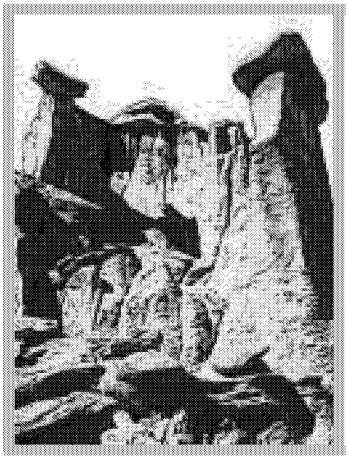
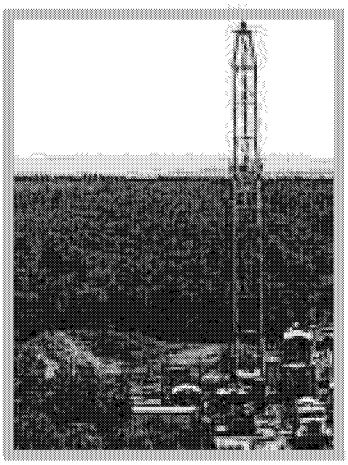
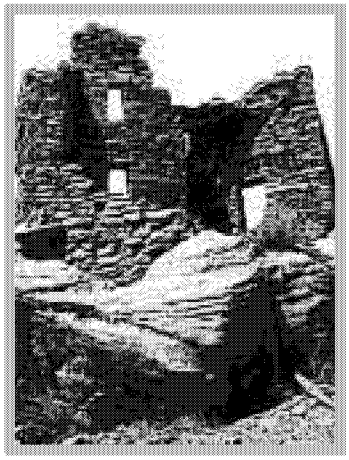
Farmington Proposed Resource Management Plan and Final Environmental Impact Statement

Volume I: Chapters 1–5







March 2003

U.S. Department of the Interior
Bureau of Land Management

Farmington Field Office
Farmington, New Mexico

BLM-NM-PL-03-014-1610

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, New Mexico 87401

IN REPLY REFER TO: 1610 (07200)

Dear Reader:

Enclosed is the Proposed Farmington Resource Management Plan (PRMP) and Final Environmental Impact Statement (FEIS). The PRMP/FEIS outlines alternatives for managing all the uses of the public lands within the Farmington Field Office (FFO) boundaries. In addition, the management of the federal oil and gas resources within the New Mexico portion of the San Juan Basin is being considered.

The Draft RMP/EIS was made available for public review and comment from June 28, 2002 to September 26, 2002. Four public hearings were held to take formal oral comments. The BLM received a total of 174 written and 46 oral comments from 196 individuals. In addition to the original comments, there were over 12,000 form letters from at least 3 different organizations that were submitted to the FFO by e-mail, facsimile, or mail. Comment documents, either oral or written, generated more than 1,500 comments. Comments were assessed and utilized in making substantive changes in the document, which strengthened the PRMP/FEIS. Appendix P of the PRMP/FEIS contains summarized comments and responses.

Air quality issues received the greatest amount of public comment. Since release of the DRMP/EIS the FFO met with the NM Air Quality Bureau (NMAQB) and Environmental Protection Agency (EPA) to discuss air quality issues. Additional air quality analysis has been conducted and is described in the PRMP/FEIS. Air quality concerns in the planning area have resulted in the formation of the Four Corners Ozone Task Force. This cooperative effort of concerned stakeholders, including federal and state agencies, local governments, industry, environmental groups and the general public is focused on developing strategies to prevent further decline in air quality in the region. BLM has a representative on the task force steering committee and will work within its authority to implement appropriate mitigation measures recommended by NMAQB and the task force.

Some reviewers commented that the Farmington Field Office prepare a regional EIS encompassing all of the San Juan Basin, including those areas in Colorado analyzed by the Southern Ute Indian Reservation Final EIS for Oil and Gas Development (SUIT) and the Northern San Juan Basin Draft EIS. This approach was considered impractical for several reasons. The SUIT and Northern Basin projects are focused entirely on oil and gas, particularly Coal Bed Methane (CBM). The Farmington RMP is a comprehensive land use plan, which addresses all uses of the public lands in the FFO. Attempting to combine the three documents would have greatly complicated the analysis for each by bringing in different issues caused by independent jurisdictions and legal responsibilities across state, county, and reservation lines, as well as Federal (USFS, EPA, FWS) regional boundaries. CBM development issues (particularly those related to water disposal and potential for coal bed fires) at the edge of the San Juan Basin in Colorado are different from those of the central basin in New Mexico. The Draft Northern Basin EIS is scheduled for release in April 2003, while the SUIT was completed in July 2002. Data and pertinent analysis presented in the SUIT were used in the cumulative analysis for the Farmington PRMP/FEIS.

The preferred alternative (Alternative D) presented in the Farmington DRMP has been brought forward, with minor modification, as the Proposed RMP. This alternative allows for full field oil and gas development in an environmentally sound manner, while minimizing surface disturbance. The amount of public land contained in Areas of Critical Environmental Concern would increase by

28,793 acres. The area of important wildlife habitat protected by timing restrictions would increase by 288, 641 acres. The area limiting OHV use to existing roads and trails would increase from 248,108 acres to 1,353,301 acres. Changes to the coal program would allow leasing by application and would address the need for coal development in areas that were not analyzed in prior planning documents.

Copies of this document have been mailed to individuals who submitted original letters or provided oral comments at public hearings, as well as appropriate state and federal agencies and local and tribal governments. In addition, copies have been sent to those persons who received copies of the Draft and requested to be on the mailing list for the PRMP/FEIS. The PRMP/FEIS is available for review at the Bureau of Land Management, Farmington Field Office, 1235 La Plata Highway Suite A, Farmington, NM 87410. The document is also available on the internet by going to the Farmington Field Office web page at www.nm.blm.gov.

BLM Planning Regulations (43 CFR 1610.5-2) state that any person who participated in the planning process and has an interest which may be adversely affected may protest. A protest may only raise those issues which were submitted for the record during the planning process. The protest must be filed within 30 days of the date that the Environmental Protection Agency publishes the notice of receipt of the Final Environmental Impact Statement. All protests must be in writing and mailed to the following address:

Regular Mail:
Director (210)
Attention: Brenda Williams
P.O. Box 66538
Washington, D.C. 20035

Overnight Mail:
Director (210)
Attention: Brenda Williams
1620 L Street, N.W.
Suite 1075
Washington, D.C. 20036

E-mail protests will not be accepted. Faxed protests will be considered as potential valid protests provided (1) that the signed faxed letter is received by the Washington Office protest coordinator by the closing date of the protest period and (2) that the protesting party also provides the original letter by either regular or overnight mail postmarked by the close of the protest period. Please direct faxed protests to "BLM Protest Coordinator" at 202-452-5112. Please direct the follow-up letter to the appropriate address above.

The protest must contain:

a. The name, mailing address, telephone number, and interest of the person filing the protest.
b. A statement of the part or parts of the plan and the issue or issues being protested.
c. A copy of all documents addressing the issue(s) that the protesting party submitted during the planning process or a statement of the date they were discussed for the record.
d. A concise statement explaining why the protestor believes the State Director's decision is wrong.

Plan approval will be documented in a Record of Decision that will be made available to the public and mailed to all interested parties. Land use plan implementation usually involves on-the-ground management actions and permitted uses which require further analysis and decision making including public involvement and allows for appeals of decisions under applicable regulations. The Farmington Field Office plans to use the PRMP as the framework for pursuing collaborative management of natural resources on public lands in the San Juan Basin. If you have any questions regarding this document, please contact Jim Ramakka, RMP Project Manager, at 505-599-6307.

Sincerely,

Steve Henke
Farmington Field Office Manager

FARMINGTON RESOURCE MANAGEMENT PLAN

AND

FINAL ENVIRONMENTAL IMPACT STATEMENT

Draft ( ) Final (X)

The United States Department of the Interior, Bureau of Land Management

Type of Action: Administrative

Jurisdiction: San Juan, McKinley, Rio Arriba and Sandoval Counties in New Mexico

Abstract: The Proposed Resource Management Plan (PRMP) and final environmental impact statement (FEIS) analyzes four alternatives for managing the public lands and resources under the jurisdiction of the Farmington Field Office, New Mexico. The administration of federal oil and gas within the New Mexico portion of the San Juan Basin is also covered. The four alternatives are: (A) Continuation of Current Management (No Action), (B) Resource Production, (C) Resource Conservation, (D) Balanced Approach. Alternative D, the preferred alternative in the Draft RMP, was selected, with minor modification, as the Proposed RMP.

The impacts of the four alternatives are presented in Chapter 4. Comments received on the Draft RMP resulted in the inclusion of additional information and clarifications. Public and agency comments are summarized in Appendix P.

For further information, please call 505-599-6307, or contact:

RMP Project Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Protests on the proposed plan must be filed within 30 days following the date that the Notice of Availability is published in the Federal Register.

Recommended:

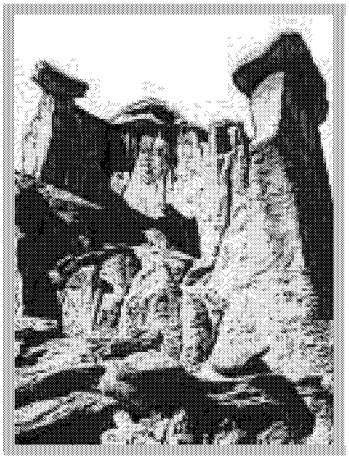
Steve Henke
Field Office Manager
Farmington Field Office

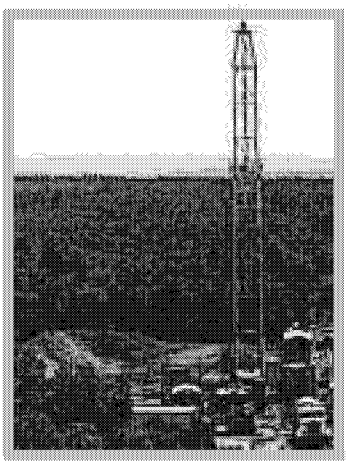
Approved:

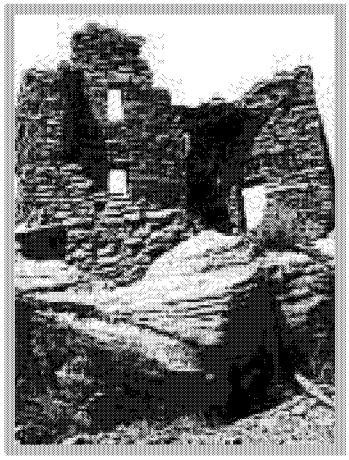
Linda S.C. Rundell
State Director
New Mexico State Office

Farmington Proposed Resource Management Plan and Final Environmental Impact Statement

Volume I: Chapters 1–5







March 2003

U.S. Department of the Interior
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Farmington Field Office
Farmington, New Mexico

BLM-NM-PL-03-014-1610

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ACRONYMS AND ABBREVIATIONS

AACL	Acceptable Ambient Concentration Level
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACRV	air quality related values
AFO	BLM Albuquerque Field Office
APD	Application for Permits to Drill
AUM	animal unit month
ATV	all-terrain vehicle
BA	Biological Assessment
BACT	best available control technology
BHP	Broken Hills Proprietary Company, Limited
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BM II	Basketmaker II
BM III	Basketmaker III
BMP	Best Management Practice
BTU	British Thermal Units
CAA	Clean Air Act
CBM	coalbed methane
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CNF	Carson National Forest
CO	carbon monoxide
COA	Condition of Approval
CRMP	Cultural Resource Management Plan
CSU	Controlled Surface Use
CWA	Clean Water Act
DEIS	Draft EIS
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ETZ	extraterritorial zone
FAR	functioning at risk
FFO	BLM Farmington Field Office
FLPMA	Federal Land Policy and Management Act
FY	fiscal year
GIS	Geographic Information System
GRTS	Glade Run Trail System
HABS	Historic American Buildings Survey
HAP	hazardous air pollutant
HMP	Habitat Management Plan
HUC	hydrologic unit code
$ISCST_3$	Industrial Source Complex Short Term
MEI	maximally-exposed individual
MLA	Mineral Leasing Act
MLE	most-likely exposure
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MSA	Management Situation Analysis
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAPI	Navajo Agricultural Products Industry
NATICH	National Air Toxics Information Clearinghouse
NEPA	National Environmental Policy Act
NF	non-functional
NHP	National Historical Park
NHPA	National Historic Preservation Act
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMAQB	New Mexico Air Quality Bureau
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMEIB	New Mexico Environmental Improvement Board
NMOCD	New Mexico Oil Conservation Division
NM Tech	New Mexico Institute of Mining and Technology
NMWQCA	New Mexico Water Quality Control Act
NMWQCC	New Mexico Water Quality Control Commission
NO_2	nitrogen dioxide
NOI	Notice of Intent
NOx	nitrogen oxides
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	Noise Sensitive Area
NSO	No Surface Occupancy
NTL	Notice to Lessee
NWA	National Wilderness Area
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OHV	off-highway vehicle
OLM	ozone limiting method
ORV	off-road vehicle
P&A	plugging and abandonment
PAC	Protected Activity Center
PAH	polynuclear aromatic hydrocarbon
PFC	Proper Functioning Condition
PI	Pueblo I
PII	Pueblo II
PIII	Pueblo III
PIV	Pueblo IV
PIF	Partners in Flight
PILT	Payment in Lieu of Taxes
PL	Public Law
$PM_{2.5}$	particulate matter 2.5 microns or less
PM_{10}	particulate matter 10 microns or less
PNM	Public Service Company of New Mexico

PRIA	Public Rangelands Improvement Act
PRLA	Preference Right Lease Application
PSD	Prevention of Significant Deterioration
REL	Reference Exposure Level
RFDS	Reasonable Foreseeable Development Scenario
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
RNA	Research Natural Area
ROD	Record of Decision
ROI	Region of Influence
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
R&PP	Recreation and Public Purposes
SDA	Specially Designated Area
SFNF	Santa Fe National Forest
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SJCC	San Juan Coal Company
SMA	Special Management Area
SMCRA	Surface Mining Control and Reclamation Act
SO_2	sulfur dioxide
SOx	sulfur oxides
SRHP	State Register of Historic Places
SRMA	Special Recreation Management Area
SRP	Special Recreation Permit
STATSGO	State Soil Geographic Database
STC	Standard Terms and Conditions
SUIT	Southern Ute Indian Tribe
SWAT	Soil-Water Analysis Tool
SWWF	southwestern willow flycatcher
TCP	traditional cultural property
TDS	total dissolved solids
T&E	threatened and endangered
TL	Timing Limitation
TSP	total suspended particulates
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USBR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
VRM	Visual Resource Management
WA	Wilderness Area
WRCS	Western Regional Corridor Study
WSA	Wilderness Study Area
WUG	Western Utility Group

MEASUREMENTS

° F	degrees Fahrenheit
bbls	barrels
Bcf	billion cubic feet
Bcfd	billion cubic feet per day
Bscf	billion standard cubic feet
dB	decibels
dBA	A-weighted decibels
gm/HP-hr	gram per horsepower-hour
gpm	gallons per minute
HP	horsepower
km	kilometer
$kWh/m^2/day$	kilowatt hours per meter squared per day
L_{eq}	equivalent sound level
Mcf	thousand cubic feet
MMcf	million cubic feet
$\mu g/m^3$	micrograms per cubic meter
mg/L	milligrams per liter
mi	miles
mi^2	square miles
mmt	million metric tons
Mscf	million standard cubic feet
ppm	parts per million
scf	standard cubic feet
TPY	tons per year
Tscf	trillion standard cubic feet

SUMMARY

The Proposed Resource Management Plan (RMP) and Final Environmental Impact Statement (EIS) for the Farmington Field Office (FFO) of the Bureau of Land Management (BLM) and cooperating federal agencies (U.S. Forest Service [USFS] and U.S. Bureau of Reclamation [USBR]) identifies the projected development of federal oil and gas reserves within the San Juan Basin in New Mexico and the proposed management direction for administration of public lands in the area administered by the FFO for the next 20 years. Located in northwestern New Mexico, the FFO is directly responsible for managing approximately 1,415,300 acres of public land and 3,020,693 acres of federal minerals in San Juan, McKinley, Rio Arriba, and Sandoval Counties. The overall planning area encompasses 8,274,100 acres.

In 1988, the FFO approved an RMP following many of the same steps that are being done now. The RMP was amended six times between 1990 and 2000. Decisions from the RMP document (including amendments) that are still valid have been carried forward into this RMP/EIS and would continue to be implemented to the extent that they are not in conflict with the direction proposed in this RMP Revision. Changes in land use demands from lessees and from the public have precipitated a revision to the RMP to evaluate impacts that would result from major changes in land use management that were not analyzed in the previous RMP and amendments.

Preparation of this document was guided by BLM planning regulations issued under the authority of the Federal Land Policy and Management Act of 1976 and federal environmental policy under the National Environmental Policy Act (NEPA) of 1969. The RMP/EIS primarily focuses on five planning issues and the decisions needed to resolve them. The issues were identified through public scoping, interviews with members of the public in the FFO area, concerns raised to BLM staff in their interactions with public land users, and resource management concerns of the BLM and cooperating agencies. The five issues are: (1) Oil and Gas Leasing and Development; (2) Land Ownership Adjustments; (3) Off-Highway Vehicle Use; (4) Management of Specially Designated Areas; and (5) Coal Leasing Suitability Assessment.

Oil and gas leasing and development is an issue primarily because of the rate of development occurring in the planning area. The EIS for the RMP Amendment (BLM 1991a), under which oil and gas activities have been conducted to date, analyzed impacts for a projection of 4,465 wells drilled in the 20-year period 1991-2011. Changes in state spacing regulations and infill drilling have revised the estimate of projected new wells on federal surface to 9,970. The surface disturbance associated with this projected increase in development would exceed the level analyzed in prior NEPA analysis.

Land ownership adjustments are conducted by the BLM to consolidate administrative boundaries when it is in the public interest. The population of San Juan County has continued to grow since the original 1988 RMP was prepared. This growth has increased the demand to make land available for urban expansion or public purposes in the tri-city area of Farmington, Bloomfield, and Aztec. The RMP revision serves to re-examine the status of lands that may be available for disposal, as well as identify lands that the BLM would like to acquire if they are made available by willing sellers.

Federal regulations (43 CFR 8342.2) require that OHV designations be accomplished through the resource management planning process. As the population of San Juan County has increased, so has the amount of OHV use on public lands along with concerns that the OHV designations established in the 1988 RMP are no longer appropriate to protect public resources. An RMP revision is necessary to re-visit OHV designations with the objective of protecting sensitive surface resources while

providing opportunities for OHV based recreation on public lands.

Prior planning efforts established a variety of Specially Designated Areas (Areas of Critical Environmental Concern [ACEC], Research Natural Areas [RNA], Special Management Area [SMA]). As time progresses, new information uncovered by inventory and monitoring efforts as well as regulatory and policy changes can identify additional lands needing special management attention. For areas to be designated as ACEC, federal regulations (43 CFR 1610.7-2) indicate the RMP process as the vehicle for analyzing proposed ACEC designations.

Coal companies have expressed an interest in leasing coal in areas that have not been analyzed since previous plans. Section 3 (3A) of the Federal Coal Leasing Amendments Act of 1976 requires comprehensive land-use planning prior to coal leasing.

These planning issues were developed partly by considering the concerns and comments from people outside the BLM and the cooperating agencies. Comments were received both in formal public scoping meetings and through public interviews conducted for the BLM in the local communities from September 2000 to April 2001. Formal consultations with tribal governments and Endangered Species Act (ESA), Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) were conducted for this planning effort. Informal consultation and coordination was carried out with other federal and state agencies and with municipalities in the area.

The FFO received over 12,000 comment documents, either in letter format via mail, e-mail, and fax, or in oral comments at public hearings. Most of these comments were submitted in form letters that contained identical text. Of the comments submitted, over 1,500 separate ones received responses that are listed in Appendix P. In response to some of these comments, changes were made to the document, now called the Proposed RMP/Final EIS. The major changes involved additional air quality modeling and the addition of a Mitigation and Monitoring section at the end of Chapter 4.

To assist the agency decision-makers and the general public in choosing appropriate solutions to the planning issues, four alternatives or combinations of management options are proposed and their impacts evaluated. These four alternatives are identified in the RMP/EIS as Alternative A—Current Management, Alternative B—Resource Production focus, Alternative C—Resource Conservation focus, and Alternative D—a Balanced Approach, which has been carried forward as the Proposed Plan. The alternatives were limited to those that span a reasonable and implementable way of managing public lands and federal minerals, while offering a broad range of potential impacts to be evaluated. All assumptions on oil and gas production potential were based on the data and projections presented in a Reasonable Foreseeable Development Scenario (RFDS) prepared for the BLM by New Mexico Institute of Mining and Technology (Engler et al. 2001).

All of the alternatives were developed to meet the intent of BLM's multiple use mission while complying with applicable laws, regulations, and policies.

Alternative A constitutes the No Action Alternative, which describes the current management of the resources affected by the planning issues and evaluates the impacts if those management practices were to continue over the 20-year planning period. Alternative A provides a baseline for comparison of other alternatives. Under all of the alternatives, resources would continue to be managed according to the Continuing Management Guidance presented in Chapter 2. Many existing management decisions that were derived from previous planning documents are incorporated into Alternative A and some would be carried forward under all alternatives. Management under all alternatives would allow for land use decisions to be responsive to changing regulations and policies.

Where there is some flexibility in management decisions, resource specialists in the FFO proposed changes that are incorporated into the other three alternatives. The Resource Production Alternative, Alternative B, attempts to resolve the planning issues while placing primary emphasis on making public land and oil and gas resources available for use and development. It was developed to evaluate the impacts of the highest amount of new well locations by assuming that there would be no commingling and little co-location of oil and gas infrastructure. Based on the history of the industry in this region, this scenario is not likely to occur to the extreme analyzed in this document, but is used as a comparison to enable the full range of surface disturbance possible and its impact on other resources. Other changes in management direction evaluated under this alternative include changes to off-highway vehicle (OHV) use designations, an increase in potential disposal areas around the tri-cities of Farmington, Aztec, and Bloomfield, a few new specially designated areas to protect natural resources, and consideration of new areas of interest for coal mining.

The Resource Conservation Alternative, Alternative C, attempts to resolve the planning issues while placing primary emphasis on protecting natural and cultural resource values. The visual resources, wilderness, wildlife, cultural resources, paleontology, threatened and endangered species, and other resource conservation-oriented programs are the focus. The goal of this alternative is to permit extraction of the mineral resources while placing limits on development activities where protection of important natural and cultural resources would be likely to be affected. Under this alternative, acreage of public land within specially designated areas would increase and have more stringent limitations on surface-disturbing activities. OHV use, areas under consideration for coal mining, and land disposal would be the most limited under Alternative C.

The Proposed Plan, Alternative D, is designed to provide balanced management direction. The goal is to resolve the five issues by providing for a combination of resource uses that would protect important environmental values and sensitive resources while also allowing development of mineral resources that provide employment and tax revenues to the region. This alternative incorporates concepts proposed in both the resource conservation and hydrocarbon production alternatives, as well as encouraging the use of new technology to lessen conflicts between the emphasis areas.

Alternative D has been selected as the Proposed Plan that would guide the future management of public lands in the FFO area. After resolution of any protests received during the 30-day protest period, the decisions about the FEIS and proposed plan will be documented in a separate Record of Decision (ROD), which has to be approved by the BLM State Director. A summary of the potential impacts that have been identified during the evaluation of each alternative is presented in the following table. The impacts identified include both adverse and beneficial effects as a basis for comparing the alternatives and for considering their environmental consequences. It is important to recognize that the following table is a summary of the most significant potential impacts identified under each alternative to enable comparison of the alternatives by the reader. Other impacts are discussed in Chapter 4 that have not been included in this section. Most of these impacts would be lessened by compliance with BLM guidelines and policy, as well as through the implementation of the mitigation measures listed at the end of Chapter 4. Definitions of terms and more complete explanations of the impacts described in this summary are included in the narrative in Chapter 4 under each resource and alternative.

SUMMARY OF POTENTIAL IMPACTS BY ALTERNATIVE

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
Watersheds			
Surface disturbance, especially bare soil on unpaved roads, is a major contributor to changes in sediment yield and the management of natural and cultural resources in a watershed. Initial short-term surface disturbance is estimated to total 13,971 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors, with 4,598 acres to be revegetated after construction. There would be approximately 358 miles of new oil and gas service roads.	Initial short-term surface disturbance is estimated to total 41,941 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors, with 13,806 acres to be revegetated after construction. There would be approximately 1,075 miles of new oil and gas service roads.	Initial short-term surface disturbance is estimated to total 31,459 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors, with 10,229 acres to be revegetated after construction. There would be approximately 797 miles of new oil and gas service roads.	Initial short-term surface disturbance is estimated to total 36,451 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors, with 10,339 acres to be revegetated after construction. There would be approximately 805 miles of new oil and gas service roads.
Minerals			
Estimated future production of gas would be affected by the number of APDs approved and the amount of reserves developed. After consideration of limitations, there would be 4,910 billion standard cubic feet (Bscf) (44 percent of potential reserves) of gas estimated to be produced during the 20-year planning period. 73 wells would be directionally drilled and 17 would not be accessible due to no surface occupancy constraints. Approximately 138,000 acres of federal minerals would be available for consideration for coal leasing after preliminary application of the unsuit-	After consideration of limitations, there would be 11,158 Bscf (100 percent of potential reserves) of gas estimated to be produced during the 20-year planning period. 84 wells would be directionally drilled and 17 would not be accessible due to no surface occupancy constraints. Approximately 378,875 acres of federal minerals would be available for consideration for coal leasing after preliminary application of the unsuitability criteria. Potential conflicts between oil and gas and coal operators are possible south of the high development oil and gas area.	After consideration of limitations, there would be 11,002 Bscf (98.6 percent of potential reserves) of gas estimated to be produced during the 20-year planning period. 195 wells would be directionally drilled and 134 would not be accessible due to no surface occupancy constraints. Approximately 378,275 acres of federal minerals would be available for consideration for coal leasing after preliminary application of the unsuitability criteria. Potential conflicts between oil and gas and coal operators are possible south of the high development oil and gas area.	After consideration of limitations, there would be 11,125 Bscf (99.7 percent of potential reserves) of gas estimated to be produced during the 20-year planning period. 145 wells would be directionally drilled and 28 would not be accessible due to no surface occupancy constraints. Approximately 378,275 acres of federal minerals would be available for consideration for coal leasing after preliminary application of the unsuitability criteria. Potential conflicts between oil and gas and coal operators are possible south of the high development oil and gas area.

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
ability criteria. Potential conflicts between oil and gas and coal operators are possible south of the high development oil and gas area.			
Soils			
The impact to soils would be an increase in soil erosion due to the increase in bare ground and unpaved roads. The amount of short-term disturbance of soils is described above under **Watersheds**. When accounting for the reclamation of plugged and abandoned (P&A) wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be over 900 acres. There would be the greatest potential for damage to soils from OHVs under this alternative due to the large acreage of open designations. Localized protection of soils would be anticipated in specially designated areas that limit OHV access and surface disturbing activities.	The impact to soils would be an increase in soil erosion due to the increase in bare ground and unpaved roads. The amount of short-term disturbance of soils is described above under **Watersheds**. When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be almost 24,800 acres. There would be much less potential for damage to soils from OHVs under this alternative due to the majority of the FFO being under limited designations.	The impact to soils would be an increase in soil erosion due to the increase in bare ground and unpaved roads. The amount of short-term disturbance of soils is described above under **Watersheds**. When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be over 18,000 acres. There would be much less potential for damage to soils from OHVs under this alternative due to the majority of the FFO being under limited designations.	The impact to soils would be an increase in soil erosion due to the increase in bare ground and unpaved roads. The amount of short-term disturbance of soils is described above under **Watersheds**. When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be over 18,500 acres. There would be much less potential for damage to soils from OHVs under this alternative due to the majority of the FFO being under limited designations.
Water			
Water usage for well drilling is estimated to be approximately 3,100 acre-feet over the planning period. Impacts to surface water quality from mineral development would result from increased erosion and sedimentation from surface disturbance during construction and bare soils on wells and roads. Localized long-term impacts from increased peak runoff rates,	Water usage for well drilling is estimated to be approximately 9,300 acre-feet over the planning period. Impacts to surface water quality from mineral development would result under this alternative from increased erosion and sedimentation from surface disturbance during construction and bare soils on wells and roads. Localized long-term impacts from increased peak	Water usage for well drilling is estimated to be approximately 6,900 acre-feet over the planning period. Impacts to surface water quality from mineral development would result from increased erosion and sedimentation from surface disturbance during construction and bare soils on wells and roads. Localized long-term impacts from increased peak runoff rates,	Water usage for well drilling is estimated to be approximately 7,000 acre-feet over the planning period. Impacts to surface water quality from mineral development would result from increased erosion and sedimentation from surface disturbance during construction and bare soils on wells and roads. Localized long-term impacts from increased peak runoff rates,

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erosion, and sedimentation are likely to result from additional mineral infrastructure and open OHV access.	runoff rates, erosion, and sedimentation are likely to result from additional mineral infrastructure. Impacts would be greatest under this alternative. The limitation of most OHV access would result in localized benefits to water resources. OHV limitations would provide a beneficial impact to water resources by reducing surface disturbance.	erosion, and sedimentation are likely to result from additional mineral infrastructure. Impacts would be greater than Alternative A, but less than Alternative B or D. The limitation of most OHV access would result in localized benefits to water resources. OHV limitations would provide a beneficial impact to water resources by reducing surface disturbance.	erosion, and sedimentation are likely to result from additional mineral infrastructure. Impacts would be greater than Alternative C and A, but less than Alternative B. The limitation of most OHV access would result in localized benefits to water resources. OHV limitations would provide a beneficial impact to water resources by reducing surface disturbance.
Air Quality			
Near-field ambient pollutant impacts due to gas production would be low, as the amount of development proposed for the alternative is the least of all alternatives. The net change in emissions (tons per year) from compressors by year 20 would be—volatile organic compounds (VOC): 744.1; carbon monoxide (CO): 12,621.7; nitrogen oxides (NOx): 13,102.7; particulate matter (PM_{10}): 5.3. The impact of greatest concern from OHV use would be the intense vehicular usage in concentrated areas adjacent to residential areas or roadways. State standards would be achieved. BLM will work with the New Mexico Air Quality Bureau (NMAQB) to ensure standards are met.	Near-field ambient pollutant impacts due to gas production would be higher than under Alternative A, as the amount of development proposed assumes maximum production. The net increase in emissions (tons per year) from compressors by year 20 would be—VOC: 2,771.5; CO: 60,462.3; NOx: 62,160.7; PM_{10}: 26.2. The State has primacy for air quality and issues permits for the larger compressors. It is possible that the 24-hour state standard for nitrogen dioxide (NO_2) could be reached or exceeded if all of the compressors identified in the RFDS were installed. FFO will participate on the steering committee of the Four Corners Regional Task Force with the NMAQB to monitor air quality and identify appropriate mitigation measures that would minimize projected impacts to air quality. State standards would be achieved. BLM will work with the NMAQB to ensure standards are met BLM will only	Near-field ambient pollutant impacts due to gas production would be higher than under Alternative A, as the amount of development proposed assumes close to maximum production. The net increase in emissions from compressors by year 20 would be 69 percent of that described under Alternative B. The State has primacy for air quality and issues permits for the larger compressors. It is possible that the 24-hour state standard for NO_2 could be reached or exceeded if all of the compressors identified in the RFDS were installed. FFO will participate on the steering committee of the Four Corners Regional Task Force with the NMAQB to monitor air quality and identify appropriate mitigation measures that would minimize projected impacts to air quality. State standards would be achieved. BLM will work with the NMAQB to ensure standards are met. BLM will only approve projects that are	Near-field ambient pollutant impacts due to gas production would be higher than under Alternative A, as the amount of development proposed assumes almost maximum production. The net increase in emissions from compressors by year 20 would be 70 percent of that described for Alternative B. The State has primacy for air quality and issues permits for the larger compressors. It is possible that the 24-hour state standard for NO_2 could be reached or exceeded if all of the compressors identified in the RFDS were installed. FFO will participate on the steering committee of the Four Corners Regional Task Force with the NMAQB to monitor air quality and identify appropriate mitigation measures that would minimize projected impacts to air quality. State standards would be achieved. BLM will work with the NMAQB to ensure standards are met. BLM will only approve projects that are

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
	approve projects that are in compliance with applicable air quality regulations. Limitations on OHV use would provide beneficial impacts in concentrated areas adjacent to residential areas or roadways to residential areas or roadways.	in compliance with applicable air quality regulations. Limitations on OHV use would provide beneficial impacts in concentrated areas adjacent to residential areas or roadways.	in compliance with applicable air quality regulations. Limitations on OHV use would provide beneficial impacts in concentrated areas adjacent to residential areas or roadways.
Upland Vegetation			
Long-term impacts to the piñon-juniper woodlands and Great Basin Desert Scrub plant communities within the high development area would result from construction of oil and gas facilities. Revegetation would not replace these plant communities during the 20-year planning period. With the least amount of surface disturbance predicted, this alternative would affect the fewest acres of vegetation (13,971 acres short-term, 9,373 long-term). The disposal of land could have negative effects on upland vegetation if new land disturbance activities were to take place after transfer. Land acquisition has the potential to have a beneficial impact on plant communities that would be placed under FFO management. The continuation of open OHV use in most of the FFO area would result in the continued degradation of upland plant communities.	Long-term impacts to the piñon-juniper woodlands and Great Basin Desert Scrub plant communities within the high development area would result from the highest acreage (41,941 acres short-term, 28,135 acres long-term) of surface disturbance for construction of oil and gas facilities. Revegetation would not replace these plant communities during the 20-year planning period. Emphasis on weed management plans and reestablishment of native vegetation would provide positive benefits. This alternative has the highest acreage that would be available for disposal, which could have negative effects on upland vegetation if new land disturbance activities were to take place after transfer. Land acquisition has the potential to have a beneficial impact on plant communities that would be placed under FFO management. The limitations on open OHV use in most of the FFO area would result in beneficial impacts to upland plant communities.	Long-term impacts to the piñon-juniper woodlands and Great Basin Desert Scrub plant communities within the high development area would result from the surface disturbance (31,549 acres short-term, 21,320 acres long-term) for construction of oil and gas facilities. Revegetation would not replace these plant communities during the 20-year planning period. Emphasis on weed management plans and reestablishment of native vegetation would provide positive benefits. Land disposal could have negative effects on upland vegetation if new land disturbance activities were to take place after transfer. This alternative has the highest acreage of land to be acquired and the greatest potential for beneficial impacts on plant communities that would be placed under FFO management. The limitations on open OHV use in most of the FFO area would result in beneficial impacts to upland plant communities.	Long-term impacts to the piñon-juniper woodlands and Great Basin Desert Scrub plant communities within the high development area would result from the surface disturbance (36,451 acres short-term, 26,112 acres long-term) for construction of oil and gas facilities. Revegetation would not replace these plant communities during the 20-year planning period. Emphasis on weed management plans and reestablishment of native vegetation would provide positive benefits. Land disposal could have negative effects on upland vegetation if new land disturbance activities were to take place after transfer. This alternative has close to the highest acreage of land to be acquired and a high potential for beneficial impacts on plant communities that would be placed under FFO management. The limitations on open OHV use in most of the FFO area would result in beneficial impacts to upland plant communities.

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Riparian Areas and Wetlands			
Beneficial impacts on riparian areas and wetlands would be derived from Controlled Surface Use (CSU) constraints on oil and gas development within approximately 2,500 acres of public land in the River Tracts SMA. However, small isolated patches of riparian vegetation that do not meet the criteria to be designated as Riparian Areas could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. Land acquisition has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas would not be included in land being considered for disposal. The continuation of limited OHV designations would be beneficial to riparian resources within River Tract Habitat Management Plan (HMP) lands. The continuation of the open OHV designation in other riparian areas could degrade riparian resources.	The proposed Ephemeral Wash Riparian Area on 7,459 acres of public land would provide additional protection to riparian and wetland areas. There would be more emphasis on acquiring inholdings within the River Tracts Riparian Area than there would be under Alternative A, which would provide additional protection to those riparian areas by applying the more stringent management prescriptions. CSU constraints in over 236,000 acres in SDAs would assist managers in avoiding riparian and wetland areas because oil and gas operations can be moved in order to minimize impacts to riparian areas and wetlands. The limitation on OHV access within designated Riparian Areas of the River Tract HMPs and the addition of the Ephemeral Wash Specially Designated Areas containing approximately 7,000 acres of public land would have a beneficial impact by protecting them from damage caused by OHV travel. The continuation of OHV traffic in dry washes could degrade small isolated patches of riparian vegetation that do not meet the criteria to be designated as Riparian Areas.	NSO constraints on oil and gas development within the 100-year floodplain of Ephemeral Wash Riparian Area and CSU constraints within most of the 10,000 acres of public land in the River Tracts and Ephemeral Wash Riparian Areas would reduce impacts to riparian and wetland areas. Impacts would be less than under Alternative B and more than under Alternative A. Land acquisition has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas would not be included in land being considered for disposal. The limitation on OHV access within designated Riparian Areas and the expansion of these areas to include an additional 7,000 acres of public land would have a beneficial impact by protecting them from damage caused by OHV travel. The elimination of OHV traffic in dry washes could benefit riparian vegetation outside designated Riparian Areas, as would the limited OHV designations in most of the FFO.	NSO constraints on oil and gas development within the 100-year floodplain of Ephemeral Wash Riparian Area and CSU constraints within most of the 10,000 acres of public land in the River Tracts and Ephemeral Wash Riparian Areas would reduce impacts to riparian and wetland areas. Impacts would be less than under Alternative B and more than under Alternatives A and C. Land acquisition has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas would not be included in land being considered for disposal. The limitation on OHV access within designated Riparian Areas of the River Tract HMPs and the addition of the Ephemeral Wash Specially Designated Areas containing approximately 7,000 acres of public land would have a beneficial impact by protecting them from damage caused by OHV travel. The continuation of OHV traffic in dry washes could degrade small isolated patches of riparian vegetation that do not meet the criteria to be designated as Riparian Areas.

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Special Status Species			
The implementation of Alternative A is not likely to adversely affect any federally listed species or designated critical habitats. FFO has established special management, monitoring, and survey protocols for all listed species. All listed plants are protected in RNAs or ACECs where OHV use is controlled and oil and gas development stipulations are established. Listed avian species are protected in ACECs, SMAs, or designated suitable habitat. Listed fish species in the San Juan River benefit from riparian management outlined in the Farmington Riparian and Aquatic Habitat Management Plan (August 2000). As new species are listed in the future, FFO would conduct necessary surveys, initiate monitoring programs, establish protective stipulations, and coordinate and consult with USFWS to ensure that development authorized by FFO will comply with the ESA.	The implementation of Alternative B is not likely to adversely affect any federally listed species or designated critical habitats. FFO has established special management, monitoring, and survey protocols for all listed species. All listed plants are protected in RNAs or ACECs where OHV use is controlled and oil and gas development stipulations are established. Listed avian species are protected in ACECs, SMAs, or designated suitable habitat. Listed fish species in the San Juan River benefit from riparian management outlined in the Farmington Riparian and Aquatic Habitat Management Plan (August 2000). As new species are listed in the future, FFO would conduct necessary surveys, initiate monitoring programs, establish protective stipulations, and coordinate and consult with USFWS to ensure that development authorized by FFO will comply with the ESA.	The implementation of Alternative C is not likely to adversely affect any federally listed species or designated critical habitats. FFO has established special management, monitoring, and survey protocols for all listed species. All listed plants are protected in RNAs or ACECs where OHV use is controlled and oil and gas development stipulations are established. Listed avian species are protected in ACECs, SMAs, or designated suitable habitat areas. Listed fish species in the San Juan River benefit from riparian management outlined in the Farmington Riparian and Aquatic Habitat Management Plan (August 2000). As new species are listed in the future, FFO would conduct necessary surveys, initiate monitoring programs, establish protective stipulations, and coordinate and consult with USFWS to ensure that development authorized by FFO will comply with the ESA.	The implementation of Alternative D is not likely to adversely affect any federally listed species or designated critical habitats. FFO has established special management, monitoring, and survey protocols for all listed species. All listed plants are protected in RNAs or ACECs where OHV use is controlled and oil and gas development stipulations are established. Listed avian species are protected in ACECs, SMAs, or designated suitable habitat. Listed fish species in the San Juan River benefit from riparian management outlined in the Farmington Riparian and Aquatic Habitat Management Plan (August 2000). As new species are listed in the future, FFO would conduct necessary surveys, initiate monitoring programs, establish protective stipulations, and coordinate and consult with USFWS to ensure that development authorized by FFO will comply with the ESA.
Fisheries and Wildlife			
No significant impacts to fisheries have been identified. Habitat fragmentation and road traffic from existing oil and gas wells, pipelines, and roads, added to projected construction would result in the potential for negative impacts to wildlife in the best locations of wildlife population. Within proposed wildlife areas, an additional 44 miles of road	No significant impacts to fisheries have been identified. Habitat fragmentation and road traffic from existing oil and gas wells, pipelines, and roads, added to projected construction would result in the potential for negative impacts to wildlife in the best locations of wildlife population. Within proposed wildlife areas, an additional 296 miles of road	No significant impacts to fisheries have been identified. Habitat fragmentation and road traffic from existing oil and gas wells, pipelines, and roads, added to projected construction would result in the potential for negative impacts to wildlife in the best locations of wildlife population. Within proposed wildlife areas, an additional 219 miles of road	No significant impacts to fisheries have been identified. Habitat fragmentation and road traffic from existing oil and gas wells, pipelines, and roads, added to projected construction would result in the potential for negative impacts to wildlife in the best locations of wildlife population. Within proposed wildlife areas, an additional 220 miles of road

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and 1,812 acres of long-term habitat disturbance is projected in addition to the existing 18,956 acres already disturbed. Habitat fragmentation would be the least under Alternative A but would still be likely to reduce the carrying capacity of the habitat for mule deer, elk, pronghorn antelope, and breeding birds. Projected functional habitat loss is projected to be 7,046 acres within 660 feet of roads. The open OHV designation throughout most of the FFO area would have a negative effect on wildlife by allowing continued disturbance and habitat loss.	and 11,546 acres of long-term habitat disturbance is projected in addition to the existing 18,956 acres already disturbed. Habitat fragmentation would be the greatest under Alternative B and would be likely to reduce the carrying capacity of the habitat for mule deer, elk, pronghorn antelope, and breeding birds. Projected functional habitat loss is projected to be 40,320 acres within 660 feet of roads The limited OHV designation throughout most of the FFO area would have a positive effect on wildlife by restricting cross-country travel in wildlife habitat areas.	and 8,569 acres of long-term habitat disturbance is projected in addition to the existing 18,956 acres already disturbed. Habitat fragmentation would be less than under Alternative B, but would still be likely to reduce the carrying capacity of the habitat for mule deer, elk, pronghorn antelope, and breeding birds. Projected functional habitat loss is projected to be 35,200 acres within 660 feet of roads The limited OHV designation throughout most of the FFO area would have a positive effect on wildlife by restricting cross-country travel in wildlife habitat areas.	and 8,569 acres of long-term habitat disturbance is projected in addition to the existing 18,956 acres already disturbed. Habitat fragmentation would be similar to that under Alternative C and would be likely to reduce the carrying capacity of the habitat for mule deer, elk, pronghorn antelope, and breeding birds. Projected functional habitat loss is projected to be 35,200 acres within 660 feet of roads The limited OHV designation throughout most of the FFO area would have a positive effect on wildlife by restricting cross-country travel in wildlife habitat areas.
Wilderness			
No direct impacts are anticipated to the Wilderness Areas (WA) from any of the alternatives. Direct impacts would only occur if oil and gas development or coal mining were allowed within the Wilderness Study Areas (WSA) in the planning area. This would most likely affect the Ah-shi-sle-pah WSA if the Preference Right Lease Applications (PRLA) currently being adjudicated would be approved for coal mining. Acquisition of inholdings within the Bisti/De-na-zin WA would benefit the area by consolidating land use management.	No direct impacts are anticipated to the WAs from any of the alternatives. Direct impacts would only occur if oil and gas development or coal mining were allowed within the WSAs in the planning area. This would most likely affect the Ah-shi-sle-pah WSA if the PRLAs currently being adjudicated would be approved for coal mining. Acquisition of inholdings within the Bisti/De-na-zin WA would benefit the area by consolidating land use management.	No direct impacts are anticipated to the WAs from any of the alternatives. Direct impacts would only occur if oil and gas development or coal mining were allowed within the WSAs in the planning area. This would most likely affect the Ah-shi-sle-pah WSA if the PRLAs currently being adjudicated would be approved for coal mining. Acquisition of inholdings within the Bisti/De-na-zin WA would benefit the area by consolidating land use management.	No direct impacts are anticipated to the WAs from any of the alternatives. Direct impacts would only occur if oil and gas development or coal mining were allowed within the WSAs in the planning area. This would most likely affect the Ah-shi-sle-pah WSA if the PRLAs currently being adjudicated would be approved for coal mining. Acquisition of inholdings within the Bisti/De-na-zin WA would benefit the area by consolidating land use management.

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Rangeland			
Impacts on rangeland from added oil and gas development would have a minimal effect on current livestock grazing when comparing the acreage of forage (13,971 acres short-term, 9,373 long-term) that would be removed from grazing due to construction of oil and gas facilities to the acreage available in the FFO. Ongoing conflicts between oil and gas operators and grazing permittees may continue. Other continuing areas of potential conflict between oil and gas operations and grazing permittees would include livestock inhibiting revegetation of disturbed areas, truck traffic disturbing or harming livestock, and the spread of noxious weeds by oil and gas vehicles that compete with desired rangeland plants. Land disposal could change the grazing authorization in the FFO area. Most of the land available for disposal would be in the area south of US Highway 550. Unlimited OHV access would continue to damage forage in most of the FFO area, leading to loss of topsoil, a reduction of soil quality, a downward trend of forage, and conflicts over OHV traffic and vandalism of rangeland improvements and fences. There would be approximately 10,000 acres in 22 specially designated areas that would limit grazing.	Impacts on rangeland from added oil and gas development would have a minimal effect on current livestock grazing when comparing the acreage of forage (41,941 acres short-term, 28,135 acres long-term) that would be removed from grazing due to construction of oil and gas facilities to the acreage available in the FFO. Ongoing conflicts between oil and gas operators and grazing permittees may continue. Other continuing areas of potential conflict between oil and gas operations and grazing permittees would include livestock inhibiting revegetation of disturbed areas, truck traffic disturbing or harming livestock, and the spread of noxious weeds by oil and gas vehicles that compete with desired rangeland plants. Land disposal could change the grazing authorization in the FFO area in the area south of US Highway 550 and around the tri-cities where 28 allotments could be affected. This would increase the potential for conflicts over livestock exclusion from urbanizing areas. Limited OHV access would benefit forage and limit damage to rangeland improvements in most of the FFO area. There would be over 9,300 acres in 23 specially designated areas that would limit grazing.	Impacts on rangeland from added oil and gas development would have a minimal effect on current livestock grazing when comparing the acreage of forage (31,549 acres short-term, 21,320 acres long-term) that would be removed from grazing due to construction of oil and gas facilities to the acreage available in the FFO. Ongoing conflicts between oil and gas operators and grazing permittees may continue. Other continuing areas of potential conflict between oil and gas operations and grazing permittees would include livestock inhibiting revegetation of disturbed areas, truck traffic disturbing or harming livestock, and the spread of noxious weeds by oil and gas vehicles that compete with desired rangeland plants. Land disposal could change the grazing authorization in the FFO area. Most of the land available for disposal would be in the area south of US Highway 550. Limited OHV access would benefit forage and limit damage to rangeland improvements in most of the FFO area. There would be approximately 64,500 acres in 67 specially designated areas that would limit grazing.	Impacts on rangeland from added oil and gas development would have a minimal effect on current livestock grazing when comparing the acreage of forage (36,451 acres short-term, 26,112 acres long-term) that would be removed from grazing due to construction of oil and gas facilities to the acreage available in the FFO. Ongoing conflicts between oil and gas operators and grazing permittees may continue. Other continuing areas of potential conflict between oil and gas operations and grazing permittees would include livestock inhibiting revegetation of disturbed areas, truck traffic disturbing or harming livestock, and the spread of noxious weeds by oil and gas vehicles that compete with desired rangeland plants. Land disposal could change the grazing authorization in the FFO area. Most of the land available for disposal would be in the area south of US Highway 550. Limited OHV access would benefit forage and limit damage to rangeland improvements in most of the FFO area. There would be approximately 25,700 acres in 31 specially designated areas that would limit grazing.

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Lands and Access			
Changes in the volume of industry-related traffic due to projected oil and gas development is primarily an access issue. It is estimated that there would be a -16 percent change in trips at the end of the 20-year planning period under Alternative A. There would be a projected increase in the amount of land in split estate in the FFO by about 264,800 acres or from 11 to 15 percent from land disposal. BLM would retain any necessary rights-of-way (ROW) during land disposal transactions. Acquisition of inholdings in specially designated areas would benefit land use management. Conflicts among OHV users, private property owners, and ranchers arising from unlimited cross-country vehicular access would continue under ongoing OHV policy.	It is estimated that there would be a +8 percent change in trips at the end of the 20-year planning period under Alternative B. There would be a projected increase in the amount of land in split estate in the FFO by about 329,300 acres, or about 44 percent, from land disposal. BLM would retain any necessary ROWs during land disposal transactions. Acquisition of inholdings in specially designated areas would benefit land use management. Conflicts among OHV users, private property owners, and ranchers would be reduced under the proposed limitations to OHV access.	It is estimated that there would be a -3 percent change in trips at the end of the 20-year planning period under Alternative C. There would be a projected increase in the amount of land in split estate in the FFO by about 14,000 acres from land disposal. BLM would retain any necessary ROWs during land disposal transactions. Acquisition of inholdings in specially designated areas would benefit land use management. Conflicts among OHV users, private property owners, and ranchers would be reduced under the proposed limitations to OHV access.	It is estimated that there would be a -2 percent change in trips at the end of the 20-year planning period under Alternative D. There would be a projected increase in the amount of land in split estate in the FFO similar to Alternative B from land disposal. BLM would retain any necessary ROWs during land disposal transactions. Acquisition of inholdings in specially designated areas would benefit land use management. Conflicts among OHV users, private property owners, and ranchers would be reduced under the proposed limitations to OHV access.
Visual Resources			
There would be a trend toward degradation of visual resources under each alternative due to the additional surface disturbance from oil and gas development and potential additional coal mining. The impact to visual resources would be the least in the high development area under Alternative A because the least development is projected. Acquisition of inholdings within specially designated areas could add	There would be a trend toward degradation of visual resources under each alternative due to the additional surface disturbance from oil and gas development and potential additional coal mining. The impact to visual resources would be the greatest in the high development area under Alternative B because the most well locations would be developed. Acquisition of inholdings within specially designated areas could add	There would be a trend toward degradation of visual resources under each alternative due to the additional surface disturbance from oil and gas development and potential additional coal mining. The impact to visual resources would be less than Alternative B and more than Alternative A. Acquisition of inholdings within the highest acreage of specially designated areas could add higher protection of visual qualities through the applica-	There would be a trend toward degradation of visual resources under each alternative due to the additional surface disturbance from oil and gas development and potential additional coal mining. The impact to visual resources would be less than Alternative B and more than Alternative A. Acquisition of inholdings within more specially designated areas could add higher protection of visual qualities through the application of VRM

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
higher protection of visual qualities through the application of Visual Resource Management (VRM) designations in some areas. OHV use would continue to contribute to localized alterations, mostly around the tri-city area, further degrading areas with deteriorated visual value. The emphasis on land disposal under this alternative would put additional land at risk for future development without VRM constraints throughout the FFO area.	higher protection of visual qualities through the application of VRM designations in some areas. Limiting OHV use to roads and trails and concentrating cross-country use into very localized areas would limit potential scarring and visual degradation. The emphasis on land disposal under this alternative would put additional land at risk for future development without VRM constraints throughout the FFO area.	tion of VRM designations in some areas. Limiting OHV use to roads and trails and concentrating cross-country use into very localized areas would limit potential scarring and visual degradation. The emphasis on land acquisition under this alternative would benefit visual resources.	designations in some areas. Limiting OHV use to roads and trails and concentrating cross-country use into very localized areas would limit potential scarring and visual degradation. The emphasis on land acquisition under this alternative would benefit visual resources.
Cultural Resources			
Impacts to cultural resources would be caused by surface disturbance from construction that has the potential to adversely affect cultural resources, including archaeological sites, historic properties, and traditional cultural properties (TCP) that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance. Inventories are required prior to all surface disturbing activities. It is projected that 736 sites would be affected and would require mitigation or avoidance before oil and gas facilities could be constructed. The addition of over 350 miles of new roads could result in increased vandalism from increased public access. The open OHV access would adversely affect cultural resources by cross-country travel. There are 84 specially designated	Impacts to cultural resources would be caused by surface disturbance from construction that has the potential to adversely affect cultural resources, including archaeological sites, historic properties, and TCPs that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance. Inventories are required prior to all surface disturbing activities. It is projected that 2,211 sites would be affected and would require mitigation or avoidance before oil and gas facilities could be constructed. The addition of almost 1,100 miles of new roads could result in increased vandalism from increased public access. The limited OHV access would have a beneficial effect on cultural resources by providing protection from cross-country travel.	Impacts to cultural resources would be caused by surface disturbance from construction that has the potential to adversely affect cultural resources, including archaeological sites, historic properties, and TCPs that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance. Inventories are required prior to all surface disturbing activities. It is projected that 1,658 sites would be affected and would require mitigation or avoidance before oil and gas facilities could be constructed. The addition of almost 800 miles of new roads could result in increased vandalism from increased public access. The limited OHV access would have a beneficial effect on cultural resources by providing protection from cross-country travel.	Impacts to cultural resources would be caused by surface disturbance from construction that has the potential to adversely affect cultural resources, including archaeological sites, historic properties, and TCPs that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance. Inventories are required prior to all surface disturbing activities. It is projected that 1,896 sites would be affected and would require mitigation or avoidance before oil and gas facilities could be constructed. The addition of over 800 miles of new roads could result in increased vandalism from increased public access. The limited OHV access would have a beneficial effect on cultural resources by providing protection from cross-country travel.

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
areas covering over 40,400 acres of public land in the FFO that would protect cultural resources.	There are 84 specially designated areas covering over 40,400 acres of public land in the FFO that would protect cultural resources.	There are 79 specially designated areas covering over 89,000 acres of public land in the FFO that would protect cultural resources.	There are 79 specially designated areas covering over 78,700 acres of public land in the FFO that would protect cultural resources.
Paleontology			
Impacts to paleontological resources would be measured by physical damage to fossil-bearing formations through excavation or surface disturbance. Alternative A would involve the least acreage of surface disturbance and have the least potential for impacts to paleontological resources due to the lower projected well numbers and the current management prescriptions within the 4 SDAs The open OHV access would continue to cause damage to paleontological formations through directly wearing down rock formations or causing accelerated erosion under Alternative A. Prior to coal mining, the required documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing fossils from their original context.	Alternative B would involve the most acreage of surface disturbance and have the greatest potential for impacts to paleontological resources due to the highest projected well numbers. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A. The limited OHV access would protect paleontological formations from damage. The additional acreage of specially designated fossil areas would result in additional protection to known and important paleontological resources. Prior to coal mining, the required documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing the fossils from their original context.	Alternative C would involve less acreage of surface disturbance and have fewer potential impacts to paleontological resources than under Alternative B, but more than under Alternative A. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A. The limited OHV access would protect paleontological formations from damage. The additional acreage of specially designated fossil areas would result in additional protection to known and important paleontological resources. Prior to coal mining, the required documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing fossils from their original context.	Alternative D would involve less acreage of surface disturbance and therefore result in fewer impacts to paleontological resources than under Alternative B, but more than under Alternatives A and C. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A. The limited OHV access would protect paleontological formations from damage. The additional acreage of specially designated fossil areas would result in additional protection to known and important paleontological resources. Prior to coal mining, the required documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing fossils from their original context.
Recreation			
Potential exists for moderate impacts on the quality of recreation opportunities from oil and gas development, particularly due to noise from compressors. It is likely that some recreational users would be annoyed by	Potential exists for widespread impacts on the quality of recreation opportunities from oil and gas development, particularly due to noise from compressors. It is likely that some recreational users would be annoyed by	Potential exists for widespread impacts on the quality of dispersed recreation opportunities from oil and gas development, particularly due to noise from compressors. The noise Notice to Lessee (NTL) would provide	Impacts on recreation would be similar to Alternative C. The noise NTL would provide somewhat less extensive protection against noise for recreational sites, but impacts would be less than under Alternatives A and B. Noise

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
widespread noise in the FFO. Acquisition of non-federal inholdings in designated recreation areas would improve management of recreation areas and benefit the qualities of these areas. Widespread OHV cross-country access would appeal to some recreationists, but conflicts with non-motorized recreational activities would persist. Development of coal mining near WA or WSA could have localized indirect effects on the quality of primitive recreational opportunities.	widespread noise in the FFO. Acquisition of non-federal inholdings in designated recreation areas would improve management of recreation areas and benefit the qualities of these areas. Limiting OHV use to designated roads and trails would not appeal to some OHV users, but would lessen potential conflict with other non-motorized recreational uses. These competing effects could be neutralized if 100,000 acres are considered for open OHV use during development of OHV management unit plans. The extensive road system in the gas fields would continue to provide access to most areas where dispersed recreational activities occur. This alternative would benefit recreational opportunities by designating four new recreation areas (as trail corridors), and subsequently, up to 94 miles of trails may be designated for various motorized and non-motorized uses in OHV management unit plans. Development of coal mining near WA or WSA could have localized indirect effects on the quality of primitive recreational opportunities.	some protection to designated noise sensitive recreation areas. However, noise levels may still be annoying for some recreational users and uses at some locations, and diminish the quality of recreational experiences. Acquisition of non-federal inholdings in designated recreation areas would improve management of recreation areas and benefit the qualities of these areas. Limiting OHV use to designated roads and trails would not appeal to some OHV users, but would lessen potential conflict with other non-motorized recreational uses. The extensive road system in the gas fields would continue to provide access to most areas where dispersed recreational activities occur. This alternative would benefit recreational opportunities by increasing the amount of land managed for recreational values by about 42 percent in four new recreation area, and subsequently, up to 94 miles of trails may be designated for various motorized and non-motorized uses in OHV management unit plans. Development of coal mining near WA or WSA could have localized indirect effects on the quality of primitive recreational opportunities.	levels may still be annoying for some recreational users at some locations and may diminish the quality of recreational experiences. Impacts on OHV use would be similar to Alternative B. However, impacts on motorized users would be offset by designation of new trails that provide for motorized sports, and consideration of open OHV use on about 66,000 acres. Non-motorized users would also benefit from trails that provide for separated uses in order to minimize users conflicts. Development of coal mining near WA or WSA could have localized indirect effects on the quality of primitive recreational opportunities.

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
Noise			
Increased numbers of wellhead compressors associated primarily with gas operations would add to the noise levels in the region. Under Alternative A, there would be approximately 9,410 additional wellhead compressors and approximately 142 larger compressors that would add to the overall level of noise. Noise mitigation would be required on a case-by-case basis to minimize impacts to residents and other land users. The noise policy to protect nesting raptors would continue to minimize impacts.	Increased numbers of wellhead compressors associated primarily with gas operations would add to the noise levels in the region. Under Alternative B, there would be approximately 14,000 additional wellhead compressors and approximately 320 larger compressors that would add to the overall level of noise. Noise mitigation would be required on a case-by-case basis to minimize impacts to residents and other land users. The noise policy to protect nesting raptors would continue to minimize impacts.	Increased numbers of wellhead compressors associated primarily with gas operations would add to the noise levels in the region. Under Alternative C, there would be approximately 12,118 additional wellhead compressors and approximately 316 larger compressors that would add to the overall level of noise. Noise mitigation would be required by the proposed Noise Policy on approximately 206,000 acres of federal minerals within and around 88 designated boundaries. The noise policy to protect nesting raptors would continue to minimize impacts.	Increased numbers of wellhead compressors associated primarily with gas operations would add to the noise levels in the region. Under Alternative D, there would be approximately 12,200 additional wellhead compressors and approximately 319 larger compressors that would add to the overall level of noise. Noise mitigation would be required by the proposed Noise Policy within and around 16 designated boundaries and 45 areas with designated receptor points. The noise policy to protect nesting raptors would continue to minimize impacts.
Social and Economic Conditions			
Change in oil and gas production has the greatest potential to cause economic impacts. Under Alternative A, there could be a moderate loss of jobs (16 percent, or 1,210 fewer jobs per year). This could have moderate impacts on the local economy, but minimal for the region. Tax revenues could benefit from gradual increase in annual production (up to 43 percent over current levels). However, market value will continue to greatly influence tax revenues. Coal industry jobs on federal leases are expected to remain steady during the planning period but could increase if new coal leases are developed. There should be little change in tax royalties from coal, and some increase in royal-	Change in oil and gas production has the greatest potential to cause economic impacts. Under Alternative B, there could be moderate increases in oil and gas industry annual jobs. About 1,460 additional jobs would represent a 20 percent increase over current levels for this industry after 20 years, and about 3 percent increase in jobs in the tri-city area over current levels. This could have minor beneficial impacts on the local economy, but minimal for the region. Tax revenues could benefit substantially from gradual increase in annual production (almost doubling current production over 20 years). However, market value will continue to greatly influence tax revenues.	Change in oil and gas production has the greatest potential to cause economic impacts. Under Alternative C, changes in job levels in the oil and gas industry would be minor. About 500 additional jobs would represent a 6 percent increase over current levels for this industry after 20 years, and about 1 percent increase in jobs in the tri-city area. This would have minimal affect on the local and regional economy. Tax revenues could benefit substantially from gradual increase in annual production (almost doubling current production over 20 years). However, market value will continue to greatly influence tax revenues. Up to 450 coal industry jobs on federal leases could be lost if San Juan	Change in oil and gas production has the greatest potential to cause economic impacts. Under Alternative D, changes in job levels in the oil and gas industry would be minor. About 540 additional jobs would represent a 7 percent increase over current levels for this industry after 20 years, and about 1 percent increase in jobs in the tri-city area. This would have minimal affect on the local and regional economy. Tax revenues could benefit substantially from gradual increase in annual production (almost doubling current production over 20 years). However, market value will continue to greatly influence tax revenues. Coal industry jobs on federal leases are expected to remain steady during

Alternative A: Current Management (No Action)	Alternative B: Resource Production	Alternative C: Resource Conservation	Alternative D: Proposed Plan
ties from oil and gas. This could have a moderate benefit to state and local revenues.	Coal industry jobs on federal leases are expected to remain steady during the planning period but could increase if new coal leases and interests are developed. Overall, increases in royalties from expanding production of federal energy resources would benefit state and local revenues.	and La Plata mines are not expanded. Less development of federal coal reserves under this alternative could decrease royalties and slightly reduce federal mineral dispersements to New Mexico. This should be offset from increased federal oil and gas employment and production.	the planning period but could increase if new coal leases and interests are developed. Overall, increases in royalties from expanding production of federal energy resources would benefit state and local revenues.
Environmental Justice			
Losses in jobs from slower development of oil and gas resources could impact minority and low-income populations in the area that are affected by the local job market. Localized impacts from new well sites could affect dispersed minority and low-income populations, but noise impacts can be mitigated on a case-by-case basis.	Overall, local minorities and low-income populations could benefit from new jobs in energy extractive resources under this alternative. All populations groups, including minorities and low-income persons residing throughout the area, could experience dispersed impacts from gas field development, but noise impacts can be mitigated on a case-by-case basis.	Local minorities and low-income populations (particularly in the Shiprock area) could be affected by job losses in coal industry under this alternative. All populations groups, including minorities and low-income persons residing throughout the area, could experience dispersed impacts from gas field development. The noise policy would tend to reduce potential incompatible development.	Impacts would be similar to Alternative B. The noise policy would tend to reduce potential incompatible development.

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CHAPTER 1
PURPOSE AND NEED

PURPOSE AND NEED

The Farmington Proposed Resource Management Plan (RMP) Revision and Final Environmental Impact Statement (EIS) has been prepared to provide a comprehensive framework for managing the public lands and for allocating resources during the next 20 years using the principles of multiple use and sustained yield. The life of the approved RMP can be extended through maintenance and amendments, as necessary to keep the document up to date and current. The Proposed RMP Revision and Final EIS establishes and analyzes areas for limited, restricted, or exclusive uses, levels of production, allowable resource uses, resource condition objectives, program constraints, and general management direction.

This document includes both a Proposed RMP Revision (with four different management alternatives) and a Final EIS, which fulfill the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA) requirements for comprehensive land use planning for public lands. In this document, from this point forward, the Proposed RMP Revision and Final EIS will simply be referred to as the Proposed RMP/Final EIS.

Five issues are addressed in the Proposed RMP/Final EIS, including:

1. Oil and Gas Leasing and Development
2. Land Ownership Adjustments
3. Off-Highway Vehicle Use
4. Specially Designated Areas (SDA)
5. Coal Leasing Suitability Assessment

Section 3 (3A) of the Federal Coal Leasing Amendments Act of 1976 also requires comprehensive land-use planning prior to coal leasing. In addition, the statutory requirement that public lands be designated as "open", "limited", or "closed" to off-road vehicle or off-highway vehicle (ORV/OHV) use will be met upon final approval of one of the decisions proposed in this document.

This document updates management constraints on and analyzes the environmental impacts of oil and gas leasing and development in the San Juan Basin in New Mexico. Various private companies hold valid federal, state, and private leases for oil and natural gas in the planning area. These leases, many dating back to the 1950s and 1960s, have created contractual rights allowing companies to develop oil and natural gas resources. These resources provide federal minerals to meet the United States' (U.S.) growing energy needs while reducing the nation's dependence on foreign energy sources. Planned development of oil and natural gas also helps protect the financial interest of the U.S. by ensuring efficient drainage of federal minerals.

Preparation of this document is guided by Bureau of Land Management (BLM) planning regulations issued under FLPMA, environmental regulations issued under NEPA and by BLM Handbook H-1600-1 (Land Use Planning) and H-1624-1 (Planning for Fluid Mineral Resources). Plan amendments, if necessary, will keep the Approved RMP current with resource management needs and policies.

In 1988, the BLM Farmington Field Office (FFO) approved an RMP following many of the same steps that are being done now. The RMP was amended six times between 1990 and 2000. Decisions from the RMP document (RMP and amendments) that are still valid will be carried forward into this Proposed RMP/Final EIS and continue to be implemented to the extent they are not in conflict with the direction proposed in this Proposed RMP/Final EIS.

The primary purpose of the EIS portion of the Proposed RMP/Final EIS is to analyze the impacts of implementing existing and future land use decisions. The EIS portion is also needed to ". . . analyze and document the

direct, indirect, and cumulative impacts of . . . reasonably foreseeable future actions resulting from federally authorized fluid mineral activities. By law, these impacts must be analyzed before the agency makes an irreversible commitment. In the fluid minerals program, this commitment occurs at the point of lease issuance. Therefore, the Proposed RMP/Final EIS satisfies NEPA requirements for issuing fluid mineral leases" (BLM Handbook H-1624-1 B.-1).

LOCATION

The planning area, located in northwestern New Mexico, encompasses approximately 8,000,000 acres of mixed land ownership and includes all of San Juan County, most of McKinley County, western Rio Arriba County, and northwestern Sandoval County. Included within this area are approximately 2,000,000 acres of public surface estate and approximately 3,000,000 acres of subsurface minerals. The management objectives and philosophies developed in this plan would be applied only to the public surface and/or mineral estate. **Map 1-1** illustrates the planning area and shows its location within New Mexico. The population of the area is centered around the Farmington-Aztec-Bloomfield-Shiprock area to the north, the Gallup-Crownpoint area to the south, and Cuba to the east.

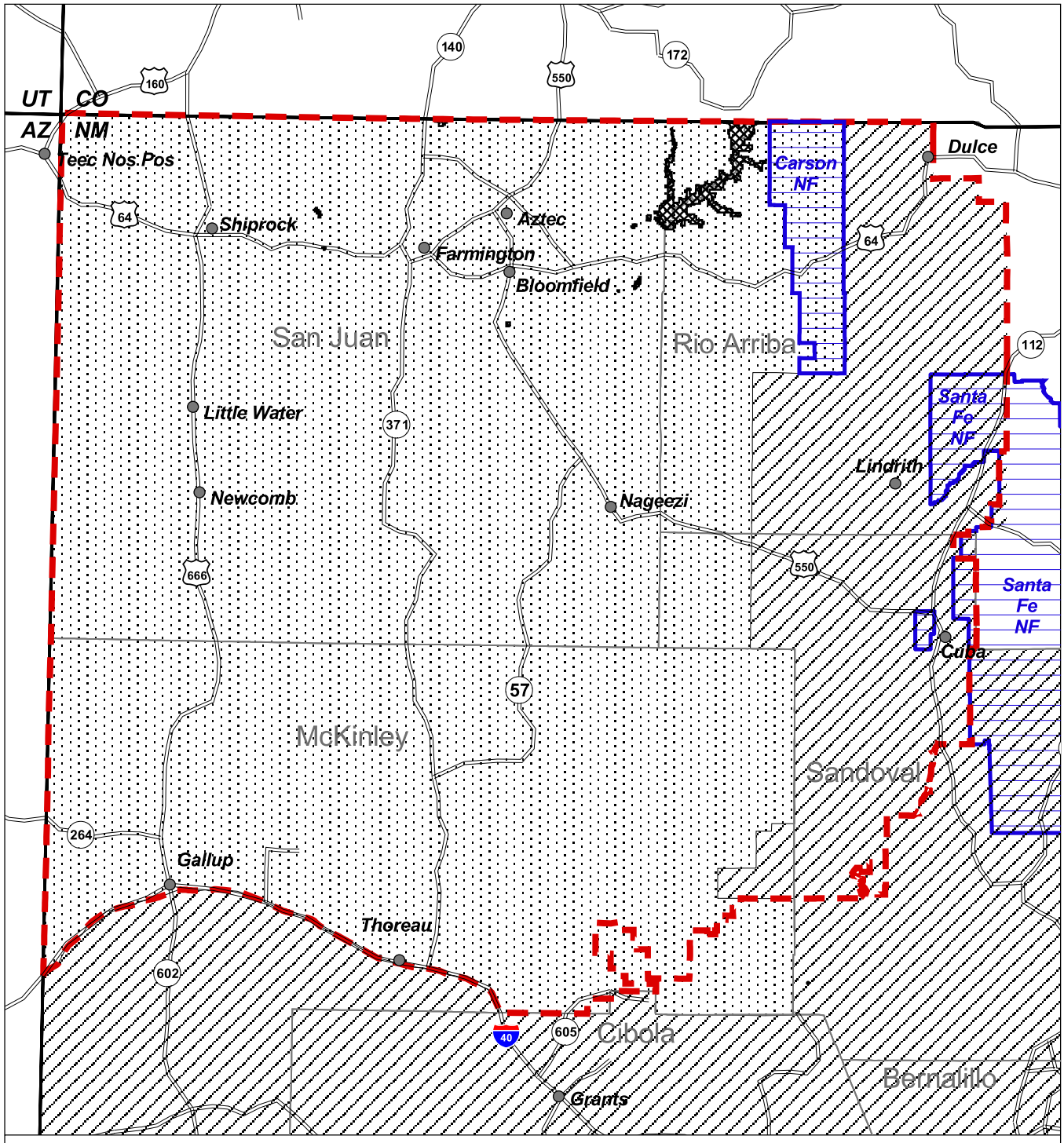
The distribution of the public lands has an important influence on land management options. The public lands are fairly well consolidated in northeastern San Juan County, while scattered, or checkerboard, ownership patterns predominate over much of the remaining planning area. The planning area includes some public land (and federal minerals) in Sandoval County that is part of the BLM Albuquerque Field Office (AFO).

SCOPE OF THE DOCUMENT

The land use planning addressed in this document pertains to public (federal) lands and federal minerals within the FFO boundaries. Additional land use planning is performed for oil and gas on U.S. Bureau of Reclamation (USBR) land. Impact analysis for future leasing and development of federal oil and gas will be addressed for the New Mexico portion of the San Juan Basin.

An Inter-Area Agreement No. NM-010-071 resulted in a change in the administration of some programs (livestock grazing and oil and gas) in the FFO and AFO. As of July 1992, the AFO assumed the responsibilities for administering (permitting) the federal minerals in the Lindrith, New Mexico area. They also assumed the permitting for oil and gas leases in the (extreme) southern portion of FFO boundaries. For this reason, the minerals (oil and gas) under the administration of the AFO are included in the Farmington Proposed RMP/Final EIS.

There are a number of surface owners that are involved in the approval (permitting) process for developing federal minerals (i.e., BLM, U.S. Forest Service [USFS], USBR, Bureau of Indian Affairs [BIA], state, private, etc.). In accordance with Title 43 Code of Federal Regulations (CFR) Subpart 1501.6, the USFS and USBR are participating as Cooperating Agencies in the preparation of this document. The USFS and USBR staff participating in this project are located in the (1) Santa Fe and Carson (Jicarilla Ranger District) National Forests (Santa Fe and Bloomfield, New Mexico) and (2) Upper Colorado Region, Western Colorado Area Office. **Map 1-2** illustrates the administrative boundaries for the lands and minerals administered by the BLM (FFO and AFO), USFS and USBR in the planning area. The amount of land and federal minerals administered by each office in the planning area is presented in **Tables 1-1 and 1-2**. Approximately half of USBR land does not overlie federal minerals.



LEGEND

- RMP/EIS Boundary
- County Boundary
- Farmington Field Office
- Albuquerque Field Office
- Bureau of Reclamation
- National Forest
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

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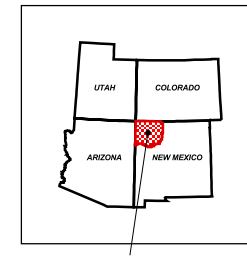
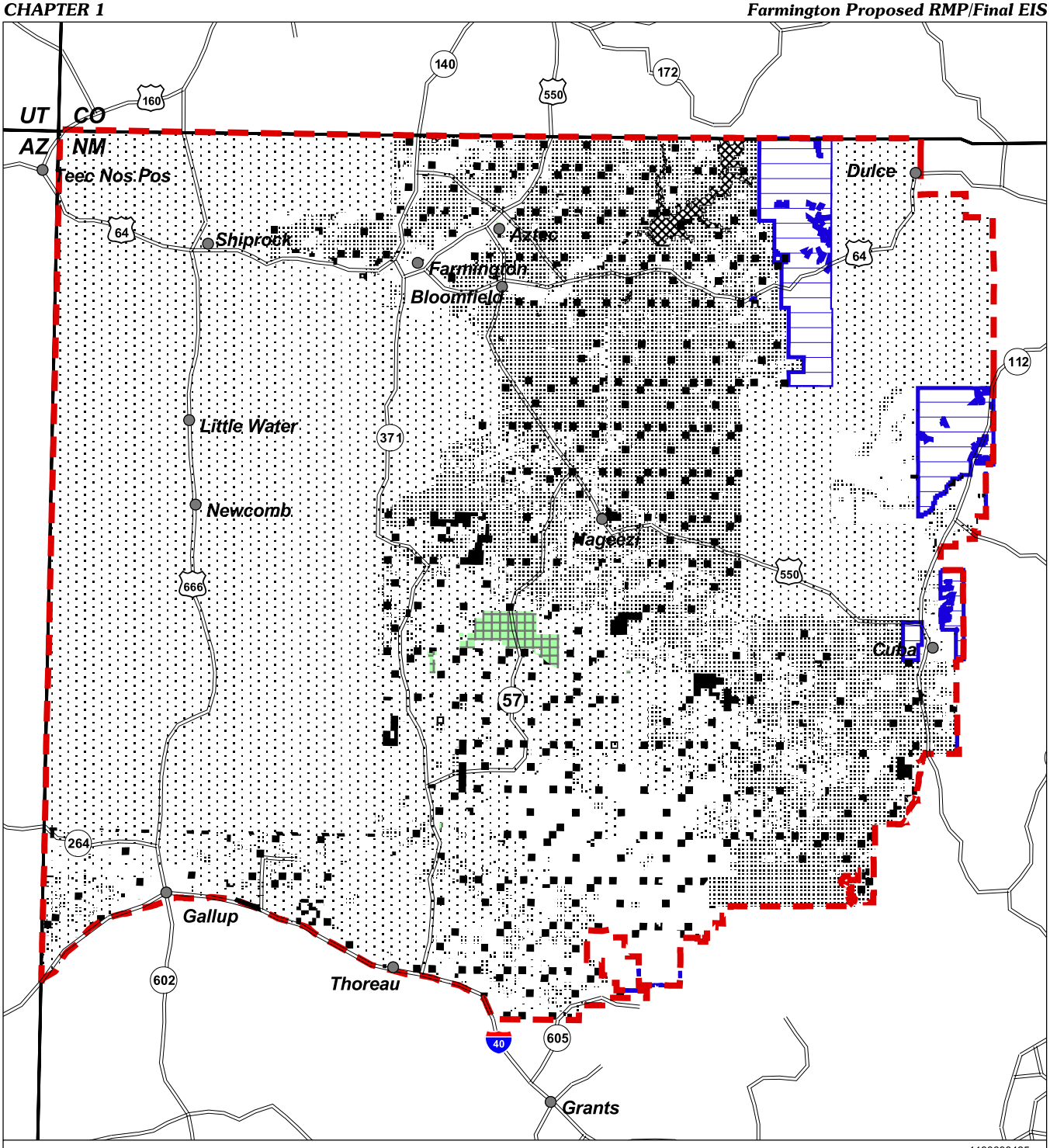
Scale in Miles



Area of Interest

Map 1-1: General Location of the Planning Area

Source: BLM 2000



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LEGEND

- RMP/EIS Boundary

Land Ownership

- BLM
- Bureau of Reclamation
- Forest Service
- National Park Service
- Private
- State
- Tribal Land

- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: BLM 2002

Map 1-2: Land Ownership in the Planning Area

Table 1-1. Surface Acres in the Planning Area

Cooperating Land Agencies	San Juan County	McKinley County	Rio Arriba County	Sandoval County	Total: Surface Acres by Owner
FFO BLM	856,593	163,580	322,431	72,682	1,415,286
AFO BLM	0	40,035	22,895	314,225	377,155
USFS	0	13	23,4301	22,558	256,872
USBR	15,982	0	15,053	0	31,035
Subtotal: Surface Acres by County	**872,575**	**203,628**	**594,680**	**409,465**	**2,080,348**
Other Land Agencies					
DOD	0	259	0	0	259
Tribal Lands	2,323,806	1,616,225	612,141	222,250	4,774,422
National Park Service	31,301	2,904	0	0	34,205
State	122,326	135,994	43,476	32,879	334,675
Private	234,460	512,522	199,499	103,719	1,050,200
Subtotal: Surface Acres by County	**2,711,893**	**2,267,904**	**855,116**	**358,848**	**6,193,761**
Total: Surface Acres	**3,584,468**	**2,471,532**	**1,449,796**	**768,313**	**8,274,109**

Source: GIS data derived from BLM FFO and SO coverages.

Table 1-2. Acres Overlying Federal Minerals in the Planning Area

Cooperating Land Agencies	San Juan County	McKinley County	Rio Arriba County	Sandoval County	Total: Surface Acres Overlying Federal Minerals by Owner
FFO BLM	843,574	149,724	315,843	69,561	1,378,702
AFO BLM	0	40,035	22,759	312,654	375,448
USFS	0	13	234,301	22,558	356,872
USBR	7,984	0	7,891	0	15,875
Subtotal: Surface Acres Overlying Federal Minerals by County	**851,558**	**189,772**	**580,794**	**404,773**	**2,026,897**
Other Land Agencies					
DOD	0	259	0	0	259
Tribal Lands	153,309	211,499	1,166	25,514	391,488
National Park Service	17,139	2,351	0	0	19,490
State	19,325	15,206	1,798	6,379	42,708
Private	142,338	119,074	195,819	82,620	539,851
Subtotal: Surface Acres Overlying Federal Minerals by County	**332,111**	**348,389**	**198,783**	**114,513**	**993,796**
Total: Surface Acres Overlying Federal Minerals	**1,183,669**	**538,161**	**779,577**	**519,286**	**3,020,693**

Source: GIS data derived from BLM FFO and SO coverages.

The Proposed RMP/Final EIS addresses the impacts of federal oil and gas leasing and development regardless of the surface ownership (i.e., state, tribal and private). When federal oil and gas are leased and developed on lands administered by other federal agencies, the BLM contacts the agency for consent to lease, specific surface protection lease stipulations, and mitigation requirements for field operations.

The BLM issues oil and gas leases where federal minerals underlie the Indian-owned surface. The Indian surface owner (BIA or tribe) is contacted for concurrence and to identify specific surface protection stipulations, if any, before the lease is issued.

Management constraints prescribed for federal oil and gas leasing and development on split estate apply only to mineral development activities permitted by the BLM. On such mineral development, the BLM provides surface and subsurface constraints that ensure the environment is protected. These constraints do not restrict the activities of private landowners. The amount of land and federal minerals administered by other surface owners is presented in Table 1-1.

Oil and gas leases for Indian mineral estate are issued by the BIA. The decision to lease or enter into a joint venture or agreement to develop Indian oil and gas is solely that of the BIA or the tribe and is not considered in this document.

THE PLANNING PROCESS

The BLM resource management planning process consists (primarily) of nine basic steps. This process requires an interdisciplinary team of resource specialists. Staff from the FFO and AFO, USFS, and USBR comprise the interdisciplinary team preparing this Proposed RMP/Final EIS. The steps described in BLM's planning regulations and handbook (H-1600-1) and followed in preparing this Proposed RMP/Final EIS are summarized below and graphically displayed in **Figure 1-1**. Publication of this document represents completion of Steps 1 through 7.

Step 1. Identification of Issues

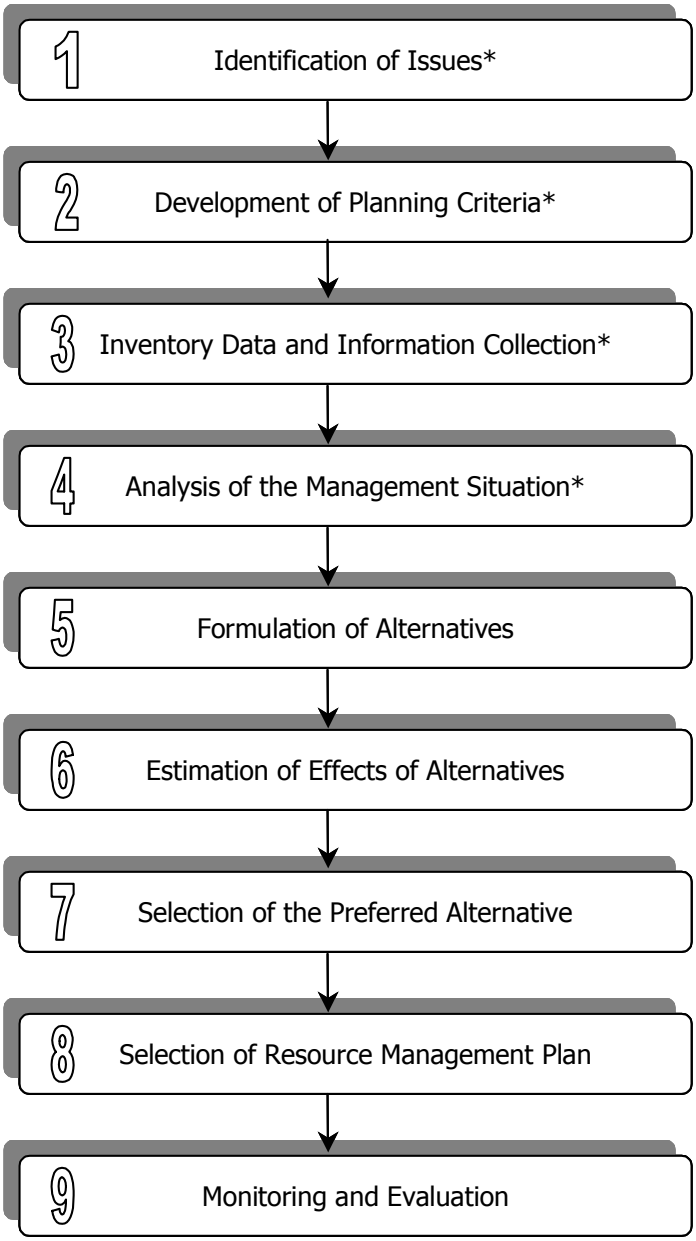
The first step in the planning process is intended to identify resource management problems or conflicts that can be resolved through the planning process. These problems or conflicts (issues) were identified by the BLM and other agency personnel as well as members of the public. Five issues were identified for this planning effort and are considered and discussed in detail in this document. Valid Existing Decisions, from BLM's previous land use planning documents, are also considered in this document. Valid Existing Decisions, with the various ways of dealing with the issues, will comprise the four different management alternatives.

Step 2. Development of Planning Criteria

During this step, preliminary decisions are made regarding the kinds of information needed to clarify the issues, the kinds of alternatives to be developed, and the factors to be considered in evaluating alternatives and selecting a preferred RMP. As each issue was identified, a list of planning criteria was developed to help guide the resolution of that issue. Valid Existing Decisions were also identified during this part of the planning process and are included in the alternatives presented in Chapter 2.

Step 3. Inventory Data and Information Collection

This step involves the collection of various kinds of environmental, social, economic, resource, and institutional data needed for completion of the process. This step can include detailed field studies, talking to individuals or groups who may have information, literature studies, or consultation with appropriate professionals. In most cases, this process is limited to inventories needed to address the issues.



** These steps may be revisited throughout the planning process and may overlap other steps.*

Figure 1-1. Steps in the RMP/EIS Planning Process

Step 4. Management Situation Analysis

This step calls for deliberate assessment of the current situation. It includes a description of current BLM management guidance, a discussion of existing problems and opportunities for solving them, and a consolidation of existing data needed to analyze and resolve the identified issues. The end result of this step was the development of an unpublished companion document known as the Management Situation Analysis (MSA). Chapter 3 of that document was used to develop the Continuing Management Guidance section of the Proposed RMP/Final EIS. MSA Chapter 2 was used as a basis for compiling the Affected Environment chapter of the RMP/EIS. Copies of the MSA are available for review in the FFO.

Step 5. Formulation of Alternatives

During this step, several complete, reasonable resource management alternatives are prepared, including one for no action and others that strive to resolve the issues while emphasizing differing amounts of resource production or protection. This important section of the RMP/EIS has been incorporated into Chapter 2.

Step 6. Estimation of Effects of Alternatives

The physical, biological, economic, and social effects of implementing each alternative are estimated in order to allow for a comparative evaluation of impacts. This step, known as the Environmental Consequences chapter, is found in Chapter 4 in this Proposed RMP/Final EIS.

Step 7. Selection of the Preferred Alternative

Based on the information generated during Step 6, the Field Manager identifies a preferred alternative. The Draft RMP/EIS document is then printed and distributed for public review. There was a 90-day public review and comment period for the Draft RMP/EIS.

Step 8. Selection of the RMP

Based on the results of public review and comment, the Field Manager will develop the Proposed RMP and publish it along with the Final EIS. It is important to note the revised RMP will replace all the previous (RMP and Resource Management Plan Amendment [RMPA]) planning documents prepared for the FFO. A final decision is made after a 60-day Governor's Consistency Review and a 30-day public protest period on the Proposed RMP/Final EIS are completed.

Step 9. Monitoring and Evaluation

This step involves the collection and analysis of long-term resource condition and trend data to determine the effectiveness of the plan in resolving the identified issues and implementation of all decisions, and to ensure that implementation of the plan is achieving the desired results. Monitoring continues from the time the new RMP is adopted until changing conditions require amendments or a revision of the whole plan or any portion of it.

PLANNING ISSUES

The BLM planning regulations (43 CFR 1600) equate land use planning with problem solving and issue resolution. An issue is defined as an opportunity, conflict, or problem regarding the use or management of public lands and resources. Not all problems are capable of resolution through land use planning—some may require changes in policy, budget, or law. Issue-driven planning, which is the approach used in RMPs, means that an emphasis is placed on addressing those aspects of current management believed to be at issue. The FFO's previous land use plans will be replaced by this document. Existing decisions are reviewed for their relevance and use in the continued management of resource uses.

Several problems brought up during the issue identification process are not included as separate issues in the Proposed RMP/Final EIS. Some of these are resolvable within Continuing Management Guidance; others, such as the protection of significant cultural resources, would be resolved with the identification of SDAs. Those aspects of current management that are **not** issues are covered in Chapter 2, under Continuing Management Guidance.

The five issues addressed in this Proposed RMP/Final EIS were identified based on interagency consultation, state government input, cooperating agency input, review by BLM staff and managers, and through extensive discussions and public meetings with individuals, industry representatives, and special interest groups.

PLANNING CRITERIA

Planning criteria are the standards, rules, and measures used for data collection and alternative formulations, and have guided draft plan preparation. Planning criteria are taken from appropriate laws and regulations, guidance found in BLM Manuals and directives, and concerns expressed in meetings and consultations, both with the public and with other agencies. Four criteria were developed for the RMP/EIS and will guide the resolution of the issues addressed in this document. The criteria are listed below.

1. Actions must comply with laws, regulations, and executive orders.
2. Actions must be reasonable and achievable.
3. Actions will be considered for their long-term benefits to the public in relation to short-term benefits.
4. Actions will be considered in an interdisciplinary approach.

The following (five) planning issues were identified for resolution in this Proposed RMP/Final EIS. The criteria that were (1) developed and used and (2) are still applicable to the issues described in previous planning documents, are included as part of the text in each issue.

The following issues relate to planning within the FFO boundaries.

Issue #1: Oil and Gas Leasing and Development

The following issues and their associated planning criteria have been identified for resolution in the RMP/EIS.

Item 1. Determine if there is additional federal mineral estate that should be considered for oil and gas leasing.

Item 2. Based on a Reasonable Foreseeable Development Scenario (RFDS), determine the effect of developing oil and gas leases in designated and/or proposed SDAs and other areas of concern.

Item 3. Determine the impact of management constraints [lease stipulations and Conditions of Approval (COA)] on oil and gas development.

Item 4. Identify the cumulative impacts of oil and gas development.

Item 5. Determine if existing management constraints on oil and gas leasing and development in SDAs would achieve the greatest degree of protection of resource values.

Item 6. Identify management constraints necessary to protect wildlife, fragile soils, water resources, and other resource values.

Item 7. Clarify the stipulations applied at the lease issuance stage and COAs applied before development activities begin.

The planning criteria for Items 1 through 3 are concerned with identifying (1) oil and gas resource occurrence potential, (2) the amount of leased acreage, producing and non-producing, (3) areas where development is occurring or is projected to occur, and (4) areas where leasing and/or development is occurring or could occur with management constraints.

Criteria for Item 4 are based on identifying (1) the area where existing (and new) leases are issued under standard terms and conditions (STC), (2) the amount of oil and gas acreage

that would not be available for future leasing and development, and (3) the least restrictive management constraints on new lease development that would protect resource values and uses. The effects of future development of existing and new leases have been considered during impact identification and analyses in this Proposed RMP/Final EIS.

The criteria used to determine the impacts on oil and gas resources are similar to those developed for determining the amount of oil and gas acreage available for leasing and development. These criteria are based primarily on identifying (1) the amount of oil and gas acreage that would not be available for leasing and development, (2) whether the type and extent of management constraints would protect resource values and uses, and (3) the effects of management constraints on future oil and gas development and production.

The primary criteria for Items 5 and 6 are based on determining (1) if continued management will adequately protect and preserve SDAs and other resource values, and (2) the implementability of management prescriptions and objectives in areas with current and future development. An additional criterion to consider is the necessity of applying stipulations to new leases in areas where existing leases may expire or terminate, particularly in SDAs with critical resource values.

BLM resource specialists have identified specific lease stipulations, COAs, and the area(s) where they are required for future leasing and development. Because stipulations are applied at the leasing stage, they are general and apply to the entire lease. COAs, which are applied at the Application for Permits to Drill (APD) stage of lease development, apply to a particular well location. The COAs attached to each APD permit will be determined primarily by the proposed location of each well. The COAs usually considered and attached to APDs are listed in Appendix G.

Issue #2: Land Ownership Adjustments

Small, scattered, and isolated tracts are often expensive or difficult to manage, and normally contribute little to the public land resource. Some of these parcels, which are close to urban areas, are also in demand for community expansion. Exchange or disposal of these tracts often improves management efficiency by focusing efforts on larger tracts where the BLM has more opportunities to meet its goals and objectives.

The basic concept of land ownership adjustments is to consolidate administrative boundaries to create a more efficient and economical land ownership pattern. Areas for retention and disposal are identified under each of the four alternatives in Chapter 2. Parcels identified for disposal after approval of the new RMP could be considered for disposal on a case-by-case basis. Where the parcels are to be sold, the following criteria established in Section 203 of FLPMA must be met:

(1) such tract because of its location or other characteristics is difficult and uneconomical to manage as part of the public lands, and is not suitable for management by another federal department or agency; or

(2) such tract was acquired for a specific purpose and the tract is no longer required for that or any other federal purpose; or

(3) disposal of such tract will serve important public objectives, including but not limited to, expansion of communities and economic development, which cannot be achieved prudently or feasibly on land other than public land and which outweigh other public objectives and values, including, but not limited to, recreation and scenic values, which would be served by maintaining such tract in federal ownership.

If a parcel is to be disposed of through exchange, Section 206 of FLPMA requires that the action would serve the public interest. For example, the action would result in better federal land management, satisfy important state or local needs, or would help accomplish

management objectives defined in this plan (e.g., inholding acquisition, trespass abatement, access needs, resource improvement, etc.). Unlimited exchange opportunities may be entertained to consolidate federal and non-federal lands within the retention areas.

To reduce the impacts of split estate where practical, the BLM may pursue mineral exchanges as authorized by FLPMA Sec. 206. Nothing in this Proposed RMP/Final EIS is intended to prohibit mineral exchanges conducted under the BLM mineral exchange policy.

Lands may be transferred out of federal ownership by any of a wide variety of exchange or disposal authorities as long as all applicable sale or exchange criteria are met and there are no major conflicts with other resource management programs, such as oil and gas. Lands in the FFO disposal area can be utilized by other BLM field offices within the State of New Mexico to provide a pool of lands for exchange purposes. There will be no title transfers of public lands within any SDA unless the disposal would enhance management of the area. In general, attempts should be made to acquire non-federal inholdings in SDAs if it is important to the management of the area.

Management of the public lands in the southern portion of the area administered by the FFO has always been difficult due to the checkerboard land ownership pattern. Land exchanges have been completed in the past to resolve unauthorized occupancies and to acquire other lands with greater public benefits. The split estate that has resulted from these exchanges has made it more difficult to develop the retained federal minerals. This will be considered during any future land disposals.

The criteria developed during the planning process provides for the following:

Retention Areas

Ownership will remain with the BLM over the long term. Exchanges for consolidating ownership will be considered and may include conveying retention lands to accomplish a desirable exchange. Recreation and Public Purposes (R&PP) applications will be considered. Sale proposals may only be considered in (very) limited instances for parcels identified in Appendix H or on a case-by-case basis.

Disposal Areas

These lands may pass out of federal ownership over the long term. Priority for disposal would be given to exchanges; however, other forms of land transfers, such as those listed in the Chapter 2 Continuing Management Guidance section, would also be considered. Further exchanges with Indian tribes would be considered after problems are resolved in the development of the federal minerals by operators and/or lessees who hold the existing or future mineral (oil and gas) leases.

Acquisitions

Inholdings (non-BLM) will be designated for acquisition if important to proper management of the area. Ownership of public land will be maintained by the BLM over the long term.

To resolve these issues, answers are needed to the following question:

On which lands should ownership be adjusted (exchanged, disposed, and/or acquired) to facilitate more efficient management?

Issue #3: Off-Highway Vehicle Use

This issue addresses OHV designations. It is BLM policy to designate all public lands in its jurisdiction as "open", "limited," or "closed" to motor vehicle use.

Motorized vehicles will be discussed in terms of design and capabilities of OHVs. ORVs are vehicles designed for and capable of travel over natural terrain and water. OHVs are mainly designed for travel on unpaved roads or trails and not particularly for off-road use. The term OHV will be used in the rest of the

document when referring to either OHV or ORV.

Public lands currently or historically used by OHV user groups may be designated "open" or "limited" for intensive OHV use if there are no significant resource protection needs, user conflicts, or public safety concerns.

To resolve this issue, answers are needed to the following questions:

What public lands should be designated as "open," "limited," or "closed" to OHV use?

What special use areas should be designated for OHV use to meet specific user group and general public demand?

What OHV designations (and areas) would result in minimum conflicts between people and resources?

Issue #4: Specially Designated Areas

The FFO boundaries contain certain areas where special management could protect important natural, cultural, recreational, paleontological, scenic, mineral, botanical, wildlife, watershed, and wilderness values (see Appendix B for a list of these areas). Special management could be achieved through identification of a variety of designations. Past planning decisions concerning special management designations will be carried forward unless additional information requires further analysis.

To resolve this issue, answers are needed to the following questions:

What areas and resource values should be identified for special management attention?

How should such areas and resource values be managed?

Issue #5: Coal Leasing Suitability Assessment

Portions of the field office boundaries are potentially valuable for the development of coal. The demand to develop this resource fluctuates almost annually due to changing demands for electric power, trends in alternate fuel costs, and availability. Recent interest has been expressed by coal companies for leasing additional coal (tracts) to meet current and future demands for power generation in the Four Corners. Currently, over 33,000 acres of BLM-administered subsurface are under Preference Right Lease Applications (PRLA). In addition, 60,698 acres were designated as competitive coal lease tracts in 1988 and 4,480 acres were determined to be suitable for leasing (by application) in 1998.

Not all public lands are available for coal exploration or leasing. There is a rigorous land use planning process through which all public lands are reviewed for potential coal leasing. The requirements for the land use plan include multiple use, sustained yield, protection of critical environmental areas, applications of specific unsuitability criteria, and coordination with other government agencies. There are four specific land use screening steps that are unique to developing land use planning decisions for federal coal lands. These are: (1) Identification of coal with potential for development, (2) Determination if the lands are unsuitable for coal development (3) Consideration of multiple use conflicts, and (4) Surface owner consultation. The purpose of the coal screening part of the land use planning process (43 CFR 3420.1-4) is to identify those federal lands that are acceptable for further consideration for coal leasing and development. During this process, the unsuitability criteria must be applied.

Coal development potential would be addressed when data are available to estimate coal reserves.

To resolve this issue, answers are needed to the following questions:

After application of the four land use planning screens for coal, which tracts should be carried forward for further consideration for coal leasing?

Are there any new areas which should be considered acceptable for further consideration for coal leasing?

CHAPTER 2
CONTINUING MANAGEMENT GUIDANCE AND ALTERNATIVES

This chapter is divided into two sections: "Continuing Management Guidance" and resource management "Plan Alternatives." The first section is a summary of the objectives, basic management policy, and program direction that is applicable regardless of which alternative is selected. The second section is a presentation of four plan alternatives developed as possible solutions to the issues discussed in Chapter 1. Each alternative presents a different blend and balance of resource allocations and emphasis. All alternatives comply with the FLPMA requirement that the public lands be managed by the principles of multiple use and sustained yield. When coupled with the continuing management guidance, any of the plan alternatives could be implemented as the selected RMP.

This RMP will provide multiple use planning for the area while consolidating and updating the existing management decisions contained in existing plans. Appendix A lists previous decisions that have been carried forward and, based on new resource information and updated Bureau guidance, provides the basis for determining which decisions remain valid and which will be revised through this RMP. The decisions presented in Appendix A received environmental analysis in previous land use or activity planning efforts. These decisions represent continuing management or monitoring requirements tied back to continued implementation of existing activity plans, regulation, or policy. When approved, the Farmington RMP will constitute the final land use plan that will supersede all previous land use planning decisions.

The RMP alternatives are designed to provide a management foundation for the public lands. Where necessary, specific actions will be detailed in future activity plans with accompanying Environmental Assessments (EA). Activity plans describe how a particular area or resource will be managed, and will comply with the allowable resource uses, levels of production, resource condition goals, program constraints, and general management practices documented in the RMP.

CONTINUING MANAGEMENT GUIDANCE

This section describes the objectives, basic management policy, and program direction that will continue to apply under all alternatives. This direction is fundamental and its associated guidance is based on laws, regulations, manuals, policies, executive orders, memoranda, and applicable planning documents. A summary of authorizing actions that guide BLM management decisions is included in Appendix K. The information that follows pertains to public land in the FFO area, except as noted.

Minerals

It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands. The following sections describe continuing management guidance for oil and gas, coal, and salable and locatable minerals.

Oil and Gas

In developing the alternatives for analysis, the BLM commissioned a study conducted by New Mexico Institute of Mining and Technology (NM Tech) working with oil and gas industry representatives to identify reasonable foreseeable demand for oil and gas development in the San Juan Basin. This study resulted in a RFDS, which forms the basis for projected oil and gas development in the

planning area over the next 20 years. The RFDS (Engler et al. 2001) projects 9,970 new well bores on federal minerals and a total of 12,461 new well bores on all land in the San Juan Basin over the next 20 years. An estimated 54 percent of these wells are expected to involve new surface disturbance. The remaining 46 percent of the wells is anticipated to be developed on existing disturbed sites through re-completion, dual completion, or directional drilling. Each new well pad is estimated to average two acres in finished size and involve another acre of associated road and pipeline disturbance (50-foot right-of-way [ROW] for both road and pipeline).

This section addresses policies guiding oil and gas on federal land in the San Juan Basin in New Mexico, including USFS and USBR land. The 1920 Mineral Leasing Act, as amended, authorizes the Secretary of the Interior to lease oil and gas resources on all public domain and federally acquired lands. Lands excluded from such leasing by legislation or secretarial policy are listed in CFR Title 43, Part 3100.0-3. They include units of the National Park System; incorporated cities, towns, and villages; and lands recommended for wilderness study, as well as lands within the National Wilderness Preservation System. BLM Lease Form 3100-11, Offer to Lease and Lease for Oil and Gas, contains STCs that grant the leaseholder the right to develop the oil and gas resource and provide for the general protection of surface and subsurface resources under normal operations.

The BLM, as agent for the Secretary of the Interior, is responsible for processing APDs and administering or assisting with the minerals development programs on BLM, USBR, USFS and other lands with federal minerals. BLM responsibilities include conducting pre-drill inspections of the proposed drill sites; assessing the status of cultural and threatened or endangered species clearances; conducting compliance inspections and enforcement actions for lease terms and conditions, safety, production verification, and site maintenance; and abandonment inspections of drilling locations. In situations where there are federal minerals underlying tribal, state, private, or other land ownership (split estate), the BLM issues the APDs and encourages the operator or lessee to obtain consent and agreements for surface use from the private surface owner.

BLM regulations, orders, notices, standard conditions of approval, and general requirements constitute the range of standard procedures and environmental protection measures that are applied to individual operators and projects, as applicable, and are authorized by 43 CFR 3160. BLM Onshore Oil and Gas Orders and Notices to Lessees are applied as standard operating procedures.

The New Mexico BLM has issued a number of Notice to Lessees (NTL) to those companies that operate on federal and Indian leases. The NTLs provide instructions for a specific field or area of a jurisdictional BLM district or state. The NTLs are consistent with or exceed the minimum standards specified in the 43 CFR 3160 regulations or Onshore Orders.

Because of growing concerns and public complaints over the increased amount of loud, continuous noise in the field office area, the FFO staff has developed an NTL to address noise. Equivalent wording will be used in a stipulation applied to noise generating activities permitted by ROWs. The objective of the NTL or stipulation is to maintain noise from oil and gas development on public lands at levels compatible with other uses. The two NTLs are analyzed in this document under Alternatives C and D. The NTLs are located in Appendix E.

Noise associated with oil and gas development varies according to the activity occurring. Noise occurs at different levels during construction, drilling, production, and abandonment phases. Noise generated may be short-term and transient in nature (i.e., construction noise generated from heavy equipment used for building roads, pipelines, or well pads). Noise created during the construction process would be localized and occur during daylight hours for the period of time it takes to complete the project; then, it

would stop. Oil and gas related noise may also be continuous and long-term, such as that associated with compressor stations, well head compressors, and pumpjacks used during the production phase of development.

The BLM applies STCs and special stipulations to the construction and operation of wells, pipelines, and compressors. STCs address the condition and management of the well location, associated equipment, access road, and reseeding and abandonment. STCs also ensure protection of cultural resources, compliance with the Endangered Species Act (ESA) of 1973, as amended, and the conservation of sensitive species. The FFO uses the "BLM General Requirements for Oil and Gas Operations on Federal and Indian Lands" as a COA that describes general requirements and standard plan of operations for wells drilled in its jurisdiction. The conditions may be supplemented by additional mitigation measures supplied by applicable surface managing agencies or surface owners in cases of split estates. If a surface managing agency or surface owner has supplied to the BLM and the operator a written environmental requirement, the requirement would be incorporated into the APD if it does not affect adjacent federal or Indian surface; does not compromise safety or conservation; or does not negate minimal federal restoration requirements in cases of abandonment. Surface managing agencies include the USBR, USFS, BIA, and National Park Service (NPS). Surface owners can include private surface owners, Indian tribes, and the State of New Mexico. The BLM grants approvals for routine modifications to a well's construction and operating plan via sundry notice.

The BLM must decide what lands are to be leased to access federal minerals and whether special management constraints modifying the STCs are needed to protect the environment and other resources. For example, many of these constraints are designed to reduce erosion and sedimentation in order to minimize the impacts on soil and water resources. These constraints are generally appended to a lease at the time of lease offer or as COAs on APDs, often within special management designations such as Special Management Areas (SMA) or Areas of Critical Environmental Concern (ACEC).

Stipulations include seasonal closures, or Timing Limitations (TL), that prohibit exploration, development, or any surface disturbing activities for designated time periods during the year to benefit wildlife. Controlled Surface Use (CSU) constraints are used to identify restrictions on well locations, surface use, or operations year-round in order to protect specific resource values or uses. No Surface Occupancy (NSO) constraints are intended for use when other constraints are insufficient to adequately protect the resource values and uses.

Lease exceptions, modifications, and waivers of management constraints can only be granted by the BLM if circumstances have changed or if the lessee demonstrates that operations can be conducted without harming the protected resource values and uses. Exceptions, modifications, and waivers are considered on a case-by-case basis as changes in the resource or management situation occur. An EA that meets NEPA requirements is prepared to evaluate the potential impacts of the proposed change.

Site-specific EAs are required prior to siting a new well. During this process, environmental impacts are identified and management constraints are developed, which will mitigate impacts to the environment, public health and safety, cultural resources, and threatened, endangered, and sensitive species. The mitigation measures become the COAs attached to the permits for surface disturbing activities, such as APDs and sundry notices. Similarly, mitigation measures are attached as stipulations to ROW grants, terms, and conditions on geophysical operations. Each mitigation measure is applied to protect a resource that would be affected by the operation being approved, even on existing leases. A reclamation plan and a weed management plan are also required.

The USFS cooperates with the BLM to ensure that management goals and objectives are achieved, surface impacts are mitigated to the maximum degree practicable, and the land affected is rehabilitated. The Federal Oil and Gas Leasing Reform Act of 1988 bestowed upon USFS the authority to consent to BLM leasing decisions. The Act gave USFS the authority to approve surface use plans filed as part of APDs. The USFS responds to BLM proposals to issue mineral leases and permits after reviewing its land management plans. The USFS requires reclamation plans for all proposed surface-disturbing activities to return the land to productive uses consistent with the ecological capability of the area and in accordance with land management goals. Applicable plans in the planning area are the Carson National Forest Plan, September 1986, as amended in October 1990, and Santa Fe National Forest Plan, as amended in October 1996.

Numerous mineral leases were located on USBR lands at Navajo Reservoir prior to their withdrawal for construction and operation of the dam and reservoir. The USBR is in the process of developing an RMP (USBR 1999), which is presently in the draft stage. One of the plan's objectives is to formally coordinate management of USBR lands with the BLM, which manages adjacent lands and is responsible for the management of minerals development on USBR lands. The BLM's responsibility extends to environmental protection, public health, and safety associated with federal oil and gas operations. Lease rights granted by the BLM include the right to occupy as much of the lease surface as is reasonable to extract the resource and the right to remove oil and/or gas. On USBR lands, these leases are managed by the BLM under the terms of a 1967 agreement that provides for review and concurrence by the USBR. As part of the review and concurrence process, the USBR has defined mitigation measures that are applicable to mineral extraction activities on USBR lands. The BLM may also grant, with USBR concurrence, approval for other uses, such as utility ROW on withdrawn lands not specifically allocated to recreation or fish and wildlife purposes.

Coal

The Surface Mining Control and Reclamation Act (SMCRA) of 1977 (30 USC 1201 *et seq.*) requires application of "unsuitability criteria" prior to coal leasing. Unsuitability criteria are used to screen out areas unsuitable for mining for various reasons (e.g., environmental conflicts). The criteria are part of 43 CFR 3461, and are included in Appendix C. Project-specific EAs are developed prior to leasing and before mining is approved, with the purpose of analyzing the impacts of coal mining on the natural and cultural resources in the area of the proposed mine site. During this process BLM coordinates with all appropriate agencies of state, federal, and tribal governments. A reclamation plan and a weed management plan are also required.

The FFO is responsible for inspection and enforcement on all coal leases to ensure compliance with lease terms and conditions and with stipulations for development exploration. Inspections are performed to ensure maximum economic recovery and conformance with the approved mining or exploration plan. The FFO is also responsible for product verification by independently auditing mine production reports to ensure fair royalty reporting to the federal government and The Navajo Nation.

Salable and Locatable Minerals

Federal lands in the planning area are important sources of mineral materials for construction projects in the region, including sand and gravel, rock and stone, and other fill materials. The FFO issues Contracts (Form 3600-9 and 5450-5) and Permits (Form 5510-1) for the removal of mineral materials managed under 43 CFR 3600. These contracts and permits can be issued for up to five years and 200,000 cubic yards of material. Any amount greater than 200,000 cubic yards must be offered through a competitive bid. A mining plan, a reclamation plan, and a weed

management plan are required with the contract or permit application, and plans must conform with modern mining and reclamation standards. The proposed operation plan goes through the NEPA process with the preparation of an EA, and is approved if the mining and reclamation plans comply with the FFO RMP and include appropriate mitigation measures, if needed. The FFO is responsible for inspection and enforcement on all contracts and permits.

The program to manage the extraction of locatable minerals, such as uranium, is also under the purview of the FFO under 43 CFR 3809. This program is currently inactive due to the lack of demand. The FFO program defines three levels of activity: 1) casual use using non-mechanized equipment, 2) notice level comprising less than five acres of surface disturbance, and 3) plan level comprising more than five acres of surface disturbance and heap leaching operations.

Renewable Energy Program

At present there are no renewable energy facilities on public lands in the FFO. The BLM, in conjunction with the Department of Energy's National Renewable Energy Laboratory, has conducted an assessment of the opportunities for development of renewable energy resources on lands managed by the BLM. The draft report, Assessing the Potential for Renewable Energy on Federal Lands (BLM 2002b), indicates that the Farmington Field Office is in the list of top 25 BLM planning units with high potential for concentrating solar power sites. The FFO did not meet the screening criteria to be considered as a potential area for the location of wind, biomass, or geothermal energy generation facilities. According to the Renewable Energy Atlas of the West (Nielsen et al. 2002) the planning area is rated as Class 1 (Poor) for wind power generation and exhibits an Annual Solar Insolation Average of 5.6-6.0 kilowatt hours per meter squared per day ($kWh/m^2/day$). With present technology, it is estimated that a 4-acre array of solar panels would be required to generate the energy equivalent to an average natural gas well in the San Juan Basin.

Economic and societal forces beyond the control of the BLM dictate the level of interest in renewable energy. To date, the FFO has not received any applications for location of renewable energy generation sites. Future applications would undergo site-specific environmental analysis as part of the right-of-way or commercial lease process.

Lands

The objective of the FFO lands program is to facilitate the acquisition, exchange, or disposal of public lands in order to provide the most efficient management of public resources. The program is responsible for processing land withdrawals, granting ROWs and easements on public lands, and acquiring easements on non-public lands where necessary. The lands program also issues leases and patents under the R&PP Act, and licenses and permits for specific uses such as filming or special events.

Land Ownership Adjustment

The basic concept of land ownership adjustment for the FFO follows the requirements of FLPMA. Land will generally remain in federal ownership unless it meets specific criteria in FLPMA and existing land use plans. The primary goal is conserving federal ownership while consolidating administrative boundaries to create a more efficient and economical land ownership pattern. This is accomplished through retaining, acquiring, and disposing of land for the purposes of consolidation that is in the public interest.

Acquisition of lands that would enhance and protect important resources will continue to be a priority for the FFO. Lands would only be acquired from owners willing to dispose of them. Currently, there are 145,000 acres of non-federal land within special management designations that are a high priority for acquisition. Also, a program to facilitate exchange of land between BLM and the State of New Mexico will continue when the exchange improves the management potential

of state and federal land. Where state or private lands are intermingled with public land, BLM may acquire land to help consolidate public use areas. Disposal may be by means of transfer, exchange, sale, withdrawal (to another federal entity), or other means. Lands will be transferred to another federal agency if use and management by that agency is suitable and serves a purpose. Lands may be exchanged or sold if they are difficult or uneconomical to manage, are not suitable for management by another federal entity, no longer serve a specific purpose, or if disposal would serve important public objectives. Disposal of lands meeting the above criteria is a priority.

Much of the land south and west of U.S. Highway 550 (US 550) is currently identified for exchange. The FFO has been successful over the last 25 years in transferring about 131,000 acres and exchanging 150,000 acres with The Navajo Nation. Exchanges have slowed down, since the most easily executed exchanges have been completed. However, the FFO will continue to process exchanges that are identified in the future.

Sales of public land identified in the 1988 RMP will continue. Appendix F includes a list of isolated disposal parcels. Sales will all be considered on a case-by-case basis for conformity with FLPMA criteria. Land sales will be disposed of at or above fair market value.

All land adjustment actions must go through the NEPA process. In general, under all land adjustments, the BLM will protect valid existing rights. These would include authorized permits, leases, ROW, and licenses. The FFO will continue a prevention program developed by BLM, The Navajo Nation, and BIA to prevent unauthorized occupation.

Recreation and Public Purpose

Lands will continue to be available for disposal to governmental or non-profit entities under the R&PP Act for public parks, building sites and correction centers, or other public purposes. BLM generally leases the land for up to five years or until substantial development has been completed and then the land may be patented. All applications are subject to public review and the NEPA process.

Land Withdrawal

The FFO will continue to review existing withdrawals on a periodic basis to ensure that the reasons for the withdrawal are still valid and only the acreage needed is retained in withdrawn status. Policy will continue to minimize the amount of land withdrawn (particularly from mining and mineral leasing) in favor of leases, permits, or cooperative use agreements that are more flexible. Upon revocation or modification of a withdrawal, all or part of the withdrawn land could be restored to multiple use. Additional land may be identified for withdrawal if criteria are met and would be processed on a case-by-case basis.

Rights-of-Way

Under the authority of FLPMA and the Mineral Leasing Act of 1920, the FFO grants ROW leases and permits to qualified individuals, businesses, and government entities for use of public lands. Since the 1950s, oil and gas production, and to a lesser extent coal mining, has been the major industry in the region. This has made energy-related ROWs for roads and pipelines one of the primary activities in the FFO lands program. The FFO processes ROW applications for access, utilities and telephone lines, fiber optic lines, and other communication sites. All ROW applications will continue to receive environmental review on a case-by-case basis.

To the extent possible, new ROWs will be located within or parallel to existing ROWs or ROW corridors to minimize resource impacts. Priority will be given to the ROWs identified in the 2002 Western Utility Group (WUG) revision (WUG 2002) of the 1992 Western Regional Corridor Study (WRCS) (WUG 1992) when considering corridor needs. BLM regulations specify the typical width allowed for different uses, including pipelines, roadways, and utility lines.

Lee Acres Landfill

The Lee Acres Landfill is a closed landfill formerly operated under permit from BLM by San Juan County as a municipal solid waste disposal site from 1962 to 1986. During the 1980s use of the landfill expanded to also allow the disposal of liquid waste. In 1985 maintenance activities resulted in a release of liquid waste and hydrogen sulfide gas. Several people were hospitalized due to inhalation of the gas. Closure of the landfill occurred shortly thereafter and the area was evaluated because of hazardous material concerns. Evaluations resulted in the landfill being listed on the National Priorities List by EPA. This listing required further assessment and development of a plan to remediate the potential hazardous material concerns at the landfill. BLM is currently in negotiation with the EPA and New Mexico Environment Department (NMED) on a Record of Decision (ROD) under authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which will guide the final cleanup at the landfill.

The Lee Acres Landfill ROD will guide and direct how cleanup will proceed at the site, how monitoring will be conducted and any necessary follow-up actions would be implemented. Additionally the ROD may provide guidance on other actions, which should be taken to protect the public health, welfare and environment from hazardous substances that may remain on the landfill following completion of remedial action. In order to assist with the institutional controls required to implement the ROD the BLM has already withdrawn 134.68 acres of public land, within which the landfill is located, from settlement, sale, location and entry as described in Public Land Order No. 7234 (62 Federal Register 2177, January 15, 1997). The current withdrawal will remain in effect until January 15, 2047.

The withdrawal does not prohibit all activities on the withdrawn land. A primary intention of the withdrawal is to prevent withdrawal of ground water beneath the site in order to preclude unacceptable risk to human health or the environment due to exposure to hazardous substances remaining at the site. Other activities may occur at BLM's discretion if they do not interfere with protecting the public health and environment from hazardous substances as outlined by the objectives and requirements identified in the Lee Acres Landfill ROD.

Roads and Access

The FFO has not had an active easement acquisition program. This is largely due to the numerous roads located throughout the FFO area that have historically been open to the public. For the most part, this network of roads (estimated at over 15,000 miles) was generated by oil and gas development in the San Juan Basin. Normally, only one or two easements are acquired each year. As required by Bureau policy, these easements generally provide legal access to BLM-initiated range improvement projects and recreation areas.

The FFO has designated 13 OHV Management Units to serve as the basis for maintenance and transportation planning. The field office is conducting an inventory of the existing road system to identify the major collector roads that could serve as the backbone for the FFO road network. This is the first step in a process to classify and designate all levels of roads within the system based on traffic levels, type of use, condition and other criteria. Subsequently, any special restrictions, needs, or actions would be defined. Improvements would be based on the "Gold Book" (USDI 1989) that provides generic guidelines and basic stipulations for road development. The BLM Manual 9113 on Roads provides additional guidelines and standards for construction and maintenance of transportation system roads on public lands.

The San Juan Basin Public Roads Committee includes members from the oil and gas industry and the FFO. The committee has developed and agreed upon a set of bylaws, which constitute a San Juan Basin Public Roads Maintenance Committee agreement (Appendix D) that will address the issue of road

maintenance on BLM system roads within the San Juan Basin. Under this agreement, 95 percent of the cost for system road maintenance will be paid by the oil and gas industry. FLPMA enables the use of cost-share authorizations to provide the financing by users for road construction and maintenance. BLM would still incur the cost of upgrading and maintaining system roads that access federal facilities through the Deferred Maintenance and Capital Improvement Process.

The USFS is beginning a Roads Analysis Policy that is an integrated ecological, social, and economic science-based approach to transportation planning that addresses existing and future road management options. Three levels of analysis to be conducted include Forest-wide evaluation of major arterial and collector roads, inventory of all roads within a fifth order watershed, and project-level analysis if roads are required. Currently, all roads are classified as Level 2 maintenance standard, which is typically 1 or 1½ lanes wide, with turnouts, crowned, and ditched.

Public Land Health

All BLM activities are expected to meet the New Mexico Standards for Public Land Health that were accepted by the Secretary of the Interior as part of the Record of Decision for the Statewide RMP Amendment/EIS for Standards for Public Land Health and Guidelines for Livestock Grazing Management (BLM 2000a). BLM staff determines whether activities meet the standards by evaluating the results against indicators developed for each standard. The standards describe the conditions needed for healthy public lands under three categories, Upland Sites, Biotic Communities, and Riparian Sites, summarized below.

Upland Sites Standard

Healthy upland ecological sites are in a productive and sustainable condition within the capability of the site. Upland soils meeting the standard are stabilized and exhibit infiltration and permeability rates that are appropriate for the soil type, climate, and landform. The combined kind, amount, and/or pattern of vegetation provide protection on a given site to minimize erosion and assist in meeting state and tribal water quality standards. Indicators for this standard may include, but are not limited to, the following:

- Consistent with the capability of the ecological site, soils are stabilized by appropriate amounts of standing live vegetation, protective litter and/or rock cover.
- Erosion is indicated by flow patterns characteristics of surface litter soil movement, gullies and rills, and plant pedestalling.
- Satisfactory plant protection is indicated by the amount and distribution of desired species necessary to prevent accelerated erosion.

Biotic Communities, Including Native, Threatened, Endangered, and Special Status Species Standard

Ecological processes such as the hydrologic cycle, nutrient cycle, and energy flow support productive and diverse native biotic communities, including special status, threatened, and endangered species. Desired plant community goals maintain and conserve productive and diverse populations of plants and animals that sustain ecological functions and processes. Restoration should first be achieved with native plants, and when appropriate, non-native plants. Indicators for this standard may include, but are not limited to, the following:

- Commensurate with the capability of the ecological site, plant and animal populations are productive, resilient, diverse, and sustainable.
- Landscapes are composed of communities in a variety of successional stages and patterns.
- Diversity and composition of communities are indicated by the kinds and amount of species.
- Endangered and special status species are secure and recovering, with the goal

of delisting and ensuring that additional species need not be listed within New Mexico.

Riparian Sites Standard

Healthy riparian areas are in a productive, properly functioning, and sustainable condition, within the capability of each site. There is present adequate vegetation of diverse age and composition to withstand high stream flow, capture sediment, provide for groundwater recharge, provide habitat, and assist in meeting state and tribal water quality standards. Indicators for this standard may include, but are not limited to the following:

- Stream channel morphology and stability as determined by gradient, width/depth ratio, channel roughness, and sinuosity.
- Streambank stability as determined by degree of shearing, sloughing, and vegetative cover on the bank.
- Appropriate riparian vegetation includes a mix of communities comprised of species with a range of age, density, and growth form.

Specially Designated Areas

The objective of the SDAs in the FFO is to protect, maintain, and enhance the special resource values on public lands. Areas that have special resource values are identified where some uses may be restricted in order to protect the resources. These areas include public lands such as SMAs, ACECs, Wilderness Areas (WA), Wilderness Study Areas (WSA), Special Recreation Management Areas (SRMA), and Research Natural Areas (RNA). The FFO and AFO generally identify areas with special designations as SMAs or ACECs. Other federal lands and state facilities within the planning area are also managed for special purposes. The FFO will continue to designate ACECs and other SDAs and to apply management prescription to protect the resource value of those areas.

Visual Resource Management

Legislation such as FLPMA, NEPA, and SMCRA outline the BLM's responsibilities for protecting the quality of the visual (scenic) values of public lands. Policy and management guidance is also provided in BLM manuals 8400, 8410-1, and 8431-1.

Public lands have a variety of visual values. These different values warrant different levels of management. Because providing the same level of management for all visual resources is neither desirable nor practical, the BLM systematically identifies and evaluates these resources to determine an appropriate level of management.

Visual values are identified through the BLM Visual Resource Management (VRM) inventory process and are considered with other resource values in the RMP. The inventory consists of a scenic quality evaluation, a visual sensitivity level analysis, and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes (Class I through Class IV). A VRM class identifies suggested degrees of human modifications that should be allowed in a landscape to protect visual resources, with Class I allowing the least modification and Class IV the most. VRM classes are not used as a device to stop surface disturbing activities. Most of the planning area is presently designated as a Class III or Class IV. These classes provide the visual management standards for the design and development of future projects and for rehabilitation of existing projects. Visual design considerations shall be incorporated into all surface-disturbing projects regardless of size or potential impact and is a management responsibility shared by all resource management programs.

The inventory classes represent the relative value of the visual resources, with Class I assigned to areas where the visual value is the greatest. These include WAs, WSAs, wild and scenic rivers, and other congressionally and administratively designated areas where

decisions have been made to preserve a natural landscape. Each class designation has a defined management objective.

- Class I—Preserve the existing character of the landscape. This class provides for natural and ecological changes; however, it does not preclude very limited management activity. The level of change can be very low and not attract attention.
- Class II—Retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- Class III—Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- Class IV—Provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

VRM classes acknowledge existing visual contrasts. More restrictive requirements would not be retroactively applied to existing projects should VRM classifications change as a result of this planning effort. New proposals would be managed to meet the intent of the VRM designations determined by this plan.

Soils and Water

The BLM's soil and watershed program places emphasis on preventing and/or avoiding further degradation of soil and water resources, as well as their conservation. The program contributes to the success of other resource programs and has a legislation mandate for the protection, restoration, and improvement of these resources. The BLM will continue to support the Natural Resources Conservation Service (formerly Soil Conservation Service) in the National Cooperative Soil Survey.

The 1974 Colorado River Basin Salinity Control Act (as amended, 1984) directs the Secretary of the Interior to "…develop a comprehensive program for minimizing salt contributions to the Colorado River from lands administered by the Bureau of Land Management." Although the BLM is the largest landowner in several subwatersheds of the San Juan Basin, other owners and agencies must be involved in improving environmental conditions. Coordinated Resource Management Plans have been a successful means for the participation of a diverse group in improving resource management. The FFO will promote the Coordinated Resource Management Plan process within the San Juan Basin to improve resource conditions when opportunities arise.

Soil and water conservation practices will be used to develop site-specific Best Management Practices (BMP) at the project level to prevent or reduce the amount of pollution to a level compatible with water quality goals.

The soils program will continue to provide support to other resource activities in the FFO and also continue to emphasize its legislative mandates for the protection, maintenance, and enhancement of the soil resources. Policy and guidance for the management of soil resources associated with lands administered by the BLM are administered in Manual Sections 7000 and 7100.

Legislative mandates are also in place for the protection of water resources through the Clean Water Act (CWA) program for the Nonpoint Source Pollution program, which emphasizes improving water quality in degraded stream systems; the riparian program, which is concerned with maintenance and restoration of riparian zones both vegetatively and hydrologically; and the Colorado River Basin Salinity Control Act, which intends to reduce salt loading throughout the San Juan Basin. All three programs have parallel or similar goals, and accomplishments in any one usually are beneficial to the others.

All water rights are acquired in accordance with state substantive and procedural law, except where Congress or the Executive Branch has created a federal reservation with a reserved water right.

Federal reserved water rights are defined based on the Interior Solicitors' Opinion of June 25, 1979, as modified by Solicitor Coldiron's September 11, 1981, opinion. BLM's federal reserved water rights claims are primarily associated with the withdrawal established by the Executive Order (EO) of April 17, 1926, dealing with public water reserves, and the withdrawal for converted oil and gas wells under the Oil and Gas Well Conversion Act of June 6, 1934.

Water quality regulations in the U.S. receive its basic authority from two laws. The Federal Water Pollution Control Act of 1972, as amended by the CWA of 1977, is the basic authority for instream water quality standards and maximum permissible pollution discharges. The Safe Drinking Water Act of 1974 is the basic authority for domestic water quality standards.

The BLM's water resource program includes participation with the state and EPA in water quality management. Specifically, the BLM works to ensure that the management and development practices comply with state water quality standards.

The hydrology program will continue to emphasize legislative mandates of protections, maintenance, and enhancement of the resources, as well as provide support to other resource activities for the FFO. Policy and guidance for the management of water resources associated with lands administered by the BLM is summarized in Manual Sections 7000 and 7200.

Air Quality

All BLM actions and use authorizations must comply with all applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans. Prior to implementation, all BLM-initiated or authorized activities within non-attainment areas must undergo a determination (when applicable) of conformity with the National Ambient Air Quality Standards (NAAQS) according to the General Conformity Rule (40 CFR Part 93.150). If the NAAQS are being met, the area is designated as attainment, and if the status of attainment has not been verified through data collection, the area is unclassified. For permitting purposes, an unclassified area is treated as an attainment area. The counties in the planning area are classified as in attainment of all state and national ambient air quality standards.

The New Mexico Air Quality Bureau (NMAQB) is responsible for enforcing the state and national ambient air quality standards in New Mexico. Any emission source proposed for the RMP would have to comply with the NMAQB regulations. For example, any new or modified stationary source that has the potential to emit more than 10 tons per year (TPY) of any regulated air contaminant or 1 TPY of lead has to file a notice of intent (NOI) prior to construction and thereafter submit annual emissions inventories. Proposed sources that emit more 10 pounds per hour or 25 TPY of any air pollutant for which there is a national or state ambient air quality standard would have to demonstrate that these emissions would not contribute to an exceedance of an ambient air quality standard or substantially degrade air quality within pristine federal Class I areas, such as National Parks greater than 6,000 acres or

National Wilderness Areas (NWA) greater than 5,000 acres. Within the project region, these areas could include the San Pedro Parks NWA in New Mexico and the Mesa Verde National Park and Weminuche NWA in Colorado.

For any proposed coal development associated with the RMP, increase in current extraction or use, the BLM would coordinate with all appropriate agencies of state, federal, and tribal governments to ensure compliance with laws and regulations. Project specific dispersion modeling and an environmental assessment will be prepared with the opportunity for public input. Air quality will be examined in conjunction with the NMAQB, following applicable permit procedures.

Invasive Weed Management

EO 11312, Invasive Species-1999, the Federal Noxious Weed Act of 1974, the New Mexico Noxious Weed Management Act of 1978, and the Federal Plant Protection Act of 2000 require the development of a weed management program. This program focuses on the inventory of existing infestations, prevention of noxious weed invasion, monitoring revegetation efforts for invasive weeds, and assessment of the success of weed control efforts.

The mission of the FFO is to detect new invasive plant species populations, prevent the spread of new invasive populations, manage existing populations using tools of integrated weed management, and eradicate invasive populations. This is accomplished when and where possible using the safest environmental methods available in a timely manner (Heil and White 2000). Prevention and management of invasive plants assists in improving the health of public lands.

A plan developed for the FFO includes the following program procedures.

- Prevention and Detection—develop a prevention and early detection program.
- Education and Awareness—generate internal and external support for noxious weed control. The FFO has a one-week invasive plant workshop at San Juan College in July.
- Inventory—ensure that adequate baseline data are available on the distribution of weeds.
- Planning—include provisions for noxious weed management in all BLM funded or authorized actions.
- Integrated Weed Management—determine the best methods for an integrated approach to weed management and implement on-the-ground operations.
- Coordination—ensure management for noxious weeds is carried out efficiently and consistently across jurisdictional and political boundaries. San Juan County is in the process of forming a weed management team that consists of members from the BLM, San Juan County officials, Cities of Farmington, Aztec, and Bloomfield, BIA, and San Juan College.
- Monitoring, Evaluation, Research, and Technology Transfer—ensure sufficient data are available to evaluate management actions, provide a basis for making informed decisions, assess progress towards management objectives, and develop new and more effective management methods.

