improvements to Dominion's Franconia substation. This substation is fed from multiple circuits allowing for a high degree of reliability. Because of physical constraints, the maximum size for a new substation transformer is 75 MVA. The BRAC demands, as reported, could exceed 100 MVA, requiring two transformer/switch sets. The Franconia substation has sufficient physical room within the existing plant to accommodate the required upgrades.

Power would be fed from the Franconia substation to a proposed substation on EPG. Approximately 4 acres must be set aside for this electrical substation near the perimeter of EPG for accessibility by Dominion.

In addition, new electrical distribution systems must be constructed at EPG to provide electricity for the BRAC tenants. The North and South Posts have sufficient capacity to provide electricity for the additional 1.49 million square feet of administrative and hospital building space under the Preferred Alternative. New and upgrades to the existing electric network and associated equipment would be required to provide adequate and reliable electricity to BRAC tenants moving to the Main Post.

4.12.2.4 Natural Gas

4.12.2.4.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the Preferred Alternative land use plan. The acreage of land designated as Professional/ Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. Substantial additions and upgrades would occur on the Main Post and EPG to provide adequate supply of natural gas. In addition to upgrades to existing distribution lines at Fort Belvoir, a new supply grid and distribution system would be necessary at EPG under the Preferred Alternative land use plan.

4.12.2.4.2 BRAC Implementation and Facilities Projects

Using an estimate of 2.5 MMcf of natural gas per 100,000 square feet of office space, the 4.7 million square feet of building space proposed at EPG would require a total of 118 MMcf of natural gas to provide for heating purposes. Also, the additional building space, including the hospital at the South Post would require 38 MMcf of natural gas. The total increase for natural gas of 156 MMcf from the construction of additional building space at EPG and the South Post is

near the current combined total purchase capacity of 160 MMcf the installation has with Washington Gas.

Washington Gas has sufficient capacity to provide the additional quantity of natural gas from existing distribution network near EPG and the Main Post to meet the additional demand. Fort Belvoir must negotiate a new supply contract with Washington Gas to have sufficient capacity to meet the demand for natural gas from existing personnel at Fort Belvoir and incoming BRAC tenants.

A new distribution network would be required at EPG, and additions and upgrades for the existing distribution system at the South Post would be required under the Preferred Alternative.

4.12.2.5 Steam

4.12.2.5.1 Land Use Plan Update

No effects would be expected. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. The existing steam distribution system is limited to the Main Post and the Davison Army Airfield, and it does not extend to EPG. Moreover, it is not feasible to extend the steam distribution to EPG.

4.12.2.5.2 BRAC Implementation and Facilities Projects

BRAC tenants at EPG could opt to have individual centralized utility plants to provide emergency power, steam and cooling water to meet the specific needs of equipment and other accessories. Because of the proposed location of the different BRAC tenants at EPG, it might not be feasible to have one centralized steam plant to serve all facilities.

Existing steam facilities at Fort Belvoir would need substantial upgrades to meet the demand of the BRAC tenants moving to the South Post. Additional demand for steam could also be met by installing units that use natural gas.

4.12.2.6 Communications

4.12.2.6.1 Land Use Plan Update

No effects would be expected as a result of implementing the Preferred Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. Substantial additions and upgrades would occur on the Main Post and EPG to provide adequate level of communication services. In addition to upgrades to existing communication system at Fort Belvoir, a new network would be necessary at EPG under the Preferred Alternative land use plan.

In the long-term, the new and upgraded communication systems at the Main Post and EPG would use current and most efficient communication equipment, thus providing a secure and reliable level of service for the various BRAC tenants.

4.12.2.6.2 BRAC Implementation and Facilities Projects

A new telecommunication network would be required at EPG to satisfy the various agency-specific needs for different levels of communication systems. In addition to providing agency-specific telecommunication systems, improvements would be necessary to the existing minimal communication infrastructure currently available at EPG to meet the demand of general users moving to the EPG site. Existing communication services on the South Post would need upgrades to provide adequate and reliable communication services for the BRAC tenants moving to the South Post. The use of updated equipment would have long-term beneficial effects by consuming less resources and space.

4.12.2.7 Solid Waste

4.12.2.7.1 Land Use Plan Update

Long-term minor adverse effects would be expected as a result of implementing the Preferred Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Preferred Alternative land use plan. The proposed changes in the acreage of land would result in constructing additional buildings or renovating existing buildings. Additional solid waste would be generated on the Main Post and EPG from office workers moving to the proposed locations. In addition, construction of new buildings and demolition/renovation of some of the existing buildings would also generate construction and demolition debris (CDD) at both locations.

4.12.2.7.2 BRAC Implementation and Facilities Projects

Municipal solid waste (MSW) generated under the Preferred Alternative would not be substantial in terms of overall monthly or yearly quantity or regional landfill capacity. Most of the municipal solid waste expected to be generated at Fort Belvoir under the Preferred Alternative is generated at other Army facilities in the region. As such, the regional impact on the landfill capacity, because of the MSW generation at EPG and the Main Post, would be minimal due to the relocating of personnel. However, Fort Belvoir would need to negotiate with the current contract hauler to dispose of the additional solid waste generated to designated landfill sites.

Using EPA's national average of 1 lb/day/employee and 5-day week, for a total of 22,000 additional office workers under the BRAC action, an additional 2,328 tons of solid waste would be generated per year at EPG and 532 tons per year on the Main Post under the Preferred Alternative. Close to 50 percent of this solid waste generated would be recycled under the mandatory recycling program in effect at Fort Belvoir, unless prohibited due to security considerations for some BRAC tenants. The installation would continue its practice of composting woody wastes and leaves. At present Fort Belvoir disposes approximately an average of 450 tons of MSW per month, well below its permitted disposal capacity of 100 tons per day.

In addition to the quantity of solid waste generated from BRAC tenants, Table 4.12-2 presents an estimate of the CDD that would be generated at Fort Belvoir by construction activities under the Preferred Alternative.

Table 4.12-2
Estimates of construction and demolition debris generated at Fort Belvoir under the Preferred and Other Alternatives

Construction activity type	Area (ft^2)	CDD factor (lb/ft^2)	Estimated waste (lb)	Estimated waste (tons)
Construction	6,190,531	4.4	27, 238,336	13,619
Renovation	320,000	20	6,400,000	3,200
Gross total	**6,510,531**		**33,638,336**	**16,819**
Amount Recycled (50%)			16,819,168	8,410
Net total CDD generated			**16,819,168**	**8,410**

Per requirements stipulated in memorandum ACSIM, DAIM-ZA, 06 Feb 06, SAB, a minimum of 50 percent of the estimated 16,819 tons of CDD would be diverted from Army-owned, noninstallation-operated landfill sites. As a result of this sustainable management of waste in military construction, renovation, and demolition activities, approximately 8,410 tons of CDD would be disposed of in various landfill sites in the area. The overall quantity of 8,410 tons of CDD equates to a yearly average (on the basis of 4 years of construction activity) of 2,103 tons, or a monthly average of approximately 175 tons. Area landfill lifespans would be reduced from their current estimates because of solid waste generated under the Preferred Alternative, but capacities are sufficient to handle the short-term waste that would be generated from construction/renovation and the long-term operational waste from the increased population at Fort Belvoir.

Solid waste other than typical municipal solid waste generated from hospital buildings and other specialized agencies, including waste such as asbestos generated from demolition of existing structures are described in Section 4.13. In addition, some BRAC tenants may dispose of their solid waste separately off-post due to security considerations.

4.12.2.8 BMPs/Mitigation

4.12.2.8.1 Potable Water Supply and Distribution

As a BMP, training for staff and contractors on water conservation measures in domestic water use and water use for construction activities would be provided.

4.12.2.8.2 Sanitary Sewage Collection and Treatment

No BMPs or mitigation measures would be required.

4.12.2.8.3 Electricity

No BMPs or mitigation measures would be required.

4.12.2.8.4 Natural Gas

No BMPs or mitigation measures would be required.

4.12.2.8.5 Steam

No BMPs or mitigation measures would be required.

4.12.2.8.6 Communications

No BMPs or mitigation measures would be required.

4.12.2.8.7 Solid Waste

As a BMP, required training would be provided for in-house staff on materials eligible for recycling municipal solid waste generated by BRAC tenants and methods for achieving the goals set by Fort Belvoir. An adequate number of containers would be provided in all appropriate locations for collection of recycled municipal solid waste. In addition, Army recycling requirements would be incorporated for CDD into all contracts awarded to outside contractors.

4.12.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

4.12.3.1 Potable Water Supply and Distribution

4.12.3.1.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the Town Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan. The potable water consumption would increase from requirements of additional workers locating to this area. Substantial additions and upgrades for the potable water infrastructure would occur at Fort Belvoir to provide adequate supply of potable water. In addition to upgrades to existing water supply lines, new distribution and storage capacity for potable water may be necessary to accommodate agency-specific needs of users such as hospital and other related services.

In the long-term, these additions and upgrades would use efficient water conserving devices, thus reducing the *per capita consumption* of potable water and eliminating waste. However, minor long-term adverse effects would occur due to the increase in the *overall total demand* on potable water infrastructure from additional personnel occupying the newly constructed or renovated buildings. Minor short-term adverse effects also would be expected. Implementing the Town Center Alternative would result in short-term disconnections and reconnections of existing potable water utility systems during the construction phase.

4.12.3.1.2 BRAC Implementation and Facilities Projects

Under the Town Center Alternative, there would be a net increase of 22,000 personnel distributed between the North and South Posts. Most of the personnel proposed to move to various office locations at the Main Post already live and work in the surrounding areas. As such, their demand on utilities would be limited to use of services during office hours and not based on residential levels of demand.

Using per capita water consumption rates as described earlier under the Preferred Alternative, under the Town Center Alternative there would be an increase of 1.73 mgd in the Main Post demand for potable water. The estimated total increase in potable water demand of 1.73 mgd together with the current average demand of 1.8 to 2.2 mgd would result in an overall demand of

3.53 to 3.93 mgd. The anticipated average demand is between 74 and 83 percent of the current rated capacity of 4.75 mgd the installation has with Fairfax Water. As required by the regulating authority, Fort Belvoir must submit a plan for upgrading the system and negotiate for additional contracted capacity with Fairfax Water for potable water.

Under the Town Center Alternative, most of the additional buildings and workers would be in the South Post. Existing off-post potable water infrastructure in the vicinity of the South Post is adequate to handle the increased demand for potable water. However, upgrades to the existing distribution network and construction of a dedicated storage tank for the exclusive use of the proposed hospital would be necessary to ensure reliability of service.

4.12.3.2 Sanitary Sewage Collection and Treatment

4.12.3.2.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the Town Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan. Wastewater generation would increase from additional office workers and new office, hospital, administrative and residential buildings. Substantial additions and upgrades would be required at the Main Post to provide adequate level of sanitary sewer services. In addition to upgrades to existing sanitary sewer lines, new collection and conveyance systems would be necessary to provide adequate level of services resulting from increased numbers of users and building locations under the Town Center Alternative land use plan.

In the long-term, because new buildings would use efficient, water-conserving devices, the proposed development would reduce the *per capita discharge* of sanitary wastewater. However, minor long-term adverse effects would occur due to the additional demand on sanitary wastewater infrastructure. Minor short-term adverse effects also would be expected. Implementing the Town Center Alternative would result in short-term disconnections and reconnections of existing sanitary sewer utility systems during the construction phase.

4.12.3.2.2 BRAC Implementation and Facilities Projects

Under the Town Center Alternative, the demand for sanitary sewer services would increase by 1.38 mgd at the Main Post, including discharges from the hospital. This increase is based on various sewer demands presented earlier under the Preferred Alternative. The additional wastewater flow of 1.38 mgd would bring the total discharge from the Main Post between 2.48 to 2.78 mgd. Though this estimate is below the 3.0 mgd average flow limit and 6.0 mgd maximum daily peak flow limit the Post has with the Fairfax County, if flows increase above the contracted amount, it would be necessary for Fort Belvoir to negotiate a new contract with the Fairfax County for discharge of additional volume of wastewater to the County sewer system.

The existing off-post sanitary sewer collection system in the vicinity of the South Post could handle the additional flow of 1.38 mgd with appropriate upgrades to the existing sanitary infrastructure, collection and conveyance system, including any required pump stations and force mains.

4.12.3.3 Electricity

4.12.3.3.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the Town Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan. Substantial additions and upgrades would occur at Fort Belvoir to provide adequate level of electricity. These additions and upgrades would be designed and built to use energy-efficient devices, thus reducing the consumption of electricity.

4.12.3.3.2 BRAC Implementation and Facilities Projects

Long-term beneficial effects would result from energy efficient electric power distribution system, as substantial upgrades to the system would be expected to occur. On the other hand, long-term minor adverse effects would occur from increases in demand for electric power due to the BRAC action.

There would be an additional 6.2 million square-feet of administrative office space. Most of the employees are likely already working Fairfax County, so the countywide impacts are probably somewhat lower than given here. The BRAC demands, as reported, may exceed 100 MVA. Additional installation capacity for electric supply would be required.

4.12.3.4 Natural Gas

4.12.3.4.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the Town Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan. Substantial additions and upgrades would occur at Fort Belvoir to provide adequate supply of natural gas. These additions and upgrades would use energy-efficient devices, thus reducing the per capita consumption of natural gas.

4.12.3.4.2 BRAC Implementation and Facilities Projects

Using an estimate of 2.5 MMcf of natural gas per 100,000 square feet of office space, the Main Post would require a total of approximately 156 MMcf of natural gas to provide for heating purposes. The above total increase for natural gas of 156 MMcf from the construction of additional building space at the Main Post is near the current combined total purchase capacity of 160 MMcf Fort Belvoir has with Washington Gas.

Washington Gas has sufficient capacity to provide the additional quantity of natural gas from existing distribution network near Fort Belvoir to meet the additional demand. Fort Belvoir should negotiate a new supply amount with Washington Gas to have sufficient capacity to meet the demand for natural gas from existing personnel and incoming BRAC tenants.

Upgrades and additions for the existing distribution system at the Main Post are required to meet the demand for natural gas from the BRAC workforce.

4.12.3.5 Steam

4.12.3.5.1 Land Use Plan Update

No effects would be expected. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan.

4.12.3.5.2 BRAC Implementation and Facilities Projects

Some of the BRAC tenants at Main Post could opt to have individual centralized utility plants to provide emergency power, steam and cooling water to meet the specific needs of equipment and other accessories. Because of the close proximity of the proposed location for the different BRAC tenants at the South Post, it could be cost effective to have one centralized plant to serve all facilities. Existing steam facilities at Fort Belvoir would need substantial upgrades to meet the demand of the BRAC tenants moving to the South Post. Additional demand for steam might also be met by installing units that use natural gas.

4.12.3.6 Communications

4.12.3.6.1 Land Use Plan Update

No effects would be expected as a result of implementing the Town Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan. Substantial additions and upgrades would occur at Fort Belvoir to provide adequate level of communication services.

4.12.3.6.2 BRAC Implementation and Facilities Projects

Substantial upgrades would be necessary for existing telecommunication network at the Fort Belvoir to satisfy the various agency-specific needs to provide different levels of communication systems.

4.12.3.7 Solid Waste

4.12.3.7.1 Land Use Plan Update

Long-term minor adverse effects would be expected as a result of implementing the Town Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Town Center Alternative land use plan. Additional solid waste would be generated at Fort Belvoir from office workers moving to the proposed locations. In addition, construction of new buildings and demolition/renovation of existing buildings would also generate additional solid waste.

4.12.3.7.2 BRAC Implementation and Facilities Projects

Solid waste generated under the Town Center Alternative would not be substantial in terms of overall monthly or yearly quantity or regional landfill capacity. Most of the solid waste expected to be generated at Fort Belvoir under the Town Center Alternative is generated at other Army facilities in the region. As such, the impact on the landfill capacity, from the solid waste generation at Fort Belvoir, would be minimal as a result of the BRAC action. However, Fort

Belvoir should negotiate with the current contract hauler to dispose of the additional solid waste generated to designated landfill sites.

Using EPA's national average of 1 lb/day/employee and 5-day week, an additional 2,860 tons of solid waste would be generated per year at Fort Belvoir from 22,000 additional workers under the Town Center Alternative. Close to 50 percent of this solid waste generated would be recycled under the mandatory recycling program in effect at Fort Belvoir.

In addition to the quantity of solid waste generated from BRAC tenants, Table 4.12-2 presents an estimate of the CDD that would be generated at Fort Belvoir by construction activities undertaken under the Town Center Alternative.

Quantities of yearly and monthly CDD generated as a result of the Town Center Alternative are same as of the CDD generated under the Preferred Alternative and presented in section 4.12.2.7.2.

4.12.3.8 BMPs/Mitigation

BMPs would be same as those stated in Section 4.12.2.8.

4.12.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.12.4.1 Potable Water Supply and Distribution

4.12.4.1.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the City Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG, Main Post, and GSA Parcel under the City Center Alternative land use plan. The potable water consumption would increase from requirements of additional workers locating to these areas. Substantial additions and upgrades for the potable water infrastructure would occur at EPG and the GSA Parcel to provide adequate level of potable water. In addition to upgrades to existing water supply lines, new distribution and storage capacity for potable water might be necessary to accommodate agency-specific needs of users such as hospital and other related services.

In the long-term, these additions and upgrades would use efficient water conserving devices, thus reducing the *per capita consumption* of potable water and eliminating waste. However, minor long-term adverse effects would occur due to the increase in *overall total demand* on potable water infrastructure from additional personnel occupying the newly constructed or renovated buildings. Minor short-term adverse effects also would be expected. Implementing the City Center Alternative would result in short-term disconnections and reconnections of existing potable water utility systems during the construction phase.

4.12.4.1.2 BRAC Implementation and Facilities Projects

Under the City Center Alternative, there would be a net increase of 22,000 personnel distributed between EPG, the GSA Parcel, and the South and North Posts. Most of the personnel proposed to move to various office locations already live and work in the surrounding areas. As such, their

demand on utilities would be limited to use of services during office hours and not based on residential levels of demand.

Of the net increase of 22,000 personnel, approximately 12,000 personnel would be assigned to the various agencies proposed to be located at EPG and approximately 9,300 personnel would be assigned to the GSA Parcel. Miscellaneous building space amounting to approximately 6.2 million square feet would be added at various locations of the three sites, with approximately 4 million square feet of additional building space constructed at EPG and more than 2.2 million square feet of constructed at the GSA Parcel.

Using a per capita water consumption of 75 gallons per day, the proposed increase in personnel under the City Center Alternative would increase the demand for potable water by 0.99 mgd at EPG, including visitors to the hospital. The demand for potable water at the GSA Parcel would increase by 0.7 mgd. The total increase of 1.73 mgd, including an increase of 0.04 mgd in potable water demand at the Main Post, together with the current average demand of 1.8 to 2.2 mgd would result in an overall demand of 3.73 to 3.93 mgd. The anticipated average demand is between 74 and 83 percent of the current rated capacity of 4.75 mgd the installation has with Fairfax Water. As required by the regulating authority, Fort Belvoir must submit a plan for upgrading the system and negotiate for additional contracted capacity with Fairfax Water for potable water. The water storage requirements for fire fighting and water needs during construction phase should also be considered during the design stages.

Existing Fairfax Water's 24-inch mains along Backlick Road on the east side and along Rolling Road on the west side could be linked with a new water line and be tapped at various locations to provide potable water for the various office buildings proposed to be located at EPG. In addition, storage tanks with sufficient capacity might need to be built to ensure reliability of supply and for emergency use. An 8-inch main provides potable water to existing buildings at EPG. No storage facilities are available for storage of potable water at the EPG site. In view of the age of the existing distribution system and to meet the demand of additional workers moving to EPG, new distribution lines and storage capacity would be necessary.

Existing potable water supply lines at the GSA Parcel could be tapped to provide water supply for new BRAC tenants moving to the site. Significant investments to construct new potable water distribution and storage systems would be necessary at the GSA warehouse site.

4.12.4.2 Sanitary Sewage Collection and Treatment

4.12.4.2.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the City Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG, the Main Post, and the GSA Parcel under the City Center Alternative land use plan. Wastewater generation would increase from additional office workers and new office, administrative, and residential buildings. Substantial additions and upgrades would occur at EPG to provide adequate level of sanitary sewer services. In addition to upgrades to existing sanitary sewer lines, new collection and conveyance systems would be necessary to provide adequate level of services because of increased numbers of users under the City Center Alternative land use plan. Substantial investments for a new collection and conveyance system would be necessary at EPG under the City Center Alternative land use plan.

In the long-term, because new buildings would use efficient, water-conserving devices, the proposed development would reduce the *per capita discharge* of sanitary wastewater. However, minor long-term adverse effects would occur due to the additional demand on sanitary wastewater infrastructure. Minor short-term adverse effects also would be expected. Implementing the City Center Alternative would result in short-term disconnections and reconnections of existing sanitary sewer utility systems during the construction phase.

4.12.4.2.2 BRAC Implementation and Facilities Projects

Under the City Center Alternative, the demand for sanitary sewer services would increase by 0.79 mgd at EPG, by 0.56 mgd at the GSA Parcel, and by 0.03 mgd at the Main Post. This increase is based on a per capita discharge of 60 gallons per day. The additional wastewater flow of 1.38 mgd would bring the total discharge from the Main Post, EPG, and the GSA Parcel between 2.48 to 2.78 mgd. Though this estimate is below the 3.0 mgd average flow limit and 6.0 mgd maximum daily peak flow limit the Post has with the Fairfax County, if flows increase above the contracted amount, it would be necessary for Fort Belvoir to negotiate a new contract with the Fairfax County for discharge of additional volume of wastewater to the county sewer system.

The existing 54-inch gravity trunk main along Accotink Creek could be tapped to discharge sanitary waste from various buildings proposed at EPG. New collections system pipes, interceptors and appurtenances would be required to convey the sanitary waste to the existing trunk main along Accotink Creek.

The existing 12-inch sanitary sewer line at the GSA Parcel has sufficient capacity to carry the additional sanitary waste flow generated at the site as a result of implementing the BRAC action. New collections system pipes, interceptors and appurtenances would be required to convey the sanitary waste to the existing trunk main.

4.12.4.3 Electricity

4.12.4.3.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the City Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG, the Main Post, and the GSA Parcel under the City Center Alternative land use plan. Substantial additions and upgrades would occur at EPG to provide adequate level of electricity. In addition to upgrades to existing distribution lines, new supply grid and distribution system would be necessary at EPG under the City Center Alternative land use plan. These additions and upgrades would be designed and built to use energy-efficient devices, thus reducing the consumption of electricity.

4.12.4.3.2 BRAC Implementation and Facilities Projects

Dominion, the electricity supplier, would need to make substantial upgrades to the electrical transmission and distribution systems to provide power to the BRAC tenants moving to EPG and the GSA Parcel. These upgrades could potentially take several years to plan and construct due to right-of-way acquisition and State Corporation Commission permitting requirements.

In addition to normal demands, new mission-critical users such as NGA require separate feeds from independent substations as well as buried primary service in lieu of overhead lines because

of UFC security and reliability standards. These requirements would add to the cost and complexity of the necessary improvements.

The BRAC demands would require improvements to Dominion's Franconia substation. This substation is fed from multiple circuits allowing for a high degree of reliability. Because of physical constraints, the maximum size for a new substation transformer is 75 MVA. The BRAC demands, as reported, may exceed 100 MVA, requiring two transformer/switch sets. The Franconia substation has sufficient physical room within the existing plant to accommodate the required upgrades.

Power would be fed from the Franconia substation to a proposed substation on EPG. Approximately 4 acres must be set aside for this station near the perimeter of EPG for accessibility by Dominion.

In addition, new electrical distribution systems would be constructed at EPG and the GSA Parcel to provide electricity for the BRAC tenants.

4.12.4.4 Natural Gas

4.12.4.4.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the City Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG, the Main Post, and the GSA Parcel under the City Center Alternative land use plan. Substantial additions and upgrades would occur at EPG and the GSA Parcel to provide adequate supply of natural gas at these locations. In addition to upgrades to existing distribution lines, new supply grid and distribution system would be necessary at EPG and the GSA Parcel under the City Center Alternative land use plan. These additions and upgrades would use energy-efficient devices, thus reducing the per capita consumption of natural gas.

4.12.4.4.2 BRAC Implementation and Facilities Projects

Using an estimate of 2.5 MMcf of natural gas per 100,000 square feet of office space, EPG would require a total of 99 MMcf of natural gas to provide for heating purposes. In addition, the GSA Parcel would require 57 MMcf of natural gas. The total increase for natural gas of 156 MMcf due to the construction of additional building space at EPG, the Main Post, and the GSA Parcel is near the current combined total purchase capacity of 160 MMcf that Fort Belvoir has with Washington Gas.

Washington Gas has sufficient capacity to provide the additional quantity of natural gas from existing distribution network near EPG and the GSA Parcel to meet the additional demand. The installation would be required to negotiate a new supply amount with Washington Gas to have sufficient capacity to meet the demand for natural gas from existing personnel at Fort Belvoir and incoming BRAC tenants.

In addition, a new distribution network would be required at EPG and the GSA Parcel to supply natural gas for the individual buildings.

4.12.4.5 Steam

4.12.4.5.1 Land Use Plan Update

No effects would be expected. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG and the GSA Parcel under the City Center Alternative land use plan. Note that there is no steam distribution system at EPG and the GSA Parcel, and extending steam distribution lines from the Main Post to these locations would not be feasible.

4.12.4.5.2 BRAC Implementation and Facilities Projects

BRAC tenants at EPG and the GSA Parcel could opt to have individual centralized utility plants to provide emergency power, steam, and cooling water to meet the specific needs of equipment and other accessories. Because of the proposed location of the different BRAC tenants at EPG and the GSA Parcel, it would not be feasible to have one centralized plant to serve all facilities.

4.12.4.6 Communications

4.12.4.6.1 Land Use Plan Update

No effects would be expected as a result of implementing the City Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG, the Main Post, and the GSA Parcel under the City Center Alternative land use plan. Substantial additions and upgrades would occur at EPG and the GSA Parcel to provide adequate level of communication services at these locations. New networks would be necessary at the EPG and the GSA Parcel under the City Center Alternative land use plan.

4.12.4.6.2 BRAC Implementation and Facilities Projects

A new telecommunication network would be required at EPG and the GSA Parcel to satisfy the various agency-specific needs for different levels of communication systems. In addition to providing agency-specific telecommunication systems, improvements would be necessary to the existing minimal communication infrastructure available at EPG and the nominal communication infrastructure available at the GSA Parcel to meet the demand of general users to be located at these locations.

4.12.4.7 Solid Waste

4.12.4.7.1 Land Use Plan Update

Long-term minor adverse effects would be expected as a result of implementing the City Center Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at EPG, the Main Post, and the GSA Parcel as a resulting of implementing the City Center Alternative land use plan. Additional solid waste would be generated from office workers moving to the proposed locations. In addition, construction of new buildings and demolition/renovation of the existing buildings would generate additional solid waste at both locations.