For all actions on public lands that involve surface disturbance or rehabilitation, reasonable steps would be required to prevent the introduction or spread of noxious weeds, including requirements for using weed seed-free hay, mulch, and straw.

Special Status Species

Special status species are managed in accordance with BLM Manual 6840. The ESA (Public Law [PL] 93-205), as amended (PL 100-478), requires special protection and management for federally listed threatened and endangered (T&E) species, species proposed to be listed as T&E, and designated and proposed critical habitat. The act also requires the

development and implementation of recovery plans for the conservation and survival of T&E species. FFO activities to implement recovery plans are described in the Biological Assessment for the RMP/EIS (BLM 2002c). In accordance with BLM Manual 6840, BLM also manages a large number of sensitive, non-listed species to protect them and prevent the need to list them as threatened or endangered. The purpose of this management prior to federal listing is to use a broad range of management options to protect a species.

Federal and state listed species are protected by requiring site-specific evaluations and clearances and by applying more stringent management prescriptions in areas that have been specially designated to protect target species. The FFO maintains a conflict map that identifies the location of listed species or potential habitat to guide any staff responsible for authorization of specific projects. When a proposed project falls within habitat that has been designated as having the potential to support a protected species, a field survey is required prior to authorization of the project. When a new threatened, endangered, or proposed species protected by the ESA is listed, any potential habitat for that species is added to the conflict map. Any action that may affect federally listed species also requires consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the ESA.

Major legislation requiring actions by federal agencies to protect T&E species, as well as other protected, non-federally listed species and habitats, include the following:

- Fish and Wildlife Conservation Act of 1980 (PL 96-366).
- Fish and Wildlife Coordination Act of 1958 (PL 85-654).
- Migratory Bird Treaty Act of 1976 (PL 94-576).
- Plant Protection Act of 2000 (PL 106-224).

Wildlife and Wildlife Habitat

The objectives of BLM's wildlife management program are to ensure optimum populations and a natural abundance and diversity of fish and wildlife values by restoring, maintaining, and enhancing habitat conditions (BLM 1987b). The objective of the FFO wildlife program is to maintain, improve, and expand wildlife habitat on public lands for both consumptive and non-consumptive uses. Wildlife management on BLM lands has emphasized the perpetuation of a biologically diverse plant and animal community. Priority wildlife management activities conducted in the FFO include big game management and bald eagle protection. The FFO is determining the numbers, habitat needs, and distribution of non-T&E bird species, including migratory songbirds. The protection and enhancement of wildlife habitat is accomplished through an aggressive program of habitat improvement projects, designation of SMAs with wildlife friendly management prescriptions, and the application of mitigation measures on key wildlife lands where oil and gas reserves are being developed. Stipulations on oil and gas activities are applied to mitigate the impacts on wildlife. The FFO administers a small amount of fisheries habitat on small, generally isolated tracts of public land mostly along the San Juan River.

Legislation such as FLPMA, the ESA, and the Public Rangelands Improvement Act of 1978 provide direction to the BLM for improving wildlife habitat. It is the responsibility of the FFO to identify opportunities to maintain, improve, and expand wildlife habitat on the public lands. The Memorandum of Understanding (MOU) No. NMSO-41 between the BLM and the New Mexico Department of Game and Fish (NMDGF) provides for cooperative development of fish and wildlife resource plans. In addition to earlier Habitat Management Plans (HMP), in recent years the Rattlesnake Canyon and Crow Mesa HMPs were prepared. Implementation of these activity plans will continue and others will be developed as needed.

Department of the Interior policy and the annual Animal Damage Control Plan for the Albuquerque District, prepared jointly by the U.S. Department of Agriculture (USDA) and the BLM, guide animal damage control activities on public lands in the planning area. The USDA has overall responsibility for the program and supervises all control activities. The BLM has approval responsibility for the specific control actions on public lands.

Riparian

Under the BLM's multiple use management, a variety of activities, such as livestock grazing, timber harvest, mining, recreation, roads, and utility corridors, take place on public lands. These activities can affect the quality and health of riparian areas that are important to fish and wildlife. Recent management guidance is provided in the Riparian and Aquatic Habitat Management Plan (BLM 2000b, c). BLM guidance on the management of riparian areas has the objective of restoring and protecting those areas within the context of authorizing other land management activities.

The goal of the FFO riparian monitoring plan is to document the progress toward achieving and then maintaining Proper Functioning Condition (PFC) while being managed under the multiple use and adaptive management concepts outlined in the Riparian and Aquatic Habitat Management Plan (BLM 2000b, c). Riparian and wetland areas are considered to be functioning properly when adequate vegetation, landform, or large woody debris are present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality. The process used to assess PFC is described in BLM Technical References 1737-9 and 1737-15. PFC is reassessed on a 3-year rotating basis. A binder containing monitoring information, such as PFC results, reassessment schedules, and photo-point monitoring photos, for each designated riparian reach is being compiled and maintained in the FFO.

Wilderness

The objective of the FFO wilderness program is to protect and manage the WA and the WSA in accordance with appropriate laws and regulations. Currently, the FFO manages the 44,608-acre Bisti/De-na-zin WA and the 6,653-acre Ah-shi-sle-pah WSA.

In 1996, Congress designated as wilderness approximately 16,525 acres located between the Bisti WA (3,946 acres) and the De-na-zin WA (24,137 acres). As a result, the Bisti and De-na-zin were combined to create one wilderness unit (PL 104-333). Management of the WA will be in accordance with the Bisti/De-na-zin Wilderness Expansion and Fossil Forest Protection Act of 1996 (PL 104-333), the San Juan Basin Wilderness Protection Act of 1984 (PL 98-603), the Wilderness Act of 1964 (PL 88-577), and BLM Wilderness Management Regulations (43 CFR 6300 and 8560).

The Bisti/De-na-zin WA contains three previously designated ACECs: Badlands, Log Jam, and Lost Pine. These areas are required to be managed under the non-impairment standards of the Wilderness Act. Existing management plans prepared for both the Bisti and De-na-zin WAs are proposed to be replaced by one updated management plan that includes the newly acquired acreage.

The Ah-shi-sle-pah WSA will be managed under the Interim Management Policy and Guidelines for Lands Under Wilderness Review until the area is either added to the National Wilderness Preservation System by Congress or removed from further consideration (BLM 1995c). The purpose of BLM's Interim Management Policy is to protect existing wilderness values, manage valid existing rights and grandfathered activities until final wilderness suitability determinations have been made. If designated wilderness, the area will be managed under the enabling legislation, the Wilderness Act of 1964, and BLM Wilderness Management Regulations (43 CFR 6300 and 8560). If released from further wilderness consideration, the area will be managed under

the principles prescribed in the appropriate land use plan for the FFO.

The New Mexico Wilderness Study Report (BLM 1991b) recognized the outstanding wilderness values found in the Ah-shi-sle-pah WSA. However, the report did not recommend the WSA for wilderness designation due to the known coal reserves, the existence of PRLAs on 90 percent of the WSA acreage, the anticipated likelihood of future mineral development, and the potential transfer of 3,094 acres in the WSA to the Navajo Tribe. Currently, no change in land ownership or surface disturbing activity has occurred in the area. However, the WSA would be difficult to manage as wilderness should the above conditions be realized.

In the AFO, five WSAs lie either wholly or partially within the planning area. These include Cabezon, Empedrado, Ignacio Chavez, Chamisa, and La Lena WSAs, with a combined acreage of 70,475 acres. They have been closed to mineral leasing since 1982, but there are pre-existing leases that were issued before then (BLM 1991b).

Forestry

The objective of the forestry program is to manage woodlands and timber stands for the production of forest products to support multiple uses and sustained yields. Multiple uses include recreation, timber sales, and harvesting of fuelwood. Timber sales are not active in the FFO area. Restoration projects focus on improving the 7,400 acres of ponderosa pine through cutting or burning the encroaching piñon and juniper. The Material Disposal Act of 1947, as amended, establishes the authority under which the BLM disposes of timber and other forest products.

Fire Management

The objective of the FFO fire program is to manage and use fire consistent with its natural role in the functioning ecosystem, and the protection of life and property.

The Farmington Interagency Fire Program operates with the cooperation of the FFO and the Jicarilla Ranger District. The program guidance is documented in the 2001 Farmington Field Office Fire Management Plan (BLM 2001a), which addresses all fuels management guidance and provides the basis for decisions regarding evaluation and response to wildfires. The plan adheres to the Federal Wildland Fire Policy (updated in 2000) and BLM Policy 92-13-1.

All fire management activities must also comply with other federal regulations on wilderness management, T&E species protection, cultural and historic preservation, and air and water quality standards and guidance. During reclamation after a fire, a weed management plan is required.

Lightning causes the majority of wildfires in the FFO area, with fires caused by people, either accidentally or intentionally, as the next major source. The increasing population in the tri-cities area has resulted in an increase in fires in the wildland/urban interface area. Fuel loadings in the urban areas are often moderate, with an occasional area of heavy fuel loadings. With the existing fuel loadings, a wind-driven fire in these areas under dry conditions could threaten structures. Areas containing high fuel loadings, such as cottonwood trees, willows, saltcedar, and alkali sacaton, are usually located on private land. There have been no known fires in either of the WAs during the past 10 years due to the predominance of badlands with little vegetation and scattered stands of sagebrush and grass.

The FFO has agreed to suppress fires on approximately 1.5 million acres of public land, 300,000 acres on USFS land, and, under the Joint Powers Agreement, on another 700,000 acres of private, state, and Indian lands where fires may occur and pose a threat to the public land.

Rangeland

The objective of the rangeland program is to promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangeland to properly functioning condition; to promote the orderly use, improvement, and development of the

public lands; to efficiently and effectively administer domestic livestock grazing; and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands. The program cares for and is working toward improving the overall health of all public lands within the BLM's responsibility.

The livestock grazing program is authorized principally by FLPMA, the Taylor Grazing Act of 1937, and the Public Rangelands Improvement Act of 1978. When grazing allotments are planned for disposal, the BLM is required to provide notification to permittees two years in advance.

Three major parts of the program are grazing administration, resource inventory and monitoring, and range improvement. Grazing administration consists of issuing and supervising permits and leases that authorize livestock grazing. Related tasks include detecting and abating unauthorized use and supervising allotments. Analyses of resource monitoring and inventory information is used to evaluate and adjust grazing use. Range improvement helps enhance rangeland resource conditions for a variety of uses, including domestic livestock and wildlife forage and watershed protection. Public rangeland will be managed to meet the Standards for Public Land Health (BLM 2000a). If the Standards are not met, the Livestock Grazing Management guidelines offer tools to guide the FFO to improve those areas not meeting the Standards.

Guidelines are reasonable and practical management options, which when applied, move rangelands toward the statewide standards. The guidelines are developed for public land livestock grazing, not for unsuitable land or land where livestock grazing does not occur. They are based on science, past and present management experience, and public input. These guidelines will be used to develop grazing management practices that will be implemented at the watershed, allotment, or pasture level.

Specific application of these guidelines, or Livestock Grazing Management Practices, occur at the field office level, in consultation, cooperation, and coordination with lessees, permittees, interested public, and landowners. Their implementation is carried out with recognition for the impact that BLM's management objectives have on adjacent landowners.

Guidelines are designed to encourage innovation and experimentation in the development of alternative livestock grazing management practices. They improve rangeland health and consider the natural migration patterns of wildlife. The goals of the Livestock Grazing Management Practices are summarized below.

- Promote native plant health, soil stability, microorganisms, water quality, stream channel morphology, function and habitat for native wildlife including threatened and endangered and special status species.
- Provide the basic requirements of rangeland ecological sites, including allowing for plant recovery and growth; allowing residual vegetation on upland and riparian sites to protect the soil from wind and water erosion, improve infiltration, and improve soil permeability; and improve or restore riparian-wetland functions.
- Use livestock to integrate organic matter into the soil, distribute seeds and establish seedings, prune vegetation to stimulate growth, and enhance water infiltration into the soil.
- Allow for flexibility in season, duration, frequency, and intensity of use.
- Consider climate topography, vegetation, wildlife, kind and class of livestock.
- Give priority to rangeland improvements and land treatments that offer the best opportunity for achieving standards of rangeland health.
- Incorporate the use of other land management practices where needed to achieve the desired plant community,

including, but not limited to prescribed fire, and biological, mechanical, and chemical land treatments.

- Use non-native plant species only in those situations where native species are not readily available or are incapable of maintaining or achieving properly functioning conditions and biological health.

Cultural Resources

The BLM's Cultural Resource Management Program is a comprehensive system for identifying, planning the appropriate use of, and managing cultural resources on public lands within areas of BLM responsibility. The program objectives are as follows:

- Respond in a legally and professionally adequate manner to (1) the statutory authorities concerning historic preservation and cultural resource protection, and (2) the principles of multiple use.
- Recognize the potential public and scientific uses of, and the values attributed to, cultural resources on the public lands, and manage the lands and cultural resources so that these uses and values are not diminished, but rather are maintained and enhanced.
- Contribute to land use planning and the multiple use management of the public lands in ways that make optimum use of the thousands of years of land use history inherent in cultural resource information, and that safeguard opportunities for attaining appropriate uses of cultural resources.
- Protect and preserve in place representative examples of the full array of cultural resources on public lands for the benefit of scientific and public use by present and future generations.
- Ensure that proposed land uses, initiated or authorized by BLM, avoid inadvertent damage to federal and non-federal cultural resources.

These program objectives are carried out through two program components: protection and utilization. The protection component is concerned with safeguarding and maintaining cultural resources for the public. Included are proactive management activities such as physical protection, preservation, and interpretation of cultural resources along with public education. The protection component is also concerned with support to other activities so that the management and development of public lands can proceed in accordance with legal and regulatory requirements. The utilization component is concerned with scientific research and collection management.

Specific legal requirements, which the BLM and other federal agency cultural resource management programs operate under to meet the program objectives, include:

- American Antiquities Act of 1906 (PL 59-209; 34 Stat. 225; 16 USC 432, 433). The act is implemented by uniform regulations at 43 CFR Part 3.
- Recreation and Public Purposes Act of 1926 (PL 69-386; 44 Stat. 741; 43 USC 869). See 43 CFR Subpart 2741 and Manual Section 2740.
- Historic Sites Act of 1935 (PL 74-292; 49 Stat. 666; 16 USC 467-467). Regulations implementing the Landmarks program are at 36 CFR Part 65.
- Reservoir Salvage Act of 1960, as amended by Archaeological and Historic Preservation Act of 1974 (PL 86-523; 74 Stat. 220, 221; 16 USC 469, PL 93-291; 88 Stat. 174; 16 USC 469).
- National Historic Preservation Act (NHPA) of 1966 (PL 89-665; 80 Stat. 915; 16 USC 470 et seq.), as amended. Section 106 of the act is implemented by regulations of the Advisory Council on Historic Preservation (ACHP), 36 CFR Part 800.
- National Environmental Policy Act of 1969 (PL 91-190; 83 Stat. 852; 42 USC 4321). The act is implemented by

regulations of the Council on Environmental Quality, 40 CFR 1500-1508.

- Archaeological and Historic Preservation Act of 1974 (PL 86-523; 16 USC 469-469c).
- Federal Land Policy and Management Act of 1976 (PL 94-579; 90 Stat. 2743; 43 USC 1701; "FLPMA").
- American Indian Religious Freedom Act of 1978 (PL 95-431; 92 Stat. 469; 42 USC 1996).
- Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC 47Oaa *et* seq.) as amended (PL 100-555; PL 100-588). It is implemented by uniform regulations and departmental regulations, both in 43 CFR Part 7.
- Native American Graves Protection and Repatriation Act of 1990 (PL 101-601; 104 Stat. 3048; 25 USC 3001). The Secretary of the Interior's implementing regulations are in 43 CFR Part 10.
- EO 11593 ("Protection and Enhancement of the Cultural Environment," 36 FR 8921, May 13, 1971).
- EO 13007 ("Protection of Religious Practices and Sacred Sites" [1996]).
- 36 CFR 60—National Register of Historic Places (NRHP) (1981).
- 36 CFR 63—Determinations of Eligibility for Inclusion in the NRHP.
- 36 CFR 79—Curation of Federally Owned and Administered Archaeological Collections.
- Guidelines for Federal Agency Responsibilities, Under Section 110 of the NHPA.
- The Secretary of the Interior's Professional Qualifications Standards (48 FR 44716, September 29, 1983).
- The Secretary of the Interior's Standards for the Treatment of Historic Properties, 1995.

In addition, the Farmington and Albuquerque Field Offices manage specific Chacoan outliers, as directed, in:

- New Mexico Wilderness Act of 1980 (PL 96-550; Title V; "Chaco Culture National Historic Park"; Sec. 501-508.
- Chacoan Outliers Protection Act of 1995 (PL 104-11).

The BLM cultural program operates under a national programmatic agreement with the ACHP and State Historic Preservation Officers. As part of the agreement, a Preservation Board was established. Implementation of the agreement in New Mexico is through a protocol agreement with the State Historic Preservation Office (SHPO). Relevant documents include:

- Programmatic Agreement among the BLM, the ACHP, and the National Conference of State Historic Preservation Officers regarding the manner in which BLM will meet its responsibilities under the NHPA (1997).
- BLM Charter for the Preservation Board (1997).
- Protocol Agreement between New Mexico BLM and New Mexico State Historic Preservation Officer (1998).

Program guidance for the BLM cultural resources program is found in these Washington Office released manuals:

- 8100 Manual—Cultural Resource Management.
- 8110 Manual—Identifying Cultural Resources.
- 8120 Manual—Protecting Cultural Resources.
- 8130 Manual—Utilizing Cultural Resources for Public Benefit.
- 8160 Manual—Native American Coordination and Consultation.

Specific BLM cultural resource program guidance for the public lands under the

responsibility of the New Mexico State Office is provided in the Handbook H-8100-1, *Procedures for Performing Cultural Resources Field Work on Public Lands in the Area of New Mexico State BLM Responsibility* (2002).

Inventory

Public lands administered by the BLM are inventoried for cultural resources while implementing both program components. For example, as part of the proactive cultural resources program, areas may be inventoried while implementing a cultural resource management plan, or to investigate areas where data is lacking and to identify at-risk cultural resources. Lands are inventoried to meet the legal requirements of taking into account the effect of a federal undertaking on cultural resources. All inventories and site recording are conducted under the guidance and standards found in Handbook H-8100-1.

The Albuquerque and Farmington Field Offices each maintain copies of the investigative records prepared for cultural resources associated with federal undertakings that they have responsibility, and this contributes to the utilization component of the program. This information, coupled with base maps showing the location of recorded sites and inventoried areas, is used to guide agency decisions regarding appropriate utilization of the resources. The BLM also contributes to the maintenance of an archaeological computer data base sponsored by the Archaeological Records Management Section of the New Mexico Historic Preservation Division. Sites recorded on public lands make up a majority of the sites on record at the Laboratory of Anthropology, and contribute significantly to the historical and scientific research being conducted throughout New Mexico.

Planning

Cultural resources can be identified as ACECs or SMAs in RMPs or amendments. In the Farmington RMP (BLM 1988), 41 areas were designated as ACECs or SMAs, one of which has since been deleted. The Cultural Resource Areas of Critical Environmental Concern RMP Amendment (BLM 1998b) designated 44 ACECs, two of which had been previously designated as SMAs in the earlier RMP.

The primary purpose of ACEC and SMA designation of cultural resources is to provide special management attention to protect and prevent irreparable damage to important historic and cultural values. Special management prescriptions affect the kinds of discretionary and non-discretionary actions at ACECs or SMAs. Management objectives for the existing ACECs or SMAs are predominantly protection and preservation of the cultural values, with some areas identified for protection of both the cultural and recreational values.

Special Designations

National Register of Historic Places

The NRHP is the nation's official list of properties (districts, sites, buildings, structures, and objects) that are significant in American history, architecture, archaeology, engineering, and culture.

NRHP properties in the planning area are prehistoric, proto-historic, and historic, representing a variety of cultural groups occupying the San Juan Basin and adjacent areas. Prehistoric and proto-historic properties within the planning area that are currently listed on the NRHP are under a variety of ownership and management jurisdictions. Cultures represented on the list include Archaic, Anasazi, and Navajo. The NRHP properties dating post-1800 are primarily within towns, not on public land.

State of New Mexico Register of Historic Places

The New Mexico Historic Preservation Division maintains a list of cultural resources that meet guidelines as being important to the prehistory and history of the state. All of the sites on the NRHP are also listed on the State Register of Historic Places (SRHP). Five BLM Chaco protection sites are listed on the SRHP but are not yet listed on the NRHP.

Chaco Culture Archaeological Protection Sites

Public Law 96-550, Title V Chaco Culture National Historical Park, Section 501-508 of the New Mexico Wilderness Act of 1980 designated 33 Chacoan outliers as Chaco Culture Archaeological Protection Sites (Protection Sites) and Chaco Canyon National Monument as Chaco Culture National Historic Park. The purpose of the title was "to recognize the unique archaeological resources associated with the prehistoric Chacoan culture in the San Juan Basin; to provide for the preservation and interpretation of these resources; and to facilitate research activities associated with these resources [Sec. 501(b)]." Four BLM sites were included. The BLM was also directed to monitor three privately owned sites and seek a cooperative arrangement with the owners. The remaining sites were on Indian allotted, Navajo Reservation and fee, and Ute Mountain Ute lands. In 1991, five Navajo fee Protection Sites were transferred to the BLM through a land exchange and one was acquired by the BLM through a combination exchange/purchase.

The need to amend PL 96-550, to add additional Protection Sites, adjust boundaries of existing Protection Sites and to delete Squaw Springs at the request of the Ute Mountain Utes, was identified. As a result, the Chacoan Outliers Protection Act of 1995 (PL 104-11) deleted two and added eight new Protection Sites including three on BLM land.

World Heritage List

Natural and cultural resources throughout the world that are of international importance may be designated as World Heritage Sites by inclusion on the World Heritage List maintained by United Nations Educational, Scientific, and Cultural Organization (UNESCO). Five BLM Chacoan outliers designated as Chaco Culture Archaeological Protection Sites in 1980 were included with Chaco Canyon as a World Heritage Site in 1987.

Protection and Utilization

The objectives of the BLM cultural resource management program protection component "are aimed towards protecting the significance of cultural resources by ensuring that they are managed in a manner suited to the characteristics, attributes, and uses that contribute to their public importance; towards giving adequate consideration to the effects of BLM land use decisions on cultural properties; towards meeting legal and regulatory obligations through a system of compliance fitted to BLM's management system, and towards ensuring that the cultural resources on public land are safeguarded from improper use and responsibly maintained in the public interest" (BLM Manual 8120 – Protecting Cultural Resources). The major emphasis of the BLM's cultural resource management program objectives involves the protection, preservation, and enhancement of the cultural resources for present and future generations. Both administrative and physical measures are undertaken to ensure these objectives are met. Special designation administrative measures may include determination of eligibility for listing on the NRHP and/or UNESCO World Heritage List, designation as ACECs, or designation as a National Historic Landmark. Cultural resources may also be considered for special designation through Public Law (e.g., Chaco outliers). Other administrative measures include limiting multiple use activities that may impact cultural resources. Some of the measures which may be taken are mineral withdrawals, road closures, closing to grazing, closing or restricting specific uses to previously disturbed areas, OHV designations and public education. Physical protection measures consist of activities such as stabilization, monitoring of site condition, patrol and surveillance programs, signing, and fencing.

The emphasis of site protection activities has been on the identification and proactive management of a wide variety of site types. Many of these sites have been designated as ACECs and SMAs. A major focus of the protection program has been implementation of

PL 96-550 and PL 104-11. Both administrative and physical protection measures have been undertaken to ensure the long-term preservation of the Chacoan outliers designated as Chaco Culture Archaeological Sites in these laws. In addition to the Chacoan outliers, other Anasazi sites, early Navajo, and historic sites are being actively protected.

A stabilization program was established in the mid-1970s and remains an active program. Since then the architecture of 24 Navajo pueblitos and six Chacoan outliers has been documented and stabilized, including emergency stabilization at one historic homestead site. An active Site Steward Program is an important aspect of the FFO site protection program. The *Site Protection Action List – Farmington Field Office* was prepared to identify and establish specific management prescriptions to protect at-risk cultural sites. Specifically, the plan established a Site Protection Plan, identified management actions to protect site integrity from visitor use and deficiency in survey coverage, and assessed stabilization needs of the ACECs or SMAs. Cultural inventory (survey) to identify at-risk and other cultural sites is part of the cultural resource program responsibility under Section 110 of the NHPA, as amended, and to implement management prescriptions identified during ACEC and SMA designation. These inventories are considered part of the program's proactive protection component rather than inventories required to meet Section 106 requirements.

The objectives of the BLM cultural resource program's utilization component "are to facilitate appropriate scientific use of cultural properties on public lands; to ensure that collections of archaeological materials removed from public lands and records relating to them are maintained in qualified public repositories as U.S. property and are used for appropriate research or educational purposes; and to ensure that the public receives tangible benefits from all uses of public land cultural resources" (BLM 8130 Manual—Utilizing Cultural Resources for Public Benefit). Use Category Designations are an assessment by BLM of the appropriate use that a cultural property may be subjected to and is a mechanism for assisting management in making decisions about land use. Use categories include scientific use, conservation for future use, traditional use, public use, experimental use, and discharge from management.

Currently within the FFO, no sites are specifically allocated for experimental use or for discharge from management. Sites that may not be eligible for the NRHP, a significant benchmark for evaluating significance and guiding management decisions, are often disturbed or destroyed during construction. Those that are not destroyed are not otherwise actively managed, but they are not formally discharged from management. Within the FFO, approximately 20 percent or less of the sites documented in any given year are not considered significant.

Three sites have been specifically allocated for traditional use: Cho'li'i, Huerfano Mesa, and Salt Point. All three are also specially designated as ACECs or SMAs. Numerous sites and landscape features are known or suspected to have traditional use, but they have not been specially allocated for such. Sites allocated for public use include one Chacoan outlier, eight Navajo pueblitos, one Navajo rock art site, four historic homesteading era sites, and one homesteading era schoolhouse. Fifteen Chacoan outlier sites and three Chaco road sites are allocated for conservation for future use. These sites are currently designated as ACECs or SMAs. The remainder of the sites (more than 8,000) is allocated for scientific use.

When use warrants, the BLM issues permits to appropriate, qualified non-federal applicants for survey and recording, and for excavation and/or removal. In addition permits may be granted for limited testing and/or removal. Within the FFO the majority of the permits are issued to meet Section 106 compliance and are associated with oil and gas field development and transportation.

Compliance

One of the objectives of the protection component of the cultural resources program involves compliance with numerous federal legal and regulatory obligations. Taking into account the effect of federal undertakings (actions or authorizations) on cultural resources is mandated by Section 106 of the NHPA of 1966, as amended. Section 106 of the act is implemented by regulations of the ACHP, 36 CFR Part 800.

The New Mexico BLM cultural resource program operates under the provisions of a 1997 National Programmatic Agreement among the BLM, the ACHP, and the National Conference of State Historic Preservation Officers, and a 1998 Protocol Agreement between New Mexico BLM and New Mexico State Historic Preservation Officer. These agreements recognize the cultural resources expertise that BLM has in its professional staff and as a result, have significantly streamlined the manner in which the BLM meets its responsibilities under the NHPA, and has reduced the often time consuming project by project consultation that had been historically required in compliance with Section 106. Although these agreement documents have greatly streamlined the BLM interaction with SHPO and the ACHP, the BLM still has significant and ongoing consultation obligations and responsibilities with Native American tribes, local and state governments, other federal agencies, and interested groups and individuals.

Much of the workload of the cultural resource staff involves ensuring that federal undertakings associated with but not limited to oil and gas development, extraction and transportation are in compliance with Section 106 and other applicable preservation laws and regulations. Over 1,000 undertakings are reviewed each year, ranging from a single well pad to major pipeline gathering systems. The BLM's policy has been to prevent impacts by planning the undertaking to avoid cultural resources, however since the "boom" of Fruitland coal gas development in the early 1990s avoidance has not always been possible or recommended due to other constraints. If impacts to the cultural resources cannot be avoided, mitigation of the effect is conducted prior to approval of the undertaking or required as a stipulation on the approval. A wide range of measures is used to avoid or mitigate impacts on cultural resources. Measures commonly used include project relocation or redesign, fencing and barriers, monitoring of construction activities and site condition, and data recovery. Most protective measures are attached to the undertaking (APD, ROW, etc.) as stipulations (COAs).

Program Direction

Protection and Preservation

Cultural resources are a finite, non-renewable resource, which require protection and preservation to ensure their existence for future generations to learn from and appreciate. These resources are the cultural heritage of all Americans and warrant pro-active management. The major protection and preservation measure has been the designation of cultural resources as ACECs and SMAs. Management prescriptions have been implemented through several programs including patrol and surveillance, monitoring, and stabilization. The patrol and surveillance program has been expanded through the use of volunteer Site Stewards who also serve as educational points of contact with visitors in the fields. The involvement of the public in the management of cultural resources is an emphasis of the cultural program and will continue. Also emphasized is the role of law enforcement in the protection of cultural resources. A stabilization program was begun in the mid-1970s that provides for long-term preservation of significant standing architecture. Stabilization of 24 pueblitos and six Chacoan outliers has been conducted. Stabilization of other prehistoric and historic sites and maintenance of previously stabilized sites will continue. Prior to stabilization the structures are recorded through Historic American Building

Survey (HABS) or other detailed methods of documentation.

Public Use

Several objectives of the BLM Cultural Resources Management Program are concerned with the management of cultural resources for public use by present and future generations. A variety of public uses are possible. The most visible public use is recreational and educational site visitation. The American public along with others are keenly interested in both the prehistory and history of the San Juan Basin. Visitation to BLM administered sites continues to increase each year. Eight pueblitos, one petroglyph site and one Chacoan outlier have been prepared for recreational public visitation in the FFO. A large format interpretive brochure and map has been prepared to direct the public to the pueblitos and petroglyph site. Management prescriptions for four homesteads and a school house identified as ACECs in 1998 include preparing of the sites for public visitation and interpretation. Actions proposed to be undertaken as part of the preparation of these sites for public visitation will include gathering of information on the historic occupation of the upper Largo Canyon area with an emphasis on the ACECs and the associated community. In addition to researching the history of human occupation of the ACECs, HABS documentation of the structures will be conducted followed by stabilization. Visitor facilities such as parking areas and trails will be constructed along with signing of the sites and preparation of interpretive brochures. Other ACECs or SMAs and possibly additional sites may be identified and prepared for future visitor use.

Research

The most obvious cultural resources managed by the BLM are the physical remains of past human occupation, such as artifacts, hearths, trails and roads, structures, and rock art. In addition to physical remains the BLM is responsible for the management of areas of traditional and sacred use by Native Americans. When appropriate to the utilization designations of the resource, the BLM encourages research. Such research may include broad surveys, photographic documentation and analysis, collections of artifact specimens, and in some cases excavation. Other research methods, such as the collection of oral histories, may also be necessary to preserve information that is seldom reflected or recognizable in the archaeological record.

Additional research is needed to help answer questions necessary for the development of best management practices and visitor uses. Areas of research concern vary; however, the Fruitland Coal Gas Data Recovery Project research design identified many of the basic archaeological concerns for prehistoric and protohistoric sites. Other research concerns for archaeological values include understanding the function of the Chacoan system, pueblito and historic sites architecture, the nature and function of rock art, and site preservation methods.

Tribal Consultation Responsibilities

The BLM, USFS, and USBR all work in cooperation with the Native American tribes and the BIA to coordinate and consult before making decisions or approving actions that could result in changes in land use, physical changes to lands or resources, changes in access, or alienation of lands. FLPMA requires coordination with tribes in preparing and maintaining inventories of the public lands and determining their various resource and other values; in developing and maintaining long-range plans providing for the use of the public lands; and in managing the public lands. Federal programs are required to be carried out in a manner sensitive to Native American concerns and tribal government planning and resource management programs.

Paleontology

Paleontological resources are managed on public lands because they are nonrenewable resources of value to scientists, educators,

hobbyists, commercial collectors, and other members of the public. Without protection, the resources may be intentionally or unintentionally damaged or destroyed, causing valuable information to be lost. Paleontological resource protection objectives include facilitating research and collection on public lands, use for education and recreation, protecting scientifically valuable resources that may be in conflict with other land and resource uses, and protecting scientifically valuable fossils, as required by law.

The paleontology program achieves these objectives through the following activities (BLM 1987a):

- Identifying and evaluating paleontological resources so they may be adequately addressed in planning and environmental analysis documents.
- Maintaining and conducting an effective and continuing protection program.
- Increasing the awareness of federal land managers and the public regarding the significance of paleontological resources and management requirements, and encouraging public participation in resource management.
- Developing volunteer or cooperative management agreements and associations with individuals, professional paleontologists, local organizations and governments, and the scientific community.
- Avoiding or mitigating impacts to valuable paleontological resources.
- Avoiding publicizing the exact locations of scientifically significant paleontological resources if such attention would conflict with management objectives.
- Managing and issuing collection permits when appropriate.

Recreation

The objective of the FFO outdoor recreation program is to ensure the continued availability of public land for a diverse array of quality resource-dependent outdoor recreation opportunities. Recreation use is managed to protect the health and safety of visitors; to protect natural, cultural, and other resource values; to stimulate enjoyment of public lands; and to resolve user conflicts. Visitor demands and new recreation uses and opportunities will continue to influence how and what recreational opportunities are provided in the FFO area.

FLPMA provides for management of outdoor recreation on public lands. Section 202(c)(9) calls for land use planning consistent with statewide outdoor recreation plans. Other national laws that govern recreation management in the FFO area include the National Trails System Act of 1968, as amended; the Land and Water Conservation Fund Act of 1964, as amended; the R&PP Act, as amended; and the Wilderness Act of 1964.

Most public lands are managed to maintain a freedom of recreational choice with a minimum of regulatory constraints. Few BLM recreational facilities or supervisory efforts exist on these lands, which are sometimes referred to as Extensive Recreation Management Areas.

Where the nature of the resource attracts intensive recreational use, public lands may be managed as a SRMA. These are areas where the BLM makes major investments in recreational facilities and visitor assistance. Specific management direction in a SRMA is formulated by the BLM to provide for resource protection and public health, safety, and enjoyment.

Developed Recreation

Developed sites and areas are places that contain structures or capital improvements primarily used by the public for recreation purposes. These sites may include such things as delineated spaces for parking, camping, or boat launching; sanitary facilities; potable water, grills or fire rings; tables; or controlled access.

Detailed management direction is provided through Recreation Area Management Plans for Simon Canyon Recreation Area and ACEC, the Dunes Vehicle Recreation Area, and the Glade

Run Trail System (GRTS) Recreation Area. The Farmington RMP (BLM 1988) provides general management direction for Angel Peak Recreation Area and ACEC and Head Canyon OHV Competition Area.

Dispersed Recreation

Current management direction for dispersed recreation opportunities is provided for in the CFR (Title 43, Part 8300) and BLM manuals. The Farmington RMP provides general management direction for Thomas Canyon SMA, Carracas Mesa SMA, and Negro Canyon SMA. Detailed direction for primitive and unconfined types of recreation can be found in management plans for the Bisti and De-na-zin WAs. The two management plans will be replaced by one updated management plan, including the additional acreage added to the WA. Recreation opportunities in the WSA will be managed under BLM's Interim Wilderness Management Policy and Guidelines for Lands Under Wilderness Review.

Recreation Opportunity System

The outdoor recreation program uses the Recreation Opportunity Spectrum (ROS) as the basic tool for inventory and management to ensure the general public a continued variety of quality recreational opportunities. Providing opportunities for backcountry recreation and more developed types of recreation close to major urban areas is emphasized. An effort is made to locate and establish use areas and trails compatible with social and natural environments in close proximity to heavily populated areas.

A broad range of outdoor recreation opportunities such as backpacking, camping, sightseeing, fishing, boating, picnicking, horseback riding, wildlife viewing, OHV use, mountain biking, and motorcycling is provided for, in an attempt to meet varying public needs. Access is maintained and developed, where necessary, to enhance recreation opportunities and allow public use. Currently, five recreation SMAs have ROS class management objectives in the management prescriptions.

Special Recreation Permits

The FFO issues Special Recreation Permits (SRP) to authorize certain recreational uses of lands administered by the BLM. Authority to issue SRPs is provided in CFR Title 43, Part 8370. Permits are issued for competitive events, commercial events, and educational use. Commercial use is recreational use of public lands for business or financial gain. Competitive use is any formally organized or structured use, event, or activity on public land in which there are the elements of competition between two or more contestants, registration of participants, and/or a predetermined course or area is designated. Competitive use also includes individuals contesting an established record such as speed or endurance. Educational use is an academic activity sponsored by an accredited institution of learning.

The FFO issues permits for a range of recreational activities annually. These include commercial guide services, hunting guides, competitive events (i.e., mountain bike races, OHV rock crawling events, motocross races, equestrian events), special large group events, and educational activities.

The increase in demand for these activities influences how the BLM plans for future recreational needs. It is anticipated that recreational activity will continue to grow in the FFO area and that the BLM will strive to meet the demand.

Off-Highway Vehicle Use

43 CFR 8340 provides for OHV use as a legitimate activity on public land wherever it is compatible with other resource management objectives. OHV designations are administrative, allowing management flexibility in response to changes in the environment. All public land is designated as "open," "limited," or "closed" to motorized vehicles. These designations are made in RMPs for public lands in each field office. The designations provide for the following uses:

- Open Area: Areas on public land where OHVs may be operated, subject to the conditions set forth in 43 CFR 8341

through 8343. Open designations generally include areas where there are no compelling resource protection needs, use conflicts, or public safety issues that would warrant limiting OHV use.

- Limited Area: Areas on public land where OHVs may be restricted at certain times, in certain areas, and/or to certain vehicular use. These restrictions may be of any type, including the following categories: number of vehicles; types of vehicles; time or season of vehicle use; permitted or licensed use only; use on maintained roads and trails; use on designated road and trails; and other restrictions. Limitations may be used to meet specific resource management objectives, protect resources or public safety.
- Closed Area: Areas on public land where OHV use is prohibited. Closures may be necessary to protect resources, ensure visitor safety, or reduce use conflicts.

Emergency OHV limitations of use, and closure of areas and trails to OHV use, can occur under the authority of 43 CFR 8341.2. However, emergency closures are not OHV designations. Emergency closures can be done on a case-by-case basis to prevent or stop unnecessary degradation of resources or adverse effects to other authorized uses. Emergency closures remain in effect only until an interim or standard designation can be made, or until the adverse effects are eliminated and measures to prevent their recurrence have been implemented.

OHV use has increased substantially in the FFO over the last decade and is an increasing concern for all resource programs. The outdoor recreation program is concerned with providing access to recreational areas and opportunities in appropriate settings for OHV activities without degrading the intrinsic qualities of the landscape that are important for a range of public land resource values. BLM is also concerned with providing adequate access to resources and facilities on federal land.

The FFO has designated 13 OHV Management Units for 499,040 acres of the field office. A plan has been developed for one unit to limit OHV use on 40,960 acres of public land. SMAs, ACECs, RNAs, WAs, and WSAs also have OHV use designations. The remainder of the public lands within the FFO is currently designated as "open," allowing cross-country travel in vehicles. The FFO will continue to apply OHV designations in order to provide for resource protection, access, and recreational use.

It is difficult to provide one definition of motorized wheeled cross-country travel and have that definition fit all the situations that might occur. Roads and trails appear differently to individuals because of the variety of terrain, vegetation and soil type found in the FFO. Cross-country travel is wheeled motorized travel by any vehicle, recreational or other, off of roads and trails. The following examples further clarify this definition.

Motorized travel is considered cross-country when:

- The passage of motorized vehicles depresses undisturbed ground and crushes vegetation.
- The motorized vehicle maximum width (the distance from the outside of the left tire to the outside of the right tire or maximum tire width for motorcycles) does not easily fit the road or trail profile. However, an all-terrain vehicle (ATV) traveling within a two-track route established by a pickup truck is not considered cross-country travel.
- Motorized vehicles use livestock and game trails, unless the trails are clearly evident, or continuous single-track routes used by motorcycles over a period of years.

Motorized travel is **not** considered cross-country when:

- Motorized vehicles use constructed roads that are maintained by the oil and gas industry and/or the BLM, unless specifically closed to use through signing and/or gates. Constructed roads are often characterized by a road prism with cut and fill slopes.
- Motorized vehicles use trails specifically designated for the vehicle being used. For example, this would include the single-track trails within SDAs that are designed for motorcycles.
- Motorized vehicles use clearly evident two-track and single-track routes with regular use and continuous passage of motorized vehicles over a period of years. A route is a track where perennial vegetation is devoid or scarce, or where wheel tracks are continuous depressions in the ground, evident to the casual observer, but are vegetated.
- Travel is within a dry wash or arroyo that is as wide as the motorized vehicle's maximum width and there are no other resource concerns such as riparian areas or springs.

The entire route must meet the above specifications. Newly created routes should be easily identified as not meeting the specifications because many portions would not show signs of regular and continuous passage of motorized vehicles and many areas would still be fully vegetated with no wheel depressions. This definition does have some ambiguity that will continue to exist until formal designation of routes, trails, and areas within the OHV Activity Plans is completed. This definition only applies to cross-country travel in the dispersed area and not to cross-country travel within the SDAs and ACECs. An SDA or ACEC may have its own management plan that defines cross-country travel within its boundaries.

Law Enforcement

The FFO Field Office Ranger works closely with the Field Manager to prioritize actions in support of resource management objectives. The Field Office Ranger's responsibilities include criminal investigations, response to public complaint, surveillance, and patrols of sensitive areas. The law enforcement activities are conducted in accordance with U.S. Department of the Interior (USDI) and BLM manuals, regulations, and policies.

The BLM Law Enforcement Program works cooperatively with other agencies in the Four Corners Area including the New Mexico State Police, San Juan County Sheriff's Office, Farmington Police Department, New Mexico Department of Game and Fish, Drug Enforcement Administration, Area II Narcotics Enforcement, Chaco Culture National Historic Park, and the Civil Air Patrol.

There are seven areas of emphasis for the Law Enforcement Program in the planning area:

1. Oil and Gas—There are approximately 18,000 producing wells within the planning area. Activity focuses on the support of the Petroleum Engineering Technicians on the theft of product, vandalism to facilities and equipment, and compliance checks.
2. Cultural Resources—There are many significant cultural resources in the planning area that are accessible through the road network. Theft and vandalism of these resources are constant threats. Support includes patrol, surveillance, and cooperative information sharing on suspected criminal activity. FFO's law enforcement program is also involved in the investigation of illegal activities and the arrest and prosecution of those caught doing illegal activities.
3. Paleontological Resources—Within the planning area, there are pockets of dense, high quality fossil items. Both the Bisti and De-na-zin WAs were specifically designed to protect these resources and provide for orderly, scientific investigations. Support focuses

on extended patrols of risk areas and recruiting volunteers to assist in providing coverage.

4. Controlled Substances—Controlled substance trafficking, production, cultivation, and use occur within the planning area. Law Enforcement efforts focus on maintaining visibility to deter illegal substance activity on the public lands, while continuing close coordination with other law enforcement organizations within the planning area.
5. Vegetation Theft—The illegal cutting and removal of woodland products continues to increase in the planning area. This activity is seasonal with demand increasing in the fall. The cutting and vehicle traffic associated with removal damages soil, plants, and wildlife habitats. The theft of plants from the designated SMAs for the Knowlton's and Mesa Verde cacti threatens these endangered species. Law enforcement efforts focus on prevention through education and permitting, patrols, and public support in reporting illegal activity.
6. Employee Safety—Resource specialists work in remote areas, and law enforcement supports safe operations in isolated areas through direct support, overflight safety checks, and provision of safety information and equipment. With awareness of any potential threat of interference, the Law Enforcement Ranger will accompany resource specialists to the field.
7. Recreation—There are numerous and varied outdoor recreation opportunities and activities occurring on the public lands within the planning area, including rafting, swimming, fishing, hunting, horseback riding, mountain biking, backpacking, bird watching, rockhounding, vehicle camping, and OHV use. Law enforcement assists the recreating public with information on special areas, permitting, opportunities, access, and land status. Support focuses on patrol of developed sites, visitor information and education, and coordination with other agencies during special events.

ALTERNATIVES

This section describes the alternatives considered in detail for meeting the purpose and need for the proposed revision to the Farmington RMP. These alternatives were selected based on the following criteria:

- Provide for maximum practicable recovery of oil and gas resources in the planning area.
- Comprehensively address and incorporate previously approved real estate and land management actions in the FFO area.
- Provide a complete and adequate RMP for the FFO area.
- Adequately protect sensitive resources and the environment.
- Provide a reasonable range of management options for the FFO.

Application of these criteria resulted in the identification of three action alternatives for detailed analysis, in addition to the no action alternative. Alternatives considered but not carried forward for detailed analysis are discussed at the end of the chapter.

Overview

The alternatives described in this section define a range of land use management options. Alternative A is no action, in which management would remain under current RMP documents and policies. This alternative is required by Council on Environmental Quality (CEQ) regulations and provides a basis of comparison for the other alternatives. Alternative B emphasizes maximum recovery of the hydrocarbon resources as the primary goal. Alternative C emphasizes conservation, protection, and enhancement of natural and cultural resources through special management of designated areas. Alternative D balances the two goals to achieve maximum practicable recovery of oil and gas, while also maximizing protection of the most sensitive environmental resources.

Each alternative addresses oil and gas leasing and development for BLM, USFS, and USBR lands in the planning area, and comprehensive resource management for BLM lands only. The alternatives differ primarily in the boundaries of some special management designations and in management prescriptions. In general, there are more acres of special management designations and the management prescriptions are more stringent under Alternative C, compared to Alternatives A, B, and D. The section on Alternative A describes current practices. The sections on Alternatives B, C, and D describe changes in stipulations, special management designations, management prescriptions, and other actions compared to Alternative A. The Continuing Management Guidance would remain in effect under all alternatives.

Since the 1988 RMP and later amendments for the FFO area were completed, the BLM has been converting land management information from paper maps into electronic Geographic Information System (GIS) data. This includes data such as special management designation boundaries, wells, roads, range allotments, and watershed boundaries. For each alternative, the GIS data were used to generate the acreage of each special management designation, oil and gas lease, and the amount of land affected by constraints on oil and gas activities. GIS data were also used to determine the number of existing and projected wells within those boundaries for each alternative. These calculations differ in some cases from acreages listed in previous RMP documents due to such factors as digitizing error, different projections, or other factors. These differences are identified in the Specially Designated Areas section of Alternative A. For this EIS, the GIS-calculated acreages were used for analysis and discussion of all alternatives to provide a consistent basis for comparison.

Each of the alternative descriptions in the following sections address how the alternative would affect the following:

1. Oil and gas leasing and development.
2. Modification of BLM ownership patterns and ROW corridor designations.
3. Modification and addition of areas with special administrative designation.
4. OHV designations of open, closed, limited.
5. Identification of additional coal leasing areas to meet anticipated production needs for the next 15 to 20 years.

Most of the limitations on land use would be applied through management prescriptions within SDAs or USBR land around Navajo Reservoir. The boundaries of many of the SDAs overlap other areas, with differing management prescriptions described in these overlapping areas. To determine the acreage under each management constraint, the most limiting constraint was applied in overlapping areas and that acreage was tallied and excluded from the acreage of the less limiting constraint. The total acreage of public land or federal minerals listed for the identified constraints under each alternative does not double-count the overlapping acreage. Under Alternative D for example, Cho'li'i (Gobernador Knob) is a cultural ACEC with NSO constraints on oil and gas development whose boundary overlaps Gobernador and Cereza Canyon Fossil Area that has CSU constraints. The acreage of Cho'li'i has been added to the total acreage of NSO constraints under Alternative D, and this acreage has been subtracted from the acreage of CSU constraints. For this reason, totaling the acreage of each SDA under the same constraint will not result in the total acreage listed under each alternative.

Alternative A

Under this alternative, the FFO would continue to manage oil and gas leasing and other resource responsibilities as it does currently. Management guidance, implementation procedures, and special management designations would remain as they currently exist under the 1988 RMP, the 1991 Amendment for oil and gas leasing and development, the 1995 RMP Amendment for OHV use, the 1995 RMP Amendment for OHV use in the GRTS, the 1998 RMP Amendment addressing coal leasing, the 1998 Amendment for cultural resources, the 2000 Final EIS for Riparian and Aquatic Habitat Management in the Farmington Field Office, and the 2000 RMP Amendment providing standards for public land health and guidelines for livestock grazing.

Oil and Gas Leasing and Development

The EIS prepared for the 1991 Oil and Gas Leasing and Development Amendment analyzed the impacts of 4,512 additional wells in the planning area to be developed by 2011, with an estimated 28,750 acres of additional surface disturbance due to oil and gas activities. All of these wells are projected to be located in the high development area shown on **Map 2-1.**

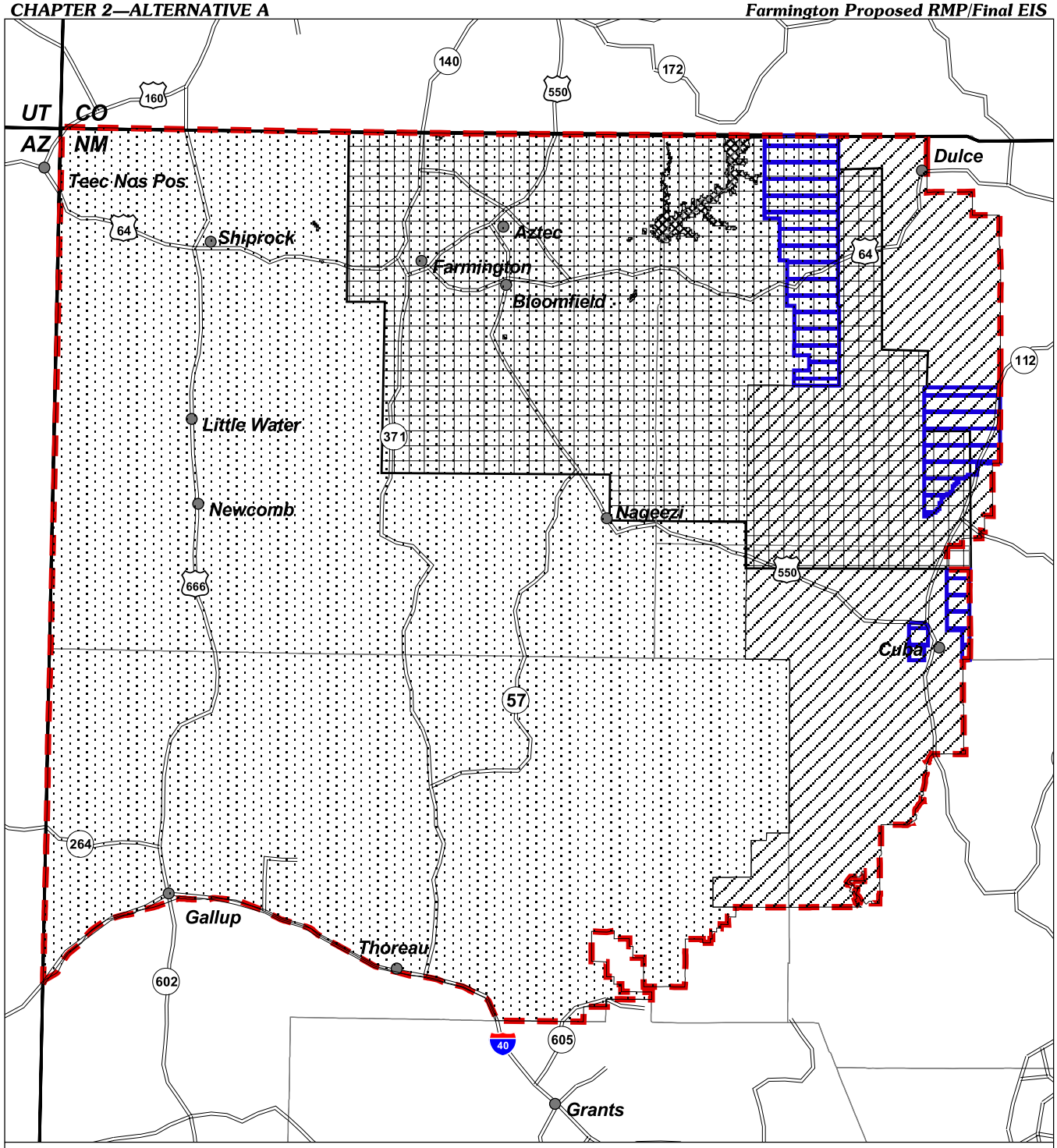
Following is a summary of the acreage of federal minerals in the planning area subject to various constraints under this alternative:

Constraint	Acreage within High Development Area	Acreage in Rest of Planning Area	Total Acreage
Leasing			
Nondiscretionary Closure	349	110,799	111,148
Discretionary Closure	21,545	31,671	53,216
Development			
STC	1,380,723	1,356,971	2,737,694
CSU	81,322	77,392	158,714
NSO	7,769	5,368	13,137
TL	173,786	21,380	195,166

Notes: STC = open under Standard Terms and Conditions; CSU = Controlled Surface Use; NSO = No Surface Occupancy; TL = Seasonal Timing Limitation.

Within the high development area, more than 99 percent of the federal oil and gas resources are currently leased. In areas identified for discretionary closure in the RMP, the development of existing leases would continue according to the terms of the lease. The BLM would continue to implement the portions of the lease that require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users.

Geologic changes over time have created various layers of sedimentary rocks and interspersed reservoirs containing hydrocarbon resources. The resulting formations contain deposits of coal, oil, and gas. There are five primary subsurface hydrocarbon formations in the planning area: the Fruitland Formation (natural gas, coalbed methane [CBM], and coal), Pictured Cliffs (gas), Mesaverde (gas and oil), Mancos (oil and gas), and the Dakota Formation (gas, oil, and coal). More information on the geology of the planning area is provided in Chapter 3.



LEGEND

- RMP/EIS Boundary
- Farmington Field Office
- Albuquerque Field Office
- Bureau of Reclamation Land
- National Forest
- Oil/Gas High Development
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: BLM 2002, Engler et al. 2001

Map 2-1: High Development Area for Oil and Gas

The location of a well drilled to a specified formation is determined by the well spacing for that formation. Spacing is regulated by the BLM and the New Mexico Oil Conservation Division (NMOCD) and is intended to maximize the economic recovery of the resource while protecting correlative rights. If spacing is not defined for a formation in a particular area, a well must be drilled according to statewide rules. The formations in the New Mexico portion of the San Juan Basin are all spaced at 160 acres, except for the Dakota, Mesaverde, and Fruitland CBM Formations, which are all spaced at 320 acres. There are provisions for infill wells within a spacing unit if it can be demonstrated that the reservoir will support an increase in well density. The Dakota and Mesaverde have both been approved by the BLM and NMOCD for infill drilling of up to three additional wells per spacing unit. The Fruitland CBM Formation is currently undergoing the same consideration for 160-acre increased density.

Under this alternative, the number of wells analyzed by the EIS prepared for the RMP Amendment for oil and gas development (BLM 1991a) would support approval of approximately 223 new APDs per year over the next 9 years. Once the 17 wells that would be inaccessible due to NSO constraints are subtracted from the total, this would result in 1,990 new wells in the planning area on public land over 9 years, with an amendment to the RMP required at the end of this period. If this rate were continued over the 20-year term of this Proposed RMP/Final EIS, it would result in 4,438 potential new wells. For the purpose of comparing impacts across alternatives, impact analysis will consider the effects of developing 4,421 projected new wells (4,438 less the 17 inaccessible wells due to NSO constraints). No infill drilling with new surface disturbance would be permitted if the increased density was approved after the 1991 Amendment, except where it occurs on existing infrastructure. New oil and gas development would need to be offset with reclaimed area to achieve no net increase in surface disturbance.

The mitigation measures listed in Appendix B-9 of the 1991 Amendment (BLM 1991a) would remain in effect. These measures were developed for environmental protection in cooperation with representatives from industry and state agencies.

A raptor noise policy has been in effect since February 2000 in which the FFO established a buffer zone concept to minimize noise impacts from wellhead compression. This noise policy was developed to minimize disturbances to raptor nest sites for golden eagles, ferruginous hawks, and prairie falcons by providing a reasonable margin around the nest. A buffer zone is defined as an area surrounding the nest for ⅓ mile on either side, or a circle of ⅔ mile diameter, measured from the center of the nest site. Oil and gas operators must meet a maximum noise level of 48.6 dBA (A-weighted decibels) at 300 feet from the compressor. Otherwise they must submit a Sundry Notice prior to installing a compressor to obtain an evaluation of the situation and a recommended mitigation that would not be more than 48.6 dBA. Noise associated with oil and gas development that affects other resource values and receptors are handled on a case-by-case basis. Each case is handled under a collaborative method to arrive at a solution to mitigate the impacts to the affected resource or receptor.

Oil and gas development on the land around Navajo Reservoir would continue to be permitted by the FFO with review and concurrence from the USBR. In addition to the stipulations applied by the BLM, USBR stipulations on oil and gas activities include the following:

- Drilling and well locations would be restricted to more than 1,500 feet from Navajo Dam and its appurtenant structures.
- No wells would be located within 500 feet of the high water line on Navajo Reservoir (elevation 6,101.5 feet

above mean sea level [MSL]) so an NSO constraint applies. An NSO constraint would be applicable along the San Juan River.

- Production facilities would not be located within 650 feet from the shoreline or on the ridgeline above the reservoir. They would be designed to minimize their visibility from the lake and other public use areas.
- The location of compressors would be reviewed to determine if mitigation is needed to minimize noise at recreation use areas and other sensitive locations.
- Co-location of gas well facilities would be encouraged to minimize surface disturbance and the duplication of facilities.
- TL constraints would be in effect within designated elk and mule deer critical winter range between December 1 and March 31, and within designated elk calving areas between December 1 and July 14.

Oil and gas development on USFS land in the planning area would continue to be permitted by the FFO with concurrence by the USFS. Site-specific EAs would continue to be completed by USFS staff for all wells or groups of wells within the same drainage, and clearances would be required to ensure no damage to significant cultural resources, T&E species, and other resources of concern. Winter closures for drilling and workover operations from November 1 to March 31 would remain in effect on the Jicarilla Ranger District. Development on the Santa Fe National Forest would be implemented under Standard Terms and Conditions.

Land Ownership Adjustments

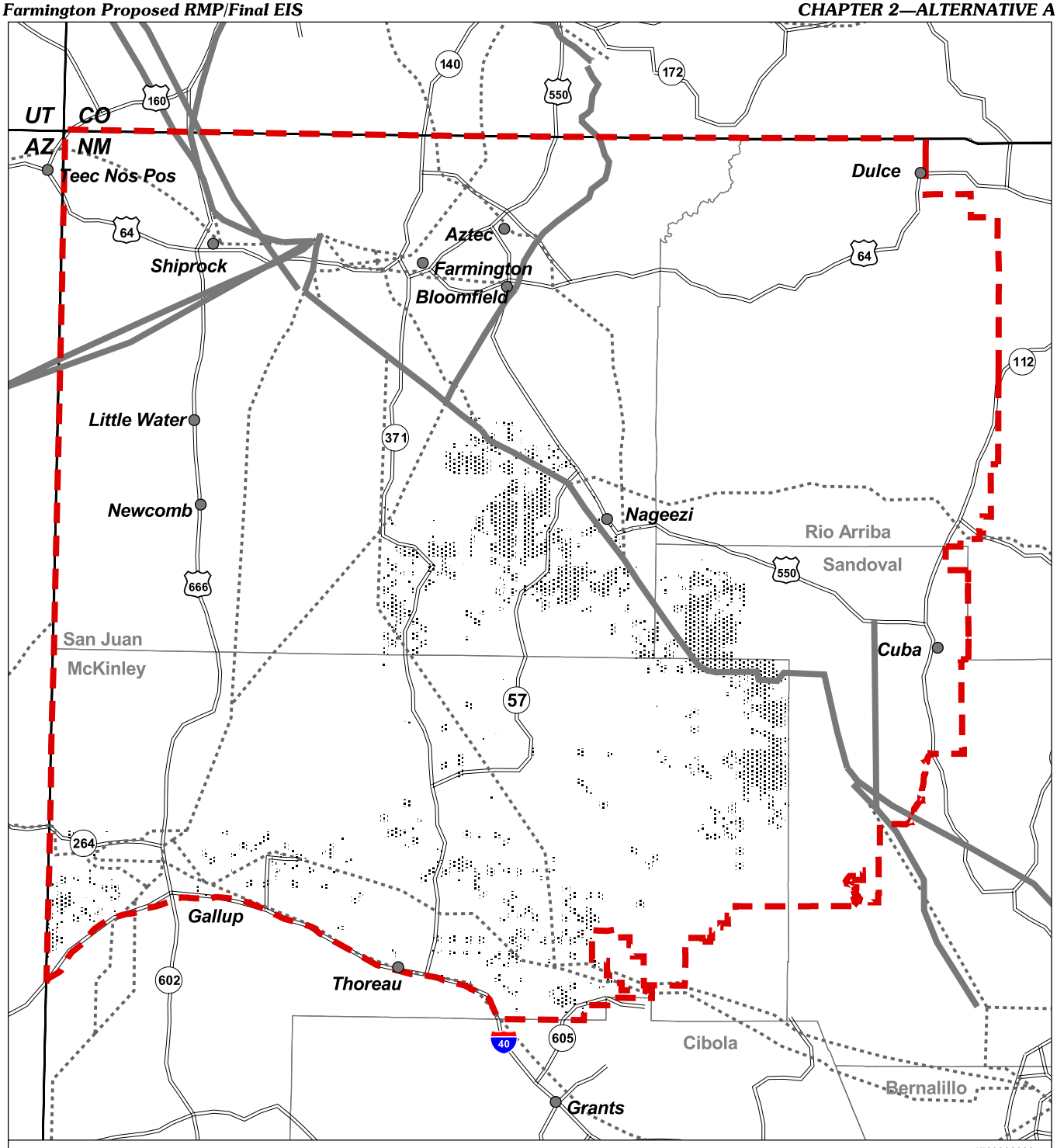
Disposal

Under this alternative, the land ownership adjustments identified in the previous RMP and amendments would be carried forward. Exchange, sale, disposal under the R&PP Act, or other legal disposal would be considered if the disposal met the criteria listed in Chapter 1. These lands include the land south and west of US 550, and approximately 2,640 acres of isolated public lands (Appendix F). **Table 2-1** shows the amount of land that would be available for disposal under Alternative A. **Map 2-2** shows the disposal area under this alternative.

Table 2-1. Land Ownership Adjustments (in Acres) for Alternatives A, B, C and D

Land Adjustment	Alternative A	Alternative B	Alternative C	Alternative D
Disposal	280,782[1]	347,505[1,2]	338,067[1,2]	340,118[1,2,4]
Acquisition	127,782	77,589	189,679[3,5]	178,237[5]

Notes: (1) Includes BLM lands south of US 550, outside of SDAs.
(2) Does not include acreage for parcels with substantial structures that may be identified in the future.
(3) Does not include acreage in riparian areas that may be identified for acquisition in the future.
(4) Does not include acreage for potential R&PP adjustments identified through scoping.
(5) Does not include acreage of BLM lands surrounding SDAs that may be identified for acquisition in the future.



LEGEND

- RMP/EIS Boundary
- ROW Corridor (WRCS)
- Priority Corridors 2 and 3
- Existing Disposal Area
- County Boundary
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: BLM 2000 & WRCS 1992

Map 2-2: Existing Disposal Areas and WRCS Corridors (WUG Revision)

Acquisition

Inholdings in all the approved SDAs would remain on the priority list for acquisition. Other lands that consolidate public ownership or benefit a resource program could also be acquired, if the acquisition were determined to be in the public interest. Any lands acquired would be managed in the same manner as the adjacent or surrounding public lands. Table 2-1 shows the amount of land that would be a priority for acquisition under Alternative A.

OHV Use

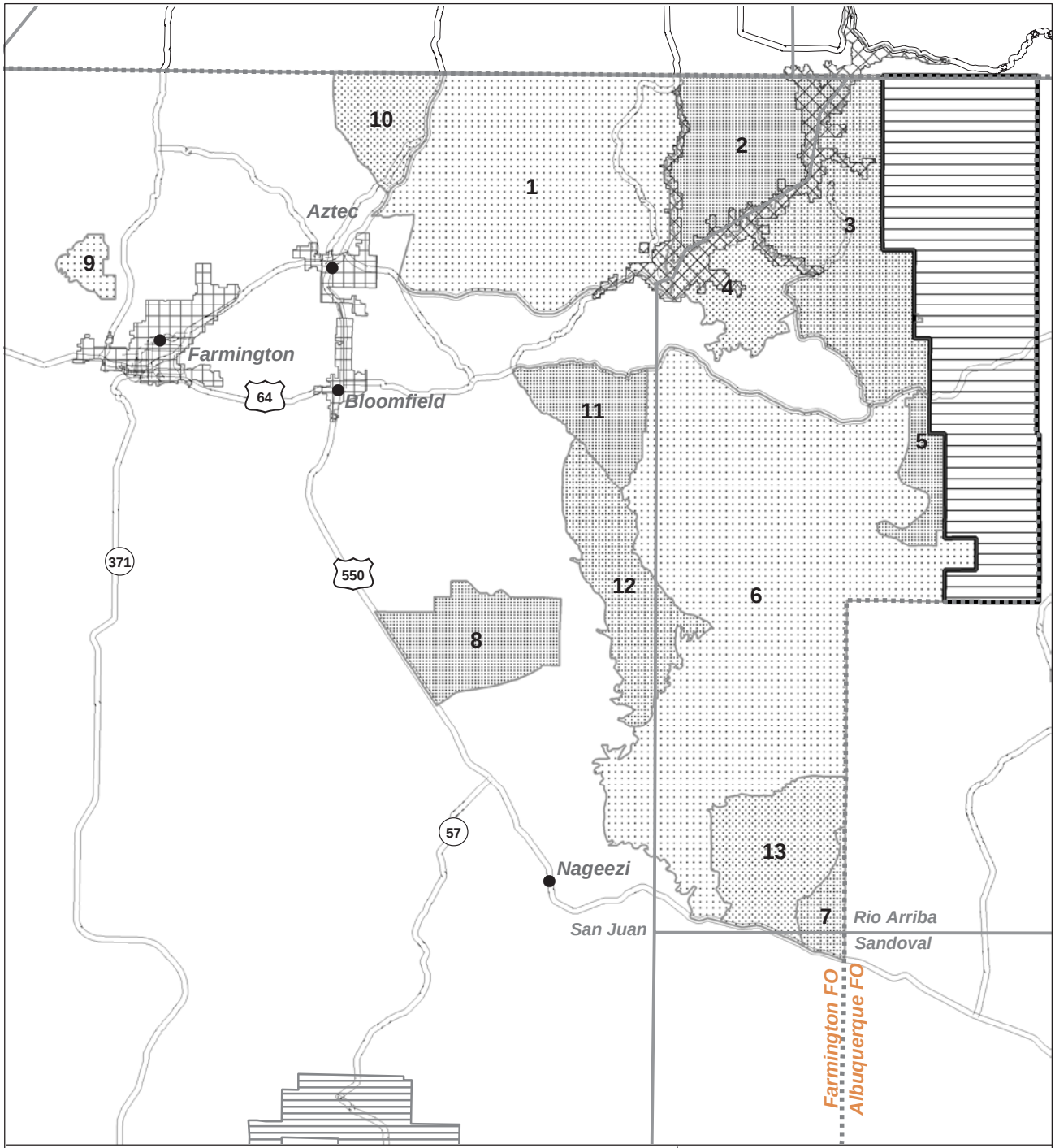
Under Alternative A, public land in the FFO would be open to OHV use as described in the 1988 RMP, unless otherwise designated. In 1995, an RMP Amendment and EA were prepared to address management of OHV use in the FFO to protect wildlife habitat (BLM 1995b). The resulting Decision Record identified 13 OHV Management Units comprising a total of 499,040 acres shown in **Map 2-3**. A plan has been completed for Rosa Mesa that limits OHV use to designated maintained roads and seasonal closures on 40,960 acres of public land. Plans would be developed for 12 units that would specify limitations for the remaining 432,787 acres based on resource needs and public use. Development of plans would involve environmental review and public input. Until then, these areas would continue to be open to OHV use.

Also in 1995, BLM prepared the Proposed GRTS Off-Highway Vehicle RMP Amendment and EA. The resulting 1996 Decision Record limited OHV use to designated routes on approximately 22,800 acres and 4,600 acres under open designation within the GRTS. A 1998 RMP Amendment for 44 new cultural ACECs specified OHV management prescriptions. (Note that some plans specified prescriptions for Off-Road Vehicles, or "ORVs." For consistency in terminology, the FFO is using OHV in future plans or revisions to refer to any motorized or mechanized vehicle. This term will supercede and incorporate any previously approved and continuing guidance for vehicles). **Table 2-2** summarizes open, closed, and limited designation for all public land within the FFO for this alternative. All existing and proposed SMAs and ACECs have specific OHV designations (see section on Specially Designated Areas below). **Table 2-3** lists several activities that may involve cross-country travel and issues related to cross-county travel. For Alternative A, access and cross-country travel would be allowed unless specifically prohibited. OHV designations and management would only apply to BLM surface-owned lands. For lands acquired in the future, the OHV management prescription would generally be the same as the surrounding unit or the SDA.

Table 2-2. Comparison of OHV Designations (in Acres) in the FFO by Alternative

Designation	Alternative A	Alternative B	Alternative C	Alternative D
	BLM[1]	BLM[1]	BLM[1]	BLM[1]
Open	1,230,839	4,616[2]	4,616	4,616[2]
Limited	122,063	1,352,931	1,352,117	1,353,301
Closed	62,384	57,739	58,553	57,369
Total	**1,415,286**	**1,415,286**	**1,415,286**	**1,415,286**

Notes: (1) Existing public (BLM surface-owned) land.
(2) Acreage under open designation does not include additional acreage to be considered for open designations under Alternatives B and D during future activity planning. Open acreage could be as much as 99,003 in Alternative B and 65,806 in Alternative D as shown in Table 2-10.



LEGEND

- 6 — OHV Management Unit*
- Chaco Culture NHP
- Municipal Area
- Navajo Reservoir
- BLM Field Office Boundary
- Carson National Forest
- County Boundary

*Individual OHV units are delineated with unique numbers and shade patterns

- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

6 3 0 6

Scale in Miles

Source: BLM FFO

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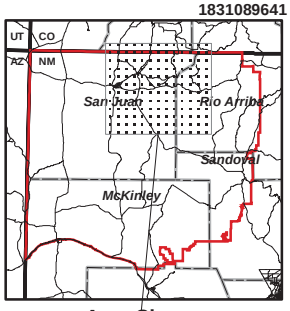


Area Shown

Map 2-3: Existing OHV Management Units in the FFO Area

Table 2-3. Summary of Dispersed Area OHV Cross-Country Issues and Exceptions

Issue	Alternative A	Alternative B	Alternative C	Alternative D
Cross-Country Travel	Majority of the FFO open to cross-country travel.	Permitted in SDAs within OHV Management Units.	Not allowed.	Same as Alternative B.
Emergency Use	Allowed.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Administrative Use	Allowed.	Allowed unless specifically prohibited.	Not allowed unless specifically authorized.	Same as Alternative B.
Lease and Permit Holders	Allowed.	Allowed unless specifically prohibited.	Not allowed unless specifically authorized.	Same as Alternative C.
In Proximity to Residences	Allowed.	Allowed unless specifically prohibited.	Not allowed within ½ mile of any residence unless on a maintained road or a designated trail or route.	Same as Alternative C.
Wetlands and Riparian Areas	Complete limited ORV designation plan to restrict vehicles to designated roads.	Prohibited. Travel limited to maintained roads.	Same as Alternative B.	Same as Alternative B.
Exceptions for OHV Cross-Country Travel				
Camping	Allowed.	Allowed within 300 feet of roads by the most direct route.	Allowed within 50 feet of roads by the most direct route.	Same as Alternative B.
Dry Washes	Allowed unless specifically prohibited.	Allowed unless specifically prohibited for protection of other resources.	Prohibited unless specifically designated.	Same as Alternative B.
Game Retrieval	Allowed unless specifically prohibited.	Allowed by the most direct route unless specifically prohibited.	Prohibited unless specifically authorized.	Same as Alternative B.
Disabled Access	Allowed per provisions of Rehabilitation Act.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Firewood and Christmas Tree Collection	Allowed unless specifically prohibited.	Not allowed unless specifically authorized by permit.	Not Allowed.	Same as Alternative B.

Specially Designated Areas

Under Alternative A, 131 areas in the FFO with special administrative designations (SMAs, ACECs, RNAs, WAs, and WSAs) approved through previous land use planning would be carried forward. **Table 2-4** summarizes the total acreage in these areas under each alternative, and **Table 2-5** summarizes the management prescriptions and actions for each SDA. The acreage in the table is derived from current BLM GIS data, which is different, in some cases, from that shown in previous planning documents. Previous documents were not always consistent in how the acreage was calculated or listed for each area. In some cases, only the acreage of public land within SDAs was listed, while in others the acreage of all land within the boundary was shown. Adjustments have been made in some of the digitized boundaries to correct previous errors and to account for updated information. As activity plans are prepared for these areas in the future, more accurate and detailed maps will be developed. Those new plans will note changes and corrections to GIS mapping. Legal boundaries for cultural ACECs are maintained on Master Title Plats in the field offices (FFO and AFO). These are the official records.

Table 2-4. Acreage of Specially Designated Areas in the FFO

Surface Ownership	Alternative A	Alternative B	Alternative C	Alternative D
BLM	491,945	468,410	713,710	649,470
Non-BLM	127,782	77,589	189,679	158,300
Total Surface[1]	**619,727**	**545,999**	**903,389**	**807,770**

Note: (1) Acres within boundary of SDAs; includes BLM and USBR lands.

The total footprint with special designation is 619,727 acres in the FFO area, of which BLM manages the surface on 491,945 acres (Table 2-4). **Table 2-6** lists the SDAs in the AFO and the oil and gas management prescriptions that would apply under all alternatives. **Map 2-4** (large fold-out map for Alternative A, located at end of document, inside back cover) shows the boundaries of designated areas. The following changes in special designations have been approved and implemented since the 1988 RMP were adopted:

- In 1996, Congress designated the Bisti/De-na-zin WA to create one wilderness unit comprised of the Bisti and De-na-zin WAs and 16,525 additional contiguous acres. The new unit included the Badlands, Log Jam, and Lost Pines ACECs, which were originally within WA boundaries;
- In 1998, an amendment was completed to designate 44 new cultural ACECs, including Chacoan outliers, Chacoan roads, Navajo Refugee sites, Navajo habitation sites, petroglyph and pictograph sites, historic sites, and Native American traditional use sites and sacred area;
- The original 150-acre GRTS was expanded to include 32,423 acres that are managed for recreational opportunities for trail and OHV use.

TO VIEW TABLE 2-5 (PAGES 2-40 THROUGH 2-213), OPEN FILE ENTITLED "TABLE 2-5.PDF"

Table 2-6. Oil and Gas Management Prescriptions for Specially Designated Areas in the AFO

Area	Total Acres[1]	Public Land Acres[1]	Federal Mineral Acres[1]	Resource Value	Management Prescriptions
1870s Wagon Road Trail SMA	630[2]	UNK	UNK	Cultural	Oil and gas: CSU restrictions.
Historic Homesteads SMA	33	33	33	Cultural	Oil and gas: CSU restrictions.
Jones Canyon SMA	651	415	651	Cultural	Oil and Gas: NSO stipulation.
Cuba Airport SMA	176	92	176	Lands	Oil and Gas: NSO stipulation.
San Luis Cliffs Window SMA	9,810	8,283	9,806	Lands	Oil and gas: CSU restrictions.
Torrejon Fossil Fauna ACEC	6,499	6,497	6,084	Paleontology	Oil and gas: CSU restrictions.
Azabache Station SMA	81	0	81	Recreation	Oil and Gas: NSO stipulation.
Cabezon Peak ACEC	1,764	1,187	1,197	Recreation	Oil and Gas: Closed.
Cañon Jarido SMA	1,800	1,800	1,800	Recreation	Oil and gas: CSU restrictions.
Continental Divide Trail SMA	1,940[2]	UNK	UNK	Recreation	Oil and gas: CSU restrictions. TL 2/1-7/1.
Headcut Prehistoric Community SMA	2,276	933	2,276	Recreation	Oil and gas: CSU restrictions.
Ignacio Chavez SMA	42,827	42,650	42,768	Recreation	Oil and gas: All but 830 acres are closed; remaining 830 acres are CSU restrictions. TL 11/16-5/14.
Pelon Watershed SMA	848	848	848	Watershed	Oil and Gas: Closed.
Cabezon WSA	1,817	1,803	1,803	Wilderness	Oil and Gas: Closed.
Chamisa WSA	12,394	12,394	12,394	Wilderness	Oil and Gas: Closed.
Empedrado WSA	8,934	8,869	8,897	Wilderness	Oil and Gas: Closed.
Ignacio Chavez WSA	32,245	32,238	32,240	Wilderness	Oil and Gas: Closed.
La Lena WSA	10,175	10,128	10,163	Wilderness	Oil and Gas: Closed.
Elk Springs ACEC	10,300	6,390	9,996	Wildlife	Oil and Gas: CSU restrictions. TL 11/16-5/14.
Empedrado Watershed Study Area	630	317	78	Watershed	Oil and Gas: Closed.
Juana Lopez RNA	38	38	38	Geology	Oil and Gas: Closed.
San Luis Mesa Raptor ACEC	9,279	7,773	7,802	Wildlife	Oil and gas: CSU restrictions. TL 2/1-7/1.

Notes: (1) All acreage listed is for the planning area, which in some cases is less than the total acreage of the specially designated area.
(2) Estimated acreage.
UNK Unknown.

Coal Leasing Suitability Assessment

Preference Right Leasing Applications

There are 14 PRLAs within the FFO boundaries. The leasing of these tracts was analyzed in the San Juan River Regional Coal EIS (BLM 1984). These tracts were identified for future leasing in the Farmington RMP (BLM 1988).

The PRLAs are located north and east of Chaco Culture National Historic Park. Several PRLAs fall within cultural ACECs, WSAs, RNAs, and WAs. According to regulatory requirements (43 CFR 3461.5), unsuitability criteria (Appendix C) have been applied to the 14 PRLAs. PRLAs NM-003835 (in part) and NM-006802 (in part) have been identified as being unsuitable for leasing under Criterion No. 1. PRLAs NM-003918 (in part) and NM-003919 (in part) were identified as being unsuitable for leasing under Criterion No. 4. Parts of three PRLAs, NM-003753, NM-003754, and NM-003835, were determined to be unsuitable under Criterion No. 6. One PRLA, NM-003755 (in part), was determined to be unsuitable under Criterion No. 7.

There are two PRLAs (NM-006802 and NM-003835 both in part) in the Bisti/De-na-zin WA and two PRLAs (NM-003919 and NM-003918 both in part) in the Ah-shi-sle-pah WSA. Parts of three PRLAs (NM-003753, NM-003835, and NM-003754) fall within the Fossil Forest RNA, and one PRLA (NM-003755 in part) is within the Ah-shi-sle-pah Road cultural ACEC. Congressional designation of the Bisti/De-na-zin WA and Fossil Forest RNA prevents the leasing of coal in these areas and, until Congress reaches a decision, no coal leases would be granted in Ah-shi-sle-pah WSA. Under Public Law 104-333, Section 1022, the Secretary of the Interior is authorized to issue coal leases in New Mexico in exchange for those parcels of PRLAs that are in a WA or RNA, if the exchange is in the public interest. Leasing may occur in the Ah-shi-sle-pah WSA, if Congress does not designate the area as Wilderness.

The remaining seven PRLAs would be processed and the applications approved or denied according to the criteria established by the Mineral Leasing Act (MLA) of 1920, as amended. These leasing criteria are concerned with leasing coal in (1) commercial quantities, (2) in areas with a coal transportation system, and (3) when there is a viable market for the coal. If the MLA criteria are met, leases would be issued to the companies that submitted these applications. At the time lease applications are processed, the unsuitability criteria would be applied again, if necessary.

The PRLA serial numbers, total acreage, surface acreage ownership and acreage affected by unsuitability criteria are presented in **Table 2-7.** The location and boundaries of the 14 PRLAs are shown on Map 2-8**.**

Table 2-7. Preference Right Lease Applications in the Planning Area

PRLA Serial No.	Federal Coal Acreage	BLM Surface Acreage	Indian Surface Acreage	State Surface Acreage	Criterion Removed Acreage
NM-008128	4,499	1,007	2,811	681	0
NM-008130	2,133	608	1,525	0	0
NM-011670	1,119	639	0	480	0
NM-003752	3,760	2,876	844	0	980
NM-003753	2,951	825	2,126	0	825
NM-003754	2,875	1,875	1,000	0	280
NM-003755	2,588	973	1,615	0	669
NM-003918	3,357	2,998	359	0	884
NM-003919	3,598	3,598	0	0	3,124
NM-003835	375	650	0	85	325
NM-003837	560	560	0	0	0
NM-007235	160	160	0	0	0
NM-008745	520	320	200	0	0
NM-006802	213	213	0	0	170
Total Acreage	**28,708**	**17,302**	**10,480**	**1,246**	**7,257**

Source: Digitized from BLM maps.

Competitive Coal Tracts

There are 17 competitive coal tracts available for leasing. The leasing of these tracts was analyzed in the San Juan River Regional Coal EIS (BLM 1984). These tracts were identified for future leasing in the Farmington RMP (BLM 1988).

The La Plata tracts are located southwest of the La Plata Coal Mine. The Kimbeto and Bisti tracts are located northeast and northwest, respectively, of the Chaco Culture National Historic Park. The Catalpa Canyon and Sundance tracts are located south of Gallup, which is outside the planning area but still under the management of the FFO through Inter-Area Agreement NM-010-071, dated July 2, 1992. The Catalpa and Sundance tracts will not be addressed further in this Proposed RMP/Final EIS. The remaining tracts are located south of the Chaco Culture National Historic Park. The tract name, federal surface acres, federal recoverable coal reserves, and federal mineable coal reserves are listed in **Table 2-8**. The boundaries and location of the competitive coal lease tracts are shown on Map 2-8.

These tracts contain approximately 763 million tons of mineable federal coal (647 recoverable) within 48,661 federal subsurface acres (17,927 surface) (BLM 1984). The delineation and designation of these coal tracts were based on the application of the unsuitability criteria, surface owner consultation data, and application of a series of multiple use screens (43 CFR 3461). Companies interested in mining the coal from these tracts would need to submit an application to lease the coal. The 20 unsuitability criteria (Appendix C) described in 43 CFR 3461.5 would be applied during the leasing process.

Table 2-8. Competitive Coal Lease Tracts

Tract Name	Federal Surface (acres)	Federal Coal (acres)	Mineable Coal Reserves (millions of tons)	Recoverable Coal Reserves (millions of tons)
Bisti #1	2,933	3,713	150	127
Bisti #4	1,040	2,600	35	30
Bisti #6/8	240	520	1	1
Sundance	0	720	4	1
Catalpa Canyon	0	120	0.4	0.3
Chico Wash South	10,070	11,670	74	63
Crownpoint East	160	9,880	149	124
Divide	400	3,031	16	14
Gallo Wash #1	120	320	11	10
Kimbeto #2	640	640	20	18
La Plata #1	200	200	9	8
La Plata #3	160	200	2	2
Lee Ranch East	0	969	16	14
Lee Ranch Middle	0	5,068	86	73
Lee Ranch West	160	6,410	101	86
Star Lake East #1	1,364	1,840	61	52
Star Lake West #2	440	760	28	24
Total	**17,927**	**48,661**	**763**	**647**

Source: Digitized from BLM maps.

Coal Belt SMA

The Coal Belt SMA, encompassing approximately 98,800 acres of federal minerals, was established in 1988 to ensure orderly development of coal resources along the Fruitland Formation. The Coal Belt SMA contains an estimated four billion tons of coal (BLM 1988). The SMA is located along the Fruitland coal (outcrop) belt from the Navajo Reservation near Bisti Trading Post to a point near Johnson Trading Post in western Sandoval County. The southern line represents the outcrop of the lowest coal seam; the northern boundary of the SMA is located where the overburden on the uppermost coal seam is 350 feet thick. The depth of the coal seam to the amount of overburden would result in extraction of most of the coal in the SMA using surface mining methods. The FFO would retain the public (surface) land in the SMA because of the large coal deposits and the possibility of conflicts between other future surface owner regarding coal leasing and/or mining.

Companies interested in obtaining a coal lease in the SMA would need to submit an application to the FFO. The 20 unsuitability criteria would be applied during the leasing process. Portions of the Coal Belt SMA are within the southern and western boundaries of the Bisti/De-na-zin WA and entirely within the Fossil Forest RNA and Ah-shi-sle-pah Road cultural ACEC. Another portion of the SMA falls within the Ah-shi-sle-pah WSA. Congressional designation of the Bisti/De-na-zin WA and Fossil Forest RNA prevents the leasing of coal in these areas. Until Congress

reaches a decision on the status of the Ah-shi-sle-pah WSA, no coal leases will be granted in that area. Leasing may occur in the Ah-shi-sle-pah WSA, if Congress does not designate the area as Wilderness. The SMA boundary is mapped by legal subdivisions and shown on Map 2-4.

License to Mine [Home Use Fuel (Coal) Source]

The existing domestic coal licenses on public lands would continue to be managed by the BLM. Navajo allottees in the area have historically used coal from surface outcrops as fuel for cooking and heating. There is one domestic use mining license issued to the Torrejon Chapter. The licenses allow members of a Chapter to collect federal coal for personal use. New domestic coal license applications would be considered on a case-by-case basis.

Fire/Fuels Management

The FFO has developed a Fire Management Plan to provide managers in the Fire Program with a functional document for integrating fire management with all other resource management programs. The plan establishes fire/fuels management and fire response/suppression direction based on safety, resource management objectives, and land use allocation objectives. Within SDAs (SMAs, ACECs, WAs, WSAs, RNAs, etc.), management actions adhere to the following guidance:

- Address Fire/Fuels Management for all land use allocations as part of watershed analysis and/or project planning. This will include determinations of the role of fire and the risk of large-scale, high-intensity wildfires at the landscape level.
- Use prescribed fire or other fuel management treatments to reduce fuel hazards and the risk of large-scale, high-intensity fire, consistent with the natural role of fire and protection standards for each special administrative designation area. Strategies will recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management activities could be damaging to long-term ecosystem function.
- Locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of special administrative designation areas. If the only suitable location for such activities is within the special administrative designation areas, an exemption may be granted following a review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements.
- Minimize delivery of chemical retardant, foam, or other additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist or, following a review and recommendation by a resource advisor, when an uncontrolled fire would cause more long-term damage.
- Immediately establish an emergency team to develop a rehabilitation treatment plan needed to attain special administrative designation areas objectives, whenever a wildfire or a prescribed fire burning outside prescribed parameters significantly damages them.
- Allow some natural fires to burn under prescribed conditions. This decision will be based on additional analysis and planning.
- Locate and manage water-drafting sites (e.g., sites where water is pumped to control or suppress fires) to minimize adverse effects on riparian habitat and water quality.

Under Alternative A, this guidance would apply to the SDAs in the FFO. In other FFO areas, the emphasis in most cases consists of aggressive initial attack to extinguish fires at the smallest size possible.

For wildland fires that escape initial attack, a Wildland Situation Analysis is performed to develop a suppression strategy to evaluate the damage induced by suppression activities compared to expected wildfire damage. Suppression tactics consider:

- Public and firefighting personnel safety;
- Protection of specific attributes of each land use allocation;
- Coordination of wildfire suppression activities to avoid causing adverse impacts on federal and non-federal lands;
- Appropriate use of suppression tools such as aircraft, dozers, pumps, and other mechanized equipment, and clear definitions of any restrictions relating to their use;
- The potential adverse effects on meeting ecosystem management objectives.

Fuels management activities are employed to modify fuel profiles in order to lower the potential of fire ignition and rate of spread; protect and support land use allocation objectives by lowering the risk of high-intensity, stand-replacing wildfires; and adhere to smoke management and air quality standards. Fire hazards are reduced through methods such as prescribed burning, mechanical or manual manipulation of vegetation and debris, removal of woodland vegetation and debris, and combinations of these methods. Hazard reduction plans will be developed through an interdisciplinary team approach and will consider the following:

- Safety of firefighting personnel;
- Developing a fuel profile that supports land allocation objectives;
- Reducing the risk of wildfire in a cost-efficient manner;
- Interagency cooperation to assure cost-effective fuel hazard reduction across the landscape;
- Adherence to smoke management and air quality standards;
- Consistency with objectives for land use allocations;
- Maintenance or restoration of ecosystem processes or structure;
- The natural role of fire in specific landscapes, current ecosystem needs, and wildfire hazard analysis included in the fire management plan.

Management of woodland fuels is important for preventing and controlling wildfire. In managing woodlands, this involves the manipulation of the fuels (vegetative materials) either by mechanical or manual methods, or through prescribed fire. Fuels treatment is an especially important consideration in the rural/urban interface areas, where forest fuels are in close proximity to private dwellings, businesses, and other structures. Mechanical and manual methods would be used in these areas and in areas where air quality considerations require reduced smoke emissions. Partial entry of prescribed fire may be initiated into natural stands where severe natural fuels buildup would contribute to high-intensity stand-destroying fires.

The use of prescribed fire will be based on the risk of high-intensity wildfire, and the associated cost and environmental impacts of using prescribed burning to meet protection, restoration, and maintenance of critical stands that are currently susceptible to large-scale catastrophic wildfire.

Under-burning will be reintroduced in areas over a period of time to create a mosaic of stand conditions. Treatments should be site-specific because some species with limited distributions are fire intolerant. The use of prescribed burning will be based on an interdisciplinary evaluation. Funding authority, therefore, must reflect the range of objectives identified for using fire under ecosystem management.

Project level prescribed fire plans will be developed using an interdisciplinary team approach. Plans will address: (1) adherence to smoke management and air quality standards,

(2) meeting stated objectives for the land use allocations, (3) maintaining or restoring ecosystem processes or structure, and (4) the role of natural fire in specific landscapes, current ecosystem needs, and wildfire hazard analysis included in the fire management plan.

Prescribed fire is used to emulate the natural role of fire to achieve resource objectives for wildlife enhancement, plant species maintenance, woodland biodiversity, and site preparation. Prescribed under-burning some proportion of homogeneous plant communities would be dependent on the type and amount of complexity that would be needed for any one plant community. The types of plant communities that may be targeted for burning would include contiguous monotypic sagebrush or woodland stands to promote more diversity or heterogeneity. Fire would be the preferred method of disturbance for biological reasons, but other methods of disturbance may produce similar results, such as chemical treatment or manipulation by machine.

In order to ensure that resource objectives such as wildlife and botanical species maintenance are met and that biodiversity elements are perpetuated, it may be necessary to employ applications of natural cycle related cool fires. There are approximately 175,000 acres of the FFO land base that could lend themselves to fire entry under prescription. It is reasonable to assume that at least an annual average of 500 acres of prescribed burning may be implemented to meet resource objectives. This would assume an approximate 30 to 50-year rotation cycle on some sites throughout the 175,000-acre land base. It is neither possible nor desirable to burn every acre on a 30 to 50-year cycle. Some sites would not benefit positively from the entry of either prescribed fire or wildfire; however, many would. Resource specialists must develop specific resource objectives and develop extensive plans to determine specific sites where benefits can occur. The need for prescribed fire varies for each resource. For example, botanical enhancement fires may need to be introduced on an annual basis on some sites. On other sites, such as under old growth stands (Douglas fir), the rotational burning could be up to 60-plus years depending on the particular site, soil structure, or other mixed plant communities. As specific area studies are developed, the need for fire applications upon a particular site will be clearly defined and activity plans developed accordingly.

Air quality considerations are also a factor in prescribed burns, in accordance with regulation and the New Mexico Smoke Management Plan.

Alternative B

Under Alternative B, the Farmington RMP would be amended to allow for maximum oil and gas development in the planning area and maximization of other public use of FFO land. Access and land use limitations would be minimized, consistent with the continuing management guidance. In the event of land use conflicts, priority would be given to minerals recovery.

Oil and Gas Leasing and Development

This alternative would provide for the development of 13,275 wells in the planning area, after the 17 wells that would be inaccessible due to NSO constraints are subtracted from the total. For analysis purposes only, no commingling of wells is assumed to occur under this alternative in order to evaluate maximum potential surface disturbance. Approximately 660 APDs per year would be approved over the next 20 years (Engler et al. 2001). The STCs on oil and gas leases would be the same as those in Alternative A. The mitigation measures listed in Appendix B-9 of the 1991 Amendment (BLM 1991a) would remain in effect.

Following is a summary of the acreage of federal minerals in the planning area subject to various constraints under this alternative:

Constraint	Acreage within High Development Area	Acreage in Rest of Planning Area	Total Acreage
Leasing			
Nondiscretionary Closure	349	110,799	111,148
Discretionary Closure	6,001	22,272	28,273
Development			
STC	1,324,428	1,335,557	2,659,985
CSU	150,083	86,187	236,270
NSO	10,847	2,443	13,290
TL	175,852	64,207	240,059

Note: STC = open under Standard Terms and Conditions; CSU = Controlled Surface Use; NSO = No Surface Occupancy; TL = Seasonal Timing Limitation.

Within the high development area, more than 99 percent of the federal oil and gas resources are currently leased. In areas being considered for discretionary closure in the RMP, the development of existing leases would continue according to the terms of the lease. The BLM would continue to implement the portions of the lease that require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users.

Assumptions related to oil and gas development that were prepared by FFO staff with concurrence from industry include the following:

- New surface disturbance would occur on 54 percent of all new wells, while 46 percent would be on existing sites through re-completion, dual completion, or directional drilling.
- The surface disturbance associated with each new well pad would average 2 acres, after interim reclamation or site rehabilitation takes place.
- The road and pipeline disturbance associated with each new well would average 1 additional acre. The road and pipeline will be constructed within the same 800-foot by 50-foot ROW.

- Reclamation would be completed at an initial rate of 133 well pads and associated ROWs per year and average 3 acres per well. The plugging and abandonment (P&A) rate is projected to increase at the rate of 5 percent per year over 20 years. Most P&As would occur in the fringe areas of the project, with abandoned sites in the high development area likely to be used again.

As described under Alternative A, the raptor noise policy, in effect since February 2000, in which the FFO established a buffer zone to minimize noise impacts from wellhead compression on raptor nest sites for golden eagles, ferruginous hawks, and prairie falcons by providing a reasonable margin around the nest would be implemented.

Oil and gas development on the land around Navajo Reservoir would be managed under CSU constraints approved by the FFO in cooperation with the USBR. There would be no change from Alternative A on the Carson and Santa Fe National Forests.

Land Ownership Adjustments

Disposal

Under this alternative, all of the lands identified for disposal in Alternative A would be available. In addition, lands within three miles of the city limits of Aztec, Bloomfield and Farmington (**Map 2-5**) would be available (except BLM land within SDAs). Exchange, sale, disposal under the R&PP Act, or other legal disposal would be considered if the disposal met the criteria listed in Chapter 1. Parcels on which substantial improvements have be inadvertently placed would also be made available for disposal, if the Authorized Officer determines that such disposal is in the public interest. Table 2-1 shows the total acres available for disposal under this alternative.

Acquisition

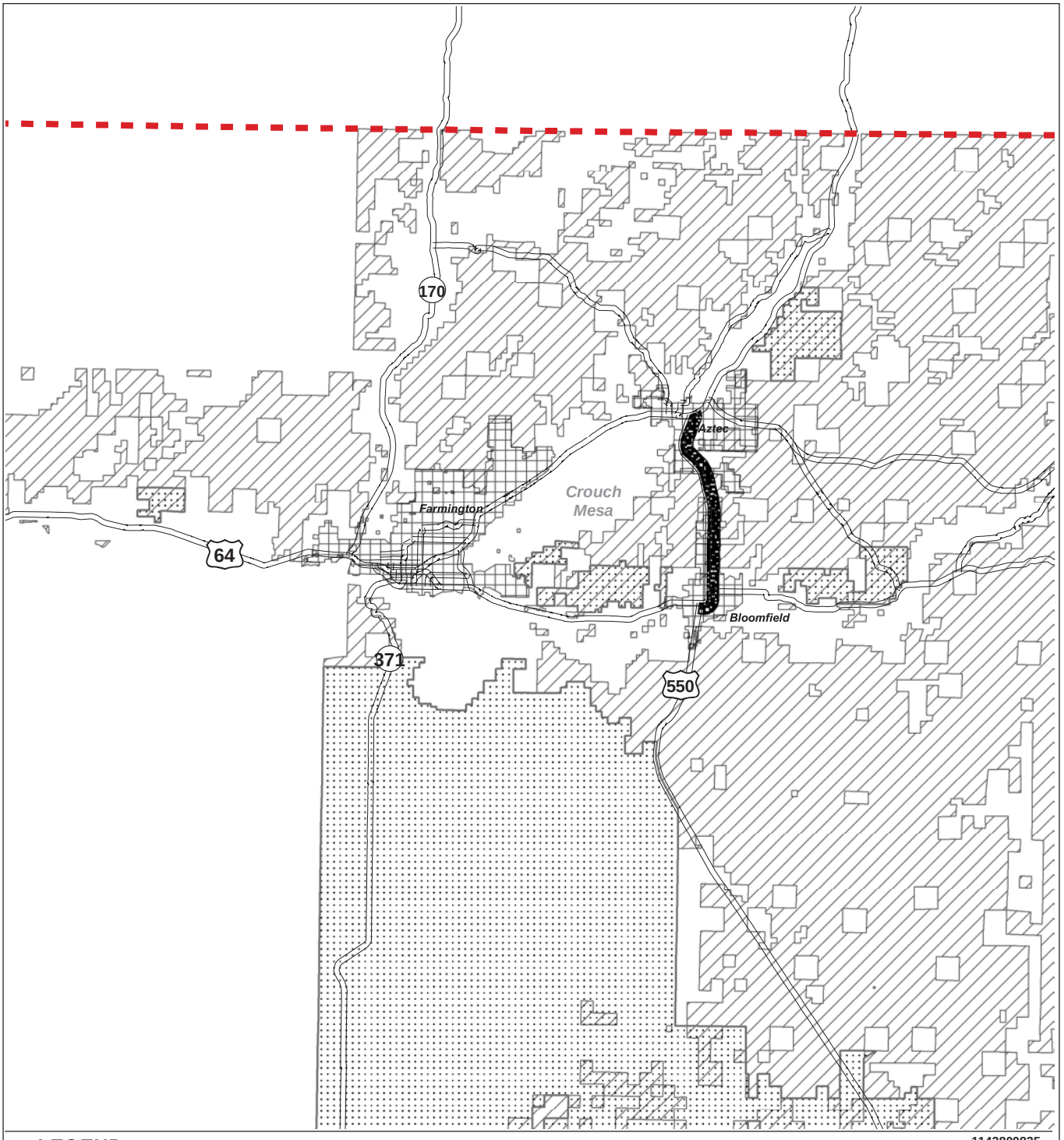
Inholdings in all of the approved SDAs would make up the priority list for acquisitions. Other lands that consolidate public ownership or benefit a resource program could also be acquired, if the acquisition were determined to be in the public interest. Any lands acquired would be managed in the same manner as the adjacent or surrounding public lands. Table 2-1 shows total acquisition under this alternative.

ROW Corridors

Under this alternative, the ROW corridors identified by the 2002 WUG revision (WUG 2002) of the 1992 WRCS would be designated for powerline and pipeline use. Any specific proposals would still be required to go through the environmental and permitting process. Proposed uses that are determined to unreasonably interfere with the use of these corridors may not be authorized. Map 2-2 shows the general alignment of the corridors.

Mineral Materials

The FFO has identified six areas (16,520 acres) of salable minerals such as sand and gravel that needs to be well managed. Additional areas could be identified in the future. Some of these areas are within the disposal area identified above. The purpose of delineating these areas is to inform managers and potential users of other resources in these areas of their value for salable minerals, so that value would be considered prior to the authorization of other actions.



LEGEND

- RMP/EIS Boundary
- Area of Potential Land Disposal
- Municipal Boundary
- BLM Owned Land
- Alt D Aztec-Bloomfield Corridor
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

4 2 0 4

Scale in Miles

Source: BLM FFO

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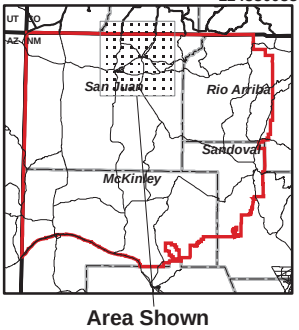


Area Shown

Map 2-5: Disposal Area Around the Tri-Cities Under Alternatives B and D

OHV Use

Under this alternative, the FFO would create 13 new OHV Management Units covering the entire field office. The 13 areas were derived by access routes, entry points, and use patterns for more effective management. **Map 2-6** shows the redefined units. Seven trails have been identified in four OHV Management Units (**Table 2-9**). The general location of these trails is shown in **Map 2-7**. Final alignment and use of the proposed trails would be determined when individual OHV Activity Plans are developed. Additional routes, trails, and areas may be identified, as plans are developed for each OHV Management Unit. Plans would be written based on priority of resource protection needs and the amount of public use. Plan development would be based on environmental review and public involvement. The individual OHV Activity Plans should be completed within 15 years.

OHV designations for SDAs may be different than the surrounding OHV Management Unit. Table 2-2 summarizes the acreage of open, limited and closed OHV designation for Alternative B.

In addition to the preparation of OHV Activity Plans, the FFO will prepare a Transportation Plan. The Transportation Plan will identify collector and resource roads that would be needed for use over the long-term. These roads would remain open for public access when oil and gas development in the area ceases. Roads identified in the Transportation Plan would be included in the individual OHV Activity Plans.

Table 2-9. Proposed Multi-Use Trails for Alternatives B, C, and D

OHV Unit	Trail	Length (miles)
Farmington	Bohanan Canyon	19.7
	Kiffen Canyon	13.4
Aztec	Aztec to Alien Run	6.7
San Juan	Aztec City	12.1
	Bloomfield	9.4
	Horn Canyon	19.7
Bloomfield	Kutz Canyon	12.6

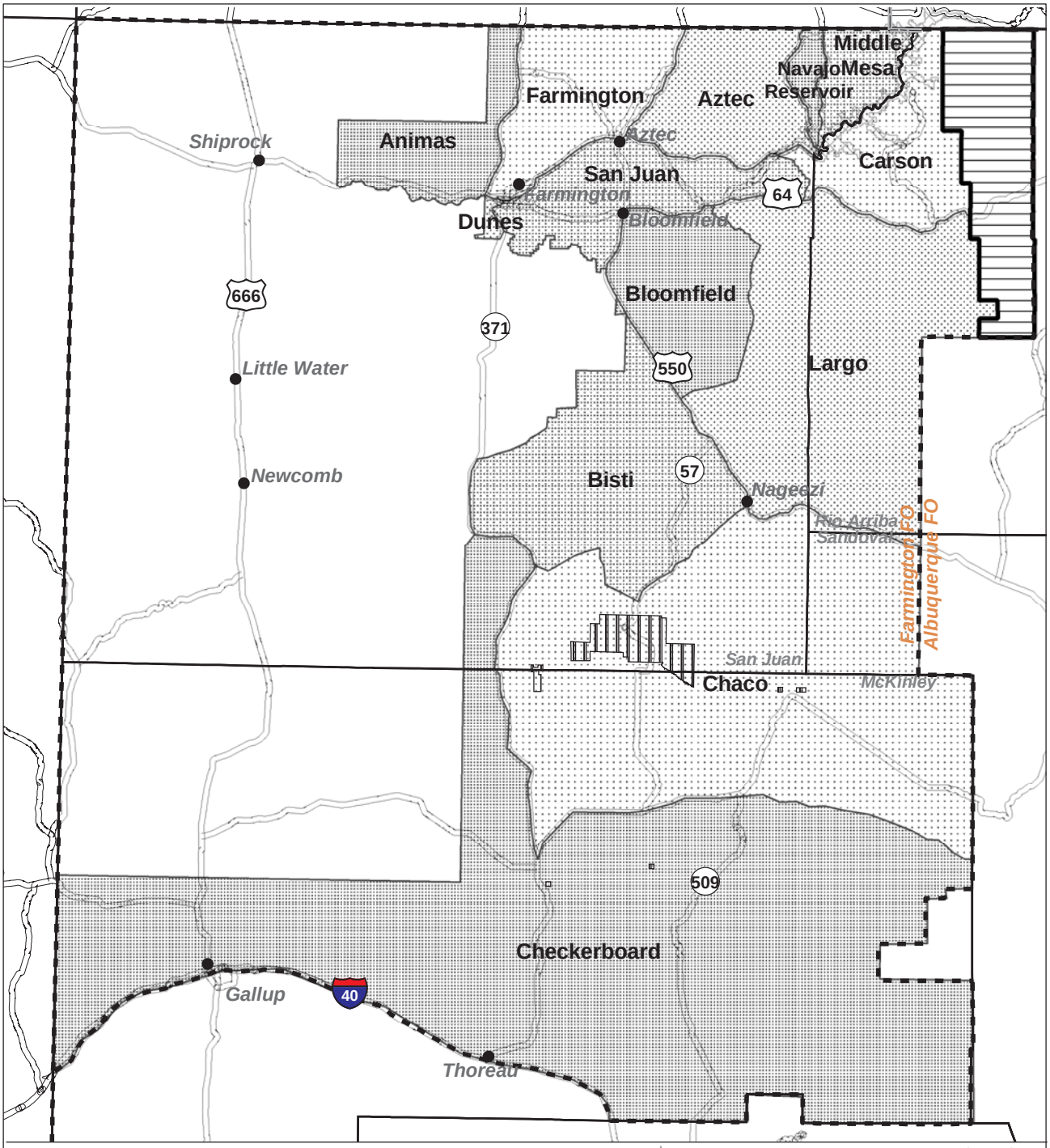
Under Alternative B, OHV use would be limited to maintained roads, designated trails, routes and areas on public lands in all Management Units, except where conditions are determined to be suitable for cross-country travel. **Table 2-10** summarizes the acreage that the FFO considers potentially suitable for cross-country travel in each of the proposed OHV Management Units. To be suitable, the land had to be:

- BLM surface;
- Outside an SDA;
- Outside a designated disposal area.

Land meeting the above criteria were identified as dispersed recreation areas, to which additional criteria were applied to determine the amount of each OHV Management Unit that would not likely be damaged by cross-country travel. In order to exclude the land that would be most susceptible to wind and water erosion, damage to vegetation or soil biological crusts, and prime farmland, land meeting the following criteria were excluded:

- Slopes greater than 30 percent;
- South-facing slopes steeper than 15 percent;
- Seasonal high water table;
- Depth to bedrock less than 20 inches;
- Highly erodible by wind or water.

The dispersed recreation areas that could be designated as open to cross-country travel would be further refined as OHV Management Unit plans are developed by FFO staff. Other site-specific screening criteria that could further restrict the potentially open areas would be applied during plan development, including avoidance of cultural resources, sensitive species habitats, riparian areas, and proximity to residences.



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LEGEND

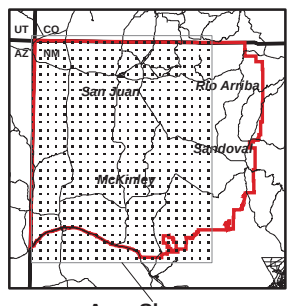
- Bisti — OHV Management Unit*
- Chaco Culture NHP
- Navajo Reservoir
- Carson National Forest
- County Boundary
- BLM Field Office Boundary
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

7 3.5 0 7

Scale in Miles

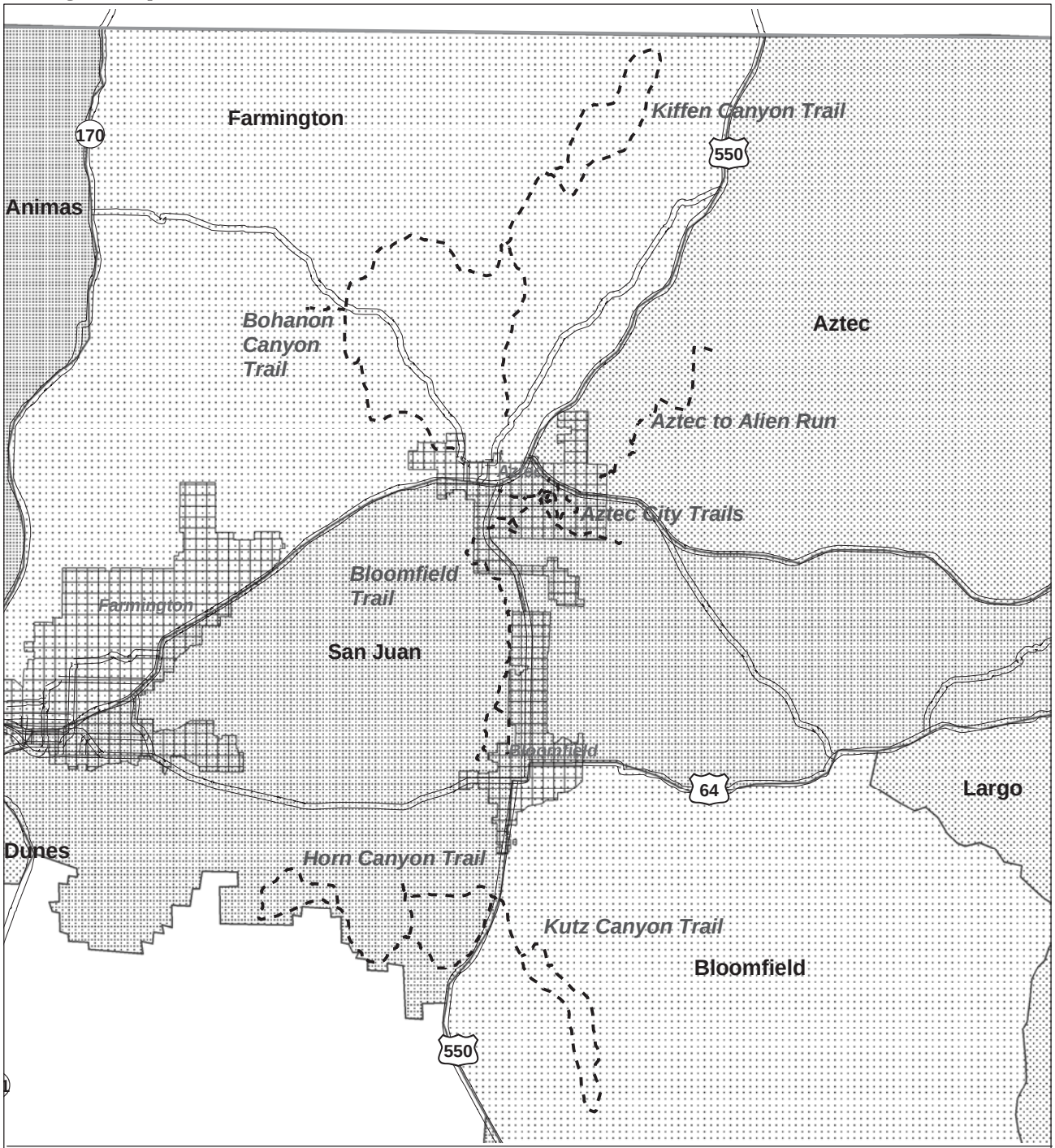
Source: BLM FFO



Area Shown

*Individual OHV units are delineated with unique names and shade patterns

Map 2-6: Proposed OHV Management Units in the FFO Area



LEGEND

- Trail
- Aztec OHV Units*
- Municipal Boundary
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

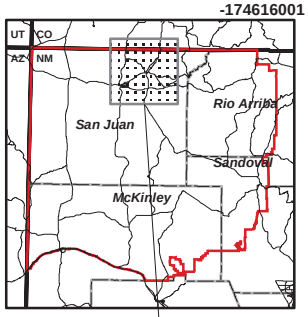
N

1 0.5 0 1 2 3

Scale in Miles

Source: BLM FFO

-174616001



Area Shown

*Individual OHV units are delineated with unique names and shade patterns

Map 2-7: Proposed Recreational Use Trails for Alternatives B, C, and D

Table 2-10. Areas Potentially Suitable for Open OHV Designation, by Management Unit

OHV Management Unit	Total Acres	Alternative B				Alternative D			
		BLM Acres	Dispersed Area (acres)[1]	Potentially Suitable for Open Designation		BLM Acres	Dispersed Area (acres)[1]	Potentially Suitable for Open Designation	
				Acres	%			Acres	%
Animas	105,572	51,758	15,301	311	2%	51,758	13,156	30	0%
Aztec	133,558	101,937	85,725	5,420	6%	101,937	19,651	853	4%
Bisti	291,535	165,040	110,440	7,583	7%	165,040	110,409	7,567	7%
Bloomfield	149,337	121,149	69,917	12,658	18%	121,149	36,896	5,387	15%
Carson	134,783	73,681	39,190	6,365	16%	73,681	2,485	336	14%
Chaco	857,597	216,008	172,956	21,886	13%	216,008	172,367	21,886	13%
Checkerboard	1,509,255	104,842	102,235	874	1%	104,842	102,235	874	1%
Dunes	4,633	2,627	1,814	91	5%	2,627	1,814	91	5%
Farmington	145,066	73,380	41,946	3,872	9%	73,380	26,976	2,135	8%
Largo	484,871	379,455	351,789	37,514	11%	379,455	196,715	23,434	12%
Middle Mesa	52,566	27,276	10,434	106	1%	27,276	9	0	0%
Navajo Reservoir	18,803	12,302	254	10	4%	12,302	17	2	9%
San Juan	143,496	68,696	67,827	3,213	5%	68,696	67,770	3,211	5%
Total	**4,031,072**	**1,398,151**	**1,069,829**	**99,903**	—	**1,398,151**	**750,501**	**65,806**	—

Sources: BLM FFO, SAIC GIS data.

Note: (1) Dispersed area is comprised of BLM surface lands that are not within an SDA (where management prescriptions for OHV use for the managed area would apply).

Specially Designated Areas

Under Alternative B, 545,999 acres in the FFO would have special management, of which BLM currently manages the surface on 468,410 acres. Areas with special administrative designations (SMAs, ACECs, RNAs, WAs, and WSAs) approved through previous land use planning would be carried forward with changes described below. Accounting for these changes, there would be 135 SDAs in the FFO under Alternative B. Changes in management prescriptions for new and existing areas are described in Table 2-5. **Map 2-8** (large fold-out map for Alternative B, located at end of document, inside back cover) shows adjusted boundaries under this alternative. Please refer to Table 2-5 for name changes.

Areas Not Carried Forward

- The Coal Belt SMA would be removed because all areas that are suitable for coal would be available for consideration for coal extraction under the lease by application procedures.
- The Right-of-Way Windows (4 units) would be removed.
- Farmington Lake Watershed would be removed because most of the property within the SMA is not owned by BLM, and a small portion is within the GRTS SMA.
- Lost Pine, Log Jam, and Badlands ACEC designations would be removed because they are within the Bisti/De-na-zin WA and consequently protected for wilderness values.

- Aztec Gilia ACEC designation would be removed, as the range and distribution of Aztec gilia is more extensive than previously identified.
- Tanner Lake Battlefield was dropped because surface ownership was transferred to The Navajo Nation as part of the Navajo-Hopi land exchange.

Areas Added or Changed

Wildlife and Threatened and Endangered Species

- Laguna Seca Mesa SMA would be enlarged and designated as the Mexican Spotted Owl ACEC and the management emphasis would change from forestry to T&E habitat values in order to delineate the critical habitat designated by the USFWS.
- The Ephemeral Wash Riparian Area would be added to provide protection of riparian resources. Management would be applied to promote the attainment and maintenance of proper functioning conditions and provide habitats for wildlife.

Recreation

- Simon Canyon ACEC would be expanded to include the portion of the Simon Canyon Recreation Area that extends beyond the ACEC boundary. The SMA designation would be removed and the area would be managed as an ACEC.
- GRTS will change names to Glade Run Recreation Area. In addition, its boundary would be changed to better reflect the area of current use. This would result in a reduction in acreage.
- Piñon Mesa Recreation Area would be designated for recreational values. There would be several trails with different types of use.
- Rock Garden Recreation Area would be designated for recreational values. The area would be used by OHVs on designated trails.
- Navajo Lake Horse Trail Recreation Area would be designated for recreational values, promoting equestrian use. Designated trail corridors would define the area.
- Alien Run Mountain Bike Trail Recreation Area would be designated for recreational values, and non-motorized use on the trail corridors.
- The boundary of Thomas Canyon Recreation Area would be enlarged and a wildlife management component would be added to the larger SMA, in addition to current recreational emphasis.
- Carracas Mesa Recreation Area would add a wildlife management component in addition to the current recreational emphasis.

Paleontology

- The Piñon Mesa Fossil Area would be added to protect significant paleontological values.
- Gobernador and Cereza Canyon Fossil Areas would be added to protect significant paleontological values.
- The Lybrook Fossil Area would be added to protect significant paleontological values.
- The Bohanon Canyon Complex would be added to protect significant paleontological values.
- The Carson Fossil Pocket would be added to protect significant paleontological values.
- The Kutz Canyon Paleontological Area would be expanded to protect significant paleontological values.

Coal Leasing Suitability Assessment

Under this alternative, emphasis of the other resource uses in the PRLAs and competitive coal tracts would shift so coal

development would become the primary resource use and the emphasis of other, existing resource uses would change. Should any of the existing oil and gas leases expire in these areas, the leases would not be reissued until coal mining is completed. There would be no future leasing of oil and gas resources until all mining is completed or specific areas are released for leasing. Current oil and gas operations and facilities may include, but are not limited to (1) P&A, producing, and abandoned wells, (2) redrilling of these wells after mining has progressed past the well location, (3) purchasing the product estimated to be produced for the remainder of the life of the well, (4) compensating the operator/lessee for any surface damage to facilities, or (5) replacement of surface and pipeline facilities after mining is completed. Future well development on existing oil and gas leases would be coordinated with the BLM staff and the mining company to avoid proposed and active coal mining areas.

Preference Right Leasing Application

Under this alternative, the 14 PRLAs identified and described in Alternative A would be carried forward for further consideration for coal leasing. Those PRLAs that fall within the cultural ACECs, WA, and RNA would not be approved for coal mining. No coal leases or PRLAs would be granted in the Ah-shi-sle-pah WSA until Congress reaches a decision on its wilderness designation. This would include approximately 4,008 (844 acres in PRLA NM-003918 and 3,124 acres in PRLA NM-003919) acres that would not be available for coal leasing. Leasing may occur, if Congress does not designate the area as wilderness. Those portions of PRLAs affected by Congressional designations may be exchanged for coal leases in New Mexico if the exchange is in the public interest. The PRLAs that are not rejected through adjudication would be issued to companies that submitted applications, if they meet the MLA criteria. The 20 unsuitability criteria (Appendix C) described in 43 CFR 3461.5 would be reapplied during the leasing process.

Competitive Coal Tracts

The 17 competitive coal tracts discussed as available for leasing in Alternative A would be considered for leasing under this alternative. Those companies that are interested in mining coal from these tracts would need to submit an application to lease the coal. The 20 unsuitability criteria (Appendix C) described in 43 CFR 3461.5 would be reapplied during the leasing process.

License to Mine [Home Use Fuel (Coal) Source]

The need for domestic home fuel needs would continue as described in Alternative A. New domestic coal license applications would be considered on a case-by-case basis.

Additional Coal Interests

Two coal mining companies, Peabody Natural Resources, Inc. (Peabody) and Broken Hills Proprietary Company, Limited (BHP), have expressed interest that additional tracts of land be considered for future coal leasing. These lands are in the vicinity of the Lee Ranch, Twin Peaks, and East Piñon areas. Map 2-8 shows the location of these tracts.

Peabody owns reserves consisting primarily of state and fee land, which frequently occur in blocks in a checkerboard pattern that do not extend over a logical mining unit. Some of these areas have adjacent federal coal reserves that could be logically developed in conjunction with Peabody's existing holdings. Peabody's additional coal tracts interests would augment the three Lee Ranch competitive coal tracts. There is a potential for coal and coal fired power generation to increase in the southwestern U.S. Therefore, adjacent federal coal reserve areas may provide the potential for new mine development or to extend the life of the existing Lee Ranch Coal Mine.

BHP's San Juan Coal Company (SJCC) currently operates coal surfacing mining operations within the boundaries of the FFO. Presently, SJCC is developing an underground mine (Deep Lease and Deep Lease Extension) adjacent to its present surface mining

operations. The Twin Peaks area contains a coal tract that has the potential to extend SJCC's planned underground mine adjacent to the San Juan Coal Mine, located adjacent to and east of the SJCC's Deep Lease Extension. SJCC has examined the potential that this tract could be mined following completion of mining underground coal within its Deep Lease (Lease No. NM-28093) and the Deep Lease Extension (Lease NM-99144) leases. Information obtained from the U.S. Geological Survey (USGS) for existing gas wells and extrapolation of drilling and trends conducted from the Twin Peaks and East Piñon areas were used to estimate tonnage projections. This potential consists of federal coal with the exception of one state section (Section 16, T30N, R14W). The surface of this area is also federally owned except for approximately 120 acres of fee surface (private) in Section 33, 50 acres in Section 8, all in T30N, R14W, and the state section described above.

To protect recreation values no underground mining would be permitted along the trail corridor in the part of the Twin Peaks area that overlies the Piñon Mesa Trail Corridor. The remainder of the Twin Peaks area would be available for leasing. To protect paleontology values, paleontological surveys would be conducted for fossil remains prior to underground mining. During active underground mining, periodic monitoring may be required for paleontological resources that may be exposed as a result of subsidence.

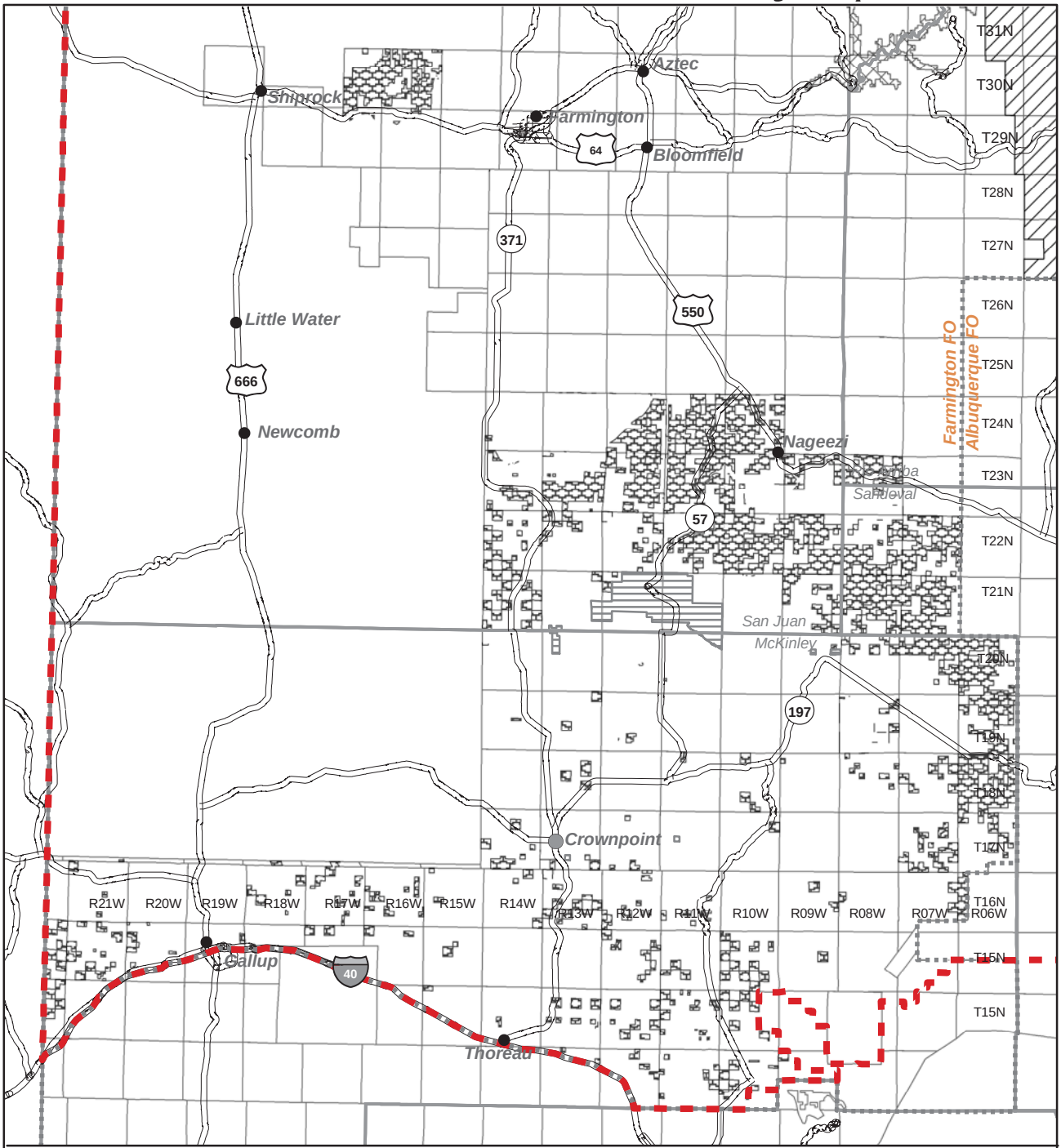
The East Piñon area tract represents a possible coal resource for SJCC to mine by underground methods following completion of mining underground coal within its Deep Lease and the Deep Lease Extension. This area lies adjacent and north of the Deep Lease and Deep Lease Extension areas. No drilling to determine coal tonnage, quality, and trend has been undertaken for this tract. Drilling data of existing SJCC coal leases, USGS data, and gas well information in the area have been used to extrapolate tonnage projections. Coal quality is expected to be comparable to the coal seams being currently mined to the west and the Deep Lease tract to the south. All coal in this is area is federally owned. However, approximately one-third of the surface is federally owned and two-thirds is privately owned fee surface.

Suitable Future Leasing and Development Coal Areas

All lands within the FFO boundaries have been identified as potentially being suitable for future coal mining development. The 20 unsuitability criteria that eliminate such land as wilderness areas, designated T&E species habitat, ROWs/easements, and culturally significant areas (Appendix C**)** have been applied throughout the planning area to the extent possible at a small scale and with currently available data. If changing conditions warrant, the unsuitability criteria would be re-applied. Any proposed areas would be processed through a Lease by Application after undergoing further site-specific application of the unsuitability screening criteria. It was determined that 378,875 acres would be suitable to consider for future leasing and development in the FFO area. The general location of these areas remaining after application of most of the unsuitability criteria is shown on **Map 2-9**. The remainder of the FFO boundary can be considered if there are (1) commercial quantities, (2) areas with a coal transportation system, and (3) when there is a viable market for the coal. Additional data will be required to make determinations on the location of commercial quantities of coal throughout the FFO area. These data would be obtained as companies do developmental exploration to identify potential coal tracts for mining.

Fire/Fuels Management

Fire/fuels management procedures under Alternative B will be the same as Alternative A, except in the number of acres in SDAs. Under this alternative, 468,410 acres of public land would fall under the guidance for these areas. Other areas would be managed in accordance with the procedures described for Alternative A.



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LEGEND

- Areas of Coal Suitability
- Chaco Culture NHP
- Navajo Reservoir
- BLM Field Office Boundary
- County Boundary
- National Forest
- RMP/EIS Boundary
- Township and Range
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

10 5 0 10

Scale in Miles

Source: BLM FFO

Map 2-9: Areas Suitable for Coal Development in the FFO Area

Alternative C

Alternative C emphasizes conservation, protection, and enhancement of natural and cultural resources through management measures that provide limitations on surface disturbing activities. Additional areas would be delineated for special management designation.

Oil and Gas Leasing and Development

This alternative would result in the development of approximately 9,836 wells, after the 134 wells that would be inaccessible due to NSO constraints are subtracted from the total. In addition to the STCs imposed under Alternative A, more limiting stipulations and other agency management restrictions would be imposed. Commingling would be required to minimize surface disturbance. The FFO would permit 80-acre spacings for the Mesaverde and the Dakota Formations, but only on the same well pad. The Fruitland Formation would be approved on 160-acre spacings, but only where the wells fall on or adjacent to existing infrastructure. The BLM would work with NMOCD to allow operators to access the Dakota Formation from Mesaverde sites at the discretion of the operator. The number of APDs to be approved would remain at approximately 500 per year over the next 20 years.

Following is a summary of the acreage of federal minerals in the planning area subject to various constraints under this alternative:

Constraint	Acreage within High Development Area	Acreage in Rest of Planning Area	Total Acreage
Leasing			
Nondiscretionary Closure	349	110,799	111,148
Discretionary Closure	74,897	39,203	114,100
Development			
STC	1,180,511	1,398,772	2,579,283
CSU	200,002	75,190	275,192
NSO	35,949	19,121	55,070
TL	573,980	64,421	638,401

Notes: STC = Open under Standard Terms and Conditions; CSU = Controlled Surface Use; NSO = No Surface Occupancy; TL = Seasonal Timing Limitation.

Within the high development area, more than 99 percent of the federal oil and gas resources are currently leased. In areas being considered for discretionary closure in the RMP, the development of existing leases would continue according to the terms of the lease. The BLM would continue to implement the portions of the lease that require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users.

Noise from oil and gas compressors has been identified by the public as an issue of primary concern in the planning area. To address these concerns, the FFO developed a Noise Policy, which would be implemented in the form of an NTL to oil and gas operators or ROW stipulation that would require mitigation of noise levels measured within and adjacent to designated Noise Sensitive Areas (NSA). The NSAs include 92 SDAs managed by the FFO, as well as all or part of seven areas within the USFS Jicarilla Ranger District, all of the USBR land, and one NPS area. The public land surface of these areas totals approximately 338,680 acres.

Noise levels inside an NSA would be limited to no more than 48.6 dBA equivalent sound level (Leq) at 300 feet in all directions from the noise source. For noise sources located outside of designated NSAs, the standard of 48.6 dBA Leq would be met at the boundary of the NSA.

Noise sources located within 300 feet of the NSA boundary would be allowed to meet the standard 300 feet from the source. For noise sources involving federal or Indian leases located near occupied dwellings or buildings, the standard of 48.6 dBA Leq would be met 100 feet from such structure. Additional information on the Noise Policy is included in Appendix E.

In addition to implementation of the Noise Policy, the raptor noise policy to minimize noise impacts from wellhead compression on raptor nest sites would be implemented as described under Alternative A.