4.12.4.7.2 BRAC Implementation and Facilities Projects

Solid waste generated under the City Center Alternative would not be substantial in terms of overall monthly or yearly quantity or regional landfill capacity. Most of the solid waste generated at EPG, the Main Post, and the GSA Parcel under the City Center Alternative is generated at other Army facilities in the region. As such, the regional impact on the landfill capacity because of the solid waste generation at EPG and the GSA Parcel would be minimal as a result of relocating personnel. However, Fort Belvoir should negotiate with the current contract hauler to dispose the additional solid waste generated to designated landfill sites.

Using EPA's national average of one lb/day/employee and 5-day work week, an additional 1,570 tons of solid waste would be generated per year at EPG, 1,210 tons per year at the GSA Parcel, and 80 tons per year on the Main Post under the City Center Alternative. Close to 50 percent of this solid waste generated would be recycled under the existing mandatory recycling program in effect at Fort Belvoir.

In addition to the above quantity of solid waste generated from BRAC tenants, Table 4.12-2 presents an estimate of the CDD that would be generated at EPG and the GSA Parcel by construction activities under the City Center Alternative.

Quantities of yearly and monthly CDD generated as a result of the City Center Alternative are same as of the CDD generated under the Preferred Alternative and presented in section 4.12.2.7.2.

4.12.4.8 BMPs/Mitigation

BMPs would be the same as those stated in Section 4.12.2.8.

4.12.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

4.12.5.1 Potable Water Supply and Distribution

4.12.5.1.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the Satellite Campuses Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Satellite Campuses Alternative land use plan. The potable water consumption would increase from requirements of additional workers moving to these areas. Substantial additions and upgrades would occur for the potable water supply infrastructure at the Main Post and Davison Army Airfield to provide adequate level of potable water. In addition to upgrades to existing water supply lines, new distribution and storage capacity for potable water might be necessary to accommodate specific needs of users such as hospital and other related services. New supply and distribution lines for potable water and storage capacity to ensure reliable service would be necessary at the Davison Army Airfield under the Satellite Campuses Alternative land use plan.

In the long-term, these additions and upgrades would use efficient water conserving devices, thus reducing the *per capita consumption* of potable water and eliminating waste. However, minor long-term adverse effects would occur due to the increase in *overall total demand* on potable

water infrastructure from additional personnel occupying the newly constructed or renovated buildings. Minor short-term adverse effects also would be expected. Implementing the Satellite Campuses Alternative would result in short-term disconnections and reconnections of existing potable water utility systems during the construction phase.

4.12.5.1.2 BRAC Implementation and Facilities Projects

Using potable water consumption rates described earlier, the proposed increase in personnel under the Satellite Campuses Alternative would increase the demand for potable water by 0.64 mgd at the Davison Army Airfield and by 1.09 mgd at the Main Post. The total increase in potable water demand of 1.73 mgd together with the current average demand of 1.8 to 2.2 mgd would result in an overall demand of 3.73 to 3.93 mgd. The anticipated average demand is between 74 and 83 percent of the current rated capacity of 4.75 mgd the installation has with Fairfax Water. As required by the regulating authority, Fort Belvoir must submit a plan for upgrading the system and negotiate for additional contracted capacity with Fairfax Water for potable water.

Existing potable water infrastructure at the North Post is adequate to handle the increased demand for potable water. However, upgrades to the existing distribution network and construction of a dedicated storage tank for the exclusive use of the proposed hospital might be necessary to ensure reliability of service.

Existing 24-inch potable water supply lines in the vicinity of Davison Army Airfield could be tapped for providing potable water for the new NGA administration and CDC buildings proposed to be constructed at the Army Airfield as part of the BRAC action. In addition, upgrades to the existing distribution network would provide adequate and reliable supply of potable water for the BRAC tenants moving to the airfield location.

4.12.5.2 Sanitary Sewage Collection and Treatment

4.12.5.2.1 Land Use Plan Update

Long-term minor adverse and beneficial effects and minor short-term adverse effects would be expected as a result of implementing the Satellite Campuses Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Satellite Campuses Alternative land use plan. Wastewater generation would increase from additional office workers and new office, hospital, administrative and residential buildings. Substantial additions and upgrades would occur at the North and South Posts and Davison Army Airfield to provide adequate level of sanitary sewer services. In addition to upgrades to existing sanitary sewer lines, new collection and conveyance systems might be necessary to provide adequate level of services from an increased numbers of users as a result of the proposed land use plan. Substantial investments for a new collection and conveyance system would be necessary at the Davison Army Airfield under the Satellite Campuses Alternative land use plan.

In the long-term, because new buildings would use efficient water conserving devices, the proposed development would reduce the *per capita discharge* of sanitary wastewater. However, minor long-term adverse effects would occur due to the additional demand on sanitary wastewater infrastructure. Minor short-term adverse effects also would be expected. Implementing the Satellite Campuses Alternative would result in short-term disconnections and reconnections of existing sanitary sewer utility systems during the construction phase.

4.12.5.2.2 BRAC Implementation and Facilities Projects

Under the Satellite Campuses Alternative, the demand for sanitary sewer services would increase by 0.51 mgd at the Davison Army Airfield and by 0.87 mgd at the Main Post. This increase is based on a per capita discharge of 60 gallons per day. The above additional wastewater flow of 1.38 mgd would bring the total discharge from the Main Post between 2.48 to 2.78 mgd. Though this estimate is below the 3.0 mgd average flow limit and 6.0 mgd maximum daily peak flow limit Fort Belvoir has with Fairfax County, if flows increase above the contracted amount, it would be necessary for Fort Belvoir to negotiate a new contract with the county for discharge of additional volume of wastewater to the County sewer system.

The existing sanitary sewer collection system in the Main Post could handle the additional flow of 0.87 mgd with appropriate upgrades to the existing sanitary infrastructure, collection and conveyance system, including any pump stations and force mains.

Sanitary waste from the new NGA administration and CDC buildings proposed to be constructed at the Davison Army Airfield as part of the BRAC action can be discharged via the existing 8-inch sanitary sewer line and associated lift station in the vicinity of Davison Army Airfield. Capacity and maintenance upgrades would be necessary for the existing sewer network in the area.

4.12.5.3 Electricity

4.12.5.3.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the Satellite Campuses Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Satellite Campuses Alternative land use plan. Substantial additions and upgrades would occur at the North and South Posts and Davison Army Airfield to provide adequate level of electricity at these locations. In addition to upgrades to existing distribution lines on the Main Post, a new supply grid and distribution system would be necessary at the Davison Army Airfield under the Satellite Campuses Alternative land use plan. These additions and upgrades would use energy-efficient devices, thus reducing the per capita consumption of electricity.

4.12.5.3.2 BRAC Implementation and Facilities Projects

There would be an additional 6.2 million square-feet of administrative office space at the Main Post and Davison Army Airfield under the Satellite Campuses Alternative. Most of these employees already work in Fairfax County, so the countywide impacts are probably somewhat lower than given here. The BRAC demands, as reported, might exceed 100 MVA; therefore, additional on-post capacity would be required.

Electricity supply for the new NGA administration and CDC buildings proposed to be constructed at Davison Army Airfield as part of the BRAC action could be provided from the existing electric grid in the vicinity. However, significant investments would be necessary to provide the required level of electricity for NGA tenants.

4.12.5.4 Natural Gas

4.12.5.4.1 Land Use Plan Update

Long-term minor adverse and beneficial effects would be expected as a result of implementing the Satellite Campuses Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Satellite Campuses Alternative land use plan. Substantial additions and upgrades would be required at the North and South Posts and Davison Army Airfield to provide adequate supply of natural gas at these locations. In addition to upgrades to existing distribution lines at Fort Belvoir, a new supply grid and distribution system would be necessary at the Davison Army Airfield under the Satellite Campuses Alternative land use plan. These additions and upgrades would use energy-efficient devices, thus reducing the per capita consumption of natural gas.

4.12.5.4.2 BRAC Implementation and Facilities Projects

Using an estimate of 2.5 MMcf of natural gas per 100,000 square feet of office space, the Main Post and Davison Army Airfield require approximately 96 MMcf and60 MMcf of natural gas to provide for heating purposes. The above total increase for natural gas of approximately 156 MMcf due to the construction of additional building space at the South Post is near the current combined total purchase capacity of 160 MMcf the installation has with Washington Gas.

Washington Gas has sufficient capacity to provide the additional quantity of natural gas from existing distribution network near Fort Belvoir to meet the additional demand. Fort Belvoir should negotiate a new supply amount with Washington Gas to have sufficient capacity to meet the demand for natural gas from existing personnel and incoming BRAC tenants.

Upgrades and additions for the existing distribution system at the North Post and Davison Army Airfield are required to meet the needs of the workforce. Washington Gas has enough capacity to supply the required volume of natural gas.

4.12.5.5 Steam

4.12.5.5.1 Land Use Plan Update

No effects would be expected. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at the North and South Posts and Davison Army Airfield under the Satellite Campuses Alternative land use plan.

4.12.5.5.2 BRAC Implementation and Facilities Projects

BRAC tenants at Davison Army Airfield could opt to have individual centralized utility plants to provide emergency power, steam and cooling water to meet the specific needs of equipment and other accessories. Existing steam facilities at Fort Belvoir and Davison Army Airfield would need substantial upgrades to meet the demand of the BRAC tenants. Demand for steam under the Satellite Campuses Alternative could also be met by installing units that use natural gas.

4.12.5.6 Communications

4.12.5.6.1 Land Use Plan Update

No effects would be expected as a result of implementing the Satellite Campuses Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Satellite Campuses Alternative land use plan. Substantial additions and upgrades would be required at the North and South Posts and Davison Army Airfield to provide adequate level of communication services at these locations. In addition to upgrades to existing communication system at Fort Belvoir, a new network would be necessary at the Davison Army Airfield under the Satellite Campuses Alternative land use plan.

4.12.5.6.2 BRAC Implementation and Facilities Projects

Substantial upgrades would be necessary for existing telecommunication network at the North and South Posts and Davison Army Airfield to satisfy the various agency-specific needs to provide different levels of communication systems.

Required communication network for the new NGA administration and CDC buildings proposed to be constructed at the Davison Army Airfield as part of the BRAC action could be provided from the existing off-post communication network in the vicinity of Davison Army Airfield.

4.12.5.7 Solid Waste

4.12.5.7.1 Land Use Plan Update

Long-term minor adverse effects would be expected as a result of implementing the Satellite Campuses Alternative land use plan. The acreage of land designated as Professional/Institutional, Residential, Community, Industrial and Training would increase at Fort Belvoir under the Satellite Campuses Alternative land use plan. Additional solid waste would be generated at the North and South Posts and at Davison Army Airfield from office workers moving to the proposed locations. In addition, construction of new buildings and demolition/renovation of existing buildings would also generate additional solid waste at both locations.

4.12.5.7.2 BRAC Implementation and Facilities Projects

Solid waste generated under the Satellite Campuses Alternative would not be substantial in terms of overall monthly or yearly quantity or regional landfill capacity. Most of the solid waste generated at Fort Belvoir under the Satellite Campuses Alternative is generated at other Army facilities in the region. As such, the effects on the landfill capacity from the solid waste generation at Fort Belvoir would be minimal from the relocation of personnel. However, Fort Belvoir should negotiate with the current contract hauler to dispose of the additional solid waste to designated landfill sites.

Using EPA's national average of 1 lb/day/employee and 5-day week, an additional 1,749 tons of solid waste would be generated per year at the Main Post and 1,111 tons per year at Davison Army Airfield under the Satellite Campuses Alternative. Close to 50 percent of this solid waste generated would be recycled under the existing mandatory recycling program in effect at Fort Belvoir.

In addition to the quantity of solid waste generated from BRAC tenants, Table 4.12-2 presents an estimate of the CDD that would be generated at Fort Belvoir by construction activities under the Satellite Campuses Alternative.

Quantities of yearly and monthly CDD generated as a result of the Satellite Campuses Alternative are same as of the CDD generated under the Preferred Alternative and presented in section 4.12.2.7.2.

4.12.5.8 BMPs/Mitigation

BMPs would be same as those stated in Section 4.12.2.8.

4.12.6 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

4.12.6.1 Potable Water Supply and Distribution

4.12.6.1.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.1.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for potable water supply would occur under the No Action Alternative.

4.12.6.2 Sanitary Sewage Collection and Treatment

4.12.6.2.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.2.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for sanitary sewer services would occur under the No Action Alternative.

4.12.6.3 Electricity

4.12.6.3.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.3.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for electricity would occur under the No Action Alternative.

4.12.6.4 Natural Gas

4.12.6.4.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.4.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for natural gas would occur under the No Action Alternative.

4.12.6.5 Steam

4.12.6.5.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.5.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for steam would occur under the No Action Alternative.

4.12.6.6 Communications

4.12.6.6.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.6.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for communication services would occur under the No Action Alternative.

4.12.6.7 Solid Waste

4.12.6.7.1 Land Use Plan Update

No effects would be expected. A land use plan update would not be implemented under the No Action Alternative.

4.12.6.7.2 BRAC Implementation and Facilities Projects

No effects would be expected. The BRAC action would not be implemented under the No Action Alternative. No changes in population and subsequent increase in demand for disposal of solid waste would occur under the No Action Alternative.

4.12.6.8 BMPs/Mitigation

No BMPs or mitigation measures would be required. The BRAC action would not be implemented under the No Action Alternative.

4.12.7 SUMMARY OF COMPARISON OF ALTERNATIVES

Different alternatives for implementing the BRAC action would have varying effects on existing utility systems, extent of upgrades, additions required to utility infrastructure, associated cost investment to implement the additions and time frame required to plan and implement them. In addition, the alternatives grade differently with respect to availability of additional capacity, on- and off-site improvements required, redundancy available for ensuring reliability of service and provision of centralized service.

Under the Preferred Alternative, most of the development would be centralized around EPG where existing utility services on EPG are close to nonexistent. However, the site is in close proximity to most utility systems. The BRAC action would require expansion to the publicly owned infrastructure as well as to some of the utility owned infrastructure.

For potable water and sanitary sewer, existing on-site utilities on EPG are currently largely inadequate to support the level of proposed development. New infrastructure would be needed on EPG for all on-site utility systems. However, the proposed BRAC facilities at EPG would require little if any improvements to off-site facilities, except for electricity and natural gas. Providing the required level of electricity at EPG would require substantial improvements to the existing off-site infrastructure. In addition, extending natural gas to EPG would require off-site improvements to existing infrastructure.

Consideration should also be given to the capacity constraints of the local utility network. Fort Belvoir purchases treatment capacity for potable water and sanitary sewer services from public utilities and currently is using only a portion of purchased capacity. However, the BRAC action demands would most likely consume all the purchased treatment capacity for both systems. There is adequate local capacity to provide natural gas for the proposed development at EPG, but some on- and off-post infrastructure improvements would be required. Providing electricity to meet the needs of BRAC tenants moving to EPG would require substantial on- and off-site upgrades, time and investment.

Redundancy is a fundamental principal in the design of all utility systems. UFC criteria recommend certain reliability and redundancy strategies designed to minimize outages from all systems; strategies include multiple feeds, looped water systems, and quick disconnects at buildings. Mission-critical activities such as NGA could have power fed from independent Dominion transmission circuits with automatic switching in addition to standby generators to support life-support and critical-data functions. It will be imperative to identify and quantify the redundancy requirements of each tenant as soon as possible because these requirements would have substantial cost effects to the utility infrastructure. Redundancy ratings for the different alternatives are comparable with one another for most utility services.

The City Center and Satellite Campuses Alternatives would be ranked the lowest in terms of providing centralized service. The centralized service provision ratings for the Preferred Alternative and the Town Center Alternative are comparable because most facilities would be concentrated on either EPG or the South Post, respectively, under these two alternatives.

Municipal solid waste and construction and demolition debris collection and disposal are comparable for all the alternatives. The sites are in close proximity to one another. As such, their impact on available landfill capacity also would be similar for all considered alternatives.

4.13 HAZARDOUS SUBSTANCES AND HAZARDOUS MATERIALS

Military operations performed at Fort Belvoir historically require the storage and use of hazardous substances and hazardous materials to successfully accomplish missions. This requirement has been in place for some time as the storage and use of hazardous substances and hazardous materials at Fort Belvoir predated today's environmental legislation, which were largely introduced in the 1970s and 1980s. (e.g., Resource Conservation and Recovery Act of 1976 [RCRA] and Comprehensive Environmental Response, Compensation and Liability Act of 1980 [CERCLA]). The adoption of these environmental statutes resulted in a complex network of federal and state requirements for the generation, use, treatment, storage and disposal of hazardous substances and hazardous materials. As a federal installation, Fort Belvoir must comply with all applicable federal, state and local laws and regulations for generation, use, treatment, storage and disposal of hazardous substances and hazardous materials. Fort Belvoir has a RCRA Part B permit (VA7213720082) issued by VDEQ for the accumulation, storage, and disposal of hazardous waste.

Fort Belvoir manages hazardous substances and hazardous materials in compliance with programs regulated by EPA and VDEQ. For successful environmental compliance, there are myriad regulatory requirements including federal, Commonwealth of Virginia, and Fairfax County regulations that must be addressed. Fort Belvoir must also comply with applicable federal, state, and local regulations implementing federal statutory requirements, including Army regulations. Executive Orders apply to Fort Belvoir as well. Fort Belvoir ENRD is tasked with maintaining Fort Belvoir's compliance with all appropriate and applicable regulations and orders for the storage and use of hazardous substances and hazardous materials. For the purpose of this analysis, the terms hazardous substances and hazardous materials include those substances defined as hazardous by CERCLA, RCRA, and the Toxic Substances Control Act (TSCA). In general, they include substances that, because of their quantity, concentration, or physical, chemical, or toxic characteristics, might present substantial danger to public health or welfare or to the environment when released into the environment.

The hazardous substances and hazardous materials evaluated in this EIS include the following:

- Petroleum Constituents
- Hazardous waste
- Solid Waste
- Asbestos-containing materials (ACMs)
- Lead-based paint (LBP)
- Polychlorinated biphenyls (PCBs)
- Pesticides
- Regulated medical waste
- Ordnance areas
- Radioactive material
- Radon

Fort Belvoir ENRD has an active environmental program that maintains compliance specific to each of these hazardous substances and hazardous materials. A summary of the regulatory requirements and the specifics of each program are discussed herein. Figure 4.13-1 illustrates the

locations of the various sites associated with hazardous substances and hazardous materials at Fort Belvoir and EPG.

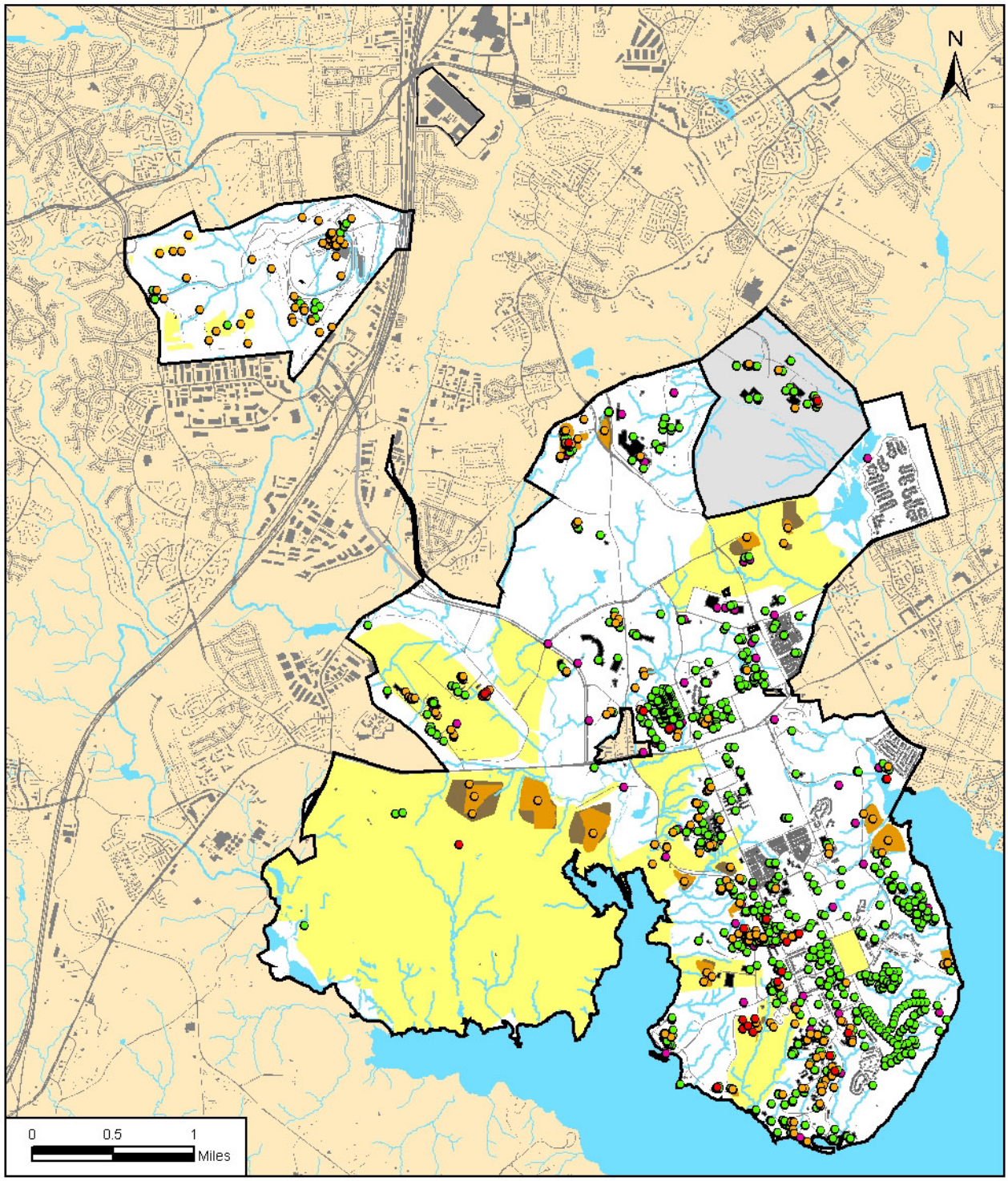
4.13.1 AFFECTED ENVIRONMENT

4.13.1.1 Petroleum Constituents

Nearly a thousand petroleum storage areas (PSAs) formerly existed or still exist at Fort Belvoir. PSAs include ASTs (aboveground storage tanks) and USTs (underground storage tanks) that store petroleum. PSAs range in size from a 275-gallon AST to a 50,000-gallon UST. For more than two decades, Fort Belvoir ENRD's Petroleum Management Program (PMP) has been addressing PSAs and petroleum release sites (PRSs). This program manages all aspects of PSAs and PRSs, including scheduling operation and maintenance, compliance monitoring, tank closure and removal, environmental investigations, remediation system design, management, and reporting. At the federal level, storage of petroleum is regulated by RCRA Subtitle I; however, VDEQ has been given enforcement authorization by the EPA. Fort Belvoir is managing its PSAs and PRS under the VDEQ Petroleum Program. The major regulations and orders applicable and relevant to petroleum are summarized in Table 4.13-1.

Table 4.13-1
Petroleum regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	RCRA Subtitle I
	Clean Water Act
Commonwealth of Virginia Regulations	9 VAC 25-580-10 et seq. Underground Storage Tanks; Technical Standards and Corrective Action Requirements
	9 VAC 25-91-10, et seq. Facility and Aboveground Storage Tanks (AST) Regulations
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
	EO#12856 Federal Compliance with Right to Know Laws and Pollution Prevention Requirements
Army Regulations	AR 200-1 Environmental Protection and Enhancement



LEGEND

- Installation Property
- HWMU
- PSA
- PRS
- Former or Operational Training Range
- Former Landfill
- SWMU

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Hazardous Substances and Hazardous Materials

Fort Belvoir, Virginia

Figure 4.13-1

Main Post. Fort Belvoir has 117 active USTs, of which 28 are regulated by VDEQ. In addition, there are 162 active ASTs, of which nine are regulated by VDEQ (Fort Belvoir, 2006d). The locations of these PSAs are illustrated in Figure 4.13-1. These tanks contain substances such as heating oil, diesel fuel, motor gasoline, type 8 jet propellant, lubricants, and used oils. To comply with UST regulatory deadlines, Fort Belvoir completed a program of tightness-testing, removal, replacement, and upgrading for the regulated USTs on-post. All UST replacements have double walls and state-of-the-art leak-detection systems to comply with UST regulations under RCRA Subtitle I. Nevertheless, both these new, replacement USTs and existing, unregulated USTs have the potential to release their contents into the soil, groundwater, surface water, and air. Additionally, there are 57 active heating oil tanks in residential housing areas. Any petroleum effected soils and groundwater would need to be properly addressed during the redevelopment of the Main Post.

EPG. There are a total of 22 PSAs within the EPG property. The locations of these PSAs are illustrated in Figure 4.13-1. Of the 22 PSAs, 8 are ASTs and 14 are USTs. Many of the tanks associated with these PSAs have been removed, and where releases confirmed, initial abatement measures were performed. Site characterizations were also performed at the release sites and in all cases a letter of no further action from VDEQ has been received. However, the natural attenuation remedy approved was based on the land use at the time. Now the land use would change because of the proposed development; the regulatory community has requested additional investigations to provide current site condition data.

GSA Parcel. Record searches have indicated that approximately 10 regulated ASTs and USTs are within the GSA Parcel, and approximately 15 AST/USTs formerly existed on the site, for a total of 25 PSAs. It is likely that residual petroleum contamination exists at these sites. The petroleum-impacted soils and groundwater would need to be properly addressed during any redevelopment of the GSA Parcel.

4.13.1.2 Hazardous Waste

Through a RCRA permit, EPA and, in the case of Fort Belvoir, VDEQ, regulate the proper management of wastes. Fort Belvoir has had an active RCRA Program in place for more than 20 years. The RCRA/Waste Management Program at Fort Belvoir is responsible for the storage, use, characterization, manifesting, remediation and proper disposal of all hazardous waste generated at the installation. The major regulations and orders applicable and relevant to hazardous waste are summarized in Table 4.13-2.

Fort Belvoir entered into a Federal Facilities Compliance Agreement (FFCA) in 1992 with EPA that identified 27 Solid Waste Management Units (SWMUs) sites as unpermitted Hazardous Waste Management Units (HWMUs). Fort Belvoir received funding and initiated corrective action at these HWMUs. Closure plans were developed, the sites were investigated, remediated, and closure reports were prepared. VDEQ has issued letters of concurrence with the no further action determination for all 27 HWMU sites. Twenty six of these sites were closed using health-based risk assessments. One of these HWMUs, the Open Burning/Open Detonation (OB/OD) Pit at site T6A on the Southwest Area, required a land use restriction as part of the closure that limited future development near the site to commercial/industrial land use only. In addition, two permitted hazardous waste sites, Building 2991 and Building 1124 on the Main Post, were closed in 2001 and 2006, respectively. Soil disturbance is restricted at these sites to avoid exposure to constituents of concern.