The mitigation measures listed in Appendix B-9 of the 1991 RMP Amendment (BLM 1991a) would be replaced with more generalized narrative that accomplishes the same overall goal of minimizing erosion and wildlife habitat disturbance. The following mitigation measures would be implemented where applicable, depending on site-specific conditions and requirements:

- Make every effort to minimize surface disturbance and intrusion into undisturbed areas through such actions as twinning of wells and directional drilling, unorthodox locations, recompletions, commingling of gas, and closed loop mud systems. Pipelines would follow existing roads.
- Development would be restricted in areas that have special topography (steep or broken and/or on benches) and soil concerns. Development in these areas would be considered on a case-by-case basis and would contain site-specific mitigation stipulations.
- Operators would be encouraged to unitize in areas of heavy development to increase management efficiency and facilitate operations in sensitive areas.
- Off-site mitigation may be indicated in crucial areas, such as areas with wildlife monitoring or studies, habitat replacement, water development, and watershed protection measures.
- Vehicle traffic and resource damage would be reduced by using new technology such as electronic data interchange and piping of produced water.

Listed below is a summary of the types of activities that would not be permissible during a closure period in an area under TL constraints. Emergency repairs needed for human safety and environmental contamination would not require prior authorization. Emergency repairs include a break in a gas or water line, repairs of tank battery facilities, and wellhead repairs.

- Any construction, including new well pads, roads, pipelines, installation of compressors, surfacing of roads, power-lines. Well pad, road construction and road improvement.
- Drilling.
- P&A (unless required to prevent environmental damage).
- Seismic exploration.
- Workovers or any activity requiring a drilling rig, unless required to prevent environmental damage, or to prevent a permanent loss of reserves. Prior approval must be approved before beginning this type of work.

Activities that are routine and do not conflict with the seasonal restrictions include routine daily operations, road maintenance, and routine pipeline maintenance.

Oil and gas development on the land around Navajo Reservoir would be managed under NSO constraints. All of the USBR land around the lake would be identified as NSO. As a result, new wells would be required to be directionally drilled from outside the boundary of USBR land.

There would be no change from Alternative A on the Carson and Santa Fe National Forests, except for the application of the Noise Policy in designated areas on USFS land.

Land Ownership Adjustments

Disposal

Under this alternative, the isolated tracts (approximately 2,640 acres) previously identified and BLM lands south and west of US 550 would remain available for disposal. In addition, the public lands on Crouch Mesa between Aztec, Bloomfield and Farmington (Map 2-5) would be added to the list for disposal. Exchange, sale, disposal under the R&PP act, or other legal disposal would be considered if the disposal met the criteria listed in Chapter 1. Table 2-1 provides the disposal acreage under this alternative.

Acquisition

Inholdings and lands surrounding SDAs would be the priority for acquisition. Additional riparian areas would also be a priority for acquisition, if their acquisition is determined by the Authorized Officer to be in the public interest. Other lands that consolidate public ownership or benefit a resource program could also be acquired. Any lands acquired would be managed in the same manner as the adjacent or surrounding public lands. Table 2-1 provides acquisition acreage under this alternative.

ROW Corridors

Under this alternative, the ROW corridors identified by the 2002 WUG revision of the 1992 WRCS would be designated for powerline and pipeline use. Any specific proposals would still be required to go through the environmental and permitting process. Proposed uses that are determined to unreasonably interfere with the use of these corridors may not be authorized. Map 2-2 shows the general alignment of the corridors.

Mineral Materials

The FFO has identified six areas (16,520 acres) of salable minerals such as sand and gravel that needs to be well managed. Additional areas could be identified in the future. Some of these areas are within the disposal area identified above. The purpose of delineating these areas is to inform managers and potential users of other resources in these areas of their value for salable minerals, so that value would be considered prior to the authorization of other actions.

OHV Use

OHV management would be similar to Alternative B. Management Unit boundaries would be the same as Alternative B, shown in Map 2-6. Acreage for each OHV designation is provided in Table 2-2. The table reflects changes in proposed SDAs for this alternative that would slightly alter the acreage for each designation. Proposed designated trails described for Alternative B would also apply for this alternative (Table 2-9). OHV use would be limited to maintained roads, designated trails, routes, and areas on public lands in all OHV Management Units. Some SDAs would be closed to vehicular use. Additional routes, trails, areas, and final alignments may be identified as plans are developed for each OHV Management Unit.

OHV Activity Plans would be written based on priority of resource protection needs and the amount of public use. The individual OHV Activity Plans should be completed within 15 years. In addition to the preparation of the OHV Activity Plans, the FFO will prepare a Transportation Plan. The Transportation Plan will identify collector and resource roads that would be needed for use over the long-term. These roads would remain open for public access when oil and gas development in the area ceases. Roads identified in the Transportation Plan would be included in the individual OHV Activity Plans.

Specially Designated Areas

Under Alternative C, 903,309 acres in the FFO would have special management, of which BLM currently owns the surface on 713,710 acres. Areas with special administrative designations (SMAs, ACECs, RNAs, WAs, and WSAs) approved through previous land use planning would be carried forward with changes described below. Accounting for these changes, there would be 141 SDAs in the FFO under Alternative C. This reflects consolidation of several areas into larger contiguous areas to

provide for more efficient management. Changes in management prescriptions for new and existing areas are described in Table 2-5. **Map 2-10** (large fold-out map for Alternative C, located at end of document, inside back cover) shows adjusted boundaries under this alternative. Please refer to Table 2-5 for name changes.

Areas Not Carried Forward

- Lost Pine, Log Jam, and Badlands ACEC designations would be removed since they are within the Bisti/De-Na-Zin WA and require no further designation.
- The Coal Belt SMA would be removed because all areas that are suitable for coal would be available for consideration for extraction under the lease by application process.
- The Right-of-Way Windows (4 units) would be removed.
- Farmington Lake Watershed SMA would be removed because the majority of the ownership is non-federal, and a small portion is within the GRTS.
- Aztec Gilia ACEC designation would be removed, as the range and distribution of Aztec gilia is more extensive than previously identified.
- Tanner Lake Battlefield was dropped because surface ownership was transferred to The Navajo Nation as part of the Navajo-Hopi land exchange.

Areas Added or Changed

Wildlife

- East La Plata Wildlife Area would be added for protection of deer winter range.
- Rattlesnake Canyon Wildlife Area would be added for deer winter range and fall/winter use by wild turkeys.
- Middle Mesa Wildlife Area would be added for protection of deer winter range.
- Rosa Mesa Wildlife Area would be added for protection of deer winter range.
- Gonzales Mesa Wildlife Area would be added for protection of deer winter range.
- Crow Mesa Wildlife Area would be added for deer and elk use all year.
- Cox Canyon Wildlife Area would be added for protection of deer winter range.
- Ensenada Mesa Wildlife Area would be added for year-long use by antelope, deer and elk.
- Cereza Canyon Wildlife Area would be added for protection of deer and elk winter range.
- Manzanares Mesa Wildlife Area would be added for protection of deer and elk winter range.
- Delgadito Mesa Wildlife Area would be added to provide for resident and migratory deer and elk.
- Angel Peak Wildlife Area would be added for antelope habitat.
- Laguna Seca Mesa Wildlife Area added for wild turkey, deer, elk, bear and Abert's squirrel.

T&E Species

- The Ephemeral Wash Riparian Area would be added to provide protection of riparian resources. Management would be applied to promote the attainment and maintenance of proper functioning conditions and provide habitats for the southwestern willow flycatcher.
- Within the Laguna Seca Mesa SMA would be the Mexican Spotted Owl ACEC, designated to protect the T&E habitat values in the critical habitat designated by the USFWS.

Cultural

All cultural SMAs carried forward from previous plans and amendments would be designated as ACECs.

Chacoan Outliers

- Twin Angels ACEC would be enlarged.
- Jacques ACEC would be enlarged and renamed as Jacques Chacoan Community ACEC.

Anasazi Communities (Non-Chacoan)

- Cedar Hill ACEC would be added.
- East Side Rincon Site would be enlarged and changed to an ACEC.
- The existing Chacra Mesa Complex ACEC and the Shephard Site SMA would be combined with surrounding lands.
- La Jara ACEC would be added.

Early Navajo Defensive Sites and Communities

- Adams Canyon SMA would change to an ACEC designation and be expanded.
- Blanco Mesa ACEC would be enlarged.
- Cottonwood Divide ACEC would be added upon acquisition of state land and mineral rights.
- Existing Crow Canyon District ACEC, NM-01-39344 ACEC, and Unreachable Rockshelter SMA, would be combined with surrounding lands and would be called Crow Canyon ACEC.
- Deer House ACEC would be enlarged.
- Existing Casa Mesa Diablo SMA and Ye'is-in-Row ACEC would be combined with surrounding lands and called Devil's Spring Mesa ACEC.
- The existing Adolfo Canyon SMA, Big Star ACEC, Carrizo Cranes ACEC, Gomez Canyon Ruin SMA, Gomez Point ACEC, Hill Road Ruin SMA, NM-01-39236 ACEC, and Rabbit Tracks ACEC would be combined with surrounding lands and called Encinada Mesa-Carrizo Canyon ACEC.
- The existing Frances Ruin ACEC and Romine Canyon SMA would be combined with surrounding lands and called Frances Mesa ACEC.
- Kachina Mask ACEC would be enlarged.
- Kiva ACEC would be enlarged.
- Muñoz Canyon ACEC would be added.
- Pointed Butte SMA would be enlarged and designated as an ACEC.
- Pork Chop Pass ACEC would be added upon acquisition of state land and mineral rights.
- Rincon Largo District SMA would be enlarged and designated as an ACEC.
- Rincon Rock Shelter SMA would be enlarged and designated as an ACEC.
- Star Rock ACEC would be added.
- String House ACEC would be added upon acquisition of state land and mineral rights.
- Existing Cibola Canyon ACEC, Compressor Station SMA, Foothold and Overlook Ruins District SMA, Hooded Fireplace and Largo School District ACEC, and Superior Mesa Community ACEC would be combined with surrounding lands and called Superior Mesa ACEC.
- Tapacito and Split Rock ACEC would be enlarged.
- Truby's Tower ACEC would be added upon acquisition of state land and mineral rights.

Petroglyph and Pictograph Sites

- Bi Yaazh ACEC would be enlarged.
- The existing Delgadita/Pueblo Canyons ACEC and Delgadito Pueblito SMA would be combined with surrounding lands into the Delgadita-Pueblo Canyons ACEC.

- Hummingbird Canyon ACEC would be added.
- Star Spring ACEC would be enlarged and renamed Star Springs-Jesus Canyon ACEC.
- Martinez Canyon ACEC would be enlarged.

Historic Sites

- Albert Mesa ACEC would be added.
- The Haynes Trading Post ACEC would be added.
- The Moss Trail ACEC would be added.

Paleontology

- The Piñon Mesa Fossil Area would be added to protect significant paleontological values.
- Gobernador and Cereza Canyon Fossil Area would be added to protect significant paleontological values.
- The Lybrook Fossil Area would be added to protect significant paleontological values.
- The Bohanon Canyon Complex would be added to protect significant paleontological values.
- The Carson Fossil Pocket would be added to protect significant paleontological values.
- The Kutz Canyon Paleontological Area would be expanded to protect significant paleontological values.

Recreation

- Simon Canyon ACEC would be expanded to include the portion of the Simon Canyon Recreation Area that extends beyond the ACEC boundary. The SMA designation would be removed and the area would be managed as an ACEC.
- The GRTS name would change to Glade Run Recreation Area and the boundary would be changed to better reflect the area of current use. This would result in a reduction in acreage.
- Piñon Mesa Recreation Area would be designated for recreational, paleontological, and visual values. There would be several trails with different types of use. The managed area would include the corridors and surrounding land.
- Rock Garden Recreation Area would be designated for recreational values. The area would be for OHV, equestrian and other recreational use on designated trails, routes and areas. Management would be applied to the trails and surrounding land.
- Navajo Lake Horse Trail would be designated for recreational values, promoting equestrian use. The managed area would include the corridors and surrounding land.
- Alien Run Mountain Bike Trail would be designated for recreational values, and non-motorized use on trail corridors and surrounding land.
- The boundary of Thomas Canyon Recreation Area would be enlarged and a wildlife management component would be added to the larger SMA, in addition to the current recreational emphasis.
- In addition to current recreational emphasis, Carracas Mesa Recreation Area would add a wildlife management component in addition to the current recreational emphasis.

Coal Leasing Suitability Assessment

Preference Right Leasing Application

The 14 PRLAs discussed in Alternative A would be carried forward under this alternative. The unsuitability criteria that limited several PRLAs would still be in effect. Those PRLAs that are affected by Congressional designation of the WA and RNA may, under public law, be exchanged for coal leases in New Mexico if it is in the public interest. At the time any of the

PRLAs are processed, the unsuitability criteria would be applied again, if necessary.

The acres in Ah-shi-sle-pah WSA would not be available for future coal leasing and development until Congress reaches a decision on the Ah-shi-sle-pah WSA status.

Competitive Coal Tracts

The 17 competitive coal tracts would not be available for leasing and coal development under this alternative. Existing coal mines would continue to extract from existing coal leases until recovery of in-place coal reserves are complete. The existing La Plata, San Juan, and McKinley Mines would not be able to expand their existing mining operations. The potential for coal mines and a power generating plant in the southern portion of the FFO would no longer exist. Approximately 560 million tons of mineable federal coal would not be recovered.

License to Mine [Home Use Fuel (Coal) Source]

The need for domestic home fuel needs would continue as identified in Alternative A. The historic use of coal from surface outcrops by Navajo allottees in the area would continue. New domestic coal license applications would be considered on a case-by-case basis.

Fire/Fuels Management

Fire/fuels management procedures under Alternative C would be the same as Alternative A, except in the number of acres in SDAs. Under this alternative, 713,710 acres of public land would fall under the guidance for these areas. Other areas would be managed in accordance with the procedures described for Alternative A.

Alternative D

Alternative D includes aspects of the other three alternatives, with the goal of balancing extraction of the mineral resource, multiple uses of public lands, and protection of natural and cultural resources. The goal of this alternative is to have full field subsurface development, as described in the RFDS, while minimizing surface disturbance to the extent possible.

Oil and Gas Leasing and Development

This alternative would provide for development of 9,942 new wells in the planning area, after the 28 wells that would be inaccessible due to NSO constraints are subtracted from the total. This would include some commingling as projected in the RFDS (Engler et al. 2001). Commingling would be encouraged where possible, including consideration of opportunities to combine oil and gas operations across leases and between different companies. The theme of this alternative would focus on permitting mineral production while mitigating impacts to other resources. The number of APDs to be approved would be approximately 500 per year over the next 20 years.

Following is a summary of the acreage of federal minerals in the planning area subject to various constraints under this alternative:

Constraint	Acreage within High Development Area	Acreage in Rest of Planning Area	Total Acreage
Leasing			
Nondiscretionary Closure	349	110,799	111,148
Discretionary Closure	35,000	46,000	81,000
Development			
STC	1,218,650	1,378,543	2,597,193
CSU	206,668	80,242	286,910
NSO	20,041	5,401	25,442
TL	419,386	64,421	483,807

Note: STC = Open under Standard Terms and Conditions; CSU = Controlled Surface Use; NSO = No Surface Occupancy; TL = Seasonal Timing Limitation.

Within the high development area, more than 99 percent of the federal oil and gas resources are currently leased. In areas being considered for discretionary closure in the RMP, the development of existing leases would continue according to the terms of the lease. The BLM would continue to implement the portions of the lease that require lessees to conduct operations in a manner that minimizes adverse impacts to other resources and other land uses and users.

Mitigation of impacts would be accomplished by the application of the following new technology, regulatory changes, and off-site mitigation, as appropriate (practical and reasonable) to reduce the footprint from each proposed well. This framework would be applied on a case-by-case basis for each proposed well, in addition to the implementation of the continuing management guidance that is common to all alternatives.

- New Technology—Construction and Production Techniques: coil tube drilling for CBM wells, directional drilling from existing pads, use of remote sensing and telemetry to reduce traffic, surface use of produced water (could apply off-site) to create riparian and wetland habitats, transport injected produced water via pipeline instead of trucking to reduce traffic, closed loop mud systems.

- Regulatory Changes—Standardize the drilling window off-sets in the federal units; encourage/permit dual completion, re-completion and commingling (both downhole and at the surface), from multiple producing formations, to reduce the total number of well pads; consider the creation of additional federal units.
- Off-Site Mitigation—Utilize the voluntarily contributed funding from the oil and gas industry to monitor impacts, develop adaptive management strategies, implement management prescriptions in the SDAs, and enhance resource conditions off-site. Contributed funds could be utilized to:
  - ♦ Monitor impacts to vegetation, soil, water, air, wildlife and habitats;
  - ♦ Purchase and construct signs, gates, access and property within SDAs;
  - ♦ Stabilize and interpret significant cultural resources;
  - ♦ Enhance habitats and meet public land health standards through vegetation manipulation, creation of additional water sites, application of produced water for riparian areas and wetlands, construction of structures and facilities to support site-specific management objectives such as kiosks, interpretive sites, parking areas, gates, fences, signs, etc.

The mitigation measures described under Alternative C that minimize erosion and wildlife habitat disturbance would be implemented where applicable, depending on site-specific conditions and requirements. They include the following:

- Make every effort to minimize surface disturbance and intrusion into undisturbed areas through such actions as twinning of wells and directional drilling, unorthodox locations, re-completions, commingling of gas, and closed loop mud systems. Pipelines would follow existing roads.
- Development would be restricted in areas that have special topographic (steep or broken and/or on benches) and soil concerns. Development in these areas would be considered on a case-by-case basis and would contain site-specific mitigation stipulations.
- Operators would be encouraged to unitize in areas of heavy development to increase management efficiency and facilitate operations in sensitive areas.
- Off-site mitigation may be indicated in crucial areas, such as areas with wildlife monitoring or studies, habitat replacement, water development, and watershed protection measures.
- Vehicle traffic and resource damage would be reduced by using new technology such as electronic data interchange and piping of produced water.

Listed below is a summary of the types of activities that would not be permissible during a closure period in an area under TL constraints. Emergency repairs needed for human safety and environmental contamination would not require prior authorization. Emergency repairs can include downhole or surface equipment repairs and/or modifications necessary to sustain the productive capability of the well.

- Any construction, including new well pads, roads, pipelines, installation of compressors, surfacing of roads, power-lines. Well pad, road construction and road improvement.
- Drilling.
- Plugging and abandonment (unless required to prevent environmental damage).
- Seismic exploration.
- Workovers or any activity requiring a drilling rig, unless required to prevent environmental damage, or to permanent loss of reserves. Prior

approval must be approved before beginning this type of work.

Activities that are routine and do not conflict with the seasonal restrictions include routine daily operations, road maintenance, and routine pipeline maintenance.

Noise from oil and gas compressors has been identified by the public as an issue of primary concern in the planning area. To address these concerns, the FFO developed a Noise Policy, which would be implemented in the form of an NTL to oil and gas operators or ROW that would require mitigation of noise levels measured within and adjacent to designated NSAs or within a specified distance from designated point receptors.

Receptor-focused controls would apply to specific locations within 46 BLM and four USFS designated areas. Boundary-focused controls would apply to all designated acreage within 7 BLM, 3 USFS, and 1 NPS NSAs. All USBR land would be considered a boundary-focused NSA. For receptor-focused NSAs, the noise standard of 48.6 dBA Leq would be achieved within 100 feet of agency-established receptor points within the designated NSAs. Established receptors are generally defined as visitor use areas, camp or picnic areas, habitat for threatened or endangered species, archaeological sites, and recreation trails, and may vary in size from a single point to several acres based on the features and resource components being managed.

In boundary-focused NSAs, the standard would be 48.6 dBA Leq, at 400 feet in all directions from the noise source. For noise sources located outside of designated NSAs, the noise standard of 48.6 dBA Leq would be met at the boundary of the NSA. Noise sources located within 400 feet of the NSA boundary would generally be allowed to meet the standard 400 feet from the source.

For noise sources involving federal or Indian leases located near occupied dwellings or buildings, the standard of 48.6 dBA Leq would be met 100 feet from such structure. Additional information on the Noise Policy is included in Appendix E.

In addition to implementation of the Noise Policy, the raptor noise policy to minimize noise impacts from wellhead compression on raptor nest sites would be implemented as described under Alternative A.

Oil and gas development on the land around Navajo Reservoir would be managed under NSO constraints in the following areas:

- Within 1,500 feet of Navajo Dam and its appurtenant structures;
- Within 500 feet of the maximum high water line (elevation 6,101.5 feet above MSL);
- Within 500 feet of the San Juan River;
- On all new leases.

The remainder of the area would be managed under CSU constraints. Unless exempted by USBR, there would be a timing limitation applied to the entire area from December 1 through March 31, and all USBR land would be managed as a boundary-focused NSA. Production facilities would not be located on the ridgeline above the reservoir and would be designed to minimize their visibility from the lake and other public use areas. Co-location of gas well facilities would be encouraged to minimize surface disturbance and the duplication of facilities.

Land Ownership Adjustments

Disposal

Under this alternative, all of the land identified for disposal in Alternative A would be available. In addition, the lands on Crouch Mesa and the lands along and less than one mile east of US 550 between Aztec and Bloomfield (Map 2-5) would be a priority for disposal. Exchange, sale, disposal under the R&PP Act or other legal disposal would be considered if the disposal met the criteria listed in Chapter 1. Additional areas identified by the various governmental entities and non-profit organizations during the scoping process for R&PP purposes (Appendix H) may be available for disposal if determined by the Authorized

Officer to be in the public interest. In some instances, the FFO would consider disposal of parcels within SDAs. Decisions would be based on an evaluation of the overall public benefit served by either disposal or continued management of special resource values. Identified parcels on which substantial improvements have been inadvertently placed would be made available for disposal, if the Authorized Officer determines that such disposal would be in the public interest. Table 2-1 provides the disposal acreage under this alternative.

Acquisition

Inholdings and lands surrounding SDAs would be the priority for acquisition. Additional riparian areas would also be a priority for acquisition, if their acquisition is determined by the Authorized Officer to be in the public interest. Other lands that consolidate public ownership or benefit a resource program could also be acquired. Any lands acquired would be managed in the same manner as the adjacent or surrounding public land. Table 2-1 provides the acquisition acreage under this alternative.

ROW Corridors

Under this alternative, the ROW corridors identified by the 2002 WUG revision of the 1992 WRCS would be designated for powerline and pipeline use. Any specific proposals would still be required to go through the environmental and permitting process. Proposed uses that are determined to unreasonably interfere with the use of these corridors may not be authorized. Map 2-2 shows the general alignment of the corridors.

The 2002 WUG revision of the 1992 WRCS proposed corridors as shown on Map 2-2 would be the designated ROW corridors for the FFO. In most cases, these corridors follow the routes of existing major electric transmission lines or petroleum transportation pipelines.

The goal of designating proposed corridors is to facilitate the transport of energy-related resources and products while minimizing environmental impacts to all lands. The FFO would encourage the use of the designated ROW corridors and ROW use areas, to the extent possible, but depending upon on site-specific needs, actual locations may vary. Utility corridors can often accommodate other compatible uses such as maintenance roads and other facilities, thus minimizing the proliferation of separate ROWs.

Designation of ROW corridors does not eliminate the requirement for the environmental analysis of any new ROW project proposals. The designated corridors would function as the agency preferred location for future ROWs. Future proposals may benefit from the surveys and impact analyses conducted for existing projects. ROW proposals outside of designated corridors would not be excluded. However, such proposals may entail greater scope of analyses and increased time necessary to analyze impacts and alternative routes.

Activities which would generally be excluded from ROW corridors include mineral material sales, range and wildlife habitat improvements involving surface disturbance or facility construction (such as water catchments, corrals, holding pens), campgrounds and public recreational facilities or other facilities which would attract public use. New oil and gas wells would be sited outside of ROW corridors.

Fourteen SDAs that would be within or adjacent to proposed WUG corridors are listed in **Table 2-11**. In most cases, the designated SDA is of such small size and/or steep topography that linear energy projects could be routed around these areas. This table identifies proposed management of ROW applications in each SDA.

Table 2-11. SDAs in Proximity to WUG Corridors

SDA Name	ROW Prescription
The Hogback	Allowed with site-specific stipulations.
Piñon Mesa Fossil Area	Allowed with site-specific stipulations.
Glade Run	Allowed with site-specific stipulations.
Rattlesnake Canyon	Allowed with site-specific stipulations.
Crow Mesa	Allowed with site-specific stipulations.
Dzil'na'oodlii (Huerfano Mesa)	No new ROWs on mesa top (37 acres). In remaining area, new ROWs restricted to existing disturbance.
Lybrook Fossil Area	Allowed with site-specific stipulations.
Torrejon Fossil Fauna	Allowed with site-specific stipulations.
North Road Segment #2	No new ROWs. One proposed corridor near north boundary. Minor routing change might be required.
North Road Segment #7	No new ROWs.
San Luis Cliffs Window	New ROWs restricted to existing corridor.
Betonnie Tsosie	Allowed with site-specific stipulations.
Bi Yaazh – Cultural	New ROWs restricted to existing disturbance.
River Tracts	Allowed with site-specific stipulations.

The developed network of existing facilities throughout and across the FFO provides an effective network for using corridors to transport hydrocarbons, and electrical energy resources across or out of the San Juan Basin. This network, in conjunction with the designated utility corridors, should accommodate future ROW needs for the next 10-15 years. Thus, the designation of SDAs in the Farmington RMP will have minimal to no adverse impacts to either interstate or intrastate transportation of energy products.

Mineral Materials

The FFO has identified six areas (16,520 acres) of salable minerals (Map 2-8) such as sand and gravel that needs to be well managed. Additional areas could be identified in the future. Some of these areas are within the disposal area identified above. The purpose of delineating these areas is to inform managers and potential users of other resources in these areas of their value for salable minerals, so that value would be considered prior to the authorization of other actions.

OHV Use

OHV management would be similar to Alternative B. Management unit boundaries would be the same as Alternative B, shown in Map 2-6. Acreage for each OHV designation is provided in Table 2-2. The table reflects changes in proposed SDAs for this alternative that would slightly alter the acreage for each designation. Restrictions on cross-country travel described in Table 2-3 would apply. Proposed designated trails described for Alternative B (Table 2-9) would also apply for this alternative. Table 2-10 quantifies the amount of land in each Management Unit that may potentially be considered suitable for open designation as OHV Management Unit plans are developed. These areas could be further reduced depending on site-specific sensitivities as described under Alternative B.

OHV Activity Plans would be written based on priority of resource protection needs and the amount of public use and should be completed within 15 years. In addition to the preparation of the OHV Activity Plans, the FFO will prepare a Transportation Plan. The Transportation Plan will identify collector and resource roads that would be needed for use over the long-term. These roads would remain open for public access when oil and gas development in the area ceases. Roads identified in the Transportation Plan would be included in the individual OHV Activity Plans.

To improve management of roads used for oil and gas, the AFO would establish a road Management Unit in the Lindrith/Cuba area patterned after the OHV Management Units in the FFO Transportation Plan.

Specially Designated Areas

Under Alternative D, 811,810 acres in the FFO would have special management, of which BLM currently manages the surface on 649,470 acres. Areas with special administrative designations (SMAs, ACECs, RNAs, WAs, and WSAs) approved through previous land use planning would be carried forward with changes described below. Accounting for these changes, there would be 137 SDAs in the FFO under Alternative D. This reflects consolidation of several areas into larger contiguous areas to provide for more efficient management. Changes in management prescriptions for new and existing areas are described in Table 2-5. **Map 2-11** (large fold-out map for Alternative D, located at end of document, inside back cover) shows adjusted boundaries under this alternative. Please refer to Table 2-5 for name changes.

Areas Not Carried Forward

- Lost Pine, Log Jam and Badlands ACEC designations would be removed since they are within the Bisti/De-Na-Zin WA and require no further designation.
- The Coal Belt SMA would be removed because all areas that are suitable for coal would be available for consideration for extraction under the lease by application process.
- The Right-of-Way Windows (4 units) would be removed.
- Farmington Lake Watershed SMA would be removed because the majority of the ownership is non-federal, and a small portion is within the GRTS.
- Aztec Gilia ACEC designation would be removed, as the range and distribution of Aztec gilia is more extensive than previously identified.
- Tanner Lake Battlefield was dropped because surface ownership was transferred to The Navajo Nation as part of the Navajo-Hopi land exchange.

Areas Added or Changed

Wildlife

- The East La Plata Wildlife Area would be added for protection of deer winter range.
- Rattlesnake Canyon Wildlife Area would be added for deer winter range and fall/winter use by wild turkeys.
- The Middle Mesa Wildlife Area would be added for protection of deer winter range.
- The Rosa Mesa Wildlife Area would be added for protection of deer winter range.
- Gonzales Mesa Wildlife Area would be added for protection of deer winter range.
- Crow Mesa Wildlife Area would be added for deer and elk use all year.
- Ensenada Mesa Wildlife Area would be added for year-long use by antelope, deer and elk.
- Cereza Canyon Wildlife Area would be added for protection of deer and elk winter range.

- Laguna Seca Mesa Wildlife Area added for wild turkey, deer, elk, bear and Abert's squirrel.

T&E Species

- The Ephemeral Wash Riparian Area would be added to provide protection of riparian resources. Management would be applied to promote the attainment and maintenance of proper functioning conditions and provide habitats for the southwestern willow flycatcher.
- Within the Laguna Seca Mesa SMA would be the Mexican Spotted Owl ACEC, designated to protect the T&E habitat values in the critical habitat designated by the USFWS.

Cultural

- All cultural SMAs carried forward from previous plans and amendments would be designated as ACECs.

Chacoan Outliers

- Twin Angels ACEC would be enlarged.
- Jacques ACEC would be enlarged and renamed as Jacques Chacoan Community ACEC.

Anasazi Communities (Non-Chacoan)

- Cedar Hill ACEC would be added.
- East Side Rincon Site would be enlarged and changed to an ACEC.
- The existing Chacra Mesa Complex ACEC and the Shephard Site SMA would be combined with surrounding lands. La Jara ACEC would be added.

Early Navajo Defensive Sites and Communities

- Adams Canyon SMA would change to an ACEC designation and be expanded. Blanco Mesa ACEC (130 acres) would be enlarged.
- Cottonwood Divide ACEC would be added upon acquisition of state land and mineral rights.
- Existing Crow Canyon District ACEC, NM-01-39344 ACEC, and Unreachable Rockshelter SMA would be combined with surrounding lands and would be called Crow Canyon ACEC.
- Deer House ACEC would be enlarged.
- Existing Casa Mesa Diablo SMA and Ye'is-in-Row ACEC would be combined with surrounding lands and called Devil's Spring Mesa ACEC.
- The existing Adolfo Canyon SMA, Big Star ACEC, Carrizo Cranes ACEC, Gomez Canyon Ruin SMA, Gomez Point ACEC, Hill Road Ruin SMA, NM-01-39236 ACEC, and Rabbit Tracks ACEC would be combined with surrounding lands and called Encinada Mesa-Carrizo Canyon ACEC.
- The existing Frances Ruin ACEC and Romine Canyon SMA would be combined with surrounding lands and called Frances Mesa ACEC.
- Kachina Mask ACEC would be enlarged.
- Kiva ACEC would be enlarged.
- Muñoz Canyon ACEC would be added.
- Pointed Butte SMA would be enlarged and designated as an ACEC.
- Pork Chop Pass ACEC would be added upon acquisition of state land and mineral rights.
- Rincon Largo District SMA would be enlarged and designated as an ACEC.
- Rincon Rock Shelter SMA would be enlarged and designated as an ACEC.
- Star Rock ACEC would be added.
- String House ACEC would be added upon acquisition of state land and mineral rights.
- Existing Cibola Canyon ACEC, Compressor Station SMA, Foothold and Overlook Ruins District SMA, Hooded

Fireplace and Largo School District ACEC, and Superior Mesa Community ACEC would be combined with surrounding lands and called Superior Mesa ACEC.

- Tapacito and Split Rock ACEC would be enlarged.
- Truby's Tower ACEC would be added upon acquisition of state land and mineral rights.

Petroglyph and Pictograph Sites

- Bi Yaazh ACEC would be enlarged.
- The existing Delgadita-Pueblo Canyons ACEC and Delgadito Pueblito SMA would be combined with surrounding lands into the Delgadita-Pueblo Canyons ACEC (360 acres).
- Hummingbird Canyon ACEC would be added.
- Star Spring ACEC would be enlarged and renamed Star Springs-Jesus Canyon ACEC.
- Martinez Canyon ACEC would be enlarged.

Historic Sites

- Albert Mesa ACEC would be added.
- The Haynes Trading Post ACEC would be added.
- The Moss Trail ACEC would be added.

Paleontology

- The Piñon Mesa Fossil Area would be added to protect significant paleontological values.
- Gobernador and Cereza Canyon Fossil Area would be added to protect significant paleontological values.
- The Lybrook Fossil Area would be added to protect significant paleontological values.
- The Bohanon Canyon Complex would be added to protect significant paleontological values.
- The Carson Fossil Pocket would be added to protect significant paleontological values.
- The Kutz Canyon Paleontological Area would be expanded to protect significant paleontological values.

Recreation

- Simon Canyon ACEC would be expanded to include the portion of the Simon Canyon Recreation Area that extends beyond the ACEC boundary. The SMA designation would be removed and the area would be managed as an ACEC.
- The GRTS boundary would be changed to better reflect the area of current use. This would result in a reduction in acreage.
- Piñon Mesa Recreation Area would be designated for recreational, paleontological, and visual values. There would be several trails with different types of use. The managed area would include corridors and surrounding land.
- Rock Garden Recreation Area would be designated for recreational values. The area would be designated for OHV, equestrian and other recreational use on designated trails, routes and areas. Management would be applied to the area including trails and surrounding land.
- Navajo Lake Horse Trail would be designated for recreational values, promoting equestrian use. The managed area would include corridors and surrounding land.
- Alien Run Mountain Bike Trail would be designated for recreational values, and non-motorized use on trail corridors and surrounding land.
- The boundary of Thomas Canyon Recreation Area would be enlarged and

wildlife management added as a resource value.

- In addition to current recreational emphasis, Carracas Mesa Recreation Area would add a wildlife management component.

Coal Leasing Suitability Assessment

Under this alternative there would be no shift in resource uses, but rather a balanced approach in the proposed leasing areas. Existing program policies and decisions for other resource programs would not change. The BLM would encourage and assist coal lessees and oil and gas lessees in their efforts to reach a cooperative development independently that would achieve the goals of both parties.

Preference Right Leasing Applications

The 14 PRLAs discussed in Alternative A would be carried forward under this alternative. The unsuitability criteria that affected several PRLAs would be in effect. Those PRLAs that are affected by Congressional designation of the WA and RNA may be exchanged for coal leases in New Mexico if it is in the public interest. At the time any of the PRLAs are processed, the unsuitability criteria would be reapplied on a site-specific basis.

The area would not be available for future coal leasing and development until Congress reaches a decision on the Ah-shi-sle-pah wilderness status.

Competitive Coal Tracts

The 17 competitive coal tracts were discussed and available for leasing under Alternative A would be considered for leasing under this alternative. Those companies that are interested in mining coal from these tracts would submit an application to lease the coal and the 20 unsuitability criteria would be reapplied during the leasing process. It was determined that 378,285 acres would be suitable to consider for future leasing and development in the FFO area.

License to Mine [Home Use Fuel (Coal) Source]

The need for domestic home fuel needs would continue as identified in Alternative A. It is assumed that the historic use of coal from surface outcrops by Navajo allottees in the area would continue. New domestic coal license applications would be considered on a case-by-case basis.

Additional Coal Interests

The two Peabody and BHP coal tracts identifying federal lands suitable for coal leasing described under Alternative B would be considered under this alternative. These lands are in the vicinity of Lee Ranch, Twin Peaks, and East Piñon areas (see Map 2-4) for the location of these tracts. The 20 unsuitability criteria would be applied during the leasing process.

In the Twin Peaks area, land acreage totaling approximately four sections in Township 30N Range 14W (Sections 10, 14, 15, 22 [NE ¼ of NE ¼], 23 [E ½ and N ½ of the NW ¼], and 26 [NE ¼ and N ½ of the SE ¼]) underlie the Piñon Mesa Fossil Area and Piñon Mesa Recreation Area. This land would not be available for coal mining. The remaining acreage in the Twin Peaks area would be available for coal mining with stipulations that protect paleontological resources, including paleontological surveys prior to underground mining and periodic monitoring during active underground mining to identify paleontological resources that may be exposed as a result of subsidence.

Fire/Fuels Management

Fire/fuels management procedures under Alternative D would be the same as Alternative A, except in the number of acres under special administrative designation. Under this alternative, 649,470 acres of public land would fall under the guidance for these areas. Other areas would be managed in accordance with the procedures described for Alternative A.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Alternatives A, B, and C represent a range of possible management approaches to oil and gas leasing and development in the planning area and resource management in the FFO area. Alternatives considered and eliminated from detailed analysis are briefly described below.

Prohibit any new oil and gas development on federal land in the planning area. This alternative was considered unreasonable because of the national need for energy resources and the BLM's legal mandate under the Mining and Minerals Policy Act of 1970 and the Minerals Policy Research and Development Act of 1980.

Prohibit any new oil and gas development outside of the high intensity oil and gas area of the FFO. This alternative was rejected because it would severely limit access to available mineral reservoirs and is inconsistent with federal laws and mandates for multiple use of public lands. STCs and NSO provisions were considered adequate to protect sensitive environmental resources without completely prohibiting oil and gas development.

Eliminate NSO restrictions in special management areas. This was not considered a reasonable alternative because it would result in violations of federal laws such as the Wilderness Act, ESA, NHPA, and FLPMA.

Eliminate restrictions on placement of roads and pipelines. This alternative would eliminate the requirement to place roads and pipelines supporting oil and gas development within the same ROWs and allow new roads and pipelines to be constructed cross-country without restrictions. The alternative was rejected because the extreme surface disturbance that would result was considered inconsistent with BLM, USBR, and USFS policies for preserving resources and managing multiple uses.

Eliminate all restrictions on OHV use in the planning area. This alternative was considered unreasonable because the alternatives examined in detail provide for a wide range of OHV access, and removing all restrictions would subject special management areas to damage from OHV use that would jeopardize the resources those areas were established to protect.

Alternatives Proposed During Public Comment Period

Public comments on the Draft RMP/EIS suggested two additional alternatives: one which would allow no new or no net increase in surface disturbance and another which would prohibit further leasing of oil and gas. These alternatives and the reasons they were eliminated from detailed analysis are described below.

No New Surface Disturbance and No Net Increase in Surface Disturbance. Several comments were received on the Draft RMP/EIS requesting consideration of an alternative that would substantially reduce new well development and avoid associated environmental impacts. Specifically, commentors requested an alternative that would preclude further habitat fragmentation in wildlife management areas by limiting well pad, road, and pipeline construction. The FFO has considered such an alternative and determined that it is not practical or reasonable, for reasons explained in the following paragraphs.

The planning area is comprised of a total of approximately 3 million acres of federal minerals. A little over half of this acreage is in the high development area for oil and gas. Within the high development area, more than 99 percent of the federal oil and gas resources are already leased, and many of those leases are held by production. The leaseholders have paid the federal government for the right to extract the minerals covered by those leases. The government, in turn, has entered into a contractual agreement to permit leaseholders to develop those resources. Leaseholders are, in fact, required by regulation to diligently develop and efficiently extract the resources covered by their leases.

Approximately 128,000 acres of public land in the high development area are in existing Critical Big Game Habitat Management Areas. This could increase to as much as 397,000 acres under Alternative C. This is the acreage that would be subject to no new surface disturbance in an alternative designed to prohibit increased habitat fragmentation. Within the 397,000 acres, there are 4,528 existing oil and gas wells and 2,700 new wells projected for development. Assuming an average production of 1.12 billion standard cubic feet (Bscf) per well, if the 2,700 projected new wells were not permitted, the potential loss of production would be approximately 3,000 Bscf (27 percent) of the total production potential of the federal minerals in the region. At an estimated $3 per thousand cubic foot (NMDFA 2001), this would represent lost revenue of about $9 billion to the leaseholders.

Precluding leaseholders from extracting these resources violates the BLM's contract responsibilities and would likely require compensation by the federal government. While it is not known what the extent of the compensation would be, it is clear from the numbers given above that the magnitude of the economic impact far exceeds a reasonable ability of the federal government to compensate leaseholders for the loss. In addition to economic issues, an alternative requiring no net increase in surface disturbance would prevent the orderly drainage of gas from underground formations and could lead to a violation of correlative rights. Linking new development to the rate of plugging and abandonment of old wells would cut the number of new wells to approximately one half that projected for the near future. This would result in a reduction of natural gas output from the Basin requiring existing customers to seek other sources of natural gas. Such an alternative would also run counter to National Energy Policy direction to meet increased demands for natural gas.

Commentors proposing either a no new surface disturbance or no net increase in surface disturbance alternative do not present site-specific data to indicate which wildlife populations would benefit from such an approach. There are virtually no pristine wildlife habitats in the FFO. Over 50 years of development have left no large blocks of unfragmented habitat. The BLM does not have scientific information to indicate which, if any, wildlife populations have declined due to oil and gas development. Mule deer have declined across their range in the West, including many areas without oil and gas development. Other species, such as elk, peregrine falcon, and wintering bald eagles have increased in the San Juan Basin during the past 20 years of ongoing oil and gas development.

Additional oil and gas development and maintenance activities on State and private lands would continue to impact wildlife habitats within the San Juan Basin. In order to protect natural and cultural resources while enabling operations to extract minerals on public lands, the BLM has developed stipulations, BMPs, and constraints, such as timing constraints in the wildlife management areas, which are addressed in the COAs accompanying each APD. These provisions have been implemented in the past to reduce impacts to wildlife. They are expected to mitigate potential adverse impacts and reduce, though not eliminate, further habitat fragmentation.

No Further Leasing. No further leasing of oil and gas has been proposed as an alternative that would reduce impacts of oil and gas development. In the Draft RMP/EIS, no new leasing was presented as a management prescription for some SDAs. However, due to the presence of prior existing leases, application of the prescription can only occur if leases expire.

In addition, it is BLM policy (BLM Manual 3031.06A, Minerals Policy) "…to keep public lands open to mineral exploration and development, unless closure or restriction is mandated by Congress or justified in the national interest."

Over 90 percent of the available lands in the planning area are already under existing oil and gas leases. Virtually all of the leases in the high development area of the planning area

were leased in the 1950s and 1960s and have been held by production. Prohibiting further leasing of Federal oil and gas in the planning area would not have any effect on the ongoing development of existing Federal leases or state or private leases. Lands that are presently available for leasing are generally on the fringes of the oil- and gas-producing region. Through the planning process, the lands with special values such as important cultural resources or crucial wildlife habitats have been designated as requiring special management prescriptions. In some cases these prescriptions indicate no leasing for oil and gas or not re-offering leases if an existing lease is allowed to expire.

Lands nominated for leasing are reviewed for the presence of potential conflicts with existing land use plans or other potential land use conflicts. If conflicts exist, the affected parcels are either withdrawn from the lease offering or special stipulations are attached to the lease. This procedure is effective in protecting sensitive resources while still allowing for the potential development of energy resources.

COMPARISON OF ALTERNATIVES A, B, C, AND D

This section presents the impacts of the alternatives in comparative form to define the differences and provide a basis for choice among the options. **Table 2-12** provides a summary of selected actions proposed under each alternative. **Table 2-13** summarizes the comparative effects of each alternative as reflected in various measurements related to each of the resource areas discussed in detail in Chapter 4, Environmental Consequences.

Table 2-12. Summary of Actions by Alternative

Action	Alternative A	Alternative B	Alternative C	Alternative D
Number of New Wells on Federal Land (over 20-year period)	4,421	13,275	9,836	9,942
New Roads for Oil and Gas Development (miles)	358	1,075	797	805
FFO Land Available for Disposal (acres)	280,782	347,505	338,067	340,118
Acres Identified for Acquisition by FFO (acres)	127,782	77,589	189,679	178,237
OHV Limitations in the FFO (acres)				
Open	1,230,839	4,616[1]	4,616	4,616[1]
Limited	122,063	1,352,931	1,352,117	1,353,301
Closed	62,384	57,739	58,533	57,369
Public Land in SDAs (acres)	491,945	468,410	713,710	649,470
Federal Minerals with Oil and Gas Stipulations (acres)				
Non-Discretionary Closures	111,148	111,148	111,148	111,148
Discretionary Closures	53,216	28,273	114,100	81,000
Controlled Surface Use	158,714	236,270	275,192	286,910
No Surface Occupancy	13,137	13,290	55,070	25,442
Open with STCs	2,737,694	2,659,985	2,579,283	2,597,193
Timing Limitations	195,166	240,059	638,401	483,807

Note: (1) Open acreage could be as much as 99,003 in Alternative B and 65,806 in Alternative D as shown in Table 2-10.

Table 2-13. Comparison of Impacts by Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
Net Long-Term Surface Disturbance from Oil and Gas Development (acres)	934	24,781	18,238	18,577
Initial, Short-term Surface Disturbance from Oil and Gas Development (acres)	13,971	41,941	31,459	36,451
Estimated Future Oil and Gas Production (Bscf)	4,910	11,158	11,002	11,125

	Alternative A	Alternative B	Alternative C	Alternative D
Potential for Soils Impacts	Increase in erosion due to increase in bare ground, unpaved roads, and open OHV access.	Greatest increase in erosion due to increase in bare ground, unpaved roads.	Increase in erosion due to increase in bare ground, unpaved roads (more than Alternative A).	Increase in erosion due to increase in bare ground, unpaved roads (more than Alternative A).
Water Required for Drilling Operations (acre-feet)	3,313	9,347	6,925	7,000
Native Vegetation Loss (acres)	13,971	41,941	31,459	36,451
Riparian Areas and Wetlands	Beneficial impacts within designated River Tracts SMA (2,500 acres). Increased potential for damage due to open OHV access.	Beneficial impacts within more protected riparian areas (10,000 acres) and more limited OHV access. Potential negative impacts on isolated patches of riparian vegetation from OHV traffic in dry washes.	Beneficial impacts within more protected riparian areas (10,000 acres) and more limited OHV access. Potential negative impacts on isolated patches of riparian vegetation from OHV traffic in dry washes.	Beneficial impacts within more protected riparian areas (10,000 acres) and more limited OHV access. Potential negative impacts on isolated patches of riparian vegetation from OHV traffic in dry washes.
Potential Habitat Loss in FFO Wildlife Habitat Areas (acres)				
Within 660 Feet of Roads	245,440	285,760	273,600	273,600
Within 1,320 Feet of Roads	405,870	486,510	462,190	462,190
Special Status Species Effects	Sensitive species and habitats not protected under ESA receive special management when warranted.	Sensitive species and habitats not protected under ESA receive special management when warranted.	Sensitive species and habitats not protected under ESA receive special management when warranted.	May affect, not likely to adversely affect, all listed or proposed species and designated critical habitats (BLM 2002c). Sensitive species and habitats not protected under ESA receive special management when warranted.
Air Emissions, Net Change over 20 Years (tons per year) before Mitigation	VOC: 744.1 CO: 12,621.7 NOx: 13,102.7 PM_{10}: 5.3	VOC: 2,771.5 CO: 60,462.3 NOx: 62,160.7 PM_{10}: 26.2	98% of that under Alternative B.	99.7% of that under Alternative B.
FFO Land in SDAs Limiting Grazing (acres)	17,954	17,273	72410	33,673
Increase in Split Estate (acres)	264,800	329,300	14,000	329,000

	Alternative A	Alternative B	Alternative C	Alternative D
Impacts on Wilderness	Potential for direct and indirect impacts from mineral development on Indian-allotted lands in WA, on prior existing leases in WSA, and open OHV designation on surrounding land.	Potential for direct and indirect impacts from mineral development on Indian-allotted lands in WA and on prior existing leases in WSA. Beneficial impact from changing OHV designation on surrounding land from Open to Limited. Proposed acquisition of adjacent lands would benefit WA and WSA.	Same as Alternative B	Same as Alternative B.
Acres in VRM Classes				
Class I	71,948	100,600	135,106	83,433
Class II	399,466	409,960	590,479	560,143
Class III	1,013,099	1,020,084	1,123,830	1,104,717
Class III/IV	2,587,591	2,541,460	2,222,689	2,323,810
Acres Managed for Recreational Values in the FFO	52,804	51,881	75,174	74,664
Estimated Number of Recorded Archaeological Sites Affected by Oil and Gas Activity	736	2,211	1,658	1,896
Effects on Cultural Resources	Least potential for damage from surface distur-bance; least effect due to land disposal; greatest potential for impacts due to OHV cross-country travel.	Highest potential for damage from surface distur-bance; greatest effect due to land disposal; decreased potential for impacts due to OHV cross-country travel.	Less potential for damage from surface disturbance than Alternative B and more than Alternative A; least effect due to land disposal and OHV cross-country travel; highest acreage of protected areas.	Less potential for damage from surface disturbance than Alternative B and more than Alternative A; similar to but slightly greater than Alternative C in potential effects due to land disposal, OHV cross-country travel, and acreage of protected areas.

	Alternative A	Alternative B	Alternative C	Alternative D
Effects on Paleontological Resources	Least potential for damage from surface disturbance.	Highest potential for damage from surface disturbance. Increase in acreage of protected areas.	Less potential for damage from surface disturbance than Alternative B. Increase in acreage of protected areas.	Similar to Alternative C.
Noise Mitigation	N/A	N/A	101 boundary-focused NSAs mitigate noise in 206,000 acres.	12 boundary-focused NSAs and receptors in 50 other NSAs mitigate noise in less acreage than under Alternative C.
Oil and Gas Employment, Change from Current Level over 20 Years	-1,210	1,460	500	540
Total Oil and Gas Expenditures over 20 Years ($000)	$3,448,200	$10,345,000	$7,887,000	$7,973,000
Environmental Justice Impacts	No disproportionately high and adverse impacts expected.	No disproportionately high and adverse impacts expected.	No disproportionately high and adverse impacts expected.	No disproportionately high and adverse impacts expected.

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Table 2-5. Management Prescriptions for Specially Designated Areas in the FFO

All areas are listed in alphabetical order by name under the resource for which they have been designated. To find the management prescriptions proposed under each alternative, locate the area on one of the maps at the back of the document, determine the name of the specially designated area and the resource value by the color of the area and its label, then look up the name under the resource in this table for FFO areas and in Table 2-6 for AFO areas.

T = Total acres, B = Public land acres (BLM and USBR), M = Federal mineral acres, N/A = Not Applicable.

** = Stricter noise standards may apply.

Biology

Lost Pine			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 81 B: 81 M: 81	T: 0 B: 0 M: 0	T: 0 B: 0 M: 0	T: 0 B: 0 M: 0
Resource Value: Biogeographical Anomaly – Remnant Ponderosa Pines. See Bisti/De-na-zin. Lost Pine managed for wilderness values.			
SPECIAL DESIGNATION			
Lost Pine ACEC.	Remove ACEC designation.	Same as Alternative B.	Same as Alternative B.

Cultural Resources

Adams Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 36 B: 36 M: 36	T: 36 B: 36 M: 36	T: 122 B: 120 M: 122	T: 122 B: 120 M: 122
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	No new ROWs in ACEC. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.

Adams Canyon			
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Adams Canyon SMA.	Same as Alternative A.	Designate as Adams Canyon ACEC and enlarge.	Same as Alternative C.

Adolfo Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Site and Communities.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs. Coordinate with ROW holders on maintenance and use of ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		

Adolfo Canyon			
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Adolfo Canyon SMA.	Same as Alternative A.		
Ah-shi-sle-pah Road			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 663 B: 663 M: 663	T: 663 B: 663 M: 663	T: 663 B: 663 M: 663	T: 663 B: 663 M: 663
Resource Value: Cultural Resources, Chacoan Roads.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close to leasing.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.

Ah-shi-sle-pah Road			
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Close to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
Extensive mitigation required. See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative A. Approval required prior to maintenance of existing ROWs.
SPECIAL DESIGNATION			
Ah-shi-sle-pah Road ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Albert Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 177 B: 0 M: 0	T: 177 B: 0 M: 0
		Resource Value: Cultural Resources, Historic Sites. BLM Land Use Planning, as noted below, would be implemented upon acquisition of state surface and minerals.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.

Albert Mesa			
		ROWs	
		No new ROWs in ACEC.	Same as Alternative C.
		OHV DESIGNATION	
		Designate Closed OHV Area.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Designate Albert Mesa ACEC.	Same as Alternative C.

Andrews Ranch[1, 2]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 640 B: 640 M: 640	T: 640 B: 640 M: 640	T: 640 B: 640 M: 640	T: 640 B: 640 M: 640
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Andrews Ranch[1, 2]			
ROWs			
No new ROWs in ACEC. Approval required prior to maintenance of any easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Andrews Ranch ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [1] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[2] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Ashii Na'a' a' (Salt Point)			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 640 B: 640 M: 640	T: 640 B: 640 M: 640	T: 640 B: 640 M: 640	T: 640 B: 640 M: 640
Resource Value: Cultural Resources, Native American Traditional Use and Sacred Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.

Ashii Na'a' a' (Salt Point)			
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	No new ROWs in ACEC. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Closed to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Salt Point ACEC.	Rename Ashii Na'a' a' ACEC.	Same as Alternative B.	Same as Alternative B.
Bee Burrow[3, 4]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 480 B: 480 M: 4805	T: 480 B: 480 M: 4805	T: 480 B: 480 M: 4805	T: 480 B: 480 M: 480[5]
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Bee Burrow[3, 4]			
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC. Approval required prior to maintenance of any easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation on 40 acres.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Implement limited designation on 440 acres.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Closed to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Bee Burrow ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [3] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[4] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

[5] Represents modified acreage based on more recent FFO information and is not reflected in BLM State Office GIS data. Updates of GIS data are in process.

Big Star			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - CSU, use existing pad and access for new wells.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: N/A.	Acquire easement.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Big Star ACEC.	Same as Alternative A.		

Bis sa'ani[6, 7]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 188 B: 188 M: 0	T: 188 B: 188 M: 0	T: 188 B: 188 M: 0	T: 188 B: 188 M: 0
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Bis sa'ani[6, 7]			
SPECIAL DESIGNATION			
Bis sa'ani ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [6] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[7] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Bi Yaazh			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 61 B: 61 M: 61	T: 61 B: 61 M: 61
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement closed designation.	Designate Limited OHV Area.	Designate Limited OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing	Continue current permitting

Bi Yaazh			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Bi Yaazh ACEC.	Same as Alternative A.	Enlarge ACEC.	Same as Alternative C.
Blanco Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 130 B: 130 M: 130	T: 130 B: 130 M: 130	T: 730 B: 728 M: 730	T: 730 B: 728 M: 730
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC.	Same as Alternative C.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Designate Closed OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.

Blanco Mesa			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	No designation.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Blanco Mesa ACEC.	Same as Alternative A.	Enlarge ACEC.	Same as Alternative C.

Blanco Star Panel			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 20 B: 20 M: 20	T: 20 B: 20 M: 20	T: 20 B: 20 M: 20	T: 20 B: 20 M: 20
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Close to grazing - 15 acres.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.

Blanco Star Panel			
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Blanco Star Panel ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Cagle's Site			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 44 B: 44 M: 44	T: 44 B: 44 M: 44	T: 44 B: 44 M: 44	T: 44 B: 44 M: 44
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Implement limited designation. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.

Cagle's Site			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	Restrict surface disturbance to previously disturbed areas.
SPECIAL DESIGNATION			
N/A. Cagle's Site SMA.	Same as Alternative A.	Designate as Cagle's Site ACEC.	Same as Alternative C.

Canyon View			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC.	Same as Alternative C.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.

Canyon View			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
N/A. Canyon View Ruin SMA.	Same as Alternative A.	Designate as Canyon View ACEC.	Same as Alternative C.
Carrizo Cranes			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 12 B: 12 M: 12	T: 12 B: 12 M: 12	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: N/A.	Acquire easement.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		

Carrizo Cranes			
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Carrizo Cranes ACEC.	Same as Alternative A.		

Casa del Rio Chaco Culture Archaeological Protection Site[8, 9]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 42 B: 0 M: 0	T: 42 B: 0 M: 0	T: 42 B: 0 M: 0	T: 42 B: 0 M: 0
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Closed.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Close to leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [8] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[9] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Casa Mesa Diablo			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Devil's Spring Mesa.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing: NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		

Casa Mesa Diablo			
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.		
VRM DESIGNATION			
Implement Class IV.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Casa Mesa Diablo SMA.	Same as Alternative A.		

Casamero Community[10]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 153 B: 153 M: 153	T: 153 B: 153 M: 153	T: 153 B: 153 M: 153	T: 153 B: 153 M: 153
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROWs.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Casamero Community[10]			
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Close to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Casamero Community ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Note: [10] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Cedar Hill			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 6,125 B: 4,114 M: 5,436	T:1,886 B: 1,886 M: 1,886
		Resource Value: Cultural Resources, Anasazi Communities (Non-Chacoan).	
		MINERALS	
		Oil and Gas: Leased Acreage - CSU mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - CSU mgmt. constraint.	New Leasing - Same as Alternative C.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.

Cedar Hill			
		ROWs	
		New ROWs placed within existing ROW corridors. Approval required prior to maintenance of any existing ROW/easements.	New ROWs will be placed within existing ROW corridors. Coordinate with ROW/easement holders on maintenance and use of ROWs/easements.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Restrict surface disturbing activities to minimize disturbance and impacts.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Designate Cedar Hill ACEC.	Same as Alternative C.
Chacra Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 11,363 B: 8,434 M: 7,702	T: 11,363 B: 8,434 M: 7,702	T: 22,065 B: 8,629 M: 13,476	T: 22,065 B: 8,629 M: 13,476
Resource Value: Cultural Resources, Anasazi Communities (Non-Chacoan).		The existing Chacra Mesa Complex ACEC and Shephard Site (**SS**) SMA combined with surrounding lands and called Chacra Mesa Complex ACEC for Alternatives C and D. See Shephard Site for Alternatives A and B.	
MINERALS			
Oil and Gas: Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO for **SS**, CSU on remaining acreage.
New Leasing - Close.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative C.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.

Chacra Mesa			
ROWs			
Permitted on a case-by-case basis.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	No new ROWs in Shephard Site. New ROWs placed in existing disturbance on remaining acreage. Coordinate with ROW/easement holders on maintenance and use of ROWs/easements.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
WILDFIRE SUPPRESSION			
Apply limited/conditional wildfire suppression methods.	Same as Alternative A.	Apply limited/conditional wildfire suppression methods.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	No designation.	Designate as Noise Sensitive Area.	No designation.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Wildfire Suppression above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Chacra Mesa Complex ACEC.	Same as Alternative A.	Enlarge Chacra Mesa Complex ACEC.	Same as Alternative C.

Cho'li'i (Gobernador Knob)			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 360 B: 360 M: 360	T: 360 B: 360 M: 360	T: 360 B: 360 M: 360	T: 360 B: 360 M: 360
Resource Value: Cultural Resources, Native American Traditional Use and Sacred Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint on 40 acres and CSU mgmt. constraint on remaining acreage.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.

Cho'li'i (Gobernador Knob)			
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Same as Alternative C.**
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	No surface disturbance outside of existing disturbance.
SPECIAL DESIGNATION			
Cho'li'i (Gobernador Knob) ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Christmas Tree Ruin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Christmas Tree Ruin ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Church Rock Outlier			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 160 B: 0 M: 160	T: 160 B: 0 M: 160	T: 160 B: 0 M: 160	T: 160 B: 0 M: 160
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC except within existing ROW disturbance. Approval required prior to maintenance of any existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROWs.	New ROWs restricted to disturbed county road bed. Approval required prior to maintenance of any existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class I designation.	Designate Class II.	Same as Alternative B.	Same as Alternative B.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative C.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Closed to other surface disturbing activities.
SPECIAL DESIGNATION			
Church Rock Outlier ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Cibola Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 20 B: 13 M: 13	T: 13 B: 6 M: 6	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.		See Superior Mesa Community.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
New ROWs must be placed in existing road. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Cibola Canyon ACEC.	Same as Alternative A.		

Compressor Station Ruin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Superior Mesa Community.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Compressor Station Ruin SMA.	Same as Alternative A.		

Cottonwood Divide			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 60 B: 0 M: 0	T: 60 B: 0 M: 0
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities. Management listed would be implemented upon acquisition of non-federal surface and minerals.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC.	Same as Alternative C.
		OHV DESIGNATION	
		Designate Closed OHV Area.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	Same as Alternative C.

Cottonwood Divide			
		SPECIAL DESIGNATION	
		Designate Cottonwood Divide ACEC.	Same as Alternative C.
Crow Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 4,006 B: 3,361 M: 3,361	T: 4,006 B: 3,361 M: 3,361	T: 7,795 B: 7,149 M: 7,146	T: 7,795 B: 7,149 M: 7,146
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		The existing Crow Canyon District ACEC (**CC**), NM 01-39344 (**NM**) ACEC, and Unreachable Rockshelter (**UR**) SMA combined with surrounding lands and called Crow Canyon ACEC.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint—**UR** (60 acres), **NM** (60 acres) and portions of **CC** (4,006 acres) (Ridge Top, Boulder Fortress, Gould Pass, Crow Canyon drainage. Additional acreage - CSU management constraint.
New Leasing - Closed.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. Constraint. Additional acreage - CSU management constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP.			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	No new ROWs, **UR, NM**, and portions of **CC** (Ridgetop, Boulder Fortress, Gould Pass, Crow Canyon drainage). For remaining acreage, new ROWs must be placed in existing ROW disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.

Crow Canyon			
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Designate Class II - UR, NM, CC (Ridge top, Boulder Fortress, Gould Pass, Crow Canyon drainage). Remaining acreage - Class III.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Close bottom of Crow Canyon to grazing.
NOISE			
None.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at visitor use area, canyon, and rim.**
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	See ROWs above. Close to surface disturbing activities.	See ROW above. Restrict other surface disturbing activities to minimize disturbance and impacts.
SPECIAL DESIGNATION			
Crow Canyon ACEC.	Same as Alternative A.	ACEC expanded.	Same as Alternative A.

Crownpoint Steps and Herradura			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 588 B: 588 M: 588	T: 588 B: 588 M: 588	T: 588 B: 588 M: 588	T: 588 B: 588 M: 588
Resource Value: Cultural Resources, Chacoan Roads.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Close.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Close.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Crownpoint Steps and Herradura			
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Closed OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
Extensive mitigation required. See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Crownpoint Steps and Herradura ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Deer House			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 361 B: 361 M: 361	T: 361 B: 361 M: 361
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Original 40 acres - NSO constraint. Remaining acreage - CSU constraint.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC.	Same as Alternative C.

Deer House			
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Designate Closed OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Deer House ACEC.	Same as Alternative A.	Enlarge Deer House ACEC.	Same as Alternative C.

Delgadita-Pueblo Canyons			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 180 B: 151 M: 180	T: 180 B: 151 M: 180	T: 361 B: 329 M: 329	T: 361 B: 329 M: 329
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.		Expand existing Delgadita-Pueblo Canyons ACEC **[DPC]** and Delgadito Pueblito SMA **[DP]** combined with surrounding lands.	
MINERALS			
Oil and Gas: Leased Acreage - CSU mgmt. constraint.	Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint - **DP**, **DPC**. Additional acreage - CSU mgmt. constraint.
New Leasing - NSO mgmt. constraint.	Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP.			
Acquisition: Acquire non-federal surface.	Same as Alternative A.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Delgadita-Pueblo Canyons			
ROWs			
New ROWs must be placed in existing ROW easement disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs and easements.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	1. No new ROWs in **DP**. 2. **DPC** and additional acreage - new ROWs in ACEC must be placed in existing ROW/easement disturbance. 3. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.
OHV DESIGNATION			
Designate Limited OHV Area. Close identified roads.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Designate Class II Area.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Close to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Closed to grazing on 10 acres.	Same as Alternative A.	Close to grazing.	10 acres of **DPC** will remain closed.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites - **DP, DPC**.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Delgadita/Pueblo Canyons ACEC.	Same as Alternative A.	Delgadita-Pueblo Canyons ACEC enlarged.	Same as Alternative C.

Delgadito Pueblito			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 37 B: 37 M: 37	T: 37 B: 37 M: 37	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Delgadita-Pueblo Canyons.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		

Delgadito Pueblito			
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Delgadito Pueblito SMA.	Same as Alternative A.		

Devil's Spring Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 660 B: 660 M: 660	T: 660 B: 660 M: 660
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities. The existing Casa Mesa Diablo SMA **[CMD]** and Ye'is-in-Row ACEC **[YIR]** combined with surrounding lands and called Devil's Spring Mesa ACEC.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint - **CMD, YIR**. Remainder of acreage - CSU constraint.

Devil's Spring Mesa			
		New Leasing - Close.	New Leasing - NSO mgmt. constraint
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP.	
		Acquisition: Acquire easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	No new ROWs - **CMD**. Remaining acreage - new ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Continue current permitting.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Closed to surface disturbing activities.	See ROW above. Restrict other surface disturbing activities to previously disturbed areas.
		SPECIAL DESIGNATION	
		Designate Devil's Spring Mesa ACEC.	Same as Alternative C.

Dogie Canyon School			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 7 B: 7 M: 7	T: 7 B: 7 M: 7	T: 7 B: 7 M: 7	T: 7 B: 7 M: 7
Resource Value: Cultural Resources, Historic Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Close to grazing	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Close to other surface disturbing activities.

Dogie Canyon School			
SPECIAL DESIGNATION			
Dogie Canyon School ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Dzil'na'oodlii (Huerfano Mesa)			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 3,702 B: 3,702 M: 3,702	T: 3,702 B: 3,702 M: 3,702	T: 3,702 B: 3,702 M: 3,702	T: 3,702 B: 3,702 M: 3,702
Resource Value: Cultural Resources, Native American Traditional Use and Sacred Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint - 37 acres federal surface top of mesa. Continue CSU mgmt. constraint on rest of acreage.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.
New Leasing - CSU mgmt. constraint. Close to leasing - 37 acres.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	No new ROWs in 37 acres of ACEC. New ROWs must be placed in existing ROW disturbance on remaining acreage. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis.	Same as Alternative A	Close to vegetation modification.	Same as Alternative C.

Dzil'na'oodlii (Huerfano Mesa)			
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative C.
SURFACE DISTURBANCE			
See Minerals and ROWs, above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Close to other surface disturbing activities - 37 acres. Restrict other surface disturbing activities to minimize disturbance and impacts.
SPECIAL DESIGNATION			
N/A. Huerfano Mesa SMA.	Rename Dzil'na'oodlii SMA.	Designate Dzil'na'oodlii ACEC.	Same as Alternative C.
East Side Rincon Site			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 128 B: 0 M: 0	T: 128 B: 0 M: 0	T: 195 B: 75 M: 75	T: 195 B: 75 M: 75
Resource Value: Cultural Resources, Anasazi Communities (Non-Chacoan).			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Original 100 acres NSO constraint. 95 acres CSU constraint.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Open.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Open.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
Mineral Acquisition: None.	Same as Alternative A.	Acquire all non-federal minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	New ROWs will be placed within existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of ROWs/easements.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.

East Side Rincon Site			
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs, above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
N/A. East Side Rincon SMA.	Same as Alternative A.	Designate East Side Rincon ACEC.	Same as Alternative C.

Encierro Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 80 B: 75 M: 80	T: 80 B: 75 M: 80	T: 80 B: 75 M: 80	T: 80 B: 75 M: 80
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.

Encierro Canyon			
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Close 10 acres.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Encierro Canyon ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Encinada Mesa-Carrizo Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 3,490 B: 3,117 M: 3,158	T: 3,490 B: 3,117 M: 3,158
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.	
		The existing Adolfo Canyon SMA **[AC]**, Big Star ACEC **[BS]**, Carrizo Cranes ACEC **[CC]**, Gomez Canyon Ruin SMA **[GC]**, Gomez Point ACEC **[GP]**, Hill Road Ruin SMA **[HR]**, NM 01-39236 ACEC **[NM]**, and Rabbit Tracks ACEC **[RT]** combined with surrounding lands and called Encinada Mesa-Carrizo Canyon ACEC for Alternatives C and D.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint - **AC, CC, GC, GP, HR, NM**, **RT**. Use existing pad - **BS**. Additional acreage - CSU mgmt. constraint.
		New Leasing - Close.	New Leasing - NSO mgmt. constraints - **AC, BS, CC, GC, GP, HR, NM, RT.** Additional acreage - CSU mgmt. constraint.

Encinada Mesa-Carrizo Canyon			
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP.	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	No new ROWs - **AC, BS, CC, GC, HR.** New ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements - **GP, NM, RT** and in remaining ACEC acreage.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Designate Class II - **AC, BS, CC, GC, GP, HR, NM, RT.** Remaining acreage Class III.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Closed to grazing - 10 acres of **NM**. Continue current permitting on remainder of acreage.
		NOISE	
		Designate as Noise Sensitive Area.	Designate receptor points at defined sites in **GC, GP, and HR.** No designation on remainder of acreage.

Encinada Mesa-Carrizo Canyon			
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to minimize disturbance and impacts.
		SPECIAL DESIGNATION	
		Encinada Mesa-Carrizo Canyon ACEC.	Same as Alternative C.

Farmer's Arroyo			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Anasazi Communities (Non-Chacoan).			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Open.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Open.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	No new ROWs. Coordinate with ROW holders on maintenance and use of ROWs.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative C.

Farmer's Arroyo			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
N/A. Farmer's Arroyo SMA.	Same as Alternative A.	Designate as Farmer's Arroyo ACEC.	Same as Alternative C.
Foothold and Overlook Ruins District			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 133 B: 133 M: 133	T: 133 B: 133 M: 133	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Superior Mesa Community.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - Implement NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		

Foothold and Overlook Ruins District			
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Foothold and Overlook Ruins District ACEC.	Same as Alternative A.		

Four Ye'i			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Four Ye'i			
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Four Ye'i ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Frances Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 7,657 B: 5,857 M: 5,890	T: 7,657 B: 5,857 M: 5,890
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.	
		The existing Frances Ruin ACEC **[FR]** and Romine Canyon SMA **[RC**] combined with surrounding lands and called Frances Mesa ACEC.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint - **FR, RC.** Additional acreage - manage under CSU mgmt. constraint.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint - **FR, RC.** Additional acreage - CSU mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.

Frances Mesa			
		ROWs	
		No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	No new ROWs in **FR, RC.** Additional acreage - new ROWs in ACEC must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Designate Class II - T.30N., R.6W., Sec. 31 SE1/4 SE1/4 - 40 acres. SE1/2 NE1/4 SE1/4 - 20 acres. E1/2 SE1/4 NW1/4 SE1/4 - 5 acres. E1/2 E1/2 SW1/4 SE1/4 - 10 acres. Remainder of acreage - Class III.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Closed to grazing.	Close **FR** to grazing - 40 acres. Continue current permitting on remaining acreage.
		NOISE	
		Designate as Noise Sensitive Area.	Designate receptor points at **FR** defined sites. Remaining acreage - no designation.
		SURFACE DISTURBANCE	
		See ROWs above. Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to minimize disturbance and impacts.
		SPECIAL DESIGNATION	
		Designate Frances Mesa ACEC.	Same as Alternative C.

Frances Ruin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 39 B: 39 M: 39	T: 39 B: 39 M: 39	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Frances Mesa.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class IV.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Frances Ruin ACEC.	Same as Alternative A.		

Gomez Canyon Ruin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Site and Communities.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Gomez Canyon Ruin SMA.	Same as Alternative A.		

Gomez Point			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 87 B: 87 M: 87	T: 87 B: 87 M: 87	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition:	Acquire easement.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
New ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Gomez Point ACEC.	Same as Alternative A.		

Gonzalez Canyon-Senon S. Vigil Homestead			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 36 B: 36 M: 36	T: 36 B: 36 M: 36	T: 36 B: 36 M: 36	T: 36 B: 36 M: 36
Resource Value: Cultural Resources, Historic Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC. Coordinate with easement holders on maintenance and use of existing easements.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing easement.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Gonzalez Canyon-Senon S. Vigil Homestead ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Gould Pass Camp			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 34 B: 34 M: 34	T: 34 B: 34 M: 34	T: 34 B: 34 M: 34	T: 34 B: 34 M: 34
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Restrict surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Gould Pass Camp ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Greenlee Ruin Chaco Culture Archaeological Protection Site[11, 12]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 60 B: 0 M: 0	T: 60 B: 0 M: 0	T: 60 B: 0 M: 0	T: 60 B: 0 M: 0
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Closed.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Close to leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [11] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[12] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Halfway House[13, 14]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Informed placement of ROWs.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROWs.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation - as part of North Road ACEC.	Designate Class I.	Same as Alternative B.	Same as Alternative B.

Halfway House[13, 14]			
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Halfway House ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [13] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[14] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Haynes Trading Post			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 43 B: 27 M: 27	T: 43 B: 27 M: 27
		Resource Value: Cultural Resources, Historic Sites.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.

Haynes Trading Post			
		ROWs	
		No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	New ROWs in ACEC must be placed in existing ROW/easement disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs/ easements.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Close acquired lands.
		NOISE	
		Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	See ROWs above. Close to other surface disturbing activities.
		SPECIAL DESIGNATION	
		Designate Haynes Trading Post ACEC.	Same as Alternative C.

Hill Road Ruin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		

Hill Road Ruin			
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs. Coordinate with ROW holders on maintenance and use of ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Hill Road Ruin SMA.	Same as Alternative A.		
Holmes Group			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 94 B: 7 M: 58	T: 94 B: 7 M: 58	T: 94 B: 7 M: 58	T: 94 B: 7 M: 58
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Holmes Group			
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire non-federal surface and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROWs.	Same as Alternative C.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II.	Same as Alternative C.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Close to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
N/A. Holmes Group SMA.	Same as Alternative A.	Expand and designate as Holmes Group ACEC.	Same as Alternative C.

Hooded Fireplace and Largo School District			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 420 B: 420 M: 420	T: 420 B: 420 M: 420	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Superior Mesa Community.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		

Hooded Fireplace and Largo School District			
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Hooded Fireplace and Largo School District ACEC.	Same as Alternative A.		
Huerfano Mesa			
See Dzil'na'oodlii			

Hummingbird			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdrawn minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	See Alternative A.	Close to surface disturbing activities.	Close to surface disturbing activities.
SPECIAL DESIGNATION			
Hummingbird ACEC.	See Alternative A.	See Alternative A.	See Alternative A.

Hummingbird Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 130 B: 0 M: 33	T: 130 B: 0 M: 33
		Resource Value: Cultural Resources, Petroglyph and Pictograph Sites. Management listed would be implemented upon acquisition of non-federal surface and minerals.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC.	Same as Alternative C.
		OHV DESIGNATION	
		Designate Closed OHV Area.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Designate Hummingbird Canyon ACEC.	Same as Alternative C.

Indian Creek[15, 16]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 99 B: 95 M: 95	T: 99 B: 95 M: 95	T: 99 B: 95 M: 95	T: 99 B: 95 M: 95
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Closed.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Indian Creek ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [15] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[16] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Jacques[17, 18]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 24 B: 0 M: 24	T: 24 B: 0 M: 24	T: 24 B: 0 M: 24	T: 24 B: 0 M: 24
Resource Value: Cultural Resources, Chacoan Outliers. Management listed would be implemented upon acquisition of non-federal surface and minerals.			
MINERALS			
Oil and Gas: Leased Acreage - N/A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - N/A.	New Leasing - NSO mgmt. constraint.	New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative C.
Leasables and Salables: N/A.	Close.	Close.	Same as Alternative C.
Locatables: N/A.	Withdraw.	Withdraw.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface (40 acres) and easement.	Same as Alternative A.	Acquire 240 non-federal surface acres and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No info.	No new ROWs issued. Approval required prior to maintenance of any existing ROWs.	No new ROWs issued. Approval required prior to maintenance of any existing ROWs.	Same as Alternative C.
OHV DESIGNATION			
No info.	Designate Closed OHV Area.	Designate Closed OHV Area.	Same as Alternative C.
VRM DESIGNATION			
No info.	Designate Class I.	Designate Class I.	Same as Alternative C.
WOOD CUTTING			
No info.	Close to wood cutting and sale.	Close to wood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
No info.	Close to vegetation modification.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
No info.	Close to grazing.	Close to grazing.	Same as Alternative C.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
No info.	Close to surface disturbing activities.	Close to surface disturbing activities.	Same as Alternative C.

Jacques[17, 18]			
SPECIAL DESIGNATION			
N/A. Jacques SMA.	Same as Alternative A.	Enlarge and designate as Jacques Chacoan Community ACEC.	Same as Alternative C.

Notes: [17] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[18] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Kachina Mask			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 10 B: 10 M: 10	T: 10 B: 10 M: 10	T: 202 B: 202 M: 202	T: 202 B: 202 M: 202
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.

Kachina Mask			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	No designation.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Kachina Mask ACEC.	Same as Alternative A.	Enlarge Kachina Mask ACEC.	Same as Alternative C.

Kin Nizhoni[19, 20]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 781 B: 526 M: 776	T: 781 B: 526 M: 776	T: 781 B: 526 M: 776	T: 781 B: 526 M: 776
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraints.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire non-federal surface and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Informed placement of ROWs.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROWs.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Closed OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Close to fuelwood cutting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Close to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Kin Nizhoni[19, 20]			
LIVESTOCK GRAZING			
Close to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
N/A. Kin Nizhoni SMA.	Same as Alternative A.	Designate as Kin Nizhoni ACEC.	Same as Alternative C.

Notes: [19] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[20] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Kin Yazhi (Little House)			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 40 B: 40 M: 40
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage -Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	No new ROWs in ACEC. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Implement limited designation. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.

Kin Yazhi (Little House)			
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to minimize disturbance and impacts.
SPECIAL DESIGNATION			
N/A. Kin Yazhi SMA.	Same as Alternative A.	Designate as Kin Yazhi ACEC.	Same as Alternative C.

Kiva			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 90 B: 90 M: 90	T: 103 B: 103 M: 103
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs. Approval required prior to maintenance of any existing ROW.	New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.

Kiva			
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Kiva ACEC.	Same as Alternative A.	Enlarge Kiva ACEC.	Same as Alternative C.

La Jara			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 8,111 B: 6,208 M: 7,464	T: 1,769 B: 1,045 M: 1,764
		Resource Value: Cultural Resources, Anasazi Communities (Non-Chacoan).	
		MINERALS	
		Oil and Gas: Leased Acreage - CSU mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - CSU mgmt. constraint.	New Leasing - Same as Alternative C.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.

La Jara			
		ROWs	
		New ROWs placed within existing ROW corridors. Approval required prior to maintenance of any existing ROW/easement.	New ROWs will be placed within existing ROW corridors. Coordinate with ROW/easement holders on maintenance and use of ROWs/easements.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Restrict surface disturbing activities to minimize disturbance and impacts.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Designate La Jara ACEC.	Reduce La Jara ACEC.

Lake Valley Chaco Culture Archaeological Protection Site[21, 22]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 28 B: 28 M: 28	T: 28 B: 28 M: 28	T: 28 B: 28 M: 28	T: 28 B: 28 M: 28
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Closed.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Close to leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [21] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[22] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Largo Canyon Star Ceiling			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 28 B: 28 M: 28	T: 28 B: 28 M: 28	T: 28 B: 28 M: 28	T: 28 B: 28 M: 28
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.

Largo Canyon Star Ceiling			
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative C.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Largo Canyon Star Ceiling ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Margarita Martinez Homestead			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 10 B: 10 M: 10	T: 10 B: 10 M: 10	T: 10 B: 10 M: 10	T: 10 B: 10 M: 10
Resource Value: Cultural Resources, Historic Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Close to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Margarita Martinez Homestead ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Martin Apodaca Homestead			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 92 B: 92 M: 92	T: 92 B: 92 M: 92	T: 92 B: 92 M: 92	T: 92 B: 92 M: 92
Resource Value: Cultural Resources, Historic Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs in ACEC must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Close to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.

Martin Apodaca Homestead			
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	Bottom of canyon - close to surface disturbing activities. Mesa top - See ROWs above. Restrict other surface disturbance to previously disturbed areas.
SPECIAL DESIGNATION			
Martin Apodaca Homestead ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Martinez Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 50 B: 50 M: 50	T: 50 B: 50 M: 50
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal	Same as Alternative C.
ROWs			
New ROWs must be placed within existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	New ROWs must be placed within existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.

Martinez Canyon			
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Martinez Canyon ACEC.	Same as Alternative A.	Enlarge Martinez Canyon ACEC.	Same as Alternative C.

Morris 41[23,24]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 82 B: 2 M: 82	T: 82 B: 2 M: 82	T: 82 B: 2 M: 82	T: 82 B: 2 M: 82
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Morris 41[23,24]			
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Closed to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Morris 41 ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [23] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[24] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Moss Trail			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 28 B: 28 M: 28	T: 28 B: 28 M: 28
		Resource Value: Cultural Resources, Historic Sites.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative C.
		OHV DESIGNATION	
		Designate Closed OHV Area.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.

Moss Trail			
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Continue current permitting.
		NOISE	
		Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Designate Moss Trail ACEC.	Same as Alternative C.
Muñoz Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 268 B: 268 M: 268	T: 268 B: 268 M: 268
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - CSU mgmt. constraint.
		New Leasing - Close.	New Leasing - CSU mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs. Approval required prior to maintenance of any existing ROW.	New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.

Muñoz Canyon			
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Continue current permitting.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
		SPECIAL DESIGNATION	
		Designate Muñoz Canyon ACEC.	Same as Alternative C.

NM-01-39236			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 10 B: 7 M: 10	T: 10 B: 7 M: 10	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
New ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements	Same as Alternative A.		

NM-01-39236			
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
NM-01-39236 ACEC.	Same as Alternative A.		

NM-01-39344			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 60 B: 60 M: 60	T: 60 B: 60 M: 60	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Crow Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.		
Disposal: Not available for disposal.	Same as Alternative A.		

NM-01-39344			
ROWs			
New ROWs must be placed in existing ROW disturbance and coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
NM-01-39344 ACEC.	Same as Alternative A.		

North Road			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 6,177 B: 5,005 M: 5,005	T: 6,177 B: 5,005 M: 5,005	T: 6,177 B: 5,005 M: 5,005	T: 6,177 B: 5,005 M: 5,005
Resource Value: Cultural Resources, Chacoan Roads.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint - 40 acres containing Halfway House ACEC. Continue CSU mgmt. constraints - rest of ACEC.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint - 40 acres containing Halfway House ACEC and within 0.25 miles of parallel roads, the "Quads" and "Kutz Drop-Off." CSU mgmt. constraint - rest of ACEC.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close to leasing.	New Leasing - Close to leasing in acreage containing Halfway House ACEC. NSO mgmt. constraint - rest of ACEC.

North Road			
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A	Same as Alternative A	Same as Alternative A
Disposal: Not available for disposal.	Same as Alternative A	Same as Alternative A	Same as Alternative A
ROWs			
No new ROWs across parallel roads and the "Quads" or in Segment 6 containing Halfway House ACEC. Rest of ACEC: New ROWs must be placed in existing ROW disturbance. Approval required prior to maintenance of existing ROWs.	Same as Alternative A	No new ROWs will be issued in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A. No new ROWs within 0.25 miles of parallel roads, the "Quads" and "Kutz Drop-Off." No new ROWs in Segment 6 containing Halfway House ACEC.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A. Acreage of Segment 6 containing Halfway House ACEC will be designated Class I.	Same as Alternative B.	Same as Alternative B.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing - Halfway House ACEC. Remaining acreage continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Identify all of ACEC as Noise Sensitive Area.	Designate receptor points at defined sites in: Segment 1. Segment 2. Segment 6, including Halfway House ACEC.** Segment 7 in Angel Peak RA.

North Road			
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above. Extensive mitigation required.	See Minerals, ROWs, and Vegetative Management above. Closed to surface disturbing activities - in acreage containing Halfway House ACEC. Extensive mitigation required.	Close to surface disturbing activities.	See ROW above. Close to surface disturbing activities - within 0.25 miles of parallel roads, the "Quads" and the "Kutz Drop-Off." Close to surface disturbing activities in Segment 6 containing Halfway House ACEC. Rest of ACEC - Restrict surface disturbing activities to minimize disturbance and impacts. Extensive mitigation required.
SPECIAL DESIGNATION			
North Road ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Pierre's Site[25, 26]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 440 B: 440 M: 440	T: 440 B: 440 M: 440	T: 440 B: 440 M: 440	T: 440 B: 440 M: 440
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage – Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Informed placement of ROWs.	No new ROWs in ACEC.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Pierre's Site[25, 26]			
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Close to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Pierre's Site ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [25] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[26] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Pointed Butte			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 36 B: 36 M: 36	T: 36 B: 36 M: 36	T: 90 B: 90 M: 90	T: 90 B: 90 M: 90
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC.	Same as Alternative C.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.	Designate Closed OHV Area.	Same as Alternative C.

Pointed Butte			
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Closed to surface disturbing activities.	Close to surface disturbing activities.
SPECIAL DESIGNATION			
N/A. Pointed Butte Ruin SMA.	Same as Alternative A.	Enlarge and designate as Pointed Butte ACEC.	Same as Alternative C.

Pork Chop Pass			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 44 B: 0 M: 0	T: 44 B: 0 M: 0
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities. Management listed would be implemented upon acquisition of non-federal surface and minerals.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.

Pork Chop Pass			
		ROWs	
		No new ROWs. Approval required prior to maintenance of any existing ROW/easement.	New ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.
		OHV DESIGNATION	
		Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
		SPECIAL DESIGNATION	
		Designate Pork Chop Pass ACEC.	Same as Alternative C.

Pregnant Basketmaker			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 8 B: 8 M: 8	T: 8 B: 8 M: 8	T: 8 B: 8 M: 8	T: 8 B: 8 M: 8
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Pregnant Basketmaker			
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Close fenced area.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Pregnant Basketmaker ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Pretty Woman			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 84 B: 84 M: 84	T: 84 B: 84 M: 84	T: 84 B: 84 M: 84	T: 84 B: 84 M: 84
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.

Pretty Woman			
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Pretty Woman ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Prieta Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 31 B: 26 M: 31	T: 31 B: 26 M: 31	T: 31 B: 26 M: 31	T: 31 B: 26 M: 31
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Prieta Mesa			
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC.	Same as Alternative C.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
N/A. Prieta Mesa SMA.	Same as Alternative A.	Designate as Prieta Mesa ACEC.	Same as Alternative C.

Rabbit Tracks			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 7 B: 7 M: 7	T: 7 B: 7 M: 7	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.		See Encinada Mesa-Carrizo Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		

Rabbit Tracks			
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
New ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Rabbit Tracks ACEC.	Same as Alternative A.		

Rincon Largo District			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 180 B: 180 M: 180	T: 180 B: 180 M: 180	T: 490 B: 490 M: 490	T: 490 B: 490 M: 490
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraint on original acreage. CSU constraint on expanded acreage.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.

Rincon Largo District			
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	No new ROWs on original 180-acre SMA. Additional acreage - new ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
N/A. Rincon Largo District SMA.	Same as Alternative A.	Enlarge and designate as Rincon Largo District ACEC.	Same as Alternative C.

Rincon Rockshelter			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: 324 B: 324 M: 324	T: 324 B: 324 M: 324
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO on original 40 acres and 80 acres around Johnson 88 Pueblito.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	New ROWs in ACEC must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.

Rincon Rockshelter			
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
N/A. Rincon Rockshelter SMA.	Same as Alternative A.	Enlarge and designate as Rincon Rockshelter ACEC.	Same as Alternative C.
Rock House-Nestor Martin Homestead			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 51 B: 51 M: 0	T: 51 B: 51 M: 0	T: 51 B: 51 M: 0	T: 51 B: 51 M: 0
Resource Value: Cultural Resources, Historic Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
New ROWs in ACEC must be placed in existing ROW/easement disturbance. Coordinate with ROW holders on maintenance and use of existing easements.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing easement.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Designate Limited OHV Area.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Rock House-Nestor Martin Homestead			
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Close to other surface disturbing activities.
SPECIAL DESIGNATION			
Rock House-Nestor Martin Homestead ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Romine Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 45 B: 45 M: 45	T: 45 B: 45 M: 45	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Frances Mesa.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class IV.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		

Romine Canyon			
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Romine Canyon SMA.	Same as Alternative A.		

Salt Point
See Ashii Na'a' a'

San Rafael Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 5,668 B: 4,234 M: 5,027	T: 5,668 B: 4,234 M: 5,027	T: 5,668 B: 4,234 M: 5,027	T: 5,668 B: 4,234 M: 5,027
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - CSU mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	Place new ROWs in existing disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.

San Rafael Canyon			
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class IV designation.	Same as Alternative A.	Designate Class II Area.	Designate Class II around pueblitos, remainder of acreage Class III.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Permitted on a case-by-case basis with approval by cultural staff.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites and visitor use area.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to minimize disturbance and impacts.
SPECIAL DESIGNATION			
San Rafael Canyon ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Santos Peak			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 128 B: 128 M: 128	T: 128 B: 128 M: 128	T: 128 B: 128 M: 128	T: 128 B: 128 M: 128
Resource Value: Cultural Resources, Historic Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B.	Same as Alternative B.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Santos Peak			
ROWs			
New ROWs in ACEC must be placed in existing ROW/easement disturbance. Coordinate with ROW holders on maintenance and use of existing easements.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing easement.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Santos Peak ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Shephard Site			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Chacra Mesa Complex.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - Close to new leasing.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		

Shephard Site			
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Shephard Site SMA.	Same as Alternative A.		

Shield Bearer			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 35 B: 35 M: 35	T: 35 B: 35 M: 35	T: 35 B: 35 M: 35	T: 35 B: 35 M: 35
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: None.	Acquire easement.	Same as Alternative B	Same as Alternative B
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Shield Bearer			
ROWs			
New ROWs must be placed in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative A.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Shield Bearer ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Simon Ruin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 47 B: 47 M: 47	T: 47 B: 47 M: 47	T: 47 B: 47 M: 47	T: 47 B: 47 M: 47
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Simon Ruin			
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC.	Same as Alternative C.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV area.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C
LIVESTOCK GRAZING			
Grazing prohibited in the flatlands and canyon bottom.	Same as Alternative A.	Same as Alternative A	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at rim, canyon (including ruin), and bottom flatland.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
N/A. Simon Ruin SMA.	Same as Alternative A.	Designate as Simon Ruin ACEC.	Same as Alternative C.

Star Rock			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 60 B: 24 M: 24	T: 60 B: 24 M: 24
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.

Star Rock			
		Locatables: Withdraw minerals.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC.	Same as Alternative C.
		OHV DESIGNATION	
		Designate Closed Area.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Designate Star Rock ACEC.	Same as Alternative C.

Star Spring/Star Spring-Jesus Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 30 B: 19 M: 19	T: 30 B: 19 M: 19	T: 393 B: 149 M: 149	T: 393 B: 149 M: 149
Resource Value: Cultural Resources, Petroglyph and Pictograph Sites.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - 25 acres NSO mgmt. constraint, remainder of acreage CSU constraint.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.

Star Spring/Star Spring-Jesus Canyon			
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Acquire all non-federal minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire non-federal surface.	Same as Alternative A. Acquire easement.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of existing ROW.	New ROWs must be placed within existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Designate Limited OHV Area.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Close the bottom of Jesus Canyon to grazing.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Star Spring ACEC.	Same as Alternative A.	Enlarge and rename as Star Spring-Jesus Canyon ACEC.	Same as Alternative C.

String House			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 60 B: 0 M: 0	T: 60 B: 0 M: 0
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities. Management listed would be implemented upon acquisition of non-federal surface and minerals.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC.	Same as Alternative C.
		OHV DESIGNATION	
		Designate Closed OHV Area.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C.
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	Same as Alternative C.

String House			
		SPECIAL DESIGNATION	
		Designate String House ACEC.	Same as Alternative C.

Superior Mesa Community			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 400 B: 400 M: 400	T: 400 B: 400 M: 400	T: 6,066 B: 5,007 M: 5,009	T: 6,066 B: 5,007 M: 5,009
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
		The existing Cibola Canyon ACEC **[CC]**, Compressor Station SMA **[CS]**, Foothold and Overlook Ruins District SMA **[F&O]**, Hooded Fireplace and Largo School District ACEC **[H&L]**, and Superior Mesa Community ACEC **[SMC]** combined with surrounding lands and called Superior Mesa ACEC.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO mgmt. constraints - **CS, F&O, H&L, CC**, 40 acres around Millennium Pueblito and 75 acres north of **CC**. Additional acreage - CSU mgmt. constraint.
New Leasing: NSO mgmt. constraint.	Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint - **CC, CS, F&O, H&L, SMC,** 40 acres around Millennium Pueblito and 75 acres north of **CC**. Additional acreage - CSU mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative C.
ROWs			
New ROWs must be placed in existing road and in existing ROW disturbance. Coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROWs/easements.	No new ROWs - **CS, F&O, H&L**, forty acres around Millennium Pueblito and 75 acres north of **CC**. New ROWs must be placed in existing road - **CC**. New ROWs must be placed in existing ROW disturbance - **SMC**. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.

Superior Mesa Community			
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Class II.	Same as Alternative A.	Designate Class II Area.	Designate Class II - **CC, SMC, F&O, H&L, CS**. Class III on remainder of acreage.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Close to vegetation modification - **CC, SMC, CS, F&O, H&L**. Permitted on a case-by-case basis on remainder of acreage.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Close to grazing 10 acres - **CC**. Continue current permitting on remainder of acreage.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at sites: **CC, F&O, and H&L.** No designation on remainder of acreage.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Close to surface disturbing activities.	See ROW above. Restrict other surface disturbing activities to minimize disturbance and impacts.
SPECIAL DESIGNATION			
Superior Mesa Community ACEC.	Same as Alternative A.	Enlarge and rename as Superior Mesa ACEC.	Same as Alternative C.

Tapacito and Split Rock			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 240 B: 240 M: 240	T: 240 B: 240 M: 240	T: 302 B: 302 M: 302	T: 302 B: 302 M: 302
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO constraint on original acreage. CSU constraint on expanded acreage.
New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Close.	New Leasing - NSO mgmt. constraint.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.

Tapacito and Split Rock			
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw minerals.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
No new ROWs in SMA.	Same as Alternative A.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW in ACEC.	No new ROWs in ACEC. Coordinate with ROW holders on maintenance and use of existing ROWs.
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class III designation.	Same as Alternative A.	Designate Class II Area.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Close to grazing.	Continue current permitting.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
SURFACE DISTURBANCE			
See Minerals and ROWs above.	Same as Alternative A.	Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
SPECIAL DESIGNATION			
Tapacito and Split Rock District ACEC.	Same as Alternative A.	Enlarge and rename as Tapacito and Split Rock ACEC.	Same as Alternative C.
Toh-la-kai[27, 28]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 10 B: 0 M: 0	T: 10 B: 0 M: 0	T: 10 B: 0 M: 0	T: 10 B: 0 M: 0
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Close.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.

Toh-la-kai[27, 28]			
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC. Approval required prior to maintenance of existing easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Toh-la-kai ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [27] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[28] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Truby's Tower			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 160 B: 80 M: 80	T: 160 B: 80 M: 80
		Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities. Management listed would be implemented upon acquisition of non-federal surface and minerals.	
		MINERALS	
		Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Leased Acreage - Same as Alternative C.
		New Leasing - Close.	New Leasing - NSO mgmt. constraint.
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Withdraw minerals.	Same as Alternative C.
		Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire non-federal surface and easement.	Same as Alternative C.
		Disposal: Not available for disposal.	Same as Alternative C.
		ROWs	
		No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW/easement.	New ROWs must be placed in existing ROW/easement disturbance. Coordinate with ROW/easement holders on maintenance and use of existing ROWs/easements.
		OHV DESIGNATION	
		Designate Limited OHV. Area. Close identified roads.	Same as Alternative C.
		VRM DESIGNATION	
		Designate Class II Area.	Same as Alternative C.
		WOOD CUTTING	
		Close to fuelwood cutting and sale.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Close to vegetation modification.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Close to grazing.	Same as Alternative C.

Truby's Tower			
		NOISE	
		Designate as Noise Sensitive Area.	No designation.
		SURFACE DISTURBANCE	
		Close to surface disturbing activities.	See ROWs above. Restrict other surface disturbing activities to previously disturbed areas.
		SPECIAL DESIGNATION	
		Designate Truby's Tower ACEC.	Same as Alternative C.
Twin Angels[29, 30]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 45 B: 45 M: 45	T: 45 B: 45 M: 45	T: 358 B: 358 M: 358	T: 358 B: 358 M: 358
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Apply NSO mgmt. constraints.	Leased Acreage - Same as Alternative C.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Close to leasing.	New Leasing - Same as Alternative C.
Leasables and Salables: Close.	Same as Alternative A.	Close.	Same as Alternative C.
Locatables: Withdraw minerals.	Same as Alternative A.	Withdraw.	Same as Alternative C.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Acquire non-federal surface and easement.	Same as Alternative C.
Disposal: Not available for disposal.	Same as Alternative A.	Not available for disposal.	Same as Alternative C.
ROWs			
Informed placement of ROWs.	No new ROWs in ACEC.	No new ROWs in ACEC. Approval required prior to maintenance of any existing ROW.	Same as Alternative C.
OHV DESIGNATION			
Implement limited designation.	Designate Closed OHV Area.	Designate Limited OHV Area. Close identified roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Designate expanded acreage Class I.	Same as Alternative C.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Close to fuelwood cutting and sale.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Close to vegetation modification.	Same as Alternative A.	Close to vegetation modification.	Same as Alternative C.

Twin Angels[29, 30]			
LIVESTOCK GRAZING			
Close to grazing.	Same as Alternative A.	Close to grazing.	Same as Alternative C.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Close to surface disturbing activities.	Same as Alternative A.	Close to surface disturbing activities.	Same as Alternative C.
SPECIAL DESIGNATION			
Twin Angels ACEC.	Same as Alternative A.	Enlarge Twin Angels ACEC.	Same as Alternative C.

Notes: [29] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[30] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

Unreachable Rockshelter			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 60 B: 60 M: 60	T: 60 B: 60 M: 60	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Crow Canyon.	
MINERALS			
Oil and Gas: Leased Acreage - Continue NSO mgmt. constraint.	Same as Alternative A.		
New Leasing - NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
No new ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class III.	Same as Alternative A.		
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		

Unreachable Rockshelter			
VEGETATIVE MANAGEMENT			
Permitted on a case-by-case basis.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
N/A. Unreachable Rockshelter SMA.	Same as Alternative A.		

Upper Kin Klizhin[31, 32]			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 60 B: 60[33] M: 60	T: 60 B: 60[33] M: 60	T: 60 B: 60[33] M: 60	T: 60 B: 60[33] M: 60
Resource Value: Cultural Resources, Chacoan Outliers.			
MINERALS			
Oil and Gas: Leased Acreage - Close.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
New Leasing - Close to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
No new ROWs in ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class I designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Upper Kin Klizhin[31, 32]			
LIVESTOCK GRAZING			
Closed to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at defined sites.**
SURFACE DISTURBANCE			
Closed to surface disturbing activities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Upper Kin Klizhin ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Notes: [31] Protected under New Mexico Wilderness Act of 1980 (PL 96-550, Title V, "Chaco Culture National Historic Park," Sec. 501 - 508).

[32] Protected under Chacoan Outliers Protection Act of 1995 (PL 104-11).

[33] Represents modified acreage based on more recent FFO information and is not reflected in BLM State Office GIS data. Updates of GIS data are in process.

Ye'is-in-Row			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 40 B: 40 M: 40	T: 40 B: 40 M: 40	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Cultural Resources, Early Navajo Defensive Sites and Communities.		See Devil's Spring Mesa.	
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Same as Alternative A.		
New Leasing: NSO mgmt. constraint.	Same as Alternative A.		
Leasables and Salables: Close.	Same as Alternative A.		
Locatables: Withdraw minerals.	Same as Alternative A.		
LAND OWNERSHIP			
Acquisition: N/A.	Acquire easement.		
Disposal: Not available for disposal.	Same as Alternative A.		
ROWs			
New ROWs must be placed in existing ROW disturbance and coordinate with ROW holders on maintenance and use of existing ROWs.	Same as Alternative A.		
OHV DESIGNATION			
Implement limited designation.	Same as Alternative A.		
VRM DESIGNATION			
Class II.	Same as Alternative A.		

Ye'is-in-Row			
WOOD CUTTING			
Closed to fuelwood cutting and sale.	Same as Alternative A.		
VEGETATIVE MANAGEMENT			
Closed to vegetation modification.	Same as Alternative A.		
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.		
NOISE			
No designation.	Same as Alternative A.		
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.		
SPECIAL DESIGNATION			
Ye'is-in-Row ACEC.	Same as Alternative A.		

Forestry

Laguna Seca Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 2,436 B: 2,436 M: 2,436	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Forestry.	See Mexican Spotted Owl under Threatened and Endangered Species.		
MINERALS			
Oil and Gas: Leased Acreage - Standard Terms and Conditions.			
New Leasing - Standard Terms and Conditions.			
Leasables and Salables: Open.			
Locatables: Open.			
Mineral Acquisition: N/A.			
LAND OWNERSHIP			
Acquisition: Acquire easement.			
Disposal: Not mentioned.			
ROWs			
Allow on case-by-case basis with special stipulations and mitigation.			
OHV DESIGNATION			
Open.			
VRM DESIGNATION			
Class IV.			

Laguna Seca Mesa			
WOOD CUTTING			
Allow the cutting/collection of firewood with a valid permit.			
VEGETATIVE MANAGEMENT			
Management of the SMA emphasizes forest development as the major goal. Other goals considered are the maintenance and /or improvement of the wildlife habitat.			
LIVESTOCK GRAZING			
Open to grazing.			
SPECIAL DESIGNATION			
N/A. Laguna Seca Mesa SMA.			

Geology

Angel Peak			
See Angel Peak under the "Recreation" Resource Value			
Badlands			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 1,364 B: 1,364 M: 1,364	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Geology. See Bisti/De-na-zin. Badlands managed for wilderness values.			
SPECIAL DESIGNATION			
Badlands ACEC.	Remove ACEC designation.	Same as Alternative B.	Same as Alternative B.
Beechatuda Tongue			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 100 B: 100 M: 100	T: 100 B: 100 M: 100	T: 100 B: 100 M: 100	T: 100 B: 100 M: 100
Resource Value: Geology.			
MINERALS			
Oil and Gas: Leased Acreage - NSO mgmt. constraint.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Close to new leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mineral Acquisition: Acquire all non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Beechatuda Tongue			
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Preclude new ROWs that would negatively affect protected resource or purpose.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Implement closed designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Class IV.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
N/A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
N/A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
N/A. Beechatuda Tongue SMA.	Rename as Beechatuda Tongue Geological Formation.	Same as Alternative B.	Same as Alternative B.

Lands

Right-of-Way Windows			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 12,986 B: 11,342 M: 11,751	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Lands: Access.	SMA designation eliminated.		
MINERALS			
Oil and Gas: Leased Acreage - Implement CSU mgmt. Constraint. No reissue of expired leases.			
New Leasing - N/A.			
Leasables and Salables: Close.			

Right-of-Way Windows			
Locatables: Withdraw minerals.			
Mineral Acquisition: N/A.			
LAND OWNERSHIP			
Discourage land uses which conflict with purpose of ROW placements, such as landing strips, landfills, and surface mining unless they are highly justified.			
Acquisition: N/A.			
Disposal: N/A.			
ROWs			
New ROWs would be granted.			
OHV DESIGNATION			
Open OHV designation.			
VRM DESIGNATION			
Classes III and IV.			
WOOD CUTTING			
Open to permitted gathering of dead and down.			
VEGETATIVE MANAGEMENT			
Permitted on case-by-case basis.			
LIVESTOCK GRAZING			
Continue current permitting.			
NOISE			
No designation.			
SPECIAL DESIGNATION			
N/A. Right-of-Way Windows SMA.			

Minerals

Coal Belt			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 130,792 B: 63,779 M: 98,807	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Minerals.	SMA designation eliminated.		
MINERALS			
Oil and Gas: Leased Acreage - N/A.			
New Leasing - N/A.			
Leasables and Salables: Open for leasing.			
Locatables: N/A.			
Mineral Acquisition: N/A.			

Coal Belt			
LAND OWNERSHIP			
Acquisition: N/A.			
Disposal: Available for disposal after mining and reclamation completed, except Fossil Forest RNA and Ah-shi-sle-pah WSA would be retained.			
ROWs			
ROWs placed through areas of low cola development potential.			
OHV DESIGNATION			
Open OHV designation.			
VRM DESIGNATION			
Classes I, III and IV.			
WOOD CUTTING			
Open to permitted gathering of dead and down.			
VEGETATIVE MANAGEMENT			
Permitted on case-by-case basis.			
LIVESTOCK GRAZING			
Continue current permitting.			
NOISE			
No designation.			
SURFACE DISTURBANCE			
See Minerals, ROWs, and Vegetative Management above.			
SPECIAL DESIGNATION			
N/A. Coal Belt SMA.			

Paleontology

Betonnie Tsosie			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 11,849 B: 7,267 M: 7,267	T: 11,849 B: 7,267 M: 7,267	T: 11,849 B: 7,267 M: 7,267	T: 11,849 B: 7,267 M: 7,267
Resource Value: Paleontology.			
MINERALS			
Oil and Gas: Leased Acreage - CSU paleontological required clearance.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Same as leased acreage.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Betonnie Tsosie			
Leasables and Salables: Permitted on a case-by-case basis with stipulations that protect paleontological values.	Same as Alternative A.	Close.	Same as Alternative A.
Locatables: Same as leasables and salables.	Same as Alternative A.	Withdraw.	Same as Alternative A.
Mineral Acquisition: Acquire non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal inholdings.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Granted on a case-by-case basis with stipulations that protect paleontological values.	Same as Alternative A.	No surface disturbing ROWs and/or easements.	Same as Alternative A.
OHV DESIGNATION			
Limited to existing roads and trails.	Limited to maintained roads, designated routes, and trails.	Limited to maintained roads.	Same as Alternative B.
VRM DESIGNATION			
Class III.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Allowed on a case-by-case basis with paleontological clearance.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Livestock grazing permitted.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
N/A. Betonnie Tsosie SMA.	Rename as Betonnie Tsosie Fossil Area.	Same as Alternative B.	Same as Alternative B.

Bohanon Canyon Fossil Complex			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 13,834 B: 12,380 M: 12,468	T: 13,834 B: 12,380 M: 12,468	T: 13,834 B: 12,380 M: 12,468
	Resource Value: Paleontology.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. Paleontological clearance required.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.

Bohanon Canyon Fossil Complex			
	New Leasing - Same as leased acreage.	New Leasing: Same as Alternative B.	New Leasing: Same as Alternative B.
	Leasables and Salables: Permitted on a case-by-case basis with stipulations that protect paleontological values.	Close.	Same as Alternative B.
	Locatables: Same as leasables and salables.	Withdraw.	Same as Alternative B.
	LAND OWNERSHIP		
	Disposal: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Granted on a case-by-case basis with stipulations that protect paleontological values.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated routes, trails, and areas.	Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
	VRM DESIGNATION		
	Apply Class III designation.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Open to permitted gathering of dead and down.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Allowed on case-by-case basis with paleontological clearance.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Bohanon Canyon Fossil Complex.	Same as Alternative B.	Same as Alternative B.

Carson Fossil Pocket			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 968 B: 968 M: 968	T: 968 B: 968 M: 968	T: 968 B: 968 M: 968
	Resource Value: Paleontology.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. Paleontological clearance required.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
	New Leasing - Same as leased acreage.	New Leasing: Same as Alternative B.	New Leasing: Same as Alternative B.

Carson Fossil Pocket			
	Leasables and Salables: Permitted on a case-by-case basis with stipulations that protect paleontological values.	Close.	Same as Alternative B.
	Locatables: Same as leasables and salables.	Withdraw.	Same as Alternative B.
	LAND OWNERSHIP		
	Disposal: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Granted on a case-by-case basis with stipulations that protect paleontological values.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated routes, trails, and areas.	Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
	VRM DESIGNATION		
	Apply Class III designation.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Open to permitted gathering of dead and down.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Allowed on case-by-case basis with paleontological clearance.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Carson Fossil Pocket.	Same as Alternative B.	Same as Alternative B.

Fossil Forest			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 2,796 B: 2,796 M: 2,796	T: 2,796 B: 2,796 M: 2,796	T: 2,796 B: 2,796 M: 2,796	T: 2,796 B: 2,796 M: 2,796
Resource Value: Paleontology.			
MINERALS			
Oil and Gas: Leased Acreage - Closed to leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Closed to new leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Closed	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdrawn.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Fossil Forest			
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Preclude ROWs.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Closed except for administrative and permitted use.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Class I.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to wood cutting and gathering.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetation gathering and sale. Vegetative treatments must benefit cultural, scientific, and educational values. Paleontological clearance required.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Closed to livestock grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative C.
SPECIAL DESIGNATION			
Fossil Forest RNA.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Gobernador and Cereza Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 27,647 B: 13,333 M: 25,643	T: 27,647 B: 13,333 M: 25,643	T: 27,647 B: 13,333 M: 25,643
	Resource Value: Paleontology.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. Paleontological clearance required.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
	New Leasing - Same as leased acreage.	New Leasing: Same as Alternative B.	New Leasing: Same as Alternative B.

Gobernador and Cereza Canyon			
	Leasables and Salables: Permitted on a case-by-case basis with stipulations that protect paleontological values.	Close.	Same as Alternative B.
	Locatables: Same as leasables and salables.	Withdraw.	Same as Alternative B.
	LAND OWNERSHIP		
	Acquisition: Acquire easements.	Same as Alternative B.	Same as Alternative B.
	Disposal: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Granted on a case-by-case basis with stipulations that protect paleontological values.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated routes, trails, and areas.	Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
	VRM DESIGNATION		
	Apply Class IV designation.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Open to permitted gathering of dead and down.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Allowed on case-by-case basis with paleontological clearance.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Gobernador and Cereza Canyon Fossil Area.	Same as Alternative B.	Same as Alternative B.

Kutz Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 39,006 B: 36, 837 M: 36,841	T: 48,423 B: 47,098 M: 47,661	T: 48,423 B: 47,098 M: 47,661	T: 48,423 B: 47,098 M: 47,661
Resource Value: Paleontology.			
MINERALS			
Oil and Gas: Leased Acreage - CSU stipulations. Paleontological clearance required.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Kutz Canyon			
New Leasing - Same as leased acreage.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Permitted on case-by-case basis with stipulations that protect paleontological values.	Same as Alternative A.	Close.	Same as Alternative A.
Locatables: Same as leasables and salables.	Same as Alternative A.	Withdraw.	Same as Alternative A.
LAND OWNERSHIP			
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Granted on a case-by-case basis with stipulations and that protect paleontological values.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Limited to existing roads and trails.	Limited to maintained roads, designated routes, trails, and areas.	Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
VRM DESIGNATION			
Classes II, III and IV.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis with paleontological clearance.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Open to livestock grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Kutz Canyon Paleontological Area.	Expand and rename as Kutz Canyon Fossil Area.	Same as Alternative B.	Same as Alternative B.

Log Jam			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 239 B: 239 M: 239	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Paleontology. See Bisti/De-na-zin. Log Jam managed for wilderness values.			
SPECIAL DESIGNATION			
Log Jam ACEC.	Remove ACEC designation.	Same as Alternative B.	Same as Alternative B.

Lybrook Fossil Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 25,703 B: 18,268 M: 19,840	T: 25,703 B: 18,268 M: 19,840	T: 25,703 B: 18,268 M: 19,840
	Resource Value: Paleontology.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. Paleontological clearance required.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
	New Leasing - Same as leased acreage.	New Leasing: Same as Alternative B.	New Leasing: Same as Alternative B.
	Leasables and Salables: Permitted on a case-by-case basis with stipulations that protect paleontological values.	Close.	Same as Alternative B.
	Locatables: Same as leasables and salables.	Withdraw.	Same as Alternative B.
	LAND OWNERSHIP		
	Disposal: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Granted on a case-by-case basis with stipulations that protect paleontological values.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated routes, trails, and areas.	Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
	VRM DESIGNATION		
	Apply Class III and IV designations.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Open to permitted gathering of dead and down.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Allowed on case-by-case basis with paleontological clearance.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Lybrook Fossil Area.	Same as Alternative B.	Same as Alternative B.

Piñon Mesa Fossil Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 19,052 B: 18,197 M: 19,033	T: 19,052 B: 18,197 M: 19,033	T: 19,052 B: 18,197 M: 19,033
	Resource Value: Paleontology.		
	Piñon Mesa Fossil Area. The proposed Piñon Mesa Fossil Area overlaps part of the proposed the Piñon Mesa Recreation Area. Management prescriptions in this table apply to paleontological resources. Where boundaries overlap, management prescriptions for the Piñon Mesa Recreation Area will apply and will include measures necessary for protection of paleontological resources.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. Paleontological clearance required.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
	New Leasing - Same as leased acreage.	New Leasing: Same as Alternative B.	New Leasing: Same as Alternative B.
	Leasables and Salables: Permitted on a case-by-case basis with stipulations that protect paleontological values. No underground mining or development of other leasables and salables would be permitted along the trail corridor identified in the Piñon Mesa Recreation Area.	Close.	Same as Alternative B, except for land parcels identified in the text under Alternative D, Additional Coal Interests, which are not available for coal mining. Surveys prior to mining and periodic monitoring may be required to protect paleontology and to check for subsidence.
	Locatables: Same as leasables and salables.	Withdraw.	Same as Alternative D, Leasables and Salables.
	LAND OWNERSHIP		
	Acquisition: Acquire easements.	Same as Alternative B.	Same as Alternative B.
	Disposal: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Granted on a case-by-case basis with stipulations that protect paleontological values.	Preclude ROWs.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads and designated trails, routes, ways, and areas.	Limited to maintained roads and designated trails.	Limited to maintained roads, and designated trails and routes.
	VRM DESIGNATION		
	Apply Class III designation.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Open to permitted gathering of dead and down.	Same as Alternative B.	Same as Alternative B.

Piñon Mesa Fossil Area			
	VEGETATIVE MANAGEMENT		
	Allowed on case-by-case basis with paleontological clearance.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Piñon Mesa Fossil Area.	Same as Alternative B.	Same as Alternative B.

Recreation

Alien Run Mountain Bike Trails			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 356 B: 334 M: 356	T: 3,334 B: 3,137 M: 3,334	T: 3,334 B: 3,137 M: 3,334
	Resource Value: Recreation.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. No new activity allowed for a distance of 100 feet on each side of the designated trail system. Exceptions granted by recreation staff on a case-by-case basis as determined by environmental review. This mgmt constraint would apply to any newly designated trails within Alien Run Mountain Bike Trails SMA.	Leased Acreage - Same as alternative B. No new activity allowed for a distance of 300 feet on each side of the designated trail system.	Leased Acreage - Same as Alternative B. No new activity allowed for a distance of 150 feet on each side of the designated trail system.
	New Leasing - CSU mgmt. constraints.	New Leasing - Same as Alternative B.	New Leasing - Same as Alternative B.
	Timing Restrictions - No construction, drilling, completion, plugging, seismic exploration, and workover activity allowed when they would interfere with authorized recreation events.	Timing Restrictions - Same as Alternative B.	Timing Restrictions - Same as Alternative B.
	Leasables and Salables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational values managed for.	Close.	Same as Alternative C.

Alien Run Mountain Bike Trails			
	Locatables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational values managed for.	Withdraw.	Same as Alternative C.
	LAND OWNERSHIP		
	Acquisitions: Acquire non-BLM inholdings.	Same as Alternative B.	Same as Alternative B.
	Disposals: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	ROWs granted on a case-by-case basis with site-specific stipulations that protect the trail system integrity and recreation values in SMA and provide for safety of users.	Same as Alternative B.	Same as Alternative B.
	No construction or maintenance activity allowed when it would interfere with authorized recreation events.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated trails, routes, ways, and areas.	Limited to maintained roads	Limited to maintained roads and designated trails.
	VRM DESIGNATION		
	Apply Class IV objectives.	Apply Class III objectives.	Same as Alternative C.
	WOOD CUTTING		
	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Close to vegetative sales. Vegetative treatments must benefit recreation values managed for and be approved by recreation staff. All reclamation activity in SMA will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.

Alien Run Mountain Bike Trails			
	NOISE		
	No designation.	Designated Noise Sensitive Area. Standard will be applied at existing and newly designated trails and developed facilities. Compliance schedule for existing units: Year 4 for existing sources impacting designated trail system.	Designate receptor points at trail systems, developed facilities.
	ROS		
	Apply roaded natural objectives.	Same as Alternative B.	Same as Alternative B.
	SHOOTING		
	Closed to shooting.	Same as Alternative B.	Same as Alternative B.
	TRAIL DESIGNATION		
	New trails may be designated in Alien Run Mountain Bike Trails based on inventory, and public demand after appropriate environmental analysis.	Same as Alternative B.	Same as Alternative B.
	BOUNDARY		
	Designation will be limited to the trail corridor (100 feet on each side of the trail).	Boundary as indicated on map.	Same as Alternative C.
	PETS		
	No restrictions.	Must be under physical control at all times.	Pets must be under control at all times.
	SPECIAL DESIGNATION		
	Delineate Alien Run Mountain Bike Trail Corridor.	Delineate Alien Run Mountain Bike Trails.	Same as Alternative C.
Angel Peak			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 10,226 B: 8,946 M: 9,952	T: 10,226 B: 8,946 M: 9,952	T: 10,226 B: 8,946 M: 9,952	T: 10,226 B: 8,946 M: 9,952
T: 248 B: 248 M: 248 (ACEC)	T: 248 B: 248 M: 248 (ACEC)	T: 248 B: 248 M: 248 (ACEC)	T: 248 B: 248 M: 248 (ACEC)
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - SMA: Continue CSU mgmt. constraint. ACEC: Continue NSO mgmt. constraint.	Leased Acreage - Recreation Area: same as Alternative A. ACEC: Same as Alternative A.	Leased Acreage - Recreation Area: NSO mgmt. constraint at all developed campground(s), trail(s), picnic area(s), overlook(s), Chacoan road, and Byway. Remaining acreage same as Alternative A. ACEC: Same as Alternative A.	Leased Acreage - Recreation Area: Same as Alternative C. ACEC: Same as Alternative A.

Angel Peak			
New Leasing - SMA: CSU mgmt. constraint. ACEC: NSO mgmt. constraint	New Leasing - SMA: same as Alternative A. ACEC: Same as Alternative A.	New Leasing - SMA: Close to leasing. ACEC: Same as Alternative A.	New Leasing - SMA: NSO mgmt. constraint. ACEC: Same as Alternative A.
Leasables and Salables: Maintain mining closure.	Same as Alternative A. Close entire SMA/ACEC.	Same as Alternative B.	Same as Alternative B.
Locatables: Open.	Withdraw.	Same as Alternative B.	Same as Alternative B.
LAND OWNERSHIP			
Acquisitions: Acquire non-BLM inholdings.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with stipulations and mitigation measures.	Preclude new ROWs that would negatively impact developed campground(s), trail(s), picnic area(s), overlook(s), Chacoan road, and Byway. Other ROWs permitted on a case-by-case basis with stipulations to maintain recreation, natural, paleontological, VRM, and cultural values managed for.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Complete limited designation to restrict use to designated maintained roads.	Limited to maintained roads, designated trails, routes, and ways.	Limited to maintained roads. Close Angel Peak Campground road to thru traffic.	Limited to maintained roads and designated trails. Use may be authorized in the wash bottom on a case-by-case basis. Close Angel Peak Campground road to through traffic.
VRM DESIGNATION			
Implement Class II objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Close to wood cutting and gathering.	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative B.	Same as Alternative B.

Angel Peak			
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis with stipulations and mitigation.	Close to vegetative sales. Vegetative treatments must benefit recreation and visual experiences managed for, and be approved by recreation staff. All reclamation activity in SMA/ACEC will use only native species seed/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at camp sites, picnic areas, overlooks, trails, and Chacoan Road.**
ROS			
Apply roaded natural objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SHOOTING			
Discharging firearms prohibited.	No shooting in developed recreation area.	Same as Alternative B.	Same as Alternative B.
SPECIAL DESIGNATION			
Angel Peak Recreation Area and ACEC.	Change name to Angel Peak Scenic Area and ACEC. Nominate the section of road from US 550 to the Angel Peak campground as a Back Country Byway.	Same as Alternative B.	Same as Alternative B.
Carracas Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 8,616 B: 7,943 M: 3,201	T: 8,616 B: 7,943 M: 3,201	T: 8,616 B: 7,943 M: 3,201	T: 8,616 B: 7,943 M: 3,201
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
Unleased Acreage - Closed to leasing.	Unleased Acreage - NSO mgmt. constraint.	Unleased Acreage - Same as Alternative A.	Unleased Acreage - Same as Alternative A.
New Leasing - Closed to leasing.	New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.

Carracas Mesa			
Timing Restrictions - No construction, drilling, and completion activities allowed from 12/01-03/31 for entire SMA and from 04/01-07/15 in designated elk calving habitat.	Timing Restrictions - Same as Alternative A.	Timing Restrictions - No construction, drilling, plugging, seismic exploration and work over activity allowed from 11/01-3/31 for entire SMA and from 04/01-07/15 in designated elk calving habitat.	Timing Restrictions - Same as Alternative C.
Leasables and Salables: Close.	Allow limited mineral entry with site-specific stipulations to maintain optimum wildlife habitat, recreation and VRM objectives.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Allow limited mineral entry with site-specific stipulations to maintain optimum wildlife habitat, recreation, and VRM objectives.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire non-BLM inholdings and easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Preclude ROW placement.	ROWs permitted on a case-by-case basis with stipulations to maintain optimum wildlife habitat, recreational, and VRM values managed for.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Implement Carracas Mesa ORV Plan. Permanently close spur roads 1003 and 1005. Restrict motor vehicles to existing, maintained roads; and seasonally close the entire SMA to all motorized access by the public (Nov. 1-March 31).	Limited to maintained roads, designated trails, routes, and ways. Apply seasonal OHV closures.	Same as Alternative A.	Same as Alternative B.
VRM DESIGNATION			
Implement Class I objectives.	Designate Class II.	Same as Alternative B.	Same as Alternative B.

Carracas Mesa			
WOOD CUTTING			
Close to wood cutting and gathering.	Close to all wood gathering and sales except for administrative needs with wildlife and recreation staff approval.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis with stipulations and mitigation.	Close to vegetative sales. Vegetative treatments must benefit wildlife, recreation and visual experiences managed for and be approved by wildlife and recreation staff.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Area retired from grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Same as Alternative C.
ROS			
Apply semi-primitive, non-motorized and motorized objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SHOOTING			
No restrictions.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WILDFIRE			
Apply limited/conditional wildfire suppression methods.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
N/A. Carracas Mesa SMA.	Change name to Carracas Mesa Recreation/Wildlife Area.	Same as Alternative B.	Same as Alternative B.
Dunes Vehicle Recreation Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 825 B: 805 M: 825	T: 825 B: 805 M: 825	T: 825 B: 805 M: 825	T: 825 B: 805 M: 825
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue standard terms and conditions mgmt. constraint.	Leased Acreage - CSU mgmt. constraint.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
New Leasing - Standard terms and conditions.	New Leasing - NSO mgmt. constraint.	New Leasing - Close to leasing.	New Leasing - NSO mgmt. constraint.

Dunes Vehicle Recreation Area			
Leasables and Salables: Open.	Close.	Same as Alternative B.	Same as Alternative B.
Locatables: Open.	Withdraw.	Same as Alternative B.	Same as Alternative B.
LAND OWNERSHIP			
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with stipulations and mitigation measures.	Same as Alternative A. Safety of users and recreational use will be first consideration.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Open	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class IV objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis.	Same as Alternative A.	Close to vegetative sales except for administrative needs. Vegetation treatments must benefit recreation experiences managed for and be approved by recreation staff.	Same as Alternative C.
LIVESTOCK GRAZING			
Open. No current permit.	Grazing permits will not be issued.	Same as Alternative B.	Same as Alternative B.
ROS			
Unclassified.	Apply rural recreation objectives.	Same as Alternative B.	Same as Alternative B.
SHOOTING			
No shooting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Glade Run			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 32,423 B: 26,559 M: 27,883	T: 22,671 B: 18,445 M: 19,083	T: 22,671 B: 18,445 M: 19,083	T: 21,544 B: 17,935 M: 18,796
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint on 150+/- acres of trail system. Remainder of SMA acreage continue mgmt. under standard terms and conditions.	Leased Acreage - CSU mgmt. constraint. No new activity allowed for a distance of 100 feet from either side of the designated trail system. Exceptions granted by recreation staff on a case-by-case basis as determined by environmental review. This mgmt constraint would apply to any newly designated trails within Glade Run Trail System.	Leased Acreage - Same as alternative B. No new activity allowed for a distance of 300 feet from either side of the designated trail system.	Leased Acreage - Same as Alternative B. No new activity allowed for a distance of 150 feet from either side of the designated trail system.
New Leasing - CSU mgmt. constraints.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Timing Restrictions - None.	Timing Restrictions - No construction, drilling, completion, plugging, seismic exploration, and workover activity allowed when they would interfere with authorized recreation events.	Timing Restrictions - Same as Alternative B.	Timing Restrictions - Same as Alternative B.
Leasables and Salables: Open.	Same as Alternative A.	Close.	Limited with site-specific stipulations that protect the integrity of the trail system and other recreational activities in SMA and provide for safety of users. No construction or maintenance activity allowed when it would interfere with authorize recreation events.
Locatables: Open.	Same as Alternative A.	Withdraw.	Limited with site-specific stipulations that protect the integrity of the trail system and other recreational activities in SMA and provide for safety of users. No construction or maintenance activity allowed when it would interfere with authorize recreation events.

Glade Run			
LAND OWNERSHIP			
Acquisitions: Acquire easements and non-BLM inholdings.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposals: Not available for disposal unless doing so would enhance trail recreation opportunities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with stipulations and mitigating measures.	ROWs granted on a case-by-case basis with site-specific stipulations that protect the integrity of the trail system and other recreational activities in SMA and provide for safety of users. No construction or maintenance activity allowed when it would interfere with authorized recreation events.	Preclude new ROWs that negatively impact designated trail system. No construction or maintenance activity allowed when it would interfere with authorized recreation events.	Same as Alternative B.
OHV DESIGNATION			
Approximately 22,800 acres limited to bladed roads, designated trails, routes, ways, and areas. Approximately 4,600 acres designated open.	Approximately 15,000 limited to bladed roads, designated trails, routes, ways, and areas. Approximately 3,800 acres designated open.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class III objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Firewood gathering, dead and down and greenwood is prohibited.	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis with stipulations and mitigation.	Close to vegetative sales. Vegetative treatments must benefit recreation values managed for and be approved by recreation staff. All reclamation activity in SMA will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Glade Run			
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at single track, trail, and developed facilities.
ROS			
No classification.	Apply rural objectives.	Same as Alternative B.	Same as Alternative B.
SHOOTING			
Discharge of firearms prohibited throughout the Glade Run Trail System, except for: grazing permittees in defense of livestock; licensed game bird hunters (shotguns only) during season north and east of Flora Vista Rd or within ½ mile of La Plata River north of Jackson lake Wildlife Refuge. The area north of Flora Vista Rd. and west of a line approximately ½ mile west of the western ridge above the Farmington Glade Arroyo will remain open to all shooting on an interim basis. Open designation to be reviewed yearly.	Close to shooting except for livestock permittees in defense of livestock.	Close to all shooting.	Same as Alternative B.
CAMPING			
Overnight camping prohibited without a special use permit.	Same as Alternative A.	No overnight use.	Same as Alternative A.
PETS			
Must be under control at all times.	Same as Alternative A.	Pets must be under physical control at all times.	Same as Alternative A.
TRAIL DESIGNATION			
New trails may be designated in Glade Run Trail System based on inventory, and public demand after appropriate environmental analysis.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
BOUNDARY ADJUSTMENT			
No adjustment.	Boundary change (see map).	Same as Alternative B.	Boundary change (see map).
SPECIAL DESIGNATION			
N/A. Glade Run Trail System SMA.	Rename as Glade Run Recreation Area.	Same as Alternative B.	Same as Alternative B.

Head Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 140 B: 138 M: 140	T: 140 B: 138 M: 140	T: 140 B: 138 M: 140	T: 140 B: 138 M: 140
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue standard terms and conditions mgmt. constraint.	Leased Acreage - CSU mgmt. constraint.	Leased Acreage - NSO mgmt. constraint.	Leased Acreage - NSO management constraint under motocross track (approximately 50 acres). CSU on remaining acreage
New Leasing - Standard terms and conditions.	New Leasing - CSU mgmt. constraint. No construction, drilling, or workover activities allowed during authorized events.	New Leasing - Close to leasing. No construction, drilling, or workover activities allowed during authorized events.	New Leasing - NSO mgmt. constraint. No construction, drilling, or workover activities allowed during authorized events.
Leasables and Salables: Open.	Close.	Same as Alternative B.	Same as Alternative B.
Locatables: Open.	Withdraw.	Same as Alternative B.	Same as Alternative B.
LAND OWNERSHIP			
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with stipulations and mitigation measures.	Preclude ROWs that would negatively impact the existing track or potential expanded track area inside SMA.	Same as Alternative B.	Same as Alternative B.
OHV DESIGNATION			
Complete limited designation to restrict use during authorized events.	Limited to maintained roads and designated motocross track. Use on motocross track limited to motorcycles and ATVs. Track may be expanded in SMA if needed, after site-specific environmental analysis.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class IV objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Open to permitted gathering of dead and down.	Same as Alternative A.	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis.	Same as Alternative A.	Close to vegetative sales except for administrative needs with approval by recreation staff.	Same as Alternative C.

Head Canyon			
LIVESTOCK GRAZING			
Continue current permitting.	Any grazing permits in Head Canyon SMA that are voluntarily relinquished or exchanged will not be reissued.	Same as Alternative B.	Same as Alternative B.
ROS			
Unclassified.	Apply rural recreation objectives.	Same as Alternative B.	Same as Alternative B.
SHOOTING			
No shooting in the developed recreation area.	Close to shooting.	Same as Alternative B.	Same as Alternative B.
SPECIAL DESIGNATION			
Head Canyon ORV Competition Area.	Change name to Head Canyon Motocross Track.	Same as Alternative B.	Same as Alternative B.
Navajo Lake Horse Trails			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 797 B: 685 M: 679	T: 6,752 B: 5,657 M: 5,951	T: 6,752 B: 5,657 M: 5,951
	Resource Value: Recreation.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. No new activity allowed for a distance of 100 feet on each side of the designated trail system. Exceptions granted by recreation staff on a case-by-case basis as determined by environmental review. This mgmt constraint would apply to any newly designated trails within Navajo Lake Horse Trails.	Leased Acreage - Same as alternative B. No new activity allowed for a distance of 300 feet on each side of the designated trail system.	Leased Acreage - Same as Alternative B. No new activity allowed for a distance of 150 feet on each side of the designated trail system.
	New Leasing - CSU mgmt. constraints.	New Leasing - Same as Alternative B.	New Leasing - Same as Alternative B.
	Timing Restrictions - No construction, drilling, completion, plugging, seismic exploration, and workover activity allowed when they would interfere with authorized recreation events and from 11/1-3/31 for Bald Eagle protection.	Timing Restrictions - Same as Alternative B.	Timing Restrictions - Same as Alternative B.