Table 4.13-2
Hazardous waste regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	RCRA Subtitle I
	CERCLA/SARA
	Clean Water Act
Commonwealth of Virginia Regulations	9 VAC 20-60-10 et alia : Virginia Hazardous Waste Management Regulations
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
	EO#12856 Federal Compliance with Right to Know Laws and Pollution Prevention Requirements
Army Regulations	AR 200-1 Environmental Protection and Enhancement

Main Post. Fort Belvoir has a RCRA Part B permit (VA7213720082) issued by VDEQ for the storage of hazardous waste. Fort Belvoir stores hazardous waste at Building 1490. Fort Belvoir also operates four temporary (less than 90 days) hazardous waste accumulation sites at Buildings 1414, 1495, and 367 on South Post and Building 2826 (DCEETA) on North Post. There are also 20+ satellite accumulation areas on the Main Post.

In addition, Fort Belvoir used to stored hazardous waste (waste fuel) in a 12,000-gallon UST at Building 1124. This unit was closed in accordance with the VDEQ approved *Building 1124 Closure Plan*, dated April 2002. In 2006 VDEQ approved the *Building 1124 Closure Report,* dated April 27 2005.

EPG. EPG was a RCRA permitted facility under EPA ID# VA1210000906. However, this permit had been issued for the HWMU at Building 5095. A closure report for Building 5095 was submitted to VDEQ in December 2000 and was approved in June 2001. Current hazardous waste generation at EPG is incidental and EPG is considered a Conditionally Exempt Small Quantity Generator. The extensive environmental investigation ongoing at EPG should reveal if hazardous waste sites exist and must be addressed before redevelopment. In September 2005, EPA Region III issued a Unilateral Administrative Order under section 3013 that requires Fort Belvoir to investigate sites at EPG. These activities are monitoring testing, analysis and reporting of hazardous waste releases to EPA Region III.

GSA Parcel. Six RCRA sites were identified at the GSA Parcel including one RCRA large quantity generator at GSA 6810 Loisdale Road Building A. This RCRA large quantity generator, permit number VA4470039336, has 12 violations with no volitions resolved. Permitted wastes include corrosive wastewater from electroplating operations, chlorinated, and nonchlorinated solvents. Violations appear to be of an administrative nature. It is possible that hazardous waste contamination exists at this site. If identified, the hazardous waste impacted soils and groundwater would need to be properly addressed during any redevelopment of the GSA Parcel.

4.13.1.3 Solid Waste

Fort Belvoir has conducted numerous studies that have identified 248 SWMUs on the installation including both the Main Post and EPG. The locations of these SWMUs are shown in Figure 4.13-1.

However, these studies were sporadically funded, and investigations and corrective action measures were intermittently conducted. The SWMUs that were investigated, remediated, and closed were about 50 sites in areas intended for proposed redevelopment. Fort Belvoir now manages an active SWMU Program to manage the sites, perform remediation, corrective action, and close the sites. Fort Belvoir's SWMU Program is managed with EPA as the lead agency and VDEQ as a contributing agency. The major regulations and orders applicable and relevant to solid waste are summarized in Table 4.13-3.

Table 4.13-4 provides a summary of the number of SWMUs by category. These categories are largely based on studies conducted in the late 1980s. Action plans for each SWMU were prepared in the 1990s. An inspection of all SWMUs was conducted in 2005.

Main Post. There are 204 SWMUs on the Main Post, which are at various stages of investigation and closure. The most recent RCRA Part B permit, issued in 2004, included the investigation and corrective actions for these SWMUs. The distribution of SWMU sites is as follows:

- North Post: 36 sites
- South Post: 148 sites
- Davison Army Airfield: 20 sites
- HEC: 6 sites

Fort Belvoir performed a visual site inspection (VSI) for each of the Main Post SWMUs in 2005 and prepared a Summary VSI report for each SWMU, which included recommendations of what action must be undertaken to achieve closure of the SWMU. The recommendations were determined on the basis of VSIs and review of available data.

EPG. There are 44 SWMUs on EPG that are in various stages of investigation and closure. In accordance with the requirements of EPA Administrative Order 3013, dated September 2005, Fort Belvoir prepared a summary of current conditions and categorized the 44 SWMUs into four

Table 4.13-3
Solid waste regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	RCRA Part B Permit (Main Post)
	RCRA Subpart D
	Unilateral Administrative Order issued by EPA Region III under Section 3013 of RCRA (EPG)
	CERCLA/SARA
	Clean Water Act
Commonwealth of Virginia Regulations	9 VAC 20-80-10 et seq.: Virginia Solid Waste Management Regulations
	9 VAC 20-60-264 Subpart H
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
	EO#12856 Federal Compliance with Right to Know Laws and Pollution Prevention Requirements
Army Regulations	AR 200-1 Environmental Protection and Enhancement

Table 4.13-4
SWMU categories

SWMU category	Description	# of SWMUs
A	Landfill or surface impoundment	29
B	Building storage unit	23
C	Wash rack	12
D	Oil/Water separator	11
E	Waste POL storage area	14
F	Aboveground waste POL tank	9
G	Underground waste POL tank	14
H	Spent battery storage area	5
I	Battery acid neutralization unit	5
J	Incinerator	6
K	Fire control training area unit	5
L	Miscellaneous unit	47
M	Engineer Proving Ground area unit	44
N	Units identified by CH2M Hill in 1992	24
Total		**248**

categories. These categories are: No Further Action (NFA), Administrative Closure (AC), Confirmatory Sampling (CS) to confirm absence or presence of contamination, and Site Investigations (SI) including soil and groundwater sampling. Of the 44 SWMUs, 9 are considered to require NFA, 12 would undergo AC, 7 would require CS and closure actions, and 16 require a SI. EPA reviewed this summary report and offered comments on the categorization of the SWMUs. EPA agreed with the categorization, with most of their comments addressing the SWMUs eligible for enrollment into the Military Munitions Response Program (MMRP). In 2006 Fort Belvoir prepared investigation plans at all sites requiring additional investigation. The investigations are underway with the first phase of the investigations to be completed in 2007. Depending on the results of the first phase, additional investigations and remediation could be required.

GSA Parcel. The record search of environmental databases did not indicate that any solid waste issues exist at the GSA Parcel.

4.13.1.4 Asbestos-Containing Materials (ACMs)

In response to the dangers posed by materials containing asbestos, federal laws were passed in the 1980s. The Asbestos Hazard Emergency Reauthorization Act of 1987 was among the first, and it addressed the asbestos in public schools. It set forth qualifications for inspection and analysis, analytical requirements, and acceptable response actions.

Two categories are used to describe ACM–Friable ACM and Non-friable ACM. Friable is defined as any material containing more than 1 percent asbestos (as determined by polarized light microscopy) that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Non-friable ACM is material that contains more than 1 percent asbestos that when dry cannot be pulverized into powder by hand pressure.

EPA and Occupational Safety and Health Administration (OSHA) regulate the remediation of asbestos-containing materials. Emissions of asbestos fiber into the ambient air are regulated by EPA in accordance with Section 112 of the Clean Air Act (CAA) of 1970, which established the National Emissions Standards for Hazardous Air Pollutants (NESHAPs). These clean air standards, along with TSCA regulations concerning asbestos abatement in the demolition or rehabilitation of buildings with ACM. The major regulations and orders applicable and relevant to ACM are summarized in Table 4.13-5.

Main Post. Fort Belvoir maintains an active asbestos program. The Asbestos Program Manager (APM) is responsible for all elements of the asbestos program including asbestos surveys and sampling, operation and maintenance, permitting, asbestos abatement design and oversight, and restoration. The installation has asbestos data on nearly all facilities on-post. When renovation projects are scheduled on-post, the APM must evaluate them for potential effects to asbestos. Supplemental asbestos surveys are performed to gather sufficient data to prepare the abatement design. The APM provides oversight during the abatement to ensure compliance with all applicable regulations and that air samples meet the acceptance criteria. Through this process, Fort Belvoir mitigates the potential for asbestos release while abating the installation one project at a time. The APM also is responsible for the overall compliance of the asbestos response actions enacted on the installation including training, operation and maintenance and public notice requirements.

EPG. An asbestos survey performed in support of the Right-of-Way (ROW) for the Fairfax County Parkway identified asbestos in eight of the nine buildings included in the survey. ACMs identified at EPG included vinyl floor tiles, caulking, glazing, acoustical tile, and roofing, among others. These ACMs would likely also be encountered in buildings on the rest of EPG. An asbestos survey would be required before demolition or renovation of these structures.

GSA Parcel. On the basis of the estimated construction date of the GSA Parcel, ACMs are likely present in the warehouse and could also be discovered in the other structures on the site. An asbestos survey would be required before demolition or renovation of these structures.

Table 4.13-5
ACM laws and regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	40 CFR Part 763 AHERA
	Toxic Substances Control Act of 1976
	40 CFR Part 61 Subpart M NESHAP
	29 CFR 1910 Occupational Safety and Health Administration (OSHA)
	29 CFR 1926.1101
Commonwealth of Virginia Regulations	9 VAC 20-80-10 et seq.: Virginia Solid Waste Management Regulations
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
Army Regulations	AR 200-1 Environmental Protection and Enhancement

4.13.1.5 Lead-Based Paint (LBP)

For centuries, lead and lead containing compounds were added to paints in the form of pigments. Epidemiological studies have indicated that exposure to lead could cause learning and cognitive

developmental deficiencies. To address the lead issue, Congress passed Title X Residential Lead-Based Paint Hazard Reduction Act of 1992, which set forth the qualifications for paint inspection, risk assessment, analytical requirements, and acceptable response actions. OSHA also regulates the exposure of workers to lead during construction and renovations. The major regulations and orders applicable and relevant to LBP are summarized in Table 4.13-6.

Similar to the asbestos program, Fort Belvoir maintains an active lead program. The Lead Program Manager (LPM) is responsible for all elements of the lead program including paint inspections and sampling, risk assessments, operation and maintenance, permitting, lead abatement design and oversight, and restoration. However, no installation-wide survey has been conducted at Fort Belvoir to determine the presence of LBP. When renovation projects are scheduled on-post, the LPM must evaluate them for potential effects to LBP.

Main Post. LBP sampling, analysis, and risk assessment was completed in 1997 for 11 homogeneous areas of existing on-post housing, including pre-1978 housing within Belvoir, Gerber, Dogue Creek, Rossell, Jadwin, Fairfax, Colyer, George Washington, River, and Woodlawn Villages, as well as the T-400 (Park and part of Jadwin Villages) and 100 (part of Gerber Village) areas. During the assessment, wipe samples were taken from interior windowsills, window troughs, and noncarpeted floors, and areas where children specifically were most likely to come in contact with dust (i.e., entryways, kitchens, bathrooms, children's bedrooms, and play areas). Paint chips were also collected from interior and exterior building components with visibly deteriorated paint. Composite soil samples were collected from bare exposed soil areas (i.e., children's play areas and building foundations or drip lines). The sample lead concentrations were then compared to Department of Housing and Urban Development (HUD) action levels for dust wipe samples (USACE, 2003).

As a result of the sampling and risk assessment, the Army implemented interim control measures in the Dogue Creek and George Washington villages to prevent human exposure where lead was detected above the EPA preliminary remediation goals for soil. Flowerbeds were built around the houses, extending 2 feet from the foundations of the houses. These flowerbeds were then filled in with dirt and mulch (USACE, 2003). In accordance with Army LBP abatement guidelines, the LBP found on interior walls exceeding HUD levels in Gerber and Dogue Creek homes were encapsulated by drywall or skim of plaster (if the building is eligible for historic preservation). No LBP was identified in Woodlawn Village housing. LBP abatement wastes, including chips and other LBP debris, were turned in to the Hazardous Waste Department for manifesting and off-site disposal as RCRA hazardous wastes (USACE, 2003).

Table 4.13-6
LBP regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	Title X Residential Lead-Based Paint Hazard Reduction Act of 1992
	29 CFR 1910 Occupational Safety and Health Administration (OSHA)
	29 CFR 1926.62
Commonwealth of Virginia Regulations	9 VAC 20-60-10: Virginia Hazardous Waste Management Regulations
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
Army Regulations	AR 200-1 Environmental Protection and Enhancement

EPG. A lead-based paint inspection performed in support of the ROW for the Fairfax County Parkway identified LBP in six of the nine buildings included in the survey. LBP painted components identified at EPG included doorframes, doors, window frames, and exterior wood components, among others. These LBP components would likely also be encountered on the rest of EPG. A lead paint inspection would be required before demolition or renovation of these structures.

GSA Parcel. On the basis of the estimated construction date of the GSA Parcel, lead paint is likely present in the warehouse and might also be discovered in the other structures located on the parcel. A lead paint inspection would be required before demolition or renovation of these structures.

4.13.1.6 PCBs

Because of their resilience to heat and electricity poly chlorinated biphenyls (PCBs) were added to electrical equipment dielectric fluid to stabilize transformers, capacitors and other electrical equipment. Unfortunately PCB's resilience also makes them persistent in the environment where they bio-accumulate in organisms, and become concentrated in the food chain. Increasing concern about the long-term effect of these persistent carcinogenic and mutagenic chemicals on human health and the environment resulted in the ban of their manufacture, sale, and distribution under Toxic Substance Control Act (TSCA) of 1976. The major regulations and orders applicable and relevant to PCBs are summarized in Table 4.13-7.

Main Post. The Army considers the garrison to be PCB-compliant with TSCA requirements. At this time, active, PCB-containing transformers (transformers containing fluids with 50 parts per million [ppm] or greater PCBs) are present at Buildings 1413 and 1157. The U.S. Army's policy is to take all transformers that are being taken offline for repair or replacement to Building 1495, where they are sampled for PCB content. Because of the size, complexity, and age of the electrical infrastructure at Fort Belvoir, the possibility of encountering PCB-containing electrical equipment still exists (USACE, 2003).

Within the Supply, Storage, & Maintenance area (700 Area) of South Post lie two areas contaminated with PCBs. One is the old Defense Reutilization and Marketing Office (DRMO) on South Post. This site had 1.7 million pounds of PCB-contaminated soil removed and the area capped with clean soil and vegetated with grass and trees. The second contaminated area is the old coal yard south of Warren Avenue on South Post. Before excavation, information regarding the known distribution and status of contaminated sites needs to be reviewed so that improvements could be safely implemented (Fort Belvoir, 2005b).

Table 4.13-7
PCB regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	TSCA of 1976
Commonwealth of Virginia Regulations	9 VAC 20-60-10: Virginia Hazardous Waste Management Regulations
	9 VAC20-80-113
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
Army Regulations	AR 200-1 Environmental Protection and Enhancement

EPG. Twenty potential PCB-containing pole and pad mounted transformers were removed in support of the ROW for the Fairfax County Parkway. None of the transformers sampled and analyzed contained PCBs greater than 50 parts per million. During an environmental investigation at EPG performed in 1990 (USATHAMA, 1990), 55 transformers were sampled analyzed for PCB content. 51 of the 55 transformers had PCB concentrations below detection limits. Of the 12 transformers where PCBs were detected, only 3 exceeded 50 parts per million PCB containing threshold. Because of the size, complexity, and age of the electrical infrastructure at EPG, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal which is accordance with Fort Belvoir's Program.

GSA Parcel. On the basis of the estimated construction date of the GSA Parcel, PCB-containing electrical equipment is likely present in the warehouse and could also be discovered in the other structures on the site. All electrical equipment including transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.

4.13.1.7 Pesticides

Pesticides have been used at Fort Belvoir since its inception, particularly on the golf courses. Fort Belvoir has employed a pesticide management program for years. Fort Belvoir recently updated its Integrated Pesticide Management Plan (IPMP) in November 2006. The storage and application of all pesticides at Fort Belvoir are performed in accordance both the U.S. Army's Integrated Pest Management (IPM) techniques and IPMP for Fort Belvoir. IPM is intended to reduce the use of pesticides and is in accordance with the Army's Pollution Prevention Program. Through a combination of cultural and biological controls and new IPM techniques specified in the IPMP, chemical pesticide usage dropped by 60 percent between 1996 and 1999. Pesticide reductions are mandated by Department of Defense Instruction 4150.7 on all DoD properties. The major regulations and orders applicable and relevant to pesticides are summarized in Table 4.13-8.

Main Post. Pesticides are stored in industrial areas on South Post and the north post golf courses and are either DoD certified or certified by the Commonwealth of Virginia as "Commercial Applicators." Approximately 60 percent of the pesticides applied on Fort Belvoir are on the North Post golf course; another 20 percent are applied on the South Post golf course. The types of pesticides used on the golf courses include fungicides and herbicides. Preventive spraying is not authorized in housing units, and interior pest control is performed by FBRC Property Manager contracted pest control company.

Table 4.13-8
Pesticide laws and regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	Federal Insecticide, Fungicide, and Rodenticide Act of 1976
	TSCA of 1976
Commonwealth of Virginia Regulations	9 VAC 20-80-10 et seq.: Virginia Solid Waste Management Regulations
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
Army Regulations	AR 200-1 Environmental Protection and Enhancement
	AR 200-5 Army Pest Management Program
	DOD Instruction 4150.7 DOD Pest Management Program

EPG. Historical use of pesticides is not well documented at EPG. SWMU investigations performed at M-42 and M-43 identified low-level DDT and its breakdown products. This indicated that, to some degree, pesticides were used at EPG in the past. The extensive environmental investigation at EPG should reveal if significant pesticides issues exist at EPG. If identified, pesticides might need to be addressed before redevelopment of the parcel.

GSA Parcel. There is little to no public information on the use of pesticides on the GSA Parcel. However, on the basis of the age of the warehouse, it is likely that pesticides were used or are used on the parcel. Any information regarding pesticides on the property should be obtained and evaluated. If necessary, soil and groundwater sampling could indicate if there are significant issues with pesticides on the GSA Parcel. If identified, pesticides might need to be addressed before redevelopment of the parcel.

4.13.1.8 Regulated medical waste

Regulated medical waste includes but is not limited to blood-soaked bandages, syringes, and organs. The main generator of medical biohazardous waste is Dewitt Army Hospital. Some of the regulated medical waste is treated at the hospital with a steam autoclave. The remainder of the waste is treated by a contractor and disposed of at an appropriate facility. Small quantities of medical biohazardous waste are also generated from the DCEETA and other nursing stations. The major regulations and orders applicable and relevant to medicinal and biohazardous waste are summarized in Table 4.13-9.

Main Post. Medically generated waste is managed in accordance with RCRA and Virginia Regulated Medical Waste Management Regulations regarding biomedical, solid, and hazardous wastes. The Logan Dental Clinic and Dewitt Hospital generate small quantities of regulated medical wastes that are disposed of off-site through private waste transporters (Fort Belvoir, 2006e). Historically, however, it is likely that all forms of waste, including biohazardous and hazardous wastes, might have been placed in the former landfills on South Post when the installation was operating its own landfills. These SWMUs are being monitored, investigated, and remediated under the installation's RCRA corrective action program.

EPG. The review of the numerous historical documents for EPG did not indicate that any regulated medical waste issues exist at EPG. The extensive environmental investigation at EPG should reveal if a significant medical and biohazardous waste or silver recovery/recycling issues exist at EPG. If identified, these issues might need to be addressed before redevelopment of the parcel.

GSA Parcel. The record search of environmental databases did not indicate that any medical/biohazardous waste issues exist at the GSA Parcel.

Table 4.13-9
Regulated medical waste regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	49 CFR, Sections 172 and 173 Medical Waste Transportation
Commonwealth of Virginia Regulations	9 VAC 20-120 Virginia Regulated Medical Waste Management Regulations
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
Army Regulations	AR 200-1 Environmental Protection and Enhancement

4.13.1.9 Ordnance Areas

The MMRP was established by under the Defense Environmental Restoration Program (DERP) to address defense sites with munitions and explosives of concern (MEC) (which include unexploded ordnance [UXO] and discarded military munitions [DMM]) and munitions constituents (MC). The Army's inventory of closed, transferring, and transferred (CTT) military ranges and sites have identified sites eligible for action under the MMRP. A report presenting the results of the MMRP Historical Records Review (HRR) has been conducted at Fort Belvoir. The DoD is establishing policy and guidance for munitions response actions under the MMRP. Key program drivers developed to date conclude that munitions response actions would be conducted under the process outlined in the National Contingency Plan (40 CFR Part 300) as authorized by CERCLA. The MMRP Historical Record Review (HRR) indicates that ranges have existed on the Main Post of Fort Belvoir. Sixteen ranges were identified in the 2002 Phase 3 Range Inventory performed at Fort Belvoir (Malcolm Pirnie, 2006). Twelve additional ranges were identified at the Main Post during the HHR preparation. Figure 4.13-1 illustrates the locations of ranges on the installation.

Since its inception as Camp Humphries, Fort Belvoir has designated areas for weapons training. A consequence of this training is that many of these former training ranges now contain UXO. In addition to UXO, the MMRP would also address any associated contamination under CERCLA. To meet the requirements in this arena, the MMRP is centrally funded and managed by the Army Environmental Center. This program would have DoD as the lead authority with regulatory input from the VDEQ Federal Facilities Division. Former training ranges containing Ordnance and Explosives (OE), UXO areas, and MEC are both on EPG and the Main Post. Investigation, clearance, and closure of these former training ranges would be addressed in the MMRP. Because the MMRP is in its infancy (within the last 2 years), cleanup thresholds are still being developed.

Main Post. U. S. Army Environmental Center contracted EA Engineering, Science, and Technology, Inc to prepare a Phase I Qualitative Assessment Report under the Operational Range Assessment Program for the operational ranges located at the Main Post of Fort Belvoir. The Phase I report indicates there are 15 ranges designated as operational on the Main Post of Fort Belvoir (EA, 2006). Nine ranges are located in the Southwest area and comprise some 1,290 acres. Four ranges at the Davison Army Airfield encompass 310 acres. The 24 acre Parade Grounds are located in the central portion of the Main Post next to Post Headquarters. Two maneuver and training areas, encompassing 248 acres, are located in the southwestern peninsula of the Main Post just West of CMRL complex (EA, 2006). Two continuous ranges located on the north post are former ranges that are being addressed under the MMRP (EA, 2006). The locations of these operational and former training ranges are illustrated in Figure 4.13-1.

However, because Fort Belvoir has been a military facility for more than 90 years and through two world wars, as well as more recent conflicts, the potential for the presence of ordnance anywhere on the installation cannot be ruled out. So, for instance, in 1990, cannon balls dating to the War of 1812 were discovered in Fairfax Village, and within the last year, a World War I- or World War II-era hand grenade was discovered in Dogue Creek Village and a World War II-era bazooka in one of the housing areas. Given the installation's history and the prominence of the surrounding area in the early wars fought on this country's soil, the risk of uncovering ordnance elsewhere in the main cantonment areas is possible (USACE, 2003).

Historical training areas have been located in the area of the FBRC properties and may well have included the use of small arms such as pistols, standard rifles, and machine guns. A 1918 document reported that there were seven rifle/machine gun type ranges on-post that were either in operation, under construction, or planned, although the locations of these ranges were not specified (USACE, 2003).

World War II training records indicate that the majority of the training at Fort Belvoir during this period would not have involved the use of live ammunition. Available data indicate that live ammunition from small arms and grenade training was used within the current wildlife preserve around Accotink Bay, or on designated ranges west of the Fort Belvoir Residential Community Project 1 (USACE, 2003). Grenade training from about 1940 to 1959 was restricted to a range referred to as Grenade Court, west of Pohick Road and Tulley Gate at the northern edge of Accotink Bay within the current wildlife preserve. The Grenade Court range potentially contains live grenades (USACE, 2003).

No heavy artillery, ordnance, or explosives are thought to have been used at Fort Belvoir on the developed areas of the Main Post or in the vicinity of the Fort Belvoir Residential Communities properties, except for the general area of Woodlawn, Lewis Heights, and Gerber villages. The Woodlawn Village property was formerly used by the Bureau of Standards as a Radio Laboratory Area, circa 1950, and as a demolition and maneuver training site, as shown on the 1918 Forestry Map. Bulk explosives and blasting caps might have been used there. Nevertheless, during the construction of Woodlawn Village in the 1970s, no types of explosives were reported to have been encountered. The area north of Lewis Heights village, T-16, was historically and is still considered an active training range, at which blank ammunition, simulators, and pyrotechnics were all in use. A 1918 Forestry Map shows an Ordnance School where Buildings 714 and 718 are located–between Buildings 707 and 708, as indicated on the 1918 Post Map. The school supplied ammunition to the troops stationed at Camp AA Humphreys. Bullets have been discovered in Gerber Village that date back to the World War I era and are thought to be remnants from the Ordnance School. Also shown on the 1918 Forestry Map is the School of Mines, which was between the existing Post Headquarters and Jadwin Village (USACE, 2003).

Portions of the George Washington, Rossell Loop, Fairfax, Park, and Jadwin Loop villages were or were thought to have been used in World War I-era trench training. The trenches were primarily on the eastern side of the post because the meteorological conditions near the water favored the formation of fog and provided the right conditions for holding other training gases, which tend to sink, within the confines of the trenches, thus creating ideal conditions for trench training (USACE, 2003).

EPG. There are 10 former training ranges at EPG that are at various stages of OE clearance and removal. EPG is composed of approximately 820 acres and is bisected by Accotink Creek, creating areas on each side of the creek known as EPG East and EPG West. EPG West is approximately 389 acres with nine ranges and EPG East is 431 acres with one 18-acre range (Eebee Field). Given its historical use and concentration of ranges, all of EPG West is being considered a range. The ROW for the proposed Fairfax County Parkway is composed of approximately 170 acres and extends through the southern portions of both sections of EPG. Most of the clearance action taken to date has occurred within the ROW. In support of the Fairfax County Parkway ROW property transfer, the Army undertook OE clearance and removal actions. About 20 acres (15 percent) of the ROW parcel encompasses former training ranges. OE removal actions have taken place at three ranges (Ranges 3, 4, and 5C) and portions of two others (Ranges 1 and 2).

The ranges on EPG fall into four categories of OE clearance and removal status: Category I OE is cleared and removed; Category II OE is partially cleared and removed; Category III represents surveys performed but OE not cleared or removed; and Category IV means no significant OE clearance actions have been undertaken. These categories and the ranges within each category are detailed below.

Category I OE Cleared and Removed. Category 1 ranges have been cleared of all OE. The USACE has certified the ranges are cleared in accordance with approved explosive safety submissions. Fourteen acres of ranges within the ROW have been cleared and designated as Category I OE.

Category II OE Partially Cleared and Removed. Category II ranges have been partially cleared of OE, and the USACE has certified grids within the ranges where OE clearance and removal actions have been completed. Ranges 1 and 2, which partially overlap the ROW on EPG West, fall in this category; about half of their 14 acres have been cleared.

Category III Surveys Performed but OE Not Cleared and Removed. Category III ranges have had some preparations for OE clearance and removal performed, but OE clearance and removal has not been performed. Because the geophysical surveys have been completed for these ranges, the anomalies located on these ranges could be quantified. Using this data, scopes of work and cost estimates to complete the remaining OE clearance on these ranges could be developed. Numerous anomalies that appear to be burial pits have been identified on these ranges during the geophysical surveys. These burial pits would likely require investigations to determine if the burial pits have impacted the environment (such as soil and groundwater contamination). Ranges 5, 5A, and 5B, which consist of 9 acres in the northern portion of EPG West, fall in this category.

Category IV No Significant OE Clearance Actions Undertaken. OE clearance actions have not been undertaken, and few investigations have been performed on ranges in this category. Without geophysical surveys of these ranges, it is difficult to estimate the number of anomalies. However, on the basis of the knowledge of other ranges on EPG, a per-acre cost estimate could be developed and extrapolated to these ranges in this category. Range 1A (7 acres) on EPG West and the abandoned airfield (Eebee Field) in the northern portion of EPG East fall in this category.

Areas Outside Training Ranges on EPG West. The recently prepared MMRP HRR has indicated that the entire western portion of EPG should be considered has having potential OE (Malcolm Pirnie, 2006). This area encompasses approximately 389 acres. To address this issue during OE clearance for the ROW, a magnetometer-assisted surface clearance (MASC) was performed for the entire area within the ROW outside the training ranges. OE was discovered on land outside the former training ranges. For these reasons, a MASC of the areas outside the training ranges on EPG West would likely be required. Performing MASC activities is the first step in clearance activities. Additional activities that would be performed at additional costs are vegetation clearing, extensive surveys, and geophysical activities.

GSA Parcel. The environmental database search performed did not indicate ordnance areas are at the GSA Parcel. On the basis of the historical use of the property as a warehouse, it is not likely that ordnance was used on the parcel in the past.

4.13.1.10 Radioactive Materials

Main Post. An inventory list is maintained for radioactive material on Fort Belvoir and is updated semiannually. DeWitt Army Hospital and other on-post medical facilities, such as the Logan Dental Clinic, produce low-level radioactive wastes. It is assumed that historically all forms of post waste, including low-level radioactive wastes, might have been placed in the former landfills on South Post, which were identified as SWMU which are currently under RCRA Corrective Action. Two SWMUs on South Post are identified by the Army as former radioactive waste storage facilities, which are related to a former decommissioned nuclear reactor plant, built for research and development purposes within the radiation testing area along Gunston Cove on the southern tip of South Post. One is northwest of Fairfax Village in an administrative area; the other is southeast of the Visitor's Center on the other side of Pohick Road near the northern tip of Accotink Bay (USACE, 2003).

EPG. In the 1990 Phase I/II Environmental Baseline Survey (EBS), this site was described as being along the eastern boundary of the EPG where four detectors with radioactive components were unearthed in 1987. Although there might still be additional detectors buried in this location, the radioactivity levels are expected to be below a threshold where an environmental hazard could be present. According to the 1990 Phase I/II EBS, "the detectors were judged to be environmentally harmless" and, therefore, no further action is recommended unless additional detectors are found. An environmental investigation is being performed at SWMU M-44 in accordance with the EPA–approved plan.

GSA Parcel. There is no public information regarding radioactive material at the GSA Parcel. On the basis of the history of the site use as a warehouse, the use of radioactive material is unlikely, nevertheless any environmental records regarding the property should be evaluated to determine if radioactive material was used and stored at the property. If identified, a radiological survey would be required to determine the nature and extent.

4.13.1.11 Radon

Radon gas is a naturally occurring, colorless, odorless, radioactive gas produced by the decay of naturally radioactive material (e.g., potassium, uranium) found in underlying bedrock. Atmospheric radon is diluted to insignificant levels, but when concentrated in enclosed areas, radon could pose human health risks. The major regulations and orders applicable and relevant to radon are summarized in Table 4.13-10.

Main Post. According to the EPA Map of Radon Zones, the rocks and soils found in southeastern Fairfax County, where Fort Belvoir is, have the highest radon potential. Radon testing is performed for residential buildings, as required by EPA, the state, and the Army. Radon testing for existing Fort Belvoir residential buildings was completed in 1991. Only three residential buildings–Building 140 in Gerber Village, Building 174 adjacent to Gerber Village, and Building 810F in Colyer Village–exhibited any elevated radon levels (above 4.0 pCi/L). No testing has been done for new or renovated buildings since 1992 (USACE, 2003).

EPG. According to the EPA Map of Radon Zones, the rocks and soils found in southeastern Fairfax County, where EPG is, have the highest radon potential. Radon testing has not been performed at EPG.

GSA Parcel. According to the EPA Map of Radon Zones, the rocks and soils found in southeastern Fairfax County, where the GSA Parcel is, have the highest radon potential. Radon testing on the GSA Parcel data has not been identified.

Table 4.13-10
Radon laws regulations and orders applicable to Fort Belvoir

Agency	Regulation or order
Federal Regulations	Clean Air Act of 1970
	EPA Map of Radon Zones document (EPA-402-R-93-071)
Commonwealth of Virginia Regulations	Radiation Control Act *Code of Virginia* Section 32.1-227
Executive Orders	EO#12088 Federal Compliance with Pollution Control Standards
Army Regulations	AR 200-1 Environmental Protection and Enhancement

4.13.2 ENVIRONMENTAL CONSEQUENCES OF THE PREFERRED ALTERNATIVE

4.13.2.1 Land Use Plan Update

The amount of administrative space included in the Preferred Alternative land use plan is twice the amount of administrative space included in the 1993 land use plan. This increase in administrative space would result in minor adverse effects as the various tenant agencies that occupy the new administrative space would also need to comply with all hazardous waste regulations. The tenants in the additional administrative spaces could also generate hazardous and toxic waste, which may also be considered a minor adverse effect.

4.13.2.2 BRAC Implementation and Facilities Projects

The major hazardous substances and hazardous material waste issues potentially affecting the Preferred Alternative are about 130 acres of former training ranges on EPG (EPG West and Eebee Field) and 30 SWMUs, several HWMUs, and PSAs. The specific consequences of Preferred Alternative with respect to each hazardous and toxic waste issues and required site preparations before development are further discussed Table 4.13-11.

Petroleum. Long-term minor adverse effects would result from an increase in storage capacity requirements for petroleum. Any construction of new storage facilities to handle storage requirements from BRAC actions would be done in accordance with applicable laws regarding construction materials, leak protection, monitoring, and spill containment.

EPG. 22 PSAs are located within the development areas of the Preferred Alternative. Of the 22 PSAs, 8 are ASTs and 14 are USTs. In addition, 10 PRSs are located within the development areas of the Preferred Alternative at EPG.

VDEQ issued letters of concurrence with the no further action determination for these PRSs at Fort Belvoir. These sites are subject to land use restrictions. Should these restrictions change an additional site investigation may be necessary along with appropriate regulatory coordination. In addition, residual petroleum contamination likely exists in the area. To address this issue, construction programs that call for disturbing areas around this PRS should require the appropriate federal OSHA construction worker protection. Disturbing previously unidentified

Table 4.13-11
Hazardous Substances and Hazardous Materials resources affected by the Preferred Alternative

Resource	Pre-development activities
Petroleum	The 22 PSAs at EPG could be aggressively addressed as part of the site preparations. A closure process involving administrative and decontamination process would be required. Confirmation samples collected beneath USTs and potentially some ASTs would likely be required to demonstrate no release has occurred. It could be expected that some USTs would have a release previously undiscovered. Site investigations at each release are approximately $40,000 each and require a month to complete. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.
Hazardous Substances and Hazardous Materials	Investigation work plans would require regulatory approval. Site investigations could be performed concurrently with site preparation activities. Additional investigation could be performed to determine if and where residual affected soils exist.
Solid waste	Investigation work plans would require EPA and VDEQ approval. Site investigations could be performed concurrently with OE clearance and site preparation activities.
Asbestos	Before initiating renovation activities, the potential for environmental effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.
Lead based paint	Before initiating renovation activities, the potential for environmental effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA and HUD standards; and state, federal, and Army regulations. Measures to control airborne lead dust would be implemented. All construction debris that contains LBP would be disposed of at licensed disposal facilities in accordance with applicable laws.
PCBs	Because of the size, complexity, and age of the electrical infrastructure at EPG, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.
Pesticides	Proposed development in the South Post golf course would occur in areas of known historical pesticide application. A pesticide survey of the South Post golf course would likely be required. From the results of the pesticides survey, the waste generated during development could be properly managed if they are effected by significant levels of pesticides
Regulated Medical Waste	No immediate site preparation activities required. However, the relocation/expansion of the Dewitt Hospital would likely result in an significant increase in the amount of regulated medical waste generated at Fort Belvoir as proposed in the development of the Preferred Alternative.
Ordnance areas	Army approval of Explosive Safety Submission (ESS) would be required. Extensive OE clearance and removal actions would be required on the 230 acres of historical training ranges. All ranges areas would require site investigations
Radioactive material	The investigation of SWMU M-44 would be required before development of the Preferred Alternative.
Radon	No immediate site preparation activities would be required. However, the expansion of tenants at Fort Belvoir has a potential to increase the amount of people exposed to radon at Fort Belvoir.

petroleum contamination would also require proper handling and disposal of contaminants as required by federal, state, local, and Army regulations.

Site Preparation Activities: Preparing the site of the development of the Preferred Alternative could be accomplished by employing a Health and Safety Program including qualified industrial hygienists and a Health and Safety Plan (HSP). Additional investigation could identify if residual

impacted soils exists and where there are located so that plans to excavate and remove the impacted soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. Most large construction firms are experienced in this area. The cost estimates for a Health and Safety Program to adequately address this issue are not considered significant as the specifications of the construction project itself would likely require a HSP. This requirement could be incorporated into the construction program without adding significant costs.

Hazardous Substances and Hazardous Materials. Long-term minor adverse effects would result from an increase in the use of hazardous materials. Additional potentially hazardous materials that could be found on-post during BRAC-related construction and operational activities include paints, thinners, asphalt, and fuel and motor oils for vehicles and equipment. An increase in the volume of these wastes generated and the amount of storage required would be anticipated.

Short-term negligible adverse effects could result from an increase in spills associated with the use of hazardous materials. Established controls such as spill containment, emergency response and clean-up procedures would limit the impact of spills.

No effects would be expected from hazardous waste disposal. The installation is a large-quantity generator of hazardous wastes and has established procedures for managing and disposing of hazardous wastes. A permitted hazardous waste storage facility is located on the Main Post. The current hazardous waste disposal procedures would continue with implementation of the Preferred Alternative. All hazardous wastes would be managed in accordance with the installation's Hazardous Waste Storage Permit and RCRA requirements.

EPG. Four HWMUs are located within the development areas of the Preferred Alternative. VDEQ has issued letters of concurrence with the no further action determination for all HWMU sites at Fort Belvoir. Disturbance of these sites could result in a complete exposure pathway to human health and the environment and a reassessment of the site would be required with appropriate regulatory coordination.

*Site Preparation Activities***:** Disturbance of HWMU sites could be mitigated by further characterizing the impacted area through sample and analysis and employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual impacted soils exists and where there are located so that plans to excavate and remove the impacted soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. The cost estimates for this mitigation are not considered significant as the specifications of the construction project itself would likely require a HSP for the general construction so addressing this constraint could be incorporated into the construction program without adding significant costs.

Solid Waste. No effects would be expected from solid waste disposal. The installation has established procedures for managing and disposing of solid wastes. The current solid waste disposal procedures would continue with implementation of the Preferred Alternative. There would be preceding cumulative impact with positive effects before development in that the SWMU located within the proposed development area of the Preferred Alternative would need to be investigated and remediated before development.

Thirty SWMUs are located within the development areas of the Preferred Alternative. Table 4.13-12 summarizes the current status of these SWMUs.

Table 4.13-12
Status of SWMUs within Preferred Alternative footprints

Recommendation	Number of SWMUs
No Further Action	4
Administrative Closure	8
Confirmation Sampling	7
Site Investigation	11

Source: Tetra Tech, 2005a.

Site Preparation Activities: Fort Belvoir has remediation and corrective action plans for these SWMUs. Mitigation ranges from administrative closure to confirmation sampling. These action plans should be implemented. However, for those sites requiring confirmation sampling, subsequent cleanup requirements could only be determined following analysis of the samples to determine if additional corrective action is required.

Asbestos. Long-term minor beneficial effects would be expected related to ACM present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. ACM would be handled in a manner consistent with applicable rules and regulations including NESHAPS regulations, and thus no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the Preferred Alternative would result in the demolition of over 40 existing buildings. This would result in an estimated 50,000 tons of construction debris. If 1 percent of this debris is ACM then 500 tons of ACM debris could be anticipated. The potential for effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.

Site Preparation Activities: Before demolition, asbestos would need to be identified and removed or abated from all the structures located within the Preferred Alternative. Initial asbestos surveys and supplemental asbestos surveys would be required performed to gather sufficient data to prepare the abatement design. Once the asbestos abatement design is completed appropriate permits and notification is required. Depending on the type of asbestos differing abatement techniques would be employed. After the asbestos is abated and air samples indicate the clearance is acceptable the demolition of the structure could undertaken.

Lead Based Paint. Long-term minor beneficial effects would be expected related to LBP present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. LBP would be handled in a manner consistent with applicable rules and

regulations, and thus no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the Preferred Alternative would result in the demolition of over 40 existing buildings. This would result in an estimated 50,000 tons of construction debris. The potential for effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA, state, HUD, federal, and Army regulations. Measures to control airborne lead dust would be implemented.

Site Preparation Activities: Lead paint surveys and supplemental lead paint surveys would be required to gather sufficient data to determine if LBP is present in the buildings to be demolished. A waste stream for the demolition of each facility could be estimated into the various components, concrete, roofing, windows, doors, framing etc. Representative samples of these components could be collected and analyzed to determine if the waste stream of components exceed the regulatory limit for lead. If the waste stream samples do not exceed the regulatory limit for lead then the waste could be managed as construction debris. If the waste stream samples exceed the regulatory limit for lead then the abatement or removal and special disposal of components containing lead based paints should be evaluated. All construction debris that contains lead above the regulatory limit would be disposed of at licensed disposal facilities in accordance with applicable laws.

PCBs. No effects would be expected. There would be preceding beneficial cumulative effects before development in that the electrical equipment located within the proposed development area of the Preferred Alternative would first need to be investigated, sampled, and managed.

Numerous pole and pad mounted transformers are located within the Preferred Alternative. Over the years, Fort Belvoir has sampled, tested, and removed, many of the PCB containing electrical components. However, due to the size, complexity, and age of the electrical infrastructure at EPG, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.

Site Preparation Activities: A survey of the electrical equipment that is likely to be removed as part of the development of the Preferred Alternative would be required. All electrical equipment should be sampled and tested to determine if the electrical equipment needs to be managed as PCB containing wastes.

Pesticides. No effects from pesticides would be expected at the Preferred Alternative. Pesticides would continue to be used in accordance with the Fort Belvoir IPMP.

Regulated medical waste. Long-term minor adverse effect would be expected as the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of regulated medical waste generated at Fort Belvoir as proposed in the development of the Preferred Alternative. This increase in hospital space would result in minor adverse effects as the various hospital tenant agencies that occupy the new space would also need to comply with all regulated medical waste regulations.

Ordnance. No adverse effects or environmental effects would be expected from ordnance. There would be preceding beneficial cumulative effects before development in that the ordnance located

within the proposed development area of the Preferred Alternative would first need to be cleared and removed.

The MMRP HRR (Malcolm Pirnie, 2006) indicates former ranges have existed in the vicinity of the Preferred Alternative. About 130 acres of former training ranges are located within the development areas of the Preferred Alternative with the potential for OE to be encountered on the remainder of the EPG Property.

Site Preparation Activities: If the 30-acre abandoned airfield (Eebee Field) located on EPG East to the northwest of Heller Loop and EPG West were cleared of OE, this could free up a considerable amount of developable land.

Radioactive Material. Long-term minor adverse effects would be anticipated as DeWitt Army Hospital and other on-post medical facilities, such as the Logan Dental Clinic, produce low-level radioactive wastes. The relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of radioactive material generated at Fort Belvoir as proposed in the development of the Preferred Alternative. This increase in hospital space would result in minor adverse effects, as the various hospital tenant agencies that occupy the new administrative space would also need to comply with all radioactive material regulations. In addition, the tenants in the additional hospital space may also generate radioactive material, which may also be considered a minor adverse effect.

Radon. Long-term minor indirect adverse effect would be expected. The expansion of administrative space at Fort Belvoir increases the amount of people potentially exposed to radon at Fort Belvoir. No immediate site preparation activities required.

4.13.2.3 BMPs/Mitigation

BMPs. Environmental and health risks are controlled by implementing existing programs, policies, regulations, and standard operating procedures (SOPs). Measures to reduce the risk of harm to humans and the environment from hazardous substances and hazardous materials would be included in these requirements.

Mitigation. No specific mitigation measures are identified.

4.13.3 ENVIRONMENTAL CONSEQUENCES OF THE TOWN CENTER ALTERNATIVE

4.13.3.1 Land Use Plan Update

Effects would be similar to those discussed in Section 4.13.2.1.

4.13.3.2 BRAC Implementation and Facilities Projects

The major hazardous and toxic waste issues potentially affecting Town Center Alternative are about 90 acres of former ranges, SWMUs, HWMUs, and the several hundred PSAs. The specific consequences of Town Center Alternative with respect to each hazardous and toxic waste issues and required site preparations before development are presented in Table 4.13-13.

Petroleum. Long-term minor adverse effects would result from an increase in storage capacity requirements for petroleum. Any construction of new storage facilities to handle storage

requirements from BRAC actions would be done in accordance with applicable laws regarding construction materials, leak protection, monitoring, and spill containment.

Table 4.13-13
Hazardous Substances and Hazardous Materials resources affected by the Town Center Alternative

Resource	Pre-development activities
Petroleum	The 191 PSAs within a proposed building envelope could be aggressively addressed as part of the site preparations. A closure process involving administrative and decontamination process would be required. Confirmation samples collected beneath USTs and potentially some AST would likely be required to demonstrate no release has occurred. It could be expected that some USTs would have a release previously undiscovered. Site investigations at each release are approximately $40,000 each and require a month to complete. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.
Hazardous Substances and Hazardous Materials	Investigation work plans would require regulatory approval. Site investigations could be performed concurrently with site preparation activities. Additional investigation could be performed to determine if and where residual impacted soils exist.
Solid Waste	Investigation work plans would require EPA and VDEQ approval. Site investigations could be performed concurrently with site preparation activities.
Asbestos	Before initiating renovation activities, the potential for environmental effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.
Lead Based Paint	Before initiating renovation activities, the potential for environmental effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA and HUD standards; and state, federal, and Army regulations. Measures to control airborne lead dust would be implemented. All construction debris that contains LBP would be disposed of at licensed disposal facilities in accordance with applicable laws.
PCBs	Due to the size, complexity, and age of the electrical infrastructure at Fort Belvoir, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.
Pesticides	Proposed development in the South Post Golf Course would occur in areas of known historical pesticide application. A pesticide survey of the South Post Golf Course would likely be required. Based on the results of the pesticides survey, the waste generated during development could be properly managed is they are impacted by significant levels of pesticides
Regulated Medical Waste	No immediate site preparation activities required. However, the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of regulated medical waste generated at Fort Belvoir as proposed in the development of the Town Center Alternative.
Ordnance Areas	Army approval of Explosive Safety Submission (ESS) required. Only the Gas Area is anticipated to require OE clearance and removal. All ranges areas would require site investigations
Radioactive Material	No immediate site preparation activities required. However, the expansion of tenants at Fort Belvoir has a potential to increase the amount of radiological material generated at Fort Belvoir.
Radon	No immediate site preparation activities required. However, the expansion of tenants at Fort Belvoir has a potential to increase the amount of people exposed to radon at Fort Belvoir.

There are 191 PSAs within the development areas of the Town Center Alternative. Preparing the PSAs for construction is a straightforward decommissioning process. Many of the open PSAs are unregulated, so a costly formal closure process could be avoided. On average, one in three USTs

at Fort Belvoir has had a release, so it could be expected that some USTs would have a release previously undiscovered. This preparation activity could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.

In addition, there are 21 PRSs within the development areas of the Town Center Alternative. VDEQ has issued letters of concurrence with a no further action determination for most of these PRSs. However, acceptance was based on not disturbing the areas. If disturbance of these sites could not be avoided, additional investigations could be required by VDEQ. In addition, residual petroleum-impacted soils likely exist in the sites. To address this issue, construction programs that call for disturbing areas around these PRSs should require the appropriate federal OSHA construction worker protection. Disturbing previously unidentified petroleum contamination would also require proper handling and disposal of contaminants as required by federal, state, local, and Army regulations.

Site Preparation Activities: Preparing the site of the development of the Town Center Alternative could be accomplished by employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual impacted soils exist and where they are located so that plans to excavate and remove the impacted soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. Most large construction firms are experienced in this area. The cost estimates for a HSP to adequately address this issue are not considered significant as the specifications of the construction project itself would likely require an HSP. This requirement could be incorporated into the construction program without adding significant costs.

Hazardous Substances and Hazardous Materials. Long-term minor adverse effects could result from an increase in the generation of hazardous substances and hazardous materials. Additional potentially hazardous materials that could be found on-post during BRAC-related construction and operational activities include paints, thinners, fluorescent lamps, batteries, and fuel and motor oils for vehicles and equipment. An increase in the volume of these wastes generated and the amount of storage required would be anticipated.

Short-term minor adverse effects would result from an increase in spills associated with the use of hazardous materials. Established controls such as spill containment, emergency response and cleanup procedures would limit the effects of spills.

No effects would be expected from hazardous waste disposal. The installation is a large-quantity generator of hazardous wastes and has established procedures for managing and disposing of hazardous wastes. The current hazardous waste disposal procedures would continue with implementation of the Town Center Alternative. All hazardous wastes would be managed in accordance with the installation's *Hazardous Waste Management Plan* and RCRA requirements.

Two HWMUs are within the development areas of the Town Center Alternative. The HWMUs are associated with Vehicle Maintenance Facility in Buildings 1949 and 1950, in the southwesternmost development area on the North Post. VDEQ has issued letters of concurrence with the no further action determination for all HWMU sites at Fort Belvoir. However, disturbance of these sites could result in a complete exposure pathway to human health and the

environment. In these cases, it is likely VDEQ would require reopening the site to protect human health and the environment.

Site Preparation Activities: Disturbance of HWMU sites could be mitigated by further characterizing the effected area through sample and analysis and employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual effected soils exist and where they are so that plans to excavate and remove the affected soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. The cost estimates for this mitigation are not considered significant as the specifications of the construction project itself would likely require an HSP for the general construction so addressing this constraint could be incorporated into the construction program without adding significant costs. Disturbing previously unidentified contamination would also require properly handling and disposal as required by federal, state, local, and Army regulations.

Solid Waste. No effects would be expected from solid waste disposal. The installation has established procedures for managing and disposing of solid wastes. The current solid waste disposal procedures would continue with implementation of the Town Center Alternative.

There would be beneficial effects before development in that the SWMUs within the proposed development area of the Town Center Alternative would need to be investigated and remediated before development. There are 19 SWMUs within the development areas of the Town Center option. Table 4.13-14 summarizes the status of these SWMUs.

Site Preparation Activities: Fort Belvoir has corrective action plans for these SWMUs. Mitigation ranges from administrative closure to confirmation sampling. These action plans should be implemented. However, for those sites requiring confirmation sampling, subsequent cleanup requirements could only be determined following analysis of the samples to determine if additional corrective action is required.

Table 4.13-14
Status of SWMUs within Town Center Alternative footprints

Recommendation	Number of SWMUs
No Further Action	2
Administrative Closure	6
Confirmation Sampling	11
Site Investigation	0

Source: Tetra Tech, 2005a.

Asbestos. Long-term minor beneficial effects would be expected related to ACM present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. ACM would be handled in a manner consistent with applicable rules and regulations, and thus, no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the Town Center Alternative would result in the demolition of more than 75 existing buildings. This would result in an estimated 500,000 tons of construction debris. If 1 percent of this debris is ACM, 5,000 tons of ACM debris could be anticipated. The

potential for effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.

Site Preparation Activities: Before demolition, asbestos would need to be identified and removed or abated from all the structures within the Town Center Alternative. Initial asbestos surveys and supplemental asbestos surveys would be performed to gather sufficient data to prepare the abatement design. Once the asbestos abatement design is completed, appropriate permits and notification would be required. Depending on the type of asbestos, differing abatement techniques would be employed. After the asbestos is abated and air samples indicate the clearance is acceptable, the demolition of the structure could be undertaken.

Lead Based Paint. Long-term minor beneficial effects would be expected related to LBP present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. LBP would be handled in a manner consistent with applicable rules and regulations, and thus no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the Town Center Alternative would result in the demolition of more than 75 existing buildings. This would result in an estimated 500,000 tons of construction debris. The potential for effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, HUD, federal, and Army regulations. Measures to control airborne lead dust would be implemented.

Site Preparation Activities: Lead paint surveys and supplemental lead paint surveys would be required to gather sufficient data to determine if LBP is present in the buildings to be demolished. A waste stream for the demolition of each facility could be estimated for the various components, concrete, roofing, windows, doors, framing, and so on. Representative samples of these components could be collected and analyzed to determine if the waste stream of components exceed the regulatory limit for lead. If the waste stream samples do not exceed the regulatory limit for lead, the waste could be managed as construction debris. If the waste stream samples exceed the regulatory limit for lead, the abatement or removal and special disposal of components containing LBP should be evaluated. All construction debris that contains lead above the regulatory limit would be disposed of at licensed disposal facilities in accordance with applicable laws.

PCBs. No effects would be expected. There would be preceding beneficial cumulative effects before development in that the electrical equipment within the proposed development area of the Town Center Alternative would first need to be investigated, sampled, and managed.

Numerous pole- and pad-mounted transformers are within the Town Center Alternative. Over the years, Fort Belvoir has sampled, tested, and removed many of the PCB-containing electrical components. However, because of the size, complexity, and age of the electrical infrastructure at Fort Belvoir, the possibility of encountering PCB-containing electrical equipment still exists. All

transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.

Site Preparation Activities: A survey of the electrical equipment that is likely to be removed as part of the development of the Town Center Alternative would be required. All electrical equipment should be sampled and tested to determine if the electrical equipment needs to be managed as PCB-containing wastes.

Pesticides. No effects from pesticides would be expected at the Town Center Alternative. Pesticides would continue to be used in accordance with the Fort Belvoir IPMP.

Proposed development for the Town Center Alternative in the South Post golf course area would occur in areas of known historical pesticide application. There would be preceding beneficial cumulative effects before development in that the golf course within the proposed development area of the Town Center Alternative would first need to be investigated, sampled, and managed.