Navajo Lake Horse Trails			
	Leasables and Salables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational and T&E values managed for.	Close.	Same as Alternative C.
	Locatables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational and T&E values managed for.	Withdraw.	Same as Alternative C.
	LAND OWNERSHIP		
	Acquisitions: Acquire non-BLM inholdings.	Same as Alternative B.	Same as Alternative B.
	Disposals: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	ROWs granted on a case-by-case basis with site-specific stipulations that protect the trail system integrity and T&E values in SMA and provide for safety of users. No construction or maintenance activity allowed when it would interfere with authorized recreation events and from 11/1 through 3/31 for Bald Eagle protection.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated trails, routes, ways, and areas.	Limited to maintained roads.	Limited to maintained roads and designated trails.
	VRM DESIGNATION		
	Apply Class III.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Close to all wood gathering and sales except for administrative needs with recreation and T&E staff approval.	Same as Alternative B.	Same as Alternative B.

Navajo Lake Horse Trails			
	VEGETATIVE MANAGEMENT		
	Close to vegetative sales. Vegetative treatments must benefit recreation and T&E values managed for and be approved by recreation and T&E staff. All reclamation activity in SMA will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	NOISE		
	No designation.	Designated Noise Sensitive Area.** Standard will be applied at existing and newly designated trails and developed facilities. A stricter standard may be required at designated camping area(s). Compliance schedule for existing units: Year 1 for existing sources impacting designated trailhead/camp area; Year 4 for existing sources impacting designated trail system.	Designate receptor points at trail system, trailhead, and developed facilities.**
	ROS		
	Apply roaded natural objectives.	Same as Alternative B.	Same as Alternative B.
	SHOOTING		
	Developed areas closed to shooting.	Close to all shooting.	Developed areas closed to shooting. Remainder of SMA closed to shooting except for licensed hunters during designated hunting seasons.
	TRAIL DESIGNATION		
	New trails may be designated in Navajo Lake Horse Trails based on inventory, and public demand after appropriate environmental analysis.	Same as Alternative B.	Same as Alternative B.
	BOUNDARY		
	Designation will be limited to the trail corridor (100 feet on each side of the trail).	Boundary as indicated on map.	Same as Alternative C.

Navajo Lake Horse Trails			
	SEASONAL CLOSURES		
	Portions of SMA closed to recreational use impacting bald eagle ACEC; 11/1-3/31.	Same as Alternative B.	Same as Alternative B.
Negro Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 1,992 B: 1,361 M: 1,992	T: 1,992 B: 1,361 M: 1,992	T: 1,992 B: 1,361 M: 1,992	T: 1,992 B: 1,361 M: 1,992
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - NSO mgmt. constraint within the canyon drainage. Acreage above the rim same as Alternative A.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
Unleased Acreage - Closed to leasing.	Unleased Acreage - NSO mgmt. constraint.	Unleased Acreage - Same as Alternative A.	Unleased Acreage - Same as Alternative B.
New Leasing - Closed to leasing.	New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Timing Restrictions - No construction, drilling, completion, plugging, seismic exploration, and workover activity from 11/1-3/31 for bald eagle.	Timing Restrictions - Same as Alternative A.	Timing Restrictions - Same as Alternative A.	Timing Restrictions - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire non-BLM inholdings.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Preclude ROW placement.	Preclude new ROWs from Negro Canyon drainage and on the NSO acreage in SMA. Permit ROWs on CSU acreage above the rim, on a case-by-case basis with site-specific stipulations that maintain recreation and natural values, VRM objectives, and wildlife habitat.	Preclude new ROWs from Negro Canyon drainage and on the unleased acreage in SMA. ROWs on CSU acreage same as Alternative B.	Same as Alternative C.

Negro Canyon			
OHV DESIGNATION			
Complete closed ORV designation and implementation plan.	Closed in Negro Canyon drainage. Limited to maintained roads and designated trail(s) above canyon rim.	Same as Alternative A.	Closed in Negro Canyon drainage. Limited to maintained roads above canyon rim.
VRM DESIGNATION			
Implement Class I objectives.	Same as Alternative A. No construction activity or equipment will be visible from Negro Canyon drainage.	Same as Alternative B.	Same as Alternative B.
WOOD CUTTING			
Close to wood cutting and gathering.	Close to all wood gathering and sales except for administrative needs with recreation and T&E staff approval.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis with stipulations and mitigation.	Close to vegetative sales. Vegetative treatments must benefit recreation, visual, and T&E values managed for and be approved by recreation and T&E staff. All reclamation activity in SMA will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at visitor use area, canyons, rim, and Bald Eagle ACEC boundary.
ROS			
Apply semi-primitive, non-motorized objectives.	Same as Alternative A in Negro Canyon drainage. Apply semi-primitive motorized objectives above the canyon rim.	Same as Alternative A.	Same as Alternative A.
SHOOTING			
No restrictions.	If recreational development occurs, restrictions would apply at developed areas.	Same as Alternative B.	Same as Alternative B.
WILDFIRE			
Apply limited/conditional wildfire suppression methods.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Negro Canyon			
SPECIAL DESIGNATION			
N/A. Negro Canyon SMA.	Same as Alternative A.	Change designation to an ACEC and rename as Negro Canyon Scenic Area.	Same as Alternative A.
Piñon Mesa			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 1,023 B: 936 M: 981	T: 9,454 B: 8,340 M: 8,489	T: 9,454 B: 8,340 M: 8,489
	Resource Value: Recreation.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. No new activity allowed for a distance of 100 feet on each side of the designated trail system. Exceptions granted by recreation staff on a case-by-case basis as determined by environmental review. This mgmt constraint would apply to any newly designated trails within SDA.	Leased Acreage - Same as alternative B. No new activity allowed for a distance of 300 feet on each side of the designated trail system.	Leased Acreage - Same as Alternative B. No new activity allowed for a distance of 150 feet on each side of the designated trail.
	New Leasing - CSU mgmt. constraints.	New Leasing - Same as Alternative B.	New Leasing - Same as Alternative B.
	Timing Restrictions - No construction, drilling, completion, plugging, seismic exploration, and workover activity allowed when they would interfere with authorized recreation events and from 3/1-6/30 for various raptor species protection and 3/1-8/1 for peregrine protection.	Timing Restrictions - Same as Alternative B.	Timing Restrictions - Same as Alternative B.
	Leasables and Salables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational, visual, and T&E values. No underground mining or development of other leasables and salables along the Piñon Mesa Trail Corridor would be permitted.	Close.	Same as Alternative C.

Piñon Mesa			
	Locatables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational, visual, and T&E values.	Withdraw.	Same as Alternative C.
	LAND OWNERSHIP		
	Acquisitions: Acquire easements and non-BLM inholdings.	Same as Alternative B.	Same as Alternative B.
	Disposals: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	ROWs granted on a case-by-case basis with site-specific stipulations that protect the trail system integrity, recreational, visual, and T&E values in SDA and provide for safety of users. No construction or maintenance activity allowed when it would interfere with authorized recreation events and from 3/1-6/30 for various raptor species protection and 3/1-8/1 for peregrine protection.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated trails, routes, ways, and areas.	Limited to maintained roads and designated trails.	Limited to maintained roads, designated trails, and routes.
	VRM DESIGNATION		
	Apply Class III objectives.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Close to all wood gathering and sales except for administrative needs with recreation and T&E staff approval.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Close to vegetative sales. Vegetative treatments must benefit recreation, visual, and T&E values managed for and be approved by recreation and T&E staff. All reclamation activity will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.

Piñon Mesa			
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	NOISE		
	No designation.	Designated Noise Sensitive Area. Standard will be applied at existing and newly designated trails and developed facilities. Compliance schedule for existing units: Year 3 for existing sources impacting designated trail system.	Designate receptor points at trail systems, developed facilities.
	ROS		
	Apply roaded natural objectives.	Same as Alternative B.	Same as Alternative B.
	SHOOTING		
	Developed areas closed to shooting. Remainder of SDA closed to shooting except for licensed hunters during designated hunting seasons.	Close to all shooting.	Same as Alternative B.
	TRAIL DESIGNATION		
	New trails may be designated in SDA based on inventory, and public demand after appropriate environmental analysis.	Same as Alternative B.	Same as Alternative B.
	BOUNDARY		
	Designation will be limited to the trail corridor (100 feet on each side of the trail).	Boundary as indicated on map.	Same as Alternative C.
	SEASONAL CLOSURES		
	Portions of SDA closed to recreational use impacting various raptor species; 3/1-6/30 and 3/1-8/1 for Peregrine.	Same as Alternative B.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Piñon Mesa Trail Corridor.	Delineate Piñon Mesa Recreation Area.	Same as Alternative C.

Rock Garden			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 284 B: 284 M: 284	T: 9,641 B: 8,403 M: 8,560	T: 9,641 B: 8,403 M: 8,560
	Resource Value: Recreation.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU mgmt. constraint. No new activity allowed for a distance of 50 feet on each side of the designated trail system. Exceptions granted by recreation staff on a case-by-case basis as determined by environmental review. This mgmt constraint would apply to any newly designated trails within SDA.	Leased Acreage - Same as Alternative B. No new activity allowed for a distance of 100 feet on each side of the designated trail system.	Leased Acreage - Same as Alternative C.
	New Leasing - CSU mgmt. constraints.	New Leasing - Same as Alternative B.	New Leasing - Same as Alternative B.
	Timing Restrictions - No construction, drilling, completion, plugging, seismic exploration, and workover activity allowed when they would interfere with authorized recreation events.	Timing Restrictions - Same as Alternative B.	Timing Restrictions - Same as Alternative B.
	Leasables and Salables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational values managed for.	Close.	Same as Alternative C.
	Locatables: Limited on case-by-case basis with site-specific stipulations that maintain trail system integrity and recreational values managed for.	Withdraw.	Same as Alternative C.
	LAND OWNERSHIP		
	Acquisitions: Acquire non-BLM inholdings.	Same as Alternative B.	Same as Alternative B.
	Disposals: Not available for disposal.	Same as Alternative B.	Same as Alternative B.

Rock Garden			
	ROWs		
	ROWs granted on a case-by-case basis with site-specific stipulations that protect the trail system integrity and values in SDA and provide for safety of users. No construction or maintenance activity allowed when it would interfere with authorized recreation events.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated trails, routes, ways, and areas.	Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
	VRM DESIGNATION		
	Apply Class IV objectives.	Apply Class III objectives.	Same as Alternative C.
	WOOD CUTTING		
	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Close to vegetative sales. Vegetative treatments must benefit recreation values managed for and be approved by recreation staff.	Same as Alternative B. All reclamation activity in SDA will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative C.
	LIVESTOCK GRAZING		
	Continue current permitting.	Same as Alternative B.	Same as Alternative B.
	ROS		
	Apply roaded natural objectives.	Same as Alternative B.	Same as Alternative B.
	SHOOTING		
	No shooting in developed recreation area.	Close entire SDA to shooting.	No shooting in developed recreation area. Remainder of SDA closed to shooting except for licensed hunters during designated hunting seasons.
	TRAIL DESIGNATION		
	New trails may be designated in SDA based on inventory, and public demand after appropriate environmental analysis.	Same as Alternative B.	Same as Alternative B.

Rock Garden			
	BOUNDARY		
	Boundary as indicated on map (defined by trail corridors only).	Enlarged boundary as indicated on map.	Same as Alternative C.
	SPECIAL DESIGNATION		
	Delineate Rock Garden Recreation Area.	Same as Alternative B.	Same as Alternative B.

Simon Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 3,928 B: 3,928[34] M: 3,685 (SMA) T: 3,714 B: 3,714[34] M: 3,714 (ACEC)	T: 3,928 B: 3,928[34] M: 3,685	T: 3,928 B: 3,928[34] M: 3,685	T: 3,928 B: 3,928[34] M: 3,685
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - NSO mgmt. constraint within the canyon drainage and bottom flatlands. CSU mgmt. constraint above the canyon rim.	Leased Acreage - Same as Alternative B.	Leased Acreage - Same as Alternative B.
New Leasing - Close to leasing.	New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Closed in canyon drainage and bottom flatlands. Considered in remainder of ACEC with approval by recreation staff and with mitigation/stipulations.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Withdraw minerals only in canyon drainage and bottom flatlands.	Same as Alternative A.	Same as Alternative A.
Mineral Acquisition: Mineral acquisition not pursued.	Same as Alternative A.	Acquire all non-federal minerals.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with stipulations and mitigation measures.	Precluded from Simon Canyon drainage. Granted in remainder of ACEC on a case-by-case basis with stipulations to maintain natural, recreation, and visual values.	Same as Alternative B.	Same as Alternative B.

Simon Canyon			
OHV DESIGNATION			
1,710 acres are closed from the canyon rim downward. OHV is limited to existing roads and trails for the 1,780 acres above the rim. Flatlands along the river (320 acres) limited to established, designated roads.	Closed in Simon Canyon drainage except for authorized use. In remainder of ACEC use will be limited to maintained roads, designated trails, routes, and ways.	Simon Canyon drainage - Same as Alternative B. In remainder of ACEC, use will be limited to maintained roads.	Same as Alternative C.
VRM DESIGNATION			
Implement Class II designation.	Same as Alternative A. No construction activity or equipment will be visible from Simon Canyon drainage.	Same as Alternative B.	Same as Alternative B.
WOOD CUTTING			
Close to fuelwood cutting and sales.	Close to all wood gathering and sales except for administrative needs with recreation staff approval.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Vegetative product sales not authorized.	Close to vegetative sales except for administrative needs. Vegetation treatments must benefit recreation experiences managed for and be approved by recreation staff. All reclamation in the ACEC will use **only** native species seed/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Continue current permitting; grazing allowed on the rim and prohibited in the flatlands and canyon bottom.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
None.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points on rim, canyon including ruin, bottom flatland.**
ROS			
Apply semi-primitive non-motorized objectives in the canyon. Apply semi-primitive motorized objectives above the rim.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Simon Canyon			
SHOOTING			
No shooting in the developed recreation area.	Same as Alternative A.	Same as Alternative A. No shooting in Simon Canyon drainage.	Same as Alternative C.
WILDFIRE			
Apply limited/conditional wildfire suppression methods.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Includes Simon Canyon Recreation Area SMA and Simon Canyon ACEC.	Add land within SMA (that is outside existing ACEC) to ACEC. Remove SMA designation and apply ACEC designation to expanded area. Change name to Simon Canyon ACEC.	Same as Alternative B.	Same as Alternative B.

Note: [34] Represents modified acreage based on more recent FFO information and is not reflected in BLM State Office GIS data. Updates of GIS data are in process.

Thomas Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 3,842 B: 3,204 M: 3,204	T: 15,644 B: 8,156 M: 12,775	T: 15,644 B: 8,156 M: 12,775	T: 15,644 B: 8,156 M: 12,775
Resource Value: Recreation.			
MINERALS			
Oil and Gas: Leased Acreage - Continue CSU mgmt. constraint.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
Unleased Acreage - Closed to leasing.	Unleased Acreage - NSO mgmt. constraint.	Unleased Acreage - Same as Alternative A.	Unleased Acreage - Same as Alternative A.
New Leasing - Closed to leasing.	New Leasing - NSO mgmt. constraint.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Timing Restrictions - None.	Timing Restrictions - No construction, drilling, plugging, seismic exploration, and workover activity allowed 11/01-4/15.	Timing Restrictions - Same as Alternative B.	Timing Restrictions - Same as Alternative B.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire non-BLM inholdings and easement.	Same as Alternative A. Expand boundary to the south.	Same as Alternative B.	Same as Alternative B.
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Thomas Canyon			
ROWs			
Preclude ROW placement.	Preclude new ROWs on the NSO acreage in SMA. ROWs on CSU acreage permitted on a case-by-case basis with site-specific stipulations that maintain recreation and natural values, VRM objectives, and wildlife habitat.	Preclude ROW placement on unleased acreage. ROWs on CSU acreage same as Alternative B.	Same as Alternative C.
OHV DESIGNATION			
Implement Thomas Canyon ORV Implementation Plan; close to all OHV travel.	Same as Alternative A in original SMA acreage. Limited to maintained roads in expanded SMA acreage.	Same as Alternative B.	Same as Alternative B.
VRM DESIGNATION			
Implement Class I objectives.	Same as Alternative A for original acreage. Designate expanded acreage as VRM III.	Same as Alternative B.	Same as Alternative B.
WOOD CUTTING			
Close to wood cutting and gathering.	Close to all wood gathering and sales except for administrative needs with recreation and wildlife staff approval.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Allowed on case-by-case basis with stipulations and mitigation.	Close to vegetative sales. Vegetative treatments must benefit recreation, visual, and wildlife values managed for and be approved by recreation and wildlife staff. All reclamation activity in SMA will use **only** native species seeds/plants unless approved by recreation staff.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Any grazing permits on original SMA acreage that are voluntarily relinquished or terminated will not be reissued.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area on original acreage. No designation on expanded acreage.	Same as Alternative C.

Thomas Canyon			
ROS			
Apply semi-primitive, non-motorized objectives.	Same as Alternative A in original acreage. Apply roaded natural objectives in expanded acreage.	Same as Alternative B.	Same as Alternative B.
SHOOTING			
No restrictions.	If recreational development occurs, restrictions would apply at developed areas.	Same as Alternative B.	Same as Alternative B.
WILDFIRE			
Apply limited/conditional wildfire suppression methods.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
N/A. Thomas Canyon SMA for protection of natural values and primitive recreational opportunities.	Same as Alternative A.	Same as Alternative A. Designate entire SMA as critical big game habitat. Rename as Thomas Canyon Natural/Wildlife Area.	Same as Alternative C.
RECREATIONAL DEVELOPMENTS			
None.	Possible development of hiking trail(s) and trailhead(s) for recreational access to SMA backcountry.	Same as Alternative B.	Same as Alternative B.

Riparian

Ephemeral Wash			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 7,499 B: 7,128 M: 7,159	T: 7,499 B: 7,331 M: 7,363	T: 7,499 B: 7,331 M: 7,363
	Resource Value: Riparian.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU stipulations.	NSO in active floodplain.	NSO in active floodplain, and CSU in 100-year floodplain.
	New Leasing - CSU stipulations.	NSO in 100-year floodplain, CSU elsewhere.	Same as Alternative C.
	Leasables and Salables: In 100-year floodplain, special stipulations and mitigation would apply.	Same as Alternative B.	Same as Alternative B.
	Locatables: In 100-year floodplain, special stipulations and mitigation would apply.	Same as Alternative B.	Same as Alternative B.
	Mineral Acquisition: Acquire non-federal minerals.	Same as Alternative B.	Same as Alternative B.

Ephemeral Wash			
	LAND OWNERSHIP		
	Acquisition: Acquire non-federal inholdings.	Same as Alternative B.	Same as Alternative B.
	Disposal: Not available for disposal.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Special stipulations and mitigation would apply.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limit to maintained roads, designated routes and trails.	Limit to maintained roads.	Same as Alternative B.
	VRM DESIGNATION		
	Class II, III, and IV.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Close to all wood cutting and gathering except for administrative purposes with approval of wildlife staff.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Vegetative management must benefit the values for which the SMA was established.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Ranges from no grazing where no authorized grazing already exists to dormant season grazing where permits do exist.	Close all areas to grazing.	Same as Alternative B.
	SPECIAL DESIGNATION		
	Delineate Ephemeral Wash Riparian Area.	Same as Alternative B.	Same as Alternative B.

Threatened and Endangered Species

Aztec Gilia			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 1,444 B: 1,081 M: 1,284	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Threatened and Endangered Species.			
MINERALS			
Oil and Gas: Leased Acreage - CSU with special protective stipulations.			
New Leasing - CSU with special protective stipulations.			
Leasables and Salables: Close to entry.			
Locatables: Withdraw from entry.			

Aztec Gilia			
LAND OWNERSHIP			
Acquisition: N/A.			
Disposal: Retain all public lands.			
ROWs			
New ROWs would be granted on a case-by-case basis with special stipulations and mitigating measures.			
OHV DESIGNATION			
Limited to designated roads.			
VRM DESIGNATION			
Class IV.			
WOOD CUTTING			
Closed to all wood cutting and gathering.			
VEGETATIVE MANAGEMENT			
Vegetative management practices should benefit habitat of Aztec gilia.			
LIVESTOCK GRAZING			
Open to livestock grazing.			
SPECIAL DESIGNATION			
Aztec Gilia ACEC.			

Bald Eagle			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 4,141 B: 3,880 M: 3,950	T: 4,141 B: 3,880 M: 3,950	T: 4,141 B: 3,880 M: 3,950	T: 4,141 B: 3,880 M: 3,950
Resource Value: Threatened and Endangered Species.			
MINERALS			
Oil and Gas: Leased Acreage - CSU stipulations. Timing limitations from 11/01-03/31.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Develop under CSU stipulations. Timing limitations from 11/01-03/31.	Same as Alternative A.	Develop timing limitations in designated buffer areas from 11/01-03/30 and no surface occupancy in designated core areas.	Same as Alternative C.
Leasables and Salables: Open to mineral entry with special stipulations.	Same as Alternative A.	Close to mineral entry	Same as Alternative C.
Locatables: Open to mineral entry.	Same as Alternative A.	Withdraw from mineral entry.	Same as Alternative C.
Mineral Acquisition: Do not acquire non-federal minerals.	Same as Alternative A.	Acquire non-federal minerals.	Same as Alternative C.

Bald Eagle			
LAND OWNERSHIP			
Acquisition: Acquire non-federal inholdings.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with special stipulations and mitigation in designated buffer areas. Closed in core areas.	Same as Alternative A.	New ROWs must be placed in existing ROW/easement disturbance.	Same as Alternative A.
OHV DESIGNATION			
Limited to existing roads and trails.	Same as Alternative A.	Limited to maintained roads, designated routes, and trails.	Same as Alternative A.
VRM DESIGNATION			
Animas Units: Class II. Navajo Lake Units: Class II.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to wood cutting and gathering.	Close to wood cutting and gathering except for administrative purposes with approval of wildlife staff.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Apply limited/conditional fire suppression.	Same as Alternative A.	Any vegetative management must benefit the purpose of the ACEC. Every effort will be made to control fire to protect the large standing Ponderosa pine and Douglas-fir.	Same as Alternative C.
LIVESTOCK GRAZING			
Open to livestock grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
None.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Designate receptor points at eagle roosts and core areas.**
SPECIAL DESIGNATION			
Bald Eagle ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

The Hogback			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 10,367 B: 9,290 M: 9,497	T: 10,367 B: 9,290 M: 9,497	T: 10,367 B: 9,290 M: 9,497	T: 10,367 B: 9,290 M: 9,497
Resource Value: Threatened and Endangered Species.			
MINERALS			
Oil and Gas: Leased Acreage - CSU stipulations.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

The Hogback			
New Leasing - Closed to new leasing.	CSU stipulation on new leasing.	Same as Alternative A.	Same as Alternative A.
Unleased Acreage: Closed to leasing.	Apply special stipulations and mitigation measures.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Mineral Acquisition: Acquire non-federal minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire non-federal inholdings and acquire easements.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case basis with stipulations and mitigation measures.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Limited to designated roads and trails.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Class II and III.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Open to wood cutting and gathering.	Same as Alternative A.	Close to wood cutting and gathering except for administrative purposes with approval of wildlife staff.	Same as Alternative C.
VEGETATIVE MANAGEMENT			
Apply limited fire suppression.	Same as Alternative A with the addition of invasive weed management.	Same as Alternative A with the addition of invasive weed management.	Same as Alternative A with the addition of invasive weed management.
LIVESTOCK GRAZING			
Open to grazing permits.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
The Hogback ACEC.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Mexican Spotted Owl			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: 2,758 B: 2,618 M: 2,758	T: 2,758 B: 2,618 M: 2,758	T: 2,758 B: 2,618 M: 2,758
See Laguna Seca Mesa (Forestry)	**Resource Value:** Threatened and Endangered Species.		
	MINERALS		
	Oil and Gas: Leased Acreage - CSU with NSO on 90 acres of mixed conifer habitat designated by BLM.	Same as Alternative B.	Same as Alternative B.

Mexican Spotted Owl			
	New Leasing - CSU with NSO on 90 acres of mixed conifer habitat designated by BLM.	Same as Alternative B.	Same as Alternative B.
	Leasables and Salables: Controlled surface use.	Same as Alternative B.	Same as Alternative B.
	Locatables: Open.	Same as Alternative B.	Same as Alternative B.
	LAND OWNERSHIP		
	Acquisition: Acquire in-holdings within the SMA.	Same as Alternative B.	Same as Alternative B.
	Disposal: Retain all public lands.	Same as Alternative B.	Same as Alternative B.
	ROWs		
	Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative B.	Same as Alternative B.
	OHV DESIGNATION		
	Limited to maintained roads, designated routes, and trails.	Same as Alternative B.	Same as Alternative B.
	VRM DESIGNATION		
	Class IV.	Same as Alternative B.	Same as Alternative B.
	WOOD CUTTING		
	Allow the cutting/collection of firewood with a valid permit except in 90 acres of designated mixed conifer habitat.	Same as Alternative B.	Same as Alternative B.
	VEGETATIVE MANAGEMENT		
	Management of the ACEC emphasizes protection of Mexican Spotted Owl mixed conifer habitat in 90 acres designated by USFWS. Other goals considered are forest development and the maintenance and/or improvement of the wildlife habitat. Limited fire suppression would apply.	Same as Alternative B.	Same as Alternative B.
	LIVESTOCK GRAZING		
	Open to grazing.	Same as Alternative B.	Same as Alternative B.
	NOISE		
	None.	Designate as Noise Sensitive Area.	Designate receptor points at defined sites.
	SPECIAL DESIGNATION		
	Expand Laguna Seca Mesa SMA and designate Mexican Spotted Owl ACEC.	Same as Alternative B.	Same as Alternative B.

Reese Canyon			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 2,344 B: 2,299 M: 2,338	T: 2,344 B: 2,299 M: 2,338	T: 2,344 B: 2,299 M: 2,338	T: 2,344 B: 2,299 M: 2,338
Resource Value: Threatened and Endangered Species.			
MINERALS			
Oil and Gas: Leased Acreage - CSU stipulations.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Closed to new leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Closed.	Require special stipulations and mitigation.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Require special stipulations and mitigation.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
ROWs permitted with special stipulations.	Same as Alternative A.	ROWs permitted with special stipulations and mitigation.	Same as Alternative C.
OHV DESIGNATION			
Eastern portion closed. Western portion limited to existing roads and trails.	Eastern portion limited to designated roads; western portion limited to maintained roads, designated routes and trails.	Same as Alternative A.	Limited to maintained roads for the entire area.
VRM DESIGNATION			
Class II.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Closed to wood cutting and gathering.	Same as Alternative A except for administrative purposes with approval of wildlife staff.	Same as Alternative A.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Apply limited fire suppression.	Same as Alternative A.	Vegetative management should benefit the purpose of the RNA. Apply limited fire suppression.	Same as Alternative C.
LIVESTOCK GRAZING			
Open to grazing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
None.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at identified cliff habitat.
SPECIAL DESIGNATION			
Reese Canyon RNA.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

River Tracts			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 2,796 B: 2,572 M: 2,699	T: 2,796 B: 2,572 M: 2,699	T: 2,796 B: 2,572 M: 2,699	T: 2,796 B: 2,572 M: 2,699
Resource Value: Threatened and Endangered Species.			
MINERALS			
Oil and Gas: Leased Acreage - Manage under a CSU management constraint stipulation.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Manage under NSO.	CSU stipulation.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw minerals.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisition: Acquire easement and non-BLM in-holdings.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Disposal: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Permitted on a case-by-case with stipulations and mitigating measures.	Same as Alternative A.	No new ROWs.	Same as Alternative A.
OHV DESIGNATION			
Limited to designated roads.	Limited to designated roads and trails.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Apply Class II and III objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Close to wood cutting and gathering.	Close to wood cutting and gathering except for administrative purposes with approval of wildlife staff.	Same as Alternative B.	Same as Alternative B.
VEGETATIVE MANAGEMENT			
Apply limited fire suppression.	Vegetative management must benefit the riparian values being protected. Every effort will be made to control fire in the river tracts to protect the large standing cottonwood trees and established stands of willow.	Same as Alternative B.	Same as Alternative B.
LIVESTOCK GRAZING			
Open to grazing.	Same as Alternative A.	If permits are relinquished or cancelled, the area will be withdrawn from grazing.	Same as Alternative C.

River Tracts			
NOISE			
None.	Same as Alternative A.	Designate as Noise Sensitive Area.	Designate receptor points at southwestern willow flycatcher habitat boundary.
SPECIAL DESIGNATION			
River Tracts Riparian Area.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Watershed Protection

Farmington Lake Watershed			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 1,445 B: 778 M: 1,082	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Watershed Protection.			
MINERALS			
Oil and Gas: Leased Acreage - CSU stipulations.			
New Leasing - CSU stipulations.			
Leasables and Salables: Open to leasables and salables.			
Locatables: Open.			
LAND OWNERSHIP			
Acquisition: None.			
Disposal: Not available for disposal.			
ROWs			
Special stipulations and mitigation.			
OHV DESIGNATION			
Limited to existing roads and trails.			
VRM DESIGNATION			
Class III.			
WOOD CUTTING			
Open to wood cutting and gathering.			
VEGETATIVE MANAGEMENT			
Vegetative management must benefit the watershed.			
LIVESTOCK GRAZING			
Open to livestock grazing.			

Wilderness

Ah-shi-sle-pah			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 6,592 B: 6,516 M: 6,552	T: 6,592 B: 6,516 M: 6,552	T: 6,592 B: 6,516 M: 6,552	T: 6,592 B: 6,516 M: 6,552
Resource Value: Wilderness.			
MINERALS			
Oil and Gas: Leased Acreage - Continue management under BLM guidelines for WSAs until Congressional determination on wilderness status.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Unleased Acreage - Closed to leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
New Leasing - Closed to leasing.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Leasables and Salables: Manage under BLM guidelines for WSAs until Congressional determination on wilderness status.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Manage under BLM guidelines for WSAs until Congressional determination on wilderness status.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Subject to Navajo and Hopi Indian Relocation Act.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Preclude ROW placement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV			
Closed to motorized and mechanized equipment.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM			
Implement Class I objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Close to wood cutting and gathering.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetative gathering and sales. Vegetative treatments for the control of noxious weeds may occur in accordance with existing laws, using nonimpairment concept.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Ah-shi-sle-pah			
LIVESTOCK GRAZING			
Continue current permitting.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Same as Alternative C.**
ROS			
Apply semi-primitive non motorized objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SHOOTING			
No shooting in developed areas.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
COLLECTION			
Collection of paleontological resources prohibited except by permit. Permits granted only for scientific endeavors. Collection of all other resources is prohibited except where otherwise authorized by law or policy.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SPECIAL DESIGNATION			
Ah-shi-sle-pah WSA.	Add designation as ACEC to protect natural, paleontological, visual, and primitive recreational values.	Same as Alternative B.	Same as Alternative B.

Bisti/De-Na-Zin			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 44,792 B: 38,381 M: 39,047	T: 44,792 B: 38,381 M: 39,047	T: 44,792 B: 38,381 M: 39,047	T: 44,792 B: 38,381 M: 39,047
Resource Value: Wilderness.			
MINERALS			
Oil and Gas: Leased Acreage - Development would occur as directed by enabling legislation.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.	Leased Acreage - Same as Alternative A.
Unleased Acreage - Closed to leasing.	Unleased Acreage - Same as Alternative A.	Unleased Acreage - Same as Alternative A.	Unleased Acreage - Same as Alternative A.
New Leasing - Closed to leasing.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.	New Leasing - Same as Alternative A.
Leasables and Salables: Close.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Locatables: Withdraw.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LAND OWNERSHIP			
Acquisitions: Acquire non-BLM inholdings.	Same as Alternative A. Acquire adjacent land to increase manageability of wilderness.	Same as Alternative B.	Same as Alternative B.

Bisti/De-Na-Zin			
Disposals: Not available for disposal.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
ROWs			
Preclude ROW placement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
OHV DESIGNATION			
Closed to motorized and mechanized equipment	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VRM DESIGNATION			
Implement Class I objectives and Federal Class II air quality standards.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
WOOD CUTTING			
Close to wood cutting and gathering.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
VEGETATIVE MANAGEMENT			
Closed to vegetative gathering and sales. Vegetative treatments for the control of noxious weed may be done in accordance with existing laws, using the minimum tool concept.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
LIVESTOCK GRAZING			
Continue current permitting. Should permits be voluntarily relinquished or exchanged new grazing permits would not be issued.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
NOISE			
No designation.	Same as Alternative A.	Designate as Noise Sensitive Area.**	Same as Alternative C.**
ROS			
Apply semi-primitive, non-motorized and motorized objectives.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
SHOOTING			
No shooting in developed areas.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
COLLECTION			
Collection of paleontological resources is prohibited except by permit. Permits only granted for scientific endeavors. Collection of all other resources is prohibited except where otherwise authorized by law or policy.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.

Bisti/De-Na-Zin			
SPECIAL DESIGNATION			
Bisti/De-Na-Zin WA. Retain designations for Badlands, Log Jam, and Lost Pine ACECs.	Remove designations for Badlands, Log Jam, and Lost Pine ACECs.	Same as Alternative B.	Same as Alternative B.

Wildlife

Angel Peak Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 51,093 B: 42,612 M: 43,104	T: N/A B: N/A M: N/A
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Drilling/construction activity during the antelope fawning period (5/1-7/15) will be coordinated with the BLM so as to minimize disturbance to the antelope.	
		New Leasing - CSU.	
		Leasables and Salables: Controlled surface use.	
		Locatables: Open.	
		Mineral Acquisition: N/A.	
		LAND OWNERSHIP	
		Acquisition: Acquire private, and state lands within the SMA.	
		Disposal: Retain all public lands.	
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	
		VRM DESIGNATION	
		Class III and IV.	

Angel Peak Wildlife Area			
		VEGETATIVE MANAGEMENT	
		Manage vegetation to provide for the needs of antelope, scaled and Gambel's quail, and various neo-tropical migratory songbirds that are either largely dependent upon either sage or grass dominated sites. Apply limited fire suppression.	
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	
		SPECIAL DESIGNATION	
		Delineate Angel Peak Wildlife Area.	
Cereza Canyon Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 45,266 B: 17,912 M: 27,868	T: 45,266 B: 17,912 M: 27,868
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	Same as Alternative C.
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		Mineral Acquisition: N/A.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class IV.	Same as Alternative C.

Cereza Canyon Wildlife Area			
		WOOD CUTTING	
		Allow the cutting/collection of firewood with a valid permit.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage vegetation to provide for the needs of wintering deer and elk. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Cereza Canyon Wildlife Area.	Same as Alternative C.
Cox Canyon Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 17,347 B: 10,949 M: 13,496	T: N/A B: N/A M: N/A
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	
		New Leasing - CSU.	
		Leasables and Salables: Controlled surface use.	
		Locatables: Open.	
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	
		Disposal: Retain all public lands.	
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	
		VRM DESIGNATION	
		Class III.	

Cox Canyon Wildlife Area			
		WOOD CUTTING	
		Allow the cutting/collection of firewood with a valid permit.	
		VEGETATIVE MANAGEMENT	
		Manage key browse species for wintering deer. Apply limited fire suppression.	
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	
		SPECIAL DESIGNATION	
		Delineate Cox Canyon Wildlife Area.	

Critical Big Game Habitat Management Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: 157,210 B:127,673 M:130,320	T: 157,210 B:127,673 M:130,320	T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A
Resource Value: Wildlife.			
MINERALS			
Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-3/31.	Same Alternative A.		
New Leasing - Seasonal restrictions on drilling and construction from 12/01-3/31.	Same Alternative A.		

Crow Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 38,252 B: 34,189 M: 34,264	T: 38,252 B: 34,189 M: 34,264
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	Same as Alternative C.
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.

Crow Mesa Wildlife Area			
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class III and IV.	Same as Alternative C.
		WOOD CUTTING	
		Allow limited firewood cutting.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage browse species such as antelope bitterbrush, big sagebrush, and mountain mahogany to provide for the fall/winter use of deer. Maintain adequate herbaceous forage for elk use year-long and spring/summer deer use. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		By signed agreement, approximately 14,000 acres of the SMA has been retired from livestock grazing. The remainder of the SMA will continue permitted livestock grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Crow Mesa Wildlife Area.	Same as Alternative C.
Delgadito Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 35,489 B: 31,971 M: 34,263	T: N/A B: N/A M: N/A
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	
		New Leasing - CSU.	

Delgadito Mesa Wildlife Area			
		Leasables and Salables: Controlled surface use.	
		Locatables: Open.	
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	
		Disposal: Retain all public lands.	
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	
		VRM DESIGNATION	
		Class III and IV.	
		WOOD CUTTING	
		Allow the cutting/collection of firewood with a valid permit.	
		VEGETATIVE MANAGEMENT	
		Manage key browse species such as antelope bitterbrush, big sagebrush, and mountain mahogany to provide for the needs of resident and migratory deer and elk. Apply limited fire suppression.	
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	
		SPECIAL DESIGNATION	
		Delineate Delgadito Mesa Wildlife Area.	
East La Plata Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 7,159 B: 5,895 M: 5,814	T: 7,159 B: 5,895 M: 5,814
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	Same as Alternative C.
		New Leasing - Close to new leasing.	Same as Alternative C.

East La Plata Wildlife Area			
		Leasables and Salables: Close.	Same as Alternative C.
		Locatables: Open	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire private lands within and immediately adjacent (1-mile radius) to the SMA.	Same as Alternative C.
		Disposal: Retain public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class III.	Same as Alternative C.
		WOOD CUTTING	
		Closed to firewood cutting.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage key browse species to meet the needs of winter deer use. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue livestock grazing retirement on old East Stateline Grazing Allotment. Continue to authorize livestock grazing on portion of SMA in the Farmington Glade Grazing Allotment.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate East La Plata Wildlife Area.	Same as Alternative C.

Ensenada Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 51,280 B: 43,179 M: 45,767	T: 51,280 B: 43,179 M: 45,767
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-7/15.	Seasonal restriction on drilling and construction from 05/01-07/15.

Ensenada Mesa Wildlife Area			
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class III and IV.	Same as Alternative C.
		WOOD CUTTING	
		Allow the cutting/collection of firewood with a valid permit.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage vegetation to meet the needs of year-long antelope, deer, and elk use. The primary focus in this SMA will be to increase the resident antelope population to where it is self-sustaining. The forage needs of resident and migratory deer and elk are also of concern. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Ensenada Mesa Wildlife Area.	Same as Alternative C.

Gonzales Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 7,499 B: 6,076 M: 6,103	T: 7,499 B: 6,076 M: 6,103
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	Same as Alternative C.
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class III and IV.	Same as Alternative C.
		WOOD CUTTING	
		Closed to firewood cutting/gathering.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage vegetation such as big sagebrush and antelope bitterbrush to meet the needs of wintering deer. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Gonzales Mesa Wildlife Area.	Same as Alternative C.

Laguna Seca Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 9,211 B: 7,460 M: 8,124	T: 9,211 B: 7,460 M: 8,124
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-06/15.	Same as Alternative C.
		New Leasing - Controlled surface use.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		Mineral Acquisition: N/A.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class IV.	Same as Alternative C.
		WOOD CUTTING	
		Allow the cutting/collection of firewood with a valid permit.	Same as Alternative C.

Laguna Seca Mesa Wildlife Area			
		VEGETATIVE MANAGEMENT	
		This is important habitat for wild turkey, deer, elk, bear and Abert's squirrels. A diverse compliment of vegetation should be maintained to provide for the year-long needs of these animals. Mature Gambel's oak should be maintained for its mast production while key browse such as bitterbrush and mountain mahogany should be maintained for deer/elk winter use. Sufficient herbaceous production should also be provided for spring/summer use by deer and turkeys and year-long elk use. Mature ponderosa pine should be maintained for turkey roosting and nesting by Abert's squirrels. That portion of the SMA designated as critical habitat for the Mexican Spotted Owl will be managed in accordance with protocol contained in the recovery plan. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Open to grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Laguna Seca Mesa Wildlife Area.	Same as Alternative C.
Manzanares Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 9,642 B: 8,238 M: 9,007	T: N/A B: N/A M: N/A
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	
		New Leasing - CSU.	
		Leasables and Salables: Controlled surface use.	

Manzanares Mesa Wildlife Area			
		Locatables: Open.	
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	
		Disposal: Retain all public lands.	
		ROWs	
		Allow on case-by-case basis with proper mitigation.	
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	
		VRM DESIGNATION	
		Class III.	
		WOOD CUTTING	
		Allow the cutting/collection of firewood with a valid permit.	
		VEGETATIVE MANAGEMENT	
		Manage key browse species such as antelope bitterbrush, mountain mahogany, and big sagebrush for the benefit of wintering deer and elk. Apply limited fire suppression.	
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	
		SPECIAL DESIGNATION	
		Delineate Manzanares Mesa Wildlife Area.	
Middle Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 46,052 B: 31,390 M: 40,317	T: 46,052 B: 31,390 M: 40,317
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31.	Same as Alternative C.
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		Mineral Acquisition: N/A.	Same as Alternative C.

Middle Mesa Wildlife Area			
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class II and III.	Same as Alternative C.
		WOOD CUTTING	
		Allow public wood collection with proper permit.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage key browse species (e.g., antelope bitterbrush, big sagebrush, and mountain mahogany) to meet the needs of wintering deer. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Middle Mesa Wildlife Area.	Same as Alternative C.
Rattlesnake Canyon Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 110,160 B: 89,173 M: 98,276	T: 110,160 B: 89,173 M: 98,276
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Prohibit drilling/construction during 12/01-06/15.	Seasonal restriction on drilling and construction from 12/01-03/31.
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.

Rattlesnake Canyon Wildlife Area			
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SDA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class III and IV.	Same as Alternative C.
		WOOD CUTTING	
		Allow public wood collection with proper permit.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage key browse species such as antelope bitterbrush, mountain mahogany and big sagebrush to meet the needs of wintering deer. Manage for mature Gambel's oak to provide mast for fall/winter use by wild turkeys. Maintain mature ponderosa and piñon pine for potential turkey roosting. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing.	Same as Alternative C.
		SPECIAL DESIGNATION	
		Delineate Rattlesnake Canyon Wildlife Area.	Same as Alternative C.

Rosa Mesa Wildlife Area			
Alternative A	**Alternative B**	**Alternative C**	**Alternative D**
T: N/A B: N/A M: N/A	T: N/A B: N/A M: N/A	T: 110,785 B: 68,103 M: 98,173	T: 69,762 B: 47,375 M: 61,406
		Resource Value: Wildlife.	
		MINERALS	
		Oil and Gas: Leased Acreage - Seasonal restriction on drilling and construction from 12/01-03/31 in the area north of State Highway 64 and east of State Highway 539 and south of Cabresto/Bancos Canyons.	Seasonal restriction on drilling and construction from 12/01-03/31 in the area north of Frances Mesa Wash and south of Cabresto/Bancos Canyons.
		New Leasing - CSU.	Same as Alternative C.
		Leasables and Salables: Controlled surface use.	Same as Alternative C.
		Locatables: Open.	Same as Alternative C.
		LAND OWNERSHIP	
		Acquisition: Acquire in-holdings within the SMA.	Same as Alternative C.
		Disposal: Retain all public lands.	Same as Alternative C.
		ROWs	
		Allow on case-by-case basis with special stipulations and mitigation.	Same as Alternative C.
		OHV DESIGNATION	
		Limited to maintained roads, designated routes, and trails.	Same as Alternative C.
		VRM DESIGNATION	
		Class II and IV.	Same as Alternative C.
		WOOD CUTTING	
		Allow public wood collection with proper permit.	Same as Alternative C.
		VEGETATIVE MANAGEMENT	
		Manage key browse species such as big sagebrush, antelope bitterbrush, and mountain mahogany to meet the needs of wintering deer. Apply limited fire suppression.	Same as Alternative C.
		LIVESTOCK GRAZING	
		Continue permitted livestock grazing area.	Same as Alternative C.

Rosa Mesa Wildlife Area			
		SPECIAL DESIGNATION	
		Delineate Rosa Mesa Wildlife Area.	Same as Alternative C.

CHAPTER 3
AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the setting of the planning area and the current condition of the environment by resource. This information provides the basis for evaluating potential changes in land management under each alternative.

CLIMATE

The climate of the planning area is classified as arid Continental, characterized by cool, dry winters and warm dry summers. The large distance from any source of oceanic moisture creates a climate of abundant sunshine and large diurnal variations in temperature.

Due to its location in the Southern Rocky Mountains, wintertime Pacific storm systems borne by westerly winds lose much of their moisture prior to passing through the region. The peak precipitation season occurs during late summer and early fall, when moisture moves into the region from the Gulf of Mexico in association with the western extension of the Bermuda High. Data from the New Mexico State University Agricultural Science Center at Farmington from 1978 through 2000 are used to characterize the planning area climate (WRCC 2001). However, the more mountainous and elevated portions of the project region experience wetter and colder conditions than those that occur at Farmington.

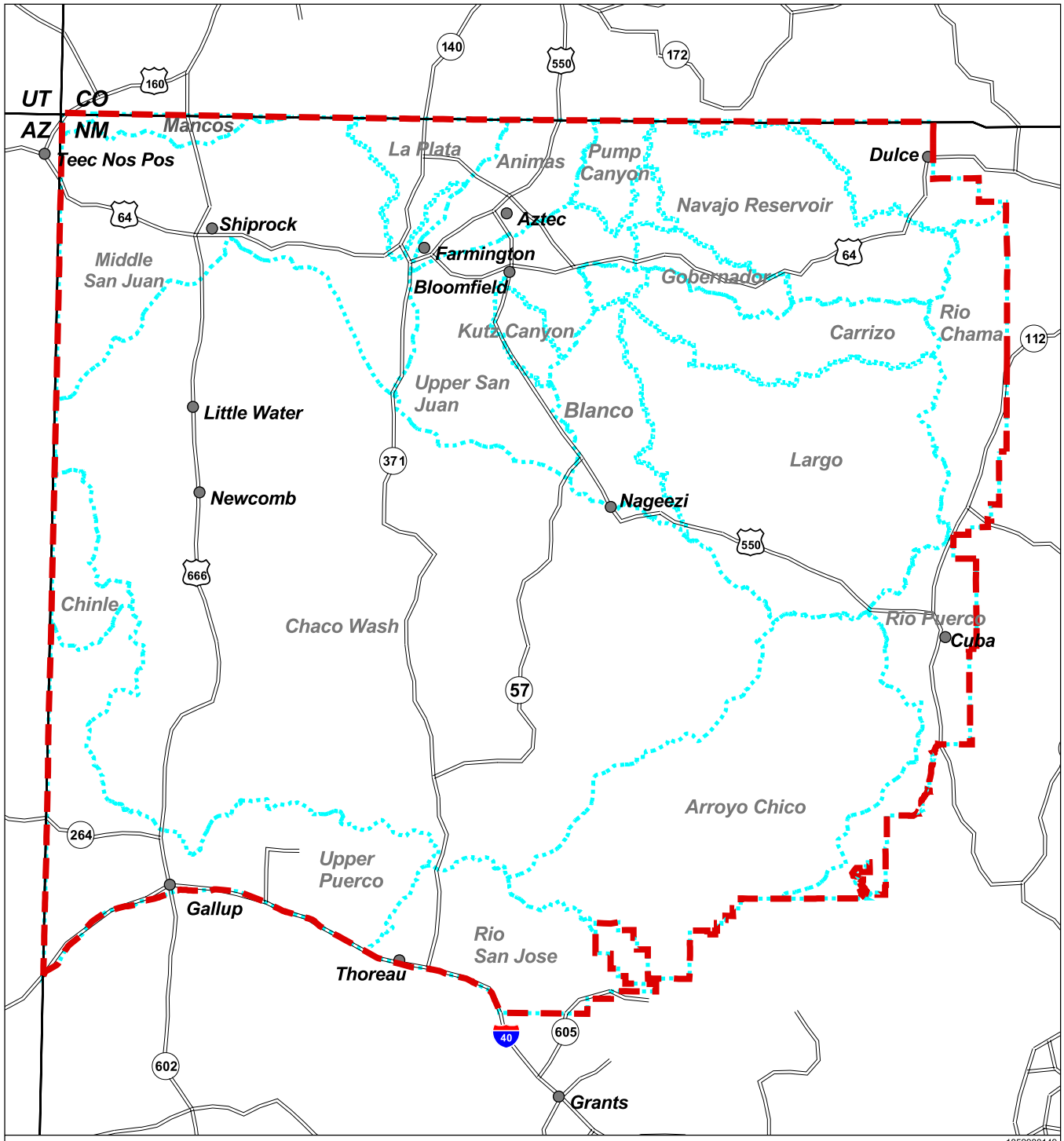
The annual precipitation at Farmington is 8.8 inches. The driest and wettest months are June and August, when 0.3 and 1.2 inches of rain occur, respectively. The average high and low temperatures at Farmington in August are 90 and 59 degrees Fahrenheit (° F), respectively. The January average high and low temperatures are 42 and 19° F.

The large-scale winds within the region tend to prevail from the southwest and westerly directions during the daytime hours for much of the year. However, local wind conditions can vary substantially from this general pattern throughout the planning area, due to the effects of topography channeling and mountain-valley circulations. For example, data collected at the New Mexico Air Quality Bureau (NMAQB) Bloomfield air quality monitoring station shows a high frequency of easterly and westerly winds (NMAQB 1997). This is due to the presence of the east-west aligned San Juan River Valley, which forces winds up the valley during daytime heating and down the valley at night, as cold air drains down this topographic depression. Additionally, winds at this station prevail from the north in association with nighttime drainage winds that flow down the localized sloping terrain at this site.

TOPOGRAPHY AND WATERSHEDS

Extremes in topographic relief exist in the planning area, including areas of broad mesas interspersed with many deep canyons with steep canyon walls, dry washes, entrenched narrow valleys, and alluvial fans and floodplains, extending on both sides of the Continental Divide. Elevations range from approximately 4,800 feet, where the San Juan River flows into Utah, to approximately 9,400 feet in the Chuska Mountains, 8,800 feet near the Jicarilla Apache land, and 7,300 feet near Cuba on the eastern side of the Continental Divide.

The planning area has been divided into watersheds for characterizing topography, soils, vegetation, and water resources. The watersheds were generated based on the Hydrologic Units (4th level) delineated by the USGS, with some subwatersheds further subdivided as necessary to correspond to the management units used by FFO staff in managing natural resources. **Map 3-1** shows the location and extent of the watersheds and subwatersheds delineated in the planning area. In the text, the term "watershed" is used to apply to the smallest named unit and could refer to either a watershed or subwatershed.



LEGEND

- RMP/EIS Boundary
- Watershed/Subwatershed
- Major Road
- Town
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: BLM 2000

Map 3-1: Watersheds and Subwatersheds in the Planning Area

A list of the watershed names, acreage, average slopes, existing wells, road density, and surface disturbance due to roads and wells in each watershed is shown in **Table 3-1**.

Table 3-1. Watersheds in the Planning Area

Watershed Name	Acres	Acres Disturbed	Existing Wells	Percent Disturbed (roads, wells)	Road Density (mi/mi^2)[1]
Animas	144,584	8,668	1,751	6.0	4.2
Arroyo Chico	782,484	4,912	0	0.6	1.1
Blanco	163,658	5,100	1,041	3.1	2.1
Carrizo	208,825	8,361	1,834	4.0	2.4
Chaco Wash	2,918,965	28,999	30	1.0	1.7
Chinle	92,926	1,228	0	1.3	2.3
Gobernador	71,251	3,202	753	4.5	2.3
Kutz Canyon	41,398	2,262	525	5.5	2.9
La Plata	114,841	3,612	687	3.1	2.4
Largo	723,415	24,667	4,783	3.4	2.5
Mancos	38,028	378	0	1.0	1.8
Middle San Juan	673,450	10,084	600	1.5	2.2
Navajo Reservoir	378,389	7,951	1,334	2.1	1.8
Pump Canyon	61,964	2,493	581	4.0	2.1
Rio Chama	218,452	2,199	52	1.0	1.6
Rio Puerco	234,490	1,838	1	0.8	1.4
Rio San Jose	254,614	3,263	1	1.3	2.3
Upper Puerco	525,711	6,696	3	1.3	2.2
Upper San Juan	657,318	24,978	3,853	3.8	3.5

Source: Derived from USGS digital elevation data and USEPA stream data.
Note: (1) mi/mi^2 = miles per square miles.

Sediment yield is an indicator of the stability of a watershed and the effect surface disturbance would have on water quality. Using a GIS tool called Soil-Water Analysis Tool (SWAT), developed by the Natural Resources Conservation Service (Arnold et al. 2000), sediment yield was calculated for three watersheds in the planning area that represent a range of land uses and surface disturbance. Sediment yield was generated using the current BLM roads coverage. The coverage does not include all of the access roads to individual oil and gas well pads, so actual road density and sediment yield values in the high production oil and gas areas are somewhat higher than calculated, but estimates provide a reasonable basis for evaluating the potential increase in sediment yield as a result of increased surface disturbance if additional wells and roads are installed.

Chaco Wash watershed was selected to represent the part of the planning area with little oil and gas activity and with a lower road density. It is fairly homogenous in land use, mainly rangeland. The Chaco Wash watershed contains 30 wells, and a road density of 1.7 miles per square mile. Approximately 1 percent of its area has surface disturbance due to well

pads and roads. The average sediment yield from this watershed is estimated at 5.8 tons/acre/year.

The Pump Canyon watershed was selected to represent an area with urban land uses, agriculture, and oil and gas development. It contains 581 wells and 2.1 miles per square mile of roads. Approximately 4 percent of its area has surface disturbance due to well pads and roads. The average sediment yield from this watershed is estimated at 35.2 tons/acre/year.

The Largo watershed was selected to represent a high intensity oil and gas development area that is mainly woodland and rangeland and extends onto USFS land. It contains 4,783 wells and 2.5 miles per square mile of roads. Approximately 3.4 percent of its area has surface disturbance due to well pads and roads. It is likely that the road density of this watershed is higher, due to the large number of wells, but based on current GIS data the average sediment yield is estimated at 2.1 tons/acre/year.

GEOLOGY AND MINERALS

Physiography and General Geology

Although most of northwestern New Mexico is in the Colorado Plateau, the San Juan Basin is the dominant feature of the planning area. The San Juan Basin is an asymmetrical syncline that extends from northwestern New Mexico into southwestern Colorado. Roughly circular in shape, it is approximately 200 miles long (north to south) and 130 miles wide, including its Colorado portion. The San Juan Basin covers approximately 15,000 to 25,000 square miles. The surficial geology of the San Juan Basin consists primarily of Quaternary to Cretaceous-aged alluvium (unconsolidated silts, sands, clays, and gravels), sandstones, siltstones, shales, limestones, conglomerates, and coal.

The central part of the San Juan Basin is a dissected plateau, gently dipping to the west. Stream erosion has formed deep, steep-sided canyons. Nearly all of the formations in the San Juan Basin can be observed on the surface because of the geologic structure and topographic relief.

Structural Characteristics

The San Juan Basin is bordered on the west by the Defiance Uplift and the Chuska Mountains, on the north by the San Juan dome, on the south by the Chaco slope and the Zuni Uplift, and on the east by the Nacimiento uplift (BLM 2000d) (**Figure 3-1**). The Hogback monocline separates the San Juan Basin to the east from the Four Corners Platform, a structural divide that forms the northwestern border of the San Juan Basin. The Hogback monocline is a horseshoe-shaped feature that rims the San Juan Basin on the northwest and north sides, with a maximum elevational rise of 700 feet above the surrounding area. Its strata dip at moderate angles to the east, southeast, and south. The western flank of the San Juan Basin merges with the eastern edge of the Defiance Uplift of northeastern Arizona. There are no sharp structural boundaries in the southern and southwestern parts of the San Juan Basin. Basement rock outcrops, including the eroded cores of the Zuni, Jemez, and Nacimiento uplifts, form the edge of the San Juan Basin to the south and east.

Cretaceous formations were downwarped into the San Juan Basin during the late Cretaceous until the early Tertiary Laramide tectonic event. By the end of the Laramide uplift, Cretaceous rocks reached their maximum depth of burial, and the San Juan Basin achieved its current structural configuration (**Figure 3-2**). Subsequent regional heating enhanced the thermal maturation of deeply buried organic matter to a level that generated gas in the center of the San Juan Basin and oil at the San Juan Basin margins (Engler et al. 2001). Although there are some anticlinal structures on the margins of the San Juan Basin, hydrocarbons in the San Juan Basin developed in stratigraphic traps.

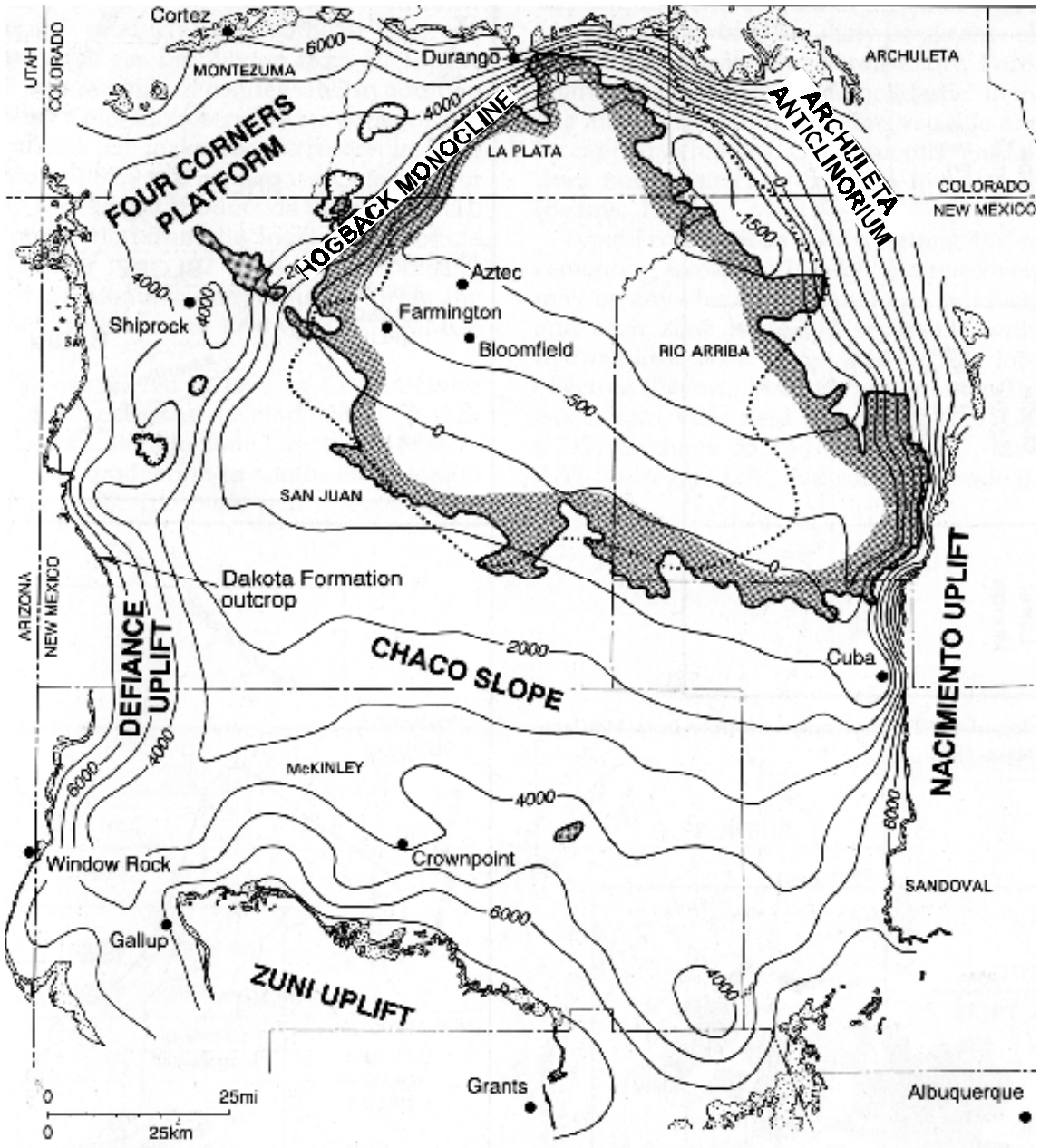


Figure 3-1. Plan View of the San Juan Basin Showing Structural Features

Source: Engler et al. 2001.

Era	System		Formation	Thickness	Production
CENOZOIC	TERTIARY		San Jose Formation	2500 ft.	Gas
			Nacimiento Formation	500-1300 ft.	Gas
			Ojo Alamo Sandstone	250 ft.	Gas
MESOZOIC	CRETACEOUS		Kirtland Shale / Farmington Sandstone	1500 ft.	Gas/Oil
			Fruitland Formation	500 ft.	Gas
			Pictured Cliffs Sandstone	250 ft.	Gas
			Lewis Shale / Huerfanito Bentonite	500-1900 ft.	Gas
		Mesaverde Group	Cliff House Sandstone	0-800 ft.	Gas
			Menefee Formation	350-2200 ft.	Gas
			Point Lookout Formation	100-300 ft.	Gas
		Mancos Shale	Upper Mancos Shale/Tocito Sandstone	2300-2500 ft.	Gas/Oil
			Gallup Sandstone/Carlile Shale		Gas/Oil
			Greenhorn Limestone		
			Graneros Shale		
			Dakota Sandstone	150-200 ft.	Gas/Oil
	JURASSIC		Morrison Formation	400-900 ft.	
			Wanakah Formation / Todilto Limestone	50-200 ft.	
			Entrada Sandstone	100-300 ft.	Oil
	TRIASSIC		Chinle Formation	500-1600 ft.	
PALEOZOIC	PERMIAN		Cutler Formation	1500-2500 ft.	
	PENNSYLVANIAN	Hermosa Formation	Honaker Trail Formation		
			Paradox Formation	200-3000 ft.	Gas?
			Pinkerton Trail Formation		
			Molas Formation	0-100 ft.	
	MISSISSIPPIAN		Leadville Limestone	0-165 ft.	
	DEVONIAN		Elbert Formation	0-325 ft.	
	CAMBRIAN		Ignacio Quartzite	0-100 ft.	
PRECAMBRIAN					

Figure 3-2. Geologic Time Column of the San Juan Basin

Source: Engler et al. 2001.

Formations dip gently to a low point in the northeastern part of the San Juan Basin (Engler et al. 2001). Dips within the central Basin are generally less than 4 degrees. Dips in the southern flank of the San Juan Basin average approximately 1-1/2 degrees. Around the San Juan Basin's edge in the vicinity of the Hogback monocline, dips are typically 10 to 40 degrees and have been measured up to 60 degrees at the monocline. The change in dip from the monocline to the central portion of the San Juan Basin, locally termed the "flexure" or "hingeline," is abrupt.

Stratigraphy

A cross-sectional view of the San Juan Basin displays the asymmetrical layering of sedimentary rocks that range in age from Cambrian to Quaternary, underlain by Precambrian rocks (**Figure 3-3**). The stratigraphy of the San Juan Basin resulted from inundation by epicontinental seas between periods of major uplift. Depositional environments of the various rock units include deep marine, shoreline, continental, and fluvial. The San Juan Basin was an active seaway connecting the central New Mexico Sea with the Paradox Basin in Utah during most of pre-Permian time. The first downwarping of the San Juan Basin occurred during Pennsylvanian-Permian time as a southeastern depression of the Paradox Basin. Clastic sediments were deposited over a weathered limestone terrace in the resulting sea. The Triassic-Jurassic interval was mainly one of emergence resulting in the deposition of wind-blown sands. Subsequent major downwarping in the Cretaceous resulted in the accumulation of a thick section of sandstone and shales, starting with the Dakota Formation. The Laramide uplift in the late Cretaceous ended the transgression of marine waters. In the Tertiary, the San Juan Mountains to the north and the southern tip of the Rocky Mountains began to erode, supplying the Tertiary sediments that fill the San Juan Basin.

The lithologic units in the San Juan Basin range in age from Cambrian to Quaternary. The lithology of the San Juan Basin includes mainly shales and sandstones of varying grain size but also includes coals, some carbonates, and igneous rocks. Sedimentary rocks display an aggregate thickness of over 14,000 feet near the Colorado-New Mexico state line. The elevation of the top of the Precambrian basement rocks is more than 7,500 feet below sea level at the deepest part of the San Juan Basin. Formations representing the Permian period through the Pennsylvanian period consist mainly of shales and sandstones. The Cretaceous-age rocks represent 6,000 feet of sandstones, siltstones, shales, and coals (Landes 1970).

Primary Hydrocarbon Reservoirs

The predominant hydrocarbon reservoirs of the San Juan Basin are all Cretaceous. These include the Fruitland Formation, Pictured Cliffs Sandstone, Mesa Verde Group, and Dakota Sandstone. These formations contain both source rocks and natural reservoirs for oil and gas. Slow decomposition of plant and animal material within the source rocks resulted in hydrocarbon deposits.

Going down the stratigraphic column in northwestern New Mexico, the first major primary hydrocarbon reservoir is the Fruitland Coal. The Fruitland Formation overlies and interfingers with the Pictured Cliffs Sandstone. The interfingering is due to minor local transgression and regression of the Cretaceous shoreline. The Fruitland Formation consists of coastal swamp, alluvial, and lacustrine deposits that accumulated inland of the prograding and aggrading shoreline deposits of the Picture Cliffs Sandstone. The Fruitland Formation is composed of interbedded sandstones, siltstones, shale, carbonaceous shales, and coal, and contains the coal resources that produce coalbed methane (CBM) as well as mineable coal (Landes 1970).

The Pictured Cliffs Sandstone is a gas reservoir consisting of a shoreline sandstone composed of an upper medium to thick-bedded ledge-forming sandstone and a lower thick, very fine-grained sandstone with interbedded shales and siltstone.

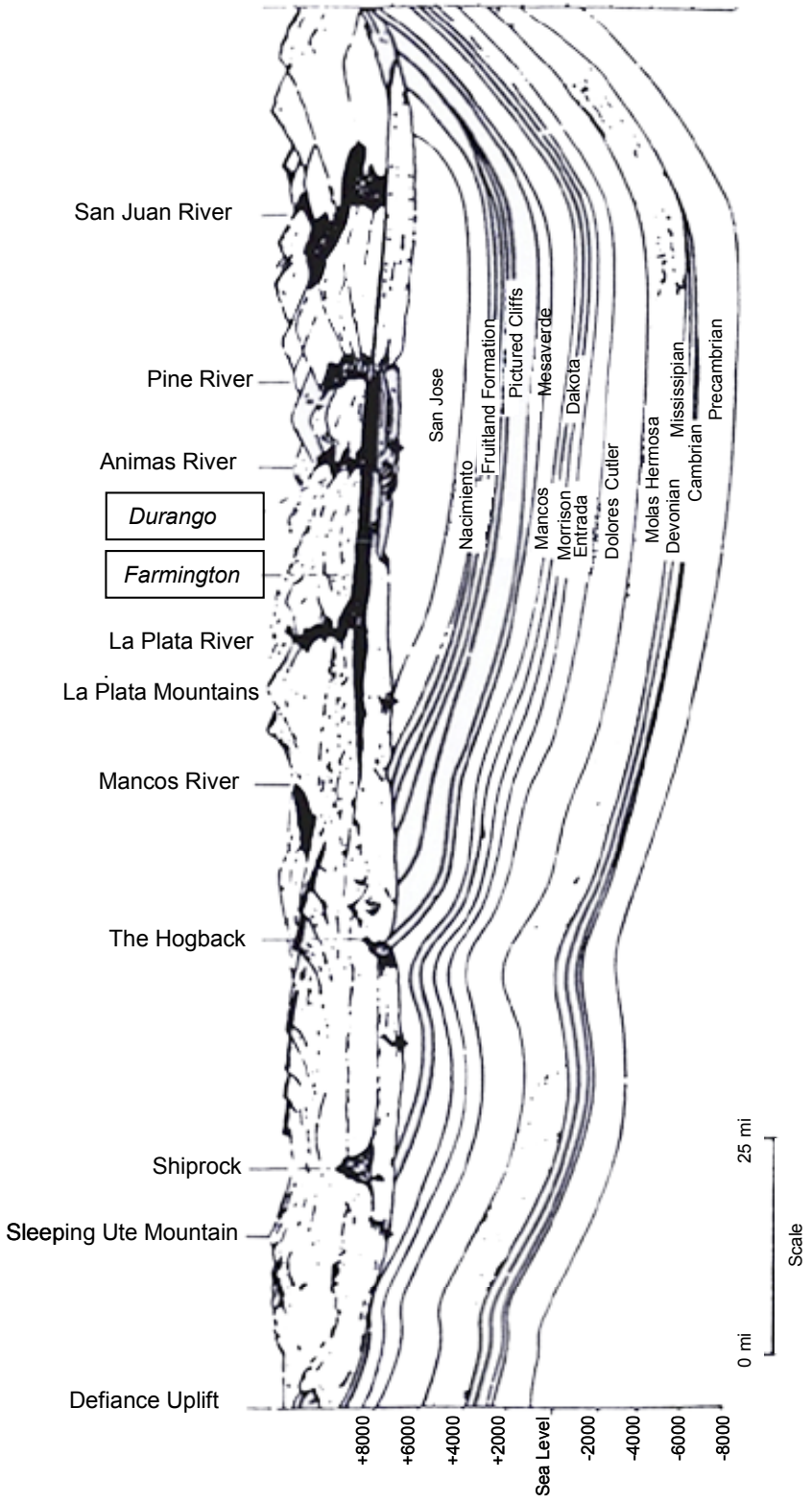


Figure 3-3. Cross-Section of the San Juan Basin

Source: Engler et al. 2001.

The Mesaverde Group is a series of gas reservoirs that represents a single regression and transgression cycle of the epicontinental Cretaceous sea. These are not blanket sands but are discontinuous shoreline deposits. The main gas-producing sandstones are the Cliff House at the top of the group and the Point Lookout at the bottom.

The Dakota Sandstone is a gas reservoir consisting of a transgressive sequence composed of sandstone, shale, minor conglomerates, and coal. The upper sandstones in the Dakota represent shoreline and offshore marine sand deposits.

Minerals

Oil and Gas Resources

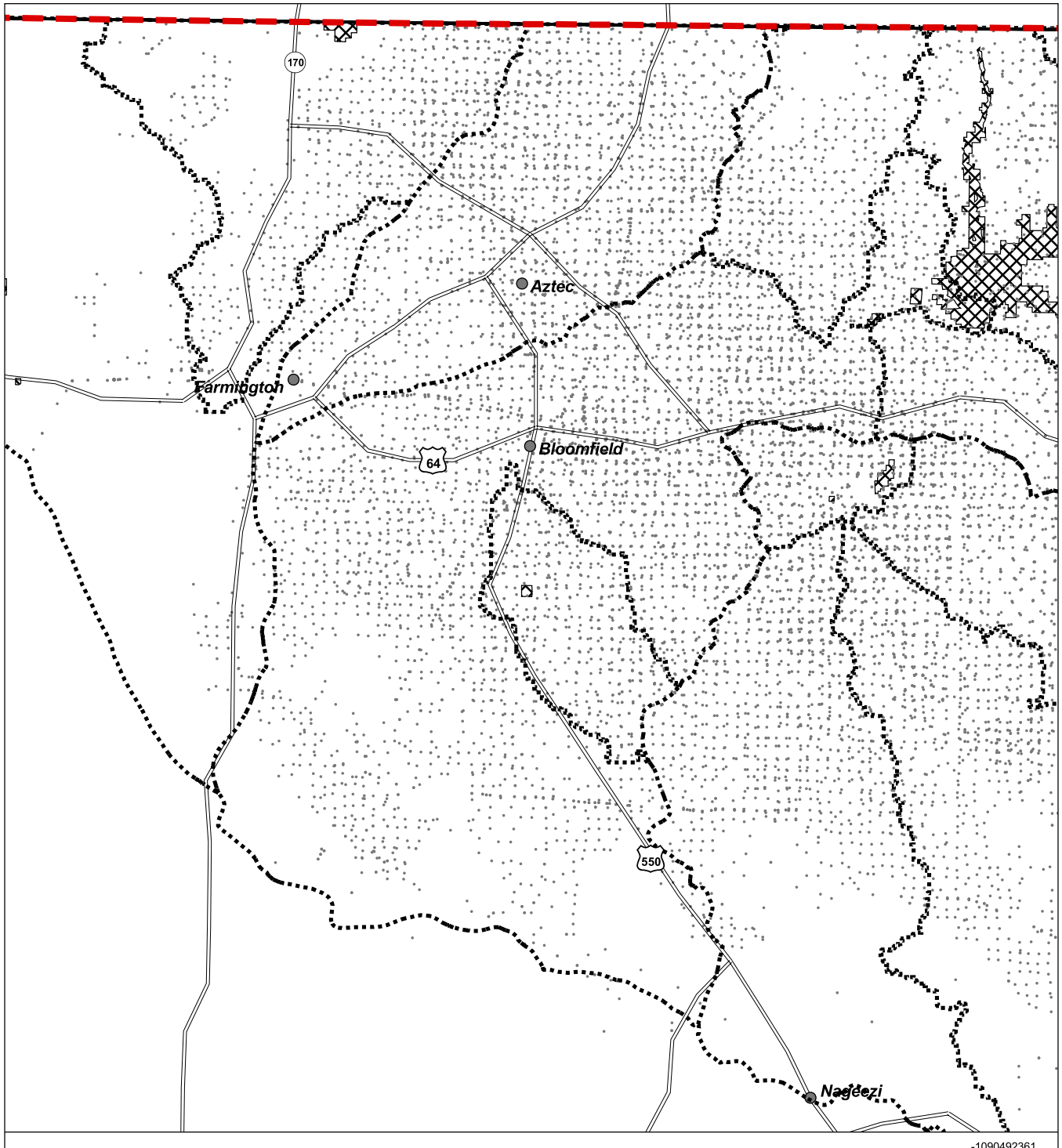
Hydrocarbon production in the planning area consists primarily of natural gas production, CBM production, and a small amount of oil/condensate production. The natural gas production rate from the entire San Juan Basin is approximately 4.0 billion cubic feet per day (Bcfd), as of July 2000 (Engler at al. 2001). The Fruitland Coal, Pictured Cliffs, Mesaverde, and Dakota formations are the primary natural gas-producing formations in the San Juan Basin, although the Fruitland Sand and Chacra also produce notable amounts of natural gas. These formations range in age from 60 to 300 million years before the present time (Tertiary to Pennsylvanian ages).

Conventional (non-coalbed methane) hydrocarbon development began during the 1940s. Natural gas production significantly increased as a result of CBM production from the Fruitland Coal in the late 1980s. Approximately 50 percent of the natural gas produced from wells in the San Juan Basin originates from CBM wells (BLM 1999a). Oil and condensate are produced primarily from the Mancos Shale/Gallup formations; however, condensate is also produced in association with natural gas from the Mesaverde and Dakota.

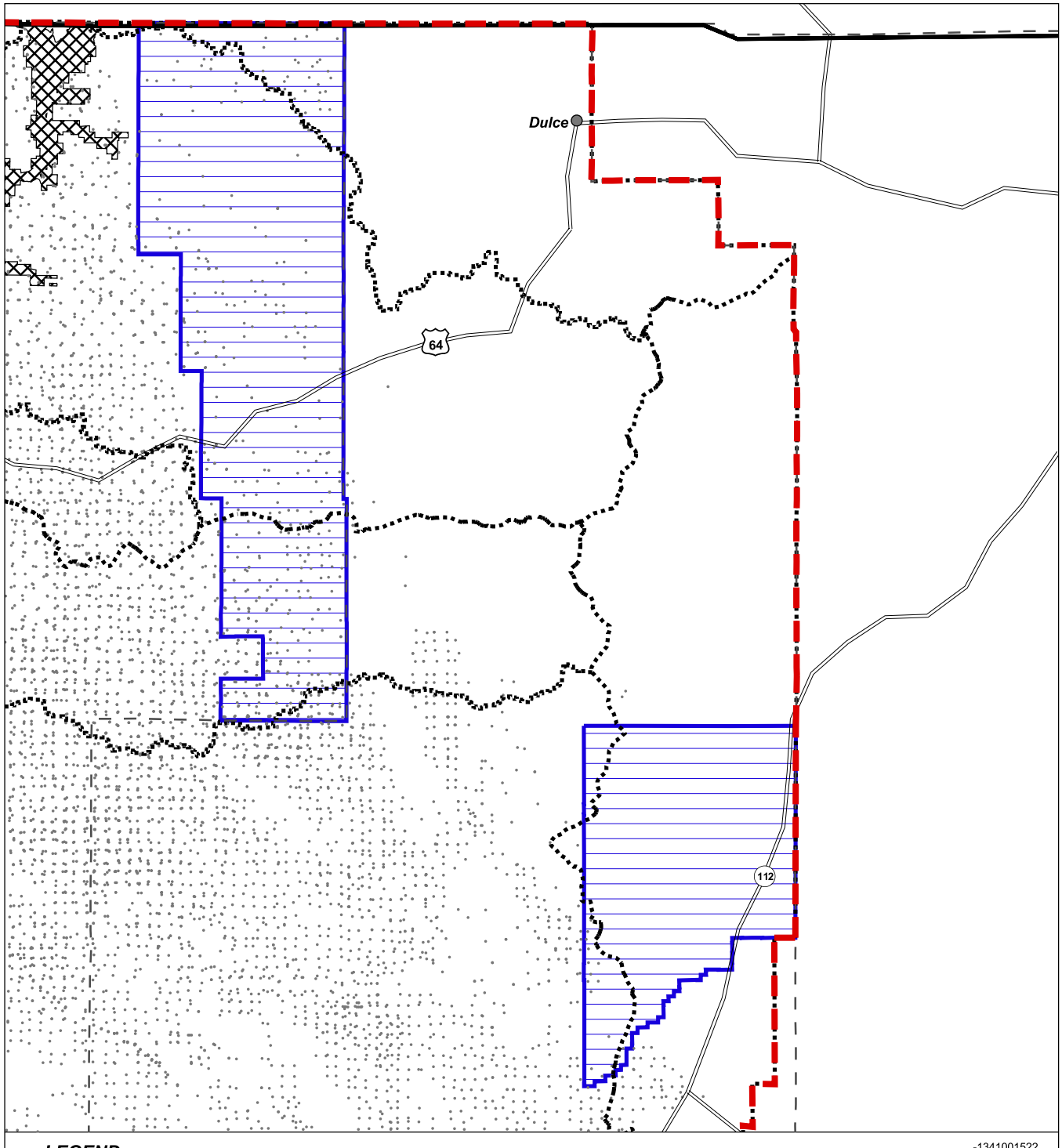
Of the 1.6 trillion standard cubic feet (Tscf) of gas produced in New Mexico in 1997, almost 1.1 trillion (about two-thirds) was from the planning area. Production increased slightly by 2000. San Juan County is the largest natural gas producing county in the state, producing between about 650 and 700 billion cubic feet (million thousand cubic feet [Mcf]) annually. McKinley County produces little natural gas, and Sandoval County produces less than 1 percent of the state's total. The planning area is much less important for its oil production, producing only 5 percent of the state's oil in 1997. The state produced 73.7 million barrels (bbls) of oil in 1997, of which 3.7 million bbls were from the planning area. In 2000, the state produced slightly less oil at 69.8 million bbls, and the planning area has a similar decline, producing on 4.4 percent, or less than 3.1 million bbls, in 2000. San Juan and Rio Arriba County are the primary producing counties in the planning area.

There are approximately 18,000 active wells in the New Mexico portion of the San Juan Basin. **Map 3-2** and **Map 3-3** show the locations of existing wells in the planning area. As of 1999, approximately 15,600 active wells produced from the six gas-bearing formations listed above. The life of a well in the planning area can extend as long as 50 years. Reservoir pressures necessitate the use of compressors in order to produce the gas. The planning area currently contains compressor stations with a capacity of approximately 168,000 horsepower (HP). The amount of oil and gas activity has generated a significant backlog of well pads waiting for field review and approval by the FFO. These locations cannot be considered "reclaimed" until that approval is granted.

The Fruitland Coal is a coal gas formation produced at 320 acre spacing per well. However, there are pilot projects underway that allow production from 160 acres per well in order to assess the feasibility of down-spacing in some areas of the San Juan Basin. The FFO operates under a BLM mandate to produce coal gas prior to mining for coal. As of 1999, there were approximately 2,250 wells that produce from the Fruitland Coal. Approximately 2,500 wells have been completed to the Fruitland Coal to date. The Fruitland Coal formation is also mined for coal and produced by well for methane gas.



Map 3-2: Oil and Gas Wells in the Western Part of the Planning Area



Map 3-3: Oil and Gas Wells in the Eastern Part of the Planning Area

If coal is mined prior to extraction of the associated methane gas, methane is released into the atmosphere. FFO policy prioritizes extraction of CBM over mining of coal. Currently, surface and underground coal mining is limited to the western portion of the FFO.

The Pictured Cliffs produces natural gas from wells spaced at 160 acres per well. There are approximately 4,000 wells that currently produce from this formation. Approximately 5,800 wells have produced from the Pictured Cliffs to date. Currently, approximately 15 percent of wells completed in this formation are dual completions or are commingled, usually with the Mesaverde or Dakota.

The Mesaverde Group produces natural gas from wells spaced at 320 acres per well, with optional infill development allowed on an 80-acre per well basis. There were 4,750 wells actively producing from the Mesaverde in July 2000. Approximately 5,300 wells in total have been completed to the Mesaverde in the San Juan Basin. Approximately 25 percent of recent Mesaverde completions are commingled or dual completions.

The Dakota produces natural gas from wells spaced at 160 acres per well. Recent studies indicate that some areas of the San Juan Basin could be approved for 80-acre infill development in the future. There were approximately 3,900 wells producing from the Dakota in 1999. Approximately 5,200 wells in total have produced from the Dakota. The RFD predicts 6,846 additional Dakota 80-acre locations within the 20-year period of analysis. Production from the Dakota can be commingled with production from the Mesaverde.

The ability to commingle gas produced from different formations and to complete more than one formation within the same wellbore (dual completion) allows operators maximize production from a single well pad. Gas produced from the Mesaverde and Dakota can be commingled either downhole or at the surface. Gas produced from the Pictured Cliffs and the Fruitland Sand can be commingled either downhole or at the surface. Other formations in the San Juan Basin that produce or have the potential to produce natural gas include Tertiary sands, the Farmington, the Fruitland Sand, the Chacra, the Lewis Shale, the Mancos Shale/Gallup Sandstone, the Entrada, and Pennsylvanian deposits.

Historical data gathered by the BLM indicates that approximately 46 percent of the total number of locations in the San Juan Basin are constructed on well pads that already exist. The remaining 54 percent of new locations are drilled on virgin sites.

Coal

The planning area contains large deposits of low sulfur Cretaceous coal concentrated in and mined mainly from the lower part of the Fruitland Formation in the FFO area. The FFO area contains approximately 7.5 billion tons of strippable coal, 3.8 billion tons of which are in the Fruitland Formation (BLM 1987a, b). The coal seams strike direction is northwest to southeast with a gentle dip to the east at 60 to 80 feet per mile. Due to compaction, deposition, and other geologic activity, the coal seams split and merge with minor bends where the coal has been warped (BLM 1998c).

The Fruitland Formation coal has been divided into the Fruitland, Bisti, and Star Lake fields. The San Juan and La Plata mines on FFO land, in addition to the Navajo mine on Navajo land, are extracting from the Fruitland Formation and serve the two power plants in the Four Corners region. The San Juan mine is developing underground mining to expand its supply, as approved in an RMP Amendment in 1998 (BLM 1998c). East of the Navajo Reservation on FFO land are the Bisti and Star Lake coal fields also in the Fruitland Formation. There has been renewed interest in coal tracts in the Star Lake area that could result in future coal lease applications being filed (Hill and Associates 2000).

The other major sources of coal in the planning area are the Mesaverde Group, Menefee Formation, extending from Durango, Colorado to south of Gallup, New Mexico, and

east past Grants, New Mexico. This coal is thinner and higher in sulfur (Hill and Associates 2000).

Three strip mines, San Juan, McKinley, and La Plata, are within the FFO boundaries, from which approximately 8 million tons are mined annually. The competitive coal lease tracts, PRLA tracts, and Coal Belt SMA remain available as established in the 1988 RMP. The 1998 RMP amendment (BLM 1998c) established that 80 to 110 million tons of coal would be made available for extraction by deep mining on a lease adjacent to the San Juan strip mine. The locations of the Coal Belt SMA, PRLAs, and competitive Coal Lease Areas are shown on Map 2-4.

Salable Minerals

Salable minerals include common materials such as sand, gravel, rock, and fill material. Most of the salable materials contracted is sand and gravel. The sand and gravel is mostly located on mesa tops that consists of remnants of the Quaternary stream cut terrace. The rock and stone materials are fragments of the weathered Ojo Alamo Sandstone and Farmington Sandstone Member.

There are 33 active permitted operations listed in **Table 3-2**. In addition, there are small quarry locations (less than the 5 acres) associated with oil and gas well sites and used to supply gravel to surface access roads.

Table 3-2. Locations of Permitted Quarries in FFO Area

Current Permitted Areas					
Township	**Range**	**Section**	**Division**	**Material**	**Acreage**
15N	17W	18	N1/2	Fill material	320
17N	13W	24	N1/2	Fill material	320
18N	12W	23	NESE	Fill material	40
20N	5W	36	SESW	Fill material	40
19N	6W	10	E1/2NE	Humate	80
19N	5W	7	NW	Humate	160
19N	5W	9	SENE	Humate	40
19N	5W	9	SESW	Red dog	40
32N	10W	29	W1/2NE	Sand and gravel	80
31N	10W	30	S1/2SW	Sand and gravel	80
31N	10W	30	NWSW	Sand and gravel	40
30N	11W	3	SESE	Sand and gravel	40
30N	11W	10	NENE	Sand and gravel	40
29N	10W	18	SENE	Sand and gravel	40
29N	10W	17	N1/2SE	Sand and gravel	80
29N	10W	15	E1/2SW	Sand and gravel	80
29N	10W	14	E1/2	Sand and gravel	320
29N	10W	15	W1/2	Sand and gravel	320
29N	9W	9	SW	Sand and gravel	160
29N	9W	9	S1/2NW	Sand and gravel	80
30N	15W	35	SESE	Sand and gravel	40
32N	13W	15	NENE	Stone	40

Current Permitted Areas					
Township	Range	Section	Division	Material	Acreage
32N	13W	14	NWNW	Stone	40
30N	12W	4	NESWNE	Fill material	10
30N	12W	11	NWSE	Sand and gravel	40
29N	13W	19	N1/2	Sand and gravel	320
29N	13W	20	W1/2SE	Sand and gravel	80
29N	12W	17	E1/2NE	Sand and gravel	80
29N	12W	14	NWNE	Sand and gravel	40
29N	12W	14	SWNE	Sand and gravel	40
29N	12W	13	NW	Sand and gravel	160
29N	12W	23	E1/2	Sand and gravel	320
29N	12W	24	W1/2	Sand and gravel	320

Source: BLM FFO.

Locatable Minerals

The primary locatable mineral in the FFO is uranium, which is found in the southern portion of the area around Ambrosia Lake and Church Rock in the Jurassic Morrison Formation and associated Rocks. A few claims have been staked in the northern portion of the FFO for metallic minerals, but these claims have little, if any, impact on the program.

Although the uranium industry is depressed, companies continue to file annual assessment work and rental fees to maintain mining claims in good standing.

The Locatable Program also includes Use and Occupancy under the Mining Laws. The purpose of the Use and Occupancy Regulations is to manage the use and occupancy of the public lands for the development of locatable mineral deposits by limiting such use or occupancy to that which is reasonably incident. A few cases dealing with Use and Occupancy have been determined to be unauthorized uses.

SOILS

The characteristics and distribution of soil types in the planning area affect the use and management of the land and the quality of surface water, air, forage, and tree growth. Soil characteristics are important to consider when siting construction activities, such as oil and gas well development, road building, and maintenance. They are also important considerations when planning recreation activities, including OHV access and trail development, rangeland improvements, timber stand improvements, protection of surface water quality through minimizing erosion, and surface stabilization.

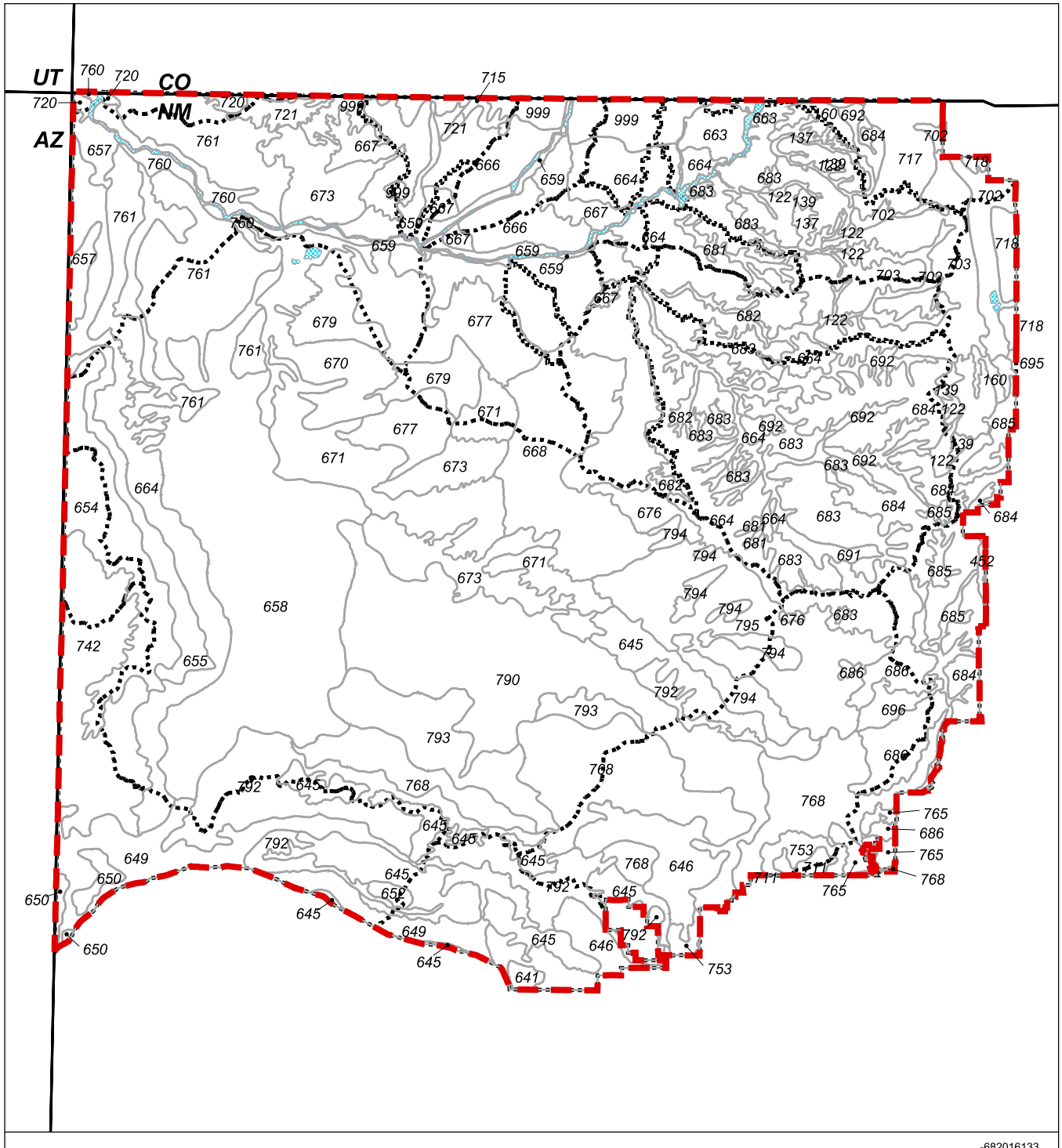
Nonpoint source pollution is an identified problem in the planning area that is directly associated with soil stability. Efforts to reduce nonpoint source pollution through implementation of erosion controls and management practices are an important part of BLM's land management activities. Some of these management practices are implemented through special stipulations that are attached to the APD for oil and gas. Others are incorporated into management prescriptions applied within OHV Management Units or SDAs. No existing program measures the effectiveness of these soil conservation practices or BMPs in terms of soil prevented from moving offsite or the amount of sedimentation that is deposited into a waterway. The FFO has begun collecting field data to compare with the results from the Water Erosion Prediction Project, developed by the U.S. Department of Agriculture, Agricultural Research Service, a simulation model to predict soil erosion by

water within a watershed and sediment delivery to a stream. Data on the rates of erosion from disturbed and undisturbed areas, available beginning in 2003, will be used to evaluate the success of BMPs and to predict potential impacts from land use activities.

Biological soil crusts are an important factor affecting soil erosion and sedimentation in arid regions such as the San Juan Basin, where the crusts are predominantly composed of cyanobacteria. These crusts affect soil stability, water infiltration, and plant germination and growth. Where biological soil crusts are intact and healthy, there is less soil erosion from wind or water, better moisture-holding capacity, and fewer opportunities for exotic weeds to become established. Because the crust-forming organisms are concentrated in the top 1 to 4 millimeters of soil, they are easily damaged by surface activities such as vehicle travel, trampling by humans or livestock, or fire, and are slow to recover (USDI 2001a). Soil crusts are affected by a variety of factors including soil texture, topography, and chemical composition. The type and integrity of soil crusts in the planning area cannot be determined from the soil map unit information, but must be determined through site-specific evaluations in the field. As a general rule, however, it is best for soil health to keep surface disruption and compression to a minimum, especially in otherwise highly erodible areas. The soils data for the planning area were derived from the State Soil Geographic Database (STATSGO) (NRCS 1991) from the Natural Resources Conservation Service. Soil maps for STATSGO are compiled by generalizing more detailed county soil survey maps. Where more detailed soil survey maps are not available, as for McKinley County, data on geology, topography, vegetation, and climate are assembled with satellite imagery, and the probable classification and extent of soils in similar areas are determined. Each map unit on a STATSGO map is plotted on a map scale of 1:250,000 and contains up to 21 components for which there are attribute data. The soil map units and attribute data described in this section are grouped by watershed and by characteristics relevant to the decisions and activities under the jurisdiction of the land managing agencies.

There are 66 different soil map units in the planning area, each having distinctive patterns of soils, topography, and drainage and named for the dominant soils in the unit. These 66 map units represent over 2,700 more detailed soil map units at the county soil survey level of study. These soil map units are shown in **Map 3-4** overlaid by the watershed boundaries and are listed by map unit symbol and name in **Table 3-3**.

The following sections provide information on each of the watersheds concerning the limitations of soils for specified uses addresses common uses in the planning area. These limitations are based on the soil properties and qualities that are used as predictors of soil behavior and for classification and mapping of soils (NRCS 1997). The soil interpretation ratings listed for each watershed include restrictions for uses related to construction and recreation activities, such as roadfill, paths and trails, camp areas, buildings, embankments, and shallow excavations, and some of the main reasons that the restrictions are included. The limitation ratings are described as slight, moderate, and severe.



Map 3-4: Soil Map Units in the Planning Area

Table 3-3. Soil Map Unit Symbols and Names in the Planning Area

Map Unit Symbol	Map Unit Name
NM122	Typic Haplustalfs-Fluventic Ustochrepts
NM132	Typic Haplustalfs-Eutric Glossoboralfs-Rock Outcrop
NM134	Vertic Haplustalfs-Typic Haplustalfs
NM137	Typic Haplustalfs-Eutric Glossoboralfs-Rock Outcrop
NM139	Typic Haplustalfs-Typic Eutroboralfs
NM160	Typic Eutroboralfs
NM161	Typic Eutroboralfs
NM176	Eutric Glossoboralfs-Typic Paleboralfs
NM349	Typic Ustorthents-Eutric Glossoboralfs-Rock Outcrop
NM441	Fluventic Ustochrepts-Aquic Ustifluvents
NM452	Typic Dystrochrepts-Dystric Cryochrepts-Rock Outcrop
NM471	Cumulic Cryoborolls-Aquic Cryoborolls-Histic Cryaquolls
NM641	Viuda-Penistaja-Rock Outcrop
NM645	Laporte-Rock Outcrop-Vessilla
NM646	Penistaja-Sparank-San Mateo
NM649	Flugle-Rock Outcrop-Catman
NM650	Rock Outcrop-Nogal-Pinitos
NM652	Cinnadale-Valnor-Techado
NM654	Stout-Hesperus-Kiln
NM655	Royosa-Telescope
NM657	Nakai-Monue-Blackston
NM658	Kimbeto-Denazar-Farb
NM659	Fruitland-Turley-Garland
NM663	Oelop-Buckle-Rock Outcrop
NM664	Rock Outcrop-Travessilla-Weska
NM666	Badland-Saido-Blancot
NM667	Badland-Persayo-Farb
NM668	Doak-Sheppard-Shiprock
NM670	Badland-Sheppard-Monierco
NM671	Sheppard-Huerfano-Notal
NM673	Badland-Rock Outcrop-Riverwash
NM676	Badland-Fruitland-Blancot
NM677	Shiprock-Avalon-Sheppard

Map Unit Symbol	Map Unit Name
NM679	Doak-Uffens-Sheppard
NM681	Gobernador-Orlie-Sparham
NM682	Sparank-Pinavetes-San Mateo
NM683	Penistaja-Sedale-Menefee
NM684	Menefee-Pinitos-Badland
NM685	Sparham-Elpedro-Nalivag
NM686	Pinitos-Royosa
NM691	Lybrook-Tsosie
NM692	Nalivag-Ruson
NM695	Elpedro-Peney-Ransect
NM696	Berryman-Menefee-Calendar
NM702	Roques-Capillo-Carrick
NM703	Roques-Carrick
NM711	Cebolleta-Charo-Rock Outcrop
NM715	Panitchen-Yenlo-Dominguez Variant
NM716	Shalona-Sedillo-Mikim
NM717	Goldvale-Valto-Hesperus
NM718	Ruko-Morapos-Goldvale
NM720	Claysprings-Myton Family-Uzona
NM721	Witt-Rizno-Ruinpoint
NM742	Augustine-Telescope-Royosa
NM753	Sandoval-Poley-Orejas
NM760	Cudei-Badland-Tocito
NM761	Littlehat-Persayo-Awet
NM765	Querencia-Sandoval-Sparank
NM768	Rock Outcrop-Zia-Sandoval
NM790	Sheppard-Fajada-Sparank
NM792	Mion-Rock Outcrop-Atarque
NM793	Doak-Kiki
NM794	Doakum-Betonnie
NM795	Blancot-Councelor-Tsosie
NM999	Dulce-Travessilla-Rock Outcrop

Source: NRCS 1991.

Following the sections on soil limiting factors in individual watersheds, there is a series of tables that summarize the soil characteristics of the watersheds relative to erodibility, and permeability Three of the watersheds, Chinle, Mancos, and Upper Puerco, are almost entirely on tribal land and are not discussed any further in the narrative. However, their soil characteristics are included in the summary tables. In general, prime farmland is determined by soils that have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air, not excessively eroded or saturated with water for long periods of time, and either does not flood frequently during the growing season or is protected from flooding (NRCS 1997). Several watersheds have some soils meeting the definitions of prime farmland, all of which must be irrigated to produce high quality crops.

Animas Watershed

The Animas watershed is located in the north central part of the planning area. Components in mapping units NM716 and NM999 contain prime farmland soils, if irrigated, in approximately 10 percent of this watershed. Approximately 65 percent of the Animas watershed is severely limited for construction of roads, small buildings, trails, other shallow excavations, and camp areas primarily due to restrictions such as shallow depth to rock and steep slopes. Smaller areas are limited for these uses due to shrink-swell potential and low soil strength. Construction of embankments is limited in a small portion of the watershed due to thin soils and a high potential of piping through the embankments.

Arroyo Chico Watershed

The Arroyo Chico watershed is located in the southeastern quadrant of the planning area on the east side of the Continental Divide. There are no prime farmland soils in this watershed. Approximately half of the Arroyo Chico watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to restrictions such as shallow depth to rock and steep slopes. Smaller areas are limited for these uses due to shrink-swell potential and low soil strength. Moderate limitations for these uses are attributed to frost action, slope, and low strength. Construction of embankments is limited in 10 to 30 percent of the watershed due to thin soils, seepage, and a high potential of piping through the embankments. Shallow excavations are severely limited in at least half of the watershed due to slope, depth to rock, and caving of cutbanks.

Blanco Watershed

The Blanco watershed is located entirely on BLM land in the center of the FFO administrative area. There are no prime farmland soils in this watershed. Approximately 70 percent of the Blanco watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to shallow depth to rock and steep slopes. Smaller areas are limited for these uses due to shrink-swell potential, low soil strength, and flooding. Moderate limitations for these uses are attributed to shrink-swell potential and, in the case of camp areas and trails, erosion and dusty conditions. Construction of embankments is limited in 25 percent of the watershed due piping through the embankments and difficulty with compaction. Shallow excavations are severely limited in most of the watershed due to slope and depth to rock.

Carrizo Watershed

The Carrizo watershed is located in the northeastern quadrant of the planning area, on BLM, USFS, and Jicarilla Apache land. There are no prime farmland soils in this watershed. Approximately 40 to 50 percent of the Carrizo watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to low strength, shrink-swell potential, shallow depth to rock, and steep slopes. Smaller areas are severely limited for these uses due to flooding. Moderate limitations for these uses are attributed to slow percolation

and thin soils. Construction of embankments is limited in a small portion of the watershed due to piping through the embankments; moderate limitations occur in half of the watershed due to soils that are difficult to compact. Shallow excavations are severely limited in most of the watershed due to slope, depth to rock, and caving cutbanks. Moderate limitations on shallow excavations occur in many areas due to clayey soils.

Chaco Wash Watershed

The Chaco Wash watershed is by far the largest watershed in the planning area, almost 3 million acres, and takes up most of the west central part of the planning area, primarily on BLM and Navajo allotment and tribal trust land. Less than 1 percent of the watershed has prime farmland soils, in map unit NM760, if they are irrigated. Approximately 20 to 35 percent of the Chaco Wash watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to low strength, shallow depth to rock, and steep slopes. Smaller areas are severely limited for these uses due to shrink-swell potential. Construction of embankments is limited in 25 to 50 percent of the watershed due to high sodium content, seepage, or piping. Shallow excavations are severely limited in 30 percent of the watershed due to slope, depth to rock, and caving cutbanks.

Gobernador Watershed

The Gobernador watershed is located in the northeast quarter of the planning area, mostly on BLM land. There are no prime farmland soils in this watershed. Approximately two-thirds of the Gobernador watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to slow percolation, steep slopes, shallow depth to rock, and shrink-swell potential. Construction of embankments is severely limited in approximately one-fourth of the watershed in areas where the soil salinity is highest. Shallow excavations are severely limited in approximately two-thirds of the watershed due mainly to the depth to rock and slope, and moderately limited in other areas due to clayey soils.

Kutz Canyon Watershed

The Kutz Canyon watershed is located in the north central part of the planning area, mostly on BLM land. There are no prime farmland soils in this watershed. Most of the Kutz Canyon watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to steep slopes and shallow depth to rock. Construction of embankments is moderately limited in only 5 percent of the watershed due to the likelihood of piping; the rest of the watershed is not limited for construction of embankments. Shallow excavations are severely limited in most of the watershed due mainly to the depth to rock and slope.

La Plata Watershed

The La Plata watershed is located in the north central part of the planning area, mostly on BLM land, and extends into Colorado. The soils described here are only for the New Mexico portion, which is within the planning area. Over 11 percent of the watershed contains prime farmland soils, within map units NM715, NM 721, and NM999. Just over half of the La Plata watershed is severely limited for construction of roads, small buildings, trails, and camp areas, primarily due to steep slopes and shallow depth to rock. Construction of embankments is severely limited in about 20 percent of the watershed due to the likelihood of piping and a small percentage due to excess salt. Shallow excavations are severely limited in over half of the watershed due mainly to the depth to rock and slope, and the potential for caving cutbanks in approximately 5 percent of the watershed.

Largo Watershed

The Largo watershed is relatively large and located in the northeast quarter of the planning area. It has two sections, connected by a small area and includes mainly BLM and Jicarilla Apache land. There are no prime farmland soils in this watershed. Just over half of the Largo

watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to steep slopes, shallow depth to rock, and low strength. A smaller portion of the watershed is severely limited due to excess sodium in the soils, shrink swell potential, flooding, and erosion; there are moderate limitations in other parts of the watershed due to slow percolation, low strength, and slope. Construction of embankments is limited in about 20 percent of the watershed due to the likelihood of piping, thin soils, difficulty with compaction, and a small percentage due to excess salt or sodium. Shallow excavations are severely limited in over half of the watershed due mainly to the depth to rock and slope.

Middle San Juan Watershed

The Middle San Juan watershed is located in the northwest corner of the planning area and includes mainly Navajo and Ute Mountain land, except for the eastern portion on BLM land. Prime farmland soils occur on approximately 7 percent of the watershed, within map units NM721, NM760, and NM999, if they are irrigated. Approximately one-third of the Middle San Juan watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to steep slopes, excess salt and sodium, and erodibility. Construction of embankments is limited in about 30 percent of the watershed due to excess salt and sodium, the likelihood of piping, and stones. Shallow excavations are severely or moderately limited in two-thirds of the watershed due mainly to the depth to rock and slope, and a lesser percentage Navajo Reservoir Watershed

Navajo Reservoir Watershed

The Navajo Reservoir watershed is located in the northeast quarter of the planning area and includes mainly USBR, BLM, and USFS land, except for the eastern portion on Jicarilla Apache land. Prime farmland soils occur on approximately 3 percent of the watershed, within map units NM717 and NM999, if they are irrigated. Over half of the Navajo Reservoir watershed is severely limited for construction of roads, small buildings, trails, and camp areas primarily due to low strength and shrink-swell potential, with 20 to 30 percent severely limited due to steep slopes, depth to rock, and erodibility. Moderate limitations exist on 25 percent of the watershed for construction of camp areas due to slow percolation. Construction of embankments is moderately limited in up to half of the watershed due to difficulty in compaction, thin soils, and the likelihood of piping. Shallow excavations are severely or moderately limited in 25 percent of the watershed due mainly to the depth to rock, slope, and the possibility of caving cutbanks.

Pump Canyon Watershed

The Pump Canyon watershed is located in the northeast quarter of the planning area, just west of the Navajo Reservoir watershed, and includes mainly BLM land. Prime farmland soils occur on over 18 percent of the watershed, within map unit NM999, if they are irrigated. Over half of the Pump Canyon watershed is severely limited for construction of roads, small buildings, trails, camp areas, and shallow excavations due to steep slopes and depth to rock. No limitations are listed for construction of embankments.

Rio Chama

The Rio Chama watershed is located in the far northeast of the planning area and is east of the Continental Divide. It includes mainly USFS and Jicarilla Apache land. Prime farmland soils occur on just over 1 percent of the watershed, within map unit NM718, if they are irrigated. From 70 to 90 percent of the Rio Chama watershed is severely limited for construction of roads, mainly due to low soil strength and shrink-swell potential. Construction of small buildings, trails, and camp areas are severely limited primarily due to steep slopes, erodibility, and the potential for flooding in 15 to 30 percent of the watershed. Moderate limitations exist on 15 to 30 percent of the watershed for these uses due to mainly to slow percolation, high clay content, and slope. Construction of embankments is moderately limited in two-thirds of the watershed due to difficulty in

compaction and thin soils. Shallow excavations are severely or moderately limited in 2 to 40 percent of the watershed due mainly to the depth to rock, slope, flooding, and the possibility of caving cutbanks.

Rio Puerco Watershed

The Rio Puerco watershed is located in the far southeast of the planning area and is east of the Continental Divide. It includes mainly BLM, USFS, and Navajo trust and allotment land. There are no prime farmland soils in the watershed. The most common severe limitations on construction of roads, small buildings, trails, and camp areas, in half of the watershed, are shallow depth to rock, steep slopes, and low soil strength. Severe limitations for these uses are limited in approximately 20 percent of the watershed due to the likelihood of flooding, erodibility, and shrink-swell potential. Moderate limitations for these uses occur in 15 to 25 percent of the watershed, primarily due to frost action, steep slopes, and high clay content. Construction of embankments has moderate to severe limitations in up to one-third of the watershed due to difficulty in compaction, piping, large stones, and thin soils. Shallow excavations are severely limited in half of the watershed due mainly to the depth to rock and slope.

Rio San Jose Watershed

The Rio San Jose watershed is located in the far south central part of the planning area and is east of the Continental Divide. It includes mainly BLM and Navajo trust and allotment land. There are no prime farmland soils in this watershed. The most common severe limitations on construction of roads, small buildings, trails, and camp areas, in half of the watershed, are shallow depth to rock and steep slopes. Severe limitations for these uses are limited in approximately 25 percent of the watershed due to the low soil strength and shrink-swell potential. Moderate limitations for these uses occur in 25 percent of the watershed, primarily due to steep slopes, frost action, and shrink-swell potential. Construction of embankments are severely limited in half of the watershed due to piping and thin soils. Shallow excavations are severely limited in half of the watershed mainly due to the depth to rock and slope.

Upper San Juan Watershed

The Upper San Juan watershed is located in the far northeast of the planning area and includes mainly USFS and Jicarilla Apache land. Prime farmland soils occur within map units NM717, NM718, and NM999, on approximately 2 percent of the watershed. The most common severe limitations on construction of roads, small buildings, trails, and camp areas, in almost half of the watershed, are shallow depth to rock, steep slopes, and low soil strength. Severe limitations for these uses are limited in approximately 20 percent of the watershed due to the erodibility and shrink-swell potential. Moderate limitations for these uses occur in another 10 to 20 percent of the watershed, primarily due to shrink-swell potential, dusty conditions, and slow percolation. Construction of embankments have moderate to severe limitations in up to 20 percent of the watershed due to difficulty in compaction, piping, seepage, large stones, and thin soils. Shallow excavations are severely limited in up to 40 percent of the watershed due mainly to the depth to rock, high clay content, caving cutbanks, and slope.

Summary Tables Comparing Soils Characteristics between Watersheds

Tables 3-4 and 3-5 summarize various soils characteristics by watershed. All soil properties quantified in the tables below were derived by determining the properties of each soil map unit, then using the amount of each map unit within each watershed to determine a weighted number for that property. For example, a soil map unit that is highly erodible but is present in 5 percent of the Animas watershed would be weighted less than a soil with a medium erosion rate that occurs in 30 percent of the watershed, resulting in a medium erosion classification for the entire watershed. These classifications can be used to consider planning on a watershed

level, but for site-specific planning, more detailed evaluations would be needed.

Table 3-4 indicates the potential for water and wind erosion. Erosion ratings are grouped into categories low, medium, and high for water and wind erosion and are based on the erosion factors listed for each soil map unit. These factors are used to describe the erodibility of the bare soil without taking into account vegetative cover, slope, or management.

Table 3-4. Potential for Water and Wind Erosion in Each Watershed

Watershed	Water Erosion			Wind Erosion		
	Low	Medium	High	Low	Medium	High
Animas		100%		14%	86%	
Arroyo Chico	12%	86%	2%	48%	52%	
Blanco		100%		29%	71%	
Carrizo		59%	41%	15%	85%	
Chaco Wash	16%	79%	5%	72%	23%	5%
Chinle		100%		100%		
Gobernador		94%	6%	27%	73%	
Kutz Canyon		100%		13%	87%	
La Plata	1%	99%		21%	78%	1%
Largo		88%	12%	33%	67%	
Mancos	23%	8%	69%	74%	6%	20%
Middle San Juan	20%	50%	30%	58%	29%	11%
Navajo Reservoir		60%	40%	5%	81%	14%
Pump Canyon		100%			100%	
Rio Chama	3%	58%	39%	1%	94%	5%
Rio Puerco	4%	95%	1%	27%	73%	
Rio San Jose	53%	47%		46%	54%	
Upper Puerco	34%	66%		59%	41%	
Upper San Juan		91%	9%	40%	59%	1%

Source: NRCS 1991.

Table 3-5 indicates the soil permeability of each watershed. Soil permeability is the quality of the soil that enables water or air to move through it. It is described for each soil mapping unit as an infiltration rate that ranges from slow through rapid in this planning area. It can be used to evaluate the potential for spills, especially hazardous materials, to infiltrate the soil and possibly affect the groundwater. It also can be used as an indicator of the success of the establishment of seedings and the need for irrigation to ensure growth. It affects the amount of surface water runoff during rainfall.

Table 3-5. Soil Permeability Rates in Each Watershed

Watershed	Slow to Moderately Slow[1]	Moderately Slow to Moderate	Moderate to Moderately Rapid	Moderately Rapid to Rapid	Rapid
Animas			100%		
Arroyo Chico		18%	35%	40%	7%
Blanco			71%	29%	
Carrizo		42%	51%	7%	
Chaco Wash	5%	6%	25%	60%	4%
Chinle			52%		48%
Gobernador		30%	70%		
Kutz Canyon			87%	13%	
La Plata	1%		99%		
Largo		27%	67%	6%	
Mancos		20%	80%		
Middle San Juan	11%	1%	66%	21%	1%
Navajo Reservoir		25%	75%		
Pump Canyon			100%		
Rio Chama		73%	25%	2%	
Rio Puerco		54%	30%		16%
Rio San Jose		49%	4%	47%	
Upper Puerco		34%	13%	28%	25%
Upper San Juan		12%	52%	36%	

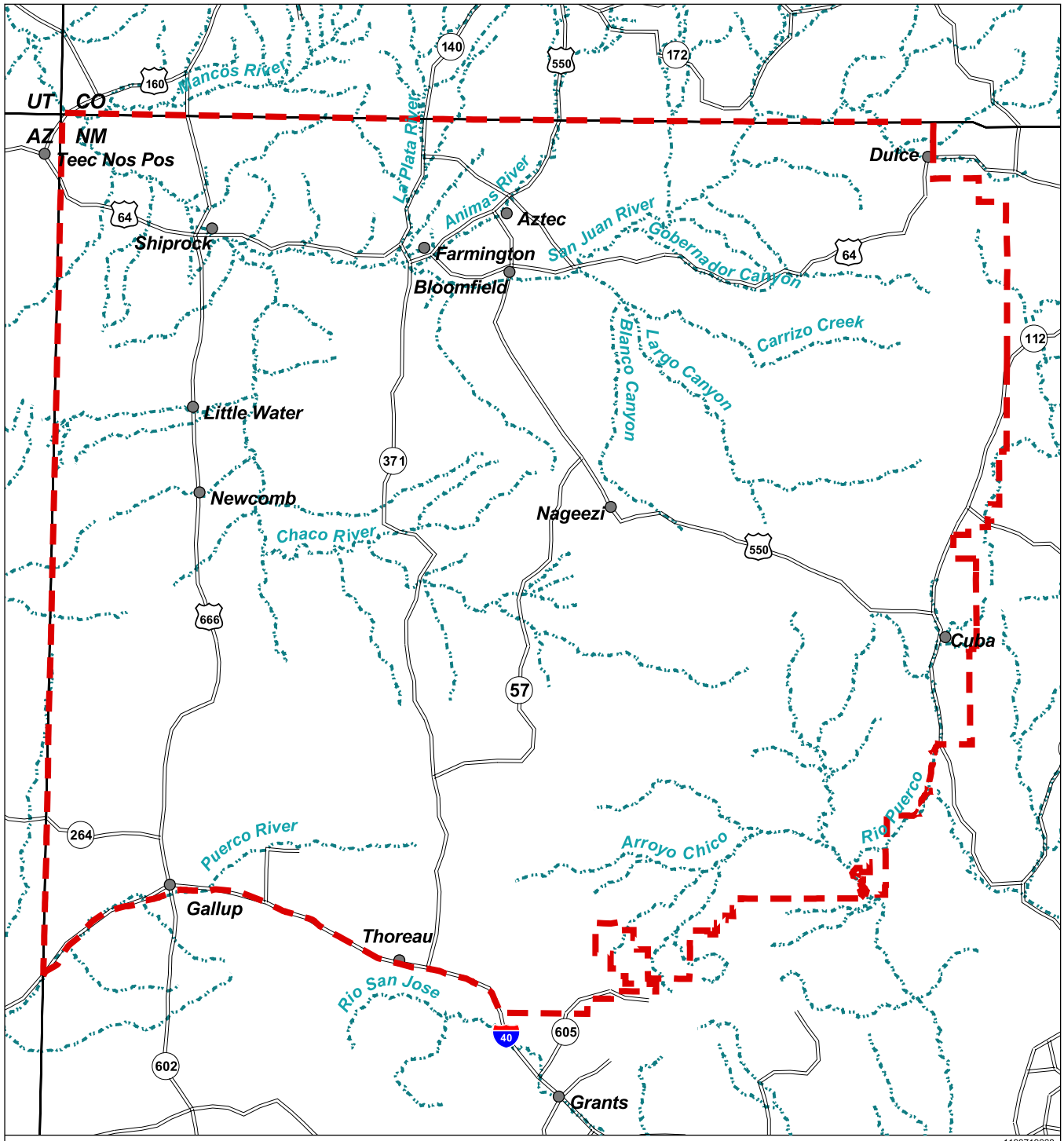
Source: NRCS 1991.

WATER RESOURCES

Water resources include surface water and groundwater. This section discusses surface water quality and quantity, groundwater quality and quantity, and waters of the U.S. Surface waters include lakes, rivers and streams and are important for a variety of reasons, including economic, ecological, recreational, and human health. Groundwater comprises the subsurface hydrologic resources of the physical environment and is an essential resource.

Surface Water

The New Mexico Water Quality Control Commission (NMWQCC) recognizes eleven distinct hydrologic basins within the state. Portions of the planning area lie within three of these regional hydrologic systems (NMWQCC 2001). The largest area is within the San Juan River basin, followed by the Upper Rio Grande basin and the Middle Rio Grande basin. The major streams are shown in **Map 3-5**.



LEGEND

- RMP/EIS Boundary
- Major Stream
- Major Road
- Town
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: USEPA 1999

Map 3-5: Major Streams in the Planning Area

The San Juan River is a major tributary to the Colorado River. Arising on the western slope of the Continental Divide in southwestern Colorado, the San Juan River flows from the San Juan Mountains north of Pagosa Springs, Colorado and enters northwestern New Mexico through the Navajo Reservoir in Rio Arriba County the west of the Jicarilla Apache Reservation and the Carson National Forest. The course of the San Juan River turns westward for approximately 140 miles through New Mexico before returning to Colorado in the four-corners area. The San Juan River then continues west through southern Utah to its confluence with the Colorado River. The San Juan River basin encompasses lands in four New Mexico counties: all of San Juan County, most of the northern half of McKinley and the western half of Rio Arriba Counties, and a small portion of Sandoval County. Parts of the Navajo and Jicarilla Apache reservations are within the basin. In this basin, the USBR operates Navajo Dam and Reservoir for water conservation, storage, flood control, and to supply irrigation water for the Navajo Nation's use on the Navajo Indian Irrigation Project.

The Upper Rio Grande basin extends over portions of seven counties, including Rio Arriba, Taos, Santa Fe, Los Alamos, Sandoval, Mora, and San Miguel. It is bounded on the north by the Colorado state line and extends south to the Angostura Diversion Works just above the confluence of the Rio Grande and Jemez River. The eastern boundary of the section runs along the major ridge line of the Sangre de Cristo Mountains, while the western boundary follows the Continental Divide through Rio Arriba County, then southeast through Sandoval County to the San Felipe Pueblo.

The Rio Grande bisects the north central portion of New Mexico from north to south for a distance of about 143 miles. The river is fed by several tributaries including the Rio Chama.

The Middle Rio Grande basin covers parts of nine counties, including Rio Arriba, McKinley, Sandoval and Bernalillo. Most of the surface water in the Middle Rio Grande is supplied by runoff and stream flow from the Upper Rio Grande. Exceptions are perennial tributaries in the Jemez Mountains, which contribute to the Jemez River and its principal tributary, the Guadalupe River, as well as the upper reaches of the Rio Puerco and its principal tributary, the Rio San Jose.

Surface Water Quantity

The principal perennial surface water drainages within the planning area include the San Juan River, the Animas River, La Plata River, and the Rio Grande. **Table 3-6** identifies all those watersheds that lie within the planning area and the hydrologic unit code (HUC) associated with each watershed. The table also indicates the number and miles of streams (both perennial and ephemeral) within each HUC. Each hydrologic unit is identified by a unique HUC consisting of two to eight digits based on four levels of classification in the hydrologic unit system. The Upper San Juan hydrologic unit includes the subwatersheds of Pump Canyon, Navajo Reservoir, Kutz Canyon, and Gobernador. The Blanco Canyon hydrologic unit includes the subwatersheds of Blanco, Largo, and Carrizo. The Middle San Juan hydrologic unit includes the La Plata subwatershed.

The San Juan River headwaters are on the Continental Divide north of Pagosa Springs, Colorado, and it flows westward through the planning area. The headwaters of a number of perennial tributaries to the San Juan River in New Mexico rise in southern Colorado. The major perennial tributaries include the Animas and the La Plata Rivers. Other major tributaries that rise in the southern portion of the San Juan Basin include Canyon Largo, Gallegos Canyon, and the Chaco River, which are all ephemeral streams.

Table 3-6. Streams within Watersheds in the Planning Area

Watershed Name	Hydrologic Unit Code	Streams in HUC[1]	Perennial/ Ephemeral (miles)[a]
Rio Puerco	13020204	15	2284/80.9
Arroyo Chico	13020205	12	1223.5/43
Rio San Jose	13020207	10	2697.8/149.7
Gobernador Kutz Canyon Navajo Reservoir Pump Canyon Upper San Juan	14080101	25	3368/1062.9
Blanco Canyon Carrizo Largo	14080103	5	1739.2/52.6
Animas	14080104	24	1323.9/744.1
La Plata Middle San Juan	14080105	21	2348.8/318.3
Chaco Wash	14080106	21	5567.2/199
Mancos	14080107	15	1010.3/216.3
Lower San Juan	14080201	15	1249.8/214.2
Chinle	14080204	18	3582.7/663.1
Upper Puerco	15020006	5	1836.5/84.4

Source: USEPA 2001c.

Note: (1) Not all streams/miles are within the planning area but they may be affected by it.

The southeastern portion of the planning area is drained by tributaries to the Rio Puerco, which ultimately flows to the Rio Grande. The two major stream systems draining southeast from the Continental Divide are Arroyo Chico and Rio San Jose. Both are also ephemeral streams.

The Puerco River (which is different from the Rio Puerco) headwaters are on the Continental Divide just north of Hosta Butte. This ephemeral stream drains southwest into the Little Colorado River at Holbrook, Arizona.

Streamflow in ephemeral channels is only in response to storm events. Differences in rainfall patterns cause streamflow to be extremely variable. Approximately one-half of the annual precipitation occurs from July through October, generally in the form of localized, short-duration, high-intensity thunderstorms. These storms may create large flows, which are commonly of limited duration and extent. Most of the stream gages within the planning area are concentrated along the perennial streams with very little information being gathered on small ephemeral streams in the southern portion of the planning area.

The type of soil and amount and type of vegetation have a major effect on the amount of precipitation that becomes surface runoff.

Surface Water Quality

Availability of water quality data, like streamflow data, is largely limited to the perennial streams in the northern part of the planning area. The water quality of the perennial streams varies from upstream to downstream and is strongly influenced by the type of rock and soils with which the water has been in contact. In their upper reaches, the

perennial streams have relatively low concentrations of dissolved solids. In their middle and lower reaches, the streams contain progressively more magnesium, calcium, sodium, and sulfate concentrations. Water quality also varies according to flow conditions. Generally there are higher concentrations of ions at lower flow conditions. **Table 3-7** describes parameters of concern within each major watershed within the planning area as well as the likely sources of impairment on the stream. The table also indicates which designated uses are not being fully supported in the watersheds, identified by the state in compliance with the CWA.

Table 3-7. Impaired Water Quality by Watershed

River and Watershed Name[1]	Hydrologic Unit Code	Parameters Of Concern	Likely Sources of Impairment
Rio Puerco	13020204	Thermal modification Stream bottom deposits	Agricultural activities, rangeland activities, road maintenance, runoff, riparian vegetation removal, hydromodification.
Rio San Jose	13020207	Thermal modification Total phosphorus pH Stream bottom deposits	Agricultural activities, rangeland activities, hydromodification, riparian vegetation removal, streambank destabilization.
Upper San Juan	14080101	Sediment Mercury Benthic pathogens Turbidity Stream bottom deposits	Atmospheric deposition; resource extraction; petroleum activities; urban runoff; storm sewers; hydromodification; riparian vegetation removal; streambank destabilization; agricultural activities; rangeland activities.
Animas	14080104	Mercury Stream bottom deposits	Atmospheric deposition; resource extraction; petroleum activities; urban runoff; storm sewers; hydromodification; riparian vegetation removal; streambank destabilization; agricultural activities; rangeland activities.
Middle San Juan	14080105	Mercury Nutrients Stream bottom deposits	Atmospheric deposition; resource extraction; petroleum activities; urban runoff; storm sewers; hydromodification; riparian vegetation removal; streambank destabilization; agricultural activities; rangeland activities.
Lower San Juan	14080201	None in New Mexico.	

Source: USEPA 2001c.

Note: (1) Not all streams/miles are within the planning area but may be affected by it.

Quality data for the ephemeral runoff south of the San Juan River are limited to only a few observations at sampling stations associated with the USGS coal hydrology program. Ephemeral flows are generally very poor quality water due to the highly erosive and saline nature of the soils, sparse vegetative cover, and rapid runoff conditions that are characteristic of the area. Surface runoff in the area usually contains greater than 10,000 milligrams per liter (mg/L) of suspended sediment and greater than 1,000 mg/L of dissolved solids. Produced water from gas wells is occasionally used during road construction.

Salinity control is a significant issue in the Colorado River Basin. Available data on salinity contribution from the FFO Area are limited, but existing information from the La Plata and Chaco Rivers does provide evidence that moderately saline water (1,000 to 2,000 mg/L dissolved solids) is predominant within these basins.

Groundwater

The planning area is underlain by sandstone aquifers and unconsolidated sand and gravel aquifers. The Colorado Plateaus Aquifers are sandstone while the Rio Grande Aquifer system is unconsolidated sand and gravel. The primary Colorado Plateaus Aquifers that underlie the planning area are the Unita-Animas Aquifer, which underlies the vast majority of the San Juan Basin, and the Mesaverde aquifer (USGS 2001a).

The Unita-Animas aquifer is composed primarily of Lower Tertiary rocks in the San Juan Basin. It consists of the San Jose Formation, the underlying Animas Formation and its lateral equivalent, the Nacimiento Formation, and the Ojo Alamo Sandstone. The San Jose Formation is the uppermost significant bedrock formation in the San Juan Basin and primarily consists of permeable, coarse, arkosic sandstone interlayered with mudstone. The Animas and Nacimiento Formations and the Ojo Alamo Sandstone consist primarily of permeable conglomerate and medium to very coarse sandstone interlayered with relatively impermeable shale and mudstone. The thickness of the Unita-Animas aquifer generally increases toward the central part of each basin. In the northeastern part of the San Juan Basin, the maximum thickness of the aquifer is about 3,500 feet (USGS 2001a).

Aquifers that have demonstrated 100 gallons per minute (gpm) potential for properly constructed wells include the San Andres-Glorieta system, the Entrada Sandstone, the Morrison Formation, the Gallup Sandstone, the Ojo Alamo Sandstone, the Nacimiento Formation and the San Jose Formation.

The Mesaverde aquifer comprises water-yielding units in the Upper Cretaceous Mesaverde Group, it equivalents, and some adjacent Tertiary and Upper Cretaceous formations. The Mesaverde aquifer is at or near land surface in extensive areas of the Colorado Plateaus and underlies the Unita-Animas aquifer (USGS 2001a). The aquifer is of regional importance in the San Juan Basin. Some of the rocks that form the Mesaverde aquifer contain coal beds, some of which have been mined for at least a century. The hydrologic effects of mining have been of increasing concern in the areas underlain by the aquifer. In the San Juan Basin, the Mesaverde aquifer consists of sandstone, coal, siltstone, and shale of the Mesaverde Group. The formations of the Mesaverde Group interweave extensively with the Mancos Shale and, to a lesser extent, with the Lewis Shale. The Point Lookout Sandstone is the most aerially extensive of the Mesaverde Group formations in the San Juan Basin. The Mesaverde aquifer has a maximum thickness of about 4,500 feet in the southern part of the basin (USGS 2001a).

The unconsolidated sand and gravel basin-fill aquifers of the Rio Grande Aquifer system are present in intermountain basins between mountains and tablelands in northern New Mexico. The Rio Grande Rift is the principal geologic feature of the area. The rift affected the configuration of the bounding highlands, which in turn has affected precipitation, runoff, groundwater recharge, source material of the basin fill, aquifer characteristics, and water quality. The rift is a northward-trending series of interconnected, downfaulted and rotated blocks located between uplifted blocks to the east and west. Various block shave been displaced downward thousands of feet, and most of the rift has been filled with alluvium and volcanic rock. The thickness of the basin fill in unknown in most areas but is estimated to be as much as 30,000 feet in the San Luis Valley and about 20,000 feet near Albuquerque (USGS 2001b).

Groundwater Quantity

Groundwater is available nearly everywhere in the planning area. Although many aquifers are known to yield water to wells somewhere in the basin, most yields are low (less than 20 gpm) (BLM 1987b). The better aquifers are found in sandstone units of Jurassic, Cretaceous, and Tertiary age. Quaternary alluvium deposits filling stream channels are also capable of yielding sufficient quantities of water for local use.

Groundwater recharge to the Unita-Animas aquifer generally occurs in the areas of higher altitude along the margins of each basin. Groundwater is discharged mainly to streams, springs, and by transpiration from vegetation growing along stream valleys. In the San Juan Basin, water recharges the Unita-Animas aquifer in the higher altitude areas that nearly encircle the basin. Groundwater generally flows toward the San Juan River and its tributaries where it is discharged to streamflow, to the alluvium that locally is present in the valleys, or to evapotranspiration (USGS 2001a).

Water generally recharges the Mesa Verde aquifer in upland areas that receive more precipitation than lower altitude areas. The available data in the San Juan Basin indicates that recharge occurs in the area of the Zuni Uplift, Chuska Mountains, and in northern Sandoval County (USGS 2001a). Groundwater discharges from the aquifer directly to streams, springs, and seeps, by upward movement through confining layers and into overlying aquifers, or by withdrawal from wells. The natural discharge areas generally are along streams and rivers such as the San Juan River and the Chaco River and their tributaries (USGS 2001a).