Site Preparation Activities: A pesticide survey of the South Post golf course would likely be required. Based on the results of the pesticides survey, the waste generated during development could be properly managed if they are affected by significant levels of pesticides.

Regulated medical waste. Long-term minor adverse effect would be expected as the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of medical and biological waste generated at Fort Belvoir. This increase in hospital space would result in minor adverse effects, as the various hospital tenant agencies that occupy the new space would also need to comply with all medical and biohazardous waste regulations.

Ordnance. No adverse effects would be expected from ordnance. There would be preceding beneficial cumulative effects before development in that the ordnance within the proposed development area of the Town Center Alternative would first need to be cleared and removed.

The MMRP HRR (Malcolm Pirnie, 2006) indicates that former ranges have existed in the vicinity of the Town Center Alternative. On the North Post, former ranges of potential concern to the development areas include the T-15 Range, and *Gas Area* in the vicinity of existing Kingman Road and Woodlawn Road. About 68 acres of T-15 are within the northeastern corner of the development area on the North Post southwest of the Kingman Road and Woodlawn Road intersection. The T-15 Range was used for small-arms training until 2002. The Gas Area overlaps the T-15 Range at the southwest quadrant of the same intersection and consists of 17 acres within the development area. The Gas Area was used for gas training in the 1940s.

On the South Post, the former Gunston Road 1,000-inch Rifle Range overlaps 0.1 acres of the southwestern end of the South Post proposed development area along the east side of Gunston Road, and a former firing area associated with this range is adjacent to the development area to the south on the west side of Gunston Road. About 1.7 acres of the fan for this firing area overlap the southwest corner of the development area. In addition, an active range is adjacent to this development area to the west and overlaps 2.0 acres of the northeast corner of the South Post development area, west of Gunston Road.

Site Preparation Activities: These ranges are along the boundaries of the proposed building envelop of this alternative and should be avoided if possible. To date, no significant OE removal actions have been performed in any of these areas. The Gas Area would likely require intrusive

activities to clear the area of UXO. The T-15 Range and Gunston Road 1,000-inch Rifle Range, and the other operational range would likely not require UXO removal and clearance. A site investigation under MMRP including soil and groundwater sampling could be anticipated at these ranges. On the basis of results of the site investigation, additional corrective action(s) could also be required. OE clearance and removal actions may be performed in the range areas concurrent to site preparation activities, provided that the OE standoff distances are respected.

Radioactive Material. Long-term minor adverse effects would be expected because DeWitt Army Hospital and other on-post medical facilities, such as the Logan Dental Clinic, produce low-level radioactive wastes. The relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of radioactive material generated at Fort Belvoir as proposed in the development of the Town Center Alternative. This increase in hospital space would result in minor adverse effects, as the various hospital tenant agencies that occupy the new administrative space would also need to comply with all radioactive material regulations. In addition, the tenants in the additional hospital space might also generate radioactive material, which could also be considered a minor adverse effect.

Radon. Long-term minor adverse effects would be expected. The expansion of administrative space at Fort Belvoir increases the amount of people potentially exposed to radon at Fort Belvoir. No immediate site preparation activities would be required.

4.13.3.3 BMPs/Mitigation

BMPs would be same as those stated in Section 4.13.2.3.

4.13.4 ENVIRONMENTAL CONSEQUENCES OF THE CITY CENTER ALTERNATIVE

4.13.4.1 Land Use Plan Update

Effects would be similar to those discussed in Section 4.13.2.1.

4.13.4.2 BRAC Implementation and Facilities Projects

The major hazardous and toxic waste issues potentially affecting the City Center Alternative are about 130 acres of former training ranges on EPG (EPG West and Eebee Field) and 30 SWMUs, several HWMUs, and PSAs. The specific consequences of City Center Alternative with respect to each hazardous and toxic waste issues and required site preparations before development are further discussed Table 4.13-15.

Petroleum. Long-term minor adverse effects would result from an increase in storage capacity requirements for petroleum. Any construction of new storage facilities to handle storage requirements from BRAC actions would be done in accordance with applicable laws regarding construction materials, leak protection, monitoring, and spill containment.

EPG. 22 PSAs are within the development areas of the City Center Alternative. Of the 22 PSAs, 8 are ASTs and 14 are USTs. In addition, 10 PRSs are within the development areas of the City Center Alternative at EPG.

VDEQ issued letters of concurrence with the no further action determination for these PRSs at Fort Belvoir. However, acceptances were based on not disturbing the area. If disturbance of this

site could not be avoided, an additional investigation could be required by VDEQ. In addition, residual petroleum contamination likely exists in the area. To address this issue, construction programs that call for disturbing areas around this PRS should require the appropriate federal

Table 4.13-15
Hazardous Substances and Hazardous Materials Resources affected by the City Center Alternative

Resource	Pre Development Activities
Petroleum	The 22 PSAs at Fort Belvoir along with the 25 PSAs at the GSA Parcel could be aggressively addressed as part of the site preparations. A closure process involving administrative and decontamination process would be required. Confirmation samples collected beneath USTs and potentially some AST would likely be required to demonstrate no release has occurred. It could be expected that some USTs would have a release previously undiscovered. Site investigations at each release would be approximately $40,000 each and require a month to complete. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.
Hazardous Substances and Hazardous Materials	Investigation work plans would require regulatory approval. Site investigations could be performed concurrently with site preparation activities. Additional investigation could be performed to determine if and where residual impacted soils exist.
Solid waste	Investigation work plans would require EPA and VDEQ approval. Site investigations could be performed concurrently with OE clearance and site preparation activities.
Asbestos	Before initiating renovation activities, the potential for environmental effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.
Lead based paint	Before initiating renovation activities, the potential for environmental effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62; EPA and HUD standards; and state, federal, and Army regulations. Measures to control airborne lead dust would be implemented. All construction debris that contains LBP would be disposed of at licensed disposal facilities in accordance with applicable laws.
PCBs	Because of the size, complexity, and age of the electrical infrastructure at EPG, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.
Pesticides	No effects would be anticipated. Ongoing investigations at EPG should identify any significant pesticide issues.
Regulated Medical Waste	No immediate site preparation activities required. However, the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of regulated medical biological waste generated at Fort Belvoir as proposed in the development of the City Center Alternative.
Ordnance areas	Army approval of Explosive Safety Submission (ESS) would be required. Extensive OE clearance and removal actions would be required on the 230 acres of historical training ranges. All ranges areas would require site investigations
Radioactive material	The investigation of SWMU M-44 would be required before development of the City Center Alternative
Radon	No immediate site preparation activities would be required. However, the expansion of tenants at Fort Belvoir has a potential to increase the amount of people exposed to radon at Fort Belvoir.

OSHA construction worker protection. Disturbing previously unidentified petroleum contamination would also require proper handling and disposal of contaminants as required by federal, state, local, and Army regulations.

GSA Parcel. Approximately 10 regulated and 15 former UST and ASTs are within the GSA Parcel, and approximately 15 AST/UST formerly existed on the site, for a total of 25 PSAs. Five leaking underground storage tanks resulting in PRSs have been identified on the GSA Parcel and are listed in Table 4.13-16. The PRSs have been closed and are not anticipated to be an issue.

Site Preparation Activities: Preparing the site of the development of the City Center Alternative could be accomplished by employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual-impacted soils exist and where they are so that plans to excavate and remove the affected soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements, along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. Most large construction firms are experienced in this area. The cost estimates for a Health and Safety

Program to adequately address this issue are not considered significant because the specifications of the construction project itself would likely require an HSP. This requirement could be incorporated into the construction program without adding significant costs.

Table 4.13-16
GSA parcel petroleum release sites

Owner	Property	Pollution complaint no.	Status
Hydro Conduit Corp.	6800 Loisdale Road	19921218	Closed
Hydro Conduit Corp.	6800 Loisdale Road	19922022	Closed
Hydro Conduit Corp.	6800 Loisdale Road	19901716	Closed
Hydro Conduit Corp.	6800 Loisdale Road	19921836	Closed
GSA Building 4	6801 Loisdale Road	19954283	Closed

Hazardous Substances and Hazardous Materials. Long-term minor adverse effects would result from an increase in the generation of hazardous substances and hazardous materials. Additional potentially hazardous materials that could be found on-post during BRAC-related construction and operational activities include paints, thinners, fluorescent lamps, batteries, and fuel and motor oils for vehicles and equipment. An increase in the volume of these wastes generated and the amount of storage required would be anticipated.

Short-term negligible adverse effects could result from an increase in spills associated with the use of hazardous materials. Established controls such as spill containment, emergency response and clean-up procedures would limit the impact of spills.

No effects would be expected from hazardous waste disposal. The installation is a large-quantity generator and permitted storage facility of hazardous wastes and has established procedures for managing and disposing of hazardous wastes. The current hazardous waste disposal procedures would continue with implementation of the City Center Alternative. All hazardous wastes would be managed in accordance with the installation's Hazardous Waste Management Program and RCRA requirements.

EPG. Four HWMUs are within the development areas of the City Center Alternative. VDEQ has issued letters of concurrence with the no further action determination for all HWMU sites at Fort

Belvoir. However, disturbance of these sites could result in a complete exposure pathway to human health and the environment. In these cases, it is likely that VDEQ would require reopening the site to protect human health and the environment.

GSA Parcel. Six RCRA permits were identified at the GSA Parcel including a RCRA large quantity generator at GSA 6810 Loisdale Road Building A. This RCRA large-quantity generator, EPA Identification number VA4470039336, has 12 violations with no violations resolved. Generated wastes include corrosive wastewater from electroplating operations, chlorinated, and nonchlorinated solvents. Violations appear to be of an administrative nature.

Site Preparation Activities: Disturbance of HWMU sites could be mitigated by further characterizing the affected area through sample and analysis and employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual impacted soils exist and where they are so that plans to excavate and remove the affected soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. The cost estimates for this mitigation are not considered significant because the specifications of the construction project itself would likely require an HSP for the general construction so addressing this constraint could be incorporated into the construction program without adding significant costs.

Solid Waste. No effects would be expected from solid waste disposal. The installation has established procedures for managing and disposing of solid wastes. The solid waste disposal procedures would continue with implementation of the City Center Alternative. There would be preceding beneficial cumulative effects before development in that the SWMUs within the proposed development area of the City Center Alternative would first need to be investigated and remediated.

Thirty SWMUs are within the development areas of the City Center Alternative. Table 4.13-17 summarizes the status of these SWMUs.

Table 4.13-17
Status of SWMUs within the City Center Alternative footprints

Recommendation	Number of SWMUs
No Further Action	4
Administrative Closure	8
Confirmation Sampling	7
Site Investigation	11

Source: Tetra Tech, 2005b

Site Preparation Activities: Fort Belvoir has corrective action plans for these SWMUs. Mitigation ranges from administrative closure to confirmation sampling. These action plans should be implemented. However, for those sites requiring confirmation sampling, subsequent cleanup requirements could be determined only following analysis of the samples to determine if additional corrective action is required.

Asbestos. Long-term minor beneficial effects would be expected related to ACM present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. ACM would be handled in a manner consistent with applicable rules and regulations, including NESHAPS and thus, no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the City Center Alternative would result in the demolition of more than 40 existing buildings. This would result in an estimated 50,000 tons of construction debris. If 1 percent of this debris is ACM, 500 tons of ACM debris could be anticipated. The potential for effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.

Site Preparation Activities: Before demolition, asbestos would need to be identified and removed or abated from all the structures within the City Center Alternative. Initial asbestos surveys and supplemental asbestos surveys would be performed to gather sufficient data to prepare the abatement design. Once the asbestos abatement design is completed, appropriate permits and notification would be required. Depending on the type of asbestos, differing abatement techniques would be employed. After the asbestos is abated and air samples indicate the clearance is acceptable, the demolition of the structure could be undertaken.

Lead Based Paint. Long-term minor beneficial effects would be expected related to LBP present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. LBP would be handled in a manner consistent with applicable rules and regulations, and thus, no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the City Center Alternative would result in the demolition of over 40 existing buildings. This would result in an estimated 50,000 tons of construction debris. The potential for effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, HUD, federal, and Army regulations. Measures to control airborne lead dust would be implemented.

Site Preparation Activities: Lead paint surveys and supplemental lead paint surveys would be required to gather sufficient data to determine if LBP is present in the buildings to be demolished. A waste stream for the demolition of each facility could be estimated into the various components, concrete, roofing, windows, doors, framing, and so on. Representative samples of these components could be collected and analyzed to determine if the waste stream of components exceed the regulatory limit for lead. If the waste stream samples do not exceed the regulatory limit for lead, the waste could be managed as construction debris. If the waste stream samples exceed the regulatory limit for lead, the abatement or removal and special disposal of components containing LBP should be evaluated. All construction debris that contains lead above the regulatory limit would be disposed of at licensed disposal facilities in accordance with applicable laws.

PCBs. No effects would be expected. There would be preceding beneficial cumulative effects before development in that the electrical equipment within the proposed development area of the City Center Alternative would first need to be investigated, sampled, and managed.

Numerous pole- and pad- mounted transformers are within the City Center Alternative.-Over the years, Fort Belvoir has sampled, tested, and removed, many of the PCB-containing electrical components. However, because of the size, complexity, and age of the electrical infrastructure at EPG, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.

Site Preparation Activities: A survey of the electrical equipment that is likely to be removed as part of the development of the City Center Alternative would be required. All electrical equipment should be sampled and tested to determine if the electrical equipment needs to be managed as PCB-containing wastes.

Pesticides. No effects from pesticides would be expected at the City Center Alternative. Pesticides would continue to be used in accordance with the Fort Belvoir IPMP.

Regulated medical waste. Long-term minor adverse effect would be expected as the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of regulated medical waste generated at Fort Belvoir as proposed in the development of the City Center Alternative. This increase in hospital space would result in minor adverse effects as the various hospital tenant agencies that occupy the new space would also need to comply with all regulated medical waste regulations.

Ordnance. No adverse effects would be expected from ordnance. There would be preceding beneficial cumulative effects before development in that the ordnance located within the proposed development area of the City Center Alternative would first need to be cleared and removed.

The MMRP HRR (Malcolm Pirnie, 2006) indicates that former ranges have existed in the vicinity of the City Center Alternative. About 130 acres of former training ranges are within the development areas of the City Center Alternative with the potential for OE to be encountered on the remainder of the EPG property.

Site Preparation Activities: If the 18-acre abandoned airfield (Eebee Field) on EPG East to the northwest of Heller Loop and EPG West were cleared of OE, this could free up a considerable amount of developable land.

Radioactive Material. Long-term minor adverse effects would be expected because DeWitt Army Hospital and other on-post medical facilities, such as the Logan Dental Clinic, produce low-level radioactive wastes. The relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of radioactive material generated at Fort Belvoir as proposed in the development of the City Center Alternative. This increase in hospital space would result in minor adverse effects, as the various hospital tenant agencies that occupy the new administrative space would also need to comply with all radioactive material regulations. In addition, the tenants in the additional hospital space could also generate radioactive material, which might also be considered a minor adverse effect.

Radon. Long-term minor adverse effects would be expected. The expansion of administrative space at Fort Belvoir increases the amount of people potentially exposed to radon at Fort Belvoir. No immediate site preparation activities would be required.

4.13.4.3 BMPs/Mitigation

BMPs would be same as those stated in Section 4.13.2.3.

4.13.5 ENVIRONMENTAL CONSEQUENCES OF THE SATELLITE CAMPUSES ALTERNATIVE

4.13.5.1 Land Use Plan Update

Effects would be similar to those discussed in Section 4.13.2.1.

4.13.5.2 BRAC Implementation and Facilities Projects

The major hazardous and toxic waste issues potentially affected by the Satellite Campuses Alternative are about 230 acres of former ranges, numerous SWMUs and HWMUs, and the several hundred PSAs. The specific consequences of Satellite Campuses Alternative with respect to each hazardous and toxic waste issues and required site preparations before development are further discussed in Table 4.13-18.

Petroleum. Long-term minor adverse effects would result from an increase in storage capacity requirements for petroleum. Any construction of new storage facilities to handle storage requirements from BRAC actions would be done in accordance with applicable laws regarding construction materials, leak protection, monitoring, and spill containment.

There are 226 PSAs located within the development areas of the Satellite Campuses Alternative. Preparing the PSAs for construction is a straightforward decommissioning process. Many of the open PSAs are unregulated, so a costly formal closure process could be avoided. On average, 1 in 3 USTs at Fort Belvoir have had a release so it could be expected that some USTs would have a release previously undiscovered. This preparation activity could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.

In addition, there are 38 PRSs located within the development areas of the Satellite Campuses Alternative. VDEQ has issued letters of concurrence with a no further action determination for most of these PRSs. However, acceptance was based on not disturbing the areas. If disturbance of these sites could not be avoided, additional investigations could be required by VDEQ. In addition, residual petroleum contamination likely exists in the sites. To address this issue, construction programs that call for disturbing areas around these PRSs should require the appropriate federal OSHA construction worker protection. Disturbing previously unidentified petroleum contamination would also require proper handling and disposal of contaminants as required by federal, state, local, and Army regulations.

Site Preparation Activities: Preparing the site of the development of the Satellite Campuses Alternative could be accomplished by employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual impacted soils exists and where they are located so that plans to excavate and remove the

Table 4.13-18
Hazardous Substances and Hazardous Materials resources affected by the Satellite Campuses Alternative

Resource	Pre-development activities
Petroleum	The 226 PSAs within a proposed building envelope could be aggressively addressed as part of the site preparations. A closure process involving administrative and decontamination process would be required. Confirmation samples collected beneath USTs and potentially some AST would likely be required to demonstrate no release has occurred. It could be expected that some USTs would have a release previously undiscovered. Site investigations at each release would be approximately $40,000 each and require a month to complete. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.
Hazardous Substances and Hazardous Materials	Investigation work plans would require regulatory approval. Site investigations could be performed concurrently with site preparation activities. Additional investigation could be performed to determine if and where residual impacted soils exist.
Solid waste	Investigation work plans would require EPA and VDEQ approval. Site investigations could be performed concurrently with OE clearance and site preparation activities.
Asbestos	Before initiating renovation activities, the potential for environmental effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.
Lead based paint	Before initiating renovation activities, the potential for environmental effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA and HUD standards; and state, federal, and Army regulations. Measures to control airborne lead dust would be implemented. All construction debris that contains LBP would be disposed of at licensed disposal facilities in accordance with applicable laws.
PCBs	Because of the size, complexity, and age of the electrical infrastructure at Fort Belvoir, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.
Pesticides	Proposed development in the South Post golf course would occur in areas of known historical pesticide application. A pesticide survey of the South Post Golf Course would likely be required. On the basis of the results of the pesticides survey, the waste generated during development could be properly managed if they are affected by significant levels of pesticides
Regulated Medical Waste	No immediate site preparation activities would be required. However, the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of regulated medical waste generated at Fort Belvoir as proposed in the development of the Satellite Campuses Alternative.
Ordnance areas	Army approval of Explosive Safety Submission (ESS) would be required. Extensive OE clearance and removal actions would be required on the 230 acres of historical training ranges. All ranges areas would require site investigations.
Radioactive material	No immediate site preparation activities would be required. However, the expansion of tenants at Fort Belvoir has a potential to increase the amount of radiological material generated at Fort Belvoir.
Radon	No immediate site preparation activities would be required. However, the expansion of tenants at Fort Belvoir has a potential to increase the amount of people exposed to radon at Fort Belvoir.

impacted soils could be developed The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure

compliance with the HSP. Most large construction firms are experienced in this area. The cost estimates for a Health and Safety Program to adequately address this issue are not considered significant because the specifications of the construction project itself would likely require an HSP. This requirement could be incorporated into the construction program without adding significant costs.

Hazardous Substances and Hazardous Materials. Long-term minor adverse effects would result from an increase in the generation of hazardous substances and hazardous materials. Additional potentially hazardous materials that could be found on-post during BRAC-related construction and operational activities include paints, thinners, batteries, and fuel and motor oils for vehicles and equipment. An increase in the volume of these wastes generated and the amount of storage required would be anticipated.

Short-term minor adverse effects could result from an increase in spills associated with the use of hazardous materials. Established controls such as spill containment, emergency response and cleanup procedures would limit the impact of spills.

No effects would be expected from hazardous waste disposal. The installation is a large-quantity generator of hazardous wastes and has established procedures for managing and disposing of hazardous wastes. The current hazardous waste disposal procedures would continue with implementation of the Satellite Campuses Alternative. All hazardous wastes would be managed in accordance with the installation's *Hazardous Waste Management Plan* and RCRA requirements.

Eight HWMUs are within the development areas of the Satellite Campuses Alternative. Two of the HWMUs are associated with Vehicle Maintenance Facility in Buildings 1949 and 1950, in the southwesternmost development area on the North Post, and the remaining six are associated with a former fire training area on Davison Army Airfield. VDEQ issued letters of concurrence with a no further action determination for all HWMU sites at Fort Belvoir. However, disturbance of these sites could result in a complete exposure pathway to human health and the environment. In these cases, it is likely that VDEQ would require reopening the sites to protect human health and the environment.

Site Preparation Activities: Disturbance of HWMU sites could be mitigated by further characterizing the affected area through sample and analysis and employing a Health and Safety Program including qualified industrial hygienists and an HSP. Additional investigation could identify if residual impacted soils exist and where they are so that plans to excavate and remove the impacted soils could be developed. The HSP specifies worker training requirements, personnel protective equipment, air monitoring requirements along with health and safety protocols appropriate to the project. The industrial hygienists would oversee the activities to ensure compliance with the HSP. The cost estimates for this mitigation are not considered significant because the specifications of the construction project itself would likely require an HSP for the general construction, so addressing this constraint could be incorporated into the construction program without adding significant costs.

Solid Waste. No effects would be expected from solid waste disposal. The installation has established procedures for managing and disposing of solid wastes. The solid waste disposal procedures would continue with implementation of the Satellite Campuses Alternative.

There would be preceding cumulative impact with positive effects before development in that the SWMU located within the proposed development area of the Satellite Campuses Alternative would need to be investigated and remediated before development.

There are 38 SWMUs within the development areas of the Satellite Campuses Alternative. Table 4.13-19 summarizes the current status of these SWMUs.

Site Preparation Activities: Fort Belvoir has corrective action plans for these SWMUs. Mitigation ranges from administrative closure to confirmation sampling. These action plans should be implemented. However, for those sites requiring confirmation sampling, subsequent cleanup requirements could only be determined following analysis of the samples to determine if additional corrective action is required.

Table 4.13-19
Status of SWMUs within Satellite Campuses Alternative footprints

Recommendation	Number of SWMUs
No Further Action	8
Administrative Closure	6
Confirmation Sampling	24
Site Investigation	0

Source: Tetra Tech, 2005a.

Asbestos. Long-term minor beneficial effects would be expected related to ACM present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. ACM would be handled in a manner consistent with applicable rules and regulations, and thus, no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the Satellite Campuses Alternative would result in the demolition of more than 80 existing buildings. This would result in an estimated 600,000 tons of construction debris. If 1 percent of this debris is ACM, 6,000 tons of ACM debris would be anticipated. The potential for effects of special hazards such as ACM would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves ACM would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, federal, and Army regulations. Measures to control airborne asbestos would be implemented. All construction debris that contains ACM would be disposed of at licensed disposal facilities in accordance with applicable laws.

Site Preparation Activities: Before demolition, asbestos would need to be identified and removed or abated from all the structures within the Satellite Campuses Alternative. Initial asbestos surveys and supplemental asbestos surveys would be required to gather sufficient data to prepare the abatement design. Once the asbestos abatement design is completed appropriate permits and notification would be required. Depending on the type of asbestos differing abatement techniques would be employed. After the asbestos is abated and air samples indicate the clearance is acceptable, the demolition of the structure could be undertaken.

Lead Based Paint. Long-term minor beneficial effects would be expected related to LBP present in existing buildings if such buildings were demolished or renovated to accommodate incoming BRAC activities. LBP would be handled in a manner consistent with applicable rules and regulations, and thus, no environmental or health effects from the removal, handling, and disposal of these materials would be expected during demolition, renovation, or construction activities.

The proposed development of the Satellite Campuses Alternative would result in the demolition of more than 80 existing buildings. This would result in an estimated 600,000 tons of construction debris. The potential for the effects of special hazards such as LBP would be evaluated and addressed as specified in the appropriate regulatory requirements. Demolition that involves LBP would be evaluated for compliance with the OSHA standard at 29 CFR 1926.62 and EPA, state, HUD, federal, and Army regulations. Measures to control airborne lead dust would be implemented.

Site Preparation Activities: Lead paint surveys and supplemental lead paint surveys would be required to gather sufficient data to determine if LBP is present in the buildings to be demolished. A waste stream for the demolition of each facility could be estimated into the various components, concrete, roofing, windows, doors, framing and so on. Representative samples of these components could be collected and analyzed to determine if the waste stream of components exceed the regulatory limit for lead. If the waste stream samples do not exceed the regulatory limit for lead, the waste could be managed as construction debris. If the waste stream samples exceed the regulatory limit for lead then the abatement or removal and special disposal of components containing LBP should be evaluated. All construction debris that contains lead above the regulatory limit would be disposed of at licensed disposal facilities in accordance with applicable laws.

PCBs. No effects would be expected. There would be preceding beneficial cumulative effects before development in that the electrical equipment within the proposed development area of the Satellite Campuses Alternative would first need to be investigated, sampled, and managed.

Numerous pole- and pad-mounted transformers are within the Satellite Campuses Alternative. Over the years, Fort Belvoir has sampled, tested, and removed, many of the PCB-containing electrical components. However, because of the size, complexity, and age of the electrical infrastructure at Fort Belvoir, the possibility of encountering PCB-containing electrical equipment still exists. All transformers would likely require additional sampling to determine PCB content before decommissioning and disposal.

Site Preparation Activities: A survey of the electrical equipment that is likely to be removed as part of the development of the Satellite Campuses Alternative would be required. All electrical equipment should be sampled and tested to determine if the electrical equipment needs to be managed as PCB-containing wastes.

Pesticides. No effects from pesticides would be expected at the Satellite Campuses Alternative. Pesticides would continue to be used in accordance with the Fort Belvoir IPMP. The proposed hospital development in the South Post golf course area would occur in areas of known historical pesticide application. There would be preceding beneficial cumulative effects before development in that the golf course within the proposed development area would first need to be investigated, sampled, and managed.

Site Preparation Activities: A pesticide survey of the South Post golf course would likely be required. From the results of the pesticides survey, the waste generated during development could be properly managed if they are affected by significant levels of pesticides.

Regulated medical waste. Long-term minor adverse effects would be expected as the relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of regulated medical waste generated at Fort Belvoir as proposed in the development of the Satellite Campuses Alternative. This increase in hospital space would result in minor adverse effects as the various hospital tenant agencies that occupy the new space would also need to comply with all regulated medical waste regulations.

Ordnance. No adverse effects would be expected from ordnance. There would be preceding beneficial cumulative effects before development in that the ordnance within the proposed development area of the Satellite Campuses Alternative would be first need to be cleared and removed.