Groundwater recharge to the Rio Grande aquifer system primarily originates as precipitation in the mountainous areas that surround the basins. Runoff from snowmelt or rainfall enters the basins and generally flows for short distances across permeable alluvial fans before the water percolates downward through streambeds of evaporates. Most of the precipitation that falls in the valleys is lost to evaporation and transpiration, with little water percolating to a sufficient depth to recharge the aquifers (USGS 2001b).

Groundwater Quality

The quality of groundwater in the San Juan Basin generally ranges from fair to poor. In most places the total dissolved solids (TDS) content exceeds 1,000 mg/L, and can range from 500 to 4,000 mg/L (BLM 1987b, USGS 2001a). The Unita-Animas Basin contains fresh to moderately saline water. Dissolved solids concentrations generally increase along the groundwater flow path in the San Juan Basin. The water is hard to very hard with actual chemical composition depending on location of withdrawal and the producing aquifer. Calcium or sodium is usually the predominant cation, and bicarbonate or sulfate the predominant anion (BLM 1987b).

The quality of the Mesa Verde aquifer is extremely variable. In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water sources contain relatively fresh water. Sparse data indicate that the dissolved solids concentration ranges from about 1,000 to 4,000 mg/L in the San Juan Basin.

The composition and TDS concentration of water in the Rio Grande aquifer system are affected by the quality of the water that enters the aquifer, the type and solubility of minerals present in the basin fill, and the quantity of water lost by evaporation and transpiration. Soluble minerals present in the rocks of the mountains adjacent to the basins affect the quality of the water draining from the mountains, which, in turn, affects the quality of the recharge entering the aquifers. Water in the aquifer system is of varied chemical composition, in part because of the varied geology of the nearby mountains. Surface water in the Rio Grande in the reach from the headwaters to Albuquerque generally has a small TDS concentration and contains a preponderance of calcium, bicarbonate, and sulfate ions.

UPLAND VEGETATION

Public lands in San Juan, McKinley, Rio Arriba, and Sandoval Counties support a diversity of upland and riparian plant communities. These plant communities or vegetation types are controlled in large part by site-specific topography, soil type, and climatic conditions. The planning area contains five major vegetation units, as well as the non-native cover type represented by urban/agricultural areas, shown in **Map 3-6** (Dick-Peddie 1993).

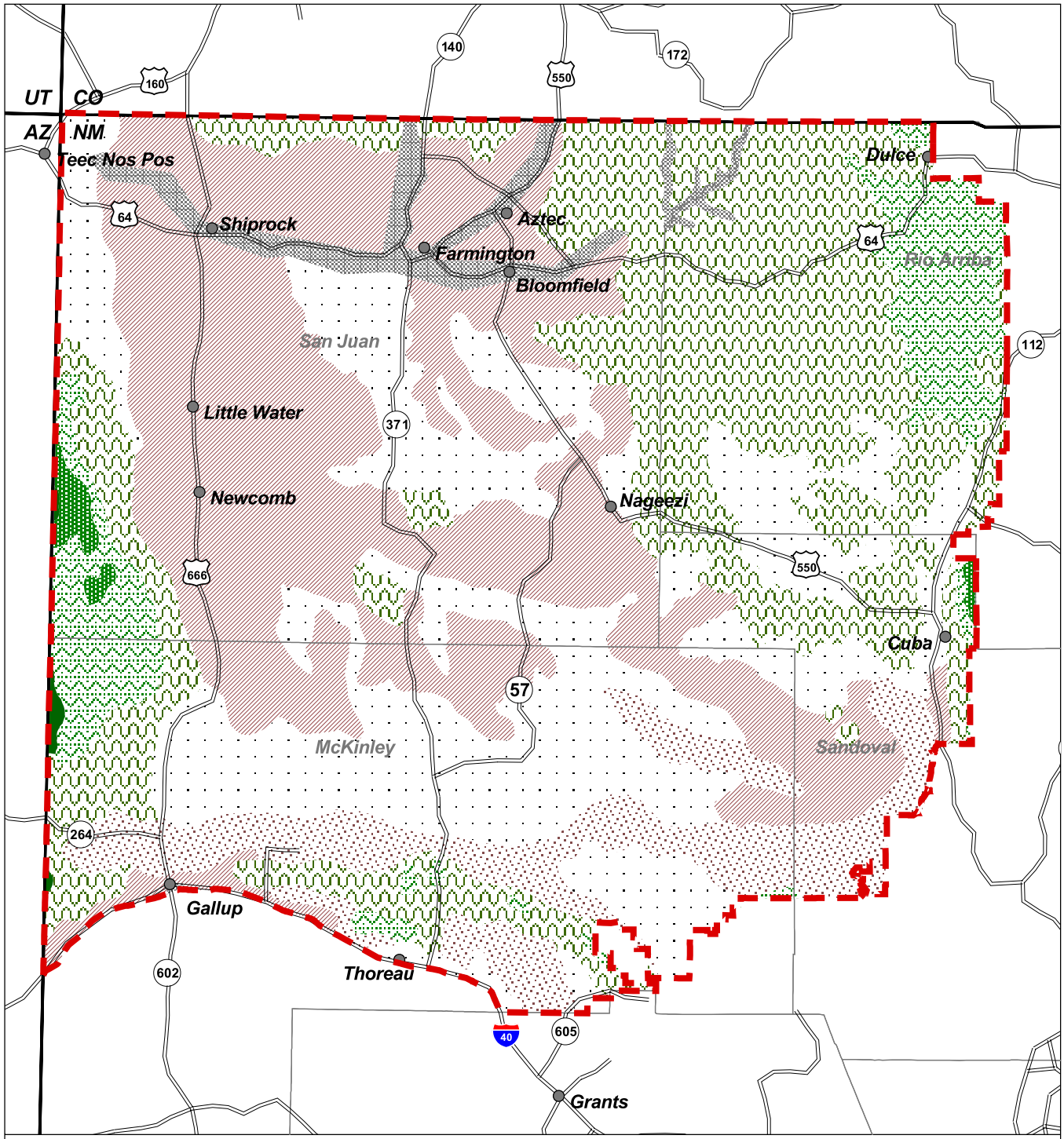
An estimated 223,600 acres of desert grasslands are found within FFO boundaries, 65,500 acres are on AFO land, and 11,800 acres on USFS land (**Table 3-8**). There are large tracts of desert grassland vegetation throughout the central portion of the planning area. Blue grama (*Bouteloua gracilis*), galleta (*Hilaria jamesii*), and dropseeds (*Sporobolus sp.*) are common. Broom snakeweed (*Gutierrezia sarothrae*) occurs in most areas along with scattered big sagebrush (*Artemisia tridentata*) and one-seed juniper (*Juniperus monosperma*) on ridges and rocky areas (BLM 1988).

Table 3-8. Acres of Plant Community Types

Plant Community Type	BLM		USFS	USBR	Total
	FFO[1]	AFO[1]			
Desert Grassland	223,600	65,500	11,800	0	300,900
Great Basin Desert Scrub	435,500	74,700	200	0	510,400
Juniper Savannah	56,500	136,000	0	0	192,500
Piñon-Juniper Woodland	633,400	90,700	191,700	12,900	928,700
Ponderosa Pine Forest	2,300	5,600	43,300	0	51,200
Subalpine Montane Grassland	300	0	0	0	300
Subalpine Coniferous Forest	0	0	6,700	0	6,700
Urban, Farmland, or Open Water	47,000	0	0	17,600	64,600
Total	**1,398,600**	**372,500**	**253,700**	**30,500**	**2,055,300**

Source: GIS data based on Dick-Peddie 1993 (acreage is not comprehensive due to course resolution and rounding).
Note: (1) Acreage reflects all land ownership within BLM administrative boundaries.

The Great Basin Desert Scrub plant community covers approximately 435,000 acres within FFO boundaries, 75,000 acres within AFO boundaries, and 200 acres on USFS land and dominates the landscape in the northwestern portion of the planning area. The major shrub species in this type are big sagebrush, shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and fourwing saltbush (*Atriplex canescens*). Big sagebrush has increased dramatically over the past 125 years. Most areas now dominated by big sagebrush in New Mexico were grassland or savannah in the middle of the last century (Dick-Peddie 1993). Within Great Basin Desert Scrub, big sagebrush usually occurs at higher elevations than the saltbush communities. Other sagebrush species found with big sagebrush are black sage (*Artemisia arbuscula*) and Bigelow sage (*A. bigelovii*). Other shrub species found with saltbush include winterfat (*Ceratoides lanata*), rabbitbrush (*Chrysothamnus sp.*), and Nuttal's saltbush (*Atriplex nuttallii*). Widespread grasses in this vegetation type include alkali sacaton (*Sporobolus airoides*), western wheatgrass (*Agropyron smithii*), Indian ricegrass (*Oryzopsis hymenoides*), and blue grama (Dick-Peddie 1993).



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LEGEND

- RMP/EIS Boundary
- County Boundary
- Coniferous and Mixed Woodland
- Desert Grassland
- Great Basin Desert Scrub
- Juniper Savanna
- Montane Coniferous Forest
- Montane Grassland
- Subalpine Coniferous Forest
- Urban, Farmland or Open Water
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: Dick-Peddie 1993

Map 3-6: Vegetation Types in the Planning Area

The Juniper Savannah plant community lies primarily in a band along the southern boundary of the planning area, and covers approximately 56,000 acres within FFO boundaries and 136,000 acres within AFO boundaries. This vegetation type occurs between the conifer woodlands and grasslands and has been expanding during this century due mainly to human activities, such as livestock grazing and fire suppression. This type consists of widely scattered low trees interspersed in grasslands. One-seed juniper and Utah juniper (*Juniperus osteosperma*) are typical, as are big sagebrush, Bigelow sagebrush, and shadscale. Blue grama, galleta, Indian ricegrass, and sideoats grama (*Bouteloua curtipendula*) are common grass species (Dick-Peddie 1993).

The Piñon-Juniper Woodland plant community type occurs primarily in the northeastern portion of the planning area and along the southern boundary. It covers an estimated 633,000 acres within FFO boundaries, 91,000 acres within AFO boundaries, 192,000 acres on USFS land, and 13,000 acres on USBR land. Trees in these woodlands can form a dense canopy or be fairly open. Dense stands generally occur above 6,600 feet in elevation and the dominant tree species are piñon (*Pinus edulis*), Utah juniper, Gambel's oak (*Quercus gambellii*), and true mountain mahogany (*Cercocarpus montanus*), with occasional stringers of ponderosa pine (*Pinus ponderosa*). Common ground cover species are mutton grass (*Poa fendleriana*), western wheatgrass (*Agropyron smithii*), buckwheat (*Eriogonum sp.*), and penstemon (*Penstemon sp.*) (BLM 1997). More open stands are located on drier sites below 6,600 feet elevation where piñon, Utah juniper, big sagebrush and antelope bitterbush (*Purshia tridentata*) are common. Blue grama and galleta are the principal grass species. Relatively large stands of big sagebrush can occur within the open woodlands (BLM 1997).

The Ponderosa Pine Forest occurs principally on USFS land along the eastern boundary of the planning area, although there is a small amount on FFO land. There are an estimated 2,300 acres within FFO boundaries, 5,600 acres within AFO boundaries, and 43,300 acres on USFS land. This forest occurs on BLM land primarily in deep canyons on north and east facing slopes. Common tree species are ponderosa pine, piñon, and Douglas fir (*Pseudotsuga menziesii*). The shrub component is dominated by antelope bitterbush, true mountain mahogany, and Gambel's oak with grass cover dominated by mutton grass and western wheatgrass. On the Jicarilla Ranger District and the Cuba Ranger District, this vegetation type occurs in scattered locations in deep canyons on north and east facing slopes. Dominant plant species at these locations are similar to those found on BLM lands.

The subalpine montane grasslands is represented by approximately 300 acres within FFO boundaries located on the very western side of the planning area along the New Mexico Arizona border. These grasslands are commonly found above 8,900 feet and up to 11,500 feet on relatively smooth terrain of southwestern exposures with slopes ranging from 20 to 50 percent (Dick-Peddie 1993). Dominant grasses in this vegetation unit include fescue (*Festuca* sp.), oatgrass (*Danthonia* sp.), tuft-hair grass (*Deschampsia* sp.), Junegrass (*Koeleria* sp.), bluegrass (*Poa* sp.), and muhly (*Muhlenbergia* sp.). Areas of heavy grazing experience vegetation community shifts from Thurber and Arizonia Fescue (*Festuca thurberi* and *F. arizonica* respectively), oatgrass and Junegrass to Kentucky bluegrass (*Poa pratensis*) (Dick-Peddie 1993). Restoration to a pre-grazing state of native vegetation occurs within 2 to 4 years if adequate recovery is allowed (Dick-Peddie 1993).

The subalpine coniferous forest unit occurs along the eastern boundary of the planning area with an estimated 6,700 acres of USFS land on the Santa Fe National Forest. The vegetation unit is characterized by elevations of approximately 9,500 feet to timberline, approximately 12,000 feet (Dick-Peddie 1993). Common flora include Englemann spruce

(*Picea englemanii*), Douglas-fir, Juniper species, Corkbark fir (*Abies lasiocarpa*), currants (*Ribes* sp.), fringed brome (*Bromus ciliatus*), mountain trisetum (*Trisetum spicatum*), and bluegrass (Dick-Peddie 1993). Vegetation communities vary among different alpine regions due to elevation and moisture differences.

The urban, farmland, and open water unit includes federal, state and private lands in the northern tier of the planning area. This vegetation unit represents the non-native land cover according to Dick-Peddie (1993). Open water areas are permanently inundated in surface water, such as the Navajo Reservoir. Irrigated cropland represents the farmland located adjacent to the San Juan, Animas, La Plata, and Los Piñas Rivers in this vegetation unit. Urban areas are concentrated in the tri-cities area (Aztec, Bloomfield, and Farmington).

Invasive Weeds

Invasive plants are found in the San Juan Basin, particularly in areas disturbed by surface activities. These plants displace native plant communities and degrade wildlife habitat. A total of 212 invasive and poisonous weeds have been identified on FFO land (Heil and White 2000). **Table 3-9** lists the invasive and non-native species of concern in the planning area and the current management classes for each species. The following management classes provide information on the current status of each species in the planning area and the priority for treatment:

- Class A: Non-native plants that have a limited distribution within or have not yet invaded the state. Some are found on public lands within the planning area, and preventing and eliminating infestations of these weeds has the highest priorities in the BLM management plan.
- Class B: Non-native plants that are presently limited to a particular part of the planning area. The management priorities are to contain them within their current areas and prevent new infestations.
- Class C: Non-native plants that are widespread throughout much of the public land within the planning area. Long-term programs of management and suppression are encouraged.

Table 3-9. 2001 Invasive and Non-Native Plant Species of Concern within the Planning Area

Common Name	Scientific Name	Class
African rue	*Peganum harmala*	A
Black henbane	*Hyoscyamus niger*	B
Bull thistle	*Cirsium vulgare*	C
Camelthorn	*Alhagi maurorum*	A
Canada thistle	*Cirsium arvense*	B
Dalmatian toadflax	*Linaria dalmatica*	A
Diffuse knapweed	*Centaurea diffusa*	A
Dyers weed	*Isatis tinctoria*	A
Hoary cress	*Cardaria draba*	C
Houndstongue	*Cynoglossum officinale*	A
Jointed goatgrass	*Aegilops cylindrica*	B
Leafy spurge	*Euphorbia esula*	B
Malta starthistle	*Centaurea solstitialis*	A
Musk thistle	*Carduus nutans*	C

Common Name	Scientific Name	Class
Onionweed	*Asphodelus fistulosus*	A
Purple loosestrife	*Lythrum salicaria*	A
Russian knapweed	*Centaurea repens*	C
Russian olive	*Elaeagnus angustifolia*	C
Saltcedar	*Tamarix spp.*	C
Scotch thistle	*Onopordum acanthium*	B
Spotted knapweed	*Centaurea maculosa*	A
Tall whitetop	*Lepidium latifolium*	A
Woolyleaf bursage	*Ambrosia grayi*	A
Yellow starthistle	*Centaurea solstitialis*	A
Yellow toadflax	*Linaria vulgaris*	A

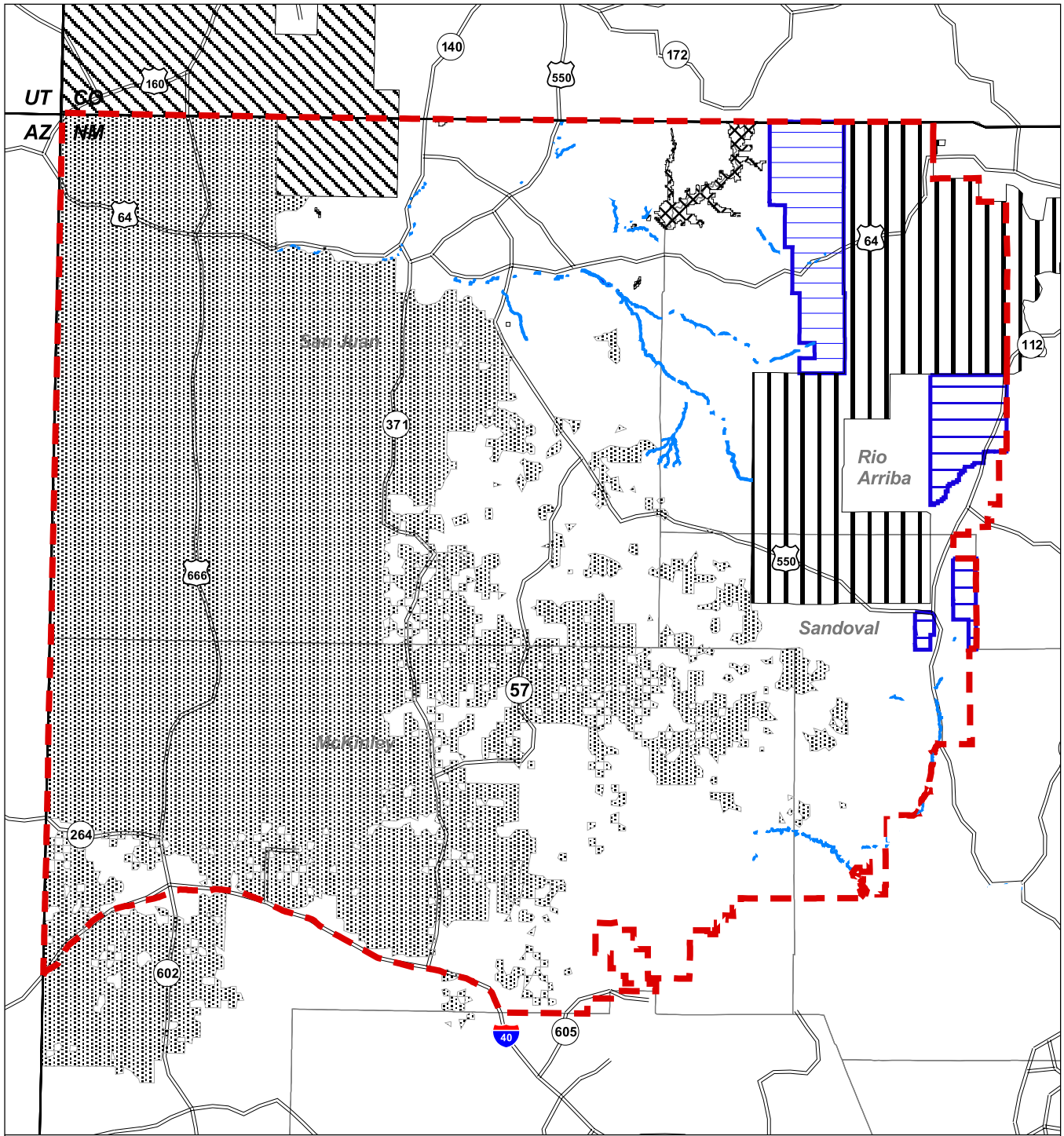
Source: BLM FFO.

RIPARIAN AREAS AND WETLANDS

Riparian areas are defined by the BLM as "a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittent flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas" (Leonard et al. 1992). Wetlands are regulated by the U.S. Army Corps of Engineers (USACE) and defined as "those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (US Army 1987).

Seventy riparian areas in 35 river tracts and along portions of nine ephemeral stream reaches were identified on FFO land as shown in **Map 3-7** (BLM 2000b). Subsequently, 13 additional tracts along ephemeral drainages were identified. Riparian areas associated with the river tracts comprise 471 acres along 20 miles of river adjacent to the Animas, San Juan, and La Plata Rivers and Pump Canyon Creek (**Table 3-10**) (BLM 2000b). An estimated 1,042 acres of riparian vegetation occurs along an estimated 109 miles of ephemeral streams including Blanco Reach, Carrizo Canyon, Ditch Canyon, Gobernador Canyon, Kutz Canyon, La Jara Canyon, Largo Canyon, Palluche Canyon, and Simon Canyon (BLM 2000b). Wetlands include the 25 acres Carrizo Oxbow wetland identified in BLM (2000b) and the more recently identified 10 acre Desert Hills wetland. Common plant species in riparian areas on FFO land are cottonwoods (*Populus spp.*), willows (*Salix spp.*), saltcedar (*Tamarix spp.*), Russian olive (*Elaeagnus angustifolia*), sedges (*Carex spp.*), rushes (*Juncus spp.*), reed canarygrass (*Phalaris arundinacea*), cattails (*Typha spp.*), bulrushes (*Scirpus spp.*), alkali sacaton, galletagrass, Indian rice-grass, sagebrush, greasewood, and four-wing saltbush (BLM 2000b).

Twenty riparian areas occur along 21 miles of the Rio Puerco, 18 miles of Arroyo Chico, and 3 miles of other ephemeral drainages, for a total of about 42 miles on AFO land (see Table 3-10). There are a total of 1,169 acres of riparian habitat along these drainages, with 601 acres along Arroyo Chico and 523 acres along Rio Puerco. Most of the native cottonwoods and willows have disappeared from these riparian areas and the invasive saltcedar and Russian olive are common in some areas.



Map 3-7: Riparian Areas on BLM Land in the Planning Area

Table 3-10. Riparian Areas on Farmington and Albuquerque BLM Land in the Planning Area

Riparian Areas (number of segments)	Length (miles)	Size (acres)	Rating[1]
Farmington BLM Riparian Areas			
Animas River (3)	1	26	2 FAR (downward) and 1 PFC
San Juan River (18)	11	314	7 FAR (3 upward, 1 downward, 3 static) and 11 PFC
La Plata River (10)	3	68	8 FAR (no trend data) and 2 PFC
Pump Canyon (4)	5	63	3 FAR (no trend data) and 1 PFC
Blanco Reach (1)	1	[2]	FAR (static)
Carrizo Canyon (8)	23	15	4 FAR (3 upward, 1 static) and 4 NF
Ditch Canyon (1)	4	13	FAR (static)
Gobernador Canyon (2)	4	30	2 FAR (upward)
Kutz Canyon (2)	6	55	2 FAR (1 downward, 1 static)
La Jara Canyon (4)	5	18	4 NF
Largo Canyon (10)	37	677	7 FAR (4 upward, 3 static) and 3 NF
Palluche Canyon (5)	19	32	2 FAR (1 upward, 1 downward) and 3 NF
Simon Canyon (1)	1	4	NF
La Fragua (1)	0.6	13	PFC
La Jara Reach #5 (1)	1.3	29	PFC
Pump Canyon #5 (1)	0.5	30	PFC
Desert Hills Overflow (1)	0.5	10	PFC
Desert Hills Wetland (1)	[2]	10	PFC
Cutter Canyon (1)	1	10	PFC
Tapicito Reach #1 (1)	1	30	FAR (static)
Tapicito Reach #2 (1)	1	40	NF
Largo Canyon Reach #11 (1)	0.25	5	FAR (static)
La Plata River Reach #11 (1)	0.25	5	FAR (static)
Bancos Canyon (1)	1	5	FAR (downward)
Cabresto Canyon (1)	0.75	5	FAR (upward)
McDermott Wash (1)	1	6	FAR (downward)
Total	**129**	**1,513**	

Riparian Areas (number of segments)	Length (miles)	Size (acres)	Rating[1]
Albuquerque BLM Riparian Areas			
Rito Leche (1)	1	10	PFC
Senorito Canyon (1)	2	35	PFC
Wilson Canyon[3] (1)	2	77	FAR (upward)
Two Bridges[3] (1)	2	30	No trend data
Coal Creek[3] (1)	4	100	FAR (upward)
Cerros Colorados[3] (4)	2	43	4 FAR (static)
Cachulie[3] (1)	2	26	FAR (downward)
San Luis Community[3] (1)	1	22	FAR (downward)
Lost Valley[3] (1)	4	103	FAR (upward)
Cabezon Community[3] (4)	2	45	4 FAR (upward)
Arroyo Chico (3)	18	601	2 FAR (1 upward, 1 downward) and 1 NF
Guadalupe Community[3] (1)	2	77	NF
Chijuilla Spring	NA[4]	<1	No trend data
Dry Spring	NA	<1	No trend data
Elk Spring	NA	<1	No trend data
Mesa Portales Spring	NA	<1	No trend data
Mesa Chirato Spring	NA	<1	No trend data
Total	**42**	**1,169**	

Source: BLM 2000b, c.

Notes: (1) FAR = functioning at risk, PFC = proper functioning condition, NF = non-functional, upward = upward trend in condition, downward = downward trend in condition, static = no apparent trend in condition.

(2) Size and/or length not provided.

(3) Riparian areas along Rio Puerco.

(4) NA = not applicable

Upland plants, such as rabbitbrush, have moved into some of the riparian areas. However, native vegetation is evident and increasing in some areas due to the exclusion of livestock or limitations on grazing. Vegetation in these areas typically grows in zones from wetter to dryer, starting with sedges and rushes common in the wettest zone and willows, grasses, saltcedar, rabbitbrush, and salt grass growing in progressively dryer areas. A few scattered remnant cottonwoods are present (BLM 2000c).

Proper-functioning condition (PFC) surveys were first conducted on FFO lands in 1994. During 1994, surveys took place on 3 tracts of the San Juan River, 9 tracts of the La Plata River, and the BLM portions of Largo Canyon, Carrizo Canyon, Palluche Canyon, La Jara Canyon, Gobernador Canyon, Kutz canyon, Pump Canyon Ditch Canyon, Blanco Canyon, and Simon Canyon. Of the river tracts, 2 were rated as PFC, 3 were rated as functioning at risk (FAR) with an upward trend, 6 were rated as FAR with no apparent trend, and 1 was rated as non-functional (NF). Of the intermittent and ephemeral systems, 1 was rated as PFC, 10 were rated as FAR with an upward trend, 6 were rated as FAR with no apparent trend, 2 were rated as FAR with downward trend, and 15 were rated NF. All of

the remaining riparian reaches were surveyed in 1998. These riparian areas consisted of 25 perennial reaches and 1 wetland. The results of the 1998 surveys were 13 reaches rated as PFC, 4 reaches rated as FAR with an upward trend, 2 reaches rated as FAR with no apparent trend, 3 reaches rated as FAR with a downward trend, on 1 reach rated as NF.

Follow-up PFC surveys were conducted since 1998 on some of the reaches with the following results: 7 reaches showed no change, 1 reach that was rated as FAR with no apparent trend was changed to FAR with a downward trend, 3 reaches that were rated FAR with no apparent trend were changed to FAR with an upward trend, and 5 reaches that were rated as NF were changed to a rating of FAR. The early results of PFC reassessment show some improving conditions.

The 1994 and 1998 PFC surveys revealed that significant portions of riparian areas were in less than PFC. FFO staff began a process to evaluate the cause and effects of management techniques in relationship to riparian conditions. Management actions implemented as a result of the evaluation process include a decision in 1998 to defer all designated riparian areas from summer grazing, the development of an EIS for Riparian and Aquatic Habitat Management in the Farmington Field Office (BLM 2000b), and the development of a riparian monitoring plan.

The FFO riparian management plan is dynamic and, as indicated above, additional riparian areas have been added since the completion of the Riparian Habitat Management Plan (BLM 2000b) (Table 3-10). If other drainages are found that meet the BLM definition of riparian areas, they will also be added. On AFO land within the planning area, three riparian sites (21 percent) are PFC and eight (57 percent) are FAR, with four showing an upward trend, three a downward trend, and one with no apparent trend. Two (14 percent) riparian sites are NF, and one (7 percent) was not categorized (BLM 2000c).

FISHERIES AND WILDLIFE

This section addresses wildlife species within the planning area, except for special status species, which are addressed in the next section.

Fisheries

The FFO area administers a small amount of fisheries habitat on small, generally isolated tracts of public land mostly along the San Juan River. Some of this land, on the San Juan upstream from Archuleta, New Mexico, provides good habitat for rainbow trout (*Oncorhynchus mykiss*). Further downstream, the water temperature rises and the river bottom is covered with mostly mud as opposed to the gravel/cobble substrate upstream. The general absence of a substrate (gravel/cobble) suitable for the production of macro-invertebrates precludes the establishment of any significant trout populations in the area downstream from Archuleta. However, native species such as the flannelmouth (*Catostomus latipinnis*) and bluehead (*C. discobolus*) suckers are abundant in this area.

The State of New Mexico classifies the Navajo Reservoir as both a cold water and a warm water fishery (USBR 1999). The reservoir also carries a "Class 1" supporting "warm aquatic life" by the State of Colorado (USBR 1999). Kokanee salmon (*Oncorhynchus nerka*), rainbow trout, brown trout (*Salmo trutla*), and northern pike (*Esox lucius*) comprise the primary cold water game fish species in the reservoir. Warm water game fish species include smallmouth bass (*Micropterus dolomieui*), largemouth bass (*M. salmoides*), bluegill (*Lepomis macrochirus*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), channel catfish (*Ictalurus punctatus*), and black bullhead (*Ameriurus melas*). Roundtail chub (*Gila robusta*), Bluehead sucker, and Flannelmouth sucker are nongame species of concern (USBR 1999).

Stocking efforts from the Colorado Department of Wildlife and the New Mexico Department of Game and Fish supports Kokanee salmon populations in the reservoir.

Rainbow trout levels are attributed to NMDGF stocking efforts while brown trout and northern pike populations are supported through migrations from adjacent tributaries. The warm water fishery of the Navajo Reservoir is sustained through natural reproduction.

Fish harvesting patterns fluctuate temporally due to accompanying species patterns. Restrictions are implemented for kokanee salmon during the fall and in the spring for trout and other fishes to protect specific spawning behaviors.

Wildlife

The FFO strives to maintain a biologically diverse complement of endemic wildlife species. As a consequence of this, a variety of monitoring and survey efforts are undertaken each year. Generally, the focus of these efforts has been upon those species with a special status designation (i.e., threatened, endangered, or sensitive, or game animals such as mule deer, elk, antelope, and wild turkey). However, in recent years, non-game species (primarily avian) have received more attention.

In 1999, the FFO initiated a monitoring program to assess the status of avian species utilizing the key habitat types common to the FFO area. This monitoring effort consisted of conducting point count surveys during the spring breeding period and again during the winter in the following habitat types: piñon-juniper; ponderosa pine/piñon pine/Gambel's oak; riparian (cottonwood, willow, saltcedar); Wyoming big sagebrush/grass (untreated); and Wyoming big sagebrush/grass (treated). A synthesis of the bird species and numbers of individuals detected in all habitat types by year is provided in Appendix O, Table O-1. The results of these surveys are generally consistent with the trends reported in the breeding bird surveys conducted by the USFWS and with the information presented in the Partners in Flight (PIF) Draft Land Bird Conservation Plan for the State of New Mexico. It is the intention of the FFO to continue, and if funding allows, expand the monitoring of avian species. Data collection of this magnitude will also enable the FFO to more effectively meet its obligations under the provisions of the Migratory Bird Treaty Act and as emphasized by EO 13186 of January 10, 2001.

The PIF Bird Conservation Plan identifies a number of bird species within the Colorado Plateau physiographic region as "priority" species. A number of the highest priority species have been detected in the FFO area. Representatives in this group include sage sparrow, mountain bluebird, loggerhead shrike, and gray vireo. Other species that occur in the FFO area and which PIF has identified in New Mexico as having a high percentage (over 10 percent) of their U.S. population include the piñon jay and western bluebird. Table O-2 in Appendix O summarizes regional breeding bird survey information for priority species for which PIF suggests that New Mexico land managers have a "high level of responsibility" to maintain or increase the current populations. The FFO will consider PIF's recommendations in its future management actions.

One of the earliest non-game species inventories was in the Chaco strippable coal belt where 175 vertebrate species were detected (Albee 1982). Species lists are on file in the FFO.

Waterfowl habitat within the planning area is limited to stock ponds, sumps, a few acres of wetlands in Carrizo and Pump Canyons, and scattered parcels of public land along the San Juan, Animas, and La Plata Rivers. Potholes enclosed by a fence to exclude livestock have been constructed in the Largo Canyon drainage for the purpose of providing waterfowl nesting habitat. Mallards (*Anas platyrhynchos*), American widgeon (*Anas americana*), green wing teal (*Anas crecca*), common merganser (*Mergus merganser*), American coot (*Fulica americana*), common goldeneye (*Bucephala clangula*), and cinnamon teal (*Anas cyanoptera*) are species typically encountered on the water impoundments and rivers. Canada geese (*Branta canadensis*) are abundant on the San Juan and Animas Rivers and the lands adjacent to them.

There are several species of upland game birds found on public lands in the planning area. Gambel's quail (*Callipepla gambelii*) are common in many of the drainages that are well vegetated while scaled quail (*Callipepla squamata*) tend to be more prevalent on drier sage/grass sites in the southern portion of the field office area. Scattered tracts of public land adjacent to private agricultural lands support small numbers of ring-necked pheasants (*Phasianus colchicus*). Merriam's wild turkey (*Meleagris gallopavo*) are found year-long in the ponderosa and piñon-juniper/Gambel's oak habitat types found in the Laguna Seca Mesa SMA, and seasonally in the Rattlesnake Canyon wildlife management area.

The FFO has inventoried and monitored golden eagles (*Aquila chysaetos*), ferruginous hawks (*Buteo regalis*), and prairie falcons (*Falco mexicanus*) since 1981 (Hawks Aloft 1998, 1999a, b, c, and FFO files). Abundance and nesting success has fluctuated probably due to weather conditions and cyclic prey abundance, but populations of ferruginous hawk and golden eagle have remained relatively stable. Owls recorded during Mexican spotted owl surveys included the long-eared owl (*Asio otus*), northern saw-whet owl (*Aegolius acadicus*), flammulated owl (*Otus flammeolus*), and great-horned owl (*Bubo virginianus*) (BLM 1995d). Detailed raptor surveys have not been conducted on AFO land, although species such as the golden eagle and prairie falcon are known breeders (Silva 2001). The northern goshawk (*Accipiter gentilis*), Cooper's hawk (*A. cooperii*), and red-tailed hawk (*Buteo jamaicensis*) are known to nest on the Jicarilla and Cuba Ranger District land (USFS 2000).

A two-year bat survey on FFO land resulted in the detection of 14 species, with the most common species determined to be the California myotis (*Myotis californicum*), long-legged myotis (*M. volans*), big brown bat (*Eptesicus fuscus*), and long-eared myotis (*M. evotis*) (Gannon 1997, 1998a). Bat surveys were also conducted in the Jicarilla Ranger District in 1998 with nine species comprising 251 individuals captured. The big brown bat, long-eared bat, pallid bat (*Antrozous pallidus*), and fringed myotis (*Myotis thysanodes*) were the most common species identified in these surveys (Gannon 1998b). It is expected that these species also occur in appropriate habitat on the Santa Fe National Forest and the AFO land.

The piñon-juniper and Great Basin Desert Scrub plant communities in the northeastern part of the planning area provide habitat for herds of wintering and resident populations of mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*). Most of the National Forest land within the project boundary is managed as year-long big game and critical wintering habitat. Much of the AFO land consists of the Piñon-Juniper Woodland vegetation type and supports a low population of mule deer and elk. Elk are most common in the riparian habitat along the Rio Puerco (Silva 2001).

Mule deer and elk are found most often on FFO land north of US 550, and are much less common south of the highway due to the lack of suitable habitat (BLM 1988). Deer and elk population density on FFO land varies by location and time of year. In most years, a large influx of migratory mule deer and a lesser number of elk takes place during the winter. Most of these animals are found on FFO land near the Colorado/New Mexico state line and adjacent to National Forest and Jicarilla Apache reservation lands. Much of this habitat on FFO land is considered critical winter range. TLs currently in place in the Laguna Seca Mesa SMA and other winter habitat provide some protection against disruptions in their habitat when fawning or calving is occurring. Resident deer density is much lower than winter population levels as determined from browse studies and helicopter surveys conducted each year. Aerial surveys conducted on some of the big game subunits on FFO land are summarized in Table 2 in SAIC 2002a.

Several small populations of pronghorn antelope (*Antilocapra americana*) reside in the area north and east of US 550 near Angel Peak and Ensenada Mesa. There are also remnants

of a once thriving population of antelope in the Twin Mounds area. The numbers of these animals have been declining over the past 10 years. Studies are currently in progress to determine the cause of this decline. Preliminary indications are that the cause may be attributable to factors such as habitat quality and predation (Hanson 2001). It has been documented that antelope disperse widely over Ensenada Mesa when fawning. Traffic and other human activities can cause does to leave their fawns, leaving them vulnerable to predators. When human disruptions are limited in the habitat during the first 10 days to 2 weeks of a fawn's life, it can remain under cover until it is strong enough to travel with the herd, greatly improving its chances for survival (Hanson 2002). About 100 antelope were released on AFO land in and near the planning area a few years ago but most of these have disappeared, leaving only an occasional pronghorn antelope to be seen (Silva 2001).

Mountain lion (*Felis concolor*) and black bear (*Ursus americanus*) are also considered big game animals that occur in the planning area. The mountain lion population in the FFO area appears to be doing well as indicated by the NMDGF harvest quota for the 2001-2002 season for Game Management Units 2 and 7, which is set at 11 lions. Reports of black bear in the FFO area are infrequent and there is no open hunting season.

HMPs have been developed for some of the wildlife management areas such as Rattlesnake Canyon and Crow Mesa. These areas are managed for big game and other wildlife on FFO land (BLM 1997, 1999b). These areas are characterized by deep canyons, piñon-juniper woodlands with stringers of ponderosa pine, and areas dominated by big sagebrush. The objectives of these HMPs are to increase the year-round resident mule deer and elk populations, contribute to the stabilization of the watersheds, and improve the existing biological diversity. Actions planned for the HMP areas include improving the quantity and quality of forage, water, and protective cover for deer and elk, and increasing ground cover to reduce soil erosion (BLM 1997, 1999b). The condition of wildlife habitats are affected by the multiple uses of the land, including mineral extraction, livestock grazing, recreation activities, and fire management.

SPECIAL STATUS SPECIES

Special status species include federally listed and proposed species, federal candidate species, and state listed species. Other sensitive species considered include BLM sensitive species, and federal species of concern. Information regarding these species are presented in summary tables in this section and more detailed species descriptions appear in SAIC 2002a and the biological assessment associated with this EIS.

Federally Listed and Proposed Species

The FFO manages habitats for species listed by the USFWS as endangered, threatened, or proposed under the authority of the ESA of 1973, as amended. Currently, there are five endangered, three threatened, and one proposed species that occur, or have the potential to occur on lands managed by FFO (**Table 3-11**). In addition, the USFWS has designated portions of FFO lands as critical habitat for the Mexican spotted owl and the Colorado pikeminnow.

A detailed analysis of the listed and proposed species is developed in the Biological Assessment (BA) for this RMP Revision. The BA contains the species ecology, the affected habitat description, and analysis of the effects of the actions authorized by the FFO, the cumulative impacts of authorized actions, and the determination of the effect of the implementation of the RMP Revision on each species. It also describes FFO efforts to implement recovery plans for listed species. It also describes efforts to implement recovery plans for listed species.

Table 3-11. Federally Listed, Proposed, and Candidate Species and Critical Habitat that Occur or Potentially Occur in the Planning Area

Species	Status[1]	Comments
Knowlton's cactus *Pediocactus knowltonii*	E	Endemic to New Mexico on rolling gravel hills in the piñon-juniper/sagebrush plant community. Entire wild population is fenced and protected from disturbances.
Mesa Verde cactus *Sclerocactus mesae-verdae*	T	Found in soils derived from Mancos, Fruitland, and Lewis shale. Largest population on Ute and Navajo tribal lands. All populations on lands managed by FFO are protected in the Hogback ACEC.
Mancos milkvetch *Astragalus humillimus*	E	Found in piñon-juniper woodlands and desert shrublands on sandstone rimrock ledges and mesa tops in San Juan County and adjacent Colorado. All populations on lands managed by FFO are protected in the Hogback ACEC.
Colorado pikeminnow *Ptychocheilus lucius*	E	Inhabits sections of the San Juan River and other rivers in the upper Colorado River basin. No wild Colorado pikeminnows have been detected in the planning area.
Colorado pikeminnow designated critical habitat	N/A	Colorado pikeminnow designated critical habitat consists of portions of the San Juan River beginning at the NM Highway 371 bridge in Farmington and continues downstream to Lake Powell.
Razorback sucker *Xyrauchen texanus*	E	Inhabits sections of the San Juan River and other rivers in the upper Colorado River basin. No razorback suckers have been detected in the planning area.
Bald eagle *Haliaeetus leucocephalus*	T	Bald eagles migrate through and winter in the planning area. Important habitats used by the eagles are protected and managed under FFO land use planning decisions and the Bald Eagle ACEC activity plan of 1992.
Mountain plover *Charadrius montanus*	PT	Endemic grassland species in the western U.S. Nine breeding records in the planning area from 1970 to 1999. Suitable nesting habitat on FFO lands has been identified and special management stipulations are attached to permits. May nest on AFO land but not confirmed.
Mexican spotted owl *Strix occidentalis lucida*	T	Found in the southwestern U.S., principally in New Mexico and Arizona. After extensive surveys, no nesting has been confirmed of FFO or AFO.
Mexican spotted owl critical habitat	N/A	Critical habitat designated in 2001. All designated critical habitat in the planning area is located within the boundaries of the proposed Mexican Spotted Owl ACEC.
Yellow-billed cuckoo *Coccyzus americanus*	C	Western subspecies breeds in Arizona, California, and New Mexico. Nests in cottonwood/willow riparian habitat along rivers. Recent data indicates it is very rare in the San Juan River valley. Potential habitat on FFO land was surveyed for this species in 2002.

Species	Status[1]	Comments
Southwestern willow flycatcher *Empidonax trailii extimus*	E	No breeding southwestern willow flycatchers (SWWF) have ever been detected in the planning area. All designated potential SWWF habitat is protected and managed under the guidelines of the Southwestern Willow Flycatcher Habitat Management Plan of 1998.

Sources: Nicholopoulos 2001, BLM 1995a, BLM 2000b, BLM 2000c.

Notes: (1) E = endangered, T = threatened, PT = proposed threatened, C = candidate species.

Critical habitat for the Mexican spotted owl (*Strix occidentalis lucida*) occurs on FFO land, and critical habitat for the Colorado pikeminnow (*Ptychocheilus lucius*) occurs in part of the San Juan River and within the 100-year floodplain from the State Highway 371 Bridge in Farmington down to Lake Powell, downstream from the planning area. Razorback sucker (*Xyrauchen texanus*) critical habitat on the San Juan River occurs from the Hogback Diversion, about 20 river miles downstream from Farmington, to Lake Powell. Listed fish species have the potential to occur in the San Juan River in the area of FFO river tracts. Listed plant species occur on FFO land, and transplanted Knowlton's cactus (*Pediocactus knowltonii*) occurs on USBR lands. Wintering bald eagles (*Haliaeetus leucocephalus*) occur on FFO and USBR lands. The Mexican spotted owl has the potential to occur on FFO land.

Other Special Status Species

Not all rare species receive the legal protection of the ESA of 1973, as amended. These species may not be rare enough to warrant protection under ESA, or there may not be sufficient data collected about the species for the USFWS to make a determination to list under ESA. Rare species or species with insufficient data are often listed as special status species. Federal land management agencies are mandated to manage special status species so that they should not need to be listed under ESA in the future.

Lists of special status species are maintained by several agencies including the USFWS, BLM, USFS, and the State of New Mexico. There are 36 special status species that may have the potential to occur in the planning area (**Table 3-12**). FFO has coordinated with the other agencies to determine which of these 36 species warrant special management, or field studies to collect data.

Six species known to occur in the planning area receive special management: beautiful gilia, also known as Aztec gilia (*Aliciella formosa*), Brack's fishhook cactus (*Sclerocactus cloveriae var. brackii*), American peregrine falcon (*Falco peregrinus anatum*), ferruginous hawk, yellow-billed cuckoo (*coccygus americanus*), and Golden Eagle (*Aquila chrysaetos*). Potential bat habitat is surveyed before construction projects that impact sandstone cliff faces are authorized. Three years of field work has been conducted to determine the potential abundance of the gray vireo. In the future, FFO will cooperate with other agencies to gather data and develop special management for special status species when the situation warrants.

FFO also monitors raptor nesting and applies special stipulations as outlined in the Raptor Policy of 2000, to protect nesting ferruginous hawk, golden eagle, and prairie falcon. Other nesting raptors observed during proposed project biological surveys are also protected by site-specific stipulations.

Table 3-12. State Listed and Other Special Status Species that Occur or Potentially Occur in the Planning Area

Species	Status[1]			Comments
	USFWS Species of Concern[2]	BLM Sensitive Species	State	
Plants				
Acoma fleabane *Erigeron acomanus*	X	X	SOC	Grows in sandy soil at base of Entrada sandstone cliffs. Endemic to McKinley County on and in area of FFO and AFO land.
Aztec gilia *Aliciella formosa*	X	X	E	Grows in salt desert shrublands on soil from Nacimiento Formation. Known from San Juan County in New Mexico on FFO land in tri-cities area.
Bisti fleabane *Erigeron bistiensis*	X	X		Found in Great Basin desert scrub on soils from Ojo Alamo Sandstone Formation.
Brack's fishhook cactus *Sclerocactus cloveriae* var. *brackii*	X	X		Occurs on sandy-clay hills of the Nacimiento Formation in desert scrub habitat.
Knight's milkvetch *Astragalus knightii*	X	X	SOC	On rimrock ledges of the Dakota Formation in conifer woodlands. Known only from the Mesa Prieta area of the middle Rio Puerco on AFO land and could occur in the planning area.
Parish's alkali grass *Puccinellia parishii*	X	X	E	Grows in alkali seeps and wetlands in desert scrub. Occurs on AFO land in Sandoval County, possibly within the planning area.
Ripley's milkvetch *Astragalus ripleyi*	X	X	SOC	Found from sagebrush to ponderosa pine in Rio Arriba and Taos counties in New Mexico and adjacent Colorado. Could occur on FFO land. Not detected on the Jicarilla Ranger District during species-specific surveys.
Sivinski's fleabane *Erigeron sivinskii*	X	X	SOC	Inhabits steep barren shale slopes of the Chinle Formation in coniferous woodlands in McKinley County, New Mexico and Apache County, Arizona. Occurs in the southern part of FFO land.
New Mexico silverspot butterfly *Speyeria nokomis nitocris*	X	X		Found in moist habitats around marshes and along streams in southwestern U.S. May occur, but not confirmed, in riparian habitats on FFO and AFO lands.
San Juan checkerspot butterfly *Euphydryas anicia chuskae*	X	X		Found at high altitudes in alpine tundra and pine forests in the Chuska Mountains in McKinley, San Juan Counties in New Mexico, Apache County, and Arizona. Not likely to occur on FFO land.
San Juan tiger beetle *Cicindela lengi jordai*	X	X		Found along sandy washes in May and June in parts of San Juan County. May occur on FFO land.
San Ysidro tiger beetle *Cicindela willistoni funaroi*	X	X		Found on mudflats from mid-July to August in New Mexico and Arizona. Could occur on mudflats on FFO and AFO lands.

Species	Status[1]			Comments
	USFWS Species of Concern[2]	BLM Sensitive Species	State	
William Lar's tiger beetle *Cicindela fulgida williamlarsi*	X	X		Found along streams and on mudflats in June and July in Arizona and New Mexico, and may occur on FFO and AFO lands.
Roundtail chub *Gila robusta*	X	X	E	Historically occurred in the San Juan, Zuni, San Francisco, and Gila River drainages. Currently, rare in the San Juan River but it may occur in area of FFO river tracts.
American and arctic peregrine falcons *Falco peregrinus anatum* and *F. p. tundrui*	X	X	T	The American peregrine falcon nests in the western and eastern U.S., while the arctic peregrine falcon breeds north of the tree line. The American peregrine falcon nests in New Mexico and both subspecies migrate through the state. There are three nest sites on FFO land but it is not known to nest elsewhere on the planning area.
Baird's sparrow *Ammodramus bairdii*	X	X	T	Breeds in grassland habitat in the northern prairie states and Canada. Likely migrant through FFO and AFO lands.
Black tern *Chlidonias niger*	X	X		Breeds in wetlands in the central and western U.S. Is likely a regular migrant that forages over ponds and uses open riparian areas and emergent wetlands on FFO and AFO lands.
Ferruginous hawk *Buteo regalis*	X	X		Breeds from the Canadian provinces south to New Mexico in grassland habitat. Five to seven active nests on FFO land recently; may also nest on AFO land in the planning area.
Gray vireo *Vireo vicinior*			T	Breeds in much of the southwestern U.S. and Mexico and winters in Mexico. Breeds in piñon-juniper woodlands on FFO land and is fairly common. Also may nest on AFO land and USFS land within the planning area.
Harlequin duck *Histrionicus histrionicus*	X			Populations in western and eastern North America. Western population winters along the pacific coast and breeds along rushing mountain stream from Canada south into Wyoming. Accidental in New Mexico and assumed to occur only rarely in planning area.
Loggerhead shrike *Lanius ludovicianus*	X	X		Breeds throughout much of the U.S. and southern Canada and winters in New Mexico. Is found in the desert scrub and grassland habitat on FFO and AFO lands. May also occur in desert scrub habitat on USFS land within the planning area.
Northern goshawk *Accipiter gentilis atricapillus*				Nests throughout North America. In the southwestern U.S., is most often found in ponderosa pine forests. There is one active goshawk territory on the Jicarilla Ranger District, but has not been recorded as a breeding species elsewhere within the planning area.

Species	Status[1]			Comments
	USFWS Species of Concern[2]	BLM Sensitive Species	State	
Western burrowing owl *Athene cunicularia*	X	X		Breeds in much of the western U.S. and Canada. Populations in New Mexico consist of breeding and wintering birds. Nests in grasslands and desert scrub habitats in association with prairie dogs or other burrowing rodents. Burrowing owls were observed during wildlife surveys on FFO land and it likely occurs elsewhere within the planning area.
White-faced ibis *Plegadis chihi*	X	X		Nests in freshwater marshes from California east into Idaho and Wyoming. May occur in riparian areas or agricultural fields during migration on FFO and AFO BLM lands.
Big free-tailed bat *Nyctinomops macrotis*	X	X		Occurs in South and Central America and the southwestern U.S., mostly in New Mexico and Arizona. Found in rugged country that provides crevices generally below 6,000 feet. Was detected at two locations on FFO land and four locations on the Jicarilla Ranger District.
Fringed myotis *Myotis thysanodes*	X	X		Occurs throughout the western U.S., including all of New Mexico. Can be found at mid-elevation grasslands, shrublands, and woodlands. Was not detected on FFO land in 1997 and 1998, but was captured 21 times on the Jicarilla Ranger District.
Long-eared myotis *Myotis evotis*	X	X		Occurs throughout much of western North America and in New Mexico. Found mostly in coniferous forests. Captured numerous times in FFO land and the Jicarilla Ranger District. Maternity colonies likely occur near some of the capture sites.
Long-legged myotis *Myotis volans*	X	X		Occurs over much of the U.S., including New Mexico. Found in coniferous forests from 6,000 to 9,600 feet. Captured numerous times on FFO and Jicarilla Ranger District land. Maternity colonies may be near some capture sites.
New Mexico jumping mouse *Zapus hudsonius luteus*	X	X	T	This subspecies occurs in Arizona and New Mexico, where it inhabits herbaceous wetland habitats in valley and mountain areas. It may occur in riparian habitat on FFO and AFO lands.
Occult little brown bat *Myotis lucifugus occultus*	X	X		Occurs throughout most of the U.S., including most of New Mexico. Usually found in ponderosa pine and oak-pine forests but can be found in most habitats near water. Not recorded during bat surveys on FFO and USFS land but could still occur in these areas.
Small-footed myotis *Myotis ciliolabrum*	X	X		Occurs throughout the western and eastern U.S., including New Mexico. Occurs in a wide variety of habitat types. Captured numerous times on FFO land and the Jicarilla Ranger District. Captures were in desert scrub to mixed conifer forest.

Species	Status[1]			Comments
	USFWS Species of Concern[2]	BLM Sensitive Species	State	
Spotted bat *Euderma maculatum*	X	X	T	Occurs in the western U.S., with historic records from all counties within the planning area. Found mostly in forested habitat but can also be found at lower elevation sites. The spotted bat was audibly detected once on FFO land and once on the Jicarilla Ranger District.
Townsend's big-eared bat *Plecotus townsendii pallescens*	X	X		Occurs in the western U.S., including the western half of New Mexico. Found in a variety of habitats and is closely tied to caves and mine shafts where it roosts and hibernates. Captured at two locations on FFO land.
Yuma myotis *Myotis yumanensis*	X	X		Occurs in the western U.S., including all of New Mexico. Found in coniferous woodlands in lower elevation habitats near water. Captured once on FFO land.

Source: Nicholopoulos 2001.

Notes: (1) FSOC = federal species of concern, SOC = state species of concern, E= endangered, and T= threatened.
(2) USFWS species of concern have no legal requirements under the ESA.

AIR QUALITY

Air quality within the planning area and its surroundings would be affected by emissions from construction and operation of the alternatives. This section describes the existing air quality resource of the planning area and applicable air regulations that could apply to the alternatives. At the present time, the planning area attains all national and New Mexico ambient air quality standards, and the air resource has not been a substantial constraint to development in the region.

Air quality in a given location is defined by pollutant concentrations in the atmosphere and is generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). One aspect of significance is a pollutant's concentration in comparison to a national and/or state ambient air quality standard. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare and include a reasonable margin of safety to protect the more sensitive individuals in the population. National standards, established by the U.S. Environmental Protection Agency (USEPA), are termed the NAAQS. The NAAQS represent maximum acceptable concentrations that generally may not be exceeded more than once per year, except the annual standards, which may never be exceeded. State standards, established by the New Mexico Environmental Improvement Board (NMEIB) and enforced by the NMAQB, are termed the New Mexico Ambient Air Quality Standards (NMAAQS). The NMAAQS are at least as restrictive as the NAAQS and they include standards for total suspended particulate matter (TSP) for which there are no national standards. **Table 3-13** presents the national and state ambient air quality standards.

The pollutants of primary concern for this air quality analysis include volatile organic compounds (VOC), nitrogen oxides (NOx), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}), and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Although VOCs or NOx (other than nitrogen dioxide) have no established ambient standards, they are important precursors to O_3 formation. Standards for $PM_{2.5}$ have been promulgated, but are not yet enforceable.

Table 3-13. National and New Mexico Ambient Air Quality Standards

Pollutant	Averaging Time	New Mexico Standards[2]	National Standards[1]	
			Primary[2,3]	Secondary[2,4]
Ozone	1-hour	—	0.124 ppm	Same as primary
	8-hour	—	0.084 ppm	Same as primary
Carbon monoxide	8-hour	8.7 ppm	9 ppm	—
	1-hour	13.1 ppm	35 ppm	—
Nitrogen dioxide	Annual	0.05 ppm	0.053 ppm	Same as primary
	24-hour	0.10 ppm	—	—
Sulfur dioxide	Annual	0.02 ppm	0.03 ppm	—
	24-hour	0.10 ppm	0.14 ppm	—
	3-hour	—	—	0.5 ppm
PM_{10}	Annual (arithmetic mean)	—	50 $\mu g/m^3$	Same as primary
	24-hour	—	150 $\mu g/m^3$	Same as primary
$PM_{2.5}$	Annual (arithmetic mean)	—	15 $\mu g/m^3$	Same as primary
	24-hour	—	65 $\mu g/m^3$	Same as primary
Lead	Calendar Quarter	—	1.5 $\mu g/m^3$	Same as primary
Total Suspended Particulates (TSP)	Annual (geometric mean)	60 $\mu g/m^3$	—	—
	30-day Average	90 $\mu g/m^3$	—	—
	7-Day	110 $\mu g/m^3$	—	—
	24-hour	150 $\mu g/m^3$	—	—

Source: USEPA 2001a.

Notes: (1) Standards, other than for ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the number of days above the standard in three continuous calendar years is less than four.

(2) Concentrations are expressed in units in which they were promulgated. Units shown as $\mu g/m^3$ are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury.

(3) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

(4) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

The planning area consists of San Juan County, the northern two-thirds of McKinley County, and the western portions of Sandoval and Rio Arriba Counties. Identifying the region of influence (ROI) for air quality requires knowledge of the types of pollutants being emitted, pollutant emission rates, topography, and meteorological conditions. The ROI for inert pollutants (pollutants other than O_3 and its precursors) is generally limited to a few miles downwind from a source.

The ROI for O_3 can extend much farther downwind than that for inert pollutants. Ozone is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. Ozone precursors are mainly VOCs and NOx. In the presence of solar radiation, the

maximum effect of VOCs and NOx emissions on O_3 levels usually occurs several hours after they are emitted and many miles from the source. Therefore, the ROI for O_3 may include much of the four-corners region.

Baseline Air Quality

The USEPA has designated all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. A nonattainment designation generally means that a primary NAAQS has been exceeded more than once per year in a given area. Areas without sufficient data to determine the attainment/nonattainment status are designated as unclassified. At the present time, the entire project region attains all national and state ambient air quality standards. However, McKinley and Rio Arriba Counties are designated as unclassified because there are presently no ambient air monitors within these rural areas.

In September 1997, the USEPA promulgated 8-hour O_3 and 24-hour and annual $PM_{2.5}$ NAAQS. Due to a lawsuit in May 1999, the U.S. Court rescinded these standards and USEPA's authority to enforce them. Subsequent to an appeal of this decision by the USEPA, the U.S. Supreme Court in February 2001 upheld these standards. This action will initiate a new planning process to monitor and evaluate emission control measures for these pollutants.

The USEPA intends to develop rulemaking on the implementation of the 8-hour O_3 standard by December 2003. The USEPA has a deadline to promulgate attainment status designations of the 8-hour O_3 standard by April 15, 2004 (USEPA 2002a). An area will attain this standard if its three-year running average of the annual fourth-highest daily maximum 8-hour O_3 concentration remains below 0.084 ppm. Implementation of the 1-hour O_3 standard will not be revoked in a given area until that area achieves this standard. Otherwise, as is the case for the project region, implementation of the 8-hour standard will replace the existing 1-hour standard.

Generally, concentrations of photochemical smog, or O_3, are highest during the summer months and coincide with the season of maximum solar insolation. Inert pollutant concentrations tend to be the greatest during periods of light winds, stable atmospheric conditions, and surface-based temperature inversions. These conditions limit atmospheric dispersion. However, in the case of PM_{10} impacts from fugitive dust episodes, maximum dust impacts within the planning area often occur during high wind events and/or in proximity to manmade ground-disturbing activities, such as agricultural tilling, vehicular activities on paved and unpaved surfaces, and mining operations.

Table 3-14 presents the maximum pollutant levels monitored at locations within the project region from 1995 through 2001 (NMAQB 1997, 2001a; USEPA 2002b). The NMAQB uses the Shiprock Substation site to monitor ambient pollutant impacts from the two large coal-fired electric generating stations in this area. The Bloomfield station occurs within the highly industrialized Bloomfield gas corridor and the NMAQB uses this station to monitor ambient pollutant levels from these sources (NMAQB 2001b). The data in Table 3-14 show that pollutant levels within the project region for the most part have not exceeded any ambient air quality standard during the 1995 through 2001 monitoring period. However, initiation of 8-hour O_3 monitoring in the project region in 1999 identified that in year 2000, O_3 levels equaled the 8-hour standard at the Shiprock Substation monitor and slightly exceeded this standard at the Bloomfield station. These pollutant readings do not represent violations of the 8-hour O_3 standard, as the three-year running average of the annual fourth-highest daily maximum 8-hour O_3 concentrations for these stations is about 0.076 ppm (NMAQB 2002). However, these data demonstrate that the project region is near the nonattainment level for this standard.

Table 3-14. Maximum Pollutant Concentrations Monitored in the Farmington RMP Project Region, 1995 to 2001

Pollutant/Monitoring Station	Averaging Time/ Measurement	Maximum Concentration by Year						
		1995	1996	1997	1998	1999	2000	2001
Ozone								
Bloomfield	1-hour (ppm)	–	–	–	–	–	0.10	0.09
Shiprock Substation		–	–	0.08	0.08	0.08	0.09	0.09
Bloomfield	8-hour [(1)] (ppm)	–	–	–	–	–	0.085	0.077
Shiprock Substation		–	–	–	–	0.074	0.084	0.077
Carbon Monoxide								
Farmington	8-hour (ppm)	2.8	3.0	2.7	5.2	2.5	1.9	–
	1-hour (ppm)	5.5	6.1	5.4	9.2	8.3	5.4	–
Nitrogen Dioxide								
Bloomfield	Annual (ppm)	–	–	0.010	0.010	0.012	0.011	0.012
Shiprock Substation		–	–	0.007	0.008	0.009	0.009	0.009
Bloomfield	24-hour (ppm)	–	–	0.026	0.022	0.027	0.028	0.033
Shiprock Substation		–	–	0.027	0.026	0.033	0.031	0.034
Sulfur Dioxide								
Bloomfield	Annual (ppm)	–	0.003	0.003	0.002	0.002	0.001	0.002
Farmington Airport		0.002	0.003	0.003	0.002	0.002	0.002	0.002
Shiprock		0.003	0.003	0.003	0.002	–	–	–
Shiprock Substation		0.014	0.013	0.016	0.016	0.009	0.007	0.004
Bloomfield	24-hour (ppm)	–	0.01	0.038	0.012	0.007	–	0.010
Farmington Airport		0.011	0.012	0.035	0.012	0.011	0.008	0.007
Shiprock		0.014	0.012	0.032	0.012	–	–	–
Shiprock Substation		0.045	0.060	0.073	0.075	0.052	0.033	0.020
Bloomfield	3-hour (ppm)	–	0.041	0.096	0.029	0.024	0.019	0.024
Farmington Airport		0.035	0.041	0.077	0.032	0.033	0.026	0.030
Shiprock		0.068	0.043	0.148	0.032	–	–	–
Shiprock Substation		0.196	0.233	0.267	0.267	0.139	0.144	0.058
PM_{10}								
Farmington	Annual Arithmetic Mean ($\mu g/m^3$)	17	16	16	12	16	14	16
Gallup		18	–	–	–	–	–	–
Shiprock		13	13	13	7	–	–	–
Farmington	24-hour ($\mu g/m^3$)	30	31	41	29	84	24	30
Gallup		37	35	–	–	–	–	–
Shiprock		27	30	79	14	–	–	–
$PM_{2.5}$								
Farmington	Annual ($\mu g/m^3$)	–	–	–	–	–	–	6.1
Farmington	24-hour ($\mu g/m^3$)	–	–	–	–	–	–	15.1

Sources: NMAQB 1997, 2001a, 2002; USEPA 2001a, 2002b.

Ambient concentrations of PM_{10} are generally dominated by sources of materials processing or disturbed earth, such as wind-blown dust from rock crushing or unpaved roads. However, materials produced from combustion processes or secondary formation in the atmosphere by photochemical processes tend to make up the majority of $PM_{2.5}$ samples. One of the main contributors to visibility impairment is $PM_{2.5}$.

Regulatory Setting

The federal Clean Air Act (CAA) of 1969 and its subsequent amendments establish air quality regulations and the NAAQS and delegate the enforcement of these standards to the states. The NMAQB enforces air pollution regulations and sets guidelines to attain and maintain the national and state ambient air quality standards within the State of New Mexico, except for tribal lands and Bernalillo County. These guidelines are found in the New Mexico State Implementation Plan. Following is a summary of the federal and state air quality rules and regulations that may apply to emission sources associated with the alternatives. This is an inclusive summary, as the programmatic nature of the alternatives does not provide the level of detail needed to identify all applicable rules and regulations.

The NMAQB enforces the national and state ambient air quality standards by developing rules to regulate and permit stationary sources of air emissions. The New Mexico air quality regulations are found in the New Mexico Administrative Code (NMAC) Title 20, Chapter 2. Any emission source proposed for the RMP would have to comply with the NMAQB regulations and ambient air quality standards. The following summarizes the more pertinent state air quality regulations that could apply to project emission sources.

- *20NMAC2.33—Gas Burning Equipment – NO_2*. New/existing natural gas burning equipment that have a heat input of greater than 1,000,000 million British Thermal Units (BTU) per hour shall not produce NO_2 emissions that exceed 0.2/0.3 pounds per million BTUs of heat input.
- *20NMAC2.35—Natural Gas Processing Plant – Sulfur*. Part 35 regulates sulfur emissions from existing/new gas processing facilities.
- *20NMAC2.42—Coal Mining and Preparation Plants – Particulate Matter*. Part 42 establishes requirements to minimize particulate matter emissions for coal mine and preparation plant sources, such as crushers, conveyors, and coal haul roads.
- *20NMAC2.60—Open Burning*. Part 60 outlines the process to obtain permits for open burning, such as fire management activities.
- *20NMAC2.70—Operating Permits*. Part 70 provides permitting requirements for stationary sources that exceed 100 tons per year (TPY) of a regulated pollutant, 10 TPY of a hazardous air pollutant (HAP), or 25 TPY of combined HAPs. Requirements include emission calculations, dispersion modeling analyses to ensure that the proposed source does not exceed any ambient air quality standard, and annual reporting.
- *20NMAC2.72—Construction Permits*. Part 72 applies to new or modified stationary sources that (1) have a potential emission rate greater than 10 pounds per hour or 25 TPY of any air pollutant for which there is a national or state ambient air quality standard or (2) exceed hourly HAPs emission levels outlined in subpart 502. However, fugitive dust emissions from coal mining operations are exempt from permits under Part 72, as new coal mining activities have to operate with an air pollution control plan for fugitive dust emissions that is approved by the New Mexico Surface Coal Mining Commission, as identified in *19NMAC8.20.2050*. Requirements may include (1) emission calculations,

(2) dispersion modeling analyses to demonstrate that the proposed source would not contribute to an exceedance of an ambient air quality standard or Prevention of Significant Deterioration increment, (3) a determination that the proposed source would not significantly impact air quality within pristine federal Class I areas (such as National Parks greater than 6,000 acres or National Wilderness Areas [NWA] greater than 5,000 acres), and (4) public notifications.

- *20NMAC2.73—Notice of Intent and Emissions Inventory Requirements*. Part 73 requires new or modified stationary sources that have potential emission rates greater than 10 TPY of any regulated air contaminant or 1 TPY of lead to file an NOI prior to construction. Sources subject to this part shall submit annual emissions inventories.
- *20NMAC2.74—Permits – Prevention of Significant Deterioration (PSD)*. The PSD requirements apply to (1) 28 identified source types that emit more than 100 TPY of any pollutant for which there is a national ambient air quality standard or (2) any other source that emits 250 TPY. Requirements include air monitoring, emission calculations, dispersion modeling analyses, implementation of best available control technologies (BACT), and a determination that the proposed source will not significantly impact air quality within pristine federal Class I areas. Within the project region, these areas could include the Mesa Verde National Park and Weminuche NWA in Colorado and the San Pedro Parks NWA in New Mexico.

Regional Air Emissions

The NMAQB compiles countywide emission inventories for stationary sources that emit more than 10 TPY of a pollutant. Additionally, the USEPA estimates point, area, and mobile source emissions are part of their National Emission Trends database. An emissions inventory is not available for the combined planning area that includes all of San Juan County and portions of McKinley, Rio Arriba, and Sandoval Counties. However, the project region encompasses all of San Juan County. This county produces the overwhelming majority of emissions from any county within the planning area, and the majority of project emission sources would occur within this region. Therefore, emissions from San Juan County are used to represent the baseline emissions within the entire planning area. **Table 3-15** summarizes the mobile and stationary source emissions that occurred in San Juan County during 1999 (USEPA 2001b). The largest stationary sources of air emissions within the region are the coal-fired San Juan electric generating station, about 10 miles west of Farmington, and the Arizona Public Service Four Corners electric generation facility on the Navajo Reservation, about 10 miles to the south of this facility. Natural gas production and transmission is the second largest stationary source category in the region. Due to these two activities, San Juan County has the largest amount of stationary source emissions of any county in New Mexico. While fugitive dust is known more as an area source, this source category produces the majority of PM_{10} in the region. The on-road vehicles mobile source category produces a large percentage of combustive emissions in the region and is the main source of CO.

Table 3-15. Summary of 1999 Annual Emissions by Source Category for San Juan County (TPY)

Source Category	VOCs	CO	NOx	SOx	PM_{10}
Electric Services	471	3,887	75,856	72,032	10,285
Crude Petroleum and Natural Gas	252	1,155	3,648	2	75
Natural Gas Liquids	811	2,158	9,587	3,176	65
Petroleum Refining	1,093	115	348	989	31
Construction Sand and Gravel	3	40	98	16	25
Natural Gas Transmission	3,411	8,132	5,685	2	7
Fuel Combustion—Indus/Other	295	1,625	720	124	215
Waste Disposal and Recycling	245	2,301	24	5	333
Petroleum Product Storage/Transport	1,532	–	–	–	–
Solvent Usage	1,483	–	–	–	–
On-Road Vehicles	3,114	30,933	4,233	174	153
Off-Road Vehicles	450	5,994	1,034	166	79
Agricultural and Forestry	–	–	–	–	1,431
Fugitive Dust	–	–	–	–	63,884
Total Source Emissions	**13,160**	**56,340**	**101,232**	**76,686**	**76,583**

Source: USEPA 2001b.

RANGELAND

There are 240 grazing allotments on BLM land within the planning area. In 1992, 63 Section 15 grazing allotments in southern McKinley County were transferred from the FFO to AFO administration, leaving 177 for which the FFO is responsible. This planning effort will have minimal impact on the grazing allotments in southern McKinley County, and the public lands within them will remain identified for eventual disposal.

The number of range allotments is subject to change, due to ongoing relinquishments, combinations, and other management adjustments. Approximately 36,000 acres of FFO land in the planning area have been removed from existing allotments for a variety of reasons, such as lack of forage, lack of water, or conflict with other users. All or part of the following allotments have been removed from grazing: Kutz, Cinder Gulch, Coyote Hills, Mine Facility, La Baca Canyon, Turley, Martinez Mesa, Hart Springs, Rancho Largo (partial), and Sweetwater (partial).

FFO grazing allotments accommodate 162 individuals permitted to graze cattle, horses, sheep, and goats. Within the public land in the Checkerboard area there are 34 Navajo community allotments with 2,200 individual operators administered by the Bureau of Indian Affairs under Section 15 of the 1936 Taylor Grazing Act. BLM administers three Navajo community allotments with 175 permittees under Section 3 of the act. There are approximately 112,800 animal unit months (AUM) of grazing authorized by FFO. An AUM refers to the amount of forage necessary to feed one animal unit for a period of one month. An animal unit is defined as one mature cow of approximately 1,000 pounds and a calf up to weaning, usually six months of age, or their equivalent of other animals.

Most allotments contain a combination of federal, state, and private land. Periods of livestock use vary from year-round to seasonal.

Most of the seasonal allotments are located in the northern half of the FFO area, while year-round grazing is permitted on most of the southern FFO area. Allotments range in size from 40 to over 67,000 acres. The majority is used to graze cattle, sometimes in combination with other livestock. Other allotments are used to provide forage for horses, sheep, goats, or a combination.

FFO rangeland is comprised primarily of five major vegetative types, including grasslands, sagebrush-grasslands, piñon-juniper, ponderosa pine-mixed shrubs, and small riparian areas. A number of the range allotments have been assessed to determine whether they meet the fundamentals of rangeland health established under 43 CFR 4180 and the guidelines for livestock grazing (BLM 2001b).

Prior to issuing a grazing permit in the FFO, an interdisciplinary team of renewable resource specialists conducts an assessment based on the Fundamentals of Rangeland Health to determine if the landscape contained within the allotment meets the appropriate criteria necessary to be considered healthy. Should the assessment indicate that the landscape does not meet the criteria, a team discussion is convened to determine if the current livestock grazing practices are causing this condition. Should corrective action be required, appropriate measures are defined and become the BLM alternative in the EA that is developed before authorizing grazing. Mitigation measures are developed in the EA procedure and are incorporated onto the Terms and Conditions of the grazing permit after the proper process has been completed.

LANDS AND ACCESS

This section describes land status, land management and use, and roads and access ways in the planning area.

Land Status

The boundaries of the planning area encompass almost 8.3 million acres in all or portions of San Juan, Rio Arriba, McKinley, and Sandoval Counties in northwest New Mexico. Generalized land ownership is illustrated in Map 1-2. Within the administrative boundary of each field office is land owned by several entities, including federal, tribal, state, and private. Land ownership within the planning area is summarized in Table 1-1 and Table 1-2.

The planning area includes BLM land managed by the FFO (almost 1.4 million acres) and the AFO (over 370,000 acres). In addition to surface ownership, BLM administers about 2.6 million acres of federal mineral estate. About 342,300 acres of this area is "split estate," where private (or patented) and state-administered surface land overlies federal mineral estate. BLM lands are relatively consolidated in northern San Juan County, the "Checkerboard" area of southern San Juan County, and in western Rio Arriba County. In McKinley County, the Lindrith area of Rio Arriba County, and around the major urban areas, public land is intermingled with a variety of other ownership.

The USBR administers a total of 31,035 acres surrounding and beneath Navajo Reservoir in the planning area, 40 percent of which is below the high water line of the reservoir. The National Park Service administers the Chaco Culture National Historic Park, comprised of approximately 33,000 acres, and Aztec National Monument (320 acres).

The USFS manages about 265,100 acres within the planning area. This land is divided between the Jicarilla Ranger District of the Carson National Forest in the western part of Rio Arriba County, and the Cuba Ranger District in the Santa Fe National Forest in eastern Rio Arriba and part of Sandoval Counties. This portion of the Santa Fe National Forest around the community of Lindrith includes several management areas: Cuba Mesa, La Jara, Corral Canyon, Continental Divide, Laguna Peak, and the North Cuba areas.

The State of New Mexico owns about 332,000 acres in the planning area. The state's land holdings mostly consist of small, consolidated parcels in the coal-rich central

portion of the FFO, and isolated sections and smaller tracts throughout the rest of the planning area.

The planning area boundary includes 4.7 million acres of tribal lands belonging to the Navajo, Jicarilla Apache, and Ute Mountain Tribes, of which over 303,000 acres overlie federal minerals. Much of the lands in the southern part of the FFO area are Indian allotments, tribal trust lands, and lands withdrawn for Indian use. Due to the land ownership pattern, the southeast part of the FFO area is often referred to as the "Checkerboard" area.

Private ownership is concentrated around the tri-cities area of Farmington, Aztec, and Bloomfield. Other small communities are located along the San Juan, La Plata, and Animas River valleys, on the east side of the planning area in the Lindrith area, and in the eastern part of McKinley County, north of Interstate 40.

Land Management and Use

The San Juan Basin is characterized by overlapping uses for oil and gas, grazing, and dispersed recreation. Other uses are focused in specific locations and include coal mining, electric power generation, agriculture, and urban development. Federal lands are managed in accordance with applicable laws and resource management plans, which control the use of public lands for a variety of activities. Plans are revised and amended periodically in response to changing conditions and resource values. On BLM lands, areas with special values are delineated and assigned a special designation with management prescriptions that emphasize particular values and protect specific resources, such as wildlife habitat, recreational opportunities, cultural, paleontological, or visual resources.

The USBR operates Navajo Dam and Reservoir for water conservation, supply, storage, and flood control, and keeps a minimum recreation pool to the extent possible. Navajo Lake is the principle storage reservoir for the Navajo Indian Irrigation Project. Navajo Lake State Park, located around Navajo Reservoir in New Mexico, is managed by the New Mexico State Park and Recreation Division. It is heavily used for recreation at developed and dispersed sites.

USFS lands of the Jicarilla Ranger District and the Cuba Ranger District are primarily used for timber production, dispersed recreation, and oil and gas production. Most of these areas are managed to balance recreational use, oil and gas production, and visual resources according to their relative value.

Land use on tribal lands follows the same patterns as elsewhere in the region, including a mix of overlapping uses of grazing; agriculture; oil, gas, and coal production; and scattered homesteads and isolated sites for commercial and industrial use. The tribes manage the use of these lands. Land use on Indian allotments is managed by the allottees, with approval of the BIA.

County governments have jurisdiction over development of non-public lands, but typically county controls over land use in the planning area are minimal. The primary control mechanism is the application of subdivision standards that address parcel size and the basic provisions for infrastructure, such as access, water, wastewater, and utilities. The incorporated urban centers have more extensive land use controls developed through community plans and implemented in zoning codes.

Farmington, Aztec, and Bloomfield comprise a major urban area in the northern part of the planning area. This tri-cities area has a combined population of about 70,000. Suburban commercial and industrial areas link the urban centers. Each of the incorporated cities controls development through zoning and has prepared or is in the process of updating a comprehensive plan. They also control land use within an extraterritorial zone (ETZ), extending between 3 to 5 miles beyond the incorporated boundary, in cooperation with San Juan County. In some locations, the ETZ of one city overlaps with that of another, creating zones with multiple jurisdictional interests. San Juan County enforces subdivision regulations, based

on state regulations, but has no zoning ordinance or comprehensive development plan.

One of the major issues facing the tri-cities area is urban expansion. Growth is evident in the concentration of commercial and industrial uses along the major highways linking Farmington, Bloomfield, and Aztec. There is a trend for development to occur in unincorporated areas where land use controls are less stringent and land costs are lower. However, these developing unincorporated areas rely on the urban centers for public services. The Northwest New Mexico Council of Governments is working with the Cities of Aztec and Bloomfield on planning efforts, particularly to consider transportation needs, development of the Bloomfield-Aztec corridor for commerce and industry, and planning for overlapping ETZs.

Crouch Mesa, located within the triangle formed by the highways linking the three cities, is mostly unincorporated and under the jurisdiction of San Juan County. However, most of this area lies within the ETZ of one or more of these cities. Efforts to plan and implement zoning for this area are beginning, but are complicated by existing laws governing the composition of ETZ authorities, which do not provide for multiple incorporated areas. Other key planning issues for the tri-cities area, particularly in light of the interface with adjacent public lands, include providing for and developing outdoor recreational sites and trails near the urban areas, and providing access to rivers for public recreation while also preserving riparian values. Most of the land along the rivers is privately owned, and in some areas, development has occurred within floodplains. This has curtailed access to the river and is causing fragmentation of riparian habitat.

The tri-cities area in proximity to public lands creates an active lands program for the FFO. There is a demand for rights-of-way for roads, utilities, and communication lines. A number of Recreation and Public Purposes leases and patents have been issued, with additional proposals in various stages of implementation. Other smaller populations centers in the planning area include the communities of Blanco, Lindrith, Gobernador, Nageezi, and Counselor.

In addition to expanding urban nodes, there is agricultural use along the Animas and San Juan Rivers and on the Navajo Indian Irrigation Project located between US 550 on the east and Chaco Culture National Historic Park on the west. This project brings water from Navajo Dam through a series of canals to irrigate up to 116,000 acres at build out. Currently about 64,000 acres are under irrigation.

Much of the land area is also used for public infrastructure ROWs. These include roads, utility corridors, and oil and gas distribution lines. Land use within ROWs is restricted to avoid incompatibility or conflict with infrastructure. Some surface activities such as grazing are compatible with ROW lands.

Roads and Access

A regional network of federal and state highways provides the basic transportation infrastructure in the planning area. US 550 is a major highway linking the tri-cities area with the interstate system and major urban centers outside the planning area. Other important roadways within the planning area include US 64, US 666, and New Mexico Highways (NM) 170, 574, 544, 537, 173, 371, 511, 96, and 595.

It is estimated that there are about 15,000 miles of roadway in the planning area, 13,000 miles of which are in San Juan County. Most of these roads are unpaved. In San Juan County about 650 miles are county roads, 400 miles of which are unpaved (Keck 2001). The majority of the road network consists of unpaved roads providing access to resources on federal lands, predominantly oil and gas facilities. In areas with a high level of oil and gas development, there is a dense network of roads, estimated at approximately 4 miles per square mile in the FFO area. Other parts of the planning area have road densities as low as 1 mile per square mile.

Maintenance of roadways is the responsibility of the government entity that owns the roadway. Many roads pass over federal, non-federal and tribal land, complicating maintenance responsibilities. Several county roads are heavily used for access to oil and gas facilities, particularly in the north and northeast part of the FFO area. San Juan County roads that are primarily used to access oil fields include San Juan County 2300, 2310, 2770, 2772, 4450, 7007, 7145, 4600, 4599, and 7250. Traffic counts are not taken for these roadways. County roads are categorized as full county-maintained (maintained at best level possible with resources available), lesser county-maintained (bladed twice a year), and unmaintained roads. Generally, roads that serve school bus routes or residences are full-maintained roads. There is a trend for the county to redesignate roads serving primarily oil and gas facilities as lesser-maintained roads because of limited resources (Keck 2001). San Juan County and its municipalities will be studying the potential to form a Metropolitan Planning Organization (MPO) that would enable them to benefit from increased federal and state resources for transportation projects (NNMCOG 1999).

The USFS manages a road system to provide access for multiple uses and management of USFS lands. As single-purpose roads are not needed to meet their current uses, they are removed and reclaimed. The USFS requires oil and gas producers to maintain the roads that serve their facilities.

WILDERNESS

The planning area includes one WA and six WSAs awaiting Congressional decision regarding their wilderness status.

The Bisti/De-na-zin WA is managed by the FFO. It contains a variety of resource values that are uncommon in the region, including the remote wind-eroded sandstone and shale badlands that contain striking geologic features with high scenic value. This area is a grama-galleta grassland ecotype (Davis 1987), only one of two examples of this ecotype protected as wilderness (the other being the Petrified Forest Wilderness in Petrified Forest National Park, Arizona). It is rich in paleontological resources, and also contains over 50 known archaeological sites. The WA contains three ACECs: the Badlands ACEC with unusual topography of compact, rolling hills, broken by narrow washes filled with mushroom formations and spires; the Log Jam ACEC with massive petrified logs; and the Lost Pine ACEC with a remnant stand of ponderosa pine, a southwestern biogeographical anomaly. The potential for seeing fossils and unique scenery provides outstanding opportunities for primitive and unconfined recreation (BLM 1988).

The Bisti/De-na-zin WA offers outstanding opportunities for primitive and unconfined recreational pursuits such as hiking, back-packing, and horseback riding. The strange geological formations are a delight to amateur and professional photographers alike, and even the casual observer is easily struck by these works of erosional art. Though relatively small, the Bisti/De-na-zin WA, without trails and without water, offers a moderate degree of challenge for the recreationist.

The opportunity for solitude is outstanding. This too is a function of the lack of water and trails—the first keeps the number of visitors venturing far into the wilderness low, and the second disperses those that do penetrate the interior. Appreciation for the serene silence that greets the visitor is one of the most frequent comments in the visitor register. The Bisti/De-na-zin WA is the only designated wilderness within the San Juan Basin.

The FFO manages Ah-shi-sle-pah WSA (6,592 acres) under BLM's *Interim Management Policy and Guidelines for Lands Under Wilderness Review* (BLM 1995b). It is located in a low intensity oil and gas development area about two miles north of the Chaco Culture National Historic Park. The area has outstanding badland scenery characterized by outcrops and highly rugged terrain with spires, towers, and mushroom shaped formations. The soft unconsolidated sediments of variegated sandstones and shales have eroded into a

variety of forms. The WSA contains geologic and paleontologic resources that provide intrinsic educational and scientific opportunities. The area also has archaeological sites and sites that are sacred to the Navajo people.

There are no WAs within the AFO in the planning area, but there are five WSAs (either wholly or partially within the planning area), encompassing 70,475 acres. Cabezon WSA (8,159 acres) features a towering volcanic plug popular for rock climbing, and habitat for a variety of raptors and other avian species. The Boco del Oso is the central topographic feature of the Empedrado WSA (9,007 acres), La Lena WSA (10,438 acres), Ignacio Chavez WSA (32,266 acres), and Chamisa WSA (10,605 acres). In addition to recreational opportunities and visual qualities, Ignacio Chavez provides winter range for deer and elk, and La Lena WSA (10,438 acres) has important raptor nesting areas. All five WSAs are within high-intensity oil and gas development areas and have recreational value.

There are no WAs or WSAs within the Jicarilla Ranger District. In the Cuba Ranger District, about 320 acres of the Chama Wilderness is located in the planning area. The Chama River is a National Wild and Scenic River. San Pedro Parks WA is located to the east of the planning area.

FIRE MANAGEMENT

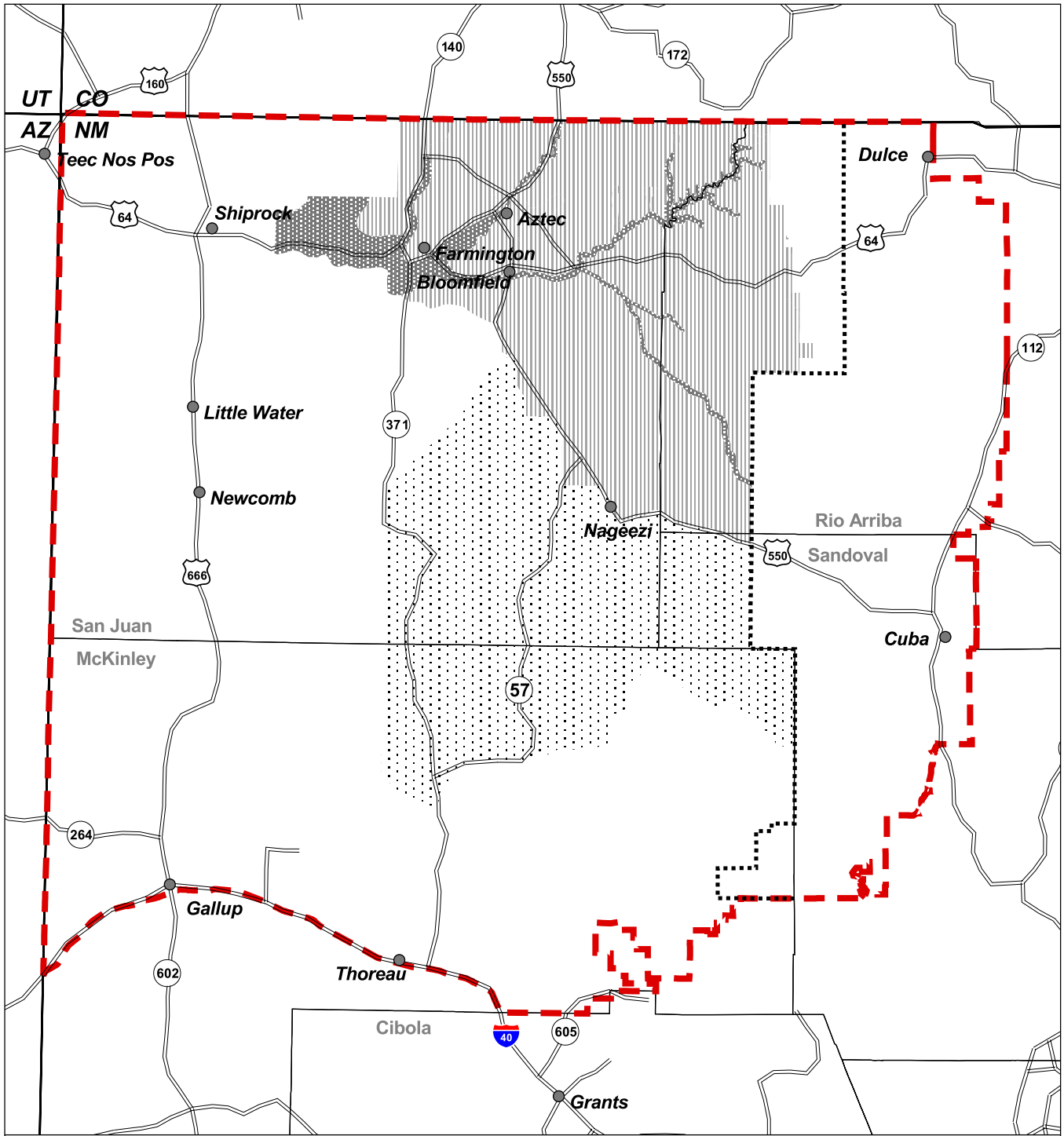
An interdisciplinary team developed resource and fire management objectives for all land within the FFO. The team developed a map that identified areas where fire would be advantageous in achieving management objectives and where fire would not be desirable. Management within these areas is also described according to whether prescribed fires or wildfire suppression should be permitted, and whether fuel reduction projects should be conducted to mitigate existing fire hazards. These areas correlate, in some cases, to the SMAs designated for resource management. Prescriptions for fire management are described for each of these designated areas in the Fire Management Plan. **Map 3-8** shows the location of these fire management areas.

Statistics from 1993 through 2000 indicate that there were 389 fires on a total of 601 acres in the FFO area. From 1987 through 1992, there were an average of 12 Action Fires that burned 61 BLM acres (BLM 2001a). Typically in the past, the period in which fire fighting resources are required to be fire ready in the FFO area was May 31 through August 8. However, in recent years fire season has been occurring over a longer period, from April 10 through August 31.

Fire engine crews are generally available during the period of April 1 through September 30 in order to get equipment ready for the active fire season and to prepare for fall and spring prescribed burns.

Fuel types within the FFO area consist mainly of sagebrush/grass, riparian (cottonwood/willow/saltcedar), piñon-juniper, and stringers of ponderosa pine and Douglas fir. On the northern and eastern exposures, Gambel's oak grows in association with the other tree species. Much of the area is dominated by badlands that have little fuel, and fine fuels are often lacking in the understory throughout much of the area, regardless of the overstory fuel type. In the area of the Jicarilla Ranger District where the BLM has administration authority, the fuels consist of piñon-juniper, ponderosa pine, Gambel's oak, and canyon bottoms of sagebrush.

Summer thunderstorms occasionally produce multiple fire starts during a single day, but these starts have only infrequently resulted in an extended attack fire situation beyond the capability of the FFO. In these instances, neighboring resources, such as the those from the Carson National Forest, the BIA Southern Ute Agency, and 14 volunteer fire departments, to provide assistance.



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LEGEND

RMP/EIS Boundary

Fire Management Objectives

A

B

C

Field Office Boundary

County Boundary

Town

Major Road

Interstate Highway

U.S. Route

State Highway

N

15 0 15

Scale in Miles

Source: BLM 2000

Map 3-8: Fire Management Units in the FFO Area

Wildfires in the FFO area infrequently extend beyond the burning period in which they were detected and initially attacked. Most wildfires in the area are declared to be controlled on the first day during which they are attacked and are declared out on the day following, so periods of consecutive fire days rarely exceeds several days. New fire starts sometimes occur on consecutive days in the FFO area.

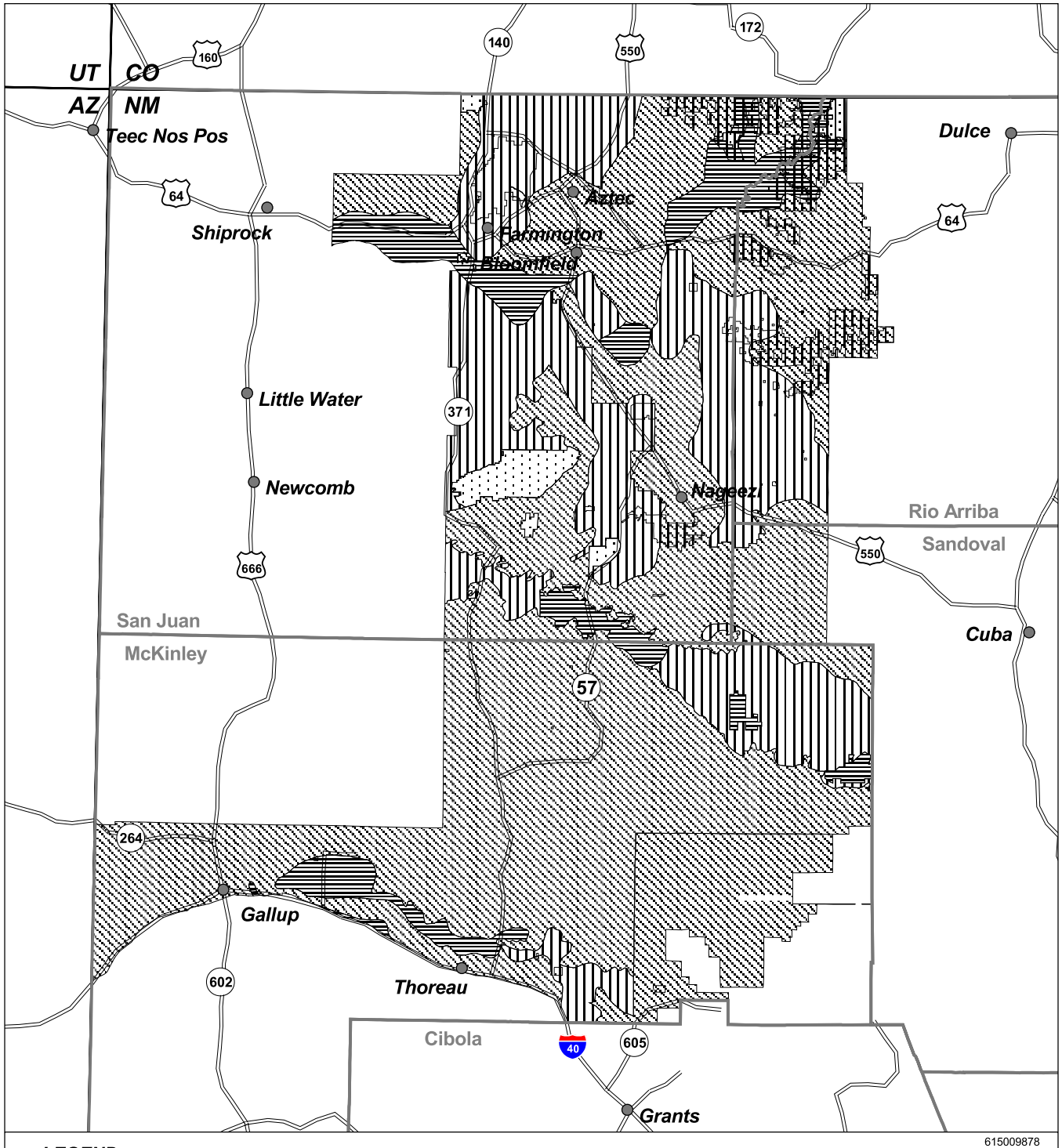
The majority of wildfires in the FFO area are caused by lightning, with fires caused by people, either accidentally or intentionally, as the next major source. The increasing population in the tri-cities area has resulted in an increase in fires in the wildland/urban interface area. Fuel loadings in the urban areas are often moderate, with some areas occasionally having moderate to heavy fuel loadings. With the existing fuel loadings, a wind-driven fire in these areas under dry conditions could threaten structures. Areas containing high fuel loadings, such as cottonwood trees, willows, saltcedar, and alkali sacaton, are usually located on private land. There have been no known fires in either of the WAs during the past 10 years due to the predominance of badlands with little vegetation and scattered stands of sagebrush and grass.

VISUAL RESOURCES

The landscape in the San Juan Basin is diverse, exhibiting many distinctive features and landforms found in arid regions where water and wind erosion have sculpted the land. The San Juan Basin is an area of young plateaus and broad valleys. Distinctive features include steep and colorful escarpments, broad vistas, rugged canyons, and pastel-colored badlands where it is dissected into plateaus and pinnacles. Sagebrush and grassland expanses are prominent in the central and southern portion of the FFO area. Piñon-juniper woodlands, rivers, and manmade structures such as reservoirs, roads, and oil and gas wells dominate the northern portion. Sightseeing is popular in the region where scenic vistas are frequent along highways, high places, and riverfronts.

Both the BLM and USFS actively manage their lands in consideration of visual qualities. BLM Handbook 8410 and BLM Manual 8411 describe the process for rating scenic quality using a combination of scenic quality, visual sensitivity, and distance from viewer. These ratings are used to identify a VRM class that guides management actions. Each class corresponds to suggested degrees of human modification that should be allowed in a landscape from a visual resources standpoint. There are four classes, with Class I including the highest rated landscapes and WAs, wild sections of National Wild and Scenic Rivers, and other Congressionally designated areas. The VRM classes and their corresponding management objectives are described in Chapter 2.

VRM classes have been determined through previous inventories and planning decisions for the entire FFO regardless of land ownership (**Map 3-9**). (It is important to note that BLM manages only the public land visual resources.) The FFO is composed of 55 percent with Class IV values, 32 percent Class III, 8 percent Class II, and 5 percent Class I. The wilderness, WSA, and 16 SDAs comprise the Class I designations. Class I areas with high intrinsic scenic value and visual sensitivity in the FFO include the Bisti/De-na-zin WA, Ah-shi-sle-pah WSA, Fossil Forest RNA, and Negro Canyon, Thomas Canyon, and Caracas Mesa SMAs. Protecting vistas from outside influences in these areas is a concern. Also, the visual context is an important component of the cultural resource values of the Chacoan Outliers, Native American Use and Sacred Areas ACECs, and additional traditional cultural properties.



LEGEND

- RMP/EIS Boundary
- VRM Classes
  - I
  - II
  - III
  - IV
- County Boundary
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: BLM 2000

Map 3-9: Existing VRM Designations in the FFO

Areas in the FFO categorized as Class II include 45 SDAs and other locations where scenic vistas (from major highways), riverfronts, and high places are important because of associated sightseeing and recreational value. Sculpted landscapes of mesas and canyons along State Highway 371 and US 550 offer high scenic value to a large number of people. Within the predominantly open, arid landscape, the San Juan and Animas Rivers and numerous mesas and mountain ranges offer views that are typical in this region (BLM 1987b).

The visual landscape of the FFO has been considerably modified due to the proliferation of gas wells, pipelines, and access roads in much of the FFO. The visual character of areas with substantial oil and gas development has progressively changed over the last several decades, since visual resource inventories were performed in the 1970s and 1980s. As the inventory is updated, it is likely that changes will be reflected in lower classifications for some areas in the FFO.

There are no VRM Class I areas within the AFO in the planning area. About 86,600 acres in 7 SMAs within the high-intensity oil and gas development area are all managed as VRM Class II lands. These include Cabezon Peak SMA, Cañon Jarido SMA, Elk Springs SMA, Empedrado WSA, Ignacio Chavez SMA, Jones Canyon SMA, and La Lena SMA (BLM 1991a).

The USFS system for visual resource management is slightly different from that used by the BLM, with five classifications based on similar principles. Corral Canyon and the western edge of the San Pedro Mountains in the La Jara area of the Santa Fe National Forest are managed to preserve visual resource value, balanced with recreation and timber uses.

BLM land around Navajo Dam and Reservoir is categorized as VRM Class II because of the expanse of water and impressive views. Contiguous USBR land has similar scenic value. The surrounding mountains and plateaus are deeply cut into a dramatic landscape. BLM land beyond the influence of the reservoir is Class IV. The *Navajo Reservoir Resource Management Plan Draft Environmental Assessment* (USBR 1999) provides information about areas that are in view from the reservoir. Most of the lands within a mile of the reservoir appear natural from a distance, but they are heavily interspersed with modifications, mostly gas wells, pipelines, and access roads. Recreational facilities around the marinas and campgrounds contribute to localized zones with visual modification (USBR 1999).

RECREATION

The climate, natural landscape, archaeological sites and cultural traditions of the four-corners region provide features and attractions for a wide range of activities. There are world-reknown attractions including Monument Valley, the Grand Canyon, Chaco Canyon, and Mesa Verde that bring in large numbers of tourists. Outstanding conditions for sporting and recreational pursuits are enjoyed by local residents and regional and out-of state visitors. On a regional basis, favorite activities include camping, hiking, hunting and shooting, fishing, nature viewing, sightseeing, winter sports, horseback riding, mountain biking, motorized sports, rock climbing, kayaking and rafting. With growing visibility of the region (for year round outdoor pursuits in the southern Colorado Rockies and biking on the barren rock shields around Moab in Utah), the FFO is also experiencing an increase in the numbers of persons who are finding and engaging in recreational activities in the management area.

Some public lands contain unique or outstanding recreation values that require special or intensive management to protect the special value and to accommodate public use. In the FFO, a multitude of recreational opportunities exist ranging from the primitive and unconfined in Bisti/De-na-zin WA to the motorized challenge of rock-crawling in the GRTS. Recreational use is the primary emphasis for eight SDAs in FFO. **Table 3-16** lists these areas and describes their opportunities and features.

Table 3-16. Recreation SMAs in the FFO

Name	Size[a]	Recreation Opportunity	Dominant Features
Dunes Vehicle Recreation Area	1,000	Minimal supervision for ORV free-play and competitive events.	Steep canyon walls, talus slopes, sandy washes, rock-filled arroyos, and moderate to steep slopes.
Head Canyon ORV Competition Area	150	ORV competitive events and motocross on a developed track.	Sparse vegetation, with relatively flat terrain sloping to hilly terrain in the south.
Angel Peak Recreation Area and ACEC	10,240 (SRMA) 500 (ACEC)	Camping, hiking, sightseeing, and picnicking.	Angel Peak geologic feature: Kutz Canyon Badlands, with extreme erosional patterns of blue and gray shale.
Carracas Mesa SMA	7,000	Hiking, hunting, primitive camping, and sightseeing. Both motorized and non-motorized.	Consists of piñon-juniper and ponderosa pine habitat, with moderate to steep walled canyons draining into Navajo Lake.
Simon Canyon Recreation Area and ACEC	3,811 (SRMA) 3,491 (ACEC)	Picnicking, camping, fishing, hiking, sightseeing, and backpacking.	Moderately steep to very steep, rough, broken, and hilly terrain. Simon Canyon varies form 5,800 at the bottom to 6,275 at the top of the rim.
Thomas Canyon SMA	4,630	Hiking, hunting, sightseeing, primitive camping, and backpacking.	Forested terrain (piñon-juniper and ponderosa pine) with steep canyons and rugged terrain, sloping up from east to west.
Negro Canyon SMA	1,600	Hiking, hunting, primitive camping, sightseeing, and backpacking.	Piñon-juniper woodland, with the rugged, steep-walled Negro Canyon and its tributaries dominating the landscape.
Glade Run Trail System (GRTS)	33,800	Used for a diverse range of recreation, on- and off-trail, including motorized trail-bike riders, ATV use, four-wheel drive use, equestrian use, mountain bike use, rock climbing, and major competitive events.	Rolling hills, sandy arroyo bottoms, sandstone slick-rock. Vegetation is sparse and varied, including piñon-juniper, sagebrush, and grasses.

Sources: BLM 1991a, 1996, 1998a.

Notes: (a) Acres as reported in BLM planning documents. May vary from acreage calculated in GIS.
SRMA = Special Recreation Management Area, ATV = all-terrain vehicle, ORV = off-road vehicle.

Public lands in the FFO offer the opportunity to enjoy outdoor recreation in three major categories: developed, dispersed and motorized recreation. These are described below.

Developed Recreation

Developed recreational opportunities that benefit from improvements are available at Angel Peak and Simon Canyon Recreation Areas. Facilities support camping and picnicking at these locations. Maintained trails have been developed in some areas (e.g., the GRTS, the Head Canyon Recreation Area) to promote specific modes of use such as bike, horse, walking, or motorized two or four-wheeled vehicles.

Dispersed Recreation

Management of some areas, such as Negro Canyon, Simon Canyon, Caracas Mesa and Thomas Canyon are aimed at preserving quiet and natural character that are important for dispersed activities, such as hiking, backpacking, hunting, and so forth. With the extensive network of oil and gas roads, there are very few inaccessible areas in the FFO. This development has both altered the visual landscape and opportunity for solitude. On the other hand, it affords public access to backcountry for dispersed recreation throughout the field office.

Motorized Recreation

Motorized recreation on public lands includes opportunities for off-highway travel (on existing maintained or primitive roads), and off-road travel (cross country, off existing roads). Motorized vehicles include various classes and types of motorcycles, dune buggies, ATVs, and four-wheel drive vehicles. OHV use has increased in popularity as more versatile vehicles have become affordable and available, making access to more remote areas of public lands possible. This has introduced human presence into remote areas and left a mark on the landscape through creation of noise, dusts, smells, visual intrusions and creation of roads and trails through repeated use. In some cases, OHV use is associated with woodcutting, hunting, mineral exploration and development, livestock operations and administrative functions throughout the FFO. The predominant purpose of recreational and sporting activities occurs mostly near the urban centers.

Recreational conflicts occur when participation in one activity reduces the experience of another. For example, most non-motorized recreationists are usually seeking quiet, and believe the noise and fumes of vehicles diminishes their experience. Many motorized recreationists who stay on roads and trails believe that those who travel cross-country on motorized vehicles are not practicing good land ethics. Under current OHV policy, 1,106,600 acres of public land in the FFO are open to cross-country travel. To meet the needs of diverse users, the FFO has developed special facilities for motorized and non-motorized vehicles use. Trails (for two-wheeled vehicles), open areas for OHV users, and rock-crawling routes are provided in the GRTS. The Dunes Vehicle Recreation Area can be used as an open area for motorized use. Head Canyon SMA has a motocross track, mostly for two-wheeled vehicles. Overall, about 25 miles of trails have been designated in the FFO, mostly for specific uses in order to minimize conflicts between different activities. There are also undesignated trails that users have created. These include trail networks on Piñon Mesa, in the area called "Alien Run" north of Aztec, the Bloomfield/Aztec trail, horse trails at Navajo Lake, and numerous other trails throughout the field office.

The AFO has 12 SMAs in the planning area, of which five have recreation as the resource emphasis. These SMAs, which encompass about 6,100 acres, include Azabache Station, Cabezon Peak, Cañon Jarido, Ignacio Chavez, and Continental Divide Trail Corridor. The Continental Divide SMA has a total of 31,120 acres crossing several states, but only a small portion is within the planning area. Historic Homesteads SMA is managed for cultural and recreational values.

Most of the land in the Jicarilla Ranger District is both accessible and well suited to dispersed recreation but there are no developed sites. Within the Cuba Ranger District, management of Cuba Mesa and Corral Canyon emphasizes recreational values. Hunting, hiking, camping, biking, and limited ORV use occurs on USFS land within the planning area.

The USBR manages Navajo Dam, the reservoir, and the surrounding shoreline areas. The dam was constructed for water conservation and flood control, with a minimum pool generally maintained for recreation. Navajo Lake State Park has facilities for camping and access to the lake. Visitation was about 540,000 in 1997, an increase of 61 percent since 1990 (USBR 1999). The Navajo

Lake Horse Trail system is accessed from the park. Other special recreational areas are located on Simon Mesa and along the Pine River and the San Juan River.

Recreation on the New Mexico portion of Navajo Lake and on the San Juan River below the dam is administered by the New Mexico State Parks and Recreation Division. Above the dam, Sims Mesa and Pine River Recreation Areas have camping, fishing, marina, and boat access to the lake. Below the dam, fishing and camping occur at San Juan River Recreation Area, and day use is facilitated at several sites along State Highway 511. (BLM manages Simon Canyon Recreation Area that has parking and camping facilities.)

CULTURAL RESOURCES

Cultural History

An area so vast as the planning area encompasses evidence of many developments throughout the prehistoric and historic periods. Perhaps best known are the remains associated with the Chaco culture, centered in Chaco Canyon. The general cultural history presented below has been abstracted from Amsden (1993), Anschuetz (1993), Bradley and Brown (1998), Marshall (1997), Riley (1996), Seymour (1996), Stuart and Gauthier (1981), Winter et al. (1993), and Vivian (1990).

Although there are many commonalities in the sequence of development across the region as a whole, there are, at the same time, subtle differences that have caused archaeologists to distinguish four different culture areas typical of the planning area. These include the Navajo Reservoir, San Juan Basin (including Chaco), Jemez/Middle Rio Grande, and Gallinas cultures.

Region-specific phase sequences are presented in **Table 3-17**. In general, the prehistory of the planning area is divided into five major periods. The earliest evidence of human occupations in the region is termed PaleoIndian. This is followed by the Archaic period during which the beginnings of agriculture emerge in the archaeological record. Subsequent developments are designated as the Formative, or Developmental, period when agriculture and large towns began to appear across the Colorado Plateau. This, in turn, is followed by the historic period, which includes developments by both American Indians as well as later Euro-American settlers. Each of these phases is discussed in more detail below.

PaleoIndian (ca. 10000 B.C. to 5500 B.C.)

The archetypal view of the PaleoIndian period is that it was characterized by relatively small bands of hunters relying on large, now extinct, Pleistocene megafauna. There is controversy concerning when these peoples first arrived in North America, with progressively earlier dates from sites of this period appearing almost every year. The earliest evidence in New Mexico conforms to the date range indicated above, although earlier sites will likely be found. Consistent with a seemingly primary focus on large game animals such as mammoth and bison, many of which were migratory. PaleoIndian sites are ephemeral, reflecting periodic movement of camps to areas where animals might be found. At the same time, there is some evidence of reliance on plant resources.

The highest concentrations of PaleoIndian sites have been found in two settings. The first setting is along the margins of playas, small ephemeral lakes that hold water for short periods during the rainy season (Judge 1973). The second setting is along ridge lines paralleling large drainages where, again, water might be available (Vivian 1990). Sites are known from the Puerco Basin, the Chuska valley along the Arizona-New Mexico border, and the Chaco Plateau (Vivian 1990). Most consist of isolated projectile points, again consistent with what seems to be a highly mobile life way.

Table 3-17. Regional Phase Sequences in the Planning Area

Period	Date	Cultural Area			
		Navajo Reservoir	San Juan Basin	Rio Grande/Jemez	Gallina
A.D.	1863-present	Reservation Navajo Lucero (Hispanic)	Reservation Navajo	US Territorial Mexican/Santa Fe Trail	
	1770-1863	Cabezon	Cabezon	Post Pueblo Revolt	Cabezon
	1650s-1770	Gobernador	Gobernador	Pueblo Revolt	Gobernador
	1540-1650s	Dinétah	Dinétah	Contact – Colonial	Dinétah
	1400-1540			Classic (Pueblo IV)	
	1100-1300	(Pueblo III)	McElmo/Mesa Verde (Pueblo III)	Coalition (Pueblo III)	Largo-Gallina
	900-1100	Arboles (Pueblo II)	Bonito (Pueblo II)	Late Developmental (Pueblo II)	
	700-900	Rosa-Piedra (Pueblo I)	White Mound (Pueblo I)	Early Developmental (Pueblo I)	
	500-700	Sambrito (Basketmaker III)	La Plata (Basketmaker III)	Alameda (Basketmaker III)	
	100-400	Los Pinos (Basketmaker II)	Basketmaker II	Rio Rancho (Basketmaker II)	
	100	En Medio			
B.C.	800-A.D.100	En Medio	En Medio		
	1800-800	Armijo	Armijo		
	3200-1800	San Jose	San Jose		
	4800-3200	Bajada	Bajada		
	5500-4800	Jay	Jay		
	10,000-5500	PaleoIndian	PaleoIndian	PaleoIndian	PaleoIndian

Sources: Vivian 1990, Winter et al. 1993, Marshall 1997, Bradley and Brown 1998.

PaleoIndian sites consist of chipped and ground stone tools, including large bifacial projectile points. These points were attached to wooden shafts to form spears or large darts, thrown with an atlatl, or spear thrower. Variations in the ways these points were manufactured, specifically reliance on fluting and lateral thinning, have allowed archaeologists to separate the PaleoIndian period into three time-sequent complexes. Non-fluted Clovis points typify the earliest complex. Later, fluted points signal the appearance of the Folsom complex. Finally, points typified by extreme lateral thinning are indicative of the Plano complex. Rarely are bone and wooden tools preserved.

Paleoenvironmental reconstructions using plant pollen suggest that drought conditions prevailed over much of the San Juan Basin between 8000 and 6500 B.C. Consistent with this reconstruction, evidence of Plano complex occupations is generally lacking for the region as a whole.

PaleoIndian components account for less than one-quarter of 1 percent of the components in the planning area. Despite numerous archaeological surveys and excavations in the planning area, the scarcity of diagnostic artifacts and assemblages currently documented point to a very limited use of the San Juan Basin during the PaleoIndian period.

On FFO lands, there are no ACECs or SMAs that are actively managed to protect

outstanding examples of cultural resources from this period. Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Archaic Period (ca. 5500 B.C. to A.D. 400)

The Archaic period is signaled by the extinction of earlier Pleistocene fauna, due to the combined effects of the drought noted earlier as well as hunting by PaleoIndian peoples. Although hunting continued to be important throughout the Archaic period, there was greater reliance on gathering of wild plant resources. Consonant with this subsistence shift is the appearance of new classes of artifacts, notably ground stone implements that were used to process plant foods for consumption. Projectile points decrease in size consistent with hunting of smaller animals.

As in the PaleoIndian period, Archaic hunting-and-gathering groups seem to have remained small in size, probably consisting of no more than a few co-residential, extended families. Archaic sites are more visible than PaleoIndian sites, but, with some exceptions, remain relatively ephemeral. This is again consistent with high mobility when groups move to take advantage of geographic and seasonal variations in the availability of plant and animal resources.

Archaic sites are found throughout the San Juan Basin. Most are found north and east of the Chaco River. Sites tend to alternate between semi-permanent (winter) base camps that were repeatedly occupied from year to year and more ephemeral (summer) sites related to the completion of specific seasonal hunting or gathering activities. Sites are found in canyon heads and cliff tops. Based on ethnographic analogies, the size of territories exploited by Archaic groups was inversely proportional to environmental diversity: where diversity was higher, territories probably were smaller and the converse.

General trends in the number of Archaic sites across the planning area are interpreted as reflecting gradual, sustained population growth throughout the Archaic period. Specifically, beginning with relatively few early Archaic Jay phase (ca. 5500 to 4800 B.C.) sites, there is a progressive increase in the number of later Bajada (ca. 4800 to 3200 B.C.), San Jose (ca. 3000 to 1800 B.C.), Armijo (ca. 1800 to 800 B.C.) and En Medio (800 B.C. to A.D. 400) phase sites over the planning area. As well, sites are larger by the San Jose phase and are accompanied by the first evidence of structures, probably constructed of poles and brush. The number and size of sites increases steadily in succeeding phases, all of which is consistent with the aggregation of larger groups of people, population growth, and repeated occupations of larger base camps.

The earliest evidence of domesticated crops, notably maize, appears in the Armijo phase. This presages the much greater reliance on domesticated crops that characterizes the later prehistory of the planning area. At the same time, reliance on domesticates implies the need to maintain fields, as well as store any surpluses that might be generated. Not surprisingly, the appearance of maize in the archaeological record is accompanied by the almost simultaneous appearance of more permanent structures and storage facilities. At the same time, there is some suggestion that maize did not appear in all parts of the San Juan Basin at the same time. Specifically, maize seems to appear earlier in the eastern part of the basin, but is largely absent in western parts of the basin. However, this may reflect an absence of surveys in the western region rather than any fundamental underlying variability in subsistence patterns across the planning area.

Archaic components account for less than 4 percent of the total components in the planning area. Numerous lithic scatters in the planning area lack diagnostic artifacts and assemblages indicating the cultural and temporal association of the sites. These sites comprise approximately 1 percent of the sites in the planning area. Many of these are site

components potentially dating to the Archaic period. While comprising a small percentage of the sites in the planning area, they remain an important class of sites for research involving the hunter-gatherer occupation in the region, and the transition to agricultural lifeways.

On FFO and AFO lands, there are 2 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. Jones Canyon ACEC (AFO)
2. East Side Rincon Site SMA (FFO)

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Basketmaker II (ca. A.D. 1 to 500)

The Basketmaker II (BM II) Phase represents the first successful agricultural populations developing sedentary settlements in the region. Dating from approximately A.D. 1 to A.D. 500, Basketmaker sites are found in southern Utah, southwestern Colorado, and eastern Arizona, as well as much of New Mexico. Due to the limited amount of research devoted to these sites, the relationship between late Archaic En Medio Phase occupations and the BM II occupation is still poorly understood. The introduction of viable agricultural strains, in particular corn (*Zea mays*), as well as squash and beans is thought to have contributed to the adoption of sedentary habitations, generally aligned with perennial drainages in the Four Corners area. Shallow pit structures and extensive use of storage features mark the adoption of agriculture as a key feature of the occupation. Population aggregation is indicated by settlements with multiple structures. Upland settlements are also found which may represent seasonal use for farming plots as well as exploitation of faunal resources. The first use of ceramic artifacts also occur during the latter part of the period, with simple vessels constructed of alluvial clays similar to those manufactured by Mogollon populations far south of the planning area.

The BM II occupation in the planning area is known from the Chaco Canyon Area and the Chaco River drainage, as well as more extensive occupations in the Navajo Reservoir area. The BM II occupation in the Navajo Reservoir area was designated the Los Pinos phase following extensive inventory and excavation for the Navajo Reservoir project. (Eddy 1966). Los Pinos phase sites cluster along the Pine and Animas rivers, with more intensive occupations to the north in Colorado.

BM II components comprise less than 1 percent of the total known components in the planning area, however are of particular interest to researchers not only due to their rarity, but because of their importance in understanding early transitions to agriculture and the adoption of sedentary settlement patterns. The first signs of population aggregation in the region are marked by the BM II period, with continuing population growth trends for the next 600 years.

On FFO lands, there are no ACECs or SMAs that actively managed to protect outstanding examples of cultural resources from this period. Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Basketmaker III (ca. A.D. 500 to 700)

Basketmaker III (BM III) occupations in the San Juan Basin are characterized by widespread adoption of domesticated crops accompanied by the appearance of pithouses, the advent of ceramic manufacturing, and the introduction of bow-and-arrow technology. Notable among the crops recovered from sites dating to this period are maize, squash, and beans. The adoption of agriculture, even in a nascent form, was probably facilitated by a return to increases in effective moisture over much of the Colorado Plateau during this period. Yet, indirect evidence of droughts during this period suggests that this was not a stable climatic regime. As a consequence, BM III groups continued to rely on wild plant

and animal resources, with agricultural products largely used to supplement wild resources.

Classic interpretations of BM III suggest that population growth continued at relatively high rates. Current notions suggest the cumulative effect was that BM III groups began to become more densely packed into the landscape. The presence of neighboring groups, who also depended on the same resources, would have constrained the ability of any one group to complete seasonal movements to obtain wild plant and animal resources. It is such constraints on movement, in conjunction with improved climatic conditions, which are thought to have contributed to the more widespread adoption of cultivated crops during this period. Similarly, by late BM III times, a major population shift from the La Plata region into the central portion of the San Juan Basin had occurred, perhaps in response to improved agricultural conditions.

BM III sites are known from the Navajo Reservoir region, Animas-La Plata watersheds, Red Rock Valley, Middle Chuska Valley, Chaco Canyon region, and southward into the Rio Puerco Valley. Relative to earlier periods, BM III sites are far more visible due to longer occupations. The shift to domesticated crops is reflected by changes in settlement patterns during BM III times. Compared to earlier times, BM III sites are disproportionately oriented toward areas containing arable land. Agriculture in higher elevations would have been constrained by frost-free periods, while those in lower elevations would have been constrained by rainfall and surface water availability. It should be emphasized that agriculture during this period relied exclusively on direct rainfall; technologies such as irrigation to supplement water supplies have not been found.

At the same time, there is evidence that BM III was not the same across all parts of the San Juan Basin. While the classic description of BM III emphasizes reliance on agriculture, there is some indication that early BM III groups in the southwestern and western portions of the basin continued to practice hunting-and-gathering to a much greater extent than agriculture. In contrast, there is evidence of greater agriculture in the Navajo Reservoir (Sambrito phase), accompanied by substantially higher populations.

BM III components comprise approximately 2 percent of the total components in the planning area, and exhibit greater size and complexity than the sites of the preceding BM II period. BM III settlements are found in the Navajo Reservoir area, the Chuska Slope and Chaco Canyon area within the Chaco Canyon drainage, and in the La Plata, Animas, Upper San Juan, Largo, Carrizo and Gobernador drainage basins.

On FFO lands, there are 8 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. East Side Rincon Site
2. Morris 41
3. Pregnant Basketmaker
4. Carrizo Cranes
5. Encierro Canyon
6. NM 01-39236
7. Martinez Canyon
8. Crow Canyon District

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Pueblo I (ca. A.D. 700 to 900)

The Pueblo I (PI) period on the Colorado Plateau generally is typified by an increase in the number of sites, an increase in average site size, the appearance of above-ground jacal and stone architecture alongside semi-subterranean pithouse structures, and larger storage facilities. Above-ground structures typically exhibit linear or oval configurations and contain about 8 rooms per site. So-called "proto-kivas" first make their appearance at some PI sites in the planning area. With the exception of the Chaco region, these trends are not thought to reflect

population growth, but rather consolidation of previously distinct residential groups into larger villages.

In the San Juan Basin, however, the overall number of PI sites is relatively low. This is attributed, in part, to deteriorating environmental conditions on the Colorado Plateau, specifically reduced rainfall and an increase in the overall variability of rainfall. Rainfall estimates appear relatively high between A.D. 700 to 750, but began a steady decline through the early A.D. 800s. Between A.D. 830 to 900, drought conditions are thought to have prevailed over much of the planning area.

The highest concentrations of PI sites are situated in the Mesa Verde region, in the Middle Chuska Valley, Chaco Canyon, Lower Chuska Valley, and the Navajo Reservoir region. The easternmost manifestation of PI, termed the Rosa phase, differs slightly from sites situated further west. Here, settlements tend to be distributed not only along drainages, but as well on outwash fans to maximize agricultural production. Over much of the northern San Juan Basin, sites tend to be situated on mesas, broad ridges, or floodplain terraces overlooking drainages.

As in BM III times, there is evidence for regional differentiation in subsistence patterns. In the southwestern portion of the San Juan Basin, sites assigned to the White Mound phases contain food remains indicating reliance on a mix of horticulture, hunting and gathering. In the northern San Juan Basin, Rosa-Piedra phase sites tend to contain relatively larger amounts of cultigens. In the center of the San Juan Basin, in Chaco Canyon, PI sites contain a similar mix of domesticated and wild resources, suggesting that drought conditions during this period caused subsistence strategies to remain diversified. To the east, reliance on domesticates appears to have been greater than in other parts of the basin.

PI components comprise over 6 percent of the total components in the planning area, with occupations clustering in the Navajo Reservoir area, the Largo, Carrizo, Upper San Juan and Gobernador watersheds, and on the Chuska Slope and Chaco Canyon areas within the Chaco River drainage basin. Recent research on PI communities in the Navajo Reservoir area have identified several large complex communities aggregated around Great Pit Houses, the early predecessor to the Great Kivas known from the later Pueblo II and Pueblo III periods. Population growth and aggregation during this period is a critical factor in the development of the later complex communities and social structures present in the Pueblo II and Pueblo III periods in the planning area.

On FFO lands, there are 8 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. East Side Rincon Site
2. Morris 41
3. Pregnant Basketmaker
4. Carrizo Cranes
5. Encierro Canyon
6. NM 01-39236
7. Martinez Canyon
8. Crow Canyon District

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Pueblo II (ca. A.D. 900 to 1050)

The Pueblo II (PII) period is characterized by an increase in the number of sites, an increase in average site size, a shift toward above-ground coursed masonry architecture, the appearance of larger numbers and larger sizes of storage facilities, and the appearance of formal kivas. Sites typically contain between 6 and 9 rooms per site, most arranged in a linear fashion. Larger sites containing more numerous rooms are often laid out in a quadrilateral pattern around central plazas.

It is during PII times that the Chaco phenomenon truly flourishes, accompanied by the establishment of very large towns, the appearance of multistoried room blocks, increasingly complex architectural elaboration of kivas, the advent of field systems in an effort to boost agricultural production, and the development of road systems to facilitate trade and exchange.

These changes seem to signal a return to accelerating population growth in response to dramatically improved climatic conditions. Unlike the PI period, climatic reconstructions for A.D. 900 to 1050 indicate a return to higher rainfall levels, although this was accompanied by episodic droughts whose intensity varied from place to place. In areas less affected by droughts, settlements were pushed into areas that would have been marginal in PI times. It is suspected that differential spatial distributions of critical resources probably became more pronounced in PII times over much of the San Juan Basin.

In short, current theories suggest that much of the PII period is typified by imbalances between people and resources, both temporally and geographically. Such imbalances necessitated the introduction of various buffering mechanisms in an effort to offset these imbalances. Among the buffering mechanisms inferred from the archaeological record were improved storage facilities, expansion of regional exchange networks, and more frequent abandonment and reestablishment of large villages in areas better suited for agriculture. One consequence is that PII sites often were occupied for relatively short periods of time.

Subsistence practices indicate greater reliance on cultivated plants, although evidence of use of wild resources persists at most PII sites. Maize, beans, and squash are quite common at both large and small sites. Evidence of agricultural intensification derives from the identification and dating of the first water control structures in the San Juan Basin. These structures were designed to augment rainfall, thereby increasing overall productivity of given plots of land. Many of these water control devices seem to provide water to outwash fans, areas that are often marginal for direct rainfall agriculture.

Earlier dissimilarities between sites in the southern San Juan Basin and those in the northern basin largely disappear during PII times. The emergence of region-wide (relative) homogeneity in ceramics, architecture, subsistence practices, and settlement patterns has been interpreted as evidence supporting the inference that region-wide trade and exchange systems emerge in full force during PII times.

One notable exception to this homogeneity is found in the Chaco Canyon region, where settlement in the Chaco heartland is typified by numerous small habitation sites distributed around fewer, but very much larger and more complex towns (central places) containing kivas, great kivas, reservoirs, dams, and roads. Sourcing studies suggest that non-local materials were being imported from far-flung parts of the Southwest.

These facts, combined with the pan-regional distribution of ceramics that are virtually identical, suggests that Chaco Canyon may have been the primary focal point for trade and exchange networks whose limits extended into northeastern Arizona, southern Colorado, and west-central New Mexico. Analyses of ceramics and chipped stone indicate that source areas for such critical resources gradually shifted over time from the southeastern part of the area (Zuni) to the western (Chuska) region and, finally, to the northern portion of the San Juan Basin. It is likely that these regions approximate the outer limits of this exchange and trading network. There is some evidence suggesting that turkeys and perhaps corn were among the crucial subsistence resources being imported into the Chaco region. If such inferences are accurate, reliance on imported foodstuffs underscores the tenuous agricultural conditions that prevailed across the central San Juan Basin during PII times.

Chaco Canyon, and the outlying sites related to it, are unique in Southwestern prehistory. One indication of the importance of

Chaco is its designation in 1987 as a World Heritage locality (UNESCO 1987).

The Chaco phenomenon is defined on the basis of multiple attributes. There are two alternating site types—great houses and villages—viewed by many as indicative of economic and political differences inherent in the Chaco system. Multistoried great houses, usually consisting of upwards of 200 rooms, typically were constructed as a series of temporally discrete units (Kantner and Mahoney 2000, Saitta 1997). In contrast, surrounding villages usually consist of single story structures ranging from 20-40 rooms in extent. Obvious differences in site construction characteristics are underscored by the recovery of exotic goods in great house sites and the virtual absence of such goods in villages. Among these goods are copper bells, turquoise, shell jewelry, and macaws from Central America (Mathien and McGuire 1986, Toll 2001). Finally, great houses appear to be nodes for upwards of 70 constructed roads or road segments, often interpreted as remnants of transportation/communication routes (Renfrew 2001; Vivian 1997a, b).

Because the "Chaco phenomenon" is one of the most well-documented archaeological manifestations in the Southwest, it is no surprise that it provides a basis for widespread discussion of the factors that contributed to its appearance, operation, and eventual collapse. The phenomenon of "Chaco" has been viewed by different scholars as either (1) largely a local geographic phenomena that appears in response to generally favorable climatic conditions and is typified by redistributive activities or (2) as one component of a much larger Mexican-Southwestern interaction network founded largely on ideational factors. The characteristics of inferences necessarily vary considerably between these perspectives.

Chaco as a Regional System

Those who view Chaco as a somewhat localized Southwestern phenomena underlain by redistributive activities assume that Chaco exhibits attenuated links to other regions (e.g., Mexico). Researchers of this perspective generally focus on the occurrence of two alternating site types, great houses and villages, as well as the presence of exotic goods and constructed roads as consistent with strategies to control access to and redistribution of goods—both subsistence resources and trade items—across the San Juan Basin (Renfrew 2001).

Those advocating the presence of religico-political elites cite the presence of large proportions of non-residential rooms at great house sites as evidence for storage of surplus foodstuffs, which were then redistributed by elites residing in great house communities. There are differences of opinion on this theme primarily with respect to inferred degrees of political centralization, ranging from egalitarian (Vivian 1990) or ranked (Grebinger 1973) to chiefdoms (Earle 2001, Lekson 1999, Saitta 1997). Others, however, find insufficient evidence to conclude that hierarchical elites were present (Feinman et al. 2000, Saitta 1997, Sebastian 1992, Vivian 1997b, Windes and Ford 1996).

The presence of upwards of 70 constructed road segments, possibly built through some form of non-coerced or coerced communal labor (Saitta 1997), is viewed by some as reinforcing the notion of politico-religious authorities coordinating road construction to facilitate transport and communication across the San Juan Basin (Cameron and Toll 2001, Nelson 1995, Vivian 1997b). Among the activities inferred for Chacoan roads are transport of beams into great house communities for use in roof construction (Snygg and Windes 1998), as access routes for pilgrims to ceremonies and periodic markets centered in great house communities (Judge 1989, Malville and Malville 2001, Renfrew 2001, Roney 1992, Vivian 1997b), as routes for the movement of turquoise, much of which seems to have been used within Chacoan communities (Mathien 2001), or as routes for military activities undertaken to forcibly integrate outlying communities into the Chaco system (Wilcox 1994). Others, however, have concluded that

these roads were too wide to have been designed simply as transportation routes, regardless of what might or might not have been transported (Roney 1992, Kantner 1997, Vivian 1997b).

Similarly, while exotic items of Mexican origin (e.g., copper bells, macaws) are known from Chacoan sites, those subscribing to the notion that Chaco was a regional network note that the overall quantity of such remains is too small to reflect widespread trade or exchange with Mexico (Renfrew 2001). At the same time, some have suggested that the value, not quantity, of exotic items from Mexico may be a far more important factor in evaluating the presence of such items at Chaco (Reyman 1995).

Finally, some see Chaco's settlement system as based largely on cosmology (Stein and Lekson 1992). Specifically, the Chaco phenomenon is argued to have been predicated on shared ritual ideology linked to cosmological events (e.g., solstices, equinoxes) which, in turn, were manifested in the structured spatial arrangement of archaeological sites (e.g., kivas, shrines, rock art, water control features, and roads) across Chacoan landscapes (see also Sofaer 1997).