The MMRP HRR (Malcolm Pirnie, 2006) indicates that former ranges have existed in the vicinity of the Satellite Campuses Alternative development areas. On the North Post, former ranges of potential concern to the development areas include the T-15 Range, and *Gas Area* in the vicinity of existing Kingman Road and Woodlawn Road. About 68 acres of T-15 are within the northeastern corner of the development area on the North Post southwest of the Kingman Road and Woodlawn Road intersection. The T-15 Range was used for small-arms training until 2002, but the only ordnance used at this range was 5.56 mm blank cartridges. The Gas Area overlaps the T-15 Range at the southwest quadrant of the same intersection and consists of 17 acres within the development area. The Gas Area was used for gas training in the 1940s.

On the South Post, the former Gunston Road 1,000-inch Rifle Range overlaps 0.1 acres of the southwestern end of the South Post proposed development area along the east side of Gunston Road, and a former firing area associated with this range is adjacent to the development area to the south on the west side of Gunston Road. 1.7 acres of the fan for this firing area overlap the southwest corner of the development area. In addition, an active range is adjacent to this development area to the west and overlaps 2.0 acres of the northeast corner of the South Post development area, west of Gunston Road.

Two former ranges overlap the proposed development area on Davison Army Airfield. The Mines and Booby Trap Area was an obstacle course area used in the 1940s. This range borders the southeastern end of the development area but is not within the building envelop. The former Mounted Pistol Range was at the southeastern end of what is now Davison Army Airfield. The fan for the range has been developed over by the runways for the airfield, covering about 138 acres; the firing area is outside of, but adjacent to, the Davison Army Airfield development area.

Site Preparation Activities: These ranges are along the boundaries of the proposed building envelop of this alternative and should be avoided if possible. To date, no significant OE removal actions have been performed in any of these areas. The *Gas Area* would likely require intrusive activities to clear the area of UXO. The T-15 Range and Gunston Road 1,000-inch Rifle Range, and the other operational range would likely not require UXO removal and clearance. A site investigation under MMRP including soil and groundwater sampling could be anticipated at these ranges. On the basis of the results of the site investigation, additional corrective action(s) could also be required. OE clearance and removal actions could be performed in the range areas concurrent to site preparation activities, provided that the OE standoff distances are respected.

Radioactive Material. Long-term minor adverse effects would be expected because DeWitt Army Hospital and other on-post medical facilities, such as the Logan Dental Clinic, produce low-level radioactive wastes. The relocation/expansion of the Dewitt Hospital would likely result in an increase in the amount of radioactive material generated at Fort Belvoir as proposed in the development of the Satellite Campuses Alternative. This increase in hospital space would result in minor adverse effects, as the various hospital tenant agencies that occupy the new administrative space would also need to comply with all radioactive material regulations. In addition, the tenants in the additional hospital space could also generate radioactive material, which could also be considered a minor adverse effect.

Radon. Long-term minor adverse effect would be expected. The expansion of administrative space at Fort Belvoir increases the amount of people potentially exposed to radon at Fort Belvoir. No immediate site preparation activities required.

4.13.5.3 BMPs/Mitigation

BMPs would be same as those stated in Section 4.13.2.3.

4.13.6 NO ACTION ALTERNATIVE

No effects on hazardous and toxic wastes, or from their use, storage, or disposal would be expected from implementing the No Action Alternative.

4.13.7 SUMMARY OF COMPARISON OF ALTERNATIVES

Minor long-term adverse effects are anticipated with each alternative with respect to the construction and operations activities associated with a development project of this size. The construction activities would involve managing, storing, and generating hazardous substances and hazardous materials. In addition, minor long-term adverse effects are anticipated, as the addition of tenants would result in the additional managing, storing, and generating hazardous substances and hazardous materials.

Although not part of the proposed action, the predevelopment preparations requirements would have a long-term beneficial effect as the UXO and hazardous materials release sites are investigated and remediated which would be beneficial to both human health and the environment. The most costly alternative for corrective action predevelopment activities is the Satellite Campuses Alternative, largely due to the project sites under this alternative being located in former training ranges with costly UXO clearance and removal. The least expensive would be the Preferred Alternative. In addition, corrective action for the Preferred Alternative would be able to be completed on a faster track than the other alternatives. The estimates for the Town Center and Satellite Campuses Alternatives do not include logical costs of finding and obtaining swing space for current tenants to be relocated into while the program redevelops the Main Post. The costs and logistical requirement to execute these alternatives would also be substantial.

4.14 MITIGATION SUMMARY

Mitigation measures for the four alternatives for implementing BRAC would be expected to reduce, avoid, or compensate for most adverse impacts. Mitigation does not include legal, regulatory, or policy-driven environmental protections and best management practices (BMPs) required to comply with federal and state laws, or Army and Fort Belvoir policies. These are already part of the Proposed Action. Only those resource areas for which mitigation has been determined to be appropriate are discussed below.

4.14.1 TRANSPORTATION

Mitigation for impacts to the transportation system could occur with respect to off-post transportation improvements and mass transit expansion. Also, the Army could designate a Transportation Demand Management Coordinator.

Traffic and Transportation. The EIS examines several transportation improvements for each of the BRAC action alternatives. The following summarizes these improvements (shown in comparative format at Table 4.3-41.

- *Preferred Alternative.* Fourteen actions, costing an estimated $458 million, are identified.
- *Town Center Alternative.* Fifteen actions, costing an estimated $732 million, are identified.
- *City Center Alternative.* Fourteen actions, costing an estimated $471 million, are identified.
- *Satellite Campuses Alternative.* Fifteen actions, costing an estimated $742 million, are identified.

Mass Transit. Bus service of a high enough quality to realize a 5 to 10 percent mode share for transit could complement the road network mitigation actions and help to reduce congestion and limit vehicle delays. The EIS identifies five basic bus service areas, then proposes and examines general routes and service concepts to achieve 5 or 10 percent mode share. For all the alternatives, a 5 percent mode split would reduce by 360 the number of vehicles entering the post during peak hour. A 10 percent mode split would reduce by 725 the number of vehicles entering the post during peak hour.

Transportation Demand Management Coordinator (TDMC). To help alleviate traffic congestion, the Army could appoint a TDMC. The TDMC would be knowledgeable of principles, practices, and methods of transportation demand management. These would include, but not be limited to, employee rideshare and commute programs; current regional programs regarding air quality and transportation; employer trip reduction requirements; marketing, promotion, and event planning practices; and parking management practices. The TDMC's principal function would be to develop and manage a transportation management plan focused on measures to reduce the number of single-occupancy vehicles. Appointing a TDMC before fiscal year 2009 would allow development of transportation program initiatives before BRAC relocation of personnel.

4.14.2 AIR QUALITY

Mitigation with respect to air quality would be required with the implementation of the City Center Alternative. Under the nonattainment new source review permitting requirements, oxides of nitrogen emission offsets at a ratio of 1:1.15 would have to be located and obtained for all stationary sources sited on EPG. Emission offsets are generally unavailable in this region and could be extremely expensive if they could be obtained at all.

4.14.3 WATER RESOURCES

Depending on the alternative selected for implementation of BRAC, up to nine subwatersheds at the post would be expected to have increases of more than 10 percent in 1-year or 10-year storm event peak discharges. A potential mitigation measure would be to develop a storm water drainage system master plan study. This study would identify current deficiencies (e.g. capacity problems, outfall problems, stream bank erosion) and determine infrastructure needs to meet BRAC requirements and long-term growth.

4.14.4 OTHER RESOURCES

No specific mitigation measures are identified for affected resources. In general, actions with respect to affected resources are protected by a variety of BMPs that preserve and conserve the resources. For example, a permit would be required under the Virginia Pollutant Discharge Elimination System program for a construction project disturbing at least 2,500 square feet; as part of the permit process, the Army would have to prepare a soil erosion and sediment control plan and storm water pollution prevention plan to guide sedimentation reduction during the construction process. BMPs typically are an inherent part of project design and implementation, and their funding is included in general project costs.

4.15 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Implementing the Preferred Alternative would result in a variety of adverse environmental effects, as detailed in Sections 4.2 through 4.13. Some of the effects could be minimized, avoided, or compensated for through mitigation, but others would be unavoidable. The principal unavoidable adverse effects on the environment are the following.

Biological Resources: Unavoidable loss of approximately 113 acres of natural habitat, including several stands of mature oak trees, to accommodate incoming BRAC actions in a manner that would best serve the military mission at Fort Belvoir.

Utilities: Unavoidable generation of about 8,410 tons of construction and demolition debris from the proposed action, which would be disposed of in various landfill sites in the area.

SECTION 5.0
CUMULATIVE EFFECTS SUMMARY

CEQ regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." In accordance with these regulations the EIS examines the cumulative effects of these types of actions on Fort Belvoir and in Fairfax County. Adverse minor effects due to cumulative activities would be expected on the varied resources in and around Fort Belvoir. Section 5.1 discusses past, present, and reasonably foreseeable future actions in the vicinity of Fort Belvoir. Sections 5.2 through 5.13 presents the effects of these actions on each resource area. Sections 5.14. discusses irreversible or irretrievable commitments of resources and short-term uses of man's environment. Section 5.15 discuses maintenance and enhancement of long-term productivity respectively.

5.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

5.1.1 Past Actions—Fort Belvoir

William Fairfax, builder of the Belvoir mansion, arrived in Virginia in the 1730s from Massachusetts. From 1734 to 1741, Fairfax assembled the property and constructed the dwelling complex at Belvoir Manor. In 1773 George William Fairfax, son of William Fairfax, left Belvoir for England. The Belvoir estate was rented and its furnishings were sold. In 1783 the mansion and several of its outbuildings were destroyed by fire, and the plantation complex gradually deteriorated into ruins. Belvoir Plantation was devastated further during the War of 1812.

The U.S. Army began using the Belvoir peninsula as an engineer training facility in 1915 when the U.S. Army Engineer School began conducting summer training exercises there. America's entry into World War I in April 1917 led to the first wave of military construction at the Virginia training site. Construction of the temporary cantonment, named Camp A.A. Humphreys in honor of Civil War Commander and former Chief of Engineers, Andrew A. Humphreys, began in January 1918 under very difficult conditions of extreme cold and unusually heavy snowfall. Some 5,000 Soldiers and 6,000 civilians cleared, surveyed, and constructed camp facilities in only 11 months. Through purchase or condemnation, the Army acquired additional acreage during 1917 and 1918. To supply the camp with building materials and other necessities, the unpaved Washington-Richmond Highway was surfaced in concrete, and a plank road was constructed that linked the camp to the Washington-Richmond Highway. Standard gauge and narrow gauge railways followed. Building these transportation systems not only facilitated deliveries to the camp, but provided engineer training experience for troops sent to the battle lines in Europe. Within only 4 months of the start of construction, Camp A.A. Humphreys was in full operation. At the end of the war in November 1918, Camp A.A. Humphreys became a demobilization center where troops were prepared for their return to civilian life. By the close of 1919, more than 14,000 men had been demobilized at Camp A.A. Humphreys. The camp retained a small garrison after the war.

The Army's commitment to the post was demonstrated by the official relocation of the Engineer School from the Washington Barracks to Camp A.A. Humphreys in 1919, thereby becoming the "home" of the U. S. Army Corps of Engineers. Following the Engineer School's move, Camp A.A. Humphreys was designated a permanent post in 1922 and renamed Fort Humphreys. An

addition to Fort Humphreys following World War I was the Engineer Board, which relocated there in 1924. The Engineer Board, forerunner of the Belvoir Research, Development, and Engineering Center, was founded in 1870 to test engineering equipment. Its establishment at Fort Belvoir marked the beginning of the installation's role in military research and development. The landscape plan adopted for Fort Humphreys also exemplified Army efforts to improve the quality of life for its personnel and the aesthetic beauty of its installations. George B. Ford, planning advisor to the War Department during the 1920s, and Howard B. Nurse, Quartermaster Corps officer, advocated creating useful and aesthetically pleasing environments that took advantage of natural vistas and used irregular lines. The results of Nurse's and Ford's philosophies are most apparent in the configuration of the officers' housing sections at Belvoir today.

In 1935 the name of the installation was changed from Fort Humphreys to Fort Belvoir. The outbreak of war in Europe in 1939 motivated the United States to begin preparing for possible involvement in the war. To prepare engineers adequately for their wartime role, Fort Belvoir once again became one of the Army's primary engineer training sites. To accommodate the influx of draftees after 1940, an additional 3,000 acres north of U.S. Route 1 were acquired to make room for the new Engineer Replacement Training Center. This included the acquisition EPG for testing of a wide range of engineering equipment. Following World War II, the engineer training role at Fort Belvoir waxed and waned according to wartime needs. In general, emphasis at Fort Belvoir in the 1950s began shifting from training to research and development. Activities on EPG dropped off after the 1950's due to commercial and residential encroachment. A detailed history of EPG can be found in Section 4.2.1.2.6. Fort Belvoir remained the home of the Engineer School until 1988. Because of a shortage of land for training at Belvoir, the Engineer School relocated to Fort Leonard Wood in Missouri, thus ending the 76-year association between the Engineer School and Belvoir.

Although its role as an engineer training center diminished after the move, Fort Belvoir continues to fulfill an important and valuable role today. The post is one of the larger installations in the MDW, which also includes Fort McNair, Fort Myer, Fort Meade, and Fort Detrick. The post's present mission is to operate and maintain the installation; execute mobilization requirements, military operations, and contingency/force protection missions; and to provide essential administrative and basic operations support to its tenant organizations. Fort Belvoir houses tenants from all armed forces, as well as such Department of Defense agencies as the Defense Logistics Agency (realigned to Fort Belvoir under 1991 BRAC Law), Defense Systems Management College and the National Geospatial-Intelligence Agency College. During this same time peroid, AMC, DCEETA, and INSCOM relocated to Fort Belvoir. Other recent actions include the ongoing Residential Communities Initiative (RCI), which involves the demolition and replacement of 1,900 homes and the renovation of 170 historically significant homes on Fort Belvoir. To carry out its missions effectively, Fort Belvoir has evolved from a traditional military installation to a more broad-based community installation. Today, Fort Belvoir functions in many ways like a small city, with its own ordinances, land use plan, building codes, utilities, public parks, and academic institutions. In addition, more than one-third of the installation's acreage has been preserved as a designated wildlife sanctuary.

5.1.2 Past Actions – Fairfax County

Fairfax County, formed in 1742 from the northern part of Prince William County, is named for Thomas Fairfax, sixth Lord of Fairfax Cameron (1693–1781), proprietor of the Northern Neck. Located near Washington, DC, Fairfax County was an important region in the Civil War. The war greatly disrupted commercial activities in the county. Both sides seized railroads and businesses, and raided and burned farms. Troops shut down business establishments depending

upon the proprietors' sympathies and the troops involved. Once the war came to an end in April 1865, the economic rebuilding of the county began quickly; but the traditional lifestyle of pre-Civil War Fairfax County never returned. In 1870 Virginia was readmitted to the Union. By that time, the economy of the county had substantially recovered from the war. Despite such growth, Fairfax County in 1870 was still mainly a rural, farm-oriented society, even while doubling its population by 1930.

The county's history from 1930 to the present is characterized as a period of growth as reflected by its population increase. The start of the shift in the county's population began in the early 1930s when Franklin D. Roosevelt's tenure as president saw increases in federal programs and bureaus. Additional employees to administer and staff the new programs and bureaus settled in Fairfax County because the automobile provided increased mobility, and the county offered a less hectic lifestyle than the inner city. The pace of growth in the county picked up in the 1940s during World War II and through the 1950s and 1960s as the federal government expanded employment to meet the war emergency, the job needs of veterans, and the creation of more programs and bureaus. By 1970 Fairfax County's total population stood at over 454,000. While federal employment growth still continued in the 1970s and 1980s, much of the county's growth during this period can be attributed to private economic interests. Because of private industry's increasing need to understand and monitor federal actions aimed at the marketplace, many corporations and industry groups began to feel a need for a presence in the Washington, DC, area during the 1970s. Encouraged by Fairfax County's growth, many firms and organizations located offices here.

Substantial growth during the past 70 years has caused broad changes in Fairfax County. The county has changed from a rural, agriculturally oriented society to an urban, business-oriented one. While this growth has altered the county's lifestyle, it has also provided county residents with one of the highest standards of living in the world. The economy has also made Fairfax County one of the wealthiest counties in the nation. It has the second highest median household income ($94,610) behind its neighbor Loudoun County (to the west) as well as the lowest homicide rate (0.3/100,000 population) of all jurisdictions in the United States. Fairfax County has an estimated population of 1,041,200, making it by far the most populous county in Virginia. The county has a total area of 407 square miles, of which 12 square miles is water and a population density of 2,455 persons per square mile. The government is the largest employer with Fort Belvoir being the county's single largest employer, and Fairfax residents make up 37 percent of employees on the installation.

5.1.3 Recent and Future Actions

The single most relevant contemporary event affecting cumulative effects analysis occurred on September 11, 2001, when terrorists hijacked U.S. airliners and flew them into buildings in New York and the Pentagon. That event led to the United States' commencement of Operation Enduring Freedom, Operation Iraqi Freedom, and the undertaking of transformation. It also affected Army doctrine concerning the provision of force protection to all military and civilian personnel. The selection of Fort Belvoir as the site for military functions within the NCR is, in large part, an outcome directly related to the events of September 11, 2001.

Other major BRAC actions in the vicinity of Fort Belvoir and the NCR include realignment of the following Department of Defense installations: Marine Corps Base Quantico in Virginia; Walter Reed Army Medical Center (WRAMC) and Bolling Air Force Base in Washington DC; and Fort Detrick and Naval Surface Warfare Center Indian Head in Maryland. Of the ones listed, WRAMC is the only closing installation. These installations were shown in Figure 1-3.

The sections that follow identify numerous other on-post and off-post actions that, in conjunction with the proposed action, have potential for creating cumulative effects.

5.1.3.1 Other Proposed Projects on Fort Belvoir

In addition to the 20 projects identified in Section 2.2.2, the Army foresees there being another 32 projects at the installation. These 32 non-BRAC projects range from small scale projects involving only renovations of existing buildings to large projects involving the construction of new sizeable structures. Chief among this latter category would be proposals such as the National Museum of the U.S. Army and associated Museum Support Center, the expansion of the Information Dominance Center, and a potential Army Reserve complex. The numerous smaller projects would occur on-post as new facilities or, in several instances, as renovations of existing facilities. Each of these projects would undergo or have already undergone their own NEPA process. A list of these 32 on-post projects can be found in Table 5-1 and their proposed locations are found on Figure 5-1.

Table 5-1
Other proposed on-post cumulative construction and renovation projects

Map number	Project number	Project title	Proposed site	Fiscal year	Size (ft^2)
1	62297	Woodlawn Connector Road[a]	Sited on forested area with forested areas on all sides	2006–2008	n/a
2	61458	Religious Education Center	Sited on semi-forested field with fields to the north, Residential area to the east, Community areas to the south and west	2010	18,000
3	64231	Physical Fitness Center (Troop Cantonment Area)	Sited on existing Community area with fields and Community areas to the north, fields and Residential area to the east, forested area and Community area to the south, Abbott Road and forested area to the west	2007	150,800
4	54897	Marina Modernization and Dogue Creek Dredging[a]	Sited on existing marina with Residential area to the north and east, Potomac River to the south, River inlet and forested area to the west	2008	6,900
5	65218	Expand Main Post Library	Sited on semi-forested field with Residential area to the north, semi-forested area to the east, Parking lots and athletic fields to the south, Community area to the west	2007	24,500
6	65314	Expand Recreation Center	Sited on existing Community area with athletic fields to the north, Belvoir Road forested area and athletic fields to the east, parking areas and Professional/Institutional areas to the south and west	2008	10,500
7	63815	Administrative Building PEO Soldier	Sited on forested area with Professional/Institutional area to the north and west, forested area to the east and south	2009	68,000

Table 5-1
Other proposed on-post cumulative construction and renovation projects *(continued)*

Map number	Project number	Project title	Proposed site	Fiscal year	Size (ft^2)
8	56184	JPRA Renovation/Addition (Building 358)	Sited on forested area with forested area to the north and west, forested area and Professional/Institutional area to the east and south	TBD	87,742
9	62539	Vet Clinic Addition	Sited on forested area and field with Warren Road and forested area to the north, forested area to the east and south, open field to the west	TBD	9,950
10	58697	Museum Support Center (MSC)[a]	Sited on semi-forested field with Route 1 and athletic fields to the north, forested area to the east, Fort Belvoir Community Club to the south, Belvoir Road and golf course to the west	2007	124,800
11	50356	Installation Industrial Support Center	Sited on field with Industrial area to the north, forested buffer and Industrial area to the east, south, and west	2010	53,000
12	59554	Battalion Headquarters for 249th Engineer Battalion	Sited on Industrial area with Pohick Road and forested area to the north Residential area to the east, forested area to the south and west	2008	14,600
13	63035	Shoppette with Gas, Burger King, Car Wash (South Post)	Sited on semi-forested field with Residential area to the north, Community area to the east, Industrial area to the south and west	TBD	7,200
14	65139	Expand Arts/Craft/Auto	Sited on a field with fields and Professional/Institutional areas to the north, semi-forested land to the east and south, forested area to the west	2008	13,000
15	n/a	D.C. National Guard (DCNG) Resources Training Center	Sited on parking area with parking area and forested area to the north, barracks to the east, vehicle storage to the south, forested area to the west	2007	20,000
16	62134	DLA Receiving and Screening Facility	Sited on field and parking lot with Kingman Road and forested area to the north, highly developed Professional/Institutional area to the west and south, forested area to the west	2007	14,800
17	65317	Golf Clubhouse/Cart Storage	Sited on forested area with golf course on north, east and west, Clubhouse to the south	2007	< 5,000
18	63206	Addition to Military Police (MP) Station	Sited on field with forested area to the north, Community buildings to the east, south, and west	TBD	< 5,000
19	55523/52694	Potomac Heritage National Scenic Trail	Sited on forested area with forested area to the north, east, and south, Residential area to the west	2007	n/a

Table 5-1
Other proposed on-post cumulative construction and renovation projects *(continued)*

Map number	Project number	Project title	Proposed site	Fiscal year	Size (ft^2)
20	57495	Soldier Support Center	Sited on fields and forested area with forested area to the north, Community areas the east and south, forested area to the west	2011	68,700
21	65141	Expand Bowling Center	Sited on South Post parking lots and athletic fields with Community area to the north, Athletic fields and Professional/ Institutional area to the east, athletic fields and community area to the south, Gunston Road and Industrial area to the west	2007	11,550
22	57837/51326	South Post Fitness Facility & Multipurpose Fields		2011	95,300
23	61453	Replace South Post Fire Station	Sited on existing fire station with semi-forested area and Gunston Road to the north, Residential area to the east, semi-forested area and Professional/Institutional to the south, forested area and field to the west	TBD	17,800
24	64742	Construct Shoppette (EPG)	Sited on forested area on EPG with mature hardwoods and young pines, scattered cleared areas, 1 active Professional/Institutional building and several abandoned buildings with tree buffer and Residential area to the north, I-95 to the east, forested area and Industrial area to the south, forested area to the west	2007	17,400
25	64230	Physical Fitness Center (EPG)		2010	70,800
26	58466	Museum of the U.S. Army Alternative Locations: (A) North Post; (B) Pence Gate[a]	*North Post*: Sited on Fort Belvoir golf course with Snyder Road and landscaped golf course to the north, Beulah Street and forested area to the east, forested area and Kingman Road to the south, residential area to the northwest, and forested area and Fairfax County Parkway to the west. *Pence Gate*: Sited on open semi-forested field with Route 1 and athletic fields to the north, forested area to the east, forested area and Professional/Institutional to the south, Belvoir Road and golf course to the west	TBD	300,300
27	n/a	DCEETA Remote Delivery Facility[a]	Sited on semi-forested field with Route 1 and athletic fields to the north, forested area to the east, forested area and Professional/ Institutional to the south, Belvoir Road and golf course to the west	2007	99,000

Table 5-1
Other proposed on-post cumulative construction and renovation projects *(continued)*

Map number	Project number	Project title	Proposed Site	Fiscal year	Size (ft^2)
28	n/a	Davison Army Airfield Flight Control Tower	Sited on existing Control Tower location with Airfield-related fields and structures in all directions	2007	n/a
29	n/a	Operations Security Evaluation Group Training Facility	Sited on forested area with forested area to the north, east, south, and west	TBD	130,000
30	n/a	Fairfax County Parkway Extension[a]	Sited on hardwood forest with forested area and Residential area to the north and west, forested area and highly developed Professional/ Institutional area to the east, forested area and Industrial area to the south	TBD	n/a
31	n/a	Information Dominance Center[a]	Sited on Professional/Institutional area with forested areas to the north and east, developed Professional /Institutional to the south and west	TBD	300,000
32	64531	PX Expansion[a]	Sited on Commercial area and forested area with forested areas to the north and south, athletic fields and a school to the east, developed commercial area to the west	TBD	186,300

[a]Projects in which compliance with NEPA has already been completed or is underway.

The Army Museum has been proposed to be located on Fort Belvoir. This action is considered in addition to the BRAC action, thus it is assessed as a cumulative effect to the BRAC action. Two sites have been identified for the Museum: a portion of the North Post golf course (the preferred site) and an area near Pence Gate on South Post.

5.1.3.2 Off-Post Proposed Projects

There are 187 off-post non-Army projects planned within 3 miles of Fort Belvoir, as shown in Figure 5-2 (Fairfax County Department of Planning and Zoning, 2006). Many of these are small in scale and would have only a negligible effect on the environment as a whole. A summary of off-post projects and a summary of land uses associated with these projects are presented in Section 4.2.1.5. Twenty projects are at least 25 acres in size and listed in Table 5-2. A complete list of the off-post cumulative projects is provided in Appendix H. There are also a number of major proposed projects outside the 3-mile area (VDOT, 2006; GWI, 2006). These include the following:

- McLane Foodservice: Construction of distribution facility (Prince William County)
- EnviroSolutions: Relocation of headquarters to area (Prince William County)
- PowerLoft: Data center under construction in new tech park (Prince William County)
- Multiple housing developments under construction in Prince William County (future projects would be postponed for one year because of a moratorium on new housing construction (Dwyer, 2006).

- Springfield Interchange (Under Construction)
- Route 123 Bridge over the Occoquan River (Under Construction)
- Woodrow Wilson Bridge (Under Construction)
- Rolling Road widening to four lanes near Old Keene Mill Road (Route 644)
- I-95/395/495 High Occupancy Toll (HOT) lanes
- Construction of a high-capacity electrical transmission line in northern Virginia by Dominion Virginia Power.

5.2 LAND USE

5.2.1 On-Post Development Not Related to BRAC

Negligible cumulative effects on land use would be expected from implementing previously planned projects for Fort Belvoir. In general, the on-post cumulative projects would be compatible with existing land use or those associated with the proposed alternatives for BRAC actions.

The Army has 32 previously planned and approved projects slated for development around the same time as the 2011 BRAC actions slated to occur by 2011. The potential total build-out gross square footage amounts to about 1.5 million gross square feet (gsf), most of it in new construction. These approved/programmed projects would appear in the planned update to the installation Master Plan.

The Museum of the U.S. Army and attendant Museum Support Center (MSC) are in the planning stages. Various sites are under consideration for both facilities. The candidate sites for the Museum include the North Post Golf Course as the preferred site and Pence Gate as the alternative site. The MSC is being considered at Pence Gate (the preferred site) and Tracy Loop on the South Post. All these sites are expected to be generally compatible with the proposed land use plan.

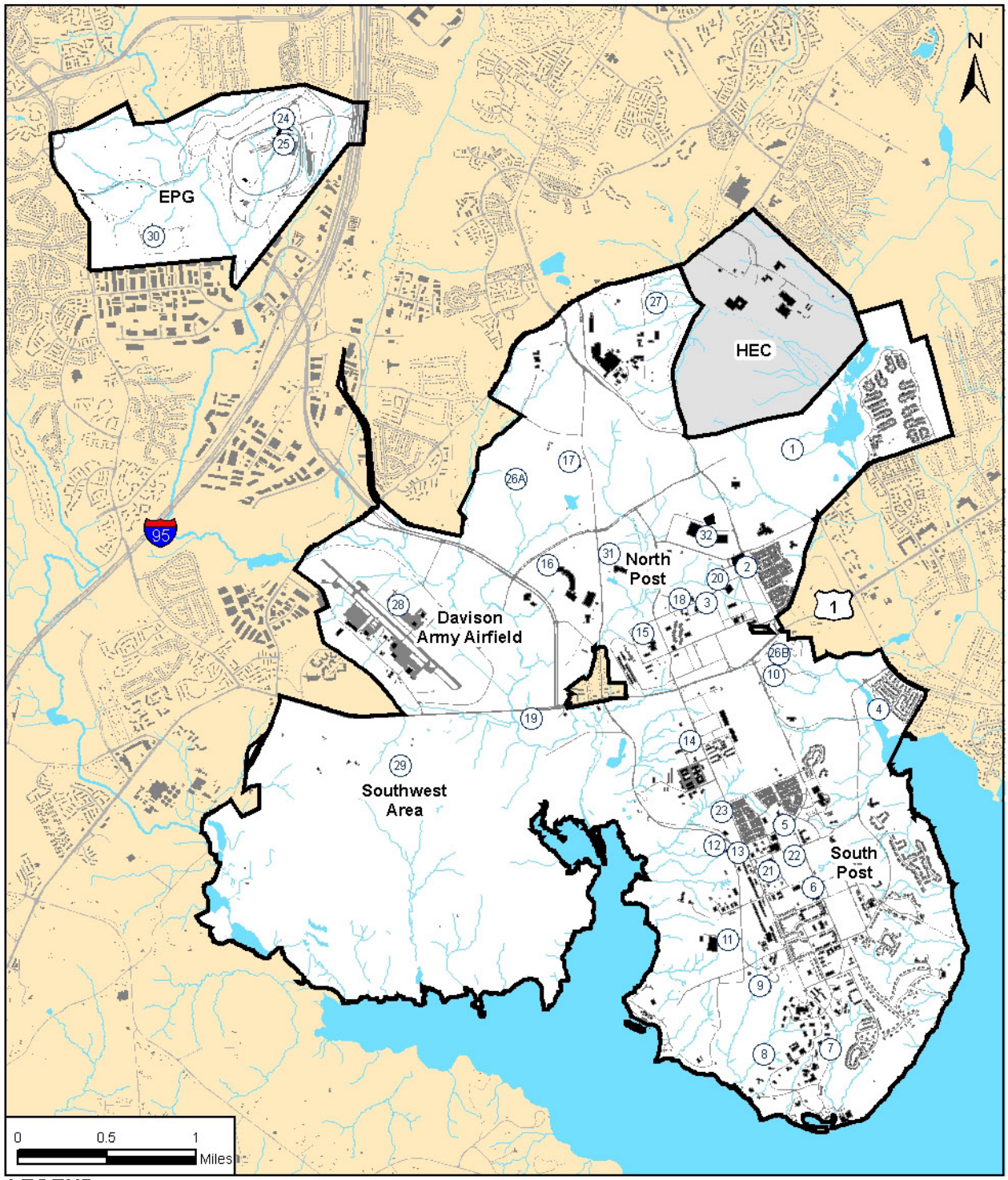
The ultimate use of EPG will not be known until the ROD for this EIS is signed, which would select a BRAC implementation alternative.

5.2.2 Off-Post Development

Negligible adverse and beneficial long-term effects on land use would be expected. The cumulative land use effects of gradual implementation of the Fairfax County Comprehensive Plan over the next 5 years would be negligible if all approved/programmed roadway improvements are realized.

The key factors that could affect cumulative land use changes for planning districts adjacent to Fort Belvoir are summarized below.

Lower Potomac District. Future developments southward along the Route 1/I-95 corridor into Prince William County are an essential component of the Fairfax County Comprehensive Plan. The most notable development in the district is the Laurel Hill planned unit development on the 3,000-acre former Lorton Prison property. This development is to be a phased operation over a decade or more and will not likely lead to changes in land use categories or cumulative effects in



LEGEND

Installation Property

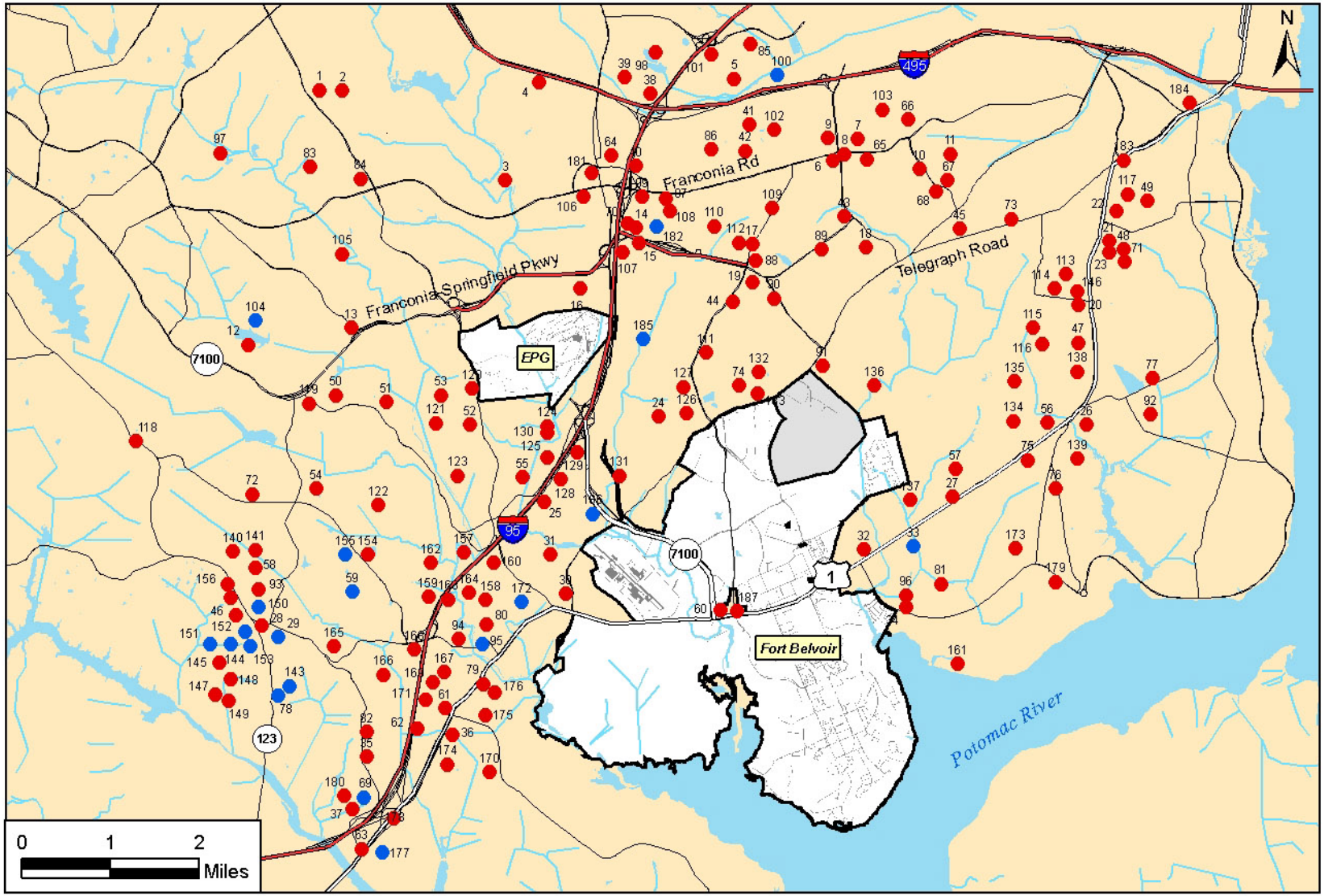
(18) Project Location

On-Post Projects for Cumulative Impacts

Fort Belvoir, Virginia

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Figure 5-1



LEGEND

- Proposed Projects < 25 acres
- Proposed Projects > 25 acres

Sources: Fort Belvoir GIS, 2006; Fairfax County GIS, 2006.

Proposed Development Projects Surrounding Fort Belvoir

Fort Belvoir, Virginia

Figure 5-2

Table 5-2
Proposed off-post projects over 25 acres within 3 miles of Fort Belvoir

Map number	Project number	Project name	Land use type	Proposed site	Total acres
29	001183-SP-011-2	Laurel Hill Golf Course Expansion	Community	Sited on a field with Community area to the north, fields and forested area to the east, Residential area and forested area to the south and west	348.6
69	006510-SP-002-1	South Run Recreational Center Fitness Center Addition	Community	Sited on forested area with forested area and fields to the north, I-95 to the east and south, forested area to the west	182.3
185	05-IV-0S	Mixed Use Development: 1,420 Res'd Units, 262K Inst., 1.31 M Office, 1.15 M Retail, 24 Acre Pvt. Rec/Open Space Option: 2,840 Res'd Units, 524K Inst., 2.62 M Office, 2.3 M Retail, 48 Acre Pvt. Rec/Open Space	Residential, Commercial	Sited on forested area and fields with Residential area and forested area to the north and east, Commercial area to the south, I-95 to the west	160.5
33	009465-SP-002-2	Mount Vernon Country Club Golf Course Improvements	Community	Sited on golf course with Residential area to the north east and south, Residential area and forested area to the west	127.7
186	05-IV-6S	848 Office OR 556K Industrial	Professional/ Institutional or Industrial	Sited on fields with Commercial area to the north, Residential area to the east, Telegraph Road and Davison Airfield to the south, forested area to the west	117.8
144	001811-SD-001-2	Occoquan Overlook	Residential	Sited on forested area and Residential area with Residential area and forested area to the north, Residential area to the east, Industrial area to the south, and forested area to the west	100.6
182	PA-506-IV-SI	Springfield Mall—Mixed Use 2M ft^2 Retail, 1M ft^2 Office, 200K ft^2 Hotel (300 Rooms), 2,400 Residential Units	Commercial	Sited on Commercial area with Commercial and Residential areas to the north, east, and south, Commercial and I-95 to the west	82.0
153	001183-SP-006-2	South County High School	Community	Sited on forested area with forested and Residential area to the north, Residential area to the east, forested area to the south and west	69.4
172	006839-SP-004-2	Cook Inlet Residential Section Three	Residential	Sited on forested and Residential area with Residential area in all directions	60.6
155	001183-SP-012-2	Spring Hill Senior Campus	Community	Sited on field with fields to the north and east, high school to south, golf course to west	59.7
78	001183-SP-014-1	Lorton Work House (Art)	Community	Sited on former correctional facility with forested area and fields to the north, east, and south, Route 123 to the west	52.1

Table 5-2
Proposed off-post projects over 25 acres within 3 miles of Fort Belvoir *(continued)*

Map number	Project number	Project name	Land use type	Proposed site	Total acres
151	001183-SP-004-2	Laurel Hill South Landbays E And F, Section 1	Residential	Sited on forested area with Residential area to the north, forested area to the east, south, and west	48.0
59	001183-SP-015-1	Spring Hill Senior Campus Senior Housing Building	Residential	Sited on fields with fields to the north and west, correctional facility to the east and south	46.8
177	009754-SP-006-2	Gunston Commerce Center Land Bay C	Commercial	Sited on forested area with forested area to the north, fields to the east, Residential and forested area to the south, forested area and Route 1 to the west	39.9
104	005466-SD-001-2	Lakewood Hills Section 10 Phase I	Residential	Sited on forested area with Residential areas in all directions	35.1
150	001183-SD-007-2	Laurel Hill South Landbay D Section 2 (MV)	Residential	Sited on forested area with Residential and forested area to the north, south, and west, fields to the east	33.2
152	001183-SP-005-2	Laurel Hill South Landbay E And F Section 2	Residential and Commercial	Sited on forested area with Residential area to the north and forested areas to the east, south, and west	33.1
143	001100-SD-001-2	Nirvana Palace	Unknown	Sited on semi-forested area with fields to the north, east, and south, Community area to the west	30.3
100	009163-SD-006-2	Highgrove Estates Section 5	Residential	Semi-forested area with Residential area to the north, Industrial area to the east, I-495 to the south, Commercial and Residential area to the west	26.9
95	004478-SD-001-2	Adkins Property	Residential	Sited on forested area with Residential areas to the north, south, and west, Commercial area to the east	25.7

Source: Fairfax County Department of Planning and Zoning, 2006

any way associated with developments on Fort Belvoir. Master planning for the adaptive reuse of Laurel Hill is underway.

Mount Vernon District. The character of the Mount Vernon Planning District, described in Section 4.2.1.4.1, is likely to change because Fairfax County desires to intensify development on the U.S. Route 1 corridor without infringing on the historic richness of the corridor. The increased focus on the potential value on this stretch of Route 1 in the ROI meets with the approval of the Southeast Fairfax Development Corporation (SFDC) and the adjacent residential neighborhoods. Fairfax County's Comprehensive Plan recommends that vacant lots adjacent to the Fort Belvoir boundary, between Sacramento Drive and Old Mill Road, be planned for residential development at a density of 16–20 dwelling units/acre. This recommendation involves a significant planned

development density to include substantial open space and recreational areas as well as a comprehensive pedestrian circulation network.

Rose Hill District. Cumulative land use effects in Rose Hill are entirely dependent on developments in Kingstowne. There exists a considerable amount of undeveloped acreage in the planned community. Therefore, the extent of Kingstowne's contribution to cumulative land use effects is expected to be confined mainly to the roadway network that serves it and Fort Belvoir. Fairfax County's Long-Range Transportation Plan accounts for extensive planned unit development infill in Kingstowne and associated increases in daily traffic volume. The Kingstowne Community Business Center (CBC) is envisioned as a major employment center with a substantial component of high-end (Class A) office space, similar to the Reston Town Center. A future transit station area is planned near the South Van Dorn Street/I-95 interchange. Most of the planning district is slated for development as suburban neighborhoods, comprising mixed housing and supporting commercial and institutional uses. A large part of the planning district is public parkland, including Huntley Meadows, which is to be preserved.

Springfield District. The notable and major development projects within several miles of Fort Belvoir, described in Section 4.2.1.5, are clustered along the Springfield-Franconia Parkway close to inter-modal transport nodes. The other long- and short-term projects identified by the county, and SFDC are scattered throughout the district and strung out along Route 1. As long as roadway improvements are built, the Springfield District contribution to cumulative effects on land use should be negligible in this intensely developed area north and east of Fort Belvoir.

5.3 TRANSPORTATION

5.3.1 Army Museum Siting

Each of the two museum sitings will have various effects on the transportation system, as well as effects on the four land use alternatives under consideration. The sitings for the Museum are North Post Golf Course and adjacent to Pence Gate on South Post. The museum expects a total of one million visitors annually, or a peak of 4,000 visitors in a day. The museum also has a staff of approximately 150 people. To quantify the effects of the museum on the transportation system, trip generation and mode split need to be developed for site traffic. Typical museums have the majority of their visitors on the weekend and do not generate visitor traffic during the morning peak period but are open for a portion, if not all, of the evening peak period. Thus, a museum would likely generate only staff trips during the morning but include both staff and some visitor trips in the evening. Table 5-3 presents the assumptions and expected trips generated during the AM and PM peak hours.

A large percent of visitor arrivals to a museum occur via buses (tour, school, or public transit), and this trend is also assumed for the Army Museum. It is expected that an approximate total of 50 vehicles trips would occur during the AM peak hour. This volume is insignificant to the traffic flows along the Fairfax County Parkway or Route 1, which would be the primary access points to the museum site. The expected traffic volumes generated by the site would be approximately 300 to 320 vehicles in the PM peak hour. Thus, the effect during both peak periods would be minor with no significant effects, provided the mitigation measures to the transportation system identified for each of the land use alternatives were implemented. Truck traffic destined to the museum site, such as delivery trucks, would likely occur outside the peak periods, so the effect on traffic flow would not be significant.

Under the proposed siting of the Museum on the North Post golf course, several access plans have been proposed from the public roadway system. First, an access could be provided off of Fairfax County Parkway between John J. Kingman Road and Telegraph Road. This new intersection would, however, likely not be possible due to the spacing of these adjacent roadways. Also, the Fairfax County transportation plans call for upgrading intersections along the corridor to interchanges, thus continuity of the corridor would be disrupted with a signalized intersection between the two new interchanges. Alternatively, access to the Museum site could be located along John J. Kingman Road; this location would place the access near the entrance to the DLA building and Kingman Gate. Security issues could arise under this configuration, which may require some additional improvements.

The proposed siting of the Museum on South Post is near Pence Gate, along the east side of Belvoir Road. This site is directly across the street from the proposed Hospital siting under the Preferred Alternative. Additional improvements may be needed along Belvoir Road.

Table 5-3
Peak hour vehicular trips for museum

	AM peak hour	PM peak hour
Employees	150	150
% Employees absent	5%	5%
Daily reporting employees	143	143
Employee trips occurring in the peak hour	40%	38%
Peak hour employee trips	57	54
LOV person (employee) trips (88%)	50	48
HOV person (employee) trips (8%)	5	4
Transit person (employees) trips (3%)	2	2
Other (1%)	1	1
Vehicle trips (employees)	47	45
	AM peak hour	**PM peak hour**
Daily Visitors	4,000	4,000
Visitors trips occurring in the peak hour	0	33%
Peak hour visitors trips	0	1,333
LOV trips (10%)	n/a	133
HOV person trips (30%)	n/a	400
Transit person trips (58%)[a]	n/a	773
Other (2%)	n/a	27
Vehicle trips (Visitors)	0	246
Bus trips (Visitors)	0	20
Total site trips	47	311

[a] Includes tour buses, school buses, and public transit

5.3.2 Other Project Sitings

Many of the other on-post cumulative projects are modernization and renovation projects or projects that would relocate activities within the existing developed area of the Main Post. The PX Expansion project would likely generate more trips due to increased services; however, these trips would be drawn from the existing clientele and would occur outside of the peak periods of travel. Taken together, they would be expected to have negligible effects on Fort Belvoir area

traffic no matter which BRAC alternative would be implemented. Any impacts on the transportation network that are associated with the off-post projects (see Section 5.1.3.2) would be mitigated through roadway improvements by the developers. As the No Action Alternative baseline assumed Year 2011 conditions, those off-post developments and associated impacts are already incorporated into the transportation analysis. The MWCOG regional travel demand model and Round 7 Cooperative Land Use Forecast were used to develop future traffic volumes used in the analyses. The land use within the Round 7 data also accounts for future growth.

5.4 AIR QUALITY

The proposed cumulative projects would have minimal long-term adverse effects on the region's air quality. Other construction and development projects would occur within the National Capital Region (NCR), and each of the projects would produce some measurable amounts of air pollutants. The effects of all past, present, and reasonably foreseeable projects in the region and associated emissions are taken into account during the development of the State Implementation Plan (SIP). This includes all on- and off-post projects including National Museum of the U.S. Army. Estimated emissions generated by all the alternatives would conform to the SIP. Therefore, by definition, the net effects of the BRAC action at Fort Belvoir in addition to all other collectively identified cumulative projects would not contribute to significant adverse cumulative air quality effects.

The Metropolitan Washington Council of Governments (MWCOG), along with the NCR Transportation Planning Board, are responsible for developing conformity demonstrations for transportation plans and programs within this area. This includes all planned transportation projects in the region. The Transportation Improvement Program (TIP) and Constrained Long Range Plan (CLRP) for the Washington Metropolitan Region contain a list of all proposed transportation projects to be built in the region. The transportation conformity demonstration for these plans evaluates the ability of the transportation project inventory contained in the TIP and CLRP, emission controls, and subsequent mobile emissions budget ability to comply with the SIP. Because the 2005 BRAC action at Fort Belvoir is not an approved transportation project, transportation conformity is not required. Vehicle emissions were included in the emission estimations and in the general conformity demonstration. It would be necessary for MWCOG to include the changes in vehicle patterns for all actions in the region when developing the new TIP and CLRP.

5.5 NOISE

No long-term effects on noise would be expected. Implementing any of the alternatives would have negligible ongoing or cumulative effects on the noise environment because of construction or changes in traffic in or around the site. The construction activities associated with these alternatives would be temporary in nature and the current noise environment would return after the projects' completion. The past, current, and reasonably foreseeable noise environment in and around the proposed site is dominated by existing and future traffic noise without the Preferred Alternative. The change in noise for all New Source Reviews (NSRs) and all alternatives would be below *barely perceptible* levels from future noise environments under the No Action Alternative. The No Action Alternative includes naturally occurring future growth in traffic because of other activities in the area. This estimated growth would be due to the on- and off-post projects outlined above including the National Museum of the U.S. Army. In addition any transportation upgrades would more than likely improve traffic flow and traffic noise impacts. This approach naturally takes into account cumulative changes in the noise environment.

5.6 GEOLOGY AND SOILS

Past, present, and reasonably foreseeable projects proposed for Fort Belvoir and the immediate vicinity could result in localized changes to topography and minimal effects on geology. Soils in the area would undergo short- and long-term to permanent impacts depending on the nature of the disturbance.

Overall, the topography of Fort Belvoir and the surrounding area would not change as a result of any of the BRAC-related projects in concert with previous or reasonably foreseeable actions. The area's plateaus and drainages will remain intact. Minor and localized changes would occur as a result of any construction project that involved leveling the ground; however, the extent of these changes would not produce cumulative effects.

The geology of the area would not experience adverse cumulative effects. The construction of roads and infrastructure on EPG under the Preferred Alternative and City Center Alternative combined with the Fairfax County Parkway extension may require some blasting of the bedrock and removal or burial of unconsolidated geologic materials. However, because of the of the nature and depth of bedrock, none of these activities would be expected to influence the geology of the area.

Soils throughout the project area would undergo short- and long-term adverse cumulative effects. Urban and Cut and Fill soils have already been affected by development so in cases of redevelopment the impact to these soil types has already occurred. With native soils the effects related to construction would generally be minor and generally limited to the areas directly disturbed by those activities. The Museum of the US Army, its Support Center and the Fairfax County Parkway extension would all result in the permanent loss of the soil resource directly under the impervious surfaces. However, portions of these projects would occur on soils previously affected (Urban soils) and impacts to native soils would be localized.

Short-term effects would result from temporary disturbances such as the installation of utility lines associated with most development projects. These activities would result in effects such as a temporary loss of soil productivity and the potential for introducing noxious species. Short-term secondary and indirect effects could result from an increase in the amount of sediments carried to the local creeks and streams in storm water runoff. Short-term adverse effects would be controlled by implementing the Commonwealth-required standard erosion control BMPs that have been developed to minimize the amount of sediment carried off construction sites. Slope stabilization would further reduce adverse effects over the long term.

Off-post past, present and reasonably foreseeable projects would have similar types of impacts as those described above for on-post projects except over a broader scale. None of the projects considered in the cumulative impacts analysis are likely to contribute to a significant cumulative impact in terms of topography or geology. Likewise, assuming that regulatory requirements are followed, the soil resource should experience localized effects that would be both short- and long-term.

It should be noted what could be considered a significant cumulative effect on the soil resource has already occurred, that being the general loss of the applicability of the prime and unique farmland designation. While the characteristics of these highly productive soils remain in place until directly impacted, the agricultural setting in Fairfax County has been lost through continued progression of the suburban landscape. The prime and unique characterization does not apply to soils occurring outside of an agricultural context such as those in suburban Fairfax County. The

current and reasonable foreseeable future activities would not have a bearing on this loss due to the degree of development that has already occurred.

5.7 WATER RESOURCES

Minor adverse long-term effects on water resources would be expected due to cumulative actions. Various other on-post and off-post proposed development projects in the vicinity of Fort Belvoir would potentially increase storm water runoff from paved surfaces and nonpoint source pollutants (e.g., sediment, nutrients, petroleum hydrocarbons) in the area. All identified projects within the watersheds that drain Fort Belvoir are listed in Table F-3 in Appendix F (i.e. the Army Museum is considered with other non-BRAC projects and is located in the Accotink Creek Watershed) and Table F-4 lists projects situated in other watersheds not included in the cumulative effects analysis.

A cumulative effects analysis was conducted using Generalized Watershed Loading Model (GWLF) to estimate potential changes in average annual flow volume and pollutant loads as a result of the change in impervious surface area in each watershed. Separate watershed models were developed for Accotink Creek, Pohick Creek, and Dogue Creek. A fourth watershed model was developed to incorporate direct drainage areas (watershed areas that flow directly into Gunston Cove, Accotink Bay, Pohick Bay, and the Potomac River). The percent change in average annual flow volume and nutrient loading in the forms of Total Nitrogen (TN) and Total Phosphorus (TP) for each watershed are presented in Table 5-4.

Table 5-4
Cumulative percent increase in flow volume, TN, and TP loads

Watershed	Percentage increase in average annual flow volume	Percentage increase in TP	Percentage increase in TN
Accotink Creek	5%	4%	5%
Direct drainages	5%	1%	2%
Dogue Creek	6%	2%	6%
Pohick Creek	3%	3%	4%

As shown in the table, increases in flow volume and nutrient loadings are not expected to be significant at the watershed scale. Appropriate required storm water management designs would be expected to minimize the adverse effects of increased storm water and nonpoint source pollutants, and additional mitigation measures that permit infiltration are recommended for implementation on a watershed basis to limit cumulative effects to waterbodies within these watersheds and receiving waters downstream.