Chaco as a Pan-Regional System

Most recently, Lekson has proposed that Chaco may be part of a much larger Mexican-Southwest settlement system. Lekson (1999) focuses on the supposed alignment of structures found at the New Mexico sites of Aztec Ruins and Chaco Canyon, along with the site of Paquimé in northern Mexico, on a north-south axis running from nearly Colorado into northern Chihuahua. These complexes are suggested to be time-sequent residences of religico-political elites that moved in response to a succession of deteriorated environmental intervals. Specifically, he proposes that a politico-religious elite, originally resident in Chaco Canyon, moved successively to Aztec (ca. A.D. 1125) and then Paquimé (A.D. 1275). What is perhaps most controversial about Lekson's argument is the notion that the arrangement of these three sites along a given meridian represents a deliberate effort to construct sites according to some preconceived plan by a multi-generational elite that spanned more than 200 years and 630 kilometers.

Not surprisingly, there are objections to Lekson's view of Chaco. For example, Phillips (2000) demurs about this model, observing that the alignment of these three sites along a given meridian may be more apparent than real and, moreover, that the presumptive similarity of architecture across these three sites is without foundation. Further, Phillips notes that, in particular, ceramic assemblages from Paquimé are quite dissimilar from Chacoan ceramics in general, suggesting that a time- and space-transgressive elite is not responsible for constructing these three sites.

Summary

This very brief overview of varying perspectives swirling around the "Chaco phenomenon" simply underscores a number of points. First, there is an on-going debate about appropriate geographic scales of analysis, particularly with respect to settlement analyses. Second, as this discussion makes clear, there are debates regarding the nature of evidence from Chacoan sites and the inferences based on such evidence. Finally, while the San Juan Basin has perhaps the largest suite of dated sites in the Southwest, attempts to identify stimuli (environmental fluctuations) and possible responses (centralization, redistribution, migration) still rely on accurate chronologies. Only as issues of this sort are addressed will the Chaco phenomenon be more completely understood. Consequently, Chaco will remain one of the most important venues in the American Southwest for examining these issues.

PII components account for approximately 7 percent of the total known components in the planning area. However, dual PII-PIII components are quite common across the planning area, adding another 8 percent of the components that date to this broad time interval. During this period the Navajo

Reservoir, Largo, Carrizo, Upper San Juan and Blanco watersheds are virtually abandoned, with populations shifting to the north, south and west. Population aggregation and community development is enhanced in these areas during the PII period. Large and complex communities are linked by formalized road networks within the San Juan Basin, with Chacoan Great Houses and communities tied to the central hub in Chaco Canyon.

On FFO and AFO lands in the planning area, there are 21 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. Jones Canyon (AFO)
2. Headcut Prehistoric Community (AFO)
3. Cañon Jarido (AFO)
4. Morris 41
5. Kin Nizhoni
6. Pierre's Site
7. Halfway House
8. Twin Angels
9. Jacques Site
10. Holmes Group
11. Casamero Community
12. Toh-la-kai
13. Indian Creek
14. Upper Kin Klizhin
15. Bis sa'ani
16. Andrews Ranch
17. Church Rock Outlier
18. North Road
19. Ah-shi-sle-pah Road
20. Crownpoint Steps and Herradura
21. Bee Burrow

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Pueblo III (ca. A.D. 1050 to 1300)

The Pueblo III (PIII) period is typified by the aggregation of populations into progressively larger centers, accompanied by the gradual collapse of the Chaco phenomenon that so defines early and middle PII times. Some researchers suggest that populations began to move northward into the northern San Juan Basin near Aztec, as well as southward out of the Mesa Verde region. Concurrent with Chaco's gradual decline in importance is a seeming realignment of social interaction spheres northward toward Mesa Verde. For example, sites along the Chuska Mountains seem to evidence a period of increased building events, accompanied by the replacement of Chacoan ceramics with those more typical of Mesa Verde. As well, the appearance of bi- and tri-wall buildings, nominally characteristic of the Mesa Verde region at sites in the San Juan Basin, suggests the gradual outward expansion of Mesa Verde peoples into areas formerly containing Chaco components. Over much of this period, sites contain between 13 and 30 rooms, with larger sites exhibiting upwards of 200 rooms.

These changes are attributed to the onset of a period of dramatically decreased rainfall after ca. A.D. 1220, accompanied by increased spatial variability in rainfall across the basin as a whole. Areas adversely affected by reduced rainfall, the central and southern San Juan Basin, seem to act as donor areas for population out-migration, while areas less subject to reduced rainfall, like the Mesa Verde and McElmo regions, become recipient areas for immigrants. Many parts of the Basin appear to have been abandoned toward the terminal portion of the PIII period.

Approximately 6 percent of total known components in the planning area date to PIII times, yet they are some of the largest and most complex Puebloan settlements in the region. Further, as noted in the PII discussion, dual PII-

PIII components are quite common across the planning area, adding another 8 percent to the total known components dating to this somewhat broad interval. PIII components are virtually absent from the Navajo Reservoir area, while the Upper Largo and Rio Chama drainages exhibit large clusters of Gallina phase settlements. Concentrations of sites and large communities are found on the Chuska Slope and the Chaco River watershed, the Upper Puerco, Rio Chama, San Jose and Rio Puerco drainages, and the Lower San Juan and its tributary drainages, including the Animas, La Plata, and Mancos.

On FFO and AFO lands in the planning area, there are 23 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These are:

1. Jones Canyon (AFO)
2. Headcut Prehistoric Community (AFO)
3. Cañon Jarido (AFO)
4. Morris 41
5. Kin Nizhoni
6. Pierre's Site
7. Halfway House
8. Twin Angels
9. Jacques Site
10. Holmes Group
11. Casamero Community
12. Toh-la-kai
13. Indian Creek
14. Upper Kin Klizhin
15. Bis sa'ani
16. Andrews Ranch
17. Church Rock Outlier
18. North Road
19. Ah-shi-sle-pah Road
20. Crownpoint Steps and Herradura
21. Bee Burrow
22. Farmer's Arroyo Site
23. Chacra Mesa Complex

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Pueblo IV (ca. A.D. 1300 to 1540)

Further movements of peoples into riverine valleys where relatively more reliable surface water supplies are found characterize the Pueblo IV (PIV) period. This marks an end to higher elevation agricultural endeavors dependent on rainfall and, perhaps, the explicit recognition that agriculture, if it was to be successful, had to rely on surface water. Sites dating to this period are generally small, containing between 1 and 4 rooms. A small subset of sites contains 100 rooms, while an even smaller subset of the largest sites contains upwards of 500 rooms.

Major settlements dating to this period are situated primarily in the Rio Grande, Rio San Jose, and Zuni River watersheds. As well, during this period, the first evidence of direct diversion irrigation systems appears among the pueblos along the Rio Grande.

Material culture also became more elaborate. For example, PIV coincides with the introduction of glaze-decorated ceramics and the use of red and yellow slips. Other examples of PIV material culture include mural paintings, petroglyphs, stone effigies, decorated pipes, and carved bone tools. The descendents of some of these groups are the contemporary Puebloan villagers.

The PIV occupation of the planning area is primarily limited to the Rio Chama watershed, where concentrations of PIV components comprise less than 1 percent of the total number of components.

On BLM lands in the planning area, there are no ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. Other

examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Historic Period (ca. A.D. 1540 to Present)

Before considering historic Navajo occupations of the planning area, it should be mentioned that small numbers of Southern Ute and Jicarilla Apache components are found in the northern reaches of the planning area. These components are probably related to activities following the establishment of the Southern Ute Reservation (1868-1877) and the Jicarilla Apache Reservation (1887). Because these components are so infrequent, they are not discussed in any detail here.

Navajo

Navajo cultural sites in the planning area constitute a high percentage of the historic period. Approximately 30 percent of all recorded cultural site components in the planning area are Navajo affiliated. These sites encompass a full range of types and include but are not limited to scatters of artifacts, game drives, small and large habitations, trails, and rock art. The culture and history of the Navajo people is also intertwined with a varied and diverse landscape that recognizes places that have pan-tribal as well as local significance.

While there is some debate on the chronology of the early Navajo and their entry into the American Southwest, the archaeological evidence indicates that they were here by at least the mid-16th century. Navajo traditional histories place them in northwest New Mexico even earlier. By about 1710, most Navajos were probably located west of Abiquiu and the Chama River, having been driven out by conflicts with Spanish, Ute, and Comanche combatants.

Navajo chronology is generally expressed in a series of phases that include the Dinétah (1540 to mid- 1600s), Gobernador (mid-1600s to 1770), Cabezon (1770 to 1863), and Reservation phases (1863 to present). The date ranges presented here are general, and various scholars may present slightly different schemes. All of these phases are manifested in the RMP planning area to varying degrees. Some areas have been extensively investigated and the distribution of Navajo sites of varying ages and types is well documented. Other areas have received only sporadic investigations and the distribution and character of Navajo sites is less well defined. Almost half of all known Navajo sites, or 10.5 percent of all components known in the planning area, cannot be assigned to any of these three general phases and are identified simply as "Unknown Navajo."

Dinétah/Gobernador Phases (ca. A.D. 1500 to 1753)

Early Navajo occupation of northwest New Mexico is documented from at least the Abiquiu/Chama River area extending west to concentrations at the eastern ends of San Juan County and the western ends of Rio Arriba County, in what is known as Dinétah ("Among the People"). Early Navajo sites are also know from the southern reaches of the San Juan Basin and in the Rio Puerco drainage, most notably at Big Bead Mesa and Chacra Mesa. Although a growing body of evidence indicates that Dinétah and Gobernador phase sites were more widely distributed across the San Juan Basin and the Colorado Plateau in general than previously believed only a few years ago, the greatest occurrence remains the Dinétah area, and elsewhere the numbers are far lower. Approximately 26 percent of all Navajo site components in the study area are dated to this time period, and the vast majority is located in the Largo and Gobernador Canyons and their drainages. Regardless of where early Navajo sites may be found on the Colorado Plateau, Dinétah is the type locality for comparative purposes with other early Navajo sites.

The Navajo of the period represent an evolving tradition originating out of a hunting and gathering existence to one that enhanced those traditions with the agricultural practices and some of the ceremonial practices of the Pueblo world, and the pastoral economies introduced by the Spanish. Some key

characteristics of the Navajo of the period include conical forked-pole hogans, defensive masonry pueblitos, elaborate ceremonially based rock art, plain gray and polychrome ceramics, low percentages of trade ceramics from nearly all pueblo areas, distinctive stone tool styles, agriculture, and pastoral economies. Many of the sites, particularly in the 18th century, are located in defensive locations.

Sometime around A.D. 1760 to 1770, the Dinétah Navajo had moved or was in the final stages of moving into other areas of the Colorado Plateau and Dinétah was effectively depopulated. Archaeological data shows little evidence for site occupation or construction after this time. Concurrent with this movement away from Dinétah, the Navajo appear to have experienced a revitalistic movement that prescribed the discarding of certain puebloan traits such as painted pottery, masonry houses, and permanent ceremonially oriented rock art.

Dinétah/Gobernador components comprise about 7.5 percent of the total components known in the planning area. On FFO and AFO lands in the planning area, there are 55 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. Jones Canyon (Dinétah and Gobernador phases) (AFO)
2. Cañon Jarido (Dinétah and Gobernador phases) (AFO)
3. Superior Mesa Community (Dinétah and Gobernador phases)
4. Bi Yaazh (Dinétah and Gobernador phases)
5. Gould Pass Camp (Dinétah and Gobernador phases)
6. Four Ye'i (Dinétah and Gobernador phases)
7. Largo Canyon Star Ceiling (Dinétah and Gobernador phases)
8. Star Spring (Dinétah and Gobernador phases)
9. Blanco Star Panel (Dinétah and Gobernador phases)
10. Shield Bearer (Dinétah and Gobernador phases)
11. Big Star (Dinétah and Gobernador phases)
12. Rabbit Tracks (Dinétah and Gobernador phases)
13. Delgadita/Pueblo Canyons (Dinétah and Gobernador phases)
14. Cibola Canyon (Dinétah and Gobernador phases)
15. Encierro Canyon (Dinétah and Gobernador phases)
16. NM 01-39236 (Dinétah and Gobernador phases)
17. Martinez Canyon (Dinétah and Gobernador phases)
18. Shephard Site (Gobernador phase)
19. Crow Canyon District (Gobernador phase)
20. Hooded Fireplace and Largo School District (Gobernador phase)
21. Tapacito and Split Rock District (Gobernador phase)
22. Frances Ruin (Gobernador phase)
23. Christmas Tree Ruin (Gobernador phase)
24. Simon Ruin (Gobernador phase)
25. San Rafael Canyon (Gobernador phase)
26. Romine Canyon Ruin (Gobernador phase)
27. Prieta Mesa Site (Gobernador phase)
28. Delgadito Pueblito (Gobernador phase)
29. Cagel's Site (Gobernador phase)
30. Adams Canyon Site (Gobernador phase)

31. Casa Mesa Diablo (Gobernador phase)
32. Rincon Rockshelter (Gobernador phase)
33. Hill Road Ruin (Gobernador phase)
34. Gomez Canyon Ruin (Gobernador phase)
35. Adolfo Canyon Site (Gobernador phase)
36. Unreachable Rockshelter (Gobernador phase)
37. Compressor Station Ruin (Gobernador phase)
38. Foothold and Overlook Ruins District (Gobernador phase)
39. Pointed Butte Ruin (Gobernador phase)
40. Rincon Largo District (Gobernador phase)
41. Kin Yazhi (Little House) (Gobernador phase)
42. Canyon View Ruin (Gobernador phase)
43. NM 01-39344 (Gobernador phase)
44. Deer House (Gobernador phase)
45. Kachina Mask (Gobernador phase)
46. Hummingbird (Gobernador phase)
47. Blanco Mesa (Gobernador phase)
48. Ye'is-in-Row (Gobernador phase)
49. Kiva (Gobernador phase)
50. Pretty Woman (Gobernador phase)
51. Gomez Point (Gobernador phase)
52. Santos Peak (Gobernador phase)
53. Salt Point **(TCP)**
54. Huerfano Mesa **(TCP)**
55. Cho'li'i (Gobernador Knob) **(TCP)**

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Cabezon Phase (ca. A.D. 1753 to 1868)

Cabezon phase Navajo sites are less well documented but nonetheless are present in the planning area. They are rarely reported, even by large-scale multi-thousand acre surveys. Problems with recognition and site dating during field surveys may account for some of the rarity of Cabezon phase sites. Cabezon Phase components make up about 1 percent of the total Navajo site record in the planning area. This is in stark contrast to the density and numbers of site from the preceding period. This period can be viewed as one during which the widely dispersed Navajo population may have begun coalescing into the areas encompassed by the modern day limits of the reservation.

Cabezon phase sites are characterized by a continuation of many of the economies present in the earlier phases, with perhaps a decline in agriculture and increasing reliance in pastoral pursuits. As previously noted, many of the obvious puebloan traits seem to have disappeared or receded in importance. Fortified defensive sites still occur but on a much smaller scale. Circular masonry hogans and cribbed-log hogans occur along side the earlier forked-pole hogan and may begin to gain predominance during this phase. Antelope game traps are first identified during this phase. Artifactually, there are sporadic occurrences of polychrome ceramics and the plain gray styles continue with some minor but notable technological distinctions that distinguish it from the earlier types. Near the end of the phase, glass and metal artifacts begin to occur more often but in limited numbers.

Cabezon components comprise less than one-half of one percent of the total components known in the planning area.

On FFO lands, there are 3 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. Salt Point **(TCP)**

2. Huerfano Mesa **(TCP)**

3. Cho'li'i (Gobernador Knob) **(TCP)**

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Reservation Phase (ca. 1868 to Present)

Reservation phase sites span the time from the Kit Carson campaign (A.D. 1863 to 1864) and subsequent internment at Bosque Redondo (A.D. 1863 to 1868), to the present time. These sites account for nearly 37 percent of the total Navajo sites in the study area, with most of those dating to the 20th century. Post-Bosque Redondo 19th century sites amount to only about 1 percent or less of total Navajo sites. This time period witnesses a near complete replacement of forked-pole hogans by circular forms, and in later years the adoption of housing styles from the dominant non-Native culture. Pastoral economies continue to gain preeminence with livestock herds in the thousands not uncommon. As the population grew and natural limits to pastoral economies were encountered, wage labor made significant inroads into the local economies and became increasingly important in supplementing the traditional economies.

On public lands, small and large habitations sites often represent sites of this period. The occasional abandoned hogan or "home site" areas are found, often completely salvaged of useable materials. Other sites include those associated with pastoral activities such as corrals and camps. The occurrence of these sites is particularly noticeable within the Eastern Navajo Agency where land patterns follow a checkerboard pattern and the use of public lands is historically common. In areas where public lands are less fragmented, reservation era sites are much less frequent.

Reservation phase components comprise about 11 percent of the total components known in the planning area.

On FFO lands, there are 3 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include:

1. Salt Point **(TCP)**

2. Huerfano Mesa **(TCP)**

3. Cho'li'i (formally Gobernador Knob) **(TCP)**

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Euro-Anglo Period

There is obvious overlap between events that occurred during the preceding Navajo historic periods and events more closely associated with Euro-Anglo occupations of the planning area. While reference is made to related Navajo events, the primary focus of this section is on events related to post-contact (A.D. 1540) Euro-Anglo activities. This general period, in turn, is segmented into Spanish, Mexican, and Anglo (A.D. 1848-present) periods.

Spanish Colonial Period (A.D. 1540-1821)

The earliest evidence of Spanish entry (*entrada*) into New Mexico is associated with the appearance of Coronado's expedition in 1540 (Winship 1990). Initial contacts with the inhabitants were not promising insofar as the Spaniards, prompted by Marcos' reports of great wealth, viewed the region's inhabitants as potential sources of wealth or information about where such wealth could be found (Winship 1990). Greeted by showers of arrows at some pueblos, Coronado's men soon found that reports of gold were overstated and that their likely reception in other villages would be equally confrontational (Winship 1990). In 1542, after smaller expeditions into the surrounding country revealed no great wealth, Coronado's expedition withdrew to Mexico.

The Spanish did not return to the region until several decades had passed. In 1598, Oñate arrived with a large party of colonists, soldiers, and priests, to establish the village of San Gabriel, near the modern-day Pueblo of San Juan. This marked the first serious attempt to establish permanent settlements in the region. According to Salmerón (1966), Oñate found little of the wealth that had prompted Coronado's expedition some 50 years earlier. In 1604, Oñate traversed portions on the planning area on his way to the Hopi Mesas and thence westward to California (Salmerón 1966). He returned by the same route, but did not establish any new Spanish settlements along the way. It is during Oñate's travels that we find the first written reference to the presence Navajo Indians in what is today the Navajo heartland; they were referred to by Salmerón as "Apache Indians of Nabaju" (1966).

There is almost no documentary evidence regarding the planning area between Oñate's arrival in 1598 and the Pueblo Revolt of 1680. Seventeenth century Spanish settlements in the area were minimal and concentrated almost solely along the eastern margin of the planning area in or near the Rio Grande valley. During this period, small settlements such as San José de Guisewa (1620) pushed westward into the planning area, only to be abandoned shortly thereafter (Williams 1986).

It is reasonable to assume that Spanish settlement brought new technologies and ways of life to indigenous peoples. Among the most important introductions were the use of metal, the introduction of domestic animals and, to the detriment of the region's inhabitants, Old World diseases. By 1650, sheep and goat husbandry appear as progressively more important components of Navajo subsistence. This inference is further supported by the archaeological recovery of European goods at seventeenth century Navajo sites, although it is unclear whether these goods were obtained by raiding or trading with Puebloan groups along the Rio Grande.

The Pueblo Revolt of 1680, as well as the 1694 rebellion that followed Vargas' 1692 Reconquest of New Mexico, was accompanied by the relocation of the inhabitants of some Rio Grande pueblos. Including both Tanoan- and Keresan-speaking elements, this population dispersal probably accelerated the adoption of Puebloan cultural elements—notably masonry architecture and painted pottery—into Navajo culture during the eighteenth century. Vintage Spanish documents, supported by substantial archaeological evidence, suggest defensively-sited Navajo hogans and pueblitos, likely in response to raiding by both Utes and Comanches, as well as threats from the Spanish. In addition, there appears to have been some Navajo dislocations southward during the eighteenth century as a result of intensive raiding by the Utes.

Spanish activities during eighteenth century focused primarily on consolidating their holdings in the Rio Grande valley. Settlements in the heart of the planning area were almost non-existent. Exceptions to this generality include, for example, the settlement of Ranch de la Posta (1780). Yet, two activities—new land grants and new trading routes—emerge as important events affecting the planning area during this period.

As in the seventeenth century, new land grants were established in the eighteenth century, mostly along the eastern margin of the planning area (Williams 1986). These included Plaza Colorado (1739), Plaza Blanca (1739), Cañada de Cochiti (1740), Abiquiu (1754), Polvadera (1766), and Piedre Lumbre (1766). Some, such as Ponderosa (1768) were established and have remained occupied, while others such as La Ventana (ca. 1778) were soon abandoned due to raiding (Julyan 1996, Swadesh 1974).

It was also during the eighteenth century that the Old Spanish Trail was established (Crampton and Madsen 1994) (**Map 3-10**). The Old Spanish Trail is a collective assortment of pack routes that connected Santa Fe and Los Angeles. It was first traversed in its entirety in 1829 and experienced about 20 years of use by traders, slavers, trappers, and immigrants until being replaced by other trails. It undoubtedly followed older Native American trail routes in some areas and portions that had been used by earlier Spanish exploring and trading ventures. In the FFO, the Old Spanish Trail has not been physically identified, but segments of the trail followed Largo Canyon (Armijo route) and Carracas Canyon (Northern Route). On December 4, 2002, President Bush signed Public Law 107-325 designating the Old Spanish Trail as a National Historic Trail.

Spanish Colonial components comprise less than one-half of 1 percent of the total components known in the planning area.

On FFO lands, there is 1 SMA, Santos Peak, that is actively managed to protect outstanding examples of cultural resources from this period.

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Mexican Period (A.D. 1821-1848)

Mexico's declaration of independence from Spain in 1821 was accompanied by the opening of the Santa Fe Trail. This inaugurated a period of progressively greater interaction between Euro-Anglos from America and New Mexico's Native American and Hispanic residents.

Excluding events taking place in Navajo country, discussed earlier, this period is not particularly noteworthy with respect to Mexican activities in the planning area. There were additional Mexican land grants finalized during this period, including most notably the San Joaquín del Rio Chama (1806, Swadesh 1974), Tierra Amarilla grant (1832, Swadesh 1974), Baca Location #1 (1835), and the Lobato grant (Williams 1986). As well, small towns such as Gallina (1818) and Cabezon (1826) also appeared in the planning area.

Trading across the Old Spanish Trail, discussed above, intensified during the Mexican Period and included both Mexican and Anglo traders (Swadesh 1974). Many of the alternate routes along the trail, which shortened its distance, were identified and used by traders traveling to California. According to the Frenchman, Duflot de Mofras (BLM 2002a):

> Caravans traveled once a year from New Mexico to Los Angeles. These consist of 200 men on horseback, accompanied by mules laden with fabrics and large woolen covers called serapes, jerzas, and cobertones, which are valued at 3 to 5 piasters each. This merchandise is exchanged for horses and mules on a basis, usually of two blankets for one animal. Caravans leave Santa Fe, New Mexico, in October, before the snows set in, and finally reach the outlying ranchos of California from where the trail leads into El Pueblo de los Angeles. This trip consumes two and one-half months. Returning caravans leave California in April in order to cross the rivers before the snow melts, taking with them about 2,000 horses.

Thus, while trade expanded during the Mexican Period, settlements and associated populations remained largely restricted to the Rio Grande valley and its major tributaries. Aside from periodic trading expeditions, the planning area was instead typified by Navajo settlements.

Map 3-10: Alignment of the Old Spanish Trail

Like their Spanish Colonial predecessors, Mexican period components are notably scarce across the planning area, comprising less than one-half of 1 percent of the total components known in the planning area.

On FFO and AFO lands in the planning area, there are no ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period.

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Euro-Anglo Period (1848 to Present)

In 1846, Doniphan's California Column entered New Mexico, ushering in a new era in the region's history. With the subsequent defeat of the Mexican Army, New Mexico officially became a territory of the U.S.

Conditions during the period between 1848 and the outbreak of the Civil War remained largely unchanged from those observed during the Mexican Period. Anglo or Hispanic settlements were very few in number and still concentrated mostly in the Rio Grande basin.

At the same time, largely in response to raiding by Native Americans, there was an increasing presence of U.S. military forces. Indeed, this period is marked by the appearance of a succession of forts (Acrey 1994, Williams 1986). These included Ft. Defiance (1851), Ft. Wingate (1849, 1862, 1868), Ft. Lowell (1866) and an unnamed Army post west of Haynes Station (1870s).

The chaos that seemed to characterize the newly-acquired territory grew even worse with the outbreak of the Civil War. Between 1861-1862, Confederate forces seized a series of Union posts beginning in El Paso, TX, and extending northward up the Rio Grande toward Santa Fe. Only after the Confederates were defeated at the Battle of Glorieta Pass in the spring of 1862 did any semblance of order return to the territory. By 1865, the Santa Fe-Durango stage route extending from Santa Fe northwestward through San Ysidro, Cuba, Haynes Station, Truby Stop, and Largo to Aztec had been established in an effort to improve communications and travel in the planning area (Williams 1986). This stage line was to remain in operation until 1881.

Perhaps the most notable event of the Civil War period was the attempt to remove all Navajo from their homelands. Termed "The Long Walk," this saw the removal of upwards of 10,000 Navajo from the eastern part of their traditional homeland (Ackerly 1998, Bailey 1988). This effort proved largely a failure, due in no small measure to Carleton's gross underestimate of the population of the Navajo Nation. By 1868, the reservation at Bosque Redondo (Ft. Sumner) was abandoned and the Navajo returned to their homeland.

The initial impetus for Anglo settlement in the planning area can be traced to passage in 1862 of the Homestead Act. Intended to promote settlement of the American West, the Act provided 160 acres to claimants once they "proved up" their claim by living and working on it. In the planning area, however, homesteading was inhibited by deteriorating conditions between settlers and Navajos, as well as constraints imposed by the outbreak of the Civil War in 1862. Further, since land ownership was unclear, settlements remained tenuous until passage of the 1868 treaty that allowed the Navajo displaced by the Bosque Redondo experiment to return to their homelands.

Accordingly, Anglo and Hispanic (Lucero phase) settlements in the planning area did not emerge until the late 1870s. Among the earlier Hispanic settlements in the region are Blanco (1879), Cuba (1887) and Rosa (1888). Anglo settlements included Aztec (1879), Bloomfield (1879), Farmington (1879), Lumberton (1881), Dulce (1883), Cedar Hill (1887), San Luis (1890), Fruitland (1891), and Sheep Springs (1892). Others such as Fairpoint (1894-1898), Pendleton (1903-22), Liberty (1907-1920), Haynes (1908-1929), and Gobernador (1916-1942) were established only to be abandoned within a few years or decades (Williams 1986).

Many initial economic activities typical of the mid-late nineteenth century focused on farming and ranching. Farming varied from rainfall-based dryland farming in upland areas to irrigated agriculture in river valleys that had relatively permanent flows. The establishment of the settlements listed above were almost invariably accompanied by the immediate construction of irrigation ditches (Ackerly 2002). For example, the La Plata Indian and McDermott ditches in the La Plata basin are believed to date to the late 1870s. In the Animas basin, the Star ditch is believed to date to the late 1870s. Irrigation systems drawing water from the San Juan River and dating to ca. 1880 include the Hammond Conservancy District, Castiano Ditch, San Juan #4, and Cuadi Ditch.

Ranching focused almost exclusively on sheep, although some cattle were also raised. Sheep ranching expanded rapidly, with totals in the state increasing from 250,000 in 1830 to upwards of 4,000,000 in 1880. Beginning in the 1850s and persisting through the 1860s, there were trail drives of large herds westward along a route that closely paralleled the Old Spanish Trail (Williams 1986). By the early twentieth century, there were 1.8 million head of sheep on the Navajo Reservation, comprising almost 93 percent of all livestock (Acrey 1994).

The rapid pace of settlement, accompanied by expansion of both farming and ranching, led to the construction in 1881 of the "Farmington Branch" of the Denver and Rio Grande Western Railroad. Intended largely to transport commodities, particularly fruit, northward and manufactured goods into the San Juan Basin, a spur line extending from Durango, CO, southward to Aztec and Farmington was completed in 1905 (Myrick 1990). What is perhaps most notable is that this spur was standard gauge, a novelty on the Denver and Rio Grande Western Railroad's system of narrow-gauge rails; it was replaced with narrow-gauge rails in 1923 (Myrick 1990).

In Navajo county, the late nineteenth century and early twentieth century were characterized by the establishment of numerous trading posts. Beginning in 1869, trading posts associated with army garrisons at Ft. Defiance and Ft. Wingate were opened for Navajo trade (Acrey 1994). In the mid-1880s, a trading post was opened in Fruitland (Acrey 1994), soon followed by trading posts at Crystal (1892) and Two Gray Hills (1897). Trading posts provided both an outlet for goods, notably blankets and jewelry, produced by Navajo craftspeople, as well a source for manufactured Anglo goods.

Historic Euro-Anglo components comprise only 3.1 percent of the known components in the planning area. Most are situated along the eastern margins of the planning area, mirroring the locations of early settlements as described above.

On FFO and AFO lands, there are 11 ACECs or SMAs that are actively managed to protect outstanding examples of cultural resources from this period. These include the:

1. Margarita Martinez Homestead
2. Dogie Canyon School
3. Rock House-Nestor Martin Homestead
4. Gonzales Canyon-Senon S. Vigil Homestead
5. Martin Apodaca Homestead
6. Jones Canyon (AFO)
7. 1870s Wagon Road Trail (Recreation) (AFO)
8. Historic Homesteads (Recreation) (AFO)
9. Azabache Station (Recreation) (AFO)
10. Headcut Prehistoric Community (AFO)
11. Cañon Jarido (AFO)

Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

Navajo Sites of Unknown Age

Approximately 36 percent of the Components in the planning area that are ascribed to the Navajo culture are insufficiently documented with regard to age. At the moment, a lack of time sensitive diagnostic artifacts or other information prevents assignment of these sites to a particular period.

Sites of Uncertain Age

The final category of components in the planning area is sites whose age is uncertain and whose affiliation is unclear. Grouped under the rubric of "Unknown," approximately 18.4 percent, or almost one component in five, cannot accurately be assigned to any time period.

Traditional Cultural Properties

Traditional cultural properties (TCP) are another class of cultural resources that occur within the planning area. These are places that have cultural values that transcend, for instance, the values of scientific importance that are normally ascribed to cultural resources such as archaeological sites. The National Park Service has defined TCPs as follows:

> A traditional cultural property can be defined generally as one [a property] that is eligible for the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (National Register Bulletin 38).

TCPs may or may not coincide with places that yield artifactual remains such as archaeological sites. Mountains, buttes, mesas, hills, or other high points in an area are often potential TCPs. Places that cause echoes ("talking rocks") may be favored as places of worship for the ability to amplify prayers and songs. Eagle nesting sites may also have great significance.

Prehistoric and historic Native American archaeological sites are quite often considered TCPs by some tribes or pueblos. For example, the Zuni Tribe views all prehistoric Pueblo sites as sacred and significant to the Zuni people. Many of the larger prehistoric Pueblo sites in the San Juan Basin, such as the Chaco outliers, have Navajo names and are linked in some cases to origin stories and ceremonies, and are recognized as part of a local community's landscape. Another form of archaeological site, rock art, is of particular interest to several tribes who regard them as places of ongoing traditional and spiritual significance. For instance, the Hopi believe that certain design elements are evidence of the migrations of clans that have ancient and modern ties to the Hopi people.

In some cases, the importance is seemingly more secular than sacred. As an example, the location and associated oral history of an old Native American battle site can be just as powerful to a community's sense of identity as a any number of Civil War battlefields are to their associated communities and descendants.

Traditional cultural properties are not restricted to Native American cultural associations. Native Americans have in the past been the "community" most likely to identify TCPs, perhaps because they may be the only "community" that most federal agencies approach. Cultural resources regulations and legislation specifically identifies Native American tribes as a required point of contact on certain occasions and this may have biased the TCP identification efforts. There are good reasons to expect that non-Native American communities may have TCPs in the planning area. Hispanic and other Euro-American properties may qualify as candidates for TCP status. Portions of the planning area had a significant period of Hispanic homesteading settlement in the mid-late 19th century and early 20th century. As an example, the "Largo Cemetery" is a place that several Hispanic families in the area maintain and they have collected historical information about it and several historic homesteads in Largo Canyon.

These old ranches and the cemetery may qualify as a TCP.

A comprehensive inventory of TCPs in the planning area is not available. When compared to the plethora of archaeological surveys that have been completed, only a handful of TCP surveys have been completed in the planning area. Compounding this dearth of information, it is only within the past 10-15 years that TCPs have been regularly considered by federal agencies as a class of cultural properties to seek out and identify in advance of federally initiated or permitted actions, and even then identification efforts can be erratic. There are a small number of historical studies that identified TCPs, such as the work of scholars in the 1930s to 1940s studying the landscape and religious geography of the Navajo (e.g., Richard Van Valkenburgh) and the field surveys by archaeologists and anthropologists working for the Navajo Nation during the Navajo Lands Claim studies in the 1950s - 1960s.

In most cases, TCP surveys are not regularly conducted on federal lands within the planning area, particularly on small scale undertakings. In the planning area, it is often only the larger actions (e.g., coal mines, major pipelines) or undertakings potentially affecting known or previously suspected TCP areas that carry such requirements. Within the past decade or so, the development of large gas delivery systems have regularly included TCP studies as part of the overall cultural resource survey. On some tribal lands within the planning area (e.g., Navajo Nation), all cultural resource surveys are required to consider and attempt to identify TCPs. When large undertakings involve lands of varying jurisdiction in the so-called "checkerboard area" of the San Juan Basin and the planning area, TCP identification efforts are conducted on all affected lands.

Identification efforts not only entails on-the-ground inspections, but consultation with knowledgeable individuals and a review of the existing literature. Non-Native American approaches to identifying TCPs are different than those studies conducted by Native American investigators. An archaeologist trained from a perspective of western science will operate within a well defined set of scientific principles and methods at conducting research. A Native American investigator or consultant would probably be the first to admit that TCPs cannot often be identified scientifically, but only by reliance on the knowledge of traditional practitioners. In many cases, seasonality can affect the identification efforts because only during certain times of the year is it appropriate to discuss sacred matters. In other cases, the traditional consultant will ask to remain anonymous and will disclose information only if details are kept confidential and not made public. For many traditionalists, this is a conundrum to disclose information that should be withheld and run the risk of compromising the important place, or to withhold information and risk damage or destruction of the important place.

For this existing situational analysis, information about TCPs or potential TCPs was gleaned from a number of sources including popular publications, unpublished manuscripts, and cultural resource management documents. As a result of this effort, references to 73 TCPs or potential TCPs on federal, private, or state lands within the planning area were identified. Twenty-four Native American Tribes and 27 Navajo Chapters were also contacted. Places on tribally controlled lands are not included.

In some cases, the TCPs are well known (e.g., Huerfano Mesa), but others are only known to a handful of traditional practitioners who in many cases requested that the specific location and nature of the place be held in confidence. In most cases, the location is adequately known, but there are a handful of TCPs where the specific locations are either vague or inconclusive because of the quality of the information. The kinds of places identified as TCPs or potential TCPs include clan origin places, landscape associated with origin history, battle sites, offering places, springs, antelope game traps/corrals, pottery gathering, a now abandoned community, trails, and a hanging location. As previously noted, most archaeo-

logical sites are viewed or potentially viewed as TCPs by one or more Native American tribes, but they are not separately counted in this inventory of TCPs. However, several of the TCPs in the current inventory do coincide with the locations of archaeological sites.

Site Density, Site Types, and Attributes of Sites

The following section discusses variability in archaeological sites by gross time period, cultural affiliations/components, average size, and occurrence of features in each of the 20 watersheds comprising the planning area. **Table 3-18** shows the relative frequency of sites by watershed and gross time period (prehistoric, historic, multicomponent prehistoric and historic, and unknown). **Map 3-11** shows the distribution of recorded archaeological sites in each watershed. More detailed information on methodology, site density, and distribution are documented in a supporting document (SAIC 2002b).

For the planning area as a whole, the ratio of prehistoric to historic sites is 1.50, or roughly three prehistoric sites for every two historic sites. Watershed-specific ratios of prehistoric sites to historic sites vary from a high of 15.1 (Rio Chama) to 5.2 (Mancos) to as little as 0.07 (Chinle). The most common, or modal, watershed-specific ratio is less than or equal to 1.0 (nine watersheds), indicating that historic sites are more common or as common as prehistoric sites. In contrast, watersheds exhibiting high ratios of prehistoric to historic sites are less common; using an arbitrary threshold of 2.0, prehistoric sites outnumber historic sites by 2:1 or more in only five of 20 watersheds. It is not clear whether these proportions are a function of total numbers of sites recorded in each watershed. Statistical analyses indicate that the ratio does not appear to be a function of sample size.

Table 3-19 summarizes the modal, or most common, types of sites likely to be found in each watershed. Salient attributes of these sites, including size and elevation, are also presented. This table provides a snapshot of the kinds of sites that archaeologists would be likely to encounter as they work in a watershed. Each site contains a variety of features. Among these, hearths, hogans, roomblocks, middens, and mounds are most common.

PALEONTOLOGY

A variety of paleontological resources exist in the planning area, including animal fossils, fossil leaves, palynomorphs, petrified wood, and trace fossils, occurring in the Triassic, Jurassic, Cretaceous, and Tertiary rocks. There are four areas that have been identified as paleontologically significant (BLM 1987a):

- Santos Peak area—important paleobotanical content and potential for vertebrate remains in the Eocene San Jose Formation.
- Kutz Canyon—numerous locations containing Paleocene mammal fossils in the Nacimiento Formation.
- West of Farmington—paleontology type sections are located in the Pictured Cliffs Sandstone, Fruitland Formation, and Kirtland Shale on or near public land.
- Regina area in the southeastern edge of the planning area—produced the classic vertebrate collections of early paleontologists from the San Jose Formation.

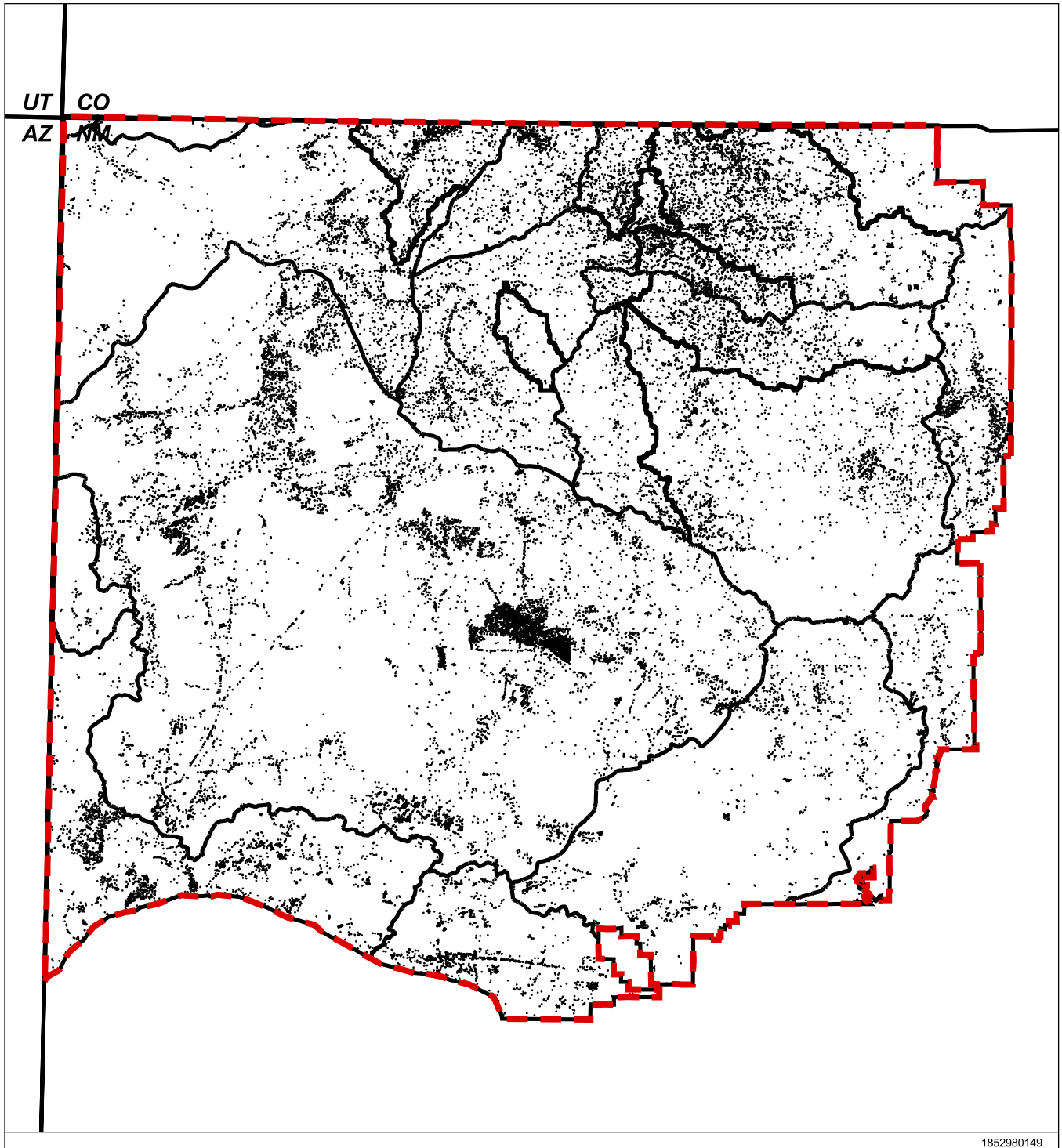
SMAs designated to protect paleontological resources are included in Table 2-5 and Table 2-6. Management prescriptions for all of these SMAs include the following:

- Implement a Limited ORV designation restricted to existing roads and trails, except as authorized.
- Develop and implement an activity and monitoring plan.
- Require paleontological clearance and mitigation for all surface disturbing activities.

Table 3-18. Frequency of Components by Watershed and Cultural Affiliation

Watershed	Paleo	Archaic	BM II	BM III	Unknown Anasazi	PI	PII	PIII	PIV	Unknown Navajo	Din/ Gob	Cabezon	Reserva-tion	Apache	Ute	Pueblo	His-panic	Euro-Anglo	General Unknown	TOTALS
Animas	1	64	22	65	26	279	201	155	1	14	223	12	4	2	0	0	7	90	210	1,376
Arroyo Chico	3	174	24	16	41	31	103	128	3	156	21	17	418	0	0	7	42	36	513	1,733
Blanco	0	8	2	22	5	31	16	9	3	59	59	7	134	0	0	0	6	4	230	595
Carrizo	1	19	8	114	37	333	117	49	2	56	601	32	8	20	0	2	30	12	147	1,588
Chaco Wash	32	795	120	1,183	1,305	2,908	4,439	3,079	18	3,017	82	105	2,475	1	1	16	32	82	3,209	22,899
Chinle	0	19	0	0	3	0	2	0		45	1	1	54	0	0	0	0	5	17	147
Gobernador	0	25	10	88	21	366	69	13	2	61	659	38	13	0	1	0	34	40	168	1,608
Kutz Canyon	0	28	1	3	1	3	8	6	1	2	5	0	7	0	0	0	0	5	42	112
La Plata	0	47	10	77	57	189	455	356	3	14	59	10	12	0	1	1	7	84	239	1,621
Largo	0	50	16	101	61	277	461	588	38	90	486	41	81	29	0	6	45	67	378	2,815
Mancos	0	6	0	10	3	25	36	30	0	11	0	0	7	0	0	0	0	0	14	142
Middle San Juan	8	134	8	117	85	216	525	415		164	7	8	353	0	1	2	0	116	457	2,616
Navajo Reservoir	0	30	76	353	121	1,779	386	119	2	58	690	34	14	68	0	6	81	89	423	4,329
Pump Canyon	0	1	41	62	13	130	42	18	1	42	294	15	3	0	0	1	14	24	199	900
Rio Chama	2	26	1	8	26	58	442	859	295	2	2	1	1	62	0	0	9	39	67	1,900
Rio Puerco	0	23	3	10	30	32	95	115	22	23	10	2	2	0	0	2	18	65	217	669
Rio San Jose	0	13	8	19	139	229	810	336	2	133	2	3	168	0	0	2	4	33	170	2,071
Upper Puerco	0	45	9	131	202	330	910	498	5	599	36	25	748	0	0	5	5	97	280	3,925
Upper San Juan	8	236	28	90	48	355	185	132	4	105	240	18	431	84	0	1	18	78	948	3,009
TOTALS	**55**	**1,743**	**387**	**2,469**	**2,224**	**7,571**	**9,302**	**6,905**	**402**	**4,651**	**3,477**	**369**	**4,933**	**266**	**4**	**51**	**352**	**966**	**7,928**	**54,055**

Source: NM ARMS 2001.



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LEGEND

RMP/EIS Boundary

Watershed/Subwatershed

Component

N

15 0 15

Scale in Miles

Source: ARMS 2000

Map 3-11. Distribution of Archaeological Components in the Planning Area

Table 3-19. Summary of Most Likely Kinds of Sites to Be Encountered in Watersheds in the FFO Area

Watershed	Modal Types of Sites Likely to be Encountered, and Their Attributes
Animas	Equally likely EITHER prehistoric Anasazi PI period components (20%) OR historic Navajo Dinétah/Gobernador period components (16%).
Arroyo Chico	Equally like EITHER historic Navajo Reservation period sites (24%) containing hogans, sweatlodges, hearths, middens, and/or corrals OR unknown sites (30%) whose content is not well understood.
Blanco	Equally like EITHER historic Navajo Reservation period sites (23%) containing hogans, sweatlodges, hearths, middens, and/or corrals OR unknown sites (39%) whose content is not well understood
Carrizo	Equally likely EITHER prehistoric Anasazi PI period components (21%) OR historic Navajo Dinétah/Gobernador period sites (38%)
Chaco	Equally likely EITHER prehistoric Anasazi PI period components (13%) OR prehistoric Anasazi PII period components (19%) OR prehistoric Anasazi PIII period components (14%) OR historic Navajo Reservation period components (11%) OR historic Navajo sites of uncertain affiliation (13%).
Chinle	Equally likely EITHER historic Navajo sites of uncertain affiliation (31%) OR historic Reservation period components (37%).
Gobernador	Disproportionately EITHER historic Navajo Dinétah/Gobernador period components (41%) prehistoric Anasazi PI period components (21%).
Kutz Canyon	Disproportionately unknown prehistoric components (38%) whose content is not well-documented OR Archaic components (25%).
La Plata	Equally likely EITHER prehistoric Anasazi PII period components (28%) OR prehistoric Anasazi PIII period components (22%) OR Unknown sites (15%) whose content is not well understood.
Largo	Equally likely EITHER prehistoric Anasazi PII period components (16%) OR prehistoric Anasazi PIII period components (21%) OR historic Navajo Dinétah/Gobernador period components (17%) OR Unknown sites (13%) whose content is not well understood.
Mancos	Equally likely EITHER prehistoric Anasazi PI period components (21%) OR prehistoric Anasazi PII period components (29%) OR prehistoric Anasazi PIII period components (19%).
Middle San Juan	Equally likely EITHER prehistoric Anasazi PII period components (20%) OR prehistoric Anasazi PIII period components (16%) OR Unknown sites (18%) whose content is not well understood.
Navajo Reservoir	Disproportionately prehistoric Anasazi PI period components (41%) with a secondary mode of historic Navajo Dinétah/Gobernador period components (15%).
Pump Canyon	Equally likely EITHER historic Navajo Dinétah/Gobernador period components (33%) OR Unknown sites (22%) whose content is not well understood OR prehistoric Anasazi PI period components (14%).

Watershed	Modal Types of Sites Likely to be Encountered, and Their Attributes
Rio Chama	Equally likely EITHER prehistoric Anasazi PIII period components (45%) OR prehistoric Anasazi PII period components (23%) OR prehistoric Anasazi PIV period components (16%).
Rio Puerco	Disproportionately unknown components (32%) whose content is not well understood OR prehistoric Anasazi PIII period components (17%) OR prehistoric Anasazi PII period components (14%).
Rio San Jose	Disproportionately prehistoric Anasazi PII period components (39%) OR prehistoric Anasazi PIII period components (16%).
Upper Puerco	Equally likely EITHER prehistoric Anasazi PII period components (23%) OR historic Navajo Reservation period components (19%) OR historic Navajo components (15%) whose content is not well understood.
Upper San Juan	Disproportionately unknown components (32%) whose content is not well understood OR historic Navajo Reservation period components (14%) OR prehistoric Anasazi PI period components (12%).

Sources: NM ARMS 2001and SAIC GIS data.

NOISE

Noise is generally defined as unwanted or annoying sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, perceived importance of the noise and its appropriateness in the setting, time of day and type of activity during which the noise occurs, and sensitivity of the individual. Noise from oil and gas compressors has been identified by the public as an issue of primary concern in the planning area.

Sound levels are usually measured and expressed in decibels. The method commonly used to quantify environmental sounds involves evaluating all of the frequencies of a sound according to a weighting system, which reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (dBA). A sound level range of 0 to 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels. Sound levels of typical noise sources from oil and gas activities are shown in **Table 3-20**.

Compressor station operations represent the largest and most long-term noise source associated with production. Sound levels measured at existing oil and gas facilities range from 44 to 69 dBA at a distance of 500 feet from a compressor station (BLM 2000d). Compressor stations operate throughout the life of an oil or gas well, but compressors can be designed and operated to reduce noise to acceptable levels.

Residences located within approximately 2,800 feet and in direct line-of-sight to production activities could experience noise levels in excess of the 55 dBA in USEPA guidelines. Recreational areas located within approximately 500 feet and in direct line-of-sight could experience noise levels in excess of 70 dBA (BLM 2000d).

Table 3-20. Noise Levels Associated with Oil and Gas Activity

Noise Source	Sound Level at 50 Feet (15 Meters)[1]
Well Drilling	83 dBA
Pump Jack Operation	82 dBA
Produced Water Injection Facilities	71 dBA
Gas Compressor Facilities	89 dBA

Source: BLM 2000d.

Note: (1) Sound levels are based on highest measured sound levels and are normalized to a distance of 50 feet (15 meters) from the source.

SOCIAL AND ECONOMIC CONDITIONS

The section contains qualitative and quantitative social and economic data. Quantitative information includes demographics, economic activity, income and poverty levels, housing, and public services and finances. A profile is provided of the four primary economic sectors: trades and services,

oil and gas production, recreation and tourism, and agriculture. Economic activities associated with BLM lands are emphasized, including public land grazing, recreation, and oil and gas development. Oil and gas tax receipts are identified and their distribution back to local governments is described. Qualitative information is also presented to provide context for evaluating the relative potential for impacts from changes in operations for some sectors.

The ROI for economic activity in the planning area includes San Juan, Rio Arriba, McKinley, and Sandoval Counties. San Juan County and the tri-cities area of Farmington, Bloomfield, and Aztec are most directly affected by oil and gas activity because this area is central to the high oil and gas development areas, and many suppliers and workers are located there. The population base and economic activity in Sandoval County, although partially within the planning area, is primarily located near the Albuquerque metropolitan area. The portion of San Juan Basin oil and gas development located in Sandoval County is relatively small. Some social and economic patterns in the planning area extend into the four-corners area (into Arizona, Utah, and Colorado). However, the FFO does not administer lands in those areas, and their activities do not directly affect public finances or activities on public lands in this extended area.

Demographics

Table 3-21 shows the current and projected population in McKinley, Rio Arriba, Sandoval, and San Juan Counties. Sandoval County, reflecting the influence of growth of Rio Rancho and the Albuquerque metropolitan area, is expected to grow the most by 2010. Very little of the Sandoval County population resides in the planning area. Rio Arriba County with its rural character and lack of an urban center is predicted to grow the least. In northwest New Mexico, the Farmington urban area experienced steady population growth over the last decade.

Table 3-22 shows the population growth in the three cities of San Juan County, as well as the county itself. In 2000, while 50,639 people lived in an incorporated area, 63,162 lived in the county outside the cities. In the 1980s and 1990s, Farmington had planned for steady population growth within its borders because of its available infrastructure. Instead, more population growth happened in the unincorporated areas of the county, in large measure because of cheaper land and housing costs.

Table 3-21. Population in Four Counties and New Mexico

County	1990	2000	Annual % Change, 1990-2000	Projected 2010	Projected Annual Average Population Growth Rate (%)
McKinley	60,879	74,798	2.33	81,673	0.92
Rio Arriba	34,507	41,190	1.99	41,201	0.0027
Sandoval	63,520	89,908	4.2	128,396	4.28
San Juan	91,605	113,801	2.42	125,614	1.04
New Mexico	1,505,619	1,819,046	2.08	N/A	1.04

Source: UNM BBER 2000.

Table 3-22. Population Growth in Three Cities and San Juan County, New Mexico

Community	1990 Census	2000 Census	Percent Increase
Aztec	5,479	6,378	16.4
Bloomfield	5,214	6,417	23.1
Farmington	33,997	37,844	11.3
San Juan County	91,605	113,801	24.2

Source: US Census 2000.

Table 3-23 shows some of the boom and bust that has characterized historical population figures. Primarily related to the cyclical nature of the oil and gas economy, Farmington and San Juan County experienced a boom in the 1950s, followed by stagnation in the 1960s. At a much smaller scale, the pattern was repeated in the 1970s and 1980s. Table 3-23 also shows that Farmington became an important locus for the county's population, but that importance has tapered off somewhat in the last couple of decades. In 1960, nearly 45 percent of the county's population lived in Farmington, while in 2000, that figure had dropped to 33 percent.

Table 3-23. Historical Population, Farmington and San Juan County, 1910-2000

Year	Farmington	Percent Change	Annual Growth Rate	San Juan County	Percent Change	Percent of County
1910	785	NA	NA	8,504	NA	9.2
1920	728	-7.3	NA	8,333	-2.0	8.7
1930	1,350	85.4	6.4	14,701	76.4	9.2
1940	2,161	60.1	4.8	17,115	16.4	12.6
1950	3,637	68.3	5.3	18,292	6.9	19.9
1960	23,786	554.0	20.7	53,306	191.4	44.6
1970	21,979	-7.6	NA	52,517	-1.5	41.9
1980	32,677	48.7	4.0	81,433	55.1	40.1
1990	33,997	4.0	0.4	91,605	12.5	37.1
2000	37,844	11.3	1.1	113,801	24.2	33.3

Source: City of Farmington 2000.
Note: NA = Not applicable.

Economic Activity

Farmington, as its name implies, was oriented to agriculture from its earliest days of settlement. Orchards were in production as early as 1878, and apple and other fruit growing was the dominant force in the economy at the beginning of the twentieth century (Crawford 2000). The industry continued to expand through the 1950s, when declining railways curtailed the fruit markets and the oil and gas boom hit the area. Table 3-23 shows the dramatic jump in the population of Farmington during the 1950s,

from 3,600 to nearly 24,000. From early experimental wells in the 1920s to fully commercial operations with a developing infrastructure, oil and gas development has since come to characterize the regional economy. The industry provides nearly $1 billion per year in taxes, royalties, and interest on investments to the state of New Mexico, at least half of it related to production in the San Juan Basin. Over 11,000 people are employed in the industry in northwest New Mexico (Four Corners Journal 2000).

Only in the last decade have civic leaders and citizens talked about the growing diversity of the region's economy, as Farmington's role as a regional retail and service center has grown. As the largest city within a 150-mile radius, Farmington draws upon a market of 250,000 people. It is becoming a regional trade area for northwestern New Mexico and southwestern Colorado. The area also benefits greatly from recreation and tourism in the four-corners region. At the same time, the oil and gas industry remains a primary employer and provides higher paying jobs than many other sectors. Agriculture, while small in terms of income and employment, remains the historical legacy of the region and is highly valued for cultural reasons and as a strategy for a diversified economy.

Energy Industry

Of the 1.6 billion Mcf of gas produced in New Mexico in 1997, almost 1.1 billion (about two-thirds) was from the planning area. This increased slightly to 68 percent of the state's production by 2000. San Juan County is the largest natural gas producing county in the state, producing about between 650 and 700 million Mcf annually. McKinley County produces little natural gas, and Sandoval County produces less than 1 percent of the state's total.

The value of gas production in New Mexico in 1997 was $3.6 billion, of which 64 percent, or $2.3 billion, came from the planning area. San Juan County accounted for $1.4 billion of this production. The value of gas production increased dramatically in 2000, up to $6.1 billion in the state. This was reflected in a similar increase, up to $3.8 billion in the planning area, or 63 percent of the state's natural gas value. Prices of gas show wide fluctuations, ranging from $1.60 to $6.53 per Mcf over 18 months (NMEMNRD 2001).

The planning area is much less important for its oil production, producing only 5 percent of the state's oil in 1997. The state produced 73.7 million bbls of oil in 1997, of which 3.7 million bbls were from the planning area. In 2000, the state produced slightly less oil at 69.8 million bbls, and the planning area has a similar decline, producing on 4.4 percent, or less than 3.1 million bbls, in 2000. San Juan and Rio Arriba County are the primary producing counties in the planning area.

The state produced $1.4 billion in oil in 1997, of which the planning area produced about 4.8 percent. In 2000, even though the quantity of oil produced by the state decreased in 2000, the value increased to $2.0 billion. The value of oil in the planning area in 2000 was 3.9 percent of the state's total value, mostly from San Juan and Rio Arriba Counties.

The value of produced oil and gas determines the viability of economically producing the reserves with alternative drilling technologies, which incur additional costs and risks over conventional methods.

The historic well costs in the San Juan Basin include drilling costs and tangible and intangible production costs. Drilling costs include surveying and staking, permits, dirt work associated with construction of the pad, access road, gathering line, drilling personnel and equipment, mud, chemicals, water, environmental clearances, and special mitigation measures that can include offset environmental mitigations. Tangible production costs include casing and tubing, wellhead equipment, flowlines, and tanks. Intangible production costs include well logging, acidizing and fracturing, completion fluids, bits, and well testing. Drilling depth, drilling time, and the types of completion and production technical requirements also affect well costs.

The planning area produced 26.8 million metric tons (mmt) of coal in 1997, increasing slightly to 27.3 mmt in 2000 (NMEMNRD 2001). Active mines include Navajo, San Juan, La Plata, McKinley, Lee Ranch, and the newly opened San Juan Underground mine. (These values differ somewhat from those reported by Hill and Associates in *Western U.S. Coal Supply Series, 2000*, where 25.9 mmt were reported for the planning area in 1997 and 29.8 mmt projected for 2000.) Production is expected to stay relatively even over the next few years. By 2006, production levels may see a slight decline back to the 1997 level. The San Juan surface mine is expected to close by 2003, and McKinley mine by about 2007, but these closures would be compensated for by increased production at the San Juan Underground mine and new production at Fence Lake, pending State District Court decision on issuing the permit (Hill and Associates 2000).

The value of coal sold in New Mexico was about $554 million in 2000, and about $531 million in the planning area. The average price per ton in 2000 was $20.42 in New Mexico, down slightly from a value of $22.58 in 1999, but considerably higher than the national average of $16.63 in 2000.

Recreation and Tourism

Little documentation exists on the number of visitors to northwest New Mexico. The New Mexico Department of Tourism estimated that visitor travel expenditures increased by about 77 percent between 1989 and 1999, from $2.0 billion to $3.6 billion. During this period, expenditures in the planning area more than doubled from $165 million to $3.6 million. It is also estimated that the planning area supports about 5,250 jobs related to tourism and recreation (NMDT, n.d.). Visitation rates are not collected for the FFO area, but BLM staff note a moderate, steady increase in the use of developed sites through observation. Visitor surveys of the Farmington Convention and Visitor Bureau indicated that the most popular visitor destination in the region is Navajo Lake.

Regionally distinctive recreation activities that bring people and outside dollars into the area are the motorized and non-motorized vehicle events and opportunities. These activities make direct use of BLM lands, although some of this activity is individual and unrecorded. Local observers point to the huge amount of activity the area sees from visitors who come to ride mountain bikes, motorcycles, and other vehicles on public lands. The Durango area is considered by local sports shop owners and sports enthusiasts to be an important source of visitors who are attracted to the lower elevation, sunnier climate, and distinctive recreation opportunities available locally.

In recent years, the number of planned recreation events designed to draw in visitors from outside the area has increased. Several biking, motorcycle, motocross, and four-wheeler events on public lands attract over 2,000 participants annually with an estimated economic impact of over $2,533,000 generated by visitor spending (Preister 2001). It is estimated that these same events draw between 10,000 and 20,000 spectators each year. These figures do not include the substantial benefit to local individuals and unorganized recreation activity that is not recorded. Given local stories about the popularity of public lands in the area, this activity is understood to be substantial.

The City of Farmington, Parks and Recreation Department, holds a permit for the annual Road Apple Rally and the Battle of the Badlands mountain bike races. Downtown Aztec has spawned a number of stores oriented to recreation, supplying bicycling, mountaineering, and other outdoor sports. A number of civic leaders indicated that the Farmington area is "on the cusp" as far as attracting high quality recreation. Mountain bikers compare the experience of their sport with Moab, Utah, which has exploded with use in the last decade. The "slick rock" experience of the area is well known for attracting four-wheel drive enthusiasts, especially from Colorado and increasingly from other locations.

Other recreation activities on BLM land that generate economic value for the planning area include fishing, hunting, and wildlife watching. Fishing and hunting licenses are distributed by the New Mexico Department of Game and Fish. Big Game Units 2A and 2B overlap with the lands with highest hunting potential, while Unit 7 is also within the planning area.

Trades and Services

The trades and services sector of the regional economy has grown in overall activity and in its relative proportion of economic activity. This economic activity is related to a growing regional population involved in retail and commercial businesses, a visitor population that makes use of local services on a seasonal basis, and increasing numbers of retirees as a segment of the population that brings money into the economy via transfer payments and local spending.

Trades and services are considered important means to diversify the local economy. Elected officials and economic development planners in the region have pointed to the problems created by the dominance of the oil and gas industry, which is prone to boom and bust cycles. As the Farmington area has grown as a regional service center, through the development of shopping centers and major chain outlets, the area is somewhat buffered from downturns in the economy for oil and gas production. However, trades and services are lower paying than other basic sectors such as oil and gas employment. The average weekly wage for a worker in mining is $807, while services workers make only $529 and retail trade workers make $310. Also, the indirect effect of continued spending from trades and services employment is less than in the mining and manufacturing sectors.

Agriculture

Agriculture is an important part of the history and customs of northwest New Mexico, but also an important component of the economy. Agriculture provides diversity in an economy that has grown more dependent on oil and gas industries, but also provides a way for people to supplement other work and to maintain traditional lifestyles and culture.

In 1999, the value of all farm commodities for the four-county region totaled almost $115 million (USDA 1999). Of this, almost 60 percent ($67.6 million) was from livestock and 40 percent from crops. San Juan County is the largest producer, with $66.5 million in agricultural products. This is largely due to the Navajo Agricultural Products Industry (NAPI), which has over 52,000 acres in diverse commodity production, irrigated by water conveyed from Navajo Reservoir. Crop values were 57 percent of the county's total, with livestock being somewhat less important in this county only due to irrigated production. Aside from NAPI, most of the irrigated farmland in the region is within the San Juan, Animas, and La Plata valleys, and relies primarily on water delivered by the USBR.

Over the last several decades, there has been a decline in the acreage and value of agriculture on farms throughout the region. Smaller "hobby" farms are increasing and provide supplemental income for many farmers.

Most livestock operators use a combination of federal, private, and state land for grazing, with the majority being federal. Permits associated with cattle grazing allotments issued by the BLM typically have been long-standing, held by a small set of families. They are used in combination with private land and sometimes state lands to make a ranch. When a ranch sale occurs, it is often as a unit. Following the ranch purchase, the new owner usually qualifies for and receives the associated public lands grazing permit from BLM.

BLM grazing permits specify how many livestock can graze, where and when they graze, and for how long. The quantity of AUMs grazed is the product of the number of livestock (an "animal unit") times the number of days they graze. This number fluctuates over time and is affected by yearly grazing conditions, the livestock market and other economic influences, and BLM management actions.

There has been a decline in the number of AUMs permitted on FFO lands over the last decade.

The formula for calculating the cost of an AUM (grazing fee) was established by the Public Rangelands Improvement Act (PRIA) of 1978 (Public Law 95-514 [43 USC 1901]) on a seven-year trial basis. Because Congress failed to legislate a new fee authority following the expiration of the trial period, President Reagan issued EO 12548 on February 14, 1986, to continue indefinitely the PRIA fee formula, and added a provision that established a minimum fee of $1.35 AUM. Federal grazing fees are not directly comparable to private land grazing lease rates. The former is only the fee for forage consumed by the livestock while permitted on BLM lands, while the latter can include charges for maintaining improvements, livestock caretaking, or other management services as specified in the lease.

Employment

Table 3-24 shows that, with the exception of Sandoval County, unemployment in the planning area is above the state average and declined slightly between 1998 and 1999. Sandoval County's lower unemployment rate reflects the stronger economy and higher number of job opportunities in the Albuquerque metropolitan area.

Table 3-24. Labor Force and Unemployment in the Planning Area, 2000

County	1998 Annual Average			1999 Annual Average		
	Civilian Labor Force	Number of Unemployed	Unemployment Rate	Civilian Labor Force	Number of Unemployed	Unemployment Rate
McKinley	25,285	2,082	8.2%	24,485	1,761	7.2%
Rio Arriba	19,145	1,707	8.9%	19,179	1,413	7.4%
Sandoval	43,106	2,172	5.0%	42,112	1,740	4.1%
San Juan	50,304	4,118	8.2%	48,643	3,716	7.6%
New Mexico	831,052	51,351	6.2%	809,094	45,485	5.6%

Source: NMDL 2000.

In 1998, employment in the four-county region was almost 125,000 in 1998. **Table 3-25** shows that San Juan County has the highest portion of workers in the mining sector, which includes oil and gas-related and coal industry jobs. In 1998, about 8.5 percent, or 4,570 jobs in San Juan County were in this sector, of which, about 930 jobs (about 20 percent) were associated with coalmines in the county (Hill and Associates 2000). Most of the remaining 3,640 jobs were in the oil and gas industry. Although data is not reported for McKinley County, only 6 percent of the workforce is in the agricultural, mining, and construction sector combined (about 1,620 jobs), of which 660 jobs were reported for the two large coalmines in McKinley County, namely, McKinley and Lee Ranch (Hill and Associates 2000). Overall, almost 7,000 jobs in the planning area were directly related to the extractive energy industry in the four-county area in 1998. Sandoval County has the most diversified economy, with almost 25 percent of its employment in manufacturing and wholesale trade. This is largely attributable to microchip manufacturing.

Table 3-25. Percent Employment by Sector, 1998

Sector	County			
	Mc Kinley	Rio Arriba	Sandoval	San Juan
Agricultural services, forestry, and other[1]	(–)	1.2	1.0	0.7
Mining[2]	(–)	0.6	0.3	8.5
Construction	(–)	6.1	6.5	10.1
Manufacturing[3]	6.6	4.9	(–)	3.3
Transportation and public utilities[4]	3.7	3.7	3.1	6.8
Wholesale trade	8.4	1.5	(–)	3.6
Retail trade	22.6	16.2	19.6	20.1
FIRE[5]	4.2	3.8	5.6	4.2
Services	23.9	37.1	25.7	27.7
Government	24.6	25.0	12.7	14.8
Total Employment[6]	**27,046**	**13,798**	**30,236**	**53,771**

Source: BEA 2000.

Notes: (1) "Other" consists of the number of jobs held by U.S. residents employed by international organizations and foreign embassies and consulates in the U.S.
(2) Mining includes oil and gas extraction employment, drilling of oil and gas wells, and support activities.
(3) Manufacturing includes mining equipment and machinery as well as petroleum refinery.
(4) Transportation includes pipeline transportation and maintenance.
(5) Finance, Insurance, and Real Estate.
(6) Includes full time and part time jobs.
(–) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

The number of employees of the ten largest employers in San Juan County totaled almost 7,300 in 1997 and are listed below (NM Business Journal 1999). Of these, about 28 percent were employed by energy-related companies, including BHP Minerals, Arizona Public Service Company, and Public Service Company of New Mexico. This illustrates the importance of energy industries in the local area.

Employers	Industry	Number of Employees
Farmington Schools	Government	1,183
Central Consolidated Schools	Government	1,095
San Juan Regional Medical Center	Services	1,000
BHP Minerals	Mining	990
City of Farmington	Government	743
Arizona Public Service Company	Transport and Utilities	563
Public Service Company of New Mexico	Transport and Utilities	520
Bloomfield Schools	Government	478
Aztec Schools	Government	405
Presbyterian Medical Services	Services	320

Earnings by Sector

Table 3-26 shows the earnings of the economic sectors in the four counties. When compared to the number of jobs in each sector (see Table 3-25), earnings for the mining and transportation and public utilities sectors tend to be high compared to other sectors, while retail trade and services sector jobs tend to be the lowest. This indicates that jobs in these sectors, on average, tend to be better paying than in other sectors. For example, the average earnings per employee in the mining and transportation and public utilities sectors in 1998 were about $51,000 and $45,600, respectively, compared to about $15,400 and $19,200 in retail trade and services, respectively.

Table 3-26. 1998 Earnings by Sector in San Juan Basin ($000)

Sector	County			
	Mc Kinley	Rio Arriba	Sandoval	San Juan
Agricultural services, forestry, and other[1]	(–)	$1,296	$2,356	$3,268
Mining[2]	(–)	$1,791	$1,099	$232,989
Construction	(–)	$13,847	$56,030	$150,719
Manufacturing[3]	$21,860	$12,374	(–)	$47,806
Transportation and public utilities[4]	$37,822	$14,852	$22,904	$166,814
Wholesale trade	$20,327	$3,118	(–)	$59,103
Retail trade	$97,616	$29,135	$80,626	$166,802
FIRE[5]	$18,673	$8,383	$25,490	$42,719
Services	$110,085	$82,834	$135,354	$284,897
Government	$224,549	$82,959	$113,384	$259,766
Total Earnings[6]	**$597,902**	**$250,589**	**$859,473**	**$1,414,883**

Source: BEA 2000.

Notes: (1) "Other" consists of the number of jobs held by U.S. residents employed by international organizations and foreign embassies and consulates in the U.S.
(2) Mining includes oil and gas extraction employment, drilling of oil and gas wells, and support activities.
(3) Manufacturing includes mining equipment and machinery as well as petroleum refinery.
(4) Transportation includes pipeline transportation and maintenance.
(5) Finance, Insurance, and Real Estate.
(6) Includes full time and part time jobs.
(–) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

Public Finance

Commercial activities on public land in the region generate millions of dollars annually. Funds are collected by the U.S. Treasury, with portions reverting back to New Mexico and disbursed to the relevant counties where production has occurred. Revenues from the energy extractive industry are of particular interest in the planning area.

Tax Revenues Generated by New Mexico from Energy Resources

The New Mexico Department of Finance and Administration calculated that state revenues from oil and gas sales in fiscal year (FY) 2001 were almost $1.3 billion (see Table 3-27). These revenues are derived from six taxes related to oil and gas production: Oil and Gas Emergency School Tax, Oil and Gas

Severance Tax, Oil and Gas Conservation Tax, Ad Valorem Production, Ad Valorem Production Equipment, and Natural Gas Processors Tax. The following are brief descriptions of each of these taxes:

- *The Oil and Gas Emergency School Tax* is levied on the "privilege of doing business as a severer of oil, gas, liquid hydrocarbon or carbon dioxide" (Legislative Council Service 2000). Natural gas is taxed at 4 percent and all other products at 3.15 percent, although allowances are given for low-producing ("stripper") wells and for other conditions.
- *The Oil and Gas Severance Tax* is levied at the rate of 3.75 percent "taxable value" (price for the product minus federal, state, and Indian royalties and reasonable trucking expenses to the "first place" of market) for the privilege of "severing" oil and gas from the soils of New Mexico.
- *The Oil and Gas Conservation Tax* is levied on the sale of oil and gas products at the rate of 19/100 of 1 percent of taxable value.
- *The Oil and Gas Ad Valorem Production Tax* is a tax in lieu of property tax levied on the value of oil and gas natural reserves wherein annual production is used as an approximation of the value of reserves.
- *The Ad Valorem Production Equipment Tax* is a property tax on oil and gas production equipment. Assessed value is determined at 27 percent of the sales value of the product for the previous calendar year against which the 33.3 percent "uniform assessment ratio" is applied.
- *The Natural Gas Processors Tax* is imposed on processing plants.

In FY 1997, about $376 million were collected by the state in taxes on oil and gas (Legislative Council Service 2000), and in FY 2000, this increased to $646 million (NMDFA 2001), reflecting a doubling in production value. Additional revenues come from rents and royalties paid by producers on public lands. In 2000, this amount was $638 million.

Revenues from these taxes are paid into the general fund, severance tax bonding fund, and land grant permanent fund. The general fund collects about 56 percent of these revenues. Revenues (which are based on the variable value of the product) are prone to fluctuate and represented 10 percent of general fund revenues in 1999 and 18 percent in 2001 (NMDFA 2001). Considering that 80 percent of all oil and gas produced in the state comes from public lands, about 80 percent of the revenues is attributable to natural gas, and the San Juan Basin is the major natural gas producing region, the planning area contributes significantly to state revenues.

Table 3-27 shows the projected taxes and royalties from fluid minerals in New Mexico in FY 2001. Direct revenue was split about evenly between taxes and rents/royalties, with the latter paid only by producers on public lands. **Table 3-28** presents the federal mineral revenue distributions received by New Mexico from federal royalties, rents and bonuses, based on mineral resources in the planning area.

Table 3-29 summarizes state and local tax revenues and royalties generated from coal production in New Mexico in 2000. Revenues generated from severance, resources excise, and conservation taxes on the state's coal production totaled $31.8 million in 2000. In addition, gross receipts taxes on coal (at an effective rate of 5.3 percent of gross sales revenues) generated an estimated $29 million and about $7.2 million in property taxes for the producing counties. The state received royalties, rent, and bonuses payments from coal leases on state lands of $1.4 million. In addition, the state received 50 percent of the royalties collected by the federal government from coal leases on public land. In 2000, federal royalties from coal leases in the state amounted to $17.3 million (with about $8.6 million dispersed to the state of New Mexico). The total tax and royalty revenues to the state

from coal production were $41.8 million dollars. Base on share of production, about $40.1 million of this was attributable to coal production in the planning area. This represents less than one percent of New Mexico general fund revenues.

Table 3-27. Taxes and Royalties from Fluid Minerals in New Mexico, FY 2001

Revenue Fund	Million $		
	Crude Oil	Natural Gas	Total
General Fund			
Oil and Gas Emergency School Tax	54.7	261.6	316.3
Oil and Gas Conservation Tax	3.5	12.4	15.9
Natural Gas Processing Tax	–	13.3	13.3
Federal Leasing Royalties	42.0	312.1	354.1
State Land Rents and Bonuses	10.3	12.6	22.9
Subtotal	**110.5**	**612.0**	**722.5**
Severance Tax Bonding Fund			
Oil and Gas Severance Tax	64.6	235.9	300.4
Land Grant Permanent Fund			
State Land Royalties	93.0	169.0	261.0
Total	**268.0**	**1,016.9**	**1,283.9**

Source: NMDFA 2001.

Table 3-28. Federal Energy Mineral Revenue Disbursements ($) to the State of New Mexico (by County of Origin), FY 2000

Resource	Mc Kinley	Rio Arriba	Sandoval	San Juan	ROI
Coal	435,120	–	–	6,208,793	6,643,913
Gas	–	41,424,105	$76,942	68,123,333	109,624,380
Gas Plant Products	–	3,872,127	5,857	8,005,563	11,883,547
Oil	9,737	1,154,887	99,933	1,187,754	2,452,311
Other	3,820	2,033,400	27,919	3,562,670	5,627,809
Rent	36,768	20,990	115,863	74,016	247,637
Bonus	1,680	4,315	4,640	343,153	353,788
Total	**$487,125**	**$48,509,824**	**$331,154**	**$87,505,282**	**$136,833,385**

Source: USDI 2001b.

Table 3-29. State and Local Tax Revenues and Royalties from Coal Production in New Mexico

Tax	Effective Tax Rate (%)	FY 2000
Volume Produced (MMT)		27.3
Gross Sales Value ($000,000)		554
Tax Revenues ($ millions)		
Severance	2.67	14.8
Severance Surtax	2.03	11.2
Resource Excise	0.6	3.3
Conservation	0.15	0.8
Gross Receipts	5.3	29.4
Property	1.3	7.2
Total	**12.1**	**66.7**
Royalties, Rents, and Bonuses ($ millions)		
Federal		17.3[1]
State		1.4
Indian Lands		20.1
Total		**38.8**

Source: O'Donnell and Clifford, n.d.
Note: (1) FY 1999.

Local Tax Revenues

Some portion of the oil and gas tax revenues are distributed to counties, school districts, and municipalities based on the location of the tax districts containing the taxed assets. The primary source of these revenues is from the Oil and Gas Ad Valorem Production Taxes that are distributed on a monthly basis to county treasurers. Ad Valorem Production and Production Equipment Tax revenues are also distributed according to the property tax rates imposed by counties. **Table 3-30** summarizes the impact of these revenues on counties in the planning area. It shows that the Equipment tax has a relatively minor impact on producing counties' revenues, but that Production tax is a major component (almost 30 percent) of Rio Arriba's budget. School districts receive additional revenues from the State of New Mexico through the Department of Finance and Administration based on state land royalties, rents and bonuses.

The federal government also makes payments to local governments to offset the loss of property taxes because of nontaxable federal lands within their boundaries. These payments are called Payments in Lieu of Taxes (PILT). Public Laws 94-565 (1976) and 97-258 (1982) are the central laws authorizing such payments. PILT payments are used by local governments to finance vital services such as firefighting, police protection, and the construction of roads and public schools. The BLM administers the program for the Department of the Interior using formulas for fair distribution established by law. **Table 3-31** shows the PILT payments to the counties in the planning area as well as the total figure paid to the State of New Mexico. The planning area received over 20 percent of the total PILT payments to New Mexico in FY 2000.

Table 3-30. Impact of Tax Revenues on County Budgets from Energy Resources, FY 2000-2001

Revenue Source	San Juan		Rio Arriba		Mc Kinley	
	$000	%	$000	%	$000	%
Total Budgeted Fund Revenues	46,334	100	32,135	100	20,831	100
Ad Valorem Oil and Gas Production Tax	3,353	7.2	8,842	27.5		<1
Ad Valorem Oil and Gas Production Equipment Tax	667	1.4	763	2.3		<1

Sources: McKinley County 2001, Olguin 2002, NMDFA 2001.

Table 3-31. Payments in Lieu of Taxes to New Mexico and Select Counties, 1999-2000

County	FY 1999 Payment ($)	FY 2000 Payment ($)
San Juan	639,353	675,137
Rio Arriba	841,676	889,964
McKinley	289,267	316,551
Sandoval	675,699	715,643
New Mexico Totals	**11,597,426**	**12,323,237**

Source: BLM 2001c.

PILT payments are allocated according to a formula that includes population, receipt sharing payments, and the amount of federal land (entitlement acreage) within an affected county. **Table 3-32** shows the number of federal entitlement acres within each county in the planning area. Although Rio Arriba County has more than twice as much federal land as other counties in the planning area, it received only somewhat higher payments, due to the application of the formula.

Table 3-32. Payment in Lieu of Taxes, Entitlement Acreage by County and Agency, FY 2000, New Mexico

County	BLM[1]	USFS[1]	USBR[1]	NPS[1]	USACE[1]	Total
San Juan	813,561	0	17,551	27,864	0	858,976
Rio Arriba	583,398	1,412,266	25,933	0	2,860	2,024,457
McKinley	228,756	179,205	0	3,306	0	411,267
Sandoval	513,275	384,663	0	25,517	580	924,035
Total Acres	**12,754,913**	**9,080,130**	**253,421**	**374,479**	**21,040**	**22,499,750**

Source: BLM 2001d.

Notes: (1) BLM = Bureau of Land Management, USFS = U.S. Forest Service, USBR = Bureau of Reclamation, NPS= National Park Service, USACE = U.S. Army Corps of Engineers.

Economic Trends

A number of trends are discernible in the planning area, related to demographics, economics, and quality of life. These include:

- The economy of the planning area, particularly San Juan County, will continue its trend toward diversification, with increased activity in the trades and services sectors related to medical, retirement, commercial, and tourism interests.
- The importance of agriculture will continue to decline modestly in terms of economic productivity, while retaining its importance as a cultural value and as a means to preserve open space.
- Oil and gas production will remain the dominant force in the economy, with related primary and secondary businesses adding higher-than-average wages to the local economy.
- The lifestyle amenities available in the Farmington area will increasingly attract urban, retirement, and recreation-oriented interests.
- Quality of life considerations are becoming more important in local public policy and planning as a component of economic diversity and viability. The increasing population; the attraction of the area for recreationists; and immigrating retired people, medical professionals, and others, coupled with the limited private land base, brings public land use and policy into the realm of local community government.
- BLM scoping efforts found widespread concern among residents about the impacts of oil and gas activities. Without attention to these issues, it is expected that the concerns will intensify.

ENVIRONMENTAL JUSTICE

Federal agencies are required to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner that ensures that no person is excluded from participation therein, denied the benefit thereof, or subjected to discrimination due to their race, color, or national origin. EO 12898 requires federal agencies to assess their projects to ensure they do not result in disproportionately high and adverse environmental, health, or safety effects on minority and low-income populations.

Table 3-33 shows that American Indians represent a high percentage of the population of McKinley and San Juan Counties, primarily reflecting the presence of the Navajo Nation and the Ute Mountain Reservation. Hispanics represent a high percentage of Rio Arriba County, compared to the state as a whole.

The current percentage of the population that is under the age of 18 and classified as children is presented in **Table 3-34**. The table shows that children, as a percentage of the population, are declining—dramatically in the case of McKinley County, but significantly in the other counties as well. In contrast, the State of New Mexico's proportion of children declined only slightly, while for the U.S. as a whole, not at all.

Poverty rates shown in **Table 3-35** indicate a high rate of poverty in McKinley County, while all but Sandoval County show higher poverty rates than the state average.

Table 3-33. Population, Ethnicity, and Race in 2000

	U.S.		New Mexico		McKinley County		Rio Arriba County		Sandoval County		San Juan County	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Population	281,421,906	100	1,819,046	100	74,798	100	41,190	100	89,908	100	113,801	100
Hispanic or Latino (All Races)	35,305,818	12.5	765,386	42.1	9,276	12.4	30,025	72.9	26,437	29.4	17,057	15.0
Not Hispanic or Latino	246,116,088	87.5	1,053,660	57.9	65,522	87.6	11,165	27.1	63,471	70.6	96,744	85.0
Population of One Race	241,513,942	85.8	1,027,867	56.5	64,329	86.0	10,821	26.3	62,033	69.0	95,045	83.5
White	194,552,774	69.1	813,495	44.7	8,902	11.9	5,619	13.6	45,227	50.3	52,922	46.5
Black or African American	33,947,837	12.1	30,654	1.7	287	0.4	85	0.2	1,418	1.6	429	0.4
American Indian and Alaska Native	2,068,883	0.7	161,460	8.9	54,742	73.2	5,002	12.1	14,239	15.8	41,290	36.3
Asian	10,123,169	3.6	18,257	1.0	327	0.4	47	0.1	857	1.0	279	0.2
Native Hawaiian and Other Pacific Islander	353,509	0.1	992	0.1	25	0.0	25	0.1	86	0.1	36	0.0
Some Other Race	467,770	0.2	3,009	0.2	46	0.1	43	0.1	206	0.2	89	0.1
Population of Two or More Races	4,602,146	1.6	25,793	1.4	1,193	1.6	344	0.8	1,438	1.6	1,699	1.5

Source: US Census 2000.

Table 3-34. Children in the Population, 1990, 2000

Location	Children Under 18, 1990	% of Population	Children Under 18, 2000	% of Population
McKinley	23,556	38.8	28,423	25.1
Rio Arriba	34,365	32.3	11,780	28.6
Sandoval	20,241	32.0	26,613	29.6
San Juan	33,340	36.4	37,099	32.6
New Mexico	446,439	29.5	509,333	28.0
U.S.	63,606,544	25.6	72,325,430	25.7

Source: US Census 2000.

Table 3-35. Poverty Rates, 1995

Location	Total Number of Poor Persons	Total % Poor	Number of Poor Related Children Age 5-17	% Poor Related to Total Children Age 5-17
McKinley County	25,727	37.7	7,865	41.6
Rio Arriba County	9,021	23.7	2,923	34.1
Sandoval County	11,173	13.2	3,721	19.7
San Juan County	23,262	22.5	7,786	27.8
New Mexico	346,994	20.2	106,556	29.2

Source: US Census 1999.

Note: Those below poverty level as determined by U.S. Department of the Census.

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

OVERVIEW

This chapter describes the potential effects on the environment of implementing each of the four alternatives described in Chapter 2. These impacts are presented relative to the existing conditions presented in Chapter 3 and quantified to the extent practical with available data. This Proposed RMP/Final EIS provides a broad scale, "big picture" level of analysis, and the exact locations of projected oil and gas development and other changes are not known at this time. Therefore, the analysis in this chapter represents best estimates of impacts, calculated primarily through GIS applications. Impacts to the resources presented in Chapter 3 are described under each alternative and by each issue that would affect that resource. If an issue is not listed, it is because no impacts to that resource are anticipated.

The primary impacts in the planning area would be due to projected increases in oil and gas activities and would result mainly from surface disturbance. The evaluation of these impacts is based on the number of wells and associated infrastructure projected over the next twenty years in the RFDS (Engler et al. 2001), modified by changes in boundaries and management of SDAs. The impacts would occur mainly in the high development area in the San Juan Basin. New or incompletely developed areas with low potential for mineral resource production lack the geologic data to predict well numbers and to enable more than a qualitative discussion of potential impacts.

Within the FFO area, the analysis addresses revisions to the RMP in all management areas, in addition to oil and gas development. The focus is on the five issue areas described in Chapter 1. The analysis pertaining to USFS and USBR land focuses on the evaluation of the impacts from oil and gas development and provides information needed to develop the Conditions of Approval of oil and gas leasing and development. This Proposed RMP/Final EIS does not address the comprehensive range of land management issues for USFS and USBR land.

Impacts are defined as modifications to the existing environment brought about by implementing an alternative. Impacts can be beneficial or detrimental, result from the action directly or indirectly, and can be long-term, short-term, or temporary.

Direct impacts are attributable to implementation of an alternative that affects a specific resource and generally occur at the same time and place. Indirect impacts can result from one resource affecting another (e.g., soil erosion and sedimentation affecting water quality) or can be later in time or removed in location, but are still reasonably foreseeable. Long-term impacts are those that would substantially remain for many years or for the life of the project. Temporary impacts are short-lived or ephemeral changes to the environment that return to the original condition once the activity is stopped, such as air pollutant emissions caused by earthmoving equipment during construction. Short-term impacts result in changes to the environment that are stabilized or mitigated rapidly and without long-term effects, such as surface disturbance that is revegetated immediately after earthmoving is completed. Impacts can vary from a slightly discernible change to a full modification or elimination of the environmental condition.

Cumulative impacts are also addressed for each resource. These are the effects of the proposed action in combination with other known and reasonably foreseeable past, present, and future actions within the San Juan Basin.

ASSUMPTIONS AND ANALYSIS

The estimates of long-term disturbance resulting from oil and gas development used for impact analysis are based on assumptions from the FFO and the RFDS developed by NM Tech. To develop the RFDS, NM Tech used GIS coverages of existing wells, examined historic production data, and analyzed production characteristics for each major reservoir in the New Mexico portion of the San Juan Basin to derive the projected number of total available completions (16,615) in the New Mexico portion of the San Juan Basin and their spatial distribution. Of this number of total completions, there would be a 25 percent reduction in well bores due to dual completions and commingling, 80 percent of which would occur on federal minerals, bringing the projected number to 9,970 over the 20-year period of analysis. This is the predicted number of wells that was used as a starting point for determining the number of new wells on federal land under each alternative. To provide an upper limit for analysis, Alternative B assumes no commingling. As explained in Chapter 2, land use planning decisions and management prescriptions were used to determine the actual number anticipated under each alternative.

The RFDS obtained the predicted number of commingled wells by decreasing the total number of locations where reservoirs could be accessed under the same spacing and densities that are allowed by rule to be commingled. The RFDS provided no basis for predicting the number of wells that could be completed through CBM wells drilled using coiled tubing. Therefore, although use of this technology can affect the amount of surface disturbance, it was not evaluated in this analysis.

Although the exact locations of these new wells are not currently known, the RFDS predicted the number of locations on a township-range basis. The locations were predicted using current and expected spacing units and well densities for producing formations in the San Juan Basin. In addition, the production characteristics, including the extent and amount of remaining reserves for each formation, were analyzed and used to predict the spatial extent of the wells in the San Juan Basin. A detailed explanation of the procedures used to predict the number of wells and areas of oil and gas development is included in the RFDS (Engler at al. 2001).

Surface disturbance caused by the construction and operation of oil and gas wells was estimated by applying the following assumptions, derived from the RFDS and from estimates based on historic data provided by FFO personnel:

- New surface disturbance would occur on 54 percent of all new well bores, while 46 percent would be located on existing sites through re-completion or directional drilling.
- Initial short-term surface disturbance for new well pad construction would average 3.5 acres, with 1.5 acres reseeded and stabilized after construction is completed, resulting in the long-term surface disturbance associated with each new well pad averaging 2 acres, after interim reclamation takes place.
- When using an existing well pad to locate a new well bore, the size of the altered pad would be approximately 2.5 acres, adding 0.5 acre in long-term surface disturbance. It is assumed that no new surface disturbance from road or pipeline installation would occur for co-located wells.
- The road and pipeline disturbance associated with each new well would average 1.5 acres initially (short-term) when accounting for a wider area of disturbance during construction, and 1 acre long-term, after stabilization is completed. An average of 800 feet of road and pipeline would be constructed within the same 50-foot wide disturbed area. Any net increase in water disposal lines associated with the Fruitland

Coalbed Methane activity is assumed to be included in these figures.

- Final abandonment and reclamation would be completed at an initial rate of 133 well pads and associated ROWs per year, averaging 3 acres per well. The plugging and abandonment rate is projected to increase at the rate of 5 percent per year over 20 years. Most P&As would occur in the fringe areas of the project, with abandoned sites in the high development area likely to be used again.
- There is approximately 168,000 HP of existing compressor stations in the San Juan Basin. An additional 360,000 HP of large compression sites are projected in association with the gas gathering systems necessary to support the projected development. The additional compression sites would be scattered throughout the high development area and are projected to include 10 to 20 stations ranging in size from 2,000 to 10,000 HP and 200 to 300 stations ranging in size from 500 to 2,000 HP. In addition, as the field continues to mature, wellhead compression is assumed to increase, with half of the planning area wells having compression averaging 100 HP at any given time over the life of the plan. Total compression could approach 2,278,000 HP.

The total amount of surface disturbance was derived considering the following:

- New wells, roads, and small pipelines, both on newly constructed well pads and on existing well pads;
- Large pipelines;
- Compressor installations; and
- Final reclamation of well pads.

To predict the amount of long-term surface disturbance associated with new wells, the analysis determined how many well locations could reasonably be developed in stipulation-restricted areas. Subsurface minerals located under a "no surface occupancy" area can be accessed from a surface location within 1,500 feet of the restricted boundary. This distance is a typical achievable offset for a directional well drilled to the Mesaverde/Dakota formations. If the shallower horizons, Fruitland or Pictured Cliffs, are not accessible using directional drilling, the percentage of unrecovered reserves would increase from that estimate. The actual number of wells to be drilled is subject to economic and technological considerations, but the numbers presented under each alternative was used for analysis and comparison. The number of wells predicted to be "not accessible" (greater than 1,500 feet from the NSO area boundary) was subtracted from the total number of predicted wells under each alternative to obtain the remaining number of wells predicted as available for drilling.

To determine how much acreage would be disturbed over the long term through the construction of new wells on new pads, the number of remaining locations was multiplied by 54 percent and then by the 3-acre average long-term disturbance associated with each location (well pad, road, pipeline). To determine the amount of surface disturbance associated with wells drilled on existing well pads, the number of remaining locations was multiplied by 46 percent and then by 0.5, which represents the average incremental acreage necessary to add a well to an existing well pad.

The amount of surface disturbance associated with large transmission pipelines was determined by assuming that the number of compressors and amount of pipeline required under each alternative would vary according to the amount of producible hydrocarbons. The amount of produced hydrocarbons is proportional to the number of completions, which in turn is affected by the number of available surface locations. Reserves producible under Alternatives B, C, and D differ only by the number of locations that would not be accessible due to surface constraints. Most of the available hydrocarbon reserves would be

accessible under those three alternatives through commingling, dual completions, directional drilling, or other innovative drilling techniques. Thus, the number of possible completions is approximately the same for all three alternatives although the number of new surface locations for each alternative varies according to the surface stipulations. The results reflect the largest amount of long-term surface disturbance possible under each alternative. The amount of surface disturbance associated with larger pipelines and compressors was determined by applying the percent of wells removed after applying surface stipulations under each alternative to the amount of acreage listed in the assumptions (11,716 acres for pipelines).

Compressors in the planning area differ in the amount of surface area required for their installation. Wellhead compressors are typically installed on the well pad, requiring no additional acreage. They were assumed to create no new surface disturbance. This analysis assumed that the maximum amount of acreage required for installation of Phase 1 compressors (2,000 to 10,000 HP) would be 10 acres each. The RFDS predicted 10 to 20 Phase 1 compressors would be installed during the period of analysis. This analysis also assumed that Phase 2 compressors (sized from 500 to 2,000 HP) require 5 acres each for installation. The RFDS predicted 200 to 300 Phase 2 compressors would be installed during the period of analysis. There may be more than one Phase 1 or Phase 2 compressor at a compressor site or station.

The net amount of long-term surface disturbance associated with each alternative was determined by subtracting the amount of acreage predicted for reclamation under each alternative from the total amount of disturbance predicted for well pad construction, larger pipelines, and compressors. There is, however, already a backlog of well pads waiting for field review and approval of final abandonment by the FFO. These locations cannot be considered "reclaimed" until that approval is granted. This analysis did not consider the backlog or how it may impact net surface disturbance in the future. The amount of reclaimed surface was assumed to be the same for all alternatives and calculated according to the FFO assumptions. Initially, 133 well pads at 3 acres each would be reclaimed during the first year, increasing at a rate of 5 percent per year thereafter. This would result in 13,194 acres of reclaimed land at the end of 20 years.

ALTERNATIVE A—CURRENT MANAGEMENT

Surface Disturbance Due to Oil and Gas Development

There would be 4,421 projected new well bores on federal minerals over a 20-year period in the planning area. Over 20 years, this would average 223 wells per year.

The surface area that would be modified for the long-term for construction of new well pads or additions to existing well pads for new well bores, access roads, and small pipelines would total 8,179 acres. Long-term surface disturbance for large pipelines and 114 Phase I and II compressors would total 5,949 acres (**Table 4-1**). Alternative A would involve approximately 44 percent of the maximum number of potential new wells projected in the RFDS.

Table 4-1. Long-Term Surface Disturbance Associated with Well Development under Each Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
Total number of predicted new well bores on federal land over 20 years	4,438	13,292	9,970	9,970
Number of well locations not accessible due to NSO constraints	17	17	134	28
Remaining number of locations available for development	4,421	13,275	9,836	9,942
Long-term surface disturbance associated with new wells (acres)	7,162	21,506	15,934	16,106
Surface disturbance associated with existing well pads (acres)	1,017	3,053	2,262	2,287
Total amount of new surface disturbance associated with wells (acres)	8,179	24,559	18,197	18,393
Amount of surface disturbance associated with construction of large pipelines (acres)	5,195	11,716	11,559	11,683
Amount of surface disturbance associated with installation of compressors (acres)	754	1,700	1,677	1,695
Total surface disturbance (acres)	14,128	37,975	31,432	31,771
Amount of reclaimed surface (acres)[1]	13,194	13,194	13,194	13,194
Net amount of surface disturbance (acres)	934	24,781	18,238	18,577

Note: (1) Does not include plugged and abandoned wells that await approval for reclamation.

After 20 years, 13,194 acres would be reclaimed. Because 46 percent of the new wells are assumed to be located on existing pads, the acreage disturbed for new development would be less than that reclaimed on an equivalent number of wells (Table 4-1). Therefore, the implementation of Alternative A would result in a net long-term surface disturbance of 934 acres, without taking into account the plugged and abandoned well backlog that may be approved for reclamation.

Watersheds

Several of the federal agencies in the planning area manage their resource programs on a watershed basis. Information on surface

disturbance by watershed is important to predict short- and long-term impacts on soils, sediment yields, habitat fragmentation, cultural resources, and surface water quality. This section estimates the surface disturbance caused by oil and gas development that is used to analyze impacts on other resources.

The number of wells projected for each watershed in the planning area was calculated using GIS based on the future locations of oil and gas development by township and range in the RFDS. This number was reduced by the number of wells that would not be accessible due to NSO constraints. It was assumed that the initial vegetation clearance and earthmoving would disturb up to 5 acres for well pads and associated infrastructure, representing the term area of surface disturbance that would affect wildlife habitat, soils, and cultural resources. Under Alternative A, there would be 2 wells in SDAs and 6 wells on USBR land under the water surface and the land adjacent to Navajo Reservoir that would not be accessible.

Surface disturbance, especially bare soil on unpaved roads, is a major contributor to changes in sediment yield in a watershed. Actual sediment yields resulting from projected oil and gas development and other surface disturbing activities could not be quantified for this analysis because site-specific locations of the new wells, roads, pipelines, compressors, and trails would be needed. It has been shown through a recent study (Phippen 2000) in the Rio Puerco watershed in Sandoval County, New Mexico, that sediment yields are highly sensitive to changes in the density of unpaved roads. In a commonly used procedure to estimate sediment yields from large watersheds (PSIAC 1968), approximately 8 percent of the sediment yield predicted is influenced by the amount of ground cover. In general, it can be concluded that areas with the highest density of development, the least ground cover, and the most erodible soils would generate the highest sediment yields. Therefore, the analysis focuses on quantifying changes in surface disturbance, amount of vegetation disturbed, and road density, with the assumption that increased sediment yields would be related to increases in these watershed parameters.

Table 4-2 shows the amount of initial surface disturbance estimated for each watershed under each alternative. **Table 4-3** estimates the increase in new roads within each watershed by alternative.

Under this alternative, initial surface disturbance is estimated to total approximately 13,971 acres due to new wells, roads, and small pipelines, in addition to the surface disturbance resulting from construction of large pipelines and compressors shown in Table 4-1. Without knowing the locations of the proposed large compressors and lateral and trunk lines, it is not possible to determine which watersheds would receive the impacts of this construction, except to assume that the majority of the earthmoving would be located in the high development area in the northern part of the planning area (Map 2-1). The largest anticipated acreage of surface disturbance would be in the high intensity oil and gas development area in the Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, and Blanco watersheds, in descending order.

Under this alternative, there would be an increase ranging between 12 and 77 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging from 1 to 6 percent in those watersheds. The total increase would be approximately 358 miles in the planning area, which would result in a slight increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines.

Table 4-2. Initial Surface Disturbance from Oil and Gas Development under Each Alternative by Watershed

Watershed	Alternative A		Alternative B		Alternative C		Alternative D	
	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)	New Well Sites	Initial Surface Disturbance (acres)
Animas	389	1,230	1,166	3,685	874	2,763	874	2,763
Arroyo Chico	0	0	0	0	0	0	0	0
Blanco	301	950	903	2,855	670	2,141	677	2,514
Carrizo	465	1,470	1,394	4,406	1,037	3,304	1,046	3,879
Chaco Wash	32	100	95	300	71	225	71	264
Chinle	0	0	0	0	0	0	0	0
Gobernador	189	597	566	1,790	418	1,342	424	1,576
Kutz Canyon	123	388	368	1,163	276	872	276	1,024
La Plata	304	961	911	2,879	683	2,159	683	2,534
Largo	810	2,561	2,427	7,669	1,816	5,754	1,811	6,756
Mancos	0	0	0	0	0	0	0	0
Middle San Juan	143	451	428	1,352	321	1,014	321	1,190
Navajo Reservoir	552	1,744	1,679	5,347	1,182	4,010	1,256	4,707
Pump Canyon	150	473	448	1,416	336	1,062	336	1,246
Rio Chama	7	23	21	5	16	5	16	5
Rio Puerco	1	4	3	9	3	10	3	12
Rio San Jose	0	0	0	0	0	0	0	0
Upper Puerco	0	0	0	0	0	0	0	0
Upper San Juan	955	3,019	2,866	9,065	2,133	6,798	2,148	7,981
Total	**4,421**	**13,971**	**13,275**	**41,941**	**9,836**	**31,459**	**9,942**	**36,451**
Total Acreage to be Revegetated		**4,598**		**13,806**		**10,229**		**10,339**

Note: In some cases, acreage varies for the same number of wells due to rounding.

Table 4-3. Increase in New Roads under Each Alternative by Watershed

Watershed	Alternative A		Alternative B		Alternative C		Alternative D	
	Miles of New Roads	% Change	Miles of New Roads	% Change	Miles of New Roads	% Change	Miles of New Roads	% Change
Animas	31	3%	94	10%	71	8%	71	8%
Arroyo Chico	0	0%	0	0%	0	0%	0	0%
Blanco	24	4%	73	13%	54	10%	55	10%
Carrizo	38	5%	113	14%	84	11%	85	11%
Chaco Wash	3	0%	8	0%	6	0%	6	0%
Chinle	0	0%	0	0%	0	0%	0	0%
Gobernador	15	6%	46	18%	34	13%	34	13%
Kutz Canyon	10	5%	30	16%	22	12%	22	12%
La Plata	25	6%	74	17%	55	13%	55	13%
Largo	66	2%	196	7%	148	5%	147	5%
Mancos	0	0%	0	0%	0	0%	0	0%
Middle San Juan	12	1%	35	2%	26	1%	26	1%
Navajo Reservoir	45	4%	136	13%	96	9%	102	9%
Pump Canyon	12	6%	36	18%	27	13%	27	13%
Rio Chama	1	0%	2	0%	1	0%	1	0%
Rio Puerco	0	0%	0	0%	0	0%	0	0%
Rio San Jose	0	0%	0	0%	0	0%	0	0%
Upper Puerco	0	0%	0	0%	0	0%	0	0%
Upper San Juan	76	3%	232	10%	173	7%	174	7%
Total	**358**		**1,075**		**797**		**805**	

Note: In some cases, percentage varies for the same miles of road due to rounding.

Most of the soils in the watersheds with the most acreage of predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls and other BMPs.

Geology and Minerals

The primary impact to mineral resources under all alternatives would be the irretrievable commitment of oil and gas resources in the San Juan Basin. The hydrocarbons produced from federal lands would no longer be available for future use. Extraction of oil and gas resources in the planning area would vary according to the ability to access subsurface hydrocarbon resources under each alternative.

Oil and Gas Leasing and Development

Access to hydrocarbon reserves in a particular formation is regulated by spacing and density rules. Well spacing units and the option to perform infill drilling affect the ability to extract mineral resources. The RFDS anticipates that spacing and/or density rules would be altered over the 20-year period of analysis to maximize extraction of hydrocarbon resources. For example, the Fruitland Coal is currently drilled on 320-acre spacing. It is expected that spacing may be decreased to 160 acres, particularly outside of the high development area. The Dakota formation is currently spaced at 320 acres, with one infill well allowed. It is expected that the spacing may be decreased to 80 acres in order to maximize extraction of its gas resources.

The application of constraints associated with SDAs can affect the ability to access the surface to drill a well. Some lease stipulations or COAs can preclude use of the surface for drilling, such as the conditions of "no surface occupancy." The minerals beneath an area with a NSO restriction may not be accessible unless the reserves can be accessed through directional drilling. Other constraints can impose use conditions, such as "controlled surface use" or "closed to new leasing." Use restrictions can be imposed by different factors, including wildlife use, which may result in seasonal timing limitations.

The amount of gas or oil produced under each alternative depends upon the number of completions associated with the alternative. Approximately 84 percent of these wells would be located on FFO BLM land, 10 percent on AFO BLM land, 1 percent on USBR land, and 5 percent on USFS land.

The analysis focused on gas reserves contained in the major gas-producing formations in the San Juan Basin because of their relative importance as compared to oil production. In order to assess how much gas would be produced under each alternative, the analysis used RFDS estimates of the reserves remaining in each of the major-producing formations. The following assumptions were made to allocate those reserves to each alternative:

- The amount of remaining hydrocarbons was assumed to be producible within the 20-year period of analysis. It is likely that full production would take longer than 20 years, but the RFDS did not provide a timeframe for the ultimate depletion of the various reservoirs, so this assumption was used as the most severe condition for analysis of environmental impacts. It provides a relative basis for estimating the impacts to production by alternative.
- The amount of producible hydrocarbons corresponds to the number of possible completions, which approximately corresponds to the number of possible locations under Alternative B.
- The number of potential completions under Alternatives C and D would be approximately the same as for Alternative B, but more use would be made of alternative drilling and production techniques (commingling, dual completions, directional drilling, etc.). The number of total completions for all alternatives was reduced by the number of locations that would be removed from use by the application of surface stipulations.
- The number of locations in Alternatives A and B is approximately equal to the number of completions.

Remaining reserves for the Pictured Cliffs, Mesaverde, Dakota, Chacra, and Fruitland Coal were provided in the RFDS. The RFDS also provided estimates for the subsurface development associated with Alternative B (Engler et al. 2001). Ratios of available locations to possible locations were generated and applied to the estimated remaining reserves for each formation to provide production estimates for each alternative, shown in **Table 4-4**.

Table 4-4. Estimated Future Production by Alternative

	Remaining Production Estimates from RFDS	Alternative A	Alternative B	Alternative C	Alternative D
Estimated number of wells after stipulations	---	4,421	13,275	9,836	9,942
Formation	**Estimated Future Production in Billion Standard Cubic Feet (Bscf)**				
Fruitland Coal	1,167	514	1,167	1,151	1,164
Pictured Cliffs	441	194	441	435	440
Mesaverde	6,034	2,655	6,034	5,950	6,016
Dakota	3,368	1,482	3,368	3,321	3,358
Chacra	148	65	148	146	148
Total	**11,158**	**4,910**	**11,158**	**11,002**	**11,125**
Percent of Total	**---**	**44%**	**---**	**98.6%**	**99.7%**

This analysis provides a relative comparison of production under each alternative. Therefore, under Alternative A, produced gas would be approximately 44 percent of the amount produced under Alternative B. Under Alternatives C and D, the amount produced would be approximately 98 and 99 percent, respectively, of the amount produced under Alternative B.

Implementation of Alternative A would limit accessibility to hydrocarbon reserves by limiting APD approval to approximately 223 per year. A total of 4,421 new wells would be developed under this alternative. NSO restrictions would require 73 directional wells (1.7 percent of the total) to be drilled to access reservoirs under SDAs and Navajo Lake. The actual number of wells approved would be limited by the spacing and density rules for the formations and the locations of the existing wells in the area. Once the P&A wells are taken into account over the 20-year period, there would be no net increase in surface disturbance, and possibly a decrease. The number of wells awaiting approval for reclamation in the FFO backlog would probably decrease over the period of analysis if FFO surface management staff devotes time to inspection of reclaimed sites. There would be 53,216 acres closed to new leasing.

The limiting factor in production would be the number of wells permitted. Under those conditions, the inability to drill infill wells would not affect resource extraction. Approximately 44 percent of the available gas would be produced under currently accepted technologies. The discontinuance of pilot programs that evaluate innovative techniques to enhance production would further limit extraction of hydrocarbon resources.

On USBR lands, after consideration of the surface constraints near Navajo Reservoir, 58 directionally drilled wells could allow access to hydrocarbon reserves located beneath the reservoir and adjacent land.

Small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells. Consequently, it is anticipated that an increase in the number of new well pads would increase the number of quarries in the high development area. Therefore, the smallest number of small quarries would be constructed under Alternative A. These small quarries would be located in areas that avoid impacts to natural

and cultural resources, permitted by FFO staff either with an APD or through other BLM permitting procedures.

Land Ownership Adjustments

Under current management, 280,782 acres of public land would be available for disposal, of which approximately 264,797 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. The issues surrounding the management of split estate are discussed further under Lands and Access.

There is the potential for conflicts between competing resource users if oil and gas wells and associated infrastructure limit access to the most desirable salable minerals areas located in the vicinity of the tri-cities area, which is also within the high development oil and gas area. Locatable minerals would not be affected by oil and gas development. These potential large quarries would also be required to go through the FFO permitting process that includes cultural, T&E species, and paleontological resource clearances.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas is the limitation imposed in these areas for how the surface resources would be managed within their boundaries in the FFO. Due to NSO constraints within SDAs, there would be 1 well that would not be accessible and approximately 15 wells that could be developed if directional drilling were used.

Coal Leasing Suitability Assessment

There would be fewer potential conflicts for mineral extraction, especially in the coalbed methane-producing formations, under this alternative because the total number of oil and gas wells approved over the next 20 years would be the lowest of all the alternatives. Conflicts over leases and operations arise when gas and coal are found in the same coal seam. Areas identified as suitable for coal development are those within the Coal Belt SMA, the 14 PRLAs, and the 17 competitive coal tracts carried forward from previous land use planning. No new lands would be considered for coal leasing outside of these previously designated areas. These areas are outside of the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources. The unsuitability criteria, established by the MLA, and adjudication of some of the PRLAs would have the potential to further reduce the 138,000 acres of federal minerals available for coal mining in these areas.

The renewed interest in the vicinity of Star Lake is in an area with few oil and gas wells projected. Management of the coal program would be implemented as it is currently, so that any land under new application for mining would be evaluated against the unsuitability criteria (Appendix C), and an RMP amendment would be completed to evaluate the site-specific impacts. The Coal Belt SMA would remain, but approval of any mining in this area would require the same evaluation as in other areas under FFO management.

Soils

The alternatives would generate impacts on soils by contributing to soil erosion or compaction from earthmoving activities and OHV use. There is also a potential for changes to prime farmland soils.

The analysis of impacts on soils examined activities associated with each alternative that could increase erosion or compaction or affect prime farmlands. The removal of vegetation and organic matter from the soil surface, and damage to soil crusts, would cause accelerated soil erosion by water and wind. The construction of new unpaved roads would result in many areas that would concentrate the flow of surface water and contribute additional sedimentation from the road surface and road banks. The amount of water erosion depends on such factors as the terrain at the site of the

surface disturbance, the erodibility and permeability of each soil type, vegetative cover, the steepness and length of the slope at the site, and the amount of precipitation.

The amount of wind erosion would also be affected by the location and type of barriers to the prevailing winds at the site. Without knowledge of the exact locations of surface disturbance, it is impossible to predict the quantity of soil that would be lost due to the site-specific nature of soil erosion prediction methods.

Indirect impacts would include the potential for increased salinity and sedimentation in waterways due to erosion. The Upper San Juan watershed contains a relatively high proportion of saline soils compared to others in the planning area and is the area of the highest projected surface disturbance due to oil and gas development. Others with saline soils in the San Juan Basin subject to potential surface disturbance and resulting erosion are the La Plata, Animas, and Middle San Juan watersheds.

Soil compaction is caused by heavy equipment, especially if the soil contains a high proportion of silt and clay or when it is wet. Soil compaction would result in damage to soil crusts, decreased soil permeability and plant rooting depth, and increased surface water runoff, contributing to accelerated erosion and flooding downstream. Compaction would make revegetation of disturbed areas more difficult. Other localized impacts to soils include mixing of soil horizons and possible contamination of soils from various chemicals and other pollutants used during oil and gas activities.

Prime farmland soils are found in five of the watersheds projected to have high amounts of new oil and gas activity, including Upper San Juan, Navajo Reservoir, La Plata, Animas, Pump Canyon, Middle San Juan, and a small amount in Chaco Wash. Excavation of topsoil and compaction of prime farmland soils would result in changes to these soils unless the soil horizons are stockpiled separately and spread across the site in their original order during reclamation.

Oil and Gas Leasing and Development

Due to the lower numbers of projected new well locations, roads, and pipelines, this alternative would have the least short-term and long-term impacts on soils from oil and gas activity. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would be approximately 13,971 acres, with 4,598 acres revegetated after construction (Table 4-2). When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be over 900 acres (Table 4-1). The resulting impacts to soils would be a slight increase in soil erosion due to the increase in bare ground and unpaved roads, without taking into account the P&A backlog that could reduce long-term surface disturbance acreage. There is the potential for impacts to prime farmlands due to construction associated with oil and gas development because the watersheds with the most prime farmland soils are within the high development area for oil and gas.

OHV Use

Open OHV access over most of the FFO area would result in damage to vegetation and soil crusts, and an increase in tracks that could turn into new roads. As vegetation is damaged on sloping terrain, tire tracks oriented up and down the hillside often concentrate surface water runoff during storm events, which develop into gullies. BLM staff has documented damage to vegetation and resulting erosion after an OHV event in the FFO area (O'Neill 2001). Increased soil erosion would also be expected to result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce vegetative cover.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Coal Belt SMA. A

majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and has low susceptibility to wind erosion, both of which would be accelerated if new coal mining operations were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Criteria used for evaluating impacts to water resources are related to water quality, water availability, and adherence to applicable local, state, and federal regulations. Impacts were evaluated by their potential to impair water quality; reduce water availability to users; endanger public health or safety by creating or worsening health hazards of safety conditions; or violate laws or regulations adopted to protect or manage water resources. Impacts to surface water resources would be considered significant if local, state or federal water quality standards were exceeded, or changes in surface flow exceeded normal maximum or minimum levels as a result of the action. Impacts to groundwater resources would be considered significant if aquifers were altered sufficiently to affect established uses, water quality were degraded below applicable water quality standards, or the quantity of usable groundwater were diminished as a result of the action.

In general, direct impacts to surface waters would result from an increase in surface disturbance, which could result in an increase in sedimentation in water bodies. Vegetative cover serves as a buffer between the impacts of erosive forces such as rain, wind, and surface water runoff to hold soil in place. As vegetation is removed (through construction activities, OHV use, etc.), soil becomes exposed to these erosive forces. During storm events these soil particles are transported downslope and into drainages. The closer the surface disturbance is to a water body, the more likely it is for sedimentation to enter a water body and affect water quality. When vegetation is disturbed along the riparian corridor, erosive forces can have detrimental impacts to channel stability, resulting in increased bank erosion, channel scour, and sedimentation.

In general, the STCs for oil and gas development and the groundwater protection programs, implemented by federal agencies to comply with federal and state laws, would minimize the potential for impacts to groundwater quality.

Oil and Gas Leasing and Development

The primary issues and concerns regarding water resource problems caused by oil and gas development involve the potential for increased runoff and resulting sedimentation from surface disturbance; water consumption and use; and groundwater contamination associated with various activities from oil and gas development. Increased runoff and associated sedimentation of local drainages could result from and increase in the areal extent of disturbances associated with well, road, and pipeline construction.

Well construction could affect surface water within the immediate vicinity of drill pads and road and pipeline construction could affect surface water along the ROWs. These localized impacts would result from accelerated erosion during storm events that occur when the soil is exposed. The magnitude of potential impacts would be dependent, in part, on seasonal variation in rainfall and snowmelt runoff when the surface disturbance occurs. Should runoff

events occur at times when the surface soil is bare, there would be a higher potential for increased sediment yield, which affects water quality. The magnitude of potential impacts would also depend on the proximity of the drill site, pipeline, or road to receiving bodies of water. If there is a sufficient vegetative buffer between the surface disturbance and any receiving water body, the impacts would be less.

Potential impacts to surface water quality also could occur from accidental contamination associated with spills of machinery fuels, lubricants, and drilling fluids. The potential for impacts to groundwater quality would be limited to drilling, well development, well testing activities, contamination from infiltration of polluted water in unlined pits, and disposal of produced water into injection wells.

During the well-drilling phase, impacts to water resources include the potential to contaminate a freshwater zone. To protect near-surface aquifers, surface casing is installed to a depth of up to 500 feet, depending on the depth necessary to penetrate past the freshwater zones. The casing is pressure tested to ensure a seal has been created to protect the freshwater zones.

Normal drilling usually exposes aquifers for only a short period of time, usually one week or less. Onshore Order No. 2 requires that all useable aquifers be protected by casing or cementing. Drilling systems use low circulation and low fluid loss materials in the drilling operation. Monitoring of make up water is used to verify that water is not entering or leaving the system.

As drilling proceeds, losses of produced water or mud may occur to differing degrees in various formations, but these losses are considered to be minimal and contained to within a few feet of the well bore. These losses are not considered to be substantial because of the very small amount of groundwater that could be affected. It would be unlikely for groundwater contamination to occur as a result of drilling activities.

All water produced in association with Fruitland CBM production would be transported via truck or pipelines to an injection well, or evaporation ponds, for disposal. Injection of produced water is consistent with BLM policy and the USEPA's Underground Injection Control permit Program (40 CFR Part 144). When water is disposed of underground, it is always introduced into a formation containing water of equal or poorer quality or a formation that has been specifically exempted by the NMOCD.

In general, the STCs required to be implemented by the federal agencies would minimize the potential for impacts to groundwater quality.

All alternatives would require some fresh water for well drilling. Drilling operations would account for most of the water actually consumed during the life of the producing wells. A small amount of water would be used for dust suppression or equipment installation during other phases of development. Recirculating mud systems or produced water would be used to reduce the total volume of water needed where appropriate and applicable. Fresh water used in drilling operations would be obtained from the San Juan and Animas Rivers, Navajo Reservoir, local municipalities, and/or from wells drilled specifically for this purpose. The water would be trucked to the location from its source to the reserve pits at each drilling well.

The amount of water used during drilling would depend on the technique used to drill the well bore. Wells that are drilled by using air or another gas as the primary drilling medium require less water than those drilled with mud. Formations that contain greater amounts of fluid, such as the CBM-producing Fruitland formation, are usually drilled with mud to maintain the integrity of the well bore.

The average amount of water needed for drilling and completion differs per formation, ranging from 2,000 barrels (67,200 gallons; 1 barrel = 42 gallons) for Pictured Cliffs to 12,000 barrels for the Mesaverde. Water requirements differ depending on the technique

and the formation. The average amount of water needed for drilling and completion of all wells, weighted by the percentage of wells in each of the major formations in the planning area, is approximately 6,750 barrels per well. If completing a different formation or zone, an additional 10 percent of the amount of completion water would be needed after the initial hole has been drilled.

Under Alternative A, new oil and gas development would result in a slight net increase in surface disturbance. Water required for the drilling operations would amount to 3,113 acre-feet. Water used to drill wells would come from legal water rights holders.

In general, potential impacts to water resources would result from an increase in sedimentation due to surface disturbance. These would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations. There would be a slight long-term net increase in sedimentation because development of new drilling sites would result in reclamation of old sites. There would be a slight increase in potential impacts to water resources in the short term as a result of sedimentation, due to initial increased acreage of surface disturbance during construction.

Land Ownership Adjustments

Modification of the BLM ownership pattern would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result. For instance, the non-federal in-holdings within a designated River Tracts SMA would be targeted for acquisition by the BLM, which could have indirect impacts to water resources due to restrictive management guidelines that would limit surface disturbing activities. Conversely, disposal of BLM land for development in the tri-cities area could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative A are currently unknown. Therefore, it is not possible to analyze potential impacts to water resources. When these uses are proposed, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

The primary concern regarding OHV impacts on water resources is the potential for increased runoff and resulting erosion and sedimentation due to vegetation degradation, soil compaction, and surface disturbance caused by OHVs. Other concerns include the potential for small fuel spills from OHVs, and OHV travel in riparian areas or surface waters, which would increase sedimentation through mechanical degradation of the riparian vegetation and/or channel bank.

Potential impacts to water resources from cross-country OHV travel would result from an increase in sedimentation due to surface disturbance and compaction. The primarily open designations for OHVs in the FFO area would adversely impact vegetation condition and soil crusts, which in turn, would result in increased runoff and sedimentation of waterways. The level of impact would depend on the specific location and season of OHV use. Use of unpaved roads and trails can create gullies in which rainfall is channeled, resulting in increased flow rate, which ultimately results in increased erosion and subsequent sedimentation of surface waters. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

Specially Designated Areas

SDAs are delineated to allow for particular uses in areas that are considered to be ecologically appropriate for the given use, while restricting activities that would negatively impact the identified resource value to be protected. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting

minimization of sedimentation. In situations where OHV cross-country travel would be permitted within an SDA, a localized negative impact to water resources could result. The management prescriptions in the majority (91) of SDAs provide some measure of restriction for OHV access and minimization of overall surface disturbing activities. This protection would be provided in a small percentage (less than 20 percent) of the total FFO area, however.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Coal Belt SMA. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if additional coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required. Site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

The primary impact to air quality from the project alternatives would occur from proposed natural gas development and production. This section describes the analysis used to estimate potential air quality impacts from this development, in addition to potential impacts from proposed changes in OHV designations. The changes proposed for coal leasing, land ownership patterns, and SDAs would have minimal effects on air quality so they are not addressed in this section.

This air quality analysis includes an evaluation of near- and far-field pollutant impacts from gas production with the use of dispersion modeling to determine if proposed emissions contribute to a predicted exceedance of an ambient air quality standard. Information on project emission sources was obtained from gas industry representatives, equipment vendors, the NMAQB, and recent NEPA documentation of gas development in the region (SAIC 2003). The air quality analysis also qualitatively evaluates the impact of proposed gas production emissions to visibility levels in pristine PSD Class I areas in proximity to the planning area. Detailed estimates of equipment usage and resulting emissions for each project alternative, in addition to supporting data that documents the modeling analyses, are included in an Air Quality Technical Report (SAIC 2003). Appendix J presents data used to estimate annual air emissions from the Proposed RMP/Final EIS alternatives.

Alternative B proposes the greatest amount of gas development and therefore potentially would produce the highest air quality impacts of any project alternative. Therefore, the project air quality analysis focused on the impacts from Alternative B. Impacts from all other project alternatives were factored from impacts estimated for this alternative. If impacts from Alternative B would not exceed any air quality standard, it is expected that this would be the case for all other project alternatives.

For the purpose of conducting a reasonable, but conservative, air quality analysis, it was assumed that all new wells would extract natural gas. The following activities would produce air quality impacts under all of the project alternatives:

1. Gas well development, including well drilling, testing, and construction of roads, well pads, pipelines, storage tanks, and compressor stations. Air quality impacts would occur from (a) combustive emissions due to the operations of mobile and stationary source equipment and (b) fugitive dust emissions (PM_{10}) due to earthmoving

activities and the operation of vehicles on both unpaved and paved surfaces. This activity would produce short-term impacts, as the time to complete individual wells is generally between one and two months.

2. Gas well production and the operation of associated gas-fired sources, such as wellhead compressors, water separator units, condensate tank heaters, dehydrators, and compressor stations. Air quality impacts would also occur due to combustive emissions and fugitive dust emissions from the operation of mobile source equipment that access and service well sites. The mobile equipment would operate on both unpaved and paved surfaces.

3. Gas well abandonment, use of mobile equipment, and reclamation of disturbed ground surfaces.

4. Operation of mobile source equipment for overburden and coal handling and stationary coal handling equipment. Air quality impacts would occur from combustive and fugitive dust emissions.

5. Land use policies that would affect the level of off-road mobile sources and ground-disturbing activities on FFO lands.

The air quality analysis in this Proposed RMP/Final EIS includes the following assumptions:

1. Annual well development would occur at a constant rate equal to the total number of wells proposed under each alternative, divided by 20 years.

2. Production for each well under an alternative would occur at a constant annual rate regardless of age (year one and up to year 20). In other words, all developed wells would have the same annual production rate. The estimate of annual well production was based on the total number of well-years over a 20-year period divided by the total production proposed under each alternative. As a result, peak annual production and emissions from each alternative would occur at the end of the 20-year period of analysis.

3. Loss of production and its associated emissions from P&A wells during the 20-year project period would offset a portion of the production and its associated emissions from each project alternative. To estimate the net change in production and emissions within the region due to a project alternative, the loss in production from P&A wells was subtracted from the production assumed for a project alternative. With an annual growth rate of 5 percent, the number of P&A wells would increase from 133 in year 1 to 336 in year 20, with a total of 4,398 P&A wells over the 20-year period. The annual production per P&A well was calculated to be the existing production in the project region (1.1 trillion standard cubic feet [Tscf]) divided by the number of existing wells (19,790), then divided by 2 to represent the reduced production associated with these old wells.

Oil and Gas Leasing and Development

Alternative A proposes to develop 4,421 new gas wells on federal lands, which would produce approximately 3,718 Bscf of gas over the 20-year life of the alternative. **Table 4-5** presents the emissions that would occur from gas production under Alternative A for the first and last year of the 20-year period. These data show that the overwhelming majority of emissions from this activity would occur from wellhead and central compression demands.

Implementation of Alternative A would result in a gradual increase in gas production and associated emissions from current levels in the San Juan Basin, as the loss of production in future years from existing wells and formations due to P&A wells would not completely offset the amount of new production from the alternative.

Table 4-5. Project Year 1 and Year 20 Annual Air Emissions Associated with Gas Production—Alternative A (Tons per Year)

Equipment Type/Scenario	VOCs	CO	NOx	PM_{10}
Project Year 1				
Wellhead Compression	25.8	1,124.4	1,133.0	0.0
Separator Units	0.4	2.7	6.3	0.5
Central Compression	24.7	67.7	86.1	0.0
Alternative A - Tons per Year	**50.9**	**1,194.8**	**1,225.4**	**0.5**
P&A Wells - Tons per Year	**(8.3)**	**(340.9)**	**(344.9)**	**(0.2)**
Alternative A Net Change (Alt A – P&A)	**42.6**	**853.8**	**880.5**	**0.4**
Project Year 20				
Wellhead Compression	517.0	22,487.8	22,660.1	0.2
Separator Units	7.4	53.5	125.7	10.2
Central Compression	493.4	1,354.3	1,721.7	0.1
Alternative A - Tons per Year	**1,017.7**	**23,895.5**	**24,507.5**	**10.4**
P&A Wells - Tons per Year	**(273.7)**	**(11,273.8)**	**(11,404.7)**	**(5.1)**
Alternative A Net Change (Alt A – P&A)	**744.1**	**12,621.7**	**13,102.7**	**5.3**

Note: Totals do not sum due to rounding.

Near-field ambient pollutant impacts due to gas production under Alternative A could approximate those estimated for Alternative B, if the density of development in a localized area for Alternative A was similar to what was assumed for Alternative B. This situation would occur in the vicinity of a high concentration of gas wells and a compression station. However, the potential for this to occur under Alternative A would be low, as the amount of development proposed for the alternative is substantially less than the development proposed for Alternative B.

Ambient impacts to nearby Class I areas and O_3 levels from Alternative A would be equal to those estimated for Alternative B, multiplied by the ratio of annual emissions between Alternative A and Alternative B. Therefore, impacts from Alternative A to these air quality issues of concern would be about 21 percent of those estimated for Alternative B.

OHV Use

Operation of OHVs can produce air quality impacts as a result of combustive and/or fugitive dust emissions. Continuation of the present OHV policies under Alternative A would not be expected to result in any significant air quality impacts. The air quality impact of greatest concern from this activity would be intense vehicular usage on unpaved surfaces in proximity to residential areas or main roadway systems.

Coal Leasing Suitability Assessment

Coal mining would result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreages of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

The amount of land currently and potentially affected by oil and gas development and operations was determined through GIS analysis. The acreage of wetland and riparian habitat in the planning area was derived from existing documentation. Information on projected ground disturbance from Tables 4-1 and 4-2 was used to assess impacts on upland and wetland and riparian vegetation.

Oil and Gas Leasing and Development

Most of the existing wells in the planning area are in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be over 14,000 acres (Table 4-1). Initial short-term surface and vegetation disturbance during construction would affect almost 14,000 acres, of which 4,600 acres would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period of impacts considered, resulting in direct impacts to vegetation. Surface disturbance facilitates the germination of noxious weeds, and equipment that travels from site to site transports weeds, resulting in the spread of noxious weeds if left uncontrolled.

Land Ownership Adjustments

Approximately 280,800 acres would be available for disposal and 128,000 acres for acquisition under Alternative A (Table 2-1 and Map 2-2). The disposal of land could have negative effects on upland and riparian vegetation if land disturbance activities were to take place. Biological surveys would be conducted on parcels of land designated for disposal to identify sensitive habitats and species. If sensitive plant communities were identified in these parcels, measures to reduce the impacts on these areas could be taken, such as exclusion of specific parcels of land from consideration for transfer and placing restrictions on the use of transferred land. Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland and riparian plant communities especially if the land were acquired in support of a resource program such as riparian areas along the rivers and washes on FFO land.

OHV Use

OHV travel in upland plant communities can result in direct plant mortality and indirect effects through soil disturbance, soil compaction, damage to biological soil crusts, and the promotion of increased erosion. The amount of land open to OHV use under Alternative A would be 1,230,839 acres (Table 2-2). The remaining FFO land would be closed or limited for OHV use. The continuation of OHV use in open areas would result in the continued degradation of upland plant communities.

Specially Designated Areas

There would be no modification or addition of SDAs for biological resources under Alternative A. Many of the areas have management prescriptions that limit vegetative disturbance such as surface disturbing activities,

OHV access, or grazing. This management would continue to protect vegetation in a limited part of the FFO.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases have the potential to affect a large amount of land; the currently permitted sites cover over 3,900 acres. Proposed coal operations would go through the NEPA process and site-specific analysis of the proposed project impacts on upland vegetation would be performed at that time.

Riparian Areas and Wetlands

The acreage of wetland and riparian habitat in the planning area was derived from existing documentation. Information on projected ground disturbance from Tables 4-1 and 4-2 was used to assess impacts on upland and wetland and riparian vegetation.

Oil and Gas Leasing and Development

The only specific constraints on oil and gas development that would protect riparian areas are the CSU constraints within approximately 2,500 acres of public land in the River Tracts SMA. There are many other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from wells to be installed in the high development area, although the impacts under Alternative A would be the least because the projected well numbers would be less than under the other alternatives. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers would be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401 of the New Mexico Water Quality Control Act (NMWQCA).

Land Ownership Adjustments

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland and riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas such as the River Tracts SMA would not be included in land being considered for disposal.

OHV Use

OHV use of the river tracts and other protected riparian areas on FFO land is limited to designated roads and trails. OHV traffic in intermittent washes would be allowed unless specifically prohibited (Table 2-3). This traffic can result in the elimination of vegetation in and along the washes, resulting in increased erosion and runoff. The continuation of OHV traffic in dry washes would continue to degrade these areas.