5.8 BIOLOGICAL RESOURCES

Long-term moderate adverse cumulative effects would be expected. Cumulative natural resource effects of the proposed on-post non-BRAC projects such as the Army Museum would generally affect the central area of the North Post, the North Post golf course, and the South Post similarly under all the alternatives. On other areas of the Main Post, cumulative projects would have a similar level of effect under the Preferred Alternative and all other alternatives. Proposed on-post non-BRAC projects and off-post projects would further diminish the availability of forest and

field habitats on and off the installation, and increase the possibility of occurrences of invasive species, edge effects on habitats, and habitat fragmentation under the Preferred Alternative and all other alternatives.

Non-BRAC projects proposed on the eastern half of EPG would likely have little cumulative effect because they would be located in an area that would be developed under the alternatives considered in the EIS. The on-post non-BRAC project on the western half of EPG, the Fairfax County Parkway extension, could disturb habitat for the small whorled pogonia and could, through edge effect, soil erosion, and habitat fragmentation, diminish the value of the habitat where the species is found on western EPG. The project could also reduce the amount of habitat of one or more Partners in Flight (PIF) species and directly or indirectly affect wetlands. In addition, clearing and grubbing of about 36 acres on EPG as part of on-going environmental corrective action activities have reduced the amount of habitat on EPG. These effects by themselves would be of some concern because of the status of EPG as a vestige of natural area in an otherwise highly developed region.

5.9 CULTURAL RESOURCES

Long-term minor adverse effects on cultural resources would be expected. Adverse visual effects on national, state, and county registered historic properties both on- and off-post would occur under each of the alternatives. These effects would be in addition to other modern developments that have already visually affected those properties. Increasing urbanization in the surrounding cities and counties, as exhibited by past and proposed future projects surrounding Fort Belvoir and proposed developments on Fort Belvoir, would likely contribute to more visual effects on these historic properties. Although the adverse visual effects from the individual BRAC projects would be mitigated to a minor level of significance, the additional visual effects from the BRAC projects, when added to existing and future visual effects would have long-term minor adverse cumulative effects to these historic properties.

Direct adverse physical effects would occur to archaeological sites under each of the alternatives. The nature of the effects is the same from one alternative to the next. Mitigation measures common to all the alternatives would reduce the effects to a minor level. Other projects both on- and off-post would also likely result in adverse effects to archaeological sites in the region. Some of these effects would be mitigated to a minor level through compliance with Section 106 of the NHPA and 36 CFR Part 800. The addition of effects from the BRAC projects on archaeological sites would be incremental and minor.

5.10 SOCIOECONOMICS

5.10.1 Economic Development

Short- and long-term beneficial and adverse cumulative effects would be expected. The past action of the establishment and continued operation of Fort Belvoir continues to have positive effects on the local economy. The proposed realignment action would add to these beneficial economic effects by generating employment, income, and business sales in the ROI from construction and operation of the proposed new facilities. There are numerous other projects (in progress or planned for the future) on Fort Belvoir and in the ROI that could have short- and long-term effects on the local economy. On-post projects include (but are not limited to) the National Museum of the U.S. Army and the Museum Support Center, a physical fitness center in the Troop Cantonment Area and on EPG and a South Post fitness facility, modernization of the marina, expansion of the Main Post library, a shoppette on the South Post, a Soldier Support

Center, an addition to the MP Station, and replacement of the South Post Fire Station. All of the proposed on-post cumulative projects are listed in Table 5-1. Projects in the ROI include, but are not limited to, ongoing development of the Lorton Town Center, housing development in Laurel Hill and Lorton, reconstruction of the I-95/I-395/I-495 interchange, improvements to Route 1, plus numerous other residential and commercial developments and transportation projects (see Table 5-2 and Section 5.1.3.2).

These proposed projects in and of themselves would have short- and long-term beneficial economic effects in terms of employment, income generation, and business sales. There would be short-term beneficial effects from the construction projects and long-term beneficial effects from the continued operation, maintenance, and use of the facilities, businesses, and houses. Population would increase as workers move to the region to fill jobs. The increase in population would increase the tax base, would increase demand for services and infrastructure, ultimately resulting in long-term increases in the types and amounts of infrastructure and services available in the ROI. The backfilling of office space vacated by the agencies moving to Fort Belvoir could create a change in regional employment. For example, Arlington County has established a task force to plan for the redevelopment of Crystal City, hoping to attract a more diverse group of businesses (Gowen, 2006). Redevelopment of vacated sites would create jobs and income, and businesses moving in could shift jobs within the region and create new jobs.

Adverse cumulative effects would occur because of the overlapping time frames for construction activities of the Proposed Action and ongoing and future projects, with the adverse effects resulting from possible construction labor and material shortages. There would be a demand for skilled building contractors (residential, industrial, and commercial), heavy and civil engineering construction contractors (for construction of roads and sewers), and specialty trade contractors (carpenters, painters, electricians, plumbers, inspectors). Lack of skilled labor could result in poor workmanship, project delays, and cost increases. Material shortages (e.g., wood products, cement, aggregate) would also lead to delays and cost increases. Over time, new workers would come in to the construction industry to fill job vacancies. Adverse effects also could result from the sustained demand from the increased population on the region's infrastructure (transportation, utilities, housing, and public services such as police, fire, and medical, public schools, and recreation) and the local economy's ability to expand to meet the demand. Price increases or declines in service could result if there is a lag as the economy responds to the new demand by increasing the supply of goods and services.

5.10.2 Sociological Environment

Long-term beneficial and adverse effects would be expected on police, fire, and medical services, schools, housing, family support and social services, shops, services, and recreation. Details on each are discussed below.

Police, Fire, and Medical Services. Long-term beneficial effects would occur on on-post police and fire services. Fort Belvoir's new facilities and increased population would require additional police, fire, and medical service facilities and personnel to maintain level-of-service and emergency response time. In addition to the BRAC projects of building and staffing an emergency services center on EPG and the new hospital and dental clinic on the South Post, under separate actions Fort Belvoir would build an addition to the Military Police station and replace the South Post fire station. These would provide adequate facilities, proper equipment, and sufficient staff to protect and serve the installation's new buildings and increased population.

Adverse effects could occur to off-post police, fire, and social services. Population projections indicate continued population growth for the ROI. The increases of individuals in the area would require increases in law enforcement, fire protection, medical, and social services. These services would be based on the number of long-term residents in the ROI and tax-based income. Declines in service could result if there is a lag in response to the increased need for these services.

Schools. Long-term adverse effects would be expected to occur on off-post schools. Continued regional population growth would increase primary and secondary school age enrollment. Many school districts in the ROI have schools operating at or above capacity. Portable classrooms are used to provide sufficient classrooms space for the students to maintain student-to-teacher ratios and small class sizes. Although the increased population base would provide education funding through taxes, having sufficient funds to meet the needs of enrollment growth, building new schools, hiring new teachers and other support staff such as guidance counselors, teacher salary agreements, and instructional materials continues to be a challenge because of budget constraints and the rising cost of education.

Family Support, Shops, Services, and Recreation. Long-term beneficial and significant adverse effects would be expected. Fort Belvoir's increased population would increase demand for shopping, service, and recreational facilities. In addition to the BRAC associated projects of building two new CDCs, a parking facility, and a family travel camp, other proposed on-post, non-BRAC projects include an expanded PX/commissary; a religious education center; two physical fitness centers on Main Post; modernization of the marina; expansion of the recreation center; a shoppette on the South Post with a gas station, fast-food restaurant, and car wash; expansion of the arts and crafts and auto crafts facilities; a new golf clubhouse; expansion of the bowling center; a scenic trail; a shoppette and a fitness center on EPG; and the Army Museum and Museum Support Center. All of the proposed on-post cumulative projects are listed in Table 5-1. These proposed actions, in addition to the BRAC actions, would result in long-term beneficial effects by providing additional shops, services, and recreation facilities to support and serve the installation's increased population.

Long-term significant adverse effects on Fort Belvoir's MWR recreation program would occur from the construction of the Army Museum and the Museum Support Center. If the museum would be constructed on the North Post golf course site, Fort Belvoir would lose a portion of this golf course, in addition to the South Post golf course as the hospital is sited there under the Preferred Alternative. In total, Fort Belvoir could lose about 60 percent of its golf course fairways, which would result in significant losses to the MWR NAF from lost revenue and undepreciated fixed assets. The Museum Support Center would eliminate one baseball field and one t-ball field used in the Fort Belvoir youth sports program, degrading the quantity and quality of youth programs offered to Soldiers living on-post. Overall, the loss of these MWR programs and facilities would reduce the quality of life for Soldiers, retirees, and their families.

5.11 AESTHETICS AND VISUAL RESOURCES

Minor adverse and beneficial effects on aesthetic and visual resources would be expected. The proposed on-post project with the largest cumulative aesthetic effect, the Museum of the U.S. Army, has two possible sites. The possibilities are the North Post golf course and the Pence Gate site on the eastern side of South Post just south of Route 1. Each site placement would have a moderate effect on aesthetics because of the size of the proposed structures, although the golf course siting would have more of an effect because of the high aesthetic integrity of the current land use. Other major changes would occur along Abbott Road on the North Post, the northeast portion of North Post, and in the Southwest Area. The building of the Operations Security

Evaluation Group Training Facility on the Southwest Area would have a moderate effect on the area because of the current forested conditions of the area, although it would be relatively secluded. The proposed Woodlawn Road replacement would have a moderate effect because of the high aesthetic integrity of the land it would pass through. Short-term adverse effects resulting from construction activities from cumulative projects would be expected to be similar to that of the Preferred Alternative. In general, the smaller buildings and additions would have a negligible adverse aesthetic change once construction is complete. The larger structures would have a more noticeable effect because of their size. Also, structures sited on areas with less development would have more of an effect on aesthetic integrity. Thus, the proposed facilities with the least effect on aesthetic integrity would be small structures sited on existing developed areas and proposed facilities with greater effect would be large structures sited on undeveloped areas.

Despite the large number of proposed off-post cumulative projects, there would not be a significant amount of aesthetic effects. The off-post portion of Fairfax County in the vicinity of Fort Belvoir, as a whole, has a large amount of development, which includes large areas of residential and commercial development along I-95 and U.S Route 1. The existing development makes the addition of these cumulative projects result in a minor effect on the aesthetic integrity of this portion of Fairfax County.

5.12 UTILITIES

Minor short- and long-term adverse cumulative effects would be expected. Implementing the Preferred Alternative would result in short-term disconnections and reconnections of all buried and aboveground utility systems during the construction phase on- and off-post as required. Activities resulting from the BRAC action and other on- and off-post development projects such as office buildings, shops, and housing complexes would result in additional building space requiring utility services, thus resulting in a cumulative increase in demand on the existing utility infrastructure. This would require existing private and public providers of utility services in the area to increase the quantity of utility services provided to meet the demand from users directly and indirectly associated with Fort Belvoir and its surroundings. These entities must review and revise the existing short- and long-term projections for providing adequate and reliable utility services for the area in the future.

To provide the required level of electricity supply at the EPG site, Dominion Virginia Power will need to upgrade its existing off-site capacity significantly. Timely action is necessary in order to plan, obtain the required permits and rights-of-way easements to ensure uninterrupted electricity supply to Fort Belvoir and the surrounding community at large.

The Energy Policy Act of 2005 (Public Law 109-58—August 8, 2005) stipulates that energy consumption per gross square foot of the Federal Buildings in fiscal years 2006 through 20015 be reduced in comparison to the base year of 2003. The percentage reduction required in 2006 is 2 percent from the baseline consumption and 20 percent in 2015. This required reduction will mitigate some of the cumulative effects of the above on- and off-post construction.

The Preferred Alternative, together with on-post construction and renovation projects planned in the near term at Fort Belvoir and off-post projects would generate additional quantities of construction and demolition debris (CDD) and result in cumulative reduction of the lifespans of local area landfill sites.

For the list of projects proposed in the near term, approximately 1.5 million square feet of building space would be constructed, generating a total of approximately 3,400 tons of CDD.

With the Army's stipulated policy requirement of recycling 50 percent of CDD, an estimated 1,700 tons of CDD would be generated over an estimated construction period of 4 years. This would result in disposing of 425 tons of CDD per year or 35 tons per month to local area landfill sites. The total volume of CDD generated as a result of the BRAC action and the proposed on-post cumulative construction and renovation projects would amount to 2,528 tons (2,103 tons from the Preferred Land Use Alternative plus 425 tons from cumulative projects) per year or 210 tons (175 tons from the Preferred Land Use Alternative plus 35 tons from cumulative projects) per month. CDD from the BRAC action, on- and off-post construction and renovation projects would result in a cumulative reduction in the lifespan of the area landfills.

5.13 HAZARDOUS SUBSTANCES AND HAZARDOUS MATERIALS

Minor short-term and long-term adverse cumulative effects would be expected. Short-term cumulative effects would be expected from the increased use of petroleum during construction. Construction would adhere to OSHA and EPA guidelines to minimize the risk of spills. Minor long-term adverse effects would be expected from the increase in generation of hazardous and solid waste generated as more people would work at Fort Belvoir and the surrounding area.

5.14 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitments of resources are related to the use of nonrenewable resources and the effects that use of such resources would have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time. Irretrievable resource commitments involve a loss in the value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species).

Construction of facilities and subsequent operations at Fort Belvoir would involve irreversible commitments of common resources to build structures (i.e., sand and stone). The Army would use energy during both construction and operations. Relative to societal demands for such resources, neither of these commitments would be significant. Implementing the Preferred Alternative would not involve irretrievable commitments of resources.

5.15 SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term uses of the biophysical components of man's environment include direct construction-related disturbances and direct effects associated with an increase in population and activity that would occur over a period of less than 5 years. Long-term uses of man's environment include effects occurring over a period of more than 5 years, including permanent resource loss.

Several kinds of activities could result in short-term resource uses that would compromise long-term productivity. Examples of such actions that affect long-term productivity are filling of wetlands or loss of other especially important habitats, conversion of prime or unique farmlands to nonagricultural use, and consumption of high-quality water at nonrenewable rates.

Implementing the Preferred Alternative would not be expected to materially affect maintenance and enhancement of cumulative long-term productivity. Construction and operation of facilities at Fort Belvoir would affect several resources, including air quality, traffic, and storm water runoff. On-post construction projects would respect management measures in the installation's INRMP, ICRMP, and other management plans designed to protect and conserve environmental resources.

Environmental effects would occur at discrete locations, and they would be of a nature that generally would not affect long-term productivity.

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SECTION 9.0
ACRONYMS AND ABBREVIATIONS

AAFES	Army and Air Force Exchange Service
ABWR	Accotink Bay Wildlife Refuge
AC	Administrative Closure
ACHP	Advisory Council on Historic Preservation
ACM	asbestos containing materials
ACP	Access Control Point
ACS	Army Community Service
ACSIM	Assistant Chief of Staff for Installation Management
ADNL	A-weighted day night average sound level
ADT	Average Daily Traffic
AFB	Air Force Base
AHERA	Asbestos Hazard Emergency Response Act of 1986
AHPA	Archaeological and Historic Preservation Act
AKO	Army Knowledge Online
AIRFA	American Indian Religious Freedom Act
AMC	Army Materiel Command
APE	Area of Potential Effect
APM	Asbestos Program Manager
AQCR	Air Quality Control Region
AQCR 47	National Capital Interstate Air-Quality Control Region
AQCR 225	State Capital Intrastate Air-Quality Control Region
AQCR 224	Northeastern Virginia Intrastate Air-Quality Control Region
AR	Army Regulation
ARPA	Archeological Resources Protection Act
ASP	Ammunition Supply Point
AST	aboveground storage tank
AT	Antiterrorism
AT/FP	Antiterrorism/ Force Protection
ATM	asynchronous transfer mode
BACT	best available control technology
BES	Baseline Environmental Survey
BMP	best management practice
BRAC	Base Realignment and Closure
BRDEC	Belvoir Research and Development Engineering Center
BRT	Bus Rapid Transit
BTU	British Thermal Units
°C	degrees Celsius
C	commercial
C-5	Neighborhood Retail Commercial District
C-6	Community Retail Commercial District
C-8	Highway Commercial District
C&D	construction and demolition
CAA	Clean Air Act
CBC	Community Business Center
CBP	Chesapeake Bay Program
CBPA	Chesapeake Bay Preservation Act
CDC	Child Development Center
CDD	Construction and Demolition Debris
CDNL	C-weighted day night average sound level
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIDC	Criminal Investigation Division Command
CIP	Capital Improvement Program
CIS	Capital Investment Strategy
CLRP	Constrained Long Range Plan
CO	carbon monoxide
CRMP	Coastal Resources Management Program
CS	Confirmatory Sampling
CTB	Commonwealth Transportation Board
CTT	closed, transferring, and transferred
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMARA	Coastal Zone Management Act Reauthorization Amendment
DA	Department of the Army
DAAF	Davison Army Airfield
DAIM	Department of the Army Installation Management
DAR	defense access roads
dB	decibel
dBA	A-weighted decibel
dBC	C-weighted decibel
dBP	Peak Level decibel
DC	District of Columbia

DCEETA	Defense Communications Electronics Evaluation and Testing Agency
DCMA	Defense Contract Management Agency
DCNG	D.C. National Guard
DD	Department of Defense (acronym used for forms only)
DDT	Dichloro-diphenyl-trichloroethane
DeCA	Defense Commissary Agency
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency
DMM	discarded military munitions
DNH	Virginia Department of Natural Heritage
DNL	Day-night average sound level
DO	Dissolved Oxygen
DoD	Department of Defense
DoDI	Department of Defense Instruction
Dominion	Dominion Virginia Power Company
DPW	Department of Public Works
DPW-ENRD	Directorate of Public Works–Environmental and Natural Resources Division
DPWL	Directorate of Public Works and Logistics
DRMO	Defense Reutilization and Marketing Office
DTRA	Defense Threat Reduction Agency
EBS	Environmental Baseline Survey
EIFS	Economic Impact Forecast System
EIS	Environmental Impact Statement
EMS	Emergency Medical Services
ENRD	Environmental and Natural Resources Division
EO	Executive Order
EOC	Emergency Operations Center
EPG	Engineer Proving Ground
EPA	U.S. Environmental Protection Agency
EQC	Environmental Quality Corridor
ERDL	Engineer Research & Development Laboratories
ERTC	Engineer Replacement Training Center
ESS	Explosive Safety Submission
EUL	enhanced use leasing
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FACEUP	Federal Agencies Chesapeake Ecosystem Unified Plan
FAR	Federal Aviation Regulations
FAR	Floor Area Ratio
FBRC-LLC	Fort Belvoir Residential Communities Limited Liability Company
FCPS	Fairfax County Public School System
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Agreement
FHWA	Federal Highway Administration
FICUN	Federal Interagency Committee on Urban Noise
FPCON	Force Protection Condition
FPPA	Farmland Protection Policy Act
FR	Federal Register
ft^2	square feet
ft/veh	feet per vehicle
FY	Fiscal Year
GCD	general conformity determination
GCR	General Conformity Rule
GIS	geographic information system
GP	General Purpose
gpd	gallons per day
GSA	General Services Administration
gsf	gross square feet
gpm	gallons per minute
GW	George Washington
GWLF	Generalized Watershed Loading Functions Model
HABS	Historic American Buildings Survey
HAP	Hazardous Air Pollutant
HEC	Humphreys Engineering Center
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HQ	Headquarters
HRR	Historical Records Review
HSP	Health and Safety Plan
HUC	Hydrologic Unit Code
HUD	Housing and Urban Development
HVAC	heating, ventilation, and air conditioning
HWMU	Hazardous Waste Management Unit
Hz	Hertz
I	industrial
I-3	Light Intensity Industrial District
I-395	Interstate 395, Shirley Highway
I-495	Interstate 495, Capital Beltway
I-6	Heavy Industrial District
I-95	Interstate 95
ICRMP	Integrated Cultural Resources Management Plan
IDG	Installation Design Guide
INRMP	Integrated Natural Resources Management Plan

INSCOM	U.S. Army Intelligence and Security Command
IPM	Integrated Pesticide Management
IPMP	Integrated Pesticide Management Plan
ISDN	integrated services digital network
ITE	Institute of Transportation Engineers
ITEC4	Information Technology, E-Commerce, and Commercial Contracting Center
JMAWR	Jackson Miles Abbott Wetland Refuge
JPRA	Joint Personnel Recovery Agency
K ft^2	thousand square feet
kV	kilovolt
L_{eq}	Equivalent Sound Level
$L_{eq}(1)$	1-hour Equivalent Sound Level
lb	pound
LAER	Lowest Achievable Emission Rate
LBP	lead-based paint
LEED	Leadership in Energy and Environmental Design
LF	Linear Feet
LID	Low Impact Development
LOS	Level of Service
LPM	Lead Program Manager
LRC	long-range component
LRT	Light-rail transit
LRTP	Long Range Transportation Plan
M ft^2	million square feet
MACT	Maximum Achievable Control Technology
MAPS	Monitoring Avian Productivity and Survivorship Program
MASC	magnetometer-assisted surface clearance
MC	Munitions Constituents
MDA HQCC	Missile Defense Agency Headquarters Command Center
MDW	Military District of Washington
MEC	munitions and explosives of concern
MEDCOM	U.S. Army Medical Command
µg/l	micrograms per liter
mg/l	milligrams per liter
µg/m3	micrograms per cubic meter
mgd	million gallons per day
MGMC	Malcolm Grow Medical Center
mm	millimeter
MMcf	Million Cubic Feet
MMRP	Military Munitions Response Program
MN	Map Number
MOE	Measures of Effectiveness
MP	Military Police
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MS4s	municipal separate storm sewer systems
MSC	Museum Support Center
MWAQC	Metropolitan Washington Air Quality Committee
msl	mean sea level
MVA	megavolt amperes
MWCOG	Metropolitan Washington Council of Governments
MWR	Army and Air Force Morale, Welfare, and Recreation
NAA	Nonattainment area
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NAF	Nonappropriated Funds
NAGPRA	Native American Graves Protection and Repatriation Act
NAICS	North American Industry Classification System
NARMC	North Atlantic Regional Medical Center
NAWQA	National Water-Quality Assessment
NB	Northbound
NBC	nuclear, biological, and chemical
NCPC	National Capital Planning Commission
NCR	National Capital Region
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFA	no further action
NGA	National Geospatial-Intelligence Agency
NHPA	National Historic Preservation Act
NIH	National Institutes of Health
NMFS	National Marine Fisheries Service
NNMC	National Naval Medical Center
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NOA	Notice of Availability
NOI	Notice of Intent
NOISEMAP	Aircraft Noise Prediction Model
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service

NRHP	National Register of Historic Places
NSPS	new source performance standards
NSR	new source review
NSR	Noise Sensitive Receptors
NVTC	Northern Virginia Transportation Commission
O_3	ozone
OB/OD	Open Burning/Open Detonation
OE	Ordnance and Explosives
OSAA	Operational Support Airlift Agency
OSACOM	Operational Support Airlift Command
OSHA	Occupational Safety and Health Administration
OTR	Ozone Transport Region
PA	Programmatic Agreements
PAH	polycyclic aromatic hydrocarbon
PAM	Department of the Army Pamphlet
PAO	Directorate of Public Affairs Office
PAT	Petersburg Area Transit
Pb	lead
PCB	polychlorinated biphenyls
pCi/L	Picocurie per liter
PCPI	per capita personal income
PDA	Physical Disability Agency
PDH	Planned Development Housing
PEO EIS	Program Executive Office, Enterprise Information Systems
PFM	Public Facilities Manual
PIF	Partners in Flight
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PMCL	primary maximum contaminate level
PM DCATS	Project Manager Defense Communications and Army Transmission Systems
PMP	Petroleum Management Program
POL	petroleum, oil, and lubricants
POTTF	Upper Potomac River segment of the Chesapeake Bay Program
POV	privately owned vehicle
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PRG	Preliminary Remediation Goals
PRS	Petroleum Release Site
PSA	Petroleum Storage Area
PSD	prevention of significant deterioration
PVC	polyvinyl chloride
PX	post exchange
R	Residential
R-1	Residential District, 1 dwelling unit per acre
R-3	Residential District, 3 dwelling units per acre
R-8	Residential District, 8 dwelling units per acre
R-20	Residential District, 20 dwelling units per acre
R-E	Residential Estate District
R&D	Research and Development
RCI	Residential Communities Initiative
RCRA	Resource Conservation and Recovery Act
REX	Richmond Highway Express Metrobus service
RFID	radio frequency identification
RMA	Resource Management Area
ROD	Record of Decision
ROI	region of influence
ROTC	Reserve Officers Training Corps
ROW	Right-of-Way
RPA	Resource Protection Area
RPMP	real property master plan
RTV	Rational Threshold Value
RV	Recreational Vehicle
SA	Secretary of the Army
SAB	Special Advisory Board
SARA	Superfund Amendments and Reauthorization Act of 1986
SAV	submerged aquatic vegetation
SB	Southbound
SCIF	sensitive compartmented information facility
SDDC	Surface Deployment and Distribution Command
SEAhut	Southeast Asia huts
sec/veh	seconds per vehicle
SFDC	Southeast Fairfax Development Corporation
sf	square feet
SHPO	State Historic Preservation Officer
SI	Site Investigation
SIP	State Implementation Plan
SM-1	Stationary, Medium Power–First Prototype nuclear power plant
SNA	Special Natural Area
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedures
SOV	Single Occupancy Vehicle
SPL	sound pressure level
SRC	Short-range component
STORET	STOrage and RETrieval

SU	standard units (units of measure for pH)
SWM	Storm Water Management
SWMU	Solid Waste Management Unit
SWPPP	Storm Water Pollution Prevention Plan
TAZ	Traffic Analysis Zone
TBD	to be determined
TBO	Total Build-Out
TBT	Tributyltin
TDMC	Transportation Demand Management Coordinator
TIP	Transportation Improvement Plan
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TMP	Transportation Management Plan
TN	Total Nitrogen
TNM	Traffic Noise Model
TOC	Total Organic Carbon
Total N	Total Nitrogen
Total P	Total Phosphorus
TP	Total Phosphorus
tpd	tons per day
tpy	tons per year
TR-55	Technical Release 55 small watershed model
TRB	Transportation Research Board
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
UFC	Unified Facilities Criteria
U.S.	United States
U.S.C.	United States Code
USACE	United States Army Corps of Engineers
USANCA	U.S. Army Nuclear and Chemical Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
VA	Virginia
VAC	Virginia Administrative Code
V/C	volume to capacity
VDCR	Virginia Department of Conservation and Recreation
VDCR-NHP	Virginia Department of Conservation and Recreation–Natural Heritage Program
VDACS	Virginia Department of Agriculture and Consumer Services
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VMRC	Virginia Marine Resources Commission
VMT	vehicle miles traveled
VOC	volatile organic compounds
VPDES	Virginia Pollution Discharge Elimination System
vph	vehicles per hour
vph/gate	vehicles per hour per gate
vphpl	vehicles per hour per lane
VRE	Virginia Railway Express
VSI	visual site inspection
VSMP	Virginia Stormwater Management Program
VWP	Virginia Water Protection
WHS	Washington Headquarters Services
WMATA	Washington Metropolitan Area Transit Authority
WRAMC	Walter Reed Army Medical Center
WWII	World War II

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