Specially Designated Areas

CSU constraints in 56 SDAs under Alternative A would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources.

Coal Leasing Suitability Assessment

Coal mining operations would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal extraction activities could lead to increased erosion and resulting sedimentation in riparian areas, although few exist in the area identified under Alternative A for coal mining. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required

once a location has been requested for consideration before this could be accurately addressed.

Special Status Species

Measures are in place to protect species listed and proposed for listing under the ESA that are known to occur or have the potential to occur in the planning area. Such measures are also in place for some of the other special status species. These measures would remain in place as part of continuing management guidance.

Oil and Gas Leasing and Development

Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment. Stipulations and management practices established as a result of these consultations would be continued to conserve these species. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described above.

Federally Listed and Proposed Species

Knowlton's Cactus. A fence protects the population of wild Knowlton's cactus on FFO land and no disturbance inside the fence would be allowed. The Knowlton's cactus transplant and seed plots on FFO lands are fenced and protected from disturbance. Unoccupied potential Knowlton's cactus habitat within Reese Canyon RNA receives special management. Future roads and well pads within the Reese Canyon RNA would be located outside of unoccupied potential habitat, and pipeline rights-of-way would be authorized only after extensive biological surveys are conducted. Stringent rehabilitation of disturbed ground would be required.

Mesa Verde Cactus. All known and potential habitat for the Mesa Verde cactus on FFO land are contained in The Hogback ACEC. There are several populations of the Mesa Verde cactus within The Hogback ACEC boundary. Extensive biological surveys would be required for all proposed projects. Any projects that would result in ground-disturbing activities that would negatively impact Mesa Verde cactus would require formal consultation with the USFWS before the project could be authorized.

Mancos Milkvetch. All known populations and potential Mancos milkvetch habitat on FFO land occur in The Hogback ACEC. Extensive biological surveys would be required for all proposed projects that would result in ground disturbance. Any projects that would result in ground-disturbing activities that would negatively impact Mancos Milkvetch would require formal consultation with the USFWS before the project could be authorized.

Colorado Pikeminnow and Razorback Sucker. Until 1987, the Colorado pikeminnow and razorback sucker were considered to be extirpated from the San Juan River due, in part, to activities associated with the construction of Navajo Dam and the Navajo Indian Irrigation Project from 1962 through 1965. Since 1987, 14 adult and 20 young-of-the-year pikeminnow have been captured in the San Juan River and its tributaries between Lake Powell and Shiprock, New Mexico. No wild Colorado pikeminnow or razorback suckers have been detected in the planning area. Concerns regarding the potential for oil and gas development activities to result in polynuclear aromatic hydrocarbon (PAH) releases into the aquatic habitat in the planning area resulted in the FFO initiation of a study of potential releases of PAHs into the environment. This study began in 1994. Based on the previous 8 years of data, the FFO concludes that authorized oil and gas activities are not contributing PAHs that would negatively affect the continued existence and recovery of the Colorado pikeminnow or the razorback sucker (Wirth 2002). Developers and operators of the oil and gas facilities on BLM land in the San Juan River basin would continue to follow BMPs to prevent erosion and

the escape of contaminants from their operations.

Bald Eagle. Oil and gas development and operations have the potential to affect wintering bald eagle through the direct loss of habitat or disturbance of birds from human activity. To protect bald eagles, the Bald Eagle ACEC Activity Plan (BLM 1992) was finalized in 1992. The plan identified 37 units totaling 4,141 acres. The major objective of this plan was to protect the most important bald eagle wintering habitat, as well as to protect the bald eagles that use these areas in the winter. Generally, the ACEC units consist of a "core" area of habitat that is actually used by eagles and a buffer area of approximately 1/4 mile of habitat not used by the eagles. No disturbance of core areas would be allowed at any time of year unless formal consultation with the USFWS is conducted. Projects are allowed in the buffer zones from April 1 to October 31, Projects are not allowed in buffer zones in the winter when eagles are in the area.

Mountain Plover. Surveys were conducted for the mountain plover on potential habitat on FFO land between 1998 and 2000, and one adult with a chick was found during these surveys. Approximately 12,000 acres of designated potential mountain plover habitat have been identified on FFO land in the southern portion of the FFO area outside the area of intense oil and gas development. The designated potential habitat has been mapped and receives special management for the mountain plover. Proposed projects inside the designated potential habitat are subject to timing limitations that consist of no surface disturbance during the mountain plover nesting season from April 1 to July 31, or for projects that take place during the nesting season, biological surveys for the mountain plover would be required before the project would be authorized. If plovers were found near the proposed oil and gas well or the facility, site-specific constraints would be developed to ensure that the project would have no negative impacts on plovers. Projects that would create a permanent noise source with the potential to affect a known plover nesting area would be subject to noise mitigation requirements.

Mexican Spotted Owl. Surveys for the Mexican spotted owl on FFO land began during the summer of 1992, in which all potential habitat on FFO land was evaluated and prioritized. These surveys followed the USFS survey protocol (USFS 1996), resulting in no spotted owls being detected. Potential habitat was surveyed again in 1993 and no spotted owls were detected. After 1993, the highest priority habitats on FFO land were surveyed periodically using nocturnal call counts and no spotted owls were detected. Mexican spotted owl critical habitat was designated on FFO land in March 2001 (USFWS 2001). No Mexican spotted owls were found during 2001 surveys. During surveys in 2002, one Mexican spotted owl was found late in the summer. After extensive follow-up surveys, no nest was found and no other owls were found. No spotted owl Protected Activity Centers (PAC) have been designated on FFO land.

The designated Mexican spotted owl critical habitat on FFO land was surveyed and analyzed during the summer of 2001 to establish Reference Conditions of the habitat as outlined in the Mexican Spotted Owl Recovery Plan (USFWS 1995). Three habitat types were established and mapped: 1) mixed conifer, 2) ponderosa pine, 3) piñon-juniper. Out of the 2,617 acres of critical habitat on FFO land, seven small stands of mixed conifer habitat were identified. These stands ranged from 2.3 to 33 acres and totaled 85.7 acres (3.3 percent of the critical habitat). Six stands of ponderosa pine covering 349.5 acres (13.4 percent of the critical habitat) were also identified. The remaining 2,182 acres of the critical habitat (83.4 percent of the total) was classified as piñon-juniper.

Oil and gas exploration and production have occurred on the designated Mexican spotted owl critical habitat since the late 1950s. All of the critical habitat has been leased for oil and gas exploration and held by production. There are currently 23 active wells and 5 abandoned well pads on the critical habitat.

The potential exists for more roads and more well pads to be built in the critical habitat under all alternatives. However, the 85.7 acres of mixed conifer habitat have not been impacted by oil and gas exploration due to the steep and rugged topography of the canyons that support the habitat.

Southwestern Willow Flycatcher. Surveys for the southwestern willow flycatcher began on FFO land in 1993 and after 9 years of surveys, no breeding southwestern willow flycatchers have been detected on FFO land. There are no historic records of this species ever breeding on land administered by the FFO or on nearby lands. The greatest threat to this species is habitat loss. The FFO administers about 7 percent of the river frontage along the San Juan, Animas, and La Plata Rivers in the planning area. This land occurs in small widely scattered parcels surrounded by private lands, which are increasingly being developed for residential uses.

Implementation of the Farmington Southwestern Willow Flycatcher Habitat Management Plan (BLM 1998a) serves to protect FFO lands along the rivers and creates islands of habitat that may improve towards potential willow flycatcher habitat over time. It includes measures to protect potential habitat to ensure that there would be no net loss of potential southwestern willow flycatcher habitat from oil and gas development or other ground disturbance activities.

Other Special Status Species

Not all rare species receive the legal protection of the ESA of 1973, as amended. These species may not be rare enough to warrant protection under ESA, or there may not be sufficient data collected about the species for the USFWS to make a determination to list under ESA. Rare species or species with insufficient data are referred to as sensitive species. BLM policy, as outlined in the Guidance on Special Status Species Management (BLM 6840 Manual), is to manage sensitive species so that actions the BLM funds, authorizes, or carries out should not contribute to species becoming listed under ESA. Lists of special status species are maintained by several agencies, including the USFWS, BLM, USFS, and the State of New Mexico. There are 34 special status species that may have the potential to occur in the planning area (Table 3-12). The FFO has coordinated with other agencies to determine which of these 34 species warrant special management or field studies to collect data.

Currently, the following species receive special management: beautiful gilia, also known as Aztec gilia (*Aliciella formosa*), Brack's fishhook cactus (*Sclerocactus cloveriae var. brackii*), American peregrine falcon (*Falco peregrinus anatum*), prairie falcon (*Falco mexicanus*), ferruginous hawk (*Buteo regalis*), yellow-billed cuckoo (*coccygus americanus*), and western burrowing owl (*Athene cunicularia*). Potential bat habitat is surveyed before construction projects that would impact sandstone cliff faces are authorized. The FFO conducted 3 years of surveys to determine the potential abundance and management needs of the gray vireo. In the future, the FFO will cooperate with other agencies to gather data and develop special management for special status species when the situation warrants.

The BLM would continue to manage non-federally listed species, according to BLM policies and guidelines, with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA.

Land Ownership Adjustments

Land ownership changes planned under Alternative A would not be expected to affect special status species. The FFO will retain in federal ownership all habitat essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and is deemed to be essential to their survival. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal.

OHV Use

Under this alternative of continuing current management, OHV use would be restricted in SDAs that protect T&E species, such as the closed designations in The Hogback ACEC, in which Mesa Verde cactus and Mancos milkvetch are known to occur.

Specially Designated Areas

No modifications or additions to SDAs for special status species would occur under Alternative A. There are 5 areas specifically designated for the protection of special status species: The Hogback ACEC, Aztec Gilia ACEC, Bald Eagle ACEC, River Tracts SMA, and Reese Canyon RNA.

Coal Leasing Suitability Assessment

The development of land suitable for coal development under Alternative A has little or no potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and Coal Belt SMA. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts SMA, would not be affected if coal mining were approved because they would be eliminated through the application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are not close to potential coal mining areas.

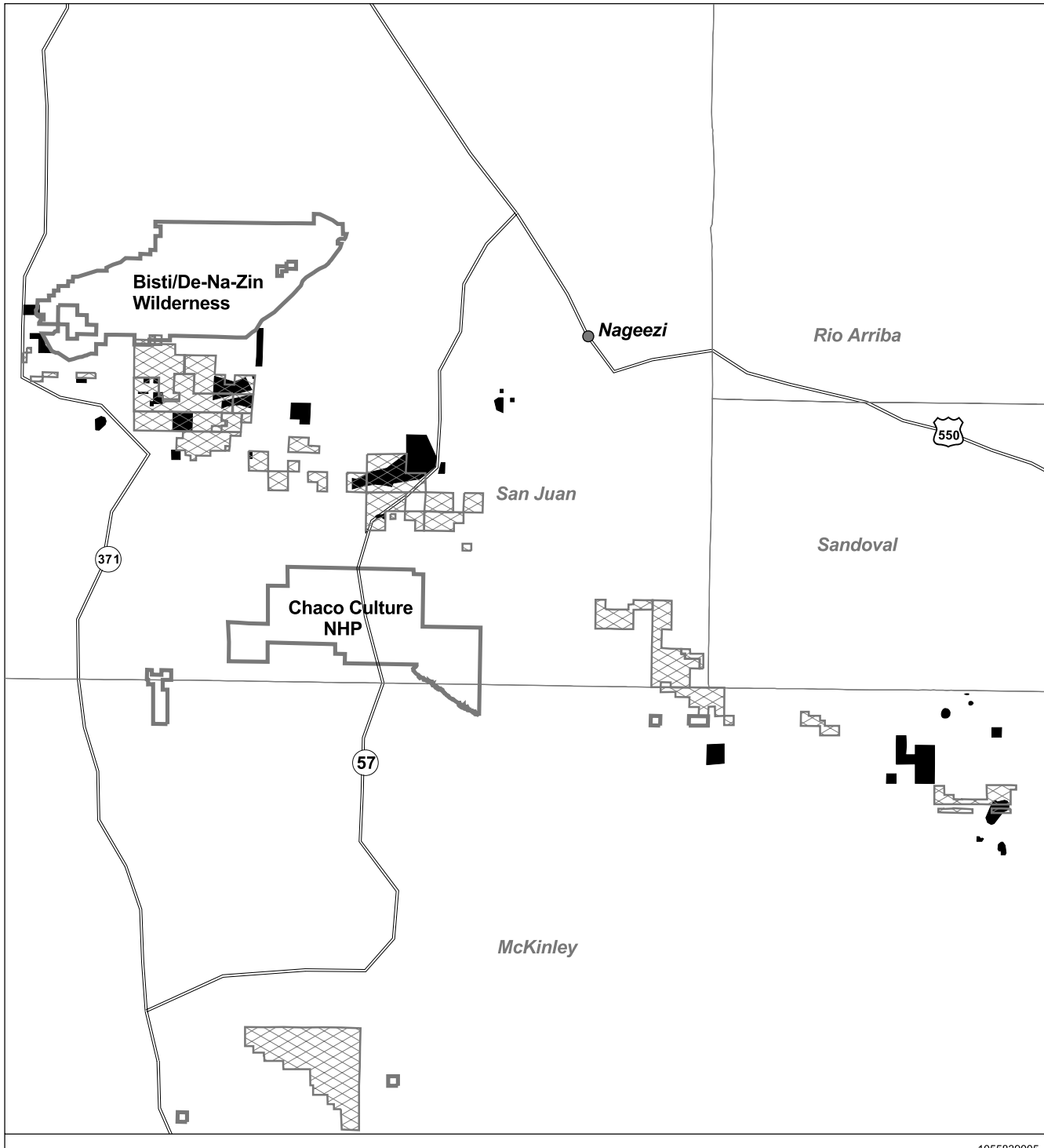
The mountain plover is a federal proposed species that may occur in the area of potential coal mining, as shown on **Map 4-1**. Many of the PRLAs and competitive lease tracts occur near or within the plover potential habitat. Coal mining in and near potential mountain plover habitat would require plover surveys to be completed before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the ESA, so it is anticipated that mitigation measures would be required to minimize impacts.

Coal mining under Alternative A has the potential to impact non-federally listed or proposed sensitive species, but potential impacts would be assessed in a project-specific environmental document and the types of protective measures to be implemented would be determined at that time.

Fisheries and Wildlife

Information on fish and wildlife was obtained from biologists working for the federal agencies in the planning area. Quantitative data regarding the effects of oil and gas development and operations on wildlife was obtained from GIS analysis. Background information regarding the impacts of various activities associated with oil and gas development on wildlife was obtained from the pertinent literature and conversations with agency biologists.

Activities associated with oil and gas development can affect wildlife and their habitat during exploration, development, operations, and abandonment (Bromley 1985). This analysis concentrates on the development and operational processes that occur from habitat alteration and the long-term presence of human activity. Oil and gas operations have the potential to impact wildlife through the direct loss of habitat and disturbance by human activity. Long-term habitat loss would occur from construction of permanent facilities such as well pads, roads, pipelines, and compressor stations. Even after parts of the well pads, roads, and pipelines are revegetated, the piñon-juniper and Great Basin Desert Scrub plant communities that comprise much of the potentially affected habitat would not be reestablished for many years.



Map 4-1: Potential Coal Mining Areas in Mountain Plover Habitat

Source: Reeves 1998, 1999c, 2000

The effects of oil and gas development activities on fisheries could involve physical or chemical changes to streams. A long-term study of PAHs associated with gas wells in the planning are has shown that these contaminants are not migrating off site and entering perennial or ephemeral drainages (Wirth 2001). Current and proposed oil and gas development and operation activities would continue to contribute to increased turbidity in perennial streams and ephemeral drainages. Given that the fisheries and other aquatic organisms in the rivers within the planning area evolved in highly turbid conditions, especially during high flow events, increased turbidity from oil and gas activities may not have a negative effect on them. For these reasons, it is believed that oil and gas well development and operations would not likely have an effect on fisheries and other aquatic resources.

Additional effects of oil and gas development on terrestrial flora and fauna can result from dust, noise, increased human activity due to greater road access, and habitat fragmentation. Although human activity would occur at the well pads and compressor stations on a regular basis, this analysis concentrates on the effects on roads because the road network is expected to be a larger contributor to the fragmentation of habitat within the planning area than the other facilities, and would generate potentially greater impacts from dust and human activity. This fragmentation was analyzed in terms of habitat loss due to road construction as well as in terms of the functional habitat loss that may occur along roads due to human activity.

It has been established that ecological effects of roads are generally negative (Forman 2000). Roads can prevent or hinder the movements of small species of wildlife such as amphibians, reptiles, and small mammals (Gibbs 1998, Trombulak and Frissell 2000). Studies of the effects of major highways on birds have shown reduced density for some species, due mainly to noise levels, not visibility of vehicles (Reijnen et al. 1995, 1996). Ferris (1979) determined that there were no significant effects on breeding bird density attributable to an interstate highway in Maine, but he did find that some forest interior species were less common and some edge species were more common within 100 meters (328 feet) of the highway. For this analysis, it is assumed that the effects of roads and other facilities on song birds are much less than found in the above studies because the traffic volumes are much lower. Human activities along roads may disrupt nesting raptors such as the northern goshawk and golden eagle (Reynolds et al. 1992, Trombulak and Frissell 2000).

A summary of some of the literature shows that ungulates may be affected by roads depending on their distance from roads (Rost and Bailey 1979, Rowland et al. 2000, Dyer et al. 2001), road density (Lyon 1983, Unsworth et al. 1998, Millspaugh et al. 2000), vehicle use levels (Cole et al. 1997, Dyer et al. 2001), road distribution and management (Cole et al. 1997, Rowland et al. 2000), surrounding habitat and terrain (Unsworth et al. 1998, Rowland et al. 2000, Dyer et al. 2001), season (Millspaugh et al. 2000, Rowland et al. 2000), sex and age of animals (Unsworth et al. 1998), and hunter use (Cole et al. 1997, Millspaugh et al. 2000).

The avoidance of roads by large species of mammals has been documented to result in the functional loss of habitat and reduced carrying capacity (Dyer et al. 2001, Rowland et al. 2000). Such avoidance behavior has been observed for mountain lions (*Felis concolor*), mule deer, and elk (Dyer et al. 2001, Rost and Bailey 1979, Lyon 1983, Rowland et al. 2000, Van Dyke et al. 1986). Rost and Bailey (1979) found that deer and elk avoid roads particularly within 200 meters (656 feet) and Forman (2000) also assumed a 200-meter (656-foot) disturbance zone on each side of secondary roads. Hershey and Leege (1976) and Ward (1976) found reduced habitat use by elk within 0.25 mile (1,320 feet) of roads. There appears to be little information on the effects of roads on pronghorn antelopes, although Ward (1976) found that pronghorn antelope were apparently not affected by traffic along an interstate highway. Ungulates such as mule deer and elk

tend to avoid habitat along well-traveled highways to a greater extent than lighter traveled secondary roads (Ward 1976), and it is assumed the same holds true for pronghorn.

Analysis is concentrated on mule deer and elk because their habitat is already fragmented, and additional oil and gas development has the potential to negatively affect their habitat. The analysis also considers pronghorn antelope and other wildlife to a lesser degree.

Studies regarding ungulate avoidance of roads have not been conducted on land within the planning area, but given the widespread documentation of this phenomenon, it is assumed that mule deer and elk would avoid most open roads. Based on information in the literature, it was assumed that deer may avoid habitat within 660 feet of roads and elk within 1,320 feet of roads. These distances were used to determine the potential functional habitat loss along roads, which does not equate to the total abandonment of the habitat but to reduced use of the habitat. For example, elk use of habitat within 1,320 feet of an interstate highway was 20 percent of the habitat use farther away; along gravel secondary roads, it was about 44 percent of habitat use farther away (Ward 1976). In the analysis, the number of habitat fragments were also determined within 0.5 mile from roads because security cover of contiguous tracts of land over 250 acres in size and at least 0.5 mile from the nearest road may be important for elk during hunting season.

This analysis of impacts on wildlife under the alternatives concentrates on the land in the high development area on FFO land. The analysis also addresses oil and gas development on USFS, USBR, and AFO land, but to a lesser degree. Within the high development area, the focus of analysis is on the 397,000 acres of public land in the 13 Wildlife Areas proposed under Alternatives C and D. The impacts within these areas are discussed under all alternatives to provide a means for comparison across alternatives. These areas are used because they encompass the major wildlife use areas and contain the 134,000 acres currently managed by the FFO, identified as Critical Big Game Habitat under Alternatives A and B (Table 2-5).

Oil and Gas Leasing and Development

There are currently an estimated 1,886 miles of roads within the boundaries of the wildlife areas that are the focus of analysis, 1,650 miles of which are on public land. In the 397,000 acres of public land in wildlife habitat, the road density averages approximately 2.6 miles per square mile (mi/mi^2). There are an estimated 4,528 existing wells that, along with roads and pipelines, have resulted in the long-term loss of almost 19,000 acres of habitat, or 4.8 percent of the area (**Table 4-6**).

Functional habitat was calculated for public and non-public land in the 13 proposed Wildlife Areas because big game and other wildlife move freely between public and non-public land. The total area within the 13 Wildlife Areas is approximately 523,700 acres. Functional habitat loss in this area is estimated to be 238,400 acres (46 percent of total), when taking into account all areas within 660 feet of roads and 391,790 acres (75 percent) within 1,320 feet of roads (Table 4-6). In other words, an estimated 46 percent of the approximately 523,700 acres of wildlife habitat occurs within 660 feet of a road and 75 percent within 1,320 feet of a road. This land may be receiving less use by mule deer and elk, and perhaps by other species of wildlife, than areas further than 1,320 feet from roads.

Table 4-6. Estimated Functional Habitat Loss and Projected Levels of Disturbance on Public Land in the Proposed Wildlife Areas on FFO Land[1]

Disturbance Category	Oil and Gas Facilities[2]						Functional Habitat Loss[3]			
	Roads		Wells[4]		Total[5]		660-foot Road Effects Zone		1,320-foot Road Effects Zone	
	Miles (mi/mi^2)	Acres Disturbed	Number	Acres Disturbed[4]	Acres Disturbed[5]	% of Total Area[6]	Acres Affected	% of Total Area[7]	Acres Affected	% of Total Area[7]
Current Disturbance	1650 (2.6)	9,900[8]	4,528	9,056	18,956	4.8%	238,400	46%	391,790	75%
Projected Disturbance										
Alternative A	44 (0.1)	-[9]	542	1,712	20,668	5.2%	245,440[10]	47%	405,870[10]	78%
Alternative B	296 (0.5)	-	3,653	11,546	30,502	7.7%	285,760[10]	55%	486,510[10]	93%
Alternative C	219 (0.4)	-	2,712	8,570	27,525	6.9%	273,600[10]	52%	462,190[10]	88%
Alternative D	220 (0.4)	-	2,712	8,570	27,525	6.9%	273,600[10]	52%	462,190[10]	88%

Notes: (1) Proposed wildlife management areas would not be part of Alternatives A and B; only some would be part of Alternative D. The current and projected acreage disturbed in these areas is shown under each alternative for comparative purposes.

(2) Includes oil and gas facilities only on public land.

(3) Functional habitat loss indicates habitat in the area of roads that is potentially used to a lesser degree then habitat further away from roads. Functional habitat loss was assessed for zones of 660 and 1,320 feet on each side of the roads.

(4) Current disturbance assumed 2 acres per existing well. Projected disturbance acreage calculated as described under Watersheds in Chapter 4.

(5) Total equals land disturbed for new wells, roads, and pipelines, plus current land disturbance.

(6) Total area equals 397,000 acres of public land within the 13 proposed wildlife areas.

(7) Total area equals 523,700 acres of public and non-public land within the boundaries of the 13 proposed wildlife areas. Non-public as well as public land is included in the functional habitat loss analysis because big game and other wildlife move freely between public and non-public land.

(8) Assumes 6 acres disturbed per mile of road using a 50 foot right-of-way.

(9) Acreage of land disturbed for new roads for each alternative is included in the acres disturbed for new wells.

(10) Acreage for alternatives = current functional habitat loss + estimated additional functional habitat loss estimated due to implementation of the alternatives. Likely an over-estimation of functional habitat loss because location of new roads is not known and some new roads would occur in areas already included in the existing functional habitat loss acreage.

Current habitat fragmentation by roads and three roads effects zones were calculated for all of the land within the 13 proposed Wildlife Areas (523,700 total acres) (**Table 4-7**). Habitat fragments were calculated for land at least 0.5 mile from the nearest roads because such habitat may be important to elk as escape cover during the hunting season (Millspaugh et al. 2000), and this also likely applies to mule deer. Elk habitat should be a contiguous area of at least 250 acres at least 0.5 mile from the nearest road. The percentage of habitat fragments outside roads and the road effects zones ranges from 98 percent of the habitat in fragments created by roads alone to 4 percent of the habitat created by the 2,640-foot road effects zones (Table 4-7).

Table 4-7. Habitat Fragments Created by Roads and Road Effects Zones in Proposed Wildlife Areas on FFO Land[1]

Fragment Categories	All Fragments			Fragments 250 Acres or More		
	Number	Average Size (acres)	% of Total Area[2]	Number	Average Size (acres)	% of Total Area[2]
Fragments created by roads alone	832	616	98%	186	2,585	92%
Fragments outside the 660-foot road effects zone	700	381	53%	198	1,226	46%
Fragments outside the 1,320-foot road effects zone	699	167	22%	105	845	17%
Fragments outside the 2,640-foot road effects zone	163	131	4%	25	635	3%

Notes: (1) Refers to 13 wildlife areas proposed for Alternative C.

(2) Total area equals approximately 523,700 acres of public and non-public land covered by 13 proposed wildlife areas on FFO land. Percent of total area refers to area of land covered by fragments created by roads alone and the percent of total area covered by habitat fragments outside the three different road effects zone categories.

Analysis of habitat fragments 250 acres or more shows a broad range in number, average size, and percent of habitat available outside the effects zones, depending on the fragment category considered. There are an estimated 25 habitat fragments of 250 acres or more totaling over 15,800 acres at least one-half mile from the nearest roads (Table 4-7), covering only 3 percent of the total area. Supporting information on the current amount of habitat disturbed, the projected amount of land disturbance, and habitat fragments for each of the proposed 13 Wildlife Areas appears in an unpublished technical report (SAIC 2002a) available at the FFO.

Current oil and gas development also may affect mule deer, elk, and other wildlife on USFS land. It is assumed that the impacts of oil and gas development and operations on these wildlife are less than on FFO land because the road density on the USBR land (2.3 mi/mi^2), Carson National Forest (CNF) (1.6 mi/mi^2), Santa Fe National Forest (SFNF) (1.4 mi/mi^2), and AFO land (2.0 mi/mi^2) are much less than on FFO land. In addition, well density is less on these lands than on FFO land.

It is assumed that the amount of current habitat alteration and loss in the planning area have resulted in a reduction in habitat carrying capacity for mule deer, elk, and other wildlife, but the degree of this reduction is not known. The potential impacts on wildlife due to habitat fragmentation and direct habitat loss presented in this RMP/EIS are based on research completed mainly outside the Southwest. Assessments of local wildlife populations are planned by FFO staff through monitoring activities to determine actual effects in the field.

Monitoring activities are summarized toward the end of this chapter.

The estimated additional direct habitat loss due to projected oil and gas development under Alternative A (1,712 acres) (Table 4-6) would be likely to further reduce the carrying capacity of the habitat for mule deer, elk, and other wildlife. The level of this reduction cannot be quantified due to 1) incomplete data on mule deer and elk populations in the planning area, 2) variations in animal reactions to vehicle density, road density, and other factors, 3) the lack of site-specific data on the effects of roads on mule deer and elk, and 4) the lack of information on the exact location of new wells and roads. It is concluded that oil and gas development under this alternative would result in a slight reduction of the mule deer and elk populations in the planning area because it would add to habitat fragmentation.

Pronghorn antelope occur principally in the Ensenada Mesa area, covering 43,179 acres of public land with 255 miles of existing roads, a road density of 3.8 mi/mi^2, and 753 existing well pads. The amount of existing long-term habitat loss is estimated to be over 3,000 acres or 7 percent of the area. A total of 57 wells would be developed in this area under Alternative A, and long-term disturbance including roads and pipelines would affect about 180 acres or 0.4 percent of the total area. Implementation of Alternative A may result in negative impacts to the pronghorn antelope due to oil and gas development, but the degree of this impact cannot be quantified because of: 1) lack of information on the location of new roads and wells; 2) lack of site-specific data on the effects of roads on antelope; and 3) variations of animal response to vehicle density, road density, and other factors.

Other species of wildlife that would be affected by oil and gas development would be those found in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. Reptile and small mammal inventories have not taken place within the planning area, although some breeding and wintering bird surveys have been completed. The distribution and abundance of bird species may be altered, depending upon the density of wells and roads, but quantifying this change would be difficult with current data. However, the FFO conducts point count surveys over 9 transect routes twice a year in piñon-juniper and Great Basin Desert Scrub habitat types to monitor changes in the numbers and distribution of bird species. Data from these surveys may be used to document future habitat disturbance and its impact on birds.

The impacts to avian species due to habitat fragmentation are somewhat variable as reported in the literature. Variables influencing this are the type of habitat affected, the magnitude of the disturbance, and the species of the birds involved. Much of the high- density natural gas development in the FFO occurs in the northeast part of the field office area where piñon-juniper are dominant. Paulin et al. (1999) found that "a landscape mosaic that intersperses cover patches with openings providing foraging and browsing opportunities may be the best way to meet an array of management objectives." Successfully revegetating pipeline rights of ways and the edges of well locations may assist in accomplishing this mosaic. In addition, this interspersion of potential foraging areas may help offset the long-term loss of nesting habitat and mast such as piñon-pine seeds and juniper berries.

Under Alternative A, new wells and roads would result in the long-term loss of an estimated 335 acres in the CNF, 6 acres on the SFNF, 70 acres on USBR land, and 500 acres on AFO land. Most of the land that would be disturbed by these activities is in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. This long-term loss would affect many of the same species as those assessed above for FFO land, including mule deer and elk. Pronghorn antelope do not occur or are uncommon in these areas. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower levels of habitat disturbance.

Land Ownership Adjustments

Over 328,000 acres of FFO land would be available for disposal, mostly south of US 550. This acreage is scattered without being concentrated in a particular wildlife habitat area, so the change in ownership is not expected to significantly affect wildlife habitat.

OHV Use

Approximately 1,230,000 acres of land would be open to OHV use on FFO land under Alternative A. OHV use can have negative effects on plant communities, and therefore negative effects on wildlife habitat. OHV use also occasionally results in direct wildlife mortality, harassment of wildlife, and wildlife abandonment of an area due to human intrusion. The degree of the effect of OHV use on wildlife on FFO land has not been determined, but since it is assumed that OHV use is greater close to the tri-cities area and decreases with distance from the cities, the greatest amount of use is in marginal wildlife habitat in the tri-cities area and less use occurs in habitat further away from the tri-cities area**.** There is potential to have negative effects on wildlife from open OHV designations in most of the FFO area.

Specially Designated Areas

There would be no additions or modifications to specially designated wildlife habitat areas under Alternative A. The Critical Big Game Habitat management areas would continue to be managed with timing limitations on oil and gas operations between December 1 and March 31 to protect turkeys, elk, and deer populations.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal mines have the potential to affect a large amount of land, most of which would not be near the major wildlife habitat areas. Proposed coal mines would go through the NEPA process and site-specific analysis of the proposed project impacts on wildlife habitat would be performed at that time.

Wilderness

Wilderness values can be degraded when and if human activities (and the evidence thereof) impair pristine qualities and naturalness. Oil and gas infrastructure and operations and OHV use are expanding in the region and could intrude on natural qualities in protected areas.

Because of the restrictions and protection associated with wilderness designation, no direct impacts are anticipated to the Bisti/De-na-zin WA from any of the alternatives. Direct impacts would only occur if oil and gas development were allowed within the WA or any of the WSAs in the planning area. Only valid existing rights predating enactment of the Wilderness Act (for WAs) and FLPMA (for WSAs) could be developed, and these would be regulated to prevent unnecessary or undue degradation of wilderness qualities. Indirect impacts would occur if activities located outside WAs or WSAs caused conditions that would be noticeable and detrimental to wilderness qualities, such as noise, dust, modifications to surrounding landscape, or ecological changes to a larger area. Cumulative impacts could result from other actions in the region that, combined with actions on public lands, could impair wilderness values.

Oil and Gas Leasing and Development

Oil and gas development along the periphery of the Bisti/De-na-zin WA and the Ah-shi-sle-pah WSA could generate noise that indirectly affects natural quiet in some locations within the protected areas. Similarly, development outside these areas could affect viewsheds from locations within the protected areas. Most surrounding areas are VRM Class III and IV, where fewer visual management constraints would be imposed on new development.

The 5 WSAs within the planning area in the AFO are closed to oil and gas development and mineral entry. Any new development in the AFO area would be outside the WSAs and

could only have minor indirect effects on peripheral areas.

Land Ownership Adjustments and Specially Designated Areas

Several actions would increase the potential for the Ah-shi-sle-pah WSA to become recommended and ultimately designated as wilderness. These include possible de-selection of acreage within the WSA by Navajo tribe and adjudication of PRLAs (making coal development less likely), inventory of adjacent lands with wilderness suitability and acquisition of these lands, and a revised recommendation to favor wilderness designation. Designation of this WSA as wilderness would add 6,563 acres to the most protected land category within the FFO and ensure that wilderness qualities would be protected for future generations.

If the Ah-shi-sle-pah WSA is designated as wilderness, its 6,563 acres would be permanently withdrawn from mineral leasing. Any leases with valid existing rights would be managed under principles of nondegradation of wilderness values. This would result in added areas with a high degree of protection of natural resources and naturalness and provide more areas for primitive and remote recreational experiences.

Ongoing FFO actions to acquire inholdings (primarily state and tribal lands) will continue in the WA. The larger consolidated wilderness created in 1996 would augment the possibilities for remote experiences, create a more manageable land unit, and lessen the potential for indirect effects from activities on adjacent lands that are not under federal management.

OHV Use

There would be no change in OHV designations that currently close the WA and WSAs to OHV use.

Coal Leasing Suitability Assessment

There is some uncertainty about lands within the Ah-shi-sle-pah WSA that could be de-selected by The Navajo Nation or by adjudication of PRLAs for possible coal development. If adjudication favors the PRLAs, mining of coal would be likely on a large part of the WSA, which would effectively degrade the natural qualities of this area. Indirect impacts from development on adjacent areas would be possible. Any future coal development of specific tracts of federal land would require further NEPA review prior to a decision. Development on adjacent areas may be regulated to minimize indirect impacts of nearby human activity.

Rangeland

Impacts to rangeland and livestock grazing would occur from any actions that would damage forage, modify land ownership and access to grazing allotments, or require major rangeland improvements in order to continue grazing. Grazing allotments cover most of the FFO area.

Oil and Gas Leasing and Development

Surface disturbance caused by oil and gas development would result in damage to vegetation used for forage and reduction of the acreage available for livestock grazing. Many issues have been raised by grazing permittees regarding poisoning or other physical damage to livestock near oil and gas wells, especially where the well pads are not fenced. Livestock may inhibit reestablishment of reseeded areas around new development by grazing new seedings. Conflict resolution between competing land uses would continue to require mediation by the FFO under all alternatives. Surface disturbance from construction of oil and gas facilities, and the movement of trucks and other equipment from site to site, often accelerate the spread of noxious weeds that can poison livestock and compete with desired rangeland plants.

There would be fewer new well sites under this alternative, so the impacts from oil and gas activity on grazing would be the least of the four alternatives, but there would be a reduction in forage and an increase in the spread of weeds in the high development area.

Land Ownership Adjustments

Land disposal could change the grazing authorization in the FFO area. Most disposal areas would be transferred under R&PP Act regulations and grazing could be continued. Under Alternative A, most of the land identified for disposal would be located south of US 550, so the grazing allotments in this area would be the most likely to be affected by changes in land ownership.

OHV Use

Unlimited OHV access would continue to damage forage in most of the FFO area. This would lead to loss of topsoil, a reduction of soil quality, and a downward trend of forage in the most used OHV areas. Improving rangeland health to meet the BLM standards would be more difficult to achieve because cross-country travel could damage forage and spread weeds. Open OHV access would continue to generate conflicts between permittees and other land users. Unlimited access increases the opportunity for vandalism of range improvements, cut fences, and harassment of livestock.

Specially Designated Areas

Grazing limitations are identified under some of the SDAs within the FFO. Under Alternative A, there would be approximately 10,000 acres in 22 SDAs that would limit grazing. These management prescriptions are identified in Table 2-5 under the Grazing heading for each area listed under this alternative.

Coal Leasing Suitability Assessment

Additional coal mining, if approved, would remove more rangeland from forage production and would result in changes to the grazing authorization for the life of the mining operation. There would be the potential for land use conflicts between mining operations and grazing permittees that would require mediation by FFO staff.

Lands and Access

Scoping raised several issues associated with lands and access, focused primarily on potential impacts to private land. These are listed below:

- Noise, visual intrusions, dust, and traffic associated with oil and gas development and operations can be incompatible with residential and commercial uses.
- The proportion of land in federal ownership in the planning area constrains development, particularly in the growing tri-cities area.
- Oil and gas vehicles cause damage to county roads that serve residences and schools.
- New Mexico's policy on livestock control can cause conflicts between land users where private and public lands interface.
- Private property in split estate situations can lead to land use conflicts when owners are unaware of severed mineral rights.
- Trespass structures and uses occur on public land.
- Open access for motorized vehicles on public land can lessen the suitability of adjacent private lands for residential uses.
- The proliferation of oil and gas field roads is widely seen as a problem both in terms of the environmental and visual damage, and also in providing public access through and in proximity to private land.
- Increased oil and gas development could increase traffic and maintenance needs on the existing road network.

Direct impacts on lands result from physical restrictions and loss (or gain) of land for a specific use. Indirect impacts occur when activities permitted on public land create conflicts with uses on private lands. For

example, compressor noise at well sites, dust, and truck traffic related to oil and gas operations can be incompatible with residential uses. Cumulative impacts on land use in the region would result if activities and management of public land, in combination with other uses or foreseeable actions, could displace a valued use, interfere with planned development, or be detrimental to public welfare or safety.

Oil and Gas Leasing and Development

Access issues in the FFO are primarily associated with oil and gas activities. Concerns include the volume of industry-related traffic on oil and gas service roads, county roads, and state and federal highways; allocation of maintenance responsibilities for roads used mostly by industry; and the proliferation of roads. Some roadways crossing federal land also cross on ROWs through private property. Occasionally, access can be limited when these roads are gated. Sometimes this occurs when ROWs expire and are not renegotiated with the landowner. Roads can also be closed to protect other resource values.

Table 4-8 shows the estimated change in vehicular activity from oil and gas field activities for each alternative. Alternatives are compared to a range of current and recent levels of oil field operations that generate between 17,300 and 21,000 average daily well site visits on federal land, and about 23,500 to 27,500 in the San Juan Basin (including non-federal land).

Table 4-8. Estimated Oil and Gas Well Site Visits by Alternative for 20-Year Planning Period

	Average Daily Trip Numbers			
	Alternative A[1]	**Alternative B**	**Alternative C**	**Alternative D**
Existing Wells				
Maintain wells (federal)	14,720	Same as Alternative A	Same as Alternative A	Same as Alternative A
Maintain wells (non-federal)	3,680			
Subtotal	18,400			
New Development				
Develop wells (federal)	130	400	300	300
Maintain new wells (federal)	2,440	7,330	5,430	5,490
Develop wells (non-federal)	140	140	140	140
Maintain new wells (non-federal)	2,550	2,550	2,550	2,550
Subtotal	5,260	10,420	8,420	8,480
Total Trips				
Wells on federal land	17,290	22,450	20,450	20,510
Wells on non-federal land	6,370	6,370	6,370	6,370
Total	**23,660**	**28,820**	**26,820**	**26,880**
Percent change from current levels (federal land)[2]	**-16%**	**+8%**	**-3%**	**-2%**
Percent change from current levels (all lands)[2]	**-20%**	**+11%**	**-2%**	**-2%**

Source: BLM 2000e.

Notes: (1) Based on trip number per function.

(2) Based on 21,000 visits on federal land and 27,500 visits to all well sites currently.

Well site visits account for development activity (including well, roads, and pipeline construction), annual maintenance on existing and projected new wells, and reductions from reclaimed wells. They also assume that well field activity occurs 365 days per year. Trips are based on the number of times a specific well site is a destination per year for certain maintenance functions or development activities. Maintenance may be performed on several wells in a day. While this is counted as several visits, it may in fact reflect one round trip with several "stops" along the way. These numbers are not the same as average traffic levels that are counted for discrete roadways by traffic counters, and therefore cannot be used to estimate additional traffic on a particular roadway. Table 4-8 shows that development on federal land accounts for about two-thirds of the estimated traffic volume from the oil and gas industry in the planning area currently. The trips cannot be attributed to specific roads, and are therefore most useful in estimating relative changes. There are no data on the level of traffic on oil and gas service roads and county roads. It is not known what portion of traffic on state and federal highways is attributable to industry use. It is generally known that county roads 2770, 4490, 4599, 7250 and 4990 are some of the most heavily used roads providing access into the oil and gas fields, and that the majority of the traffic on these roads is related to industry.

Impacts described below focus on overall change in traffic volumes in the planning area from oil and gas activities. The contribution of activities on federal land is provided as a percentage of overall changes.

Oil and gas development under this alternative would continue at the same level as current operations. Over the 20-year period of analysis, about 2,000 wells would be plugged and abandoned, and the sites reclaimed. With projected new development, about 8,130 acres would be disturbed and no longer available for a variety of surface uses. About 300 miles of new oil and gas service roads and 5,200 acres for new pipelines would generally be located within existing ROWs. Where feasible, new major pipelines would be placed in existing utility, communication or highway corridors identified in the Western Regional Corridor Study (WUG 1992).

Over 20 years, about 9 large Phase I compressors (over 2,000 HP), about 133 new Phase II well compressors (500 to 2,000 HP), and 2,230 wellhead compressors (100 HP) would be installed at new sites on land with federal minerals and about 7,200 at existing well sites. These sites would be distributed throughout the high development area and could be located near communities and residences. Noise levels from some of these sites and smaller compressors at specific wells could be incompatible if located close to existing residences. As local noise ordinances are developed to address oil and gas issues, these would be enforceable on new permits within those jurisdictions. In the meantime, municipalities and BLM would continue to resolve noise conflicts on a case-by-case basis. The number of complaints and cases requiring resolution would be likely to increase as a result of the increased density of compressors, particularly near urban areas or communities. Temporary impacts could occur throughout the FFO from construction and development activities, such as noise, dust, and emissions from construction equipment and vehicles, but these would be localized and temporary in nature and have no long-term effect on any particular land use.

Currently, about 11 percent (744,500 acres) of the land within the FFO area has split mineral estate. There are just over 100,000 acres of private land within 3 miles of the tri-cities area incorporated boundaries, and about half this land has split estate. It is expected that the federal government would retain mineral rights to any lands disposed of by sale, exchange, or R&PP transfer. This could increase the amount of land in split estate in the FFO by about 264,800 acres (or 36 percent), increasing split estate from 11 to 15 percent within the FFO administrative area. This would continue to be an issue, particularly for private

lands near urban areas where future development options may be constrained by the potential for oil and gas development. Split estate complicates the oil and gas leasing process and therefore does not favor production. In urban areas, the surface land use controls of local jurisdictions would apply lease terms for oil and gas development on private land.

Where federal oil and gas minerals are developed on non-federal land (split estate areas), there is potential for incompatibility between existing or planned use of the surface real estate, and oil and gas operations with their noise, traffic, and visual appearance. BLM would continue to coordinate with surface owners on suitable conditions of approval on APDs. Local plans or zoning codes can influence the types of conditions that may be incorporated into drilling permits. These would generally provide for management of not only the subject property, but adjacent areas as well. On tribal land, the appropriate tribal office, BIA, and allotment holders, where applicable, would review applications. Issues of conflicting uses, loss of land for specific uses, or access concerns would be considered on a case-by-case basis. Adjustments in well locations, noise reducing measures, or other mitigations may be required to minimize conflicts with surrounding land uses.

Over the 20-year period of analysis, there may be a net increase of about 2 percent in the mileage of roads within the high development area of the FFO. This does not account for restoration or closure of roads as well sites are reclaimed. The projected number of daily trips for Alternative A would be the same or less than current levels from operations on federal land, based on typical fluctuating levels of activity over the last few years. No impact on service capacity of roadways would be caused by this alternative.

The new FFO Roads Committee and program is aimed at dividing fiscal and road maintenance responsibilities fairly between the BLM, counties, and the oil and gas industry. This is expected to improve some of the maintenance problems that have occurred in the past and provide a better and more equitable division of resources. In the meantime, San Juan County will emphasize maintenance on county roads that serve residences and schools. The roads program would inventory the level and type of traffic on BLM roads and make needed improvements over time.

Land Ownership Adjustments

Land would be available for disposal or transfer south of US 550; however, fewer land adjustments are expected in the future. This is due to the depletion of desirable acquisition lands through a series of successful exchanges since 1988 RMP was completed. BLM land in the tri-cities area would still be available under R&PP Act applications. Disposals from the 1988 RMP would be carried forward (listed in Appendix F) and land south of US 550 would generally be available for exchange. All disposals would be reviewed for consistency with BLM and local plans and objectives. Disposal should provide a greater public benefit for appropriate use of land resources and may be implemented when the disposal does not conflict with resource protection and manageability of public lands. The BLM would generally maintain any existing valid mineral rights, increasing potential for split estate conditions. As such, development options on split estate lands may be constrained by the potential for future oil and gas development.

Acquisition of up to 127,782 acres of inholdings would consolidate federal ownership, particularly in locations with distinctive resource values. This should make these areas easier to manage and improve access to public lands. Management prescriptions may limit use on some acquired lands (such as for grazing, future mineral access and leasing, or cross-country vehicular traffic). Under the FFO road program, BLM would retain any needed ROWs on disposal properties, therefore sales, exchanges, and transfers of land should not impact existing access. Acquisition of inholdings in SDAs would

generally improve continuity of access due to consolidated ownership.

OHV Use

Conflicts among OHV users, private property owners, and ranchers arising from unlimited cross-country vehicular access would continue under ongoing OHV policy. It is possible that some additional roadways would be closed to protect wildlife or other resources values as plans are developed for each OHV management unit.

Specially Designated Areas

BLM would attempt to acquire 127,782 acres of inholdings and any underlying non-federal mineral rights within the boundaries of SDAs. The acquired lands would be managed under the public land laws and any management prescriptions applicable to the contiguous public lands. Acquisition of inholdings would consolidate federal ownership, particularly in locations with distinctive resource values. This should make these areas easier to manage and improve access to public lands.

Coal Leasing Suitability Assessment

Unsuitability criteria have already been applied to the PRLAs, Coal Belt SMA, and the 17 competitive lease tracts. Reapplication of the unsuitability criteria would be required for any future applications to lease land in the FFO for the purpose of coal mining. This process would eliminate the potential for incompatible mining activities in many areas that have special resource values or special protection, such as WAs, WSAs, cultural sites, special habitat. Buffer distances would be required between any future site and community and private land uses, such as schools, residences, cemeteries, and parks, that are considered incompatible or sensitive to coal mining. However, these minimal separations and the application of the unsuitability criteria would likely provide little attenuation of changes in visual context and character, noise, traffic, or dust to nearby locations from development of a new coal mine. Specific mine proposals would need to be environmentally assessed to address site-specific compatibility issues in the approval process.

Applications for sites for collecting home fuel are reviewed on a case-by-case basis. This would limit potential for permitting sites that are incompatible with surrounding uses.

Visual Resources

The primary issue related to visual resources is the degree of visible change that may occur in characteristic landscapes, viewsheds, and areas with high scenic value. Project activities can introduce differing elements of form, line, color, and texture into the landscape. Direct impacts result from construction or placement of manmade features, such as roads, structures, equipment, or manipulation of vegetation. Indirect effects can result when actions change conditions that result in unsightly landscapes.

The degree of contrast and dominance of changes within the viewing area are the measure of change. Contrast also depends on viewing distance and the size of the features. Generally, the foreground refers to an area within a few yards to several hundred yards from the viewer, the middle-ground is several hundred yards to 5 miles from the viewer, and the background is generally beyond 5 miles from the viewer. In conjunction with the degree of contrast, the sensitivity or visual value of a location is considered when assessing overall impact to visual resources. Noticeable levels of visual modification in areas with lower visual value (VRM Classes III and IV) would produce less impact than the same degree of change in an area that has high visual value (VRM Classes I or II).

Several concerns were identified by BLM specialists and the community, particularly relative to the effects of energy development and OHV use on the visual quality of the surroundings. These are summarized below.

- It is generally perceived that the visibility of manmade features (roads, oil and gas wells, pipelines) in the

landscape has increased significantly in the last few decades.

- Many unauthorized roads are created when vehicles (both recreational and industry) take short cuts and drive around barriers. These tracks are then used repeatedly until the path becomes an unofficial road. This adds to the proliferation of roads and their visual impact.
- Visual scarring from OHV use is increasing, particularly around urban areas that are more accessible.
- Heavy trucks and vehicles operate on low-grade roads after rains and snow, and create large ruts that become gullies, widen the width of the original road, and create unsightly ground disturbance in the natural landscape.
- Well pad size and density contribute to a high degree of modification to the natural landscape. Well sites are located in prominent and visible locations, rather than sited to minimize their visibility from more traveled roadways and recreation spots.
- Follow-up and monitoring of reclamation activities (such as reseeding) is inconsistent, so these management prescriptions do not produce the intended natural restoration.
- Unreclaimed sites and discarded equipment add to the preponderance of manmade intrusions in the landscape.

Under all of the alternatives, construction of new well pads, pipelines and road segments, and associated clearing of vegetation have the greatest potential to alter visual conditions. Other major components associated with oil and gas development include water disposal well facilities, on-site water storage tanks, overhead powerlines, and compressor stations.

Well pads and facilities are visually dominant in the foreground and greatly alter the immediate environs. Several conditions influence the visibility of new and existing elements, such as vegetative cover (type and density), terrain and line-of-site, and presence of other elements with visual dominance in the viewing area. When vegetative cover is low, new well pads and equipment would produce a moderate degree of contrast and change in the foreground. When vegetative cover is moderate to dense, clearing for new pads would introduce a high degree of change in the foreground and moderate change on middle-ground views. Most oil and gas facilities and related infrastructure have relatively little visibility in distant landscape views and therefore have little impact from afar except where vegetation is dense or line-of-sight is uninterrupted.

Very little exploratory work is expected in the planning area because the mineral resource is well defined. Activities during construction generate short-term visual impacts such as dust, truck traffic, night time site lighting, and placement of heavy equipment. Longer term visual impacts result from clearing vegetation from about 5 acres for new well pads, pipelines, and road segments. (Part of this area is reseeded after initial construction.) The contrast created by vegetation removal depends on the type and density of the cover. Longer-term visual scars can also be created from some sites that require a large amount of cutting and filling that contrasts with surrounding landforms. Structural contrast is largely related to the distance from which components are observed. Under STCs, measures are taken to minimize visibility, such as aligning new road and pipeline with land contours, and painting equipment to blend with natural color tones. In general, during the production phase, well pad facilities become subordinate to the landscape in middle-ground view (between 0.25 and 1 mile) and noticeable but not dominant to a casual observer in background views (1 to 5 miles) (BLM 2000e). Other larger facilities, like major new pipeline corridors, longer road segments, compressor stations, or resource storage centers, may be visible in distant views.

During the abandonment phase, equipment is removed and disturbed surfaces are

reclaimed with appropriate seed mixes. When sites are successfully restored to a natural condition, long-term improvement to the characteristic landscape results. Under each alternative, a projected level of reclamation would offset the impacts of new development. The net change is considered for each alternative below.

Because locations of specific well sites are not known, and impacts are most apparent in localized settings, the impact evaluations in this Proposed RMP/Final EIS are based generally on the projected percentage increase of oil and gas features in the landscape during the 20-year period of analysis. The potential for project activities to affect VRM Class I and II areas is noted within the FFO area. Because no new wells are projected within SDAs in the AFO, little or no impacts are expected to sensitive visual resources in the AFO area. Within the USFS land, there is strong precedent for enforcing visual management objectives. This is expected to continue and to minimize impacts on sensitive locations within the Jicarilla and Cuba Ranger Districts.

Within the planning area, the use of vehicles off roadways is another activity that causes visual changes. OHV activity can create pathways of disturbed vegetation, which form noticeable linear elements, and can also contribute to soil erosion and subsequent change or loss of vegetation. This kind of damaging activity appears unsightly to many viewers because of the associated environmental degradation. This disturbance can be highly visible in areas where vegetation is removed, or in unvegetated landscapes where tracks can be highly noticeable. However, in some situations, dense vegetation can also hide (absorb) some of disturbance and make it less visible. OHV use has the most impact in the foreground and almost no visible impact in distance views. Generally, there needs to a high level of activity to result in "scarring" of the landscape. Such areas are mostly reported in the vicinity of the tri-cities area most accessible to greater numbers of recreationists. Some OHV travel is also reported around well pads, where heavy trucks can cause serious disturbance, particularly during wet weather.

Visual resources would continue to be managed according to prescriptions for specific SDAs; otherwise, VRM Class III and IV objectives would generally apply. **Table 4-9** lists the acreage in each VRM class under each alternative. Acreage includes both federal and non-federal lands, although VRM objectives would only apply directly to BLM land. Also, BLM would consider VRM classification of contiguous areas in defining COAs on APDs for federal minerals on non-federal land.

Table 4-9. VRM Classes of FFO Lands under Each Alternative

VRM Class	Acres[1, 2]			
	Alternative A	Alternative B	Alternative C	Alternative D
VRM I	71,948	100,600	135,106	83,433
VRM II	399,466	409,960	590,479	560,143
VRM III	1,013,099	1,020,084	1,123,830	1,104,717
VRM IV	2,587,591	2,541,460	2,222,689	2,323,810
Total[3]	**4,072,104**	**4,072,104**	**4,072,104**	**4,072,104**

Sources: BLM FFO, SAIC GIS data.

Notes: (1) SDAs with more than one VRM class were counted as the most restrictive class. Therefore, acres may overestimate the amount of land in Classes I and II.

(2) Includes federal and non-federal land in the FFO.

(3) Totals may not add up due to rounding.

Oil and Gas Leasing and Development

The existing landscape in the high development area is interspersed with 18,000 wells and associated infrastructure, of which about 14,400 wells are on federal minerals, and about 12,240 within the FFO area. The high oil and gas development area covers about 7,000 square miles with an average density of almost 2.6 wells per square mile. The average road density in these areas is about 2 miles of roadway per square mile. By all accounts, development has become more noticeable over time as the number of wells has increased.

Under this alternative, 4,421 new wells (almost 2,300 new well sites) are projected on land with federal minerals and about 300 miles of new roadway. This represents approximately a 2 percent increase in new roads and road density. After subtracting the 2,000 wells that would be reclaimed, the well density would increase very slightly (less than 1 percent) from the current 2.6 wells per square mile. Restoration of unproductive well sites to a natural condition is estimated to improve some areas. Little net change in the quality of the visual landscape is expected.

Within the high development area, the projected number of oil and gas wells would represent a slight increase to the existing operations. This infill development would produce minor change in the degree of manmade modification over time, with minimal degrading of visual quality. If VRM objectives can be met, no adverse visual impact would result. Mitigations can be used to lessen impacts, such as siting wells away from canyon rims, using locations that are largely hidden by intervening landscape from most viewing locations, installing low profile tanks, and painting well pad equipment to blend with surroundings. In some circumstances, it is likely that VRM I objectives cannot be achieved, and impacts would result. The level of change may be acceptably low for one new well site, but each new site in VRM I areas would need to be evaluated on a case-by-case basis to account for other features in the area.

Land Ownership Adjustments

No additional lands are identified for disposal under this alternative. Impacts to visual resources can occur if future development of disposed land causes visual changes that are incompatible with adjacent management objectives of BLM lands. Acquisition of inholdings within SDAs could add higher protection of visual qualities through the application of VRM designations in some areas.

OHV Use

OHV use would continue to contribute to localized alterations, mostly around the tri-cities area, further degrading areas with deteriorated visual value. Under this alternative, no change in VRM objectives is proposed and no actions would be undertaken to preserve these areas from further alteration. This would result in further decline in the visual quality of some locations around the tri-cities area. These would be noticeable from some roadways within the foreground and middle-ground viewing distance.

Specially Designated Areas

No changes in VRM prescriptions are identified under this alternative. As indicated in Table 4-9, about 88.7 percent of the FFO would be managed for VRM Classes III and IV standards and about 11.3 percent for VRM Classes I and II.

Coal Leasing Suitability Assessment

No new coal mines are currently proposed, but based on projections, new locations are likely to be developed over the next 20 years to replace projected declines at some mines in the San Juan Basin. Development is most likely to occur in the coal-rich belt extending from La Ventana on US 550, to Bisti on Highway 371 to Blanco Trading Post on US 550. Only areas that are identified as suitable (after applying the unsuitability criteria listed in Appendix C) would be considered. This area includes a high concentration of land with high visual and

cultural resource value that is managed to preserve scenic quality. Development of a new surface coal mining operation would cause substantial changes to the visual environment in the immediate surrounding area. Surface disturbance within the Ah-shi-sle-pah WSA could have significant adverse impacts on visual quality of this area with exceptional scenic and wilderness value. Although areas outside Bisti/De-na-zin WA are not classified as VRM I, potential impacts of future coal mines to viewsheds that contribute to outstanding qualities of the WA would need to be evaluated. Visual context and viewsheds of several cultural sites, including Chacoan Roads, Pierre's Site ACEC, Chaco Culture Archaeological Protection sites, Chaco Culture National Historic Park, and Traditional Cultural Properties would potentially be affected, and require assessment through further NEPA analysis that would be required for such an action in the future.

The impact on the landscape could be significant in localized areas around the mines. Depending on aspect, relation of highways to the new mining operations, and intervening terrain and vegetation, these alterations may affect a wider viewshed or expose a large number of viewers to highly degraded visual conditions. These issues would be further evaluated in a NEPA process prior to permitting of new coal mining. Approvals would need to consider sensitive visual resources in the permitting and review process, and mitigations would need to be developed for specific proposals to address any potential impacts on sensitive visual resources.

Overall, little change to visual conditions would result from oil and gas development under Alternative A. Some deterioration would continue from cross-country OHV use, particularly on easily accessible public lands in the tri-cities area, and major localized modifications could result from developing a new surface coal mine.

Cultural Resources

All impacts to cultural resources described in this chapter include those likely to occur but would not necessarily be limited to those listed. Direct impacts to cultural resources would be caused by surface disturbance during construction and by driving over sites with OHVs. New construction has the potential to intersect and adversely affect archaeological sites and TCPs that previously have not been disturbed, especially in the areas with the highest density of sites and surface disturbance.

Indirect impacts to cultural resources would be related primarily to new road construction. The presence of new roads in areas previously inaccessible to vehicular traffic is likely to be accompanied by accelerated vandalism of archaeological sites situated near these new roads (Nickens et al. 1981).

Estimates of critical "distance from roads" at which archaeological sites are likely to be vandalized vary widely. Studies from Colorado suggest that sites within 402 meters (1,319 feet) of roads are likely to be vandalized (Nickens et al. 1981), while studies from Utah indicate that sites within 741 meters (2,431 feet) of roads are most likely to be vandalized (Honeycutt and Fetterman 1985). Studies from Arizona indicate that sites within 600 meters (1,969 feet) of a road are likely to be vandalized (Ahlstrom et al. 1992). Considered together, prior studies indicate that archaeological sites within 400 to 800 meters (1,312 to 2,625 feet) of new roads would be subject to increased vandalism.

Due to mitigation measures required under continuing management regulations and policies, indirect impacts from vandalism resulting from the construction of new roads would be more likely to adversely affect cultural resources than direct impacts from new construction. The magnitude of impacts, both direct and indirect, would vary substantially among watersheds, depending on the number of wells to be constructed and the archaeological site density.

Archaeological site numbers and density vary considerably from one watershed to another. Site numbers and density were projected from the recorded site data in NM ARMS (2001). The estimated amount of new lands subject to initial surface disturbance varies from a low of almost 14,000 acres under Alternative A to almost 42,000 acres under Alternative B (Table 4-2). The number of archaeological sites likely to be affected in each watershed under each alternative was estimated using a weighted average of site densities for each watershed. The resulting weighted average site density in each watershed was then multiplied by the number of acres projected to be affected by each alternative. **Table 4-10** lists the number of archaeological sites potentially affected in the 19 watersheds under each alternative. These data should be used to interpret the relative effect of oil and gas development across watersheds, and from one alternative to another. The actual impacts on archaeological sites cannot be determined until site-specific locations of wells, roads, and pipelines are known.

Table 4-10. Projected Archaeological Sites Affected by Oil and Gas Activities by Watershed

Watershed	Alternative A	Alternative B	Alternative C	Alternative D
Animas	129	386	289	289
Arroyo Chico	0	0	0	0
Blanco	47	141	106	124
Carrizo	78	234	176	207
Chaco Wash	10	31	23	27
Chinle	0	0	0	0
Gobernador	41	123	92	108
Kutz Canyon	10	30	23	27
La Plata	60	178	134	157
Largo	128	384	288	338
Mancos	0	0	0	0
Middle San Juan	22	67	50	59
Navajo Reservoir	88	271	203	238
Pump Canyon	25	75	56	66
Rio Chama	1	0	0	0
Rio Puerco	0	0	0	0
Rio San Jose	0	0	0	0
Upper Puerco	0	0	0	0
Upper San Juan	97	291	218	256
Total	**736**	**2,211**	**1,658**	**1,896**

Source: NM ARMS 2001.

Oil and Gas Leasing and Development

This alternative would have the least effect on cultural resources, with 736 archaeological sites projected to be within the areas of disturbance. In decreasing order of impact, recorded archaeological sites in the Animas, Largo, Upper San Juan, Carrizo, and La Plata watersheds would be most affected by this alternative (Table 4-10). In watersheds where the percentage of archaeological surveys is low, affected site quantity estimates may be underestimated.

The 358 miles of new roads (Table 4-3) constructed to serve oil and gas operations would provide greater public access to archaeological sites and TCPs in the high development area. A potential impact from oil and gas development would be increased vandalism of archaeological sites and TCPs due to construction of new roads.

Land Ownership Adjustments

The acquisition of non-federal land is proposed within 84 SDAs in the FFO that are designated to protect cultural resources. If these parcels are acquired, additional protection to significant sites would result.

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted.

OHV Use

Because OHV access would be open in most of the FFO area under this alternative, there would be a high potential for archaeological sites, especially those that are unrecorded or unprotected by closed and limited OHV designations within SDAs, to be damaged by vehicles driving across the landscape.

Specially Designated Areas

Special protection from such surface disturbing uses as oil and gas activities, mineral entry, land disposal, vegetative disturbance, and OHV access would be provided to important cultural sites in 84 SDAs within approximately 40,400 acres in the FFO area. This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

Site-specific cultural resources surveys and tribal consultation would be required before applications to mine coal for commercial or home fuel use would be approved. Any sites identified during these surveys would require avoidance or mitigation before mining could begin. Application of the unsuitability criteria would reduce the chance for impacts to sites eligible for the National Historic Register. Cultural resources protected in the SDAs would not permit coal mining.

Paleontology

Impacts to paleontological resources would be measured by physical damage to fossil-bearing formations through excavation or surface disturbance.

Oil and Gas Leasing and Development

Alternative A would involve the least acreage of surface disturbance and have the least potential for impacts to paleontological resources due to the lower projected well numbers and the current management prescriptions within the 4 SDAs.

Land Ownership Adjustments

There would be no impact on known paleontological resources because the resources would be surveyed prior to land transfers and important resources would be eliminated from disposal parcels.

OHV Use

Cross-country travel has been documented by BLM staff to have damaged some geologic and paleontological resources. Repeated rock climbing and damage to slopes, soils, and

vegetation could result in damage to paleontological formations through directly wearing down rock formations or causing accelerated erosion under Alternative A due to its open designation in most of the FFO.

Specially Designated Areas

There would be no changes to the management prescriptions and boundaries of any of the SDAs specifically intended to protect paleontological resources under Alternative A. Not designating additional areas could adversely affect some paleontological resources by not providing protection of important formations known to occur outside existing SDAs.

Coal Leasing Suitability Assessment

Coal mining would have the potential to affect these resources but, without site-specific information on the location of possible new mines, no impacts can be addressed. An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context.

Recreation

The primary concern for recreational resources is the potential for displacing or significantly altering existing recreational opportunities. These changes could come about through land requirements and operations associated with fluid and non-fluid mineral development, changes in OHV use, and land adjustments.

Direct impacts would result if recreational areas and uses are displaced or excluded due to other activities. Indirect impacts would occur when other actions affect the visual quality, noise environment, cultural resources, or health of vegetation and wildlife that contribute to recreational experience.

The local community and BLM resource specialists have identified several issues related to recreation, listed below:

- Increased population and popularity of the area for outdoor recreation is placing new demands on recreational opportunities for a range of activities.
- Access brings people seeking different kinds of experiences into direct contact, often interfering with differing recreational objectives. For example, motorized vehicles can cause noise that interferes with hunting, hiking, and back country camping. Motorized vehicles cause widening and damage to trails that is detrimental and unsafe for mountain bikers and horse riding. There are disagreements among different recreational users about the need for segregating trails for particular uses.
- Noise from oil and gas compressors is affecting the quiet environments that are desirable in many dispersed recreational activities.
- Noise from OHVs and other motorized recreational vehicles is disturbing other recreationists and residents adjacent to popular OHV sites.
- Some people feel strongly that the public lands are extensive, there is ample room for everyone, and therefore the land should be widely accessible for all uses.
- BLM provides very little surveillance and on-site monitoring at recreation sites, and vandalism, particularly at popular recreation sites close to the tri-cities area, is increasing and difficult to manage. Common acts of vandalism include destruction of oil and gas equipment, theft or destruction of signs, graffiti, and littering.
- Road closures impede access for hunting and other recreational use. On the other hand, some OHV users are ignoring barriers and entering areas that

are private or closed for resource protection purposes.

- Shooting is allowed in some areas but can be unsafe and unnerving for other recreationists, and can occur in areas that are not designated for this activity. Safety is becoming a greater concern as the numbers of people and mix of recreation activities increase.
- Livestock are sometimes harassed by motorized recreationists.
- OHV use is causing visual scarring of some sensitive landscapes.
- Because of the current open OHV designation for most of the FFO area, some users assume that all areas are open to OHVs. People are unsure where restrictions apply.

Table 4-11 summarizes existing and projected oil and gas activity in the recreation areas under each alternative.

Table 4-12 indicates the number of acres that would fall within ROS classes under each alternative.

Table 4-13 presents recreational SMAs under each alternative.

Table 4-11. Oil and Gas Activity in Recreation Areas in the FFO Area under Each Alternative

Recreation Area Condition	Alternative A	Alternative B	Alternative C	Alternative D
Existing wells in Recreation Areas	430	409	561	561
New wells in Recreation Areas	176	427	360	360
Acres in Recreation Areas[1]	52,804	51,881	75,174	75,174
Well density change (percent)	41%	105%	63%	63%
Area displaced in Recreation Areas (percent)[2]	<1%	2.4%	1.4%	1.4%

Notes: (1) Applies to BLM land only.
(2) Not accounting for wells that go out of production.

Table 4-12. ROS Classifications in the FFO Area under Each Alternative

ROS Class	Acres[1]			
	Alternative A	Alternative B	Alternative C	Alternative D
Rural	0	19,388	27,502	19,388
Roaded Natural	8,946	15,452	39,435	39,431
Semi-primitive non-motorized/motorized[2]	5,275	6,636	5,275	5,275
Semi-primitive non-motorized	49,462	54,617	55,978	55,978
Primitive	0	0	0	0
Total	**63,683**	**96,093**	**128,190**	**120,072**

Notes: (1) Applies to BLM land only.
(2) Motorized uses generally apply to mesa top areas. Canyon sides and bottoms would be non-motorized.

Table 4-13. Areas Managed for Recreational Values in the FFO Area under Each Alternative

In Recreation Areas	Acres[1]			
	Alternative A	Alternative B	Alternative C	Alternative D
Acres managed for recreation	52,804	51,881	75,174	75,174
Percent change in Recreation Area	N/A	-1.7%	+42.4%	+42.4%
Percent of FFO[1, 2]	3.7%	3.7%	5.3%	5.3%

Notes: (1) Applies to BLM land only.
(2) Not accounting for future land adjustments.

Under this alternative, several of the ongoing issues and conflicts in managing recreational resources would continue. In addition, there could be an increase in the number of oil and gas facilities dispersed throughout the high development area over the next 20 years that could directly and indirectly affect recreation.

Oil and Gas Leasing and Development

About 4,421 new oil and gas wells could be developed on federal land in the FFO in the next 20 years, and about 2,390 on new sites. Accounting for newly disturbed and restored areas, a small amount of land in the high development area (about 900 acres) would become unavailable for multiple use. This should have little effect on the availability of dispersed recreation throughout the FFO area. Potential changes in visual quality, road density, noise levels, and overall human activity would be insignificant.

Current constraints on oil and gas development and the extent of areas specially managed for recreational values (about 53,000 acres, or 3.7 percent of FFO land) would remain in effect. There are currently about 430 wells within the 8 SMAs managed for recreational values, with about 396 new wells projected over the next 20 years. The average well density in these areas could increase by about 40 percent. This does not account for wells that may be reclaimed because it is not known where these would be located. Recreation would be displaced by new well facilities on less than 1 percent of these areas.

About half the new wells would have small compressors that generate noise. Under this alternative, there may be 300 new noise sources in recreation areas throughout the FFO. About 133 large compressors (between 500 and 10,000 HP) and up to 9,710 small compressors (100 HP) scattered throughout federal land in the oil and gas fields would also generate noise at new sites. Overall, this would cause localized changes in the noise environment throughout the FFO area near compressors. This could have widespread effects on the quality of dispersed recreation. Because of existing stipulations and protective laws, the WA and WSAs would be relatively unaffected by oil and gas operations, and noise from motorized vehicle use. Along the periphery of these areas, there may be indirect effects from noise sources on adjacent lands.

There would be about 440 new wells on AFO land under Alternative A. None are projected within WSAs or SMAs where recreation would be an emphasized value because these areas are generally outside the highly productive oil and gas fields. Consequently, minimal impact is expected to recreation in the AFO area.

Under Alternative A, the areas immediately around Navajo Lake and along the San Juan River would continue to be restricted by NSO constraints, with CSU stipulations for oil and gas development applying elsewhere on USBR land. Over the next 20 years, there could be 110 projected new wells on USBR land. Assuming some reclamation, there should be no net loss or gain of land for multiple uses.

Controlled surface use stipulations and VRM II classification allow for more careful siting of new wells, minimizing potential conflicts with recreation areas. Noise from existing well compressors and its effect on quality recreation has been a concern. A small number of new noise sources should have minimal overall impact, which could be lessened through site modifications. New wells would be sited as much as possible to avoid lakeside and rim locations that are easily visible from the lake or campsite areas.

About 230 new wells are projected for the USFS lands, primarily in the Jicarilla Ranger District, and about half may have small compressors. New development would increase traffic on some forest roads and introduce new noise sources where people undertake dispersed recreational activities throughout the District. APDs would include actions to minimize impacts on visual objectives and consider siting relative to designated recreation areas. This would tend to lessen some impacts on recreation in USFS areas. It is unlikely that fewer people would recreate in these areas, but they would be likely to choose locations, when possible, away from intrusive manmade features. Clearing land can be more obvious in woodland areas, but forest and relief provide some screening of oil and gas facilities. Winter closure to exploration and well development would continue to prevent undesirable conditions for wildlife and recreationists from November to April, particularly hunters. The public would be able to purchase the trees cleared for new oil and gas roads, but the new roads would be gated and not provide general access to the public. Continuing to review new well sites carefully and requiring clearance for resources of concern (including recreation sites) would lessen the potential for direct impacts on developed recreation.

Overall, changes in visitation levels at developed recreation sites are difficult to predict, but visitor satisfaction would be likely to decline if scenic and acoustic quality declines as a result of oil and gas development. Under this alternative, little overall change in visitor satisfaction is expected as a result of low numbers of projected oil and gas development.

Land Ownership Adjustments

Under Alternative A, land disposal would be emphasized, particularly as exchanges with other federal or state entities. If BLM disposed of land in the tri-cities area that is popular for recreation activities (for example, biking areas along the rim of Crouch Mesa), and it was developed for some other use, this loss of resource would be detrimental. To avoid this, applications under the R&PP Act would continue to be reviewed and evaluated for consistency with BLM policy. Actions to dispose of BLM lands that could affect special recreation areas or other areas that have become popular for unofficial OHV travel and mountain biking use would be favored if they incorporate these uses in a publicly beneficial manner after disposal. Areas south of US 550 that are available for transfer or exchange tend to have fewer special values for recreation, although some dispersed activities occur throughout the FFO. Disposal of these areas would have little impact on recreation. Acquisition of inholdings in recreation SMAs would improve management and access for recreation.

OHV Use

Under this alternative, the majority of BLM land in the FFO area would remain open to off-road use. Some users who enjoy unconstrained access see this as beneficial. However, the potentially incompatible mix of motorized and un-motorized uses would continue in open areas. Also, the potential for noise and dust from widespread cross-country travel to affect private landowners would continue. With population increases and the burgeoning reputation of this area for vehicular recreation, over the next 20 years there would likely be more off-road activity, particularly near urbanized areas. Indirect effects could reduce the quality of hunting opportunities and the natural qualities that are a component of outdoor recreationists' enjoyment.

Management plans for OHV use would be pursued in 13 areas identified in the 1996 OHV amendment. The assumption is that these areas would be classified as "limited" to maintained roads and designated trails, and this expectation has been accounted for under continuing management guidance. Much of the land in these areas is popular for hunting and outdoor recreation. Given the extensive network of maintained roads throughout the FFO and particularly the oil and gas areas, access should remain high. Some road closures for protecting specific resources have limited motorized access to favored hunting areas and could continue in the future. Even if all 13 OHV management units limited motorized access, over 60 percent of the FFO area would be open to cross-country travel.

Specially Designated Areas

There would be no change in SDAs or their prescriptions under this alternative. ROS classifications (Table 4-12) would remain the same. An updated inventory of roads in the FFO is needed in order to apply the ROS as a management tool to improve the recreational experience.

Coal Leasing Suitability Assessment

No additional (new) development of coal resources has been specifically located under this alternative within the FFO. The area with the highest potential for coal mining has no specially designated recreation areas. Development would not be permitted in the WA where the recreational experience has special value. There would be no development in the WSA until a Congressional decision is made and/or the PRLAs adjudicated. If adjudication favors the PRLAs, development of coal mines in the WSA would have localized impacts on land that has high intrinsic value for remote recreation opportunities. The value of some special cultural sites and fossil deposits in the area that are popular for public visitation could be affected indirectly if a new surface mine were developed nearby (see Visual Resources).

Noise

Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. According to the RFDS (Engler et al. 2001), small compressors of approximately 100 HP are expected to increase to be associated with approximately half the number of new and existing wells in the planning area. With a projected 4,421 new wells projected under Alternative A, and 14,400 existing wells on federal minerals, this could result in 9,410 small compressors scattered throughout the high development area on land with federal minerals. Noise from the small wellhead compressors caused by mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 9 large compressors (2000 to 10,000 HP) and 133 mid-size compressors (500 to 2,000 HP) would be installed under Alternative A. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA to a distance of 50 feet from the source.

Actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor stations and well pads. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added and would be mitigated on a case-by-case basis.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells.

OHV Use

Noise from OHV use would be most prevalent in the FFO area under Alternative A because access would have the fewest restrictions. OHV noise would be short-term, however, with insignificant long-term impacts.

Social and Economic Conditions

The primary socioeconomic issues associated with implementing the alternatives arise from potential changes in jobs and income, spending in the local economy, and changes in revenues in the form of royalties and taxes and disbursements to local governments. The following analysis focuses on development of oil and gas resources on federal lands as the primary action that could effect measurable change in the above categories. Of concern to the oil and gas industry, in terms of viability, is balancing production costs with value of the product.

Direct effects include changes in employment and income for oil and gas workers, expenditures in the local and regional economy for constructing new wells and infrastructure, changes in productive value and production payments (such as royalties), and changes in taxes and disbursements to state and local government. The estimation of direct expenditures for new well construction provides a comparison of the relative cost of alternate drilling technologies for each alternative.

Indirect effects are measurements of induced economic activity brought about by direct effects. This analysis addresses indirect jobs and expenditures that may be generated, based on multipliers from equivalent analyses.

Cumulative impacts from changes in other productive uses on federal and non-federal lands may also result. This analysis generally considers changes in coal production and grazing operations in the FFO area. Under all alternatives, projections for coal production in the San Juan Basin are relatively stable with a slight reduction in annual production over the next 20 years. Specific mines are expected to close in the FFO (McKinley and La Plata) but new mines are likely to open. This would be largely market-driven, with the underlying premise that the region's power plants will continue to operate and generate demand. Also, that given current infrastructure, certain plants need coal supplied from nearby sources. Overall, coal jobs are expected to stay about at current levels, although there may be some fluctuations and possible declines up to 8 percent (about 100 jobs) over 20 year period. Also, the location of any future operations may be more (or less) favorable for workers in some locations in respect to driving distances to work or the need to relocate. The relative contribution from the coal industry compared to oil and gas would remain small but important as a stabilizing component.

Table 4-14 compares the impact of the alternatives on employment. The job numbers are based on the average number of employees expected per well site per year for maintenance and development functions (BLM 2000d, *e*). They include both direct jobs (those described above), and indirect and induced jobs. These are jobs that are generated to support oil and gas field functions (such as suppliers of well equipment), and jobs that are generated as a result of earnings and spending from oil and gas industry jobs. For example, there may be demand for additional services or economic activity that stimulates jobs across several industrial sectors (i.e., retail and wholesale trade, services, real estate and banking, etc.). It is expected that most jobs would be local (in San Juan and Rio Arriba Counties) and primarily in the tri-cities area. These estimates represent average projected jobs. They do not take into account variabilities in market demand and responding fluctuations in production and employment that are character-

istic of the industry. Under all alternatives, boom-bust cycles are likely to continue. Assuming that about 80 percent of wells are on federal land, total employment in the San Juan Basin associated with oil and gas industry would be about 20 percent higher than the levels shown in the table.

Table 4-14. Average Annual Oil and Gas Employment for Federal Minerals in the Planning Area

	Employment			
	Alternative A	Alternative B	Alternative C	Alternative D
Current Oil and Gas Employment				
Average annual development jobs[1]	860			
Estimated current maintenance oil and gas jobs	6,870			
Total estimated current oil and gas jobs[2]	7,730			
Projected New Employment				
New development jobs	7,760	20,370	15,590	15,730
Average year development jobs[3]	390	1,020	780	790
New maintenance jobs (20th year)[4]	-740	1,300	580	610
Total oil and gas jobs (20th year)[5]	6,520	9,190	8,230	8,270
Change from current levels	-1,210	1,460	500	540
Existing employment in planning area	124,851	124,851	124,851	124,851
Percent change in regional employment (%)	-1%	+1%	+0.3%	+0.4%
Change from current oil and gas employment (%)	-16%	+20%	+6%	+7%

Source: BLM 2000d, e.

Notes: (1) Jobs for development of new wells and infrastructure have varied over the last 10 years. The estimates in this table are based on recent years (2000 and 2001). These years represent higher levels of development (and therefore more jobs) than was typical in the last 10 years. The estimates are derived from numbers of employee days for specific development and maintenance functions, and multipliers that account for indirect and induced jobs generated by expenditures by the oil and gas industry (BLM 2000d, e).

(2) Oil and gas jobs associated with development on non-federal land would increase these totals by about 20 percent.

(3) Based on an assumed 20-year buildout of projected wells.

(4) For maintaining new wells. Negative values reflect loss of maintenance jobs when the overall number of new wells is less than those that go out of production.

(5) Includes maintenance of existing wells and new wells (accounting for decommissioned wells) and new development jobs.

Table 4-15 compares expenditures across the alternatives. These account for costs associated with development of new wells, and maintenance of existing and new wells in the planning area. A recent technical report on the Economics of Alternative Drilling Technology (available from the FFO) estimates the average drilling cost per well by alternative. Other average functional costs and multipliers were also used to calculate the total direct and indirect expenditures for projected oil and gas operations (BLM 2000d, e). These values represent a comparative baseline and may not include all expenditures over the next 20 years.

Table 4-15. Expenditures for Oil and Gas Development for Federal Minerals in the Planning Area

	($000)			
	Alternative A	Alternative B	Alternative C	Alternative D
Cost per new well (drilling)	551	541	535	536
New wells (drilling)	2,436,000	7,182,000	5,262,000	5,329,000
New compressors	95,625	360,000	360,000	360,000
New pipeline	162,000[2]	540,000	540,000	540,000
Total direct costs	2,694,000	8,082,000	6,162,000	6,229,000
Indirect expenditures (1.28 multiplier[1])	754,200	2,263,000	1,725,000	1,744,000
Total expenditures over 20 years	3,448,200	10,345,000	7,887,000	7,973,000
Per year average expenditure[2]	172,410	517,250	394,370	398,660

Sources: BLM 2000d, e; SAIC 2002c.

Notes: (1) Multiplier from BLM 2000e.

(2) Does not include cost for new oil and gas roads.

When compared to overall employment, earnings, and revenues in the planning area, the effects of the alternatives are not anticipated to result in measurable changes in demographics, economic activity, public infrastructure and services, or local government services of the region.

Recreation and tourism are becoming increasingly important to the economy of the planning area. Various forms of outdoor recreation are popular, and they sometimes come in conflict with one another. Increased oil and gas development could have a negative impact on some types of recreation. Because there is no data on current levels of public use of FFO lands for recreation, it is not possible to estimate relative changes in recreational use and associated economic activity, except qualitatively. Changes in the visual landscape, cross-country access, and increased noise can affect the recreational qualities for some users and visitors. However, increased population and current trends in outdoor recreational activities suggest that this industry will not decline over the next 20 years. Also, the FFO is actively promoting and managing for popular vehicular sports (both motorized and unmotorized). These activities should overall provide for stable economic contributions from recreation and related tourism in the region.

Employment

Under this alternative, based on a total of about 220 new wells and reclamation of 211 wells per year on average over the next 20 years, there would be a loss in development jobs of about 400 to 500 jobs per year in the planning area. This is based on current levels of development in the planning area. There would be a loss of maintenance jobs over 20 years (740 fewer by the twentieth year), resulting in an overall average decline in oil and gas employment on federal land of about 16 percent in the long-term. Short-term changes would be minimal. This would have a moderate impact on oil and gas industry employment in the planning area, but minimal impact overall for the region.

Employment in the coal industry may fluctuate due to production both on federal and non-federal land. Some mines are forecast to decline in production, notably La Plata and McKinley on FFO land. However, the San Juan Underground mine should increase production, offsetting losses in jobs basin-wide. In response to market demands and resource potential, new

mines may open. These are most likely to be located on the competitive coal lease tracts or within the Coal Belt SMA where most of the resource is located. However, other areas both on federal or non-federal land could be developed if found to be viable. Specific proposals would undergo permitting and environmental review. Overall, 20-year production for the San Juan Basin is estimated to peak in the next year or so and decline slightly but remain stable thereafter (Hill and Associates 2000). Associated jobs are likely to reflect the same pattern, with some potential fluctuations and change in the location of jobs.

Displacement of grazing due to resource development or other FFO actions would be small and have little effect on jobs.

Development Expenditures

An analysis of well development costs found that under Alternative A, the cost for drilling 4,421 wells is estimated at just over $2.4 billion, at an average cost of about $551,000 per well (SAIC 2002c). The average well cost for this alternative was the most expensive among all the alternatives. This affects industry by increasing production cost and lowering profit margins. Additional direct costs for roads, pipelines, compressors and equipment would increase the total investment to about $2.7 billion. Additional indirect expenditures could result in a total of just over $3.4 billion spent over 20 years, an average of $172.4 million per year (non-escalated). This represents a considerable decline in expenditures and rate of development over current levels but within the range experienced over the last 10 years. If current levels were projected into the future at the same cost per well as projected for this alternative, it is expected that average expenditures would be about $446 million per year. Alternative A would fall short of current development expenditures by almost 260 percent.

Development of new mining facilities could generate expenditures in the local economy for goods and services. When specific proposals are identified the impact on the local economy would be further assessed. Individual proposals would be assessed. These would generally have positive impacts on the local economy.

Revenues

Under Alternative A, the projected volume of oil and gas production on federal land over the next 20 years is estimated at 4,910 billion cubic feet (Bcf). (Calculations are based on gas values, because oil accounts for a very small portion of the fluid mineral product in the planning area.) Assuming a value of $3.00 per Mcf (NMDFA 2001), the total value of this product could be about $15 billion (in 2001 dollars). Additional production on non-federal land could increase this value by about 30 percent.

It is difficult to predict royalties and taxes for any given year in the future because some existing wells would go out of production and new wells added each year. Also, the variability of gas prices could considerably alter the taxable base value. Under this alternative, there would be a slight increase in production potential over the next 20 years over the existing levels, based on new well development and projected well abandonment. With New Mexico deriving between 10 and 20 percent of its general funds from energy resources, this would provide a stable tax revenue base over the long term. However, it should be noted that although this alternative would result in a small and gradual increase in production potential over current levels over the long-term, production potential would not grow as rapidly as it would if the current day rate of new development were sustained.

In addition to oil and gas taxes, there would also be continuing taxes on other minerals (primarily coal in the planning area). Under this alternative, future development of competitive coal tracts or suitable lands in PRLAs in the FFO is possible. Based on assessments by Hill and Associates (2000), several options could meet the demands of the San Juan power plant. The nearby La Plata competitive lease tracts could be developed in addition to ongoing expansion of the San Juan Under-

ground mine. San Juan could also be supplied by a possible expansion of the Navajo mine (not on FFO land). Development of additional Lee Ranch tracts could make up for projected declines of Lee Ranch mine, but this coal would continue to go to out-of-state customers. Production of federal minerals would continue to provide royalty revenues over the planning period. Royalties may decline slightly as projected production of the La Plata, McKinley, and Lee Ranch mines decline (Hill and Associates 2000).

Under all alternatives, future tax and royalty revenues will depend on market value, production volume, location, and owner of the produced energy mineral resources. Also, tax policies and assessed rates will continue to determine the total revenue value. Each of these variables can greatly influence future revenues to the state and local jurisdictions.

Ongoing PILTs paid to local governments would remain essentially unchanged. These represent a relatively minor source of revenues for the four counties in the planning area.

Environmental Justice

Each of the counties in the planning area has a high proportion of minority populations compared to the state and nation as a whole. McKinley and San Juan County have a distinctly high percentage of American Indians, while Rio Arriba has a large Hispanic population, and all but Sandoval County have higher levels of low-income populations. Four Indian reservations either overlap or are adjacent to the planning area. Consequently, the potential exists for minority and low-income populations to be affected by the alternatives under consideration in this Proposed RMP/Final EIS.

Specific issues of concern for this analysis include:

- Potential for economic impacts (such as job losses or increases).
- Potential for land use impacts (such as noise impacts from compressors, or displacement of communities or existing uses where minority or low-income persons reside or work).
- Potential for conditions that pose a public health or safety risk (such as those that deteriorate air quality or release hazardous materials).

Concern has been expressed about royalty payments for federal mineral resources on Indian lands. Resolution of this legal issue is beyond the scope of this EIS.

Because of the broad scale of this EIS, it is not possible to determine the location of projected new oil and gas development and, therefore, potential impacts on specific communities or residents are not predictable. Any potential impacts, such as noise from compressors, or placement of large equipment that is incompatible with residential uses, would be addressed in site-specific APDs. Similarly, avoidance of specific resources, such as sensitive plant species or cultural sites, would be implemented at the site-specific level.

Most activities taking place on federal land in the San Juan Basin occur without influence of demographic or income values, but rather, in response to various resource values. In general, resource production and protection is balanced for overall public benefit. Specific activities may take place in locations that affect specific local populations or individuals that may be disproportionately minority or low-income in composition. This is particularly likely for Rio Arriba and McKinley counties that have high percentages of the population in both these categories. Change in energy resource production has the greatest potential to affect these counties that derive tax revenues from these industries and where jobs are particularly needed (Table 3-24, Table 3-30).

Under Alternative A, there may be minor job losses in energy related jobs. However, new coal mines, not yet identified, may benefit some communities more than other by providing jobs. Increased employment opportunities are generally evaluated as positive impacts for the area, and could benefit areas where the labor pool is comprised of minority and low-income

population. Localized impacts from siting of future wells or mines may affect communities or isolated residences. Given the population characteristics, these may be impacts to persons of minority and/or low-income status. However, site selection per se, is driven by resource value, development costs, and ownership issues. Future applications and approvals would be subject to environmental review. Approvals would consider necessary mitigation to reduce specific incompatibilities between proposed development and any sensitive human activities.

Some displacement of multiple uses on federal land from new well facilities and changes in stipulations and management prescriptions would slightly reduce the availability or quality of some resources for the public at large. Potentially affected resources include recreation, grazing, wood gathering, access, cultural sites, mineral entry and leasing, and visual qualities. These impacts would generally occur away from population centers and would not directly affect particular populations.

The positive effects of additional jobs and economic activity in the region from oil and gas development have the potential to benefit all residents. Under Alternative A, some loss of jobs and economic activity in the oil and gas industry could have minor negative effects. It is not possible to identify specific jobs or businesses that would be affected. Oil and gas development on non-federal land, including Indian lands, is not projected to decline.

Land disposal actions proposed for the tri-cities area could increase the supply of land available for urban development. This could offset trends for rising land prices as buildable and serviceable land is depleted. Indirectly, this could benefit low-income persons by preserving a supply of affordable housing.

ALTERNATIVE B—RESOURCE PRODUCTION

Surface Disturbance Due to Oil and Gas Development

The assumptions and methods used to determine impacts are described under Alternative A. The amount of long-term surface disturbance associated with well construction would be 24,781 acres for Alternative B. This does not include plugged and abandoned wells already awaiting approval for reclamation. Surface disturbance associated with large pipelines is assumed to be 11,716 acres. Approximately 1,700 acres of disturbance would be associated with the installation of 20 Phase 1 compressors and 300 Phase 2 compressors (Table 4-1). There would be an additional 13,800 acres of initial short-term surface disturbance that would be revegetated after construction.

Watersheds

Under Alternative B, short-term surface disturbance is estimated to total approximately 42,000 acres due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the planning area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 30 to 232 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 2 and 18 percent in those watersheds. The total increase would be approximately 1,075 miles in the high development area (Table 4-3). This would result in a potential increase in sediment yield due to the additional acreage of bare soil and miles of unpaved roads, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced when well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

Geology and Minerals

Oil and Gas Leasing and Development

Implementation of Alternative B would allow access to hydrocarbon reserves without the need to commingle production or use dual completions. The number of completions allowed under this alternative would be 13,275 on federal minerals after consideration of surface constraints that would limit access to 17 wells. Each completion would produce from a single well bore. NSO restrictions would require 84 directional wells (0.6 percent of all wells) to be drilled to access reservoirs under SDAs and Navajo Reservoir. There would be 28,273 acres closed to new leasing in the planning area.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, the largest number of quarries would be constructed under Alternative B. These small quarries would be approved with APDs or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

Land Ownership Adjustments

Under Alternative B, 347,505 acres of public land would be available for disposal, of which approximately 265,000 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas, resulting in fewer conflicts and limits to these important deposits through improved planning and coordination.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be less than under Alternative A because access to these areas would be preserved to the extent possible by FFO resource managers.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas would be the limitations imposed on how the surface resources would be managed within their boundaries in the FFO. Due to NSO constraints within SDAs in the FFO, there would be 1 well that would not be developed and approximately 26 wells that could be developed if directional drilling were used.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the SDAs. There would be little impact on the extraction of locatable minerals, however, because most of the limitations on mineral leasing would be in SDAs that are not in the vicinity of the locatable minerals in the planning area.

Coal Leasing Suitability Assessment

There would be more potential conflicts for mineral extraction, especially in the coalbed methane-producing formations, under this alternative because the total number of oil and gas well sites approved over the next 20 years would be the highest of all the alternatives. The areas identified as suitable for coal mining development after application of most of the unsuitability criteria (378,875 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation. The Additional Coal Interests shown on Map 2-8 are south and west of the high development area, so fewer conflicts would be anticipated.

Soils

Oil and Gas Leasing and Development

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have the greatest short-term and long-term impacts on soils from oil and gas activity. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would be approximately 41,900 acres, with 13,800 acres revegetated after construction (Table 4-2). When accounting for the reclamation of P&A wells and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be almost 24,800 additional acres (Table 4-1). The resulting impacts to soils would be a potential increase in soil erosion due to the increase in bare ground and unpaved roads.

There is the potential for more impacts to prime farmlands due to construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area, and more wells would be completed.

OHV Use

Limited OHV access over most of the FFO area would result in less potential for damage to vegetation and soil crusts, and thereby less potential for sheet, rill, and gully erosion through enforcement of OHV designations. Increased soil erosion would be expected to result where OHVs are permitted to ride on

existing trails because they would increase soil compaction and further reduce existing vegetative cover while preventing its reestablishment. Adding the acreage listed as potentially suitable for open OHV designation listed in Table 2-10 would not result in significant soil impacts because the highly erodible soils and those topographic features with the most fragile biological crusts would be eliminated from consideration. Site-specific evaluations of potential soil impacts would be conducted before final open designations are made.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and high salinity, and has low susceptibility to wind erosion, all of which would be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Oil and Gas Leasing and Development

Under Alternative B, new oil and gas development would result in a net increase in long-term surface disturbance of almost 24,800 acres (Table 2-1). Water required for the drilling operations would amount to over 9,347 acre-feet and would be supplied by legal water rights holders.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to a greater area of surface disturbance than under Alternative A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the impacts would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in short-term impacts to water resources as a result of sedimentation from the increased acreage of short-term surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

Land Ownership Adjustments

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The larger disposal area in the vicinity of the tri-cities area that would be considered for development could result in an increase in water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative B are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

Because the acreage of open designations for OHVs would be greatly reduced under Alternative B, potential impacts to water resources would be less than under Alternative A even with the potential designation of additional open acreage (Table 2-10) added as the OHV Activity Plans are completed. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted and in the bottoms of washes.

Specially Designated Areas

Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. In situations where OHV cross-country travel would be permitted within a SDA, a localized negative impact to water resources could result. The management prescriptions in the majority of SDAs provide some measure of restriction for OHV access and minimization of overall surface disturbing activities. This protection would be provided in slightly more acreage than under Alternative A, but still a small percentage (less than 20 percent) of the total FFO area.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

Oil and Gas Leasing and Development

Alternative B proposes to develop 13,275 new gas wells on federal lands, which would produce approximately 11,158 Bscf of gas over a 20-year period. Information from the RFDS (Engler et al. 2001) and consultations with natural gas industry representatives (Bays 2001; Brown 2001; Gantner 2001) and the NMAQB (Uhl 2001) were considered in the estimation of emissions for each year of the alternative. Assumptions used in the emission estimations include the following:

1. The alternative would develop 663 new gas wells each year.

2. Half of the new gas wells would require the use of a 95 HP gas-fired compression unit. Each unit would operate at 100 percent load for 85 percent of the year. The average emission factors from NMAQB source test data of 12 existing wellhead compression units ranging in size from 65 to 145 HP were used to calculate annual emissions of criteria pollutants from these sources (NMAQB 2001a). The average NOx and CO factors obtained from these data were determined to be 13.2 and 13.1 grams per horsepower-hour (gm/HP-hr), respectively.

3. Half of the new gas wells would require the use of a 250,000 BTUs per hour gas-fired separator unit. These units would operate 50 percent of the year at 100 percent load. Emission factors for these sources were obtained from the USEPA (USEPA 1998).

4. An additional 18,000 HP of central compression would be developed in each year of the period of analysis. These units would operate 100 percent of the year at 90 percent load. The average emission factors from NMAQB source test data of 39 existing units ranging in size from 2,500 to 4,500 HP were used to calculate emissions of NOx and CO from these sources (NMAQB 2001a). These factors were determined to be 1.6 and 1.3 gm/HP-hr for NOx and CO, respectively.

Table 4-16 presents estimated emissions from gas production under Alternative B for the first and last year of the 20-year period of analysis. These data show that the overwhelming majority of emissions from this activity would occur from wellhead compression demands. The project emission calculations assume a constant high well compression demand for the life of a given well. However, emissions for these sources in project years 1 and 20 are somewhat overestimated, as 50 percent of the proposed wells would not need wellhead compressors at such an early age of production, as was assumed in the emission calculations. The net change in proposed annual emissions from current levels would be offset somewhat due to the abandonment of existing production.

The emission estimates for the proposed wellhead compressors may be of importance to future air quality planning in the region. Wellhead compressors are generally small enough to fall below the NMAQB permitting and NOI emission inventory processes, but they represent a potentially substantial future emission source category in the region.

Table 4-16. Project Year 1 and Year 20 Annual Air Emissions Associated with Gas Production—Alternative B (Tons per Year)

Equipment Type/Scenario	VOCs	CO	NOx	PM_{10}
Project Year 1				
Wellhead Compression	77.6	3,377.0	3,402.9	0.0
Separator Units	1.1	8.0	18.9	1.5
Central Compression	73.5	201.8	256.5	0.0
Alternative B - Tons per Year	**152.3**	**3,586.8**	**3,678.3**	**1.6**
P&A Wells - Tons per Year	**(8.3)**	**(340.9)**	**(344.9)**	**(0.2)**
Alternative B Net Change (Alt B - P&A)	**144.0**	**3,245.9**	**3,333.4**	**1.4**
Project Year 20				
Wellhead Compression	1,552.6	67,539.6	68,057.2	0.5
Separator Units	22.1	160.6	377.5	30.5
Central Compression	1,470.4	4,035.9	5,130.9	0.3
Alternative B - Tons per Year	**3,045.1**	**71,736.1**	**73,565.5**	**31.3**
P&A Wells - Tons per Year	**(273.7)**	**(11,273.8)**	**(11,404.7)**	**(5.1)**
Alternative B Net Change (Alt B - P&A)	**2,771.5**	**60,462.3**	**62,160.7**	**26.2**

Note: Totals do not sum due to rounding.

Near-Field Impact Analysis

Air quality dispersion modeling was used to estimate the near-field pollutant impacts that would occur from implementation of Alternative B. The intent of the analysis was to identify a reasonable but conservative upper bound of impacts that would occur from the project alternatives. Alternative B was selected for the modeling analysis because it would produce the greatest amount of air emissions and resulting impacts. All other project alternatives would be expected to produce less air quality impacts.

Air quality modeling only evaluated operational emission sources. Proposed construction activities associated with gas development would be similar to the construction activities immediately north of the planning area, described in the Oil and Gas Development on the Southern Ute Indian Tribe (SUIT) Draft EIS (DEIS) (BLM 2000e). This document presents a detailed and conservative modeling analysis of both combustive and fugitive dust (PM_{10}) emission sources associated with well pad construction activities. The results of the analysis showed that construction activities would produce pollutant impacts that would remain below the ambient air quality standards. The maximum impacts from proposed construction activities and fugitive dust sources were shown to occur very close to the activity location source, with concentrations decreasing rapidly with distance from the source.

The exact locations of operational emission sources associated with proposed gas development are not known at this time. Therefore, the near-field analysis modeled a reasonable but conservative module of project emission sources that could occur at a generic location within a projected high-density well development area (greater than 6 wells per square mile). This scenario would produce an upper bound of impacts that would be expected to occur from any combination of proposed sources within the planning area. The results of the modeling analysis indicate that impacts from proposed operation emission sources would decrease rapidly with distance from the sources. Therefore, it is expected that distant emissions sources would not substantially contribute to near-field impacts analyzed for the project emissions module.

Definition of the proposed emissions module was based on information obtained in the RFDS and in consultation with natural gas industry representatives (Bays 2001, Brown 2001, and Gantner 2001). To be conservative, the analysis focused on the Dakota formation, which would potentially develop up to eight wells per section (square mile). The areal extent of the emissions module was four sections that included 32 wells. The RFDS assumes that 50 percent of the future wells developed in the San Juan Basin would have well compressors rated at approximately 95 HP. However, to be conservative, it was assumed that each well would have a 95 HP gas-fired well compressor. The RFDS assumes that the San Juan Basin would require an additional 360,000 HP of central compression. Therefore, a 10,000 HP central compressor station was included as part of the emissions module. This scenario is based on a high-density well placement and is deemed to represent an upper bound of emissions that would produce near-field impacts within the planning area under any alternative.

The emission module source layout has well compressors placed at the center of each 80-acre parcel and the central compressor station situated at the end of the four sections (see Figure 1 in the Air Quality Technical Report). This arrangement was selected to maximize the overlap of emission plumes that would disperse from the various sources. The well compressors were assumed to be 95 HP Caterpillar, Inc., Model 3304 natural gas-fired engines. The compressor station was designed with three Caterpillar Model 3612 natural gas-fired engines, each rated at 3,350 HP. To produce a conservative analysis, the highest emission rates between vendor emission estimates and the NMAQB source test data previously mentioned in the discussion of

project annual emission estimations were used in the modeling analysis. As a result, the highest NOx and CO emission factors for the well compressors units were determined to be 15.8 (Kaufman 2001) and 13.1 grams per horsepower-hour (gm/HP-hr) (NMAQB 2001a), respectively. The NOx and CO emission factors used in the analysis for the Caterpillar 3612 engine were 2.0 and 2.5 gm/HP-hr, respectively. The CO emission factor was based on vendor data (Caterpillar Inc., 2001). The NOx emission factor for the 3612 engine provided by Caterpillar was 0.7 gm/HP-hr. However, the analysis used a more conservative NOx factor of 2.0 gm/HP-hr to simulate implementation of the emission limitation associated with the Level One Oil and Gas Installations Air Quality Permit issued by the NMAQB under Regulation 20 NMAC 2.72 (Construction Permits).

To further identify maximum impacts, all sources were modeled as operating 24 hours per day and 365 days per year. Stack parameters for modeled emission sources were obtained from Caterpillar, Inc., and the NMAQB.

The Air Quality Technical Report describes (1) model selection; (2) the modeled emission sources and their stack characteristics; (3) selected emission factors and calculated emission rates; (4) the receptor grids used; (5) selected model options; and (6) meteorological data (SAIC 2003).

State and National Ambient Air Quality Standards

The Industrial Source Complex Short Term (ISCST3) model was used to predict the maximum concentrations of criteria pollutants that would occur from the emissions module. Considering that natural gas would be the fuel used by the overwhelming majority of proposed sources, NOx (NO_2) and CO will be the pollutants emitted in the greatest amounts. Sulfur dioxide (SO_2) and particulate emissions (both TSP and PM_{10}/$PM_{2.5}$) would be small, given the low sulfur content and low particulate content of the natural gas fuel.

The modeling analysis evaluated the emissions module as if it were in flat terrain, due to the lack of site-specific development information. This approach is reasonable, given the programmatic nature of the RMP/EIS. However, dramatic variations in topography occur within the project region and predicted impacts of air effluent plumes in complex terrain can be substantially greater compared to those in flat terrain. The NMAQB permitting process would require the use of site-specific terrain data to ensure identification of maximum pollutant impacts from proposed emission sources within its surrounding terrain.

The highest CO and NO_2 concentrations measured at the Farmington and Bloomfield monitoring stations during the period from 1995 to 2001 (see Table 3-14) were added to the maximum predicted project pollutant concentrations, and the resulting total project impacts were compared to the applicable ambient air quality standards to determine their significance. Monitored pollutant data from the Bloomfield station simulates some of the highest pollutant impacts recorded within the planning area from existing sources. The Bloomfield station was sited by the NMAQB to monitor elevated pollutant impacts from the highly industrialized Bloomfield gas corridor (Uhl 2001). Emissions sources from the El Paso Blanco compressor station and Conoco San Juan Gas Plant occur within 2 kilometers (km) (1.24 miles) of the Bloomfield monitoring station. These are the third and fifth largest sources of NOx in San Juan County, and their combined emissions in 1996 were 2,714 tons of NOx (USEPA 2001b). The annual NOx potential-to-emit levels for these two facilities are about 3,800 tons per year (NMAQB 2001b). Excluding the Four Corners and San Juan power plants west of Farmington, approximately 40 and 52 percent of the remaining NOx emissions emitted in San Juan County occur within 5 and 10 km (3.11 and 6.21 miles) of the Bloomfield monitoring station. That equates to roughly 3,500 and 5,000 tons per year of NOx emissions, respectively, that occurred in 1996 within these

radii (USEPA 2001b). There are no other areas within the planning area that have this density of emissions. Therefore, the use of ambient pollutant data monitored at the Bloomfield station provides a representative measure of the most severe air quality impacts from existing sources within the planning area.

Use of ambient pollutant data to simulate existing emission sources in a modeling analysis is an appropriate method for this EIS due to the large area and land use plan nature of the RMP/EIS. However, this may not be a thorough method for a permitting analysis under NMAQB guidelines, as due to proximity and meteorological effects, the monitoring station may not capture the maximum pollutant concentrations from all existing sources. The monitored data also may not represent future air quality conditions if they do not include impacts from approved, yet un-constructed emission sources.

Meteorological data collected at the Bloomfield monitoring station were used in the near-field modeling analysis. These data have a high frequency of westerly and easterly winds, due the presence of the east-west alignment of the San Juan River Valley. These data also show a high frequency of northerly winds, which occur from nighttime drainage flow down the Bloomfield Canyon. These data show that terrain has a substantial effect on local wind conditions. Hence, a site-specific dispersion modeling analysis would have to use meteorological data that is representative of the proposed project site.

To be consistent with NMAQB dispersion modeling guidelines, background pollutant data and ambient air quality standards were converted from units of ppm to $\mu g/m^3$ to take into consideration the effects of elevation (NMAQB 1998). To be conservative, the emissions module was analyzed at an elevation of 6,000 feet. For example, this procedure would convert the NMAAQS 24-hour NO_2 standard of 0.10 ppm to 153 $\mu g/m^3$.

Table 4-17 summarizes the ambient pollutant impacts predicted for Alternative B. These data show that the emissions scenario evaluated for natural gas development under Alternative B would contribute to an exceedance of the 24-hour state NO_2 standard, which would be a potentially significant air quality impact. The emissions module would not contribute to an exceedance of any other ambient air quality standard. As part of the NMAQB permitting process, proposed stationary sources that emit more than 25 tons per year or 10 pounds per hour would be required to demonstrate compliance with the ambient air quality standards prior to gaining approval for construction (Regulation 20 NMAC 2.72). This would include a consideration of existing emission sources and terrain features within the proposed source region of influence. Measures that could reduce predicted significant pollutant impacts include the reconfiguration of emission source locations, enhancement of effluent plume rises, and additional emission controls. Modeling result printouts for maximum impact cases are provided as Attachments 1-4 in the Air Quality Technical Report.

During the NMAQB permitting process, if an initial dispersion modeling analysis shows that proposed emission sources contribute to an exceedance of an ambient NO_2 standard, a second tier analysis is performed to more accurately estimate ambient NO_2 impacts. This ozone limiting method (OLM) considers atmospheric chemistry and the role ambient O_3 plays in converting NOx emissions to ambient NO_2. It is possible that use of the OLM in the dispersion modeling analysis for this EIS would reduce the maximum NO_2 impacts estimated for the project emissions module to the point that they would not contribute to an exceedance of the State 24-hour standard. However, to be conservative, it is assumed that proposed NOx emissions would remain potentially significant.

Table 4-17. Maximum Pollutant Impacts Analyzed for Gas Production— Alternative B

Pollutant	Averaging Period	Modeled Maximum Impact ($\mu g/m^3$)	Background Concentration[1] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS[2] ($\mu g/m^3$)	NMAAQS[2] ($\mu g/m^3$)
Carbon Monoxide	8-hour	332	4,838	5,170	8,374	8,095
	1-hour	778	8,560	9,338	32,567	12,189
Nitrogen Dioxide	Annual[3]	33	17	50	81	76
	24-hour[4]	120	50	170	–	153

Notes: (1) Background concentrations of CO and NO_2 are equal to the maximum values monitored at the Farmington and Bloomfield monitoring stations during the period 1996-2001 (see Table 3-14). Data then converted from units of ppm to $\mu g/m^3$ for an elevation of 6,000 feet (NMAQB 1998).

(2) AAQS converted from units of ppm to $\mu g/m^3$ for an elevation of 6,000 feet (NMAQB 1998).

(3) Annual NO_2 modeled impact is equal to the maximum-modeled NOx impact times a factor of 0.75 (NMAQB 1998).

(4) 24-hour NO_2 modeled impact is equal to the maximum-modeled NOx impact times a factor of 0.4 (NMAQB 1998).

Wellhead compressors contributed the overwhelming majority of ground level pollutant concentrations at the predicted maximum impact locations. The central compressors only contributed approximately 2 percent of the total NO2 impact for either the annual or 24-hour averaging periods at these locations. Despite being larger emission sources, the central compressor units have stack characteristics that produce a much higher plume rise, compared to the wellhead compressors. As a result, by the time the plumes from these larger sources impact ground level, their pollutant concentrations are substantially diluted.

Prevention of Significant Deterioration Increment Consumption

Modeling results indicate that the high-density module of proposed compressor emission sources would generate a maximum annual NO2 impact of 33 $\mu g/m^3$. This impact is greater than the annual PSD Class II increment (25 $\mu g/m^3$) and is potentially significant. Emissions from the wellhead compressors are predicted to produce the overwhelming majority of this impact. Under NMAQB Regulation 20 NMAC 2.72 (Construction Permits), proposed stationary sources that emit more than 25 tons per year or 10 pounds per hour would be required to demonstrate compliance with the PSD increments, in addition to the ambient air quality standards. In the event of PSD review, a detailed analysis would occur at the time of permitting to determine the amount of NO2 increment consumed by a proposed source(s). Existing and approved emission sources in the project area consume PSD increment and therefore the amount of increment available to new sources is something less than the total increment. There are several localized areas within the planning area where the available PSD Class II increment is nearly exhausted (such as the Bloomfield gas corridor). As a result, a permit application for the proposed emissions module within this area would be denied under the requirements of NMAQB Regulation 20.2.72, unless emission reductions were provided to offset a large portion of PSD increment consumed by the module. However, since Regulation 20.2.72 only applies to sources that emit more 25 tons per year or 10 pounds per hour of a pollutant, the wellhead compressors would be exempt from these requirements, unless a portion or all of their emissions were combined to represent one permit unit or source.

Impact Radius

The impact radius for the various pollutants and averaging periods of concern (i.e., the distances at which module impacts would fall below the pollutant-specific significance levels)

was determined by examining the coarse grid modeling runs. For NO_2, the distances where the annual and 24-hour averaging period impacts drop below their significance levels of 1 and 5 $\mu g/m^3$ would be 40 and 25 kilometers, respectively. For CO, it was determined that all modeled impacts, including the maximum value, would be below the 1- and 8-hour significance levels of 500 and 2,000 $\mu g/m^3$.

Incremental Risk from Hazardous Air Pollutants

Proposed natural gas-fired sources would emit various HAPs, including 1,1,2,2-tetrachloroethane; 1,1,2-trichloroethane; 1,1-dichloroethane; 1,3-butadiene; acetaldehyde; acrolein; benzene; carbon tetrachloride; chlorobenzene; chloroform; ethylbenzene; ethylene dibromide; formaldehyde; methanol; methylene chloride; n-hexane; naphthalene; styrene; toluene; vinyl chloride; and xylene. However, 1,3-butadiene, acetaldehyde, acrolein, benzene, and formaldehyde are the only HAPs that would be emitted in sufficient quantities from proposed operations to pose an appreciable risk to public health. These five pollutants are therefore analyzed in detail. The risk from these pollutants would be in the form of either potential cancer risk or non-carcinogenic risk to a target endpoint such as the kidney, liver, eye, reproductive system, respiratory system, cardiovascular system, central nervous system, or immune system. **Table 4-18** presents a summary of the averaging period and health risk concerns for each of these pollutants. Non-carcinogenic health risks occur as either a long-term (chronic) or short-term (acute) concern. Factors used to estimate HAPs emissions from proposed natural gas-fired sources were obtained from *Compilation of Air Pollutant Emission Factors, AP-42* (USEPA 2000).

Table 4-18. Risk Assessment Concerns for HAPs Emitted from Gas Production—Alternative B

Pollutant	Averaging Period		Cancer Risk	Non-Cancer Risk (Chronic)	Non-Cancer Risk (Acute)
	Annual	Short-Term			
1,3-Butadiene	X		X	X	
Acetaldehyde	X		X	X	
Acrolein		X		X	X
Benzene	X	X	X	X	X
Formaldehyde	X	X	X	X	X

Acceptable Ambient Concentration Levels (AACL) or Reference Exposure Levels (REL), as reported in the USEPA's National Air Toxics Information Clearinghouse database (USEPA 1997a) and in California's Office of Environmental Health Hazard Assessment (OEHHA) database (OEHHA 2002), are used to determine the potential for acute or chronic health risk. The AACLs and RELs are the maximum exposure concentration levels at which no adverse health effects would occur. **Table 4-19** shows the AACLs/RELs compared to the maximum concentrations predicted by the ISCST3 model to occur from emissions associated with the high-density area source module (as described above and in the Air Quality Technical Report). With the exception of short-term acrolein, the results in Table 4-19 indicate that emissions from the module would not be sufficient to cause an acute or chronic health concern. Maximum concentrations would be less than the AACLs/RELs. The short-term AACL/REL for acrolein was established based on an exposure concentration that caused mild eye irritation to some subjects over a period of one hour.

Table 4-19. Comparison of Maximum Ground-Level Concentrations from Gas Production to AACLs/RELs— Alternative B

Pollutant	Acute Health Risk		Chronic Health Risk	
	Maximum Short-Term Concentration[1] (µg/m3)	Acute AACL/REL[2]	Maximum Annual Concentration[1] (µg/m^3)	Chronic AACL/REL[2]
1,3-Butadiene	--	NA	0.002	20
Acetaldehyde	--	NA	0.03	9
Acrolein	0.46	0.19	0.02	0.06
Benzene	0.06	1,300	0.01	60
Formaldehyde	4.7	94	0.16	3

Notes: (1) The emissions source module and modeling techniques are described in the Air Quality Technical Report.
(2) Sources: USEPA 1997a; OEHHA 2002.

Long-term incremental exposure to the carcinogenic compounds (1,3-butadiene, acetaldehyde, benzene, and formaldehyde) is evaluated based on estimates of the increased latent cancer risk over a 70-year lifetime. The cancer risk is calculated by summing the products of the maximum annual average pollutant concentrations predicted by the ISCST3 model times the applicable USEPA unit risk factors (USEPA 1997b). The resulting estimated cancer risk is compared to the range of accepted cancer risk criteria of an increase of 1 to 100 cancer cases per million people (1 x 10^{-6} to 100 x 10^{-6}), as found in the Superfund National Oil and Hazardous Substances Pollution Contingency Plan (USEPA 1990).

Two estimates of cancer risk were computed: (1) a maximally-exposed individual (MEI) risk and (2) a most-likely exposure (MLE) risk. The typical USEPA criterion for cancer risk assumes that a person will be continuously exposed to maximum HAP concentrations for a period of 70 years. However, the USEPA allows adjustments to reflect the normal years of residence at a specific location. For the MEI scenario, the exposure duration is assumed to be the typical life of a natural gas well (20 years). Therefore, the MEI residency adjustment factor is 20 ÷ 70, or 0.286. For the MLE scenario, the exposure duration is assumed to be 9 years, corresponding to the mean duration that a family remains at a residence (USEPA 1993). Thus, the MLE residency adjustment factor is 9 ÷ 70, or 0.129.

A second adjustment factor is applied to the MLE scenario to account for the percentage of time during any given day that a potentially exposed person would be at home and therefore exposed to the maximum HAP impact concentration. The USEPA method assumes that 64 percent of the day a person would be exposed to the maximum HAP concentration and during the remainder of the day, the person would be exposed to 25 percent of the maximum HAP concentration (USEPA 1993). Therefore, the MLE daily exposure adjustment factor is ([0.64] x [1.0]) + ([0.36] x [0.25]), or 0.73. As a conservative assumption for the MEI scenario, it is assumed that a person would remain at home 24 hours per day for the entire period of exposure. Thus, the daily adjustment factor for the MEI scenario is 1.0.

Combining the two adjustment factors results in a value of (0.129 x 0.73) = 0.094 for the MLE scenario, and (0.286 x 1.0) = 0.286 for the MEI scenario. To calculate the incremental cancer risk for the MEI and MLE scenarios, the predicted maximum annual average pollutant concentrations were multiplied by the unit risk factors and then by the respective overall adjustment factors. As

shown in **Table 4-20**, the resulting summed values are 0.21 x 10^{-6} for the MLE risk and 0.65 x 10^{-6} for the MEI risk. Both the MLE risk and the MEI risk would be below the range of acceptable risk criteria. The cancer risk impact of project emissions under Alternative B would be less than significant.

Table 4-20. Maximum Cancer Risk Associated with Emissions from Gas Production—Alternative B

Pollutant	Maximum Annual Concentration[1] ($\mu g/m^3$)	Unit Risk Factor[2] $(\mu g/m^3)^{-1}$	MEI Cancer Risk	MLE Cancer Risk
1,3-Butadiene	2.40 x 10^{-3}	3.0 x 10^{-5}	2.1 x 10^{-8}	6.8 x 10^{-9}
Acetaldehyde	2.50 x 10^{-2}	2.2 x 10^{-6}	1.6 x 10^{-8}	5.2 x 10^{-9}
Benzene	5.20 x 10^{-3}	7.8 x 10^{-6}	1.2 x 10^{-8}	3.9 x 10^{-9}
Formaldehyde	1.63 x 10^{-1}	1.3 x 10^{-5}	6.0 x 10^{-7}	2.0 x 10^{-7}
TOTAL			**6.5 x 10^{-7}**	**2.1 x 10^{-7}**

Notes: (1) The emissions source module and modeling techniques are described in the Air Quality Technical Report.
(2) Source: USEPA 1997b.

Far-Field Impact Assessment

Due to the proximity of federal Class I areas to the planning area, proposed gas development sources have the potential to impact air quality in these pristine areas. The CAA allows almost no degradation of air quality in Class I areas from proposed emission sources. The Regional Haze Regulation promulgated by the USEPA in 1999 also directs states to achieve "natural" visibility conditions in Class I areas within the next 60 years.

The closest Class I areas to the planning area are the Mesa Verde National Park and Weminuche NWA in southwest Colorado and the San Pedro Parks NWA in the SFNF in New Mexico. Mesa Verde National Park is about 12 miles from the northwest corner of the project gas production region. Weminuche NWA is about 28 miles from the northern border of the project gas production region. The San Pedro Parks NWA is about 10 miles from the southeast corner of the gas production region.

Criteria used to determine the significance of air quality impacts in Class I areas have been developed for new source review as part of the NMAQB Construction and PSD permitting processes (NMAQB Regulations 20 NMAC 2.72 and 20 NMAC 2.74). Regulation 20 NMAC 2.72 requires proposed stationary sources that emit more than 25 tons per year or 10 pounds per hour to demonstrate compliance with the Class I increments, in addition to the ambient air quality standards. In addition to these requirements, Regulation 20 NMAC 2.74 requires that proposed major sources that emit more than 100 or 250 tons per year of a pollutant (depending on the source type) to determine the potential for these sources to affect (1) visibility and (2) atmospheric deposition of pollutants in Class I areas. The National Park Service, USFWS, and USFS, as part of their Federal Land Managers' Air Quality Related Values Work Group process, have developed new source review guidelines for the evaluation of impacts in Class I areas. However, the criteria to evaluate impacts to Class I areas as part of the NEPA process under these guidelines are not well defined.

The following presents analyses to evaluate the impact of proposed gas production emissions to Class I areas in proximity to the project region. These analyses include (1) a quantitative analysis to estimate impacts to PSD

NO_2 increment levels and (2) a qualitative analysis to estimate visibility impacts.

PSD Increment Analysis

The ISCST3 model was used to predict the maximum annual concentrations of NO_2 within nearby Class I areas from the same emissions module analyzed for project near-field impacts. These estimated NO_2 impacts were then compared to the PSD Class I increment for NO_2 (2.5 $\mu g/m^3$) to determine compliance with this standard. To minimize the transport distance of emissions from the module to each Class I area considered in the analysis, a module was placed within the nearest projected high-density well development area (greater than 6 wells per square mile) in proximity to each Class I area (See Figure 9.1-1 in the RFDS [Engler et al. 2001)]). The transport distances between each emissions module and Class I area include the following:

- Mesa Verde - 19 miles to the northwest.
- Weminuche NWA - 29 miles to the north.
- San Pedro NWA 1 - 42 miles to the south-southeast.
- San Pedro NWA 2 - 42 miles to the southeast.
- San Pedro NWA 3 - 50 miles to the east-southeast.

The analysis evaluated the impact of an emissions module to the San Pedro NWA from the three closest projected high-density well development areas to ensure identification of maximum impacts.

The results of the analysis determined that the maximum annual NO_2 impact within each of the three Class I areas would be (1) 0.12 $\mu g/m^3$ within Mesa Verde, (2) 0.05 $\mu g/m^3$ within Weminuche NWA, and (3) 0.10 $\mu g/m^3$ within San Pedro NWA. On the average, the wellhead compressors produced about 74 percent of the total impact at these locations, compared to the central compressors. Existing and approved emission sources within the project area have consumed a portion of the PSD Class I increment within each of these areas and therefore the amount of increment available to new sources is something less than 2.5 $\mu g/m^3$. However, since the NO_2 impact from the emissions module within any Class I area is a maximum of 5 percent of the Class I increment, these impacts would not be expected to contribute to an exceedance of the PSD Class I increment for NO_2.

The above analysis provides a relative sense of the impact of proposed emission sources to Class I areas. The analysis evaluated a very conservative scenario of emissions of which the majority of the sources would be exempt from a Class I increment analysis under NMAQB regulatory requirements. Nevertheless, at some point in the future the combined impact of all proposed gas production sources to Class I increment levels would be somewhat greater than the levels estimated for the emissions module. As a result, emissions from proposed sources in future years would consume some of the allowable NOx increment within nearby Class I areas. Given the magnitude of emissions estimated for Alternative B in future years and the sensitivity of the air quality resource in Class I Areas, the impact of NOx emissions from proposed sources to nearby Class I areas would be potentially significant.

Visibility Analysis

The SUIT FEIS (BLM 2000e) performed a far-field dispersion modeling analysis to estimate cumulative impacts from proposed gas development to visibility levels in nearby Class I areas. Its proposed action includes the maximum development of 636 coalbed methane wells and the addition of 118,000 HP of field compression. The analysis concluded that cumulative impacts could produce a "just noticeable change" to visibility on a single day at the Mesa Verde National Park and up to three days at the Weminuche Wilderness Class I areas. However, due to the conservative nature of the analysis, it is unlikely that these potential visibility impacts would actually occur.

Using the SUIT FEIS far-field modeling analysis as a means to determine the potential

for visibility impacts to Class I areas from the FFO proposed actions is difficult. Both projects propose gas development in adjacent regions, although the FFO proposed emission sources are more to the southeast and generally farther away from the Mesa Verde Class I area when compared to the SUIT project sources. As a result, the variations of meteorology and terrain between the two source regions and Mesa Verde would produce somewhat different pollutant transport conditions and ensuing impacts to this Class I area. In addition, substantially higher gas development is proposed in the FFO planning area compared to the SUIT FEIS alternatives. The maximum amount of emissions modeled for the SUIT analysis was 4,527 tons per year of NOx. Proposed development under Alternative B in year 20 could increase annual VOC and NOx emissions from current levels by 2,700 and 62,000 tons within the San Juan Basin, excluding emissions from the abandonment of existing production wells.

Due to the proximity of the Mesa Verde National Park to the planning area's high development area in the northwest part of the San Juan Basin, gas production emissions from Alternative B would have the highest potential to impact visibility in this Class I area. The results of air monitoring in Mesa Verde National Park and Weminuche NWA showed that sulfates and nitrates (photochemically converted from SO_2 and NOx to $PM_{2.5}$) contributed to roughly 50 and 6 percent of the pollutant loads, respectively, in these areas on poor visibility days in 1997 (USEPA 2002c). Visibility reducing impacts from the projected development would mainly occur from NOx emissions, as the development would emit only small amounts of SO_2. The monitored data above imply that the potential for the conversion of NOx emissions to visibility-reducing nitrates in the project region is low. However, the estimated NOx emissions from Alternative B are of such magnitude, that the projected development would have the potential to form enough nitrates to significantly impact visibility in the Mesa Verde National Park. The San Pedro Parks NWA and the Weminuche NWA in Colorado are farther away from areas of project high gas development. However, the prevalence of southwest and west winds in the region would occasionally transport emissions from Alternative B sources to these Class I areas and could substantially impact visibility in these pristine areas.

Due to the proximity of the Mesa Verde National Park to the planning area's high development area in the northwest part of the San Juan Basin, gas production emissions from Alternative B would have the highest potential to impact visibility in this Class I area. Monitoring results show that SO_2 emissions (photochemically converted to sulfates [$PM_{2.5}$]) contributed to roughly 50 percent of the poor visibility days in 1997 in Mesa Verde National Park and Weminuche NWA (USEPA 2002c). Visibility reducing impacts from projected development would mainly occur from the photochemical conversion of proposed NOx emissions to nitrates (as $PM_{2.5}$). Nitrates contributed to 6 percent of the pollutant load on the visibility-impaired days in these 2 Class I areas in 1997. The projected development would emit only small amounts of SO_2, the pollutant most responsible for visibility degradation in nearby Class I areas. The potential for NOx emissions to be converted to visibility-reducing nitrates in the project region is low. However, the magnitude of NOx emissions estimated for Alternative B is high enough that they would have the potential to form enough nitrates to significantly impact visibility in the Mesa Verde National Park. The San Pedro Parks NWA and the Weminuche NWA in Colorado are farther away from areas of project high gas development. However, the prevalence of southwest and west winds in the region would occasionally transport emissions from Alternative B sources to these Class I areas and could substantially impact visibility in these pristine areas.

If any PSD major sources were proposed under Alternative B, the applicant would have to evaluate the effect of proposed emissions on visibility and pollutant deposition levels to

nearby Class I areas as part of the requirements of NMAQB Regulation 20 NMAC 2.74. However, as shown in Table 4-16, the overwhelming majority of project emissions would occur from small sources that would be exempt from these requirements unless they were accumulated as one permit unit.

Ozone Impact Assessment

Gas production activities from the projected development are estimated to substantially increase O_3 precursor emissions of VOCs and NOx in a region that is measuring O_3 levels near the USEPA 8-hour nonattainment threshold. Review of the data in Tables 3-15 and 4-16 shows that by project year 20, VOC and NOx emissions under Alternative B would amount to about 21 and 61 percent of the 1999 San Juan County emissions inventory. However, the actual emission increases from projected development compared to existing levels would be somewhat less, as the existing emissions inventory presented in Table 3-15 does not include existing emissions from (1) the high development area in Rio Arriba County or (2) a substantial number of natural gas-fired wellhead compressor engines that fall below the NMAQB NOI threshold of 10 tons per year. Additionally, the emissions from projected development may be overestimated in project years 1 and 20, as 50 percent of the proposed wells may not need wellhead compressors at such an early age of production, as was assumed in the annual emission calculations.

A definitive determination regarding the significance of the impact of O_3 precursor emissions from the array of gas development sources proposed under the projected development would require an intensive computerized photochemical modeling analysis, which is beyond the scope of this EIS. Criteria used to determine the significance of proposed O_3 precursor emissions therefore were obtained from the USEPA General Conformity Rule (40 CFR Part 93, Subpart B). This rule applies to proposed federal actions in nonattainment areas and previous nonattainment areas that have attained the NAAQS (known as maintenance areas). While the planning area presently attains all NAAQS, application of criteria in the Conformity Rule to the analysis of in this RMP/EIS holds merit, given the tenuous attainment status for 8-hour O_3 levels in San Juan County. The Conformity Rule identifies annual emission *de minimis* thresholds that trigger requirements for more rigorous analyses to demonstrate that a federal action would conform to a State Implementation Plan (SIP), essentially an attainment or maintenance plan. The magnitudes of the *de minimis* thresholds vary by the severity of the nonattainment condition of a region. A maintenance area has the least restrictive thresholds and therefore is most applicable model for the project region, as the project region is in a similar situation as a maintenance area where air quality is just under the level of a NAAQS. The *de minimis* thresholds for an O_3 maintenance area are 100 tons per year of VOCs or NOx.

Exceedance of a *de minimis* threshold is not a final statement of the significance of emissions from a federal action, as the Rule allows options for an action to demonstrate that it would conform to a SIP, and in essence, not produce significant impacts to a region. In the case of O_3, a federal action would demonstrate conformity with a SIP if its emissions (1) were already accounted for in the attainment or maintenance demonstration of a SIP, (2) were fully offset through emission reductions implemented through a federally enforceable mechanism, or (3) were included in a revised SIP.

A review of the emissions estimated for gas production from the projected development shows that Alternative B would substantially exceed the conformity *de minimis* thresholds identified for O_3 maintenance areas. Additionally, the projected development would substantially increase emissions from current levels within the planning area. As a result, emissions from projected development would be expected to increase ambient O_3 levels in the planning area by an unspecified amount. Since San Juan County is near the

nonattainment level for 8-hour O_3 concentrations, the impact of the emissions from projected development would be potentially significant to ambient O_3 levels within this portion of the project region.

OHV Use

OHV use and resulting air quality impacts under Alternative B would be similar to or less than those described under Alternative A.

Coal Leasing Suitability Assessment

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

Oil and Gas Leasing and Development

Most of the existing wells in the planning area are in the piñon-juniper woodlands and Great Basin Desert Scrub plant communities. The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be approximately 38,000 acres. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Approximately 42,000 acres of these plant communities would have the highest level of disturbance from initial construction for oil and gas development. Areas that are reseeded (13,800 acres) would not return to their original plant cover types in the 20-year period of impacts considered. Surface disturbance and vehicle travel would result in the spread of noxious weeds that can be mitigated through implementation of a weed management plan.

Land Ownership Adjustments

Over 347,000 acres would be available for disposal and 77,600 acres for acquisition under Alternative B (Table 2-1). The dominant upland plant communities on this land are Great Basin Desert Scrub and Desert Grasslands. Much of this habitat is in close proximity to urban areas and has been degraded by human activity. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place. Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on upland plant communities through improved management of natural resources.

OHV Use

OHV travel in upland plant communities can result in direct plant mortality and spread of noxious weeds, and indirect effects through soil disturbance and the promotion of increased erosion. The amount of land open to OHV use under Alternative B would be 4,616 acres (Table 2-2) in SDAs. The majority of FFO land would be closed or limited for OHV use. The continuation of OHV use in open areas would result in the continued degradation of upland plant communities. However, because the open designation would be only 0.3 percent of the FFO area, much less than under Alternative A, the impacts to vegetation from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-10).

Specially Designated Areas

Many of the areas have management prescriptions that limit vegetative disturbance, OHV access, or grazing. This management would continue to protect vegetation in a limited portion (less than 30 percent) of the FFO.

Coal Leasing Suitability Assessment

Specific locations of new coal mining areas on FFO land have not been identified. Coal mining has the potential to affect a large amount of land, depending on how many of the currently permitted sites are approved for strip mining. Applications for coal mining would go through the NEPA process and site-specific analysis of the project impacts on upland vegetation would be performed at that time.

Riparian Areas and Wetlands

Oil and Gas Leasing and Development

The only specific constraints on oil and gas development that would protect riparian areas are the CSU constraints within approximately 10,000 acres in 2 SDAs. There are other riparian areas within the planning area that could be affected by oil and gas development through surface disturbance, construction, and removal of vegetation. While it is impossible to quantify the impacts to riparian areas without knowing the locations of well, road, pipeline, and compressor sites, it is anticipated that there would be impacts to riparian areas from the high well numbers projected to be installed in the high development area. Any construction along the edge or across water bodies or wetlands would be required to meet state and federal requirements for sediment and erosion control, and the developers would be required to obtain permits from the USACE and the NMED in compliance with Section 404 of the CWA and Section 401 of the NMWQCA.

Land Ownership Adjustments

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land.

Approximately 347,500 acres of FFO land would be made available for disposal on FFO land under this alternative (Table 2-1). Designated FFO riparian areas such as the River Tracts would not be included in land being considered for disposal. Land available for acquisition would be 77,500 acres, less under this alternative than under Alternative A. This would result in less potential for a positive impact to biological resources through the acquisition of inholdings and parcels with important biological functions.

OHV Use

OHV use of specially designated riparian areas on FFO land would be limited to designated roads and trails and intermittent wash bottoms (Table 2-3). This traffic can result in the elimination of vegetation in and along the washes, resulting in accelerated erosion and surface water runoff. The OHV traffic in dry washes would continue to degrade these areas. However, the more limited OHV access overall would, in general, provide additional protection to riparian areas and intermittent washes. Even if additional acreage were included in the "Open" category (Table 2-10) with completion of the OHV Activity Plans, none of that acreage would be in riparian areas.

Specially Designated Areas

The proposed Ephemeral Wash Riparian Area on 7,459 acres of public land would provide additional protection to these important areas within the FFO. There would be more emphasis on acquiring inholdings within the River Tracts Riparian Area than there would be under Alternative A, which would provide additional protection to those riparian areas by applying the more stringent management prescriptions, as identified in Table 2-5. CSU constraints in over 236,000 acres in SDAs under Alternative B would assist managers in avoiding riparian and wetland areas because oil and gas operations can be moved in order to minimize impacts to riparian areas and wetlands.

Coal Leasing Suitability Assessment

Coal mining operations would not take place in significant wetland and riparian habitat because these areas would be screened out through application of the unsuitability criteria. There is the potential that coal mining could

lead to increased erosion and resulting sedimentation in riparian areas, although few exist in the area identified for coal mining. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately addressed.

Special Status Species

Measures are in place to protect species listed and proposed for listing under the ESA that are known to occur or have the potential to occur on federal land in the planning area, as well as for other special status species. The species, critical habitats, and protective measures are listed under Alternative A, Special Status Species.

Oil and Gas Leasing and Development

Implementation of Alternative B would be expected to affect the same special status species as Alternative A. Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment. Stipulations and management practices established as a result of these consultations would be continued to conserve these species. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described in previous sections. The FFO would reinitiate consultation as necessary to ensure compliance with ESA.

Land Ownership Adjustments

The amount of land that would be made available for disposal in the tri-cities area is greater under this alternative than under the other alternatives, and typically consists of degraded habitat in close proximity to human activity and is therefore considered marginal habitat. No federally listed or proposed species or their critical habitat are known to occur in land being considered for transfer to local municipalities.

The FFO would retain in federal ownership all habitat essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and that is deemed to be essential to their survival. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal.

OHV Use

The amount of land open to OHV use under Alternative B would be 4,616 acres within SDAs. The majority of FFO land would be closed or limited for OHV use. Because the open designation would be only 0.3 percent of the FFO area, much less than under Alternative A, the potential for impacts to special status species from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-10) as the OHV Activity Plans are completed. It is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys, placed on the conflict map maintained at the FFO, and OHV travel is restricted through the appropriate process and environmental document.

Specially Designated Areas

The Aztec Gilia ACEC would be eliminated under this alternative because this plant is much more widespread on FFO land than originally thought, and the habitat within the ACEC is not representative of optimum Aztec gilia habitat. This would not negatively impact the Aztec gilia because the protective measures described under Alternative A would be required.

The Bald Eagle ACEC would be maintained to protect nesting and use sites from disturbance. An Ephemeral Wash Riparian

Area would be created under Alternative B, which would include the ephemeral wash riparian reaches and wetlands designated in the Riparian EIS (BLM 2000c), including over 7,400 acres. The proposed Riparian Area would provide protection for potential southwestern willow flycatcher habitat, as well as for wildlife habitat in general.

The Mexican Spotted Owl ACEC would be established for the protection of the federally designated critical habitat. Within the boundaries of this ACEC, the management prescriptions would follow the requirements of the Recovery Plan, including the prohibition of cutting of ponderosa pine and Douglas fir, and limits on oil and gas development in the mixed conifer forest.

Coal Leasing Suitability Assessment

Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and additional coal interests. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because they would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining, as shown on Map 4-1. Many of the PRLAs, competitive lease tracts, and additional coal interest areas, occur near or within the plover potential habitat. Coal mining in and near potential mountain plover habitat would require plover surveys to be completed before applications to mine would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act, so it is anticipated that mitigation measures would be required to minimize impacts.

Fisheries and Wildlife

Oil and Gas Leasing and Development

Implementation of Alternative B would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

An estimated 3,653 wells would be developed in the 397,000 acres of public land in wildlife areas in the high development areas under Alternative B. The construction of these wells and associated roads and pipelines would result in the long-term loss of about 11,500 acres of habitat (Table 4-6). The long-term loss of habitat from existing and projected development would be about 30,500 acres or 7.7 percent of the area. An estimated 296 miles of new roads would be constructed, which would result in an increased road density from 2.6 to 3.1 mi/mi^2. Habitat fragmentation from the new roads cannot be determined at this time, but the potential decrease in functional habitat within 660 feet of roads could be as much as 47,000 acres. Within 1,320 feet, it could be 95,700 acres. This represents an increase from 46 to 55 percent functional habitat loss within 660 feet and from 75 to 93 percent within 1,320 feet of roads. This is likely to be an overestimation because of the overlap in those areas. These losses would further reduce the carrying capacity of the habitat for mule deer, elk, and other wildlife.

A total of 382 wells would be developed in pronghorn antelope habitat in the Ensenada Mesa area. The estimated amount of long-term disturbance from these new wells, roads, and pipelines, would be about 1,200 acres or 3 percent of the total area. About 31 miles of roads would be constructed, resulting in an increase in road density from 3.8 mi/mi^2

currently to 4.2 mi/mi^2. Functional habitat loss could increase by as much as 6,080 acres (14 percent of the total Angel Peak Wildlife Area) for the 660-foot effects zone, and 12,160 acres (28 percent) for the 1,320-foot road effects zone. This may be an overestimation of this increase due to new roads overlapping existing roads. The increase in habitat disturbance, roads, functional habitat loss, fragmentation, and human activity would have greater impacts on pronghorn antelope under this alternative than Alternative A.

Other species of wildlife would also be affected by oil and gas development, including the displacement of breeding birds. The loss of 11,500 acres of land in the 523,700-acre study area could result in the long-term loss of habitat for breeding birds. Many of the breeding birds in this area use the Mixed Coniferous Woodland and Great Basin Desert Scrub habitat, which would not be replaced within the 20-year period of analysis.

Under Alternative B, new wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 28 acres on the SFNF, 340 acres on USBR land, and 2,500 acres on AFO land. Many of the same species that were assessed above on FFO land also occur on these lands. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower numbers of projected wells and roads, resulting in lower levels of habitat fragmentation.

Land Ownership Adjustments

The amount of additional land that would be made available for disposal in the tri-cities area under this alternative would be more than under the other alternatives. Within a three-mile buffer of the tri-cities area, implementation of this alternative would have the potential to affect some relatively undisturbed habitat as well as the more degraded areas that occur nearer human habitation. Wildlife species associated with the Great Basin Desert Scrub and Desert Grassland plant communities would be affected if the land use and management change under the new owner.

OHV Use

The potential impacts of OHV activities would be the less than under Alternative A because the access would be more limited.

Specially Designated Areas

The Critical Big Game Habitat areas would be continued with their timing limitations to protect wintering deer, elk, antelope, and turkeys. Thomas Canyon would be enlarged, and both Carracas Mesa and Thomas Canyon would be managed for wildlife as well as recreational value, resulting in an additional 16,000 acres of public land with a goal of wildlife habitat management.

Coal Leasing Suitability Assessment

Specific new coal lease areas have not been identified. The coal extraction program on FFO has the potential to affect a large amount of land. Proposed coal operations would go through the NEPA process and an analysis of the proposed project on wildlife would be performed at that time.

Wilderness

Oil and Gas Leasing and Development

The level of new oil and gas development in areas surrounding the WA and WSAs would be slightly higher than current levels, but could be more than would occur under Alternative A. The nature of the potential indirect impacts would be similar but to a slightly greater degree than under Alternative A. However, under this alternative, the FFO would pursue acquisition of adjacent lands, increasing the manageability of wilderness land. Acquiring additional land around the WAs would enhance management of the surrounding areas in a manner that is compatible with wilderness.

Noise from new compressor sites or well locations could affect peripheral areas of the WA and WSA. To reduce these potential indirect effects, conditions could be applied to

new oil and gas development on lands adjacent to the WA and WSA to preserve wilderness qualities, providing protection of natural quiet along the periphery of the protected areas.

Land Ownership Adjustments

Acquisition of land surrounding the WA and WSAs would reinforce wilderness values and provide for compatible use of lands adjacent to WAs. Other adjustments would be the same as Alternative A.

OHV Use

There would be no change in OHV designations that close the WA and WSA to OHV use.

Specially Designated Areas

Designating Ah-shi-sle-pah WSA as an ACEC would provide legislative protection for special resource values and allow for additional control of productive uses regardless of its future wilderness status.

Coal Leasing Suitability Assessment

Potential coal development in the vicinity of Bisti/De-na-zin WA and in or around Ah-shi-sle-pah WSA would have similar impacts as described for Alternative A. Indirect impacts such as visual, air quality, or sound quality could affect adjacent WA and WSA areas. Application of the coal unsuitability criteria would prevent direct impacts of coal development in WAs and WSAs.

Rangeland

Oil and Gas Leasing and Development

Due to the high numbers of projected wells and associated infrastructure that would be constructed under Alternative B, there would be more impacts on rangeland and livestock grazing due to surface disturbance and fragmentation of grazing allotments than under the other alternatives. Impacts would result from the reduction of the acreage of forage available for grazing through surface disturbance, construction of oil and gas facilities, and the increased potential for spreading weeds from more facilities and more travel between them. There would also be more potential for conflicts with oil and gas operations, as described for Alternative A.

Land Ownership Adjustments

There would be 28 grazing allotments within the area identified for disposal under this alternative that extends three miles from the tri-cities area municipal boundaries. All or part of the following range allotments would be affected by land disposal in this area: 5004, 5005, 5006, 5007, 5009, 5010, 5016, 5018, 5019, 5025, 5028, 5030, 5031, 5032, 5033, 5035, 5037, 5047, 5070, 5072, 5127, 5128, 5140, 5144, 5145, 5146, 5147, 5150.

According to FFO staff (Sanchez 2001), when urban areas extend their boundaries into range allotments, conflicts between adjacent land users arise, especially regarding control of livestock through fencing. FFO policy corresponds with state policy that fencing should be constructed to exclude livestock from an area. However, county and municipal regulations often only require that animals be controlled by their owners. If the local fencing requirements became applicable to permittees grazing cattle or horses near the urban areas, there would be a potential economic impact resulting from the cost of erecting fences to contain livestock. If the cost of fencing is prohibitive, this could result in permittees giving up their allotments or transferring them to sheep farmers who would use herders to control their livestock.

OHV Use

There would be fewer conflicts between grazing permittees and OHV users, as described in Alternative A, because OHV access would be much more limited than under Alternative A. There would also be fewer opportunities for noxious weeds to be spread by cross-country OHV travel, so weed management problems would be reduced. Even if additional acreage were opened to OHV use as the OHV Activity Plans are completed, conflicts with grazing permittees would be a major consideration in the designation of those open areas.

Specially Designated Areas

Grazing limitations identified in 22 of the SDAs under Alternative B include approximately 8,000 acres that would be closed to grazing, almost 1,000 acres in three areas in which grazing permits would not be reissued if they expire, and 7 acres that would be withdrawn from grazing in these areas. All of these limitations are proposed for public land, and all but the acreage that would not be reissued are currently in effect, so few new impacts on grazing would result.

Coal Leasing Suitability Assessment

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

Lands and Access

Oil and Gas Leasing and Development

About 24,800 acres of land within the FFO would be disturbed over the next 20 years for new oil and gas facilities. About half this disturbance would be for new pipelines and would occur in existing utility and transportation corridors to the extent feasible. These actions would displace existing use on less than 2 percent of the land overlying federal minerals estate in the FFO. This would have little overall effect on multiple use objectives. Specific effects on multiple uses and natural resource values are discussed under their respective resource sections. Use of non-federal land could also be displaced, or conditions altered, from new oil and gas facilities. BLM would coordinate with surface owners to minimize potential incompatible development, but suitable uses of some areas may be altered.

There would be up to 320 large compressors (over 500 to 10,000 HP) and about 14,000 smaller compressors (about 100 HP) installed at new and existing well sites throughout the oil and gas region. Potential impacts from these noise sources on adjacent uses, such as residences, community facilities, other noise sensitive uses or receptors, would be reviewed on a case-by-case basis. Suitable methods to reduce noise may be incorporated into COAs. However, there are likely to be incompatible adjacent uses in locations throughout the area. Impacts during construction (such as localized noise, dust, and emissions) would be more frequent than under Alternative A, and may be inconvenient and incompatible with some ongoing uses, but would be temporary.

Under Alternative B, about 1,100 miles of new roadway may be constructed as a result of oil and gas development. About 650 miles may be reclaimed resulting in a net increase of about 3 percent over the existing network. Under the new roads program, maintenance of new industry service roads would primarily be borne by industry users. Industry-related traffic is estimated to increase by about 8 to 30 percent from federal oil and gas production and 11 to 22 percent in the planning area over current levels. This would likely generate moderate to significant increases on specific roadways, but it is not known to what degree it would affect traffic flow. Traffic, largely by heavier trucks, is expected to increase the amount of maintenance needed to keep some roads functional. This would be particularly problematic on roads that are currently in poor condition. The road inventory will evaluate existing road condition and capacity for additional traffic. Other access and road-related actions would have similar effects as described for Alternative A.

The creation of new roads, although relatively small proportionately, would exacerbate existing problems that are attributed to the proliferation of roads. With respect to land use compatibility, expanded road access would continue to extend human activity into areas that remain natural at the present time.

Land Ownership Adjustments

In addition to the land adjustments described for Alternative A, disposal of about 347,500 acres in the FFO, including 71,250 acres of BLM land within a 3-mile distance of the tri-cities area corporate boundaries, would be a priority for the FFO. BLM lands within

existing or proposed SDAs would not be available for disposal, minimizing potential loss of areas with special value. Throughout the FFO, split estate could increase by about 329,300 acres, or about 44 percent over current levels. Most likely, land near the tri-cities area would be leased and patented under various appropriate R&PP Act applications. These transactions would need to be consistent with BLM objectives and stated community needs and goals. Implementation of R&PP disposals would be facilitated by clear community plans for development on disposal parcels. Sales at fair market value may also be executed. The 71,250 acres could increase the non-federal land supply by over 50 percent in the tri-cities area, providing opportunities for community expansion and growth. However, all this land would likely become split estate. The types of suitable uses on split estate lands may be limited by the possibility of incompatible oil and gas development. Future development in these areas would be guided by applicable zoning or subdivision regulations. Potential conflicts between grazing operations on FFO land and adjacent private land could increase if fencing issues are not considered, particularly in disposal actions (see Rangeland).

OHV Use

The default classification of BLM lands in the FFO as limited to cross-country travel could improve conflicts between some OHV uses (such as four-wheeling and motocross) in the vicinity of residences, particularly closer to developed areas. Also, potential for cross-country travel on private land that is accessible due to public easement along many roads would be reduced. Development of Activity Plans for 13 OHV units would be coordinated with future transportation plans to provide for recreational use of designated trails and areas into the future.

Specially Designated Areas

BLM would acquire 77,589 acres of non-federal inholdings under this alternative, reflecting proposed adjustments in boundaries of SDAs. The effects of acquisitions and disposals would be similar to Alternative A. Accounting for proposed acquisitions, specially managed land could increase by 11 percent over current conditions.

Coal Leasing Suitability Assessment

Several coal leases could be developed under this alternative, including expansion of the San Juan mine and coal interests in the Lee Ranch/Hospah area. Further NEPA analysis would address potential impacts to adjacent non-federal lands as proposal for specific parcels are identified. The San Juan mine is comprised of multiple leases. The existing mining operations and power plant dominate the nearby landscape. Expansion would be consistent with this highly modified industrial area. Residential uses have also developed nearby along Highway 64, likely due to availability of infrastructure, lower land and development costs, and proximity to employment areas. Impacts on nearby residential areas would need to be addressed when expansion areas are defined. Development of any new mine, whether on federal or non-federal land, would also require further environmental analysis. Potential impacts on surrounding land uses would be addressed. A likely location would be the Lee Ranch/Hospah area. The area is generally isolated with very low population. The FFO has no SDAs in this location. The 1870s Wagon Road Trail passes through some of the identified coal interests and lease tracts. A large new surface mine in this area may be visible from sensitive locations (such as cultural sites) for fairly long distances. Impacts from continuing home fuel collection would be the same as Alternative A.

Visual Resources

Oil and Gas Leasing and Development

The level of oil and gas development on federal minerals under Alternative B would be considerably higher than under Alternative A. About 13,300 new wells are projected on land overlying federal minerals with 7,170 at new

locations and about 4,400 wells (and associated unused roads) would be reclaimed. The average well density would increase from the current 2.6 wells per square mile to 2.9 wells per square mile in the high development area by the end of the 20-year period of analysis. Considering existing and future development on both federal and non-federal land, well density could increase in the high development area from 2.6 to 3.1 wells per square mile in the high development area. This would increase the overall presence of oil and gas development by about 20 percent over current levels. This would cause noticeable changes to the visual landscape and likely contribute to downgrading of VRM conditions on a regional basis.

About 11,100 wells are projected for land with federal minerals in the FFO area. Accounting for reclamation, an estimated 24,800 acres would be disturbed. However, because of NSO leasing stipulations in some of the VRM Class I and II areas, some wells could not be drilled within these SDAs. Therefore, the potential for degradation of visual conditions on the periphery of these areas is high. Enforcement of VRM standards would reduce the effects of development on valued visual resources.

Over 140 projected new wells (on 80 new sites) on USBR land would add to the density of manmade alterations in the landscape. Required setbacks from shoreline and recreational sites would minimize the intensity of visual impacts. Maintaining VRM Class II objectives may be difficult if all projected wells are permitted. About 700 new wells (involving about 400 new locations) may be drilled in USFS areas (primarily in the Jicarilla Ranger District). USFS policies would favor oil and gas production and would allow above-ground pipelines and new roads to be constructed, increasing the potential for visible modifications. Under this alternative, the impact of manmade modifications in the landscape would become more evident and visual conditions would decline.

Land Ownership Adjustments

The emphasis on land disposal under this alternative would put additional land at risk for future development without VRM constraints throughout the FFO area. Similar impacts from development on non-federal lands as described for Alternative A would also apply. In the tri-cities area, 26,600 acres of BLM land would be high priority for disposal. None of the 10 SDAs within the tri-cities area disposal area have VRM Class I or II rating; therefore, the overall sensitivity of these areas to any future changes is relatively low.

OHV Use

Limiting OHV use to roads and trails and concentrating cross-country use into very localized areas would limit potential scarring and visual degradation that can be caused by off-road travel. This would limit potential visual impacts in the FFO on a widespread basis and benefit visual resources. As the OHV Activity Plans are completed, any new OHV open areas would be analyzed for their effect on the landscape and would have to meet the VRM category designation.

Specially Designated Areas

Management of FFO lands for VRM objectives under this alternative would be similar to Alternative A. However, expansion of some SDAs would increase the amount of land managed for VRM Class I and II classifications to about 13 percent of the FFO area. This is a slight increase over current conditions. This would have a minimal minor benefit on visual resources.

Overall, considerable impacts could result to visual resources on federal lands under this alternative, primarily due to increases in oil and gas infrastructure, and, to a lesser degree, from some permitted and incidental cross-country OHV use. With the enforcement of VRM objectives, impacts can be avoided in the most sensitive and valued areas.

Coal Leasing Suitability Assessment

Potential impacts of Alternative B to visual resources would be similar to Alternative A.

Any large new surface mining operation could cause considerable change in nearby areas, and be visible for great distances. This could affect the visual quality of the proposed Piñon Mesa Trail Recreation Area and could expose travelers along nearby roadways to increased visual impacts. Development of coal interests in the Lee Ranch/Hospah area could affect viewsheds of sensitive cultural resources. The surrounding area is particularly rich in Chacoan sites, including the Chaco Culture National Historic Park.

Cultural Resources

All impacts to cultural resources described in this section include those likely to occur but would not necessarily be limited to those listed.

Oil and Gas Leasing and Development

The higher projected surface disturbance under this alternative would potentially affect 2,211 archaeological sites (Table 4-10). As under Alternative A, archaeological sites in the Largo, Carrizo, La Plata, and Upper San Juan watersheds would be most affected by this alternative. Site quantities in the Largo watershed may be underestimated.

This alternative would result in an increase of almost 1,100 miles of new roads (Table 2-3) in the high development area, which would greatly increase public access to archaeological sites and TCPs. An increase in vandalism would be anticipated due to increased public access.

Land Ownership Adjustments

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted. No known significant cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within SDAs because sites would be protected by a single landowner (FFO) and a comprehensive management plan.

OHV Use

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternative A for archaeological sites to be damaged by vehicles driving across the landscape. If additional acreage were designated as open to OHV use (Table 2-10) as the Activity Plans are completed, cultural resources would be considered during planning and inventory.

Specially Designated Areas

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, grazing, and OHV activities would be provided to important cultural sites in 86 SDAs that are either SMAs or ACECs within approximately 40,400 acres in the FFO area. All of these areas would be designated as noise sensitive. Proposed management prescriptions would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

When specific locations of proposed coal mines are known, cultural resource clearance would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use.

Ground subsidence has already been documented in the vicinity of the Deep Lease coal mine in the northwestern part of the FFO area, identified as BHP Additional Coal Interest on Map 2-8. Additional monitoring in this area would be needed as deep coal mining continues, in order to identify and mitigate impacts to cultural resources.

Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

Paleontology

Oil and Gas Leasing and Development

Alternative B would involve the most acreage of surface disturbance and have the greatest potential for impacts to paleontological resources due to the highest projected well numbers. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A.

Land Ownership Adjustments

There would be no impact to known paleontological resources from land disposal because the resources would be surveyed prior to land transfers and important paleontological resources would not be available for disposal. If inholdings within 4 existing and 5 proposed SDAs were acquired, more paleontological resources would be protected through implementation of management prescriptions than under Alternative A.

OHV Use

The limited OHV designation in most of the FFO area would greatly reduce cross-country travel and the resulting damage to slopes, soils, and vegetation that could affect paleontological formations through directly destroying surface fossils, wearing down rock formations, or accelerated soil erosion. By eliminating areas with shallow bedrock from consideration for open OHV designation in the future (Table 2-10), impacts to paleontological formations would be avoided. Designation of additional acreage in the "Open" category as the OHV Activity Plans are completed should have little effect on paleontological resources since the most important of these are protected within SDAs.

Specially Designated Areas

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 SDAs.

Coal Leasing Suitability Assessment

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. More areas are under consideration for coal mining. Consequently, there could be the potential for additional impacts if additional coal mining were to be approved in areas where unidentified paleontological resources occur.

Recreation

Oil and Gas Leasing and Development

Under this alternative, development of 11,100 new oil and gas wells in the FFO area could cause a net displacement of 1.8 percent of the FFO lands that are open to the public for recreation. All of this land is within the high development area in the northeast half of the planning area. This should have minimal effect on the availability of dispersed recreation throughout the FFO area.

Some stipulations on oil and gas development in areas specially managed for recreation would be changed. Relatively more recreation land would have NSO restrictions. This stipulation would prevent oil and gas development directly on a larger portion of special recreation areas. The existing 409 wells in these areas would increase by about 427 new wells, almost doubling the amount of associated infrastructure, vehicular traffic, noise, and visual modification. They would cause minor displacement of recreational use on about 2.4 percent of the recreation areas and somewhat increase road density and oil-and-

gas-related traffic over current levels. Accounting for wells that would be plugged and abandoned, the average well density in recreation areas would increase by about 105 percent. Excluding the areas specially developed for OHV use, this is likely, over time, to degrade the quality of opportunities for outdoor recreational activities that enjoy quiet and natural surroundings.

It is expected that about half the new wells within recreation areas would have compressors that generate noise. Noise could become more prevalent and scattered throughout these areas, as well as the rest of the highly productive oil and gas area. Conflicts between noise sensitive uses would be addressed and mitigated on a case-by-case basis. Because of existing stipulations and protective laws, the WA and WSAs would be relatively unaffected by oil and gas and motorized vehicle use. Along the periphery of these areas, there may be indirect effects from changes in visual quality and incidental noise sources from activities on adjacent lands.

About 320 larger (500 to 10,000 HP) compressors and about 14,000 small well-site compressors would also be sited throughout the oil and gas areas. Noise reduction measures may be required for some sites near residences and some developed recreation sites, but many would not be mitigated on the current case-by-case basis. Consequently, noise generated by these facilities could be incompatible with quiet outdoor activities in some locations.

Impacts on recreation to AFO land would be similar to Alternative A. There would be about 1,300 new wells on AFO lands, but based on resource potential, very few in the recreation areas. There may be localized effects on dispersed recreation, primarily from visual alterations and compressor noise.

Under this alternative, the areas around Navajo Lake would have a CSU stipulation. The number of new wells around the lake could increase from 128 to 290 (half expected to have compressors) over the next 20 years. Controlled surface use stipulations and VRM II classification allow for more careful siting of new wells, minimizing potential conflicts with recreation areas. Noise from existing well compressors and its effect on quality recreation has been a concern. The number of new noise sources could have impacts on recreational uses if not reduced through site modifications. Wells would be sited as much as possible to avoid lakeside and rim locations that are easily visible from the lake or campsite areas. However, new development would likely be noticeable to recreationists, as are existing facilities.

About 700 new wells are projected for the USFS lands, primarily in the Jicarilla Ranger District. This level of development would more than double traffic on some forest roads, add over 50 miles of new roadway, and introduce new noise sources from compressors to areas where people undertake dispersed recreational activities. A variety of current management practices would be relaxed to facilitate development that would contribute to less desirable conditions for quality dispersed outdoor recreation. Road densities could increase over 0.5 mi/mi^2, the established planning objective for the Jicarilla Ranger District, requiring amendments to the existing Forest Plan. Increased evidence of human activities (sight, sound, and disturbance) over current levels would degrade conditions for a variety of outdoor recreational pursuits in natural settings. Increased erosion, sedimentation, and habitat fragmentation resulting from increased road density would indirectly affect wildlife, vegetation, and visual quality desired for quality dispersed outdoor recreation. Specific recreation sites may be affected by visual and audible intrusions of oil and gas facilities if not mitigated by siting and other physical methods.

Similarly, about 160 new wells around Navajo Lake could affect the visual quality and sound levels around the primary recreation sites such as Pine River Recreation Emphasis Area, Sims Mesa Recreation Emphasis Area, and San Juan River Management Area. Use of noise-reducing methods could minimize some of the audible impacts.

Overall, changes in visitation levels for recreational activities are difficult to predict, but visitor satisfaction would likely decline as scenic and acoustic quality declined in popular and remote recreation areas throughout federal land under this alternative.

Land Ownership Adjustments

Under a management framework of maximizing productive use and access, lands would be more easily available by sale and under the R&PP Act. An area around the tri-cities area of 71,250 acres would be available for disposal. This could mitigate the shortage of land for development in the urbanizing tri-cities area. Established or proposed recreation areas that are near the tri-cities area would not be available for disposal unless proposals include plans for recreational uses. Disposal and development of favored recreation areas would be detrimental to recreational opportunities unless this is the proposed use of the receiving entity. BLM would review all proposals for consistency with BLM objectives, compatibility with adjacent public land uses, and public purposes. Preferably, these would be documented in planning documents or well-supported in community involvement initiatives. Acquisition of inholdings in recreation areas would improve management and access for recreation.

OHV Use

Expansion of the OHV management units to cover the entire resource area under a default "limited" classification would dramatically alter potential for cross-country travel. There would continue to be fairly lenient provisions for exceptions and certain uses (such as residents, emergency access, permit holders) that would allow for some travel off roads in "limited" areas. Also, as OHV Activity Plans for each unit are developed, public input would be used to further define areas that may be suitable for cross-country travel. A preliminary screening identified about 100,000 acres of BLM land that may be suitable for OHV and cross-country use in addition to SDAs comprised of 4,616 acres. The advantage of this approach is that particularly suitable areas could be used for cross-country sports, and potential damage to areas with other resources values would be reduced.

Considering the extensive road network in the oil and gas development area, access by the public for most purposes and to most areas (either productive or recreational), would remain high. This alternative would provide added protection for natural and cultural resources, and provide benefits for some recreationists that prefer opportunities for quiet and natural experiences.

Under this alternative, the trail system would be expanded by almost 300 percent with 94 miles of new trails. Trails would greatly augment appropriate recreational facilities for both motorized and unmotorized vehicle use. The proposed trails would be located close to the larger population centers, providing ready access. More trails could be identified during preparation of the OHV Activity Plans.

Specially Designated Areas

As shown in Table 4-13, the amount of land specially managed for recreation would decline slightly (due to reducing the size of the GRTS area). While this is not significant in quantity, four popular areas in proximity to the tri-cities area would become recreation areas: Alien Run Mountain Bike Trail, Piñon Mesa Trail, Rock Garden, and Navajo Lake Horse Trails. These new areas would respond to the need and demand for additional and segregated trails for motorized and un-motorized vehicles and horseback riding. This would have a beneficial effect on recreational opportunities in the FFO area. ROS classifications shown in Table 4-12 would apply to about 32,000 additional acres, providing a standard for maintaining a mix of recreational opportunity and for managing road density and other development in these areas.

In addition to changes in stipulations on oil and gas development, changes in management prescriptions would generally be applied to protect a range of resource values that would indirectly benefit recreation. Examples include

restrictions on shooting in developed sites, reclamation efforts using native plant species, a policy of no land disposals within SDAs, clearances for surface disturbing activities, and case-by-case review of new ROWs. Renaming three recreation areas would provide more informative description of their resource value for recreationists. This would be particularly useful for out-of-region visitors.

Coal Leasing Suitability Assessment

Development of coal leases, PRLAs, and coal interests has the most potential to affect dispersed recreation in the remote badland areas around Bisti/De-na-zin WA and Ah-shi-sle-pah WSA. Development around the WSA, whether designated or not, could indirectly influence exceptional landscape qualities for persons recreating in that area.

Development of the San Juan mine could expand the immediate area affected by mining operations. Areas surrounding Farmington are used for a variety of recreational activities. Changes in visual and sound quality from expanded coal operations could affect the quality of recreational experiences west of Farmington. If the San Juan mine expanded into this proposed area, no underground mining or development of other leasables and salables along the Piñon Mesa Trail Corridor would be permitted.

Noise

Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 13,275 new wells projected under Alternative B, and 14,400 existing wells on land with federal minerals, this could result in almost 14,000 small wellhead compressors scattered throughout the high development area. Noise from the wellhead compressors from mechanical parts and exhaust ranges from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 300 mid-size compressors (500 to 2,000 HP) would be installed under Alternative B. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

Actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added and would be much greater than under Alternative A because there would be 4,400 more small compressors and 174 more large compressors in use over the 20-year period. These would continue to be mitigated on a case-by-case basis.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells.

OHV Use

Limiting OHV use to designated roads and trails could lessen noise in remote areas. Many more maintained roads would be constructed in the high development area and used by OHVs. This would contribute to intermittent traffic noise in the immediate surrounding area for the

long-term. Development of OHV Activity Plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

Social and Economic Conditions

Employment

Under this alternative, based on a total of 13,275 new wells and reclamation of 4,398 wells per year over the next 20 years, there would be an increase of about 1,020 development jobs per year in the planning area over current levels employed in oil- and gas-related jobs. There would also be a gain in annual maintenance jobs (about 1,300) after 20 years, resulting in a 20 percent increase in oil and gas employment on federal land after 20 years. This would have a positive impact on local oil and gas industry employment and earnings in the planning area, and minimal impact overall for the region. However, industry jobs would still be subject to boom-bust cycles due to market-driven demands.

Under this alternative, coal mining jobs associated with federal minerals would not be expected to decline with expansion of existing mines and possible new operations on competitive lease tracts, recent coal interests, and PRLAs. If several new locations become productive, this could result in substantial job increases for the coal industry, but fairly minor increases for the region. There is a shortage of experienced underground miners, so this type of operation would likely draw from other states.

Expenditures

Under Alternative B, the estimated cost for drilling 13,275 wells is almost $7.2 billion, at an average cost of $541,000 per well. No commingling of wells was assumed for this alternative. These costs assume about 110 directional wells, or approximately 1 percent of the total number of projected wells, for this alternative. Additional direct costs would increase the total investment to almost $8.1 billion. Additional indirect expenditures could result in a total of $10.3 billion spent over 20 years or an average of $517 million per year (non escalated). This represents a threefold increase in expenditures for federal oil and gas development compared to Alternative A, and over 20 percent increase above current expenditures. This alternative would provide the greatest influx of expenditures into the local and regional economies and somewhat outpace the estimated expenditures if current development were continued.

Revenues

Under Alternative B, the projected oil and gas production volume on federal land over the next 20 years is estimated at 11,158 Bcf. Because oil is a very small percentage of production in the San Juan Basin, these calculations are based on gas values. Assuming a value of $3.00 per Mcf, the total value of this product could be about $33.5 billion (in 2001 dollars). The volume of production each year would slowly increase, more than doubling current levels in 20 years. Therefore, potential effects on tax revenues would be significant from increasing production. Other factors, primarily product value and tax rates, would be far more influential in future tax revenue potential.

Under this alternative, additional coal leasing could be pursued. However, a recent industry study of coal production indicates that overall production from mines on federal land in the Four Corners area is not expected to increase over the next 20 years. Some mines are likely to lose production while others increase or expand. Therefore, overall production and value of coal are not expected to change significantly. Expansion of the San Juan Basin mine, and development of federal minerals on the coal lease tracts rather than non-federal minerals, would benefit total federal royalties paid to the State of New Mexico. Additional development could extend the lifespan of coal resources in the basin.

Grazing may be displaced from land that is used for oil and gas development or where new management prescriptions would withdraw

grazing. Under this alternative, about 2 to 3 percent of the FFO land would no longer be available for grazing. New oil and gas development could affect small pieces of many allotments throughout oil and gas fields. This may slightly reduce the amount of permitted AUMs and therefore the amount paid to the FFO. Slightly reduced cattle numbers would lower the total productive value in the FFO by about 2 to 3 percent under current levels. Although the value is small in relative terms, the marginal viability of cattle ranching and potential loss of lifestyle values would remain of concern. The potential impact to local and regional cattle ranching under this alternative would be minimal.

Environmental Justice

Effects on minorities and low-income populations would be essentially the same as under Alternative A. Effects of compression noise may be widespread and could be incompatible with adjacent uses, especially near communities or homes. Tribal entities and BIA would review APDs on tribal surface land and contribute to COAs to reduce impacts of new oil and gas facilities. Increases in oil and gas-related jobs could provide some benefit for the local labor pool particularly in Rio Arriba. McKinley County would benefit economically from development of a new mine in the Lee Ranch/Hospah area, but no specific proposals are identified at this time.

ALTERNATIVE C—RESOURCE CONSERVATION

Surface Disturbance Due to Oil and Gas Development

The assumptions and methods used to determine impacts are described under Alternative A. The amount of long-term surface disturbance associated with well construction would be 18,197 acres under Alternative C. Surface disturbance associated with large pipelines would be 11,559 acres. The total amount of surface disturbance associated with future compressor installation (Phase 1 and Phase 2) would be approximately 1,680 acres for Alternative C. There would be an additional 10,200 acres of initial short-term surface disturbance that would be revegetated after construction.

Subtracting reclaimed acreage of 13,194, the net amount of long-term surface disturbance under this alternative would be 18,238 acres (Table 4-1). This does not include plugged and abandoned wells already awaiting approval for reclamation.

Watersheds

Under Alternative C, initial short-term surface disturbance is estimated to total almost 31,500 acres (Table 4-2) due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the FFO area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 22 to 173 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 1 and 13 percent of those watersheds. The total increase would be approximately 797 miles in the planning area (Table 4-3). This would result in an increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest percentage of unpaved roads and bare ground from construction of new wells, pipelines, and roads.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

Geology and Minerals

Oil and Gas Leasing and Development

Implementation of Alternative C assumes that commingling and dual completions would be common. The number of completions allowed to extract federal minerals under this alternative would be 9,836 after consideration of surface stipulations that would eliminate access to 134 wells. NSO restrictions would require 195 directional wells (2 percent of all wells on federal minerals) to be drilled to access reservoirs under SDAs and USBR land. There would be 114,100 acres closed to new leasing.

There would be a NSO restriction placed on all of the USBR land that would eliminate access to 102 wells and limit resource extraction to 64 directional wells drilled outside of the USBR boundary. Spacing and density rules would determine the actual number that could be developed.

The implementation of the proposed Noise Policy would add restrictions and additional mitigation requirements to gas wells in or near

NSAs, but would not affect extraction of the mineral resources.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, there would be more quarries constructed under Alternative C than Alternative A, but fewer than under Alternative B. These quarries would be approved with the APDs or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

Land Ownership Adjustments

Under current management 338,067 acres of public land would be available for disposal, of which approximately 304,450 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be a potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be less than under any other alternative because the disposal area would be limited to Crouch Mesa in the tri-cities area.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas would be the limitation imposed on the management of resources within their boundaries in the FFO. Due to NSO constraints within SDAs in the FFO, there would be 32 wells that would not be developed and 131 wells that could be developed if directional drilling were used. With more acreage within SDAs, there would be more limitations on mineral extraction operations and leasing than under the other alternatives.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the SDAs. There would be little impact on the extraction of locatable minerals, however, because most of these limitations are in SDAs that are not in the vicinity of the locatable minerals in the planning area.

Coal Leasing Suitability Assessment

There would be fewer potential conflicts for mineral extraction under this alternative because fewer areas would be considered for coal mining, by limiting the PRLAs to those outside the Ah-shi-sle-pah WSA and by not considering the Additional Coal Interest areas for new mining. The total number of oil and gas wells approved over the next 20 years would be lower under this alternative than all but Alternative A, and there would be more restrictions on mineral leasing within SDAs.

The areas identified as suitable for coal development after application of most of the unsuitability criteria (378,275 acres) are outside the high development oil and gas area, but conflicts would still have the potential to arise in the Fruitland Formation mineral resources.

Soils

Oil and Gas Leasing and Development

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have more short-term and long-term impacts on soils from oil and gas activity than Alternative A, but less than Alternative B. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would amount to approximately 31,500 acres (Table 4-2). When accounting for the reclamation of P&A wells, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be 17,000 acres more than under Alternative A. The

resulting impacts to soils would be an increase in soil erosion, but the amount of erosion would be determined by the location of the construction on the landscape and the mitigation measures (BMPs) used.

There is the potential for more impacts to prime farmlands due to more construction associated with oil and gas development than under Alternative A because the watersheds with the most prime farmland soils are within the high development area.

OHV Use

Limited OHV access over most of the FFO area would result in the potential for less damage to soil crusts and vegetation, and thereby less potential for sheet, rill, and gully erosion, through enforcement of regulations. Increased soil erosion would be expected to result where OHVs are permitted to ride on existing trails because OHV traffic would increase soil compaction and further reduce any existing vegetative cover, and prevent its reestablishment. Because additional open designations would not be made under Alternative C, this alternative would result in the fewest impacts to soils from OHV use.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs and competitive lease tracts. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. Most of this watershed is moderately susceptible to water erosion, high salinity, and has low susceptibility to wind erosion, which would be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species are preferred but not required under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Oil and Gas Leasing and Development

Under Alternative C, new oil and gas development would result in a net increase in surface disturbance of about 18,200 acres. Water required for the drilling operations would amount to approximately 6,925 acre-feet and would be supplied by legal water rights holders.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to more surface disturbance than under Alternative A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the direct impacts would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in potential short-term impacts to water resources as a result of sedimentation from the increased acreage of initial surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

Land Ownership Adjustments

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The smaller disposal area in the vicinity of the tri-cities area that would be considered for development could result a lower potential for an increase in water use in the region than

under Alternative B, but possibly more than Alternative A, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative C are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

Because the acreage of open designations for OHVs would be greatly reduced under Alternative C and no additional open designations would be considered, potential impacts to water resources would be less than under all other alternatives. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

Specially Designated Areas

Alternative C contains the highest acreage of SDAs (713,710) and the most restrictive management prescriptions for surface disturbing activities. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, and a resulting minimization of sedimentation. This protection would be provided in 49 percent of all the public land in the FFO area.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs and competitive lease tracts. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Installation and maintenance of BMPs to reduce surface water runoff and erosion would be required according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

Oil and Gas Leasing and Development

Alternative C proposes to develop 9,836 new gas wells on federal lands, which would produce approximately 10,840 Bscf of gas over a 20-year period. This production rate is slightly less than production estimated for Alternative B. Emissions from gas production for Alternative C were estimated by the same methods used to estimate emissions for Alternative B, which focused on the number of proposed wells. This approach was taken, as it is believed that the number of wells and their associated compression demands influence emissions from this activity more then production amounts. Annual emissions and resulting ambient air quality impacts from gas production under Alternative C therefore would be about 72 percent of those estimated for Alternative B. However, it is possible that isolated cases of near-field ambient impacts could approximate those estimated for Alternative B in areas of high-density well development. Appendix J includes the emissions estimates for Alternative C.

OHV Use

A policy that limits vehicular use to designated open areas, maintained roads, and designated trails would reduce the amount of ground disturbance in the planning area. This would reduce the potential for fugitive dust emissions and wind-blown dust. As a result, OHV use and resulting air quality impacts under Alternative C would be less than under Alternatives A or B.

Coal Leasing Suitability Assessment

Coal mining can result in the generation of fugitive dust and equipment emissions that have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

Oil and Gas Leasing and Development

The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land would be approximately 31,400 acres. Initial surface and vegetation disturbance during construction would affect an additional 10,300 acres, which would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period of impacts under consideration, resulting in direct impacts to vegetation.

Surface disturbance promotes the germination of noxious weeds, and equipment that travels from well to well would spread weeds. This would result in the proliferation of weeds that compete with native vegetation unless mitigated through implementation of a weed management plan. Revegetating disturbed areas with the appropriate native plants would benefit the upland vegetation plant communities.

Land Ownership Adjustments

Approximately 338,000 acres of land would be available for possible disposal under Alternative C. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place, similar to that described for Alternative A. An estimated 190,000 acres would be available for acquisition (Table 2-1), more than would be available under Alternatives A and B. This would result in an increased potential for positive impacts to upland vegetation relative to Alternatives A and B through implementation of vegetative management practices and a weed management plan on more acreage in the FFO. This has the potential to have a beneficial impact on upland plant communities, especially if the land were acquired in support of a resource program because vegetation-disturbing activities would be limited and localized.

OHV Use

All FFO land would be designated as limited, requiring that OHVs stay on maintained roads unless otherwise designated open or closed. Cross-country travel would not be allowed except under certain limited circumstances on 4,616 acres of public land in the FFO (Table 2-3). The acreage of closed areas would be greater than under Alternatives A or B (Table 2-2), and OHV use of 2-track roads or trails would only be allowed in designated areas. The potential for OHV traffic to degrade upland plant community types and spread weeds would be less than under the other alternatives.

Specially Designated Areas

There would be additional limitations on surface occupancy for oil and gas, restrictions on mineral access, and more limited OHV access within SDAs under Alternative C. There would be more acreage within these areas than under any other alternative, so the limitations on land use, such as vegetation-disturbing activities, OHV access, or grazing, would be applied to more public land within the FFO area than under the other alternatives. If inholdings are acquired, implementation of weed management plans would be more

successful on land with contiguous federal ownership.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases would affect less land under Alternative C because only the PRLAs outside of the Ah-shi-sle-pah WSA and the competitive coal tracts would be considered for coal mining. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on upland vegetation would be performed at that time.

Riparian Areas and Wetlands

Oil and Gas Leasing and Development

Approximately 2,500 acres of public lands along the San Juan, Animas, and La Plata Rivers would be protected by CSU constraints outlined in the River Tracts Riparian Area. In addition, the FFO proposes to establish the Ephemeral Wash Riparian Plan to ensure that development does not occur in active flood plains, and to develop mitigation measures for all new disturbance within 100-year floodplains of designated riparian areas. Mitigation would focus on, but is not limited to, restoration of wash channels by construction of sediment barriers, construction of sumps, and riparian vegetation improvement projects.

Land Ownership Adjustments

Land acquisition would consolidate inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes on FFO land. Designated FFO riparian areas such as the River Tracts and Ephemeral Wash Riparian Areas would not be included in land being considered for disposal, so no impacts would result.

OHV Use

OHV use of the River Tracts and other protected riparian areas on FFO land would be limited to maintained roads and designated trails. OHV cross-country travel would be prohibited in intermittent washes unless an area is specifically designated for such use (Table 2-3). Therefore, the potential for negative impacts to riparian areas and washes from OHV use would be less than under the other alternatives, as long as the limitations are enforced.

Specially Designated Areas

The addition of the Ephemeral Wash Riparian Area would increase protection of riparian areas within the FFO. The increased acreage of CSU and NSO constraints in SDAs within the FFO would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources. The 58,553 acres with closed designations for OHV use are all in SDAs and would help to limit damage to riparian and wetland areas that may be within the boundaries.

Coal Leasing Suitability Assessment

Coal mining would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas, although fewer areas would be considered under Alternative C than under Alternative A. Coal mining has the potential to directly affect arroyos, and permits for such activities may be required. The potential for this impact would be assessed in a project-specific NEPA document. It is not anticipated that coal mining would significantly affect riparian areas, but site-specific analysis would be required once a location has been requested for consideration before this could be accurately evaluated.

Special Status Species

Oil and Gas Leasing and Development

Alternative C would stress conservation of natural resources while allowing for increased

oil and gas development. It is estimated that there would be disturbance of over 31,000 acres of land with federal minerals. This would be an increase in disturbed land over Alternative A, and a decrease in disturbance from the acreage under Alternative B. Most of this disturbed land would be in the high development area, which is principally in the piñon-juniper woodlands and Great Basin Desert Scrub habitats.

Implementation of Alternative C would be expected to affect the same special status species as Alternative A. Formal consultation with the USFWS under the ESA of 1973 as amended was completed for the 1988 RMP and the 1991 RMP Amendment. Stipulations and management practices established as a result of these consultations would be continued to conserve these species. The BLM would continue its current management of non-federally listed species with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA. BLM's proactive management practices for these species are described in previous sections. The FFO would reinitiate consultation as necessary to ensure compliance with ESA.

Land Ownership Adjustments

As under Alternatives A and B, habitat for federally listed and proposed species would be retained and protective measures for other sensitive species would be implemented as appropriate. Land acquisition would benefit special status species by consolidating public land where there is potential habitat. Land ownership adjustments would have no negative impact and possibly a positive impact on special status species.

OHV Use

Under this alternative, more land would be designated as closed or limited for OHV use than under Alternatives A and B. No additional land would be opened to OHV access. OHVs would be required to stay on graded, maintained roads outside designated areas. OHV use of 2-track roads and trails would only be allowed in areas designated by FFO staff and no OHV travel in wash bottoms would be permitted. Therefore, the potential for OHV traffic to degrade special status species or their habitat would be low, less than under Alternatives A and B.

Specially Designated Areas

The modifications and additions of SDAs to protect special status species described under Alternative B would also be proposed under Alternative C. The Mexican Spotted Owl ACEC would replace the existing Laguna Seca SMA and management would implement the Recovery Plan to provide protection for this species. The Ephemeral Wash Riparian Area would provide protection to potential habitat for the southwestern willow flycatcher.

Coal Leasing Suitability Assessment

The development of land suitable for coal mining under Alternative C has little potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs and competitive lease tracts. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because they would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining (Map 4-1). Many of the PRLAs and competitive lease tracts occur near or within the plover habitat. Coal mining in and near potential mountain plover habitat would require surveys to be completed and clearances issued before applications to mine would be approved. In addition, consultation with the

USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act.

Proposed commercial coal mining, and mines for home fuel use, would go through the NEPA process with documentation once exact locations are known, and an analysis of the proposed project impacts on special status species would be performed. Protective measures would be required once potential sites and impacts are known.

Fisheries and Wildlife

Oil and Gas Leasing and Development

Implementation of Alternative C would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

The general impacts of oil and gas development and operations on wildlife would be greater than under Alternative A because more wells and roads are projected to be constructed, but less than under Alternative B. This alternative would include the establishment of 13 Wildlife Areas to manage big game and other wildlife, encompassing almost 397,000 acres of public land (Map 2-6).

An estimated 2,700 wells would be developed in the 397,000-acre study area under Alternative C, and the construction of these wells and associated roads would result in the long-term loss of almost 8,600 acres of habitat. The total long-term loss of habitat from existing and projected development would be over 27,500 acres or 6.9 percent of the area (Table 4-6). An estimated 219 miles of new roads would be constructed in the Wildlife Areas, which would result in an increased road density from 2.6 to 3.0 mi/mi^2. Additional functional habitat loss within 660 feet of roads could be as much as 35,200 acres; 70,400 acres within 1,320 feet. This represents an increase from 46 to 52 percent functional habitat loss within 660 feet and 75 to 88 percent within 1,320 feet of roads. This estimated increase in functional habitat loss is likely to be overestimated due to overlap of those fragmented habitat areas.

This habitat loss would be likely to further reduce the carrying capacity of the wildlife habitat. The exact level of this reduction cannot be quantified for the same reasons given for Alternative A. The 397,000-acre area would be managed for big game and other wildlife mainly through prohibitions of some oil and gas operations in the winter and spring and vegetation management. Alternative C would be expected to result in a reduction of the mule deer and elk populations in the planning area due to habitat loss and fragmentation from oil and gas development. This reduction would be less than under Alternative B due to the implementation of wildlife management practices in the 13 Wildlife Areas and the construction of fewer new well pads and roads.

A total of 283 wells would be developed in the Ensenada Mesa Wildlife Area that is important to antelope under this alternative. The estimated amount of long-term disturbance including roads would be 900 acres or 2 percent of the total area. About 23 miles of roads would be constructed, resulting in an increase in road density from 3.8 mi/mi^2 to 4.1 mi/mi^2 for this alternative. The increase in habitat disturbance, roads, and human activity would have greater impacts on pronghorn antelope under this alternative than Alternative A but less than under Alternative B.

Other species of wildlife would be affected by oil and gas development under this alternative, including the displacement of breeding birds. The loss of almost 8,600 acres of public land in the 397,000-acre area could result in the long-term loss of habitat for breeding birds. Many of the breeding birds in this area use the piñon-juniper woodlands and Great Desert Scrub habitats, which would not be replaced within the 20-year period of analysis by reclamation or revegetation.

Under Alternative C, new wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 27 acres in

the SFNF, and 2,500 acres on AFO land. Many of the same species that were assessed above for FFO land also occur on these lands. It is believed that the impacts of this alternative on wildlife in these areas would be less than on FFO land due to the lower levels of habitat disturbance projected. No habitat loss would occur on USBR land because of NSO stipulations on oil and gas development.

Land Ownership Adjustments

The amount of land that would available for disposal under this alternative would be about 338,000 acres of public land (Table 2-1), which is slightly more than under Alternative A, and less than under Alternative B. More land would be considered for acquisition under this alternative because there would be more land within SDAs for which acquisition of inholdings would be a priority. This has the potential to have greater positive impacts on wildlife than under Alternatives A and B, especially since more of the land to be acquired would be within the better wildlife habitat areas in the FFO.

OHV Use

Most FFO land would be designated for limited OHV use under this alternative (Table 2-2) and OHVs would be required to stay on graded maintained roads. OHV use of 2-track roads or trails would be allowed only in designated areas and cross-country travel in washes would not be permitted in most cases (Table 2-3). Therefore, the potential for OHV traffic to degrade wildlife habitat would be lower than under the other alternatives.

Specially Designated Areas

Wildlife management, particularly for big game, would be expanded under this alternative to include Angel Peak, Cereza Canyon, Cox Canyon, Crow Mesa, Delgadito Mesa, East La Plata, Ensenada Mesa, Gonzales Mesa, Laguna Seca Mesa, Manzanares Mesa, Middle Mesa, Rattlesnake Canyon, and Rosa Mesa Wildlife Areas, as well as the Ephemeral Wash Riparian Area. Within the Laguna Seca Mesa Wildlife Area would be the Mexican Spotted Owl ACEC. The land within these wildlife areas support resident and wintering herds of deer, elk, and antelope, a viable population of wild turkey, and other wildlife, as noted in Table 2-5 under the management prescriptions for each wildlife area.

The Angel Peak Wildlife Area would become a designated wildlife area, which would lessen the impacts on pronghorn antelope through the implementation of timing limitations for oil and gas operations between May 1 and July 15. There would also be prescriptions in the Angel Peak Wildlife Area to manage vegetation for the needs of antelope, quail, and neo-tropical migratory songbirds that are dependent on sagebrush and grasses. Management prescriptions in the 13 Wildlife Areas would reduce the potential impacts of surface disturbance activities on wildlife.

Coal Leasing Suitability Assessment

Specific locations of new coal lease areas on FFO land have not been identified. Coal leases would affect less land under Alternative C because only the PRLAs outside of the Ah-shi-sle-pah WSA and the competitive coal tracts would be considered for coal mining, resulting in fewer impacts on wildlife. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on wildlife habitat would be performed and documented once locations of applications are known.

Wilderness

Oil and Gas Leasing and Development

Impacts from oil and gas development on the WA and WSAs would be the same as described for Alternatives A and B. Gradual increase in the new wells in surrounding areas could have some indirect impacts on wilderness qualities from changes in overall landscape quality and noise sources. Under this alternative, a Noise Policy would require that noise from any noise source (primarily compressors) be at levels of 48.6 dBA or lower in the WA and WSA. Some peripheral locations

may therefore experience noise levels that are higher than ambient levels that one would expect to experience in a wilderness setting.

Land Ownership Adjustments

A policy favoring acquisition over disposal, particularly on the edges of the WA and WSA would support wilderness values. Acquired lands inside the WA would be managed as wilderness, expanding protection of wilderness values. Acquiring lands in surrounding areas would minimize potential for indirect impacts of future development on adjacent wilderness qualities.

OHV Use

There would be no change in OHV designations that currently close the WA and WSA to OHV use.

Specially Designated Areas

Future designation and protection of the Ah-shi-sle-pah WSA would be the same as under Alternative B.

Coal Leasing Suitability Assessment

Impacts from coal mining would be the same as described for Alternative B.

Rangeland

Oil and Gas Leasing and Development

Impacts due to surface disturbance and fragmentation of grazing allotments under Alternative C would be greater than Alternative A and less than Alternative B. The same types of effects from the removal of forage in the high development area where oil and gas facilities should be constructed, the potential for poisoning if fences are not maintained around well pads, and the spread of noxious weeds, would exist.

Land Ownership Adjustments

The priority under this alternative would be land acquisition, rather than disposal. There would be few new impacts on permittees near the urban areas because it would be less likely that land in these areas would be transferred out of federal control. The range allotments that would be affected are 5028, 5030, and 5032 on Crouch Mesa if land disposal were to be considered.

OHV Use

Impacts on rangeland would be less under this alternative than Alternatives A and B because OHV access would be limited to maintained and graded roads in most areas. This would result in fewer conflicts between OHV users and grazing permittees, and less potential for OHVs to spread noxious weeds.

Specially Designated Areas

Grazing limitations identified for some of the SDAs under Alternative C include approximately 52,000 acres closed to grazing, over 11,000 acres in which grazing permits would not be reissued if they expire, and over 600 acres that would be withdrawn from grazing. Grazing restrictions would be proposed in 67 SDAs. Because acquisition of inholdings would be a priority within these areas and the SDAs cover more acreage, grazing allotments in the areas where grazing permits remain would consist of more contiguous land than under Alternatives A and B after acquisition is complete.

Coal Leasing Suitability Assessment

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

Lands and Access

Oil and Gas Leasing and Development

Under this alternative, the level of oil and gas development would be less than under Alternative B, and is reflected in lower estimated surface disturbance and displacement of multiple use activities. Of the projected 18,238 acres disturbed, over half would be in existing ROWs and infrastructure corridors.

There would be 316 large new compressors, and about 4,920 small compressors at new well pads, in addition to

about 7,000 small compressors at existing wells gradually installed over the next 20-year period. Oil and gas facilities would need to meet a 48.6 dBA level at 100 feet of any dwelling or occupied structure. This standard would apply to new facilities in municipal areas if no appropriate standards exist. The standard meets compatibility guidelines established by the U.S. Department of Housing and Urban Development for all developed uses, including residential. Therefore, noise impacts on residential and commercial uses are expected to be minimal. The FFO would apply a maximum 48.6 dBA noise standard on 266,273 acres of public land in 88 designated NSAs, selected to protect recreational use, cultural sites, and wilderness values. These measures would reduce potential for incompatible noise levels with other uses on public and non-public land. Compared to Alternative B, with fewer small compressors and implementing the proposed Noise Policy, this alternative would have less potential for noise impacts, particularly at sensitive locations such as homes, occupied buildings, and specially designated NSAs.

Impacts to ongoing land uses from noise, dust, and emissions during development of new oil and gas facilities would be temporary and minor. They would occur less frequently than under Alternative B, but more than Alternative A.

Under Alternative C, an estimated 800 miles of new oil and gas roads could be constructed. Accounting for road reclamation, a net increase of 150 miles (or 1 percent) may result. Oil and gas-related traffic on regional and gas field roads is estimated to be similar to current levels to as much as 18 percent higher than Alternative A. Therefore, no change to traffic flow would result from this alternative.

Land Ownership Adjustments

Under this alternative, BLM would tend to retain land in federal ownership and acquire inholdings. This would benefit continuity in access, assuming ROWs on private land are maintained in a timely manner. Up to 338,067 acres could be disposed of, particularly if suitable acquisition areas were identified. The disposal area around the tri-cities area would be confined to the Crouch Mesa triangle. A smaller amount of BLM land (almost 14,000 acres) would become available for future urban growth and development, and nearly all would become split estate. Increase from split estate within the FFO administrative area would be similar but slightly less than Alternative B. Mineral development could be incompatible with high levels of residential development that is already occurring on Crouch Mesa. Impacts would be similar but less extensive than those described for Alternative B.

Designation of the WUG revised WRCS ROW corridors would provide for a managed approach to siting new infrastructure, potentially minimizing future disturbance and fragmentation from proliferating corridors. However, the specific alignment of new corridors would need to be environmentally cleared prior to designation.

Identification of valuable locations for salable minerals would allow for consideration of future access to these resources in any disposal actions that may involve these areas. This could limit future uses on some disposal areas in the tri-cities area.

OHV Use

Limited OHV access throughout the FFO should lessen conflicts between OHV users and adjacent private property owners. Disturbance of cattle and ranching operations should also decline with less pervasive access.

Specially Designated Areas

BLM could acquire 189,679 acres of non-federal inholdings within SDAs under this alternative, reflecting proposed new and adjustments within their boundaries. Accounting for proposed acquisitions, specially managed land could increase by 84 percent over current conditions. Over 64 percent of BLM land in the FFO would be in a SDA. Effects of acquisitions would benefit valuable natural, recreation, cultural, and wildlife resources. Application of management

prescriptions on these acquired lands could reduce the availability of lands for mineral entry, grazing, and other productive uses. Most of this land is in remote areas and would not affect the need to divest federal ownership near urban areas. Acquisition of inholdings in SDAs near the tri-cities area would benefit the recreational and open space needs of the urban area. Both community members and city planners have expressed this as a desired resource and for the expanding area and buffer against urban sprawl.

Coal Leasing Suitability Assessment

Under this alternative, expansion of existing coal mines in the FFO would not occur and only suitable portions of 14 PRLAs would be available for future production. Indirect impacts on the WSA could occur if a surface coal mining operation were developed adjacent to the WSA, indirect effects from noise, visual changes, and increased human activity could lessen the potential for a natural experience in the southern part of the WSA. There would also be potential to affect sensitive viewsheds of several cultural sites and the Chaco Culture National Historic Park, depending on location of any future mine. Impacts from continuing home fuel collection would be the same as Alternative A.

Visual Resources

Oil and Gas Leasing and Development

Under this alternative, about 9,800 new well locations are projected for areas overlying federal minerals and about 4,400 well sites reclaimed. A net increase of almost 900 well sites would increase the average well density on federal land from the current 2.6 to about 2.7 wells per square mile in the high development area. Impacts would be similar to those described for Alternative B, but would be less pervasive and contribute to potentially moderate changes in the overall landscape character.

The same degree of change would occur in areas with VRM Class I and II objectives. Leasing stipulations would prevent some development of wells directly within these SDAs, but impacts could occur from directional drilling on adjacent areas with lower VRM objectives and indirectly affect visual values within the SDAs. Therefore, there is potential for degradation of visual conditions on the periphery of these areas. Closure of most VRM I areas to new oil and gas leasing would provide some additional protection. Enforcement of VRM standards would reduce effects of development on valued visual resources. This would continue to be managed primarily through selecting locations that are less visible but still operable in terms of extracting the resource.

Protection of visual values would be emphasized both on USBR and USFS lands under this alternative. Several measures, including NSO stipulations on USBR land around Navajo Lake, would lessen visible degradation, push new development back from the shoreline, and likely lessen the number of permitted new wells. Increasing the distance would reduce the visibility of new wells, but other mitigations may also be needed to meet VRM II objectives. USFS would require siting and physical mitigations to meet VRM objectives and minimize the visibility of new wells.

Land Ownership Adjustments

Under Alternative C, land adjustments would favor retention of federal land and allow for management of visual values. Acquisition of inholdings in SDAs would increase the acreage of public land in areas with high visual value and protection in the FFO.

OHV Use

A policy that limits vehicular use to roads and designated trails would prevent damage to soil and vegetation throughout the FFO area. To the degree that new restrictions can be enforced, this would prevent unsightly conditions caused by either repeated cross-country travel (that denudes vegetation, and causes visible scarring of the land and the spread of weeds) or heavy vehicles passing

over wet ground (that cause deep ruts). The policy on cross-country travel exceptions, and permittees and lessees, would be much more restrictive, allowing few cross-country exceptions.

Specially Designated Areas

With the expansion of SDAs, VRM Class I and II objectives would apply to more land within the FFO area (Table 4-9). The amount of land managed for VRM I and II objectives would increase to almost 18 percent of the FFO area. This would provide a strong basis for management decisions that conserve visual quality in the most values areas, providing a benefit for visual resources. New areas would be designated specifically for OHV use to concentrate motorized sports into specific locations. This would confine visual deterioration from OHV use to a much smaller area and benefit visual resources.

Overall, Alternative C would have the least impact on visual resources. Visual alterations from moderately aggressive levels of oil and gas development would be assuaged by emphasis on minimizing visibility of new development. Confining cross-county OHV use in the FFO area to a few areas would limit vegetative loss and soil damage that can alter the landscape.

Coal Leasing Suitability Assessment

Development of adjacent PRLAs could have indirect effects on viewsheds surrounding the WA and WSA if a new surface mine were developed. Visual resources would be protected in other parts of the FFO area through resolution of conflicts between new production and visual values.

Cultural Resources

All impacts to cultural resources described in this chapter include those likely to occur but would not necessarily be limited to those listed.

Oil and Gas Leasing and Development

This alternative would potentially affect approximately 1,658 archaeological sites in the same four watersheds described in Alternative A: Largo, Carrizo, La Plata, and Upper San Juan (Table 4-10). Cultural resource surveys and clearances would be required prior to issuance of APDs, and avoidance or mitigation of identified sites would be required.

The 796 miles of new roads (Table 4-3) constructed to serve oil and gas facilities would provide greater public access to cultural resources in the high development area, resulting in increased potential for vandalism.

Land Ownership Adjustments

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted. No known significant cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within SDAs because sites would be protected by a single landowner (FFO) and a comprehensive management plan.

OHV Use

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternative A for archaeological sites to be damaged by vehicles driving across the landscape. No additional areas would be opened for OHV access, so there would be less potential for site damage than under Alternative B.

Specially Designated Areas

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, and OHV activities would be provided to important cultural sites in 79 SDAs that include approximately 89,000 acres in the FFO area. This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree. Most of these areas would be designated as boundary-focused NSAs under Alternative C.

Coal Leasing Suitability Assessment

When specific locations of proposed coal mines are known, cultural resource clearance for commercial mines or home fuel use would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use.

Ground subsidence has already been documented in the vicinity of the Deep Lease coal mine in the northwestern part of the FFO area, identified as BHP Additional Coal Interest on Map 2-8. Impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation and monitoring before coal mining would begin.

Paleontology

Oil and Gas Leasing and Development

Alternative C would involve less acreage of surface disturbance and have fewer potential impacts to paleontological resources than under Alternative B, but more than under Alternative A. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A.

Land Ownership Adjustments

Impacts on paleontology would be the same as Alternative B.

OHV Use

Impacts on paleontological resources would be similar to Alternative B. However, no additional areas would be designated open to OHV access, so there would be less potential for impacts to paleontological formations from OHV use than under any other alternative.

Specially Designated Areas

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 SDAs. This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. With only 9 PRLAs (14 minus 5 within Ah-shi-sle-pah WSA) available for coal mining under this alternative, there would be the least potential for impacts to paleontological resources if additional coal mining were to be approved.

Recreation

Oil and Gas Leasing and Development

Existing well density in the recreation areas would increase, having similar relative impacts as described for Alternative A from changes in visual surroundings, isolated noise sources, traffic, and other oil and gas activity. The total portion of the FFO that may be displaced in recreation areas is somewhat less than under Alternative B (1.4 percent compared to 2.4 percent), and dispersed over a larger area (75,174 acres). The resulting average well density in recreation areas would increase by about 63 percent over existing conditions in recreation areas (Table 4-11).

Under this alternative, the 48.6 dBA or lower noise standard would apply to over 206,000 acres with federal minerals in the FFO.

With the exception of the areas developed for motorized vehicle recreation, recreation areas are designated as noise sensitive and would be protected under the Noise Policy. This policy would apply to oil and gas development adjacent to the WA and WSA. While this provides benefits over current conditions, noise levels of 48.6 dBA would not be desirable for many outdoor dispersed recreational activities.

Impacts on dispersed recreation and campgrounds on USFS land would be less than under Alternative B due to fewer new wells (about 510) and application of the proposed Noise Policy. Also, USFS would implement several constraints and practices that would conserve the natural environment and landscape, providing indirect benefits to recreation. Impacts on USBR lands from oil and gas development would be less than those described in Alternative B due to the NSO constraints. Most new well sites would tend to be located further from recreation sites, minimizing direct visual and acoustic impacts on visitors.

Land Ownership Adjustments

In general, retaining land in federal ownership would tend to preserve land for public access and multiple use, including recreation. Only land on Crouch Mesa would be disposed of in the tri-cities area, reducing the potential for conversion of open space to urban use. This is a desirable conversion since it is difficult for BLM to monitor recreational activity on areas that are highly accessible to a large number of persons. Similar to Alternatives A and B, the BLM would review applications for exchange or lease and patenting under R&PP Act for consistency with recreational objectives. Open space for recreation would be preserved around the tri-cities area under this alternative.

OHV Use

Under this alternative, a limited OHV designation would be applied throughout the FFO area unless otherwise designated. Vehicles would need to stay on maintained roads, such as oil field service roads, and designated trails. This policy is intended to simplify current policies and correct ambiguities that make enforcement by BLM and compliance by the public problematic. Cross-country travel would no longer be allowed in the FFO area, except in small designated areas.

Table 2-2 shows that less than 1 percent of federal land in the FFO would have an open designation under Alternative C. This would occur only on 4,616 acres within areas specially managed for cross-country OHV uses (the Dunes and portions of GRTS). No additional land would be considered for possible open designation. These restrictions are expected to reduce impacts on soil and limit loss and deterioration of vegetative cover. Also, noise from OHV use would be more controllable and predictable. Areas adjacent to the Dunes and Head Canyon may still experience incompatible noise. New Recreation Areas, particularly Rock Garden and Piñon Mesa, would have developed trails for OHV use. People who prefer unconstrained access to public lands would not favor these restrictions. Other recreationists would benefit from the lack of disruption caused by cross-country motorized vehicle use. The trend to provide separate trails and areas for different classes of conveyance would lessen some of the conflicts currently reported by recreationists. Designation of 94 miles of new trails would benefit a variety of motorized and non-motorized vehicles.

Specially Designated Areas

Similar to Alternative B, Alternative C would respond to some specific recreational needs in the FFO area. These have mostly been identified through meetings with local user groups and observations of BLM specialists.

Specially managed recreation areas would increase in extent by almost 60 percent (to 83,293 acres) over current conditions, and represent 6 percent of the FFO area. This would benefit recreational opportunities by providing protection of these values on more land. Four new Recreation Areas are close to the tri-cities area and would therefore directly benefit local users. The areas identified would generally be larger than under Alternative B with more extensive NSO stipulations on oil

and gas development. ROS classifications would also be allocated to additional land. As shown in Table 4-12, the amount of land under ROS management would double over current conditions. However, due to current road density and intended motorized use of some of the new areas, they would mostly be managed for the least stringent classifications (Rural and Roaded Natural). More emphasis would be placed on preserving visual qualities (see Visual Resources). This would benefit a large range of outdoor recreational pursuits.

Changes in management prescriptions for recreational areas and other resource areas would generally benefit the quality of recreational opportunities to a greater degree than under Alternative B. Prescriptions would be more conserving of natural and real estate resources that benefit recreation than under Alternative B. For example, some sensitive areas would be closed to new ROWs, developed sites may be closed to shooting (for safety reasons), and additional areas may be closed or withdrawn from grazing or mineral entry and leasing. Also, VRM Class I would be maintained wherever it currently applies. As under Alternative B, appropriate and manageable portions of recreation areas near the urban centers would be available for hunting.

Coal Leasing Suitability Assessment

Limited development may occur in portions of 14 PRLAs, but these do not overlap with any specially designated Recreation Areas. Expansion of the San Juan mine would not be pursued, lessening potential impacts of highly visible mining operations near the urban edges, where recreational use is increasing noticeably.

Noise

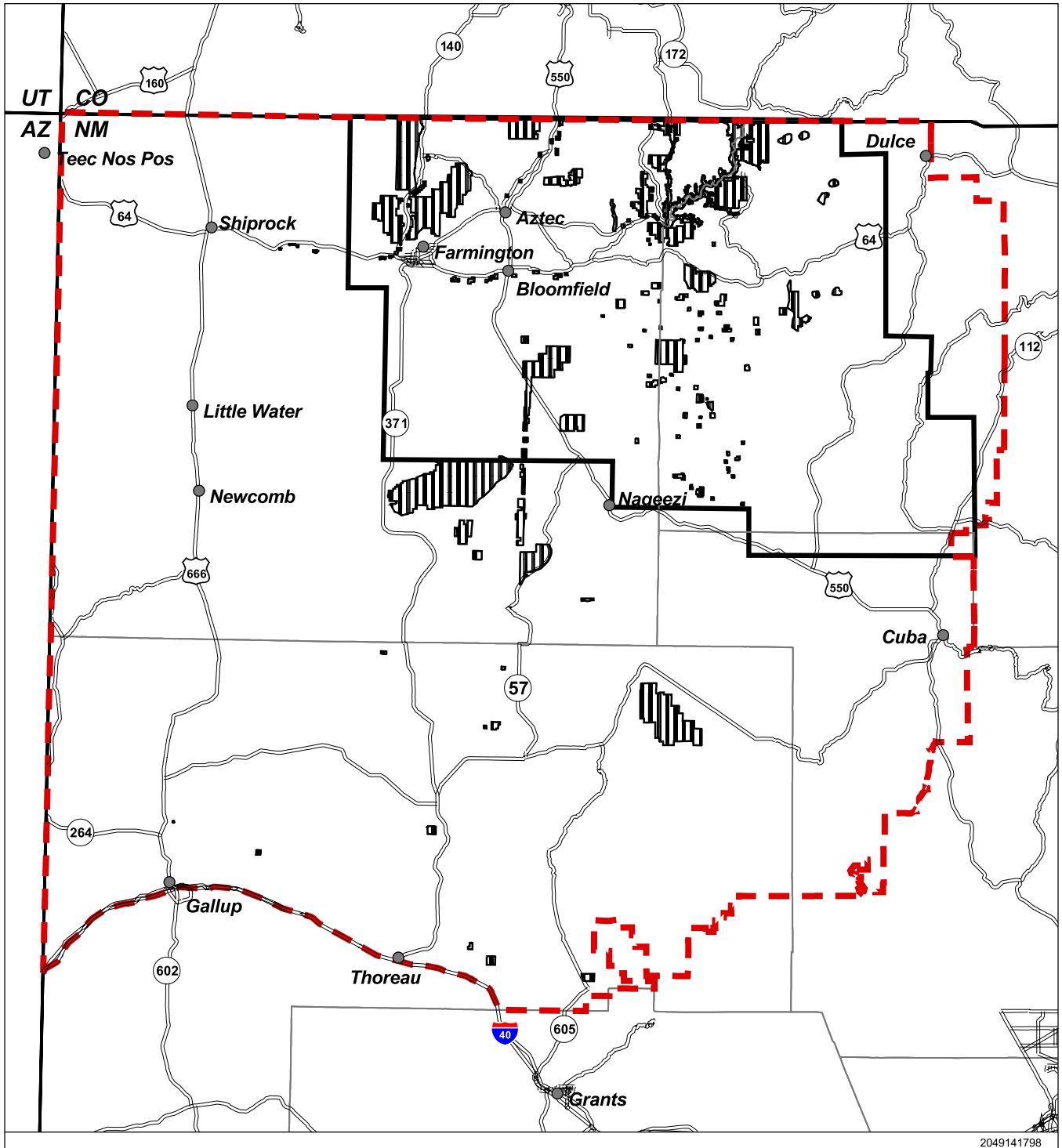
Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 9,836 new wells projected under Alternative C, and approximately 14,400 existing wells on public land, this could result in 12,100 small wellhead compressors scattered throughout the high development area. Noise from the small wellhead compressors from mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 296 mid-size compressors (500 to 2,000 HP) would be installed under Alternative C. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

A Noise Policy (Appendix E) would require noise mitigation to be implemented inside the boundaries of 97 designated NSAs in the planning area, and within 300 feet from the noise source near these NSAs, to achieve a sound level of 48.6 dBA over a continuous 24-hour period. This standard must also be met within 100 feet of dwellings and municipal areas. The mitigation requirements would apply to over 206,000 acres with federal minerals, 135,000 acres of which would be in the high development area. **Map 4-2** shows the areas subject to the Noise Policy under Alternative C.

This noise standard is less than the noise generated by the compressors listed above, but actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy, as described under Alternatives A and B.



LEGEND

- RMP/EIS Boundary
- Oil and Gas High Development Boundary
- NSA Area
- Town
- Major Road
- Interstate Highway
- U.S. Route
- State Highway

N

15 0 15

Scale in Miles

Source: BLM 2001

Map 4-2: Noise Sensitive Areas in the FFO under Alternative C

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added. The impacts would be much greater than under Alternative A because there would be 2,700 more small compressors and 174 more large compressors in use over the 20-year period. Implementation of the Noise Policy established in an NTL to oil and gas operators would provide localized noise mitigation within and near the designated areas.

The Draft NTL presented in Appendix E would be considered final upon approval of the RMP.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells. The implementation of the Noise Policy would lessen some of the impacts from oil and gas compressor noise in localized areas.

OHV Use

Noise from OHV use would be less prevalent than under Alternative A because access would be limited to maintained roads in most of the FFO area. Many more maintained roads would be constructed in the high development area, but OHV noise would be short-term with insignificant long-term impacts. Development of OHV management plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

Specially Designated Areas

Under the proposed Noise Policy, there would be 88 SDAs that are identified as NSAs. These areas are shown on Map 4-2 with the other NSAs in the planning area.

Social and Economic Conditions

Employment

Under Alternative C, based on a total of 9,836 new wells (and about 5,300 at new sites) and reclamation of 4,398 wells per year over the next 20 years. There would be a gain of about 500 jobs per year over current levels at the end of 20 years, resulting in a minor increase of about 6 percent in oil and gas industry job levels.

As recoverable coal is depleted, production at La Plata and San Juan (surface) mine would cease, with a possible loss of about 400 to 450 jobs. Because production from the San Juan Underground mine would replace supply from San Juan surface and La Plata, it is expected that the San Juan power plant would continue to operate. The loss of 450 direct jobs in the coal industry is regionally insignificant (less than 1 percent of the four-county civilian labor force), but would have local impacts on the tri-cities area and Crownpoint areas, where most of the workers reside. Some of these jobs may be offset by expansion and hiring at the San Juan Underground mine. Later in the planning period, jobs may decline at McKinley mine as well. Under this alternative, because no coal production on FFO land would occur, and there would be no increase from other actions on FFO land, there may be no offset of these job losses. However, other mines may expand, such as the Navajo mine and non-federal interests, providing jobs within the region. Overall, slight gains in fluid mineral jobs would be offset by possible layoffs of coal jobs, for no net benefit to employment and earnings.

Expenditures

Under Alternative C, the estimated cost for drilling 9,836 wells is about $5.3 billion, at an average cost of $535,000 per well. Additional direct costs would increase the total investment to about $6.2 billion. Additional indirect expenditures could result in a total of about $7.9 billion spent over 20 years, or an average

of $394 million per year (non-escalated). This represents a 230 percent increase in expenditures for oil and gas development on federal land compared to Alternative A. Current expenditures are estimated to be about 11 percent higher than those estimated for this alternative, but these have fluctuated over the last decade in response to market-driven forces.

Revenues

Under Alternative C, the projected oil and gas production volume on federal land over the next 20 years is estimated at 11,125 Bcf. Because oil is a very small percentage of production in the San Juan Basin, these calculations are based on gas values. Assuming a value of $3.00 per Mcf, the total value of this product could be about $33.4 billion (in 2001 dollars). Production of federal oil and gas resources would more than double over current levels over the 20-year planning period, providing for a much higher tax and royalties revenue base for the State of New Mexico. However, any revenues would be dependent on the value of the product.

Under this alternative, changes in coal production on federal land would be minimal in the next 5 years. As the McKinley mine loses production, there could be a decline in coal royalties paid to the state; however, new production is expected to occur within the Four Corners area. Because coal royalties are a relatively small portion of the New Mexico General Fund, compared to oil and gas, these losses would have a minor impact on state revenues.

Grazing could be displaced from land that is used for oil and gas development or where new management prescriptions would withdraw grazing. Under this alternative, the change to the land available for grazing would be modest (about 6 percent of the FFO land), but greater than under Alternative B. New oil and gas development could affect small pieces of many allotments throughout oil and gas fields. A reduction in permitted AUMs would decrease fees paid to the FFO. Changed management prescriptions for several SDAs could affect larger areas of contiguous land, potentially affecting some allotments disproportionately. Therefore, impacts may be incurred by a few ranchers, rather than more broadly by small reductions for several ranchers. Slightly reduced cattle numbers would lower the total productive grazing value in the FFO area by about 6 percent. Although the value is small in relative terms, this loss could affect some smaller operators and have a minor negative impact on local cattle ranching.

Environmental Justice

Potential impacts to persons of minority or low-income status would be similar to those described for Alternative A. The oil and gas industry would continue to provide job opportunities, but would still be subject to market fluctuations. The new Noise Policy would lessen the potential for impacts on land uses and communities throughout the planning area, particularly from development of federal minerals on split estate (including tribal lands). It is likely that a high proportion of workers at San Juan and La Plata mine are Native American or Hispanic. Loss of mining jobs could therefore have a moderate impact on minorities in the local area.

Change in OHV use on federal land under Alternative C may affect access for some persons who are accustomed to cross-country travel and access. This could affect minority or low-income persons who tend to use public lands to some degree for subsistence. For example, wood and plant gathering and hunting may directly supplement other sources for some families. When vehicles are limited to roads and designated trails, it may be less convenient to gather and haul wood. However, the existing road network provides extensive access to nearly all areas; therefore, these uses would continue unless otherwise restricted by management prescriptions.

ALTERNATIVE D—BALANCED APPROACH

Surface Disturbance Due to Oil and Gas Development

The assumptions and methods used to determine impacts are described under Alternative A. The amount of surface disturbance associated with well construction would be 18,393 acres for Alternative D. Surface disturbance associated with large pipelines is assumed to be 11,683 acres. The total amount of surface disturbance associated with future compressor installation (Phase 1 and Phase 2) would be approximately 1,695 acres for Alternative D (Table 4-1).

Subtracting reclaimed acreage of 13,194, the net amount of surface disturbance under this alternative would be 18,577 acres. This does not include plugged and abandoned wells already awaiting approval for reclamation.

Watersheds

Under Alternative D, initial short-term surface disturbance is estimated to total approximately 36,500 acres due to construction of new wells, roads, and small pipelines. As under Alternative A, it was assumed that the majority of the earthmoving for large pipelines and compressors would be located in the high development area in the northern part of the FFO area. The largest anticipated acreage of surface disturbance would occur in the same watersheds most affected under Alternative A: Upper San Juan, Largo, Navajo Reservoir, Carrizo, Animas, La Plata, Blanco, Gobernador, Pump Canyon, Middle San Juan, and Kutz Canyon, in descending order (Table 4-2).

Under this alternative, there would be an increase ranging from 22 to 174 miles of new roads in 11 of the 19 watersheds, resulting in an increase in unpaved roads ranging between 1 and 13 percent in those watersheds. The total increase in new roads would be approximately 805 miles in the planning area (Table 4-3), without taking into account road closures due to P&A wells. This would result in an increase in sediment yield overall, with the largest increases anticipated in the same watersheds that would have the highest surface disturbance from new well locations and pipelines in the center of the high development area.

Most of the soils in the watersheds with the majority of the predicted surface disturbance and new road construction are moderately to highly erodible due to rainfall and surface water runoff. Most of these watersheds are in the low to moderate category for wind erosion. It is likely that significant erosion and sedimentation would be caused by increased initial surface disturbance, which would be reduced once well pads, roads, and pipelines are stabilized by seeding and the establishment of surface water controls.

Geology and Minerals

Oil and Gas Leasing and Development

Implementation of Alternative D assumes that commingling and dual completions would be common. The number of completions allowed on federal land under this alternative would be 9,942 after consideration of stipulations that would limit access to 28 wells. NSO constraints would require 145 directional wells (1.5 percent of all wells on federal minerals) to be drilled to access formations under SDAs and Navajo Reservoir. There would be 81,000 acres closed to new leasing. Because 99 percent of the high development area is currently leased, there would be little impact on mineral extraction from lease closure designations.

Because small quarries of less than 5 acres are frequently excavated to supply sandstone and gravel for stabilizing roads to oil and gas wells, it is anticipated that, as the number of new well pads increase, so would the number of quarries in the high development area. Therefore, there would be more quarries constructed under Alternative D than Alternatives A and C, but fewer than under Alternative B. These quarries would be

approved with the APDs, or through other BLM permitting procedures, and would be located in areas that avoid impacts to natural and cultural resources.

Land Ownership Adjustments

Under current management over 340,000 acres of public land would be available for disposal, of which approximately 304,500 acres contain federal minerals, mostly located in the areas identified as suitable for coal mining and in the vicinity of the tri-cities area. If this land leaves federal ownership, there would be the potential for complications in extracting these minerals because coordination between the non-federal landowner and the federal mineral manager would be required. Land disposal transactions would be required to consider impacts to the 6 salable mineral areas.

The potential for conflicts between competing users of the land in the vicinity of the 6 salable mineral areas delineated in Map 2-5 would be similar to that described under Alternative B because the size and location of the disposal areas would be the similar. FFO staff would coordinate land use decisions to avoid limiting access to the 6 salable mineral areas.

Specially Designated Areas

The primary effect on oil and gas development from the designation of special areas would be the limitations on the use of surface resources within their boundaries. Due to NSO constraints within SDAs in the FFO, there would be 12 wells that would not be developed and approximately 87 wells that could be developed if directional drilling were used.

Locatable minerals would not be affected by oil and gas development, but would be withdrawn or closed in most of the SDAs. There would be little impact on the extraction of locatable minerals, however, because most of these limitations are in SDAs that are not in the vicinity of the locatable minerals in the planning area.

Coal Leasing Suitability Assessment

The number of potential conflicts for mineral extraction under this alternative would be similar to that described under Alternative B because the same PRLAs, competitive lease tracts, and Additional Coal Interest areas would be available for new mining.

There are approximately 168,900 acres within the FFO area that have already been fully screened through application of the unsuitability criteria. The remaining acreage outside the high oil and gas development area under FFO jurisdiction have been partially screened by applying the unsuitability criteria at a coarse resolution with currently available GIS data, resulting in the identification of an additional 209,400 acres that have the potential to be mined for coal. All acreage would be open to leasing-by-application (43 CFR 3420) but would require the application of the unsuitability criteria prior to leasing action.

Soils

Oil and Gas Leasing and Development

Due to the higher numbers of projected new well locations, roads, and pipelines, this alternative would have more short-term and long-term impacts on soils from oil and gas activity than Alternatives A and C, but less than under Alternative B. Initial short-term surface disturbance from construction of new wells, pipelines, and roads would amount to approximately 36,500 acres. When accounting for the reclamation of P&A well locations and roads, and the installation of large pipelines and compressors, the net long-term surface disturbance over 20 years would be approximately 18,600 acres. The resulting impacts to soils would be an increase in soil erosion, but the amount of increase would be determined by the location of the construction on the landscape and the mitigation measures (BMPs) used.

There is the potential for more impacts to prime farmlands due to construction associated with oil and gas development than under

Alternative A because the watersheds with the most prime farmland soils are within the high development area for oil and gas. Mitigation measures described under Alternative A could be employed to minimize impacts during site reclamation.

OHV Use

Limited OHV access over most of the FFO area would result in the potential for less damage to soil crusts and vegetation, and thereby less potential for sheet, rill, and gully erosion through enforcement of regulations. Increased soil erosion would be expected to result where OHVs are permitted to ride on existing trails because they would increase soil compaction and further reduce any existing vegetative cover, while preventing its reestablishment. Adding the acreage listed as potentially suitable for open OHV designation listed in Table 2-10 would not result in significant soil impacts because the highly erodible soils and those topographic features with the most fragile biological crusts were eliminated from consideration. Site-specific evaluations would be conducted before final open designations are made.

Coal Leasing Suitability Assessment

Impacts to soils have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas are located within the Chaco Wash watershed, which would have the greatest chance of being affected if additional coal mining were approved. The majority of this watershed is moderately susceptible to water erosion and high salinity, and has low susceptibility to wind erosion, which would all be accelerated if additional coal mining were started.

Inclusion of BMPs in future coal leases to reduce surface water runoff and erosion would be required to meet state and federal regulations and would minimize accelerated erosion. Prompt revegetation and a weed management plan would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native plant species would be required in seed mixtures under this alternative. Site-specific impacts on soils from new coal leasing would be evaluated in project-specific EAs before issuance of the leases by the BLM.

Water Resources

Oil and Gas Leasing and Development

Under Alternative D, new oil and gas development would result in an increase in net surface disturbance of almost 18,600 acres. Water required for the drilling operations would amount to approximately 7,000 acre-feet and would be supplied by legal water rights holders.

In general, potential long-term impacts to surface water resources would result from an increase in sedimentation and salt yields due to more surface disturbance than under Alternatives A. Peak runoff rates would increase due to removal of vegetation and compaction of soils on new roads and well pads, but the impacts of this would depend on the location of the new facilities in each watershed and their distance from drainages, rivers, and other water bodies.

There would be an increase in potential short-term impacts to water resources as a result of sedimentation from the initial increased acreage of surface disturbance during construction. Potential impacts to groundwater could result from infiltration in unlined pits or spills from oil and gas operations. The short- and long-term impacts to surface water and groundwater would be minimized through the use of BMPs and pollution prevention measures as required by federal and state regulations.

Land Ownership Adjustments

Modification of BLM land ownership would not directly impact water resources. Depending on the modifications implemented, indirect impacts to water resources could result if land management changes due to land transfers. The larger disposal area in the vicinity of the tri-cities area that would be considered for development could result in an increase in

water use in the region, if the land were to be developed for public use.

Potential uses of any land that would be transferred under Alternative D are currently unknown. Therefore, it is not possible to analyze impacts to water resources. When these uses are proposed in the future, subsequent NEPA analysis would be required to determine the specific impacts.

OHV Use

Because the acreage of open designations for OHVs would be greatly reduced under Alternative D, potential impacts to water resources would be less than under Alternative A. Localized impacts to water resources would continue to occur on lands where cross-country travel is permitted.

Specially Designated Areas

Alternative D contains more acreage of SDAs (649,470) and more restrictive management prescriptions for surface disturbing activities than Alternatives A and B. Depending on the location of the area, there is a potential to positively affect water resources through improved land management practices and greater restriction of surface disturbance, which would result in improved vegetative cover, protection of soil crusts, reduction in road development, and a resulting minimization of sedimentation. This protection would be provided in 43 percent of the public land in the FFO area. In situations where OHV cross-country travel would be permitted within a SDA, a localized negative impact to water resources could result.

Coal Leasing Suitability Assessment

Impacts to surface water and groundwater quantity and quality have the potential to occur as a result of coal mining in the PRLAs, competitive lease tracts, and Additional Coal Interest areas. A majority of the potential coal mine areas drain to the Chaco River, which would have the greatest chance of being affected if new coal mining were approved.

Clearances for all resources, and installation and maintenance of BMPs to reduce surface water runoff and erosion, would be required for both commercial mines and those for home fuel use, according to BLM policy to meet state and federal regulations. Prompt revegetation would be required after mine reclamation to stabilize the slopes and soils, minimize erosion, and reduce the spread of weeds. Native species would be required. The site-specific potential impacts from new coal leases would be evaluated in project-specific EAs before approval would be granted by the BLM.

Air Quality

Oil and Gas Leasing and Development

Alternative D proposes to develop 9,942 new gas wells on federal lands, which would produce approximately 11,002 Bscf of gas over the 20-year period of analysis. This production rate is slightly less than production estimated for Alternative B. Emissions from gas production for Alternative D were estimated by the same methods used to estimate emissions for Alternative B, which focused on the number of proposed wells. This approach was taken, as it is believed that the number of wells and their associated compression demands influence emissions from this activity more then production amounts. Annual emissions and resulting ambient air quality impacts from gas production under Alternative D therefore would be about 70 percent of those estimated for Alternative B. However, it is possible that isolated cases of near-field ambient impacts could approximate those estimated for Alternative B in areas of high-density well development. Appendix J includes the emissions estimates for Alternative D.

OHV Use

Proposed OHV usage under Alternative D and its resulting air quality impacts would be somewhat less than for Alternative A, due to limitations on cross-country travel.

Coal Leasing Suitability Assessment

Coal mining can result in the generation of fugitive dust and equipment emissions that

have the potential to affect air quality. If new mines are opened as old ones are reclaimed, no new significant impacts to air quality would be anticipated beyond current conditions. If increased acreage of coal mines are approved, impacts on air quality may occur. When site-specific locations of new coal mines are known, EAs would be developed to analyze the impacts and mitigation measures may be identified in the permitting process.

Upland Vegetation

Oil and Gas Leasing and Development

The amount of long-term vegetation disturbance within the planning area for new wells, roads, pipelines, and compressors on public land could be almost 32,000 acres. Initial short-term surface and vegetation disturbance during construction would affect 10,300 acres, which would be reseeded once regular operations begin. The specific locations of the new wells and other facilities are not known but most would be constructed in the high development area containing primarily piñon-juniper woodlands and Great Basin Desert Scrub plant community types. Areas that are reseeded would not return to their original plant cover types in the 20-year period considered. Developers would be encouraged to use existing road and pipeline ROWs to minimize additional disturbance.

The increased surface disturbance and vehicle traffic would increase the spread of noxious weeds. Weed management plans would need to be developed and implemented to minimize this problem and protect native vegetation.

Land Ownership Adjustments

Over 340,000 acres of public land would be available for possible disposal under Alternative D (Table 2-1) in most of the same areas as those described for Alternative B. The disposal of land could have negative effects on upland vegetation if land disturbance activities were to take place, similar to that described for Alternative B. An estimated 178,000 acres would be available for acquisition (Table 2-1), more than would be available for Alternatives A and B, and less than under Alternative C. This would result in an increased potential for positive impacts to upland vegetation relative to Alternatives A and B. This has the potential to result in a beneficial impact on upland plant communities, especially if the land were acquired in support of a resource program because vegetation-disturbing activities would be limited and localized on the acquired acreage. Weed management plans would be developed and implemented on the acquired acreage.

OHV Use

Most FFO land would be designated as limited, requiring that OHVs stay on maintained roads unless otherwise designated open or closed (Table 2-3). The acreage of closed areas would be greater than under Alternatives A or B and less than under Alternative C (Table 2-2), OHV use of 2-track roads or trails would be allowed in designated areas, and additional areas would be considered for open designations in several OHV management units in the future through the appropriate land use planning process. The potential for OHV traffic to degrade upland plant community types would be less than under all but Alternative C.

Specially Designated Areas

There would be limitations on surface occupancy for oil and gas, restrictions on mineral access, and more limited OHV access within SDAs under Alternative D than under the current management. There would be more acreage within these areas than under Alternatives A and B, so the limitations on land use, such as vegetation-disturbing activities, OHV access, and grazing would be applied to more public land within the FFO area than under current conditions, resulting in the potential for improved vegetative cover in approximately 45 percent of the public land in the FFO. If inholdings are acquired within SDAs, weed management would be more

successful on consolidated blocks of public land.

Coal Leasing Suitability Assessment

Two new coal mine areas have been identified. Peabody Coal Company identified the Lee Ranch Area and BHP identified the Twin Peak/East Piñon area. Coal leases would be considered on 378,000 acres that remain after preliminary application of the unsuitability criteria was completed for the FFO area at a coarse resolution. Before approval of mining would be granted, proposed coal mining locations would be evaluated through reapplication of the unsuitability criteria and analysis of project impacts through the NEPA process, once site-specific locations are known. All coal mines, commercial and home fuel, would be reclaimed and revegetated. Weed management plans would be required to minimize the spread of noxious weeds.

Riparian Areas and Wetlands

Oil and Gas Leasing and Development

Approximately 2,500 acres of public lands along the San Juan, Animas, and La Plata Rivers would be protected by CSU constraints outlined in the River Tracts Riparian Area. In addition, the FFO proposes to establish the Ephemeral Wash Riparian Plan to ensure that development does not occur in active flood plains, and develop mitigation measures for all new disturbance within 100-year floodplains of designated riparian areas. Mitigation would focus on, but is not limited to, restoration of wash channels by construction of sediment barriers, construction of sumps, and riparian vegetation improvement projects.

Land Ownership Adjustments

Land acquisition would concentrate on inholdings on FFO land and has the potential to have a beneficial impact on riparian plant communities, especially if land were acquired in support of the riparian resource program along the rivers and washes. Designated FFO riparian areas such as the River Tracts and Ephemeral Wash Riparian Areas would not be included in land being considered for disposal, so no impact to these areas would result.

OHV Use

OHV use of the River Tracts and other protected riparian areas on FFO land would be limited to designated roads and trails, and intermittent washes (Table 2-3), so the potential for negative impacts to riparian areas and washes from OHV use would be greater than under Alternative C and less than under Alternative A, as long as the limitations are enforced.

Specially Designated Areas

The addition of the Ephemeral Wash Riparian Area and maintenance of the River Tracts Riparian Area would increase protection of riparian areas within the FFO. CSU constraints in other SDAs within the FFO would assist managers in avoiding riparian and wetland areas because they can require that oil and gas operations be moved in order to minimize impacts to specific resources. The areas with closed designations for OHV use would also help to limit damage to riparian and wetland areas that may be within their boundaries.

Coal Leasing Suitability Assessment

Coal mining would not take place in significant wetland and riparian habitat because these areas would be screened out during the application process. There is the potential that coal mining could lead to increased erosion and resulting sedimentation in riparian areas. Coal mining has the potential to directly affect arroyos, and permits and associated BMPs for activities that could affect waterways and wetlands may be required. The potential for this impact would be assessed in a project-specific NEPA document once the exact location of the mining application is known. It is not anticipated that coal mining would significantly affect riparian areas due to requirements for mitigation and pollution prevention, but site-specific analysis would be required once a

location has been requested for consideration before this could be accurately addressed.

Special Status Species

Oil and Gas Leasing and Development

It is estimated that 9,942 new wells would be developed under this alternative over the next 20 years, resulting in the disturbance of almost 36,500 acres of land with federal minerals (Table 4-2). This would be an increase in disturbed land over Alternative A, and a decrease from the acreage under Alternative B. Most of this disturbed land would be in the high development area, which is principally in the piñon-juniper woodlands and Great Basin Desert Scrub habitats.

Consultation has been completed with the USFWS for this alternative and a biological assessment was prepared (BLM 2002c). BLM's findings are that oil and gas development under Alternative D may affect but would not adversely affect listed and proposed species or designated critical habitat. The USFWS concurred with BLM's findings in a letter dated October 2002.

Not all rare species receive the legal protection of the ESA of 1973 as amended. These species may not be rare enough to warrant protection under ESA, or there may not be sufficient data collected about the species for the USFWS to make a determination to list under ESA. Rare species or species with insufficient data are referred to as sensitive species. BLM policy, as outlined in the Guidance on Special Status Species Management (6840 Manual), is to manage sensitive species so that actions the BLM funds, authorizes, or carries out should not contribute to species becoming listed under ESA. Lists of special status species are maintained by several agencies, including the USFWS, BLM, USFS, and the State of New Mexico. There are 34 special status species that may have the potential to occur in the planning area. (Table 3-12). FFO has coordinated with other agencies to determine which of these 34 species warrant special management, or field studies to collect data.

Currently, the following species receive special management: beautiful gilia, also known as Aztec gilia (*Aliciella formosa*), Brack's fishhook cactus (*Sclerocactus cloveriae var. brackii*), American peregrine falcon (*Falco peregrinus anatum*), prairie falcon (*Falco mexicanus*), ferruginous hawk (*Buteo regalis*), yellow-billed cuckoo (*coccygus americanus*), and western burrowing owl (*Athene cunicularia*). Potential bat habitat is surveyed before construction projects that would impact sandstone cliff faces are authorized. FFO conducted 3 years of surveys to determine the potential abundance and management needs of the gray vireo. In the future, FFO will cooperate with other agencies to gather data and develop special management for special status species when the situation warrants.

The BLM would continue to manage non-federally listed species, according to BLM policies and guidelines, with the goal of contributing to the conservation of these species to reduce the potential for their being listed under the federal ESA.

Land Ownership Adjustments

The amount of land that would be made available for disposal in the tri-cities area is similar to that under Alternative B, although the total acreage listed for disposal would be less. The land in the tri-cities area typically consists of degraded habitat in close proximity to human activity, and is therefore considered marginal habitat. The FFO would retain in federal ownership all habitat essential for the survival and recovery of any listed species, including habitat that was used historically, that has retained its potential to sustain listed species, and that is deemed to be essential to their survival. Surveys would be required to determine whether special status species are located within a parcel under consideration for disposal.

OHV Use

The amount of land open to OHV use under Alternative D would be 4,616 acres. The majority of FFO land would be closed or limited for OHV use. The open designation would be much less than under Alternative A, so the potential for impacts to special status species from cross-country travel would be much less, even if some additional acreage would be designated as open in the future (Table 2-4). It is possible that OHV access could affect special status species until their existence and habitat are identified by FFO staff during surveys and placed on the conflict map maintained at the FFO.

Specially Designated Areas

The modifications and additions of SDAs to protect special status species described under Alternative B would also be proposed under Alternative D. The Ephemeral Wash Riparian Areas would provide protection to potential habitat for the southwestern willow flycatcher. Similarly, habitat management practices for the proposed Mexican Spotted Owl ACEC would provide protection for this species.

Coal Leasing Suitability Assessment

The development of land suitable for coal mining under Alternative D has little or no potential to affect federally listed species or designated critical habitat. Knowlton's cactus occurs near Navajo Reservoir, outside the location of the PRLAs, competitive lease tracts, and Additional Coal Interests. The Mesa Verde cactus and Mancos milkvetch are within The Hogback ACEC, which would not permit coal mining. Potential Colorado pikeminnow, razorback sucker, and southwestern willow flycatcher habitat, as well as federally designated pikeminnow critical habitat along the San Juan River in the River Tracts Riparian Area, would not be affected if coal mining were approved because these areas would be eliminated through application of the unsuitability criteria. The Bald Eagle ACEC units and the Mexican spotted owl potential and federally designated critical habitats on FFO land are also not close to potential coal mining areas.

The mountain plover is a federal proposed species that may occur in the area of potential coal mining (Map 4-1). Many of the PRLAs, competitive lease tracts, and Additional Coal Interests occur near or within plover potential habitat. Applications to mine coal (commercial and for home fuel use) in and near potential mountain plover habitat would require plover surveys to be completed before they would be approved. In addition, consultation with the USFWS would be required when site-specific applications to mine coal on FFO land are received, in compliance with the Fish and Wildlife Coordination Act.

Proposed coal mining would go through the NEPA process and an analysis of the proposed project impacts on special status species would be performed when site-specific locations are considered. Clearances would be required and site reclamation would be conducted once mining is completed.

Fisheries and Wildlife

Oil and Gas Leasing and Development

Implementation of the preferred alternative would not be expected to have an impact on fisheries or other aquatic resources for the reasons discussed under Alternative A, Fisheries and Wildlife.

An estimated 2,700 wells would be developed in the 397,000-acre study area under Alternative D, and the construction of these wells and associated roads would result in the long-term loss of almost 8,600 acres of habitat. The long-term loss of habitat from existing and projected development would be over 27,000 acres or 6.9 percent of the area. An estimated 220 miles of new roads would be constructed, which would result in an increased road density from 2.6 to 3.0 mi/mi^2. Additional functional habitat loss within 660 feet of roads could be as much as 35,200 acres; 70,400 acres within 1,320 feet. This represents an increase from 46 to 52 percent functional

habitat loss within 660 feet and 75 to 88 percent within 1,320 feet of roads. This estimated increase in functional habitat loss is likely to be overestimated due to overlap in those fragmented habitat areas.

The estimated number of new wells and roads and associated functional habitat loss under Alternative D would be slightly greater than under Alternative C in the entire planning area, but the same within the 397,000 acres of wildlife habitat. Of the 397,000 acres used to assess the impacts of oil and gas development on wildlife, 297,000 acres of public land would be included in 9 Wildlife Areas (Map 2-6) to be managed for big game and other wildlife through timing limitations on oil and gas development activities in the winter and spring, vegetation management, and other measures. Potential habitat loss and fragmentation in the pronghorn antelope habitat in the Ensenada Mesa Wildlife Area would be similar to that described under Alternative C.

Habitat loss and fragmentation would be likely to further reduce the carrying capacity for wildlife although the exact level of this reduction cannot be quantified for the same reasons given under Alternative A. The impacts on mule deer, elk, pronghorn antelope, and other wildlife would be slightly more than those described under Alternative C, and could result in a reduction of the wildlife populations in the planning area as compared to Alternative A.

Other species of wildlife would be affected by oil and gas development under this alternative, including the displacement of breeding birds. The loss of almost 8,600 acres of public land in the 397,000-acre area could result in the long-term loss of habitat for breeding birds. Many of the breeding birds in this area use the piñon-juniper woodlands and Great Basin Desert Scrub habitats, and most of this habitat would not be replaced for a long time after well pad reclamation.

The number of new wells and roads on USFS and AFO lands would be the same as under Alternative C. More wells (approximately 140) would be developed on USBR land than under Alternatives A and C, but less than under Alternative B. New wells and roads would result in the long-term loss of an estimated 1,680 acres in the CNF, 200 acres on USBR land, 30 acres on the SFNF, and 2,500 acres on AFO land. Many of the same species that were assessed above for the FFO area also occur on other federal lands. It is believed that the impacts of Alternative D on wildlife in these areas would be less than on FFO land due to the lower levels of oil and gas development and associated habitat disturbance.

Land Ownership Adjustments

The amount of public land that would available for disposal under this alternative would be over 340,000 acres (Table 2-1), more than under Alternatives A and C and less than under Alternative B. More land would be considered for acquisition than under Alternative A because there would be more land within SDAs for which acquisition of inholdings would be a priority. This has the potential to have greater positive impacts on wildlife than under Alternatives A and B, especially since more of the land to be acquired would be within the better wildlife habitat areas in the FFO.

OHV Use

The amount of land open to OHV use under Alternative D would be 4,616 acres, with the possibility that more could be designated as open in the future (Table 2-4). The majority of FFO land would be closed or limited for OHV use. The open designation would be much less than under Alternative A, so the potential for impacts to wildlife from cross-country travel would be much less.

Specially Designated Areas

Wildlife management, particularly for big game, would be expanded under this alternative (as compared to current management) to include 297,000 acres of public land in Cereza Canyon, Crow Mesa, East La Plata, Ensenada Mesa, Gonzales Mesa, Laguna Seca Mesa, Middle Mesa, Rattlesnake Canyon, and Rosa Mesa Wildlife Areas, as well as Ephemeral Wash Riparian Area. Within the

Laguna Seca Mesa Wildlife Area would be the Mexican Spotted Owl ACEC. The land within these wildlife areas support resident and wintering herds of deer, elk, and antelope, a viable population of wild turkey, and other wildlife, as noted in Table 2-5 under the management prescriptions for each Wildlife Area. Constraints such as TLs in the 9 Wildlife Areas would reduce the potential impacts of oil and gas operations and other human activities on wildlife.

Coal Leasing Suitability Assessment

Specific locations of new coal mining areas on FFO land have not been identified. Coal mines would not be located within the best wildlife areas. Proposed coal mining would go through the NEPA process and site-specific analysis of the proposed project impacts on upland wildlife habitat would be performed at that time.

Wilderness

In general, impacts on the WA and WSAs would be generally similar as those describe for Alternative C.

Potential development of coal leases and interests and PRLAs (depending on adjudication) on land surrounding the WA and Ah-shi-sle-pah WSA could have similar indirect impacts as described for Alternative B. Unsuitability criteria screening would reduce potential for direct impacts of mining within these areas.

Rangeland

Oil and Gas Leasing and Development

The impacts under this alternative would be similar to those under Alternative C, with slightly greater acreage of forage removed by oil and gas development in the high development area.

Land Ownership Adjustments

The impacts of land disposal under Alternative D would be similar to those but slightly less than under Alternative B because the 3-mile area near the tri-cities area would be a priority for land transfer.

OHV Use

Impacts on rangeland under this alternative would be similar to Alternative C.

Specially Designated Areas

Grazing limitations in SDAs would affect over 25,000 acres in 31 areas. Most grazing permits in 4 areas would not be reissued if they expire. Acquisition of inholdings in these areas would be a priority, so grazing allotments in the areas where grazing permits remain would consist of more contiguous land than under Alternatives A and B.

Coal Leasing Suitability Assessment

Impacts on rangeland and grazing permits from additional coal mining would be the same as that described for Alternative A.

Lands and Access

Impacts on lands and land use from this alternative would generally be similar to Alternative C.

Oil and Gas Leasing and Development

Oil and gas development would generally be similar to Alternative C. Disturbance, displacement and new road construction from 9,942 new wells (involving about 5,370 new locations) would be similar in extent to Alternative C. The Noise Policy under this alternative would provide similar standards to adjacent uses on non-public land for residential, community uses, cemeteries, parks, and other noise sensitive uses. The Noise Policy would apply for a combination of 13 defined areas and 42 point locations. This would provide standards for somewhat less acreage than the FFO but would apply to most sensitive locations.

Oil and gas-related traffic on regional and gas field roads is estimated to be similar to current levels (with a possible slight reduction based on new well development), but about 20 percent higher than projections for Alternative

A. However, industry traffic has fluctuated in response to production demands. Over the long-term, industry-related traffic would be similar to Alternative C, and could contribute to higher traffic and changes in traffic flow on some roads. Temporary impacts during construction to ongoing land uses would be similar to Alternative C.

Impacts from oil and gas development on access within the planning area would be similar to Alternative C. A net increase in roads of 1 percent would have minimal effect on access.

Land Ownership Adjustments

The land disposal area would be similar to Alternative C, with the addition of land between Aztec and Bloomfield. This would provide a mixture of benefits by augmenting urban land supplies, and keeping valuable open space for recreation. Retention of federal mineral ownership would cause additional split estate, having the same effect as described for Alternative C.

OHV Use

OHV access would be similar to Alternative C, with slightly more access allowed off roads for special or exceptional uses. Also, consideration of some suitable areas for cross-country travel during development of OHV management unit plans could benefit access in some areas.

Specially Designated Areas

Provisions for and changes in SDAs would be similar to Alternative C, with somewhat less land designated for wildlife values. BLM would acquire a slightly larger area (178,237 acres) of inholdings within SDAs than under Alternatives A and B, potentially increasing the total managed areas by 50 percent. Accounting for proposed acquisitions, expansion of some areas, and new designations, specially managed land could increase by 75 percent over current conditions. Effects of acquisitions on public land management would be the same as described for Alternative A.

Coal Leasing Suitability Assessment

Future development of competitive lease tracts, and other coal interests, particularly in the Lee Ranch/Hospah area and the BHP interests near La Plata and San Juan mines would be likely. Impacts on lands and land uses would be similar to those described under Alternatives A and B. All coal mines, commercial and home fuel, would be required to be reclaimed when completed. Impacts from continuing home fuel collection would be the same as Alternative A.

Visual Resources

Oil and Gas Leasing and Development

The level of oil and gas development projected for this alternative is similar to Alternative C. The potential impact to characteristic landscapes would be the same as described for Alternative C.

Impacts from oil and gas wells on USBR land would be greater than Alternative C and less than under Alternative A. On USFS land, proposed practices would tend to be protect visual conditions and impacts would be similar to Alternative C.

Land Ownership Adjustments

Land adjustment policies under this alternative would favor acquisition of inholdings in SDAs and potentially would increase management of visual resource values in areas with potential value. This would benefit visual resources. Disposals in the tri-cities area would not be expected to affect prime visual resources in the FFO area, so little impact to visual resources would result.

OHV Use

Impacts on visual resources would be similar to those described under Alternative B.

Specially Designated Areas

Under Alternative D, management of FFO lands for VRM objectives would be similar to Alternative A. The amount of land managed for VRM I and II objectives would increase to

almost 16 percent. This is slightly higher than for Alternative B, and slightly less than for Alternative C. This moderate increase would benefit conservation of visual qualities in the areas with highest value.

Coal Leasing Suitability Assessment

This alternative would protect Ah-shi-sle-pah WSA from future coal development and preserve the outstanding visual quality of the area. Expansion of San Juan mine and development of a new mine on any of the competitive lease tracts or coal interests could cause highly visible surface disturbance. Mines for home fuel use would cause minimal visual impact. According to an industry study, development of coal interests around Lee Ranch and Hospah are most likely. Most of these areas have VRM Class III or IV ratings and would allow moderate or fairly extensive modification. However, specific locations may be in the viewshed of many sensitive cultural sites and areas with high visual value. Impacts from new mine development would be similar to those described for Alternative A.

Cultural Resources

All impacts to cultural resources described in this chapter include those likely to occur but would not necessarily be limited to those listed.

Oil and Gas Leasing and Development

This alternative would affect approximately 1,895 archaeological sites in the same watersheds as the other alternatives (Table 4-10). The 805 miles of new roads in the high development area would provide new public access to archaeological sites and TCPs, potentially increasing vandalism.

Land Ownership Adjustments

Prior to land disposal, evaluations of the cultural resources on that parcel would be conducted. No known significant cultural sites and TCPs would be included in disposal parcels. Acquisition of inholdings would benefit cultural resources within SDAs because sites would be protected by a single landowner (FFO) and a comprehensive management plan.

OHV Use

OHV access would be limited to maintained and graded roads in most of the FFO area, so there would be less potential than under Alternatives A and B for archaeological sites to be damaged by vehicles driving across the landscape. If additional areas were to be designated as open for cross-country travel, cultural resources surveys would be required and clearances would be issued before the areas would be approved.

Specially Designated Areas

Special protection from such uses as oil and gas activities, mineral entry, land disposal, vegetation management, and OHV activities would be provided to important cultural sites in 79 SDAs within approximately 78,700 acres in the FFO area. The Noise Policy would require mitigation of noise either within the boundary or from important cultural sites within 34 cultural ACECs.

This would minimize impacts to the cultural resources within these protected areas. Impacts to cultural resources caused by surface disturbance from oil and gas development, grazing, OHV travel, and other activities commonly occurring in the planning area would still occur to some degree.

Coal Leasing Suitability Assessment

When specific locations of proposed coal mines are known, cultural resource clearance for commercial mines or home fuel use would be required before approval. Any archaeological sites or TCPs that are found would be avoided or mitigated. Clearance, avoidance, and mitigation would also be required before mining coal for home fuel use. Therefore, impacts to cultural resources would either be minimized during the approval process, or sites would be documented through mitigation before coal mining would begin.

Paleontology

Oil and Gas Leasing and Development

Alternative D would involve less acreage of surface disturbance and therefore result in fewer impacts to paleontological resources than under Alternative B, but more than under Alternatives A and C. CSU constraints would limit oil and gas development impacts to paleontological resources within 9 SDAs, resulting in more protection than would occur under the 4 areas in Alternative A.

Land Ownership Adjustments

Impacts to paleontological resources would be the same as under Alternative B.

OHV Use

Impacts to paleontological resources would be the same as under Alternative B.

Specially Designated Areas

By proposing 5 new paleontological areas, more paleontological resources would be protected under this alternative than under Alternative A. Over 135,000 acres of public land containing known important formations would be protected through the implementation of management prescriptions within 9 SDAs. This includes approximately 135,000 acres of public land within Betonnie Tsosie, Bohanon Canyon Complex, Carson Fossil, Fossil Forest, Gobernador and Cereza, Kutz Canyon, Lybrook Fossil, Piñon Mesa Fossil, and Torrejon Fossil Fauna Paleontology Areas.

Coal Leasing Suitability Assessment

An inventory of paleontological resources would be required prior to mining, as well as documentation or collection of vertebrate specimens uncovered during mining, in compliance with an agreement between the BLM and the State of New Mexico. This documentation would add to the body of knowledge about paleontological resources in the San Juan Basin, while permanently removing them from their original context. More areas are under consideration for coal mining. Consequently, there could be the potential for additional impacts if additional coal mining were to be approved in areas where unidentified paleontological resources occur.

Recreation

Oil and Gas Leasing and Development

Impacts from development of 360 new wells under Alternative D in expanded recreation areas would be similar to those described for Alternative C. With up to 12,500 new small compressors and 320 large compressors located throughout the FFO, there may be several locations affected by noise. The Noise Policy under this alternative would designate some recreational sites by point locations rather than an inclusive area. Less land would be protected from potentially undesirable noise levels from well site compressors. However, the policy provides for the 48.6 dBA level or lower at key locations, trails, campgrounds and recreational sites with specified buffer areas. Specific recreational resources would benefit from the Noise Policy proposed under this alternative, but most of the FFO could be affected by widespread noise sources. This could degrade the quality of the area for dispersed recreation.

Land Ownership Adjustments

Impacts of land adjustments under Alternative D would be similar to Alternative C. The BLM would be more open to land disposal in the tri-cities area, but would continue to review R&PP Act applications for consistency with BLM objectives and identified community interests, particularly for outdoor recreational facilities for motorized and un-motorized vehicles.

OHV Use

OHV classifications and impacts on recreational use of OHVs would be similar to those described for Alternative B, with somewhat less land (about 66,000 acres) being potentially suitable for open OHV designation

after further planning is pursued. Other discrete areas would be available for specific recreationist activities such as controlled OHV use in Angel Peak Recreation Area, as well as wash bottoms and more trails designated for specific one- or two-track uses.

Specially Designated Areas

Recreation management areas would increase by 42.4 percent over current (the same as Alternative C), benefiting recreational resources in the FFO. ROS classifications would be essentially the same as Alternative C. More areas would be available for hunting and shooting access than under Alternative C.

Coal Leasing Suitability Assessment

Expanded coal development in the vicinity of San Juan mines would generally limit the desirability of the immediate area for recreation. Potential impacts to the proposed Piñon Mesa Trail Recreation Area could be the same as under Alternative B. Potential development in the south part of the FFO would have less potential to affect recreation. However, several cultural sites also provide for public visitation and may be affected by altering the context of cultural resources (from oil and gas and coal development). Overall impacts on dispersed recreational opportunity would be minimal. Coal development would not occur in the WA or WSA, benefiting opportunities for the most primitive and remote recreational experiences.

Noise

Oil and Gas Leasing and Development

The major cause of noise impacts would be the increased number of wellhead compressors associated primarily with gas operations. With 9,942 new wells projected under Alternative D, and 14,400 existing wells on public land, this could result in almost 12,200 small wellhead compressors scattered throughout the high development area. Noise from the small wellhead compressors from mechanical parts and exhaust range from 91 to 107 dBA at the source when operating at 100 percent load (Wagner Power Systems 2002).

In addition to the small wellhead compressors, it is estimated that 20 large compressors (2000 to 10,000 HP) and 299 mid-size compressors (500 to 2,000 HP) would be installed under Alternative D. Noise from these compressors, assuming that they are gas-fired, would range from 44 to 69 dBA at a distance of 500 feet and 89 dBA at a distance of 50 feet from the source.

A Noise Policy (Appendix E) would require noise mitigation within 400 feet of the noise source to be implemented inside the boundaries of 16 designated NSAs, and within a specified distance from receptor points in 45 additional NSAs, to achieve a sound level of 48.6 dBA over a continuous 24-hour period. This noise standard would also be required within 100 feet of dwellings and municipal areas. The acreage to be submitted to noise mitigation would be less than the acreage under Alternative C, but it is not measurable until FFO staff identify the locations of receptor points and the distance from each point that is subject to Noise Policy.

This noise standard is less than the noise generated by the compressors listed above, but actual noise impacts from gas operations would be highly variable, depending on the type of compressor and muffler, location, distribution, and terrain of the compressor sites. Noise impacts would be mitigated near identified golden eagle, ferruginous hawks, and prairie falcon nests in compliance with the FFO raptor noise policy, as under Alternatives A and B.

Individually, the noise generated by the small compressors may be an annoyance for residents or visitors to the planning area. Also, a significant impact on the human environment could result from the combined noise of many compressors of different sizes in an area. Noise impacts under this alternative would increase as new wells and compressors are added. Potential impacts would be much greater than under Alternative A because there would be 2,760 more wellhead compressors and 177 more large compressors in use over the 20-year

period. Implementation of the Noise Policy established in an NTL to oil and gas operators would provide localized noise mitigation within and near the designated areas.

Land Ownership Adjustments

If public land becomes non-federal land through disposal or exchange, increasing the non-federal landowners and land users in the high development area, it is possible that there would be additional conflicts over noise, if more people live or recreate in areas interspersed with gas wells. The implementation of the Noise Policy would lessen some of the impacts from oil and gas compressor noise in localized areas.

OHV Use

Noise from OHV use would be less prevalent than under Alternative A because access would be limited to maintained roads in most of the FFO area. Many more maintained roads would be constructed in the high development area, but OHV noise would be short-term with insignificant long-term impacts. Development of OHV management plans may identify trails and OHV open areas where noise would be generated. Proximity to existing sensitive receptors would be considered in identifying open areas in the future.

Specially Designated Areas

Under the proposed Noise Policy, noise mitigation within and around 16 SDAs and 45 areas with designated receptor points within them. The noise policy to protect nesting raptors would continue to minimize impacts.

Social and Economic Conditions

Employment

Employment in the oil and gas industry under this alternative would be similar to Alternative C. Regional changes in employment in the energy extractive industries would be minimal. There would likely be no loss of coal mining jobs under this alternative, as there would be under Alternative C. This would therefore minimize potential for local impacts on coal mining-dependent labor pools. Overall, there would be a slight gain in job levels in extractive industries, but these would represent minimal increases for the planning area as a whole.

Expenditures

Expenditures under Alternative D would be similar to Alternative C and current expenditures for the oil and gas industry. The estimated cost for drilling 9,942 wells is $5.3 billion, at an average cost of about $536,000 per well. Additional direct costs would increase the total investment to about $6.2 billion. Additional indirect expenditures could result in a total of $7.9 billion spent over 20 years, or an average of $399 million per year (non-escalated). This represents 130 percent increase in expenditures for oil and gas development on federal land compared to Alternative A and about 10 percent less than if current levels were maintained.

Revenues

Impact on tax revenues and royalties from oil and gas development would be essentially the same as under Alternative C. Over 20 years, production potential could more than double in the FFO area.

Under this alternative, coal production from existing mines on federal land may decline by 50 percent over the next 20 years. However, this could be offset by expanding deep leases at San Juan and La Plata mines. The resulting impact on coal royalties and taxes is not known, but would likely be minor, considering that coal revenues are currently only 5 percent of energy extractive industry revenues in New Mexico.

Impacts on grazing would be similar to Alternative B. Like Alternative C, the reduced acreage would reflect changed management prescriptions and therefore affect larger areas of contiguous land, which could affect some allotments disproportionately. Therefore, impacts may be incurred by a few ranchers, rather than more broadly by small reductions for several ranchers. A slight reduction (about 3

percent) in permitted AUMs would somewhat decrease fees paid to the FFO and productive value of grazing. Although the value is small in relative terms, this loss could affect some smaller operators and may have a minor negative impact on local cattle ranching.

Environmental Justice

Impacts on minorities and low-income persons would be generally similar to those described for Alternative A. There would be no projected job losses; therefore, potential impacts on minority workers from loss of coal mining jobs under Alternative C would not result.

Change in OHV use on federal land under Alternative D may affect access for some persons who are accustomed to cross-country travel and access. This could affect minority or low-income persons who tend to use public lands to some degree for subsistence. For example, wood and plant gathering and hunting may directly supplement other sources for some families. When vehicles are limited to roads and designated trails, it may be less convenient to gather and haul wood. However, the existing road network provides extensive access to nearly all areas; therefore, these uses would continue unless otherwise restricted by management prescriptions.

CUMULATIVE IMPACTS

The analysis of cumulative impacts focuses on the extent to which impacts from each alternative could combine with impacts from past, present, and future actions to create a significant adverse impact in the planning area. Past and present impacts are reflected in the existing conditions in the San Juan Basin in New Mexico. Analysis of future impacts includes the following considerations.

- The cumulative impacts identified in the RFDS for development of oil and gas on all land and from all mineral ownership types within the planning area, including the FFO area, AFO area, USBR lands around Navajo Reservoir, USFS lands in Carson and Santa Fe National Forests, Indian land, and state and private land.
- The cumulative effects of implementing the proposed changes to land use management in the FFO area in combination with other reasonably foreseeable actions.

This analysis is more general than the analysis of direct and indirect impacts because decisions about other actions in the planning area would be made by many public and private entities, and the location, timing, and magnitude of these actions are not well known.

Surface Disturbance Due to Oil and Gas Development

The predicted acreage of current and future disturbance due to oil and gas development on non-federal minerals under each alternative was combined with the current and future disturbance on federal minerals to estimate cumulative surface disturbance in the planning area. The 1991 Oil and Gas Leasing and Development Amendment (BLM 1991a) estimated the impacts of an additional 4,512 wells as 28,750 acres at that time. However, those numbers have been exceeded and disturbance incurred prior to this amendment was not quantified in that document. Abandoned locations that are waiting for reclamation approval currently contribute to the total area of surface disturbance not associated with active wells. Specific data describing current surface disturbance are not available, so a broad estimate was made by adding the predicted amount of surface disturbance associated with each alternative to an estimate of the disturbance associated with approximately 18,000 active wells in the New Mexico portion of the San Juan Basin, using the same assumptions as described at the beginning of this chapter. The 3-acre average for well pads was used, and estimates for large pipeline and compressor construction were scaled in proportion to the amount of disturbance predicted in the RFDS. The resulting amount of long-term surface disturbance associated with current facilities producing federal minerals is broadly estimated at approximately 83,500 acres.

The RFDS projects a total of 12,461 wells to be developed over 20 years in the San Juan Basin (assuming 25 percent dual completions and commingling), of which 80 percent would be constructed to extract federal minerals. The cumulative impacts from the additional 2,491 wells that would be developed on non-federal minerals, was estimated assuming the same rate of commingling and dual completions as described for federal minerals. Based on the assumptions used to calculate surface disturbance for new wells and associated facilities, described under Assumptions for Analysis at the beginning of Chapter 4, there would be approximately 8,300 acres of long-term surface disturbance from construction of well pads, 80 large compressors, and large pipelines.

The net acreage of surface disturbance associated with projected new oil and gas development under Alternative D on all mineral ownership in the San Juan Basin would be almost 27,000 acres, as shown in **Table 4-21**. In combination with current surface disturbance, there would be approximately 110,400 acres or 4.8 percent of the land in the high development area (1.3 percent of all land) that would be affected by oil and gas construction

within the New Mexico portion of the San Juan Basin.

Development of federal and non-federal minerals under Alternative A would result in long-term disturbance of approximately 9,300 acres. In combination with current surface disturbance, there would be almost 92,800 acres or 4 percent of the land in the high development area (1.1 percent of all land) disturbed. Under Alternative B, almost 117,000 acres or 5 percent of the land within the high development area (1.4 percent of all land in the planning area) would be affected when adding current and projected new oil and gas development. Alternative C would result in nearly the same acreage of long-term surface disturbance as Alternative D.

Table 4-21. Net Surface Disturbance from Oil and Gas Development on All Mineral Ownership

Surface Disturbance	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
New Development on Federal Minerals	934	24,781	18,238	18,577
New Development on Non-Federal Minerals	8,353	8,353	8,354	8,354
Subtotal of New Development	**9,287**	**33,134**	**26,592**	**26,931**
Existing Surface Disturbance	83,500	83,500	83,500	83,500
Total Surface Disturbance	**92,787**	**116,634**	**110,092**	**110,431**

Note: In some cases, acreage varies for the same number of wells due to rounding.

Under Alternative D, there would be approximately 44,300 acres of initial, short-term surface disturbance on land with federal and non-federal minerals caused by projected new wells, roads, and small pipelines constructed for oil and gas production in the high development area. Approximately 200 miles of new roads that would be added to accommodate the new well pads projected on non-federal minerals. The total miles of new roads on both federal and non-federal minerals in the high development area would be 9 percent under Alternative D and would increase the road density to just over 3 mi/mi^2 if all existing roads remain open (**Table 4-22**).

Table 4-22. Existing and New Roads in High Development Area

	Alternative A	Alternative B	Alternative C	Alternative D
New Roads on Federal Minerals (miles)	358	1075	797	805
New Roads on Non-Federal Minerals (miles)	202	202	202	202
Existing Roads (miles)	10,083	10,083	10,083	10,083
Total Road Miles	**10,643**	**11,360**	**11,082**	**11,090**
New Roads as Percentage of All Roads	5%	11%	9%	9%
New Road Density (miles/mile^2)	2.93	3.13	3.05	3.06

Note: In some cases, acreage varies for the same number of wells due to rounding.

Under Alternative A, there would be a total of 21,800 acres of initial, short-term surface disturbance on federal and non-federal wells, roads, and pipelines in the high development area. The total miles of new roads on both federal and non-federal minerals in the high development area would be 5 percent and would increase the road density to 2.9 mi/mi^2 if all existing roads remain open.

Under Alternative B, there would be a total of 49,800 acres of initial, short-term surface disturbance. The total miles of new roads on both federal and non-federal minerals in the high development area would be 11 percent and would increase the road density to over 3.1 mi/mi^2 if all existing roads remain open.

Initial short-term surface disturbance under Alternative C (39,300 acres) would be slightly less than under Alternative D in the high development area, but the amount of new roads and the road density would be almost the same.

Other surface disturbance would be expected to occur in the vicinity of urban areas, as municipalities increase in population. As existing coal mines expand, there would be surface disturbance that would be offset by reclamation unless new mines are opened in addition to the current mining operations. Because the coal mining industry is volatile and subject to market conditions, it is impossible to predict the location and amount of coal mining that would occur in the San Juan Basin over the next 20 years.

Geology and Minerals

Hydrocarbon reserves would continue to be depleted from the formations in the basin under all alternatives and the loss of this resource is permanent. Recent gas production has been dominated by the Fruitland Coal formation. Its production trend is still increasing, and a stable trend has not yet been established. The three major conventional gas-producing formations, the Mesaverde, Dakota, and Pictured Cliffs, appear to have entered the late depletion stage (Engler et al. 2001).

Impacts on salable minerals would continue to occur and would most likely increase as construction of roads and buildings increase to meet the demands of a growing population. Sand and gravel quarries would be likely to be developed or expanded near the tri-cities area and other population centers, such as Cuba, Gallup, and Grants. There is no foreseeable demand for extracting locatable minerals during the next 20 years.

Soils

The cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and gas development and other activities. Reclamation of P&A wells and closure of roads and pipelines would reduce the overall impacts by grading and stabilizing those areas so they are no longer contributing to erosion and sedimentation. Many additional construction activities are anticipated to occur over the next 20 years, especially in the vicinity of expanding urban areas.

It is not possible to predict the quantity of soil erosion and compaction that would result from OHVs and other surface disturbing activities in the San Juan Basin because enforcement of regulations would be a critical factor to control the amount and effect of this type of public activity on federal land. OHV access on private and state land varies across the San Juan Basin. It is known, however, that OHV traffic contributes to accelerated erosion and sedimentation, and that fewer limitations on cross-country travel would be expected on most non-federal land. It is likely that, if limitations on OHV travel are implemented on public land as proposed under Alternative D, there may be an increase in the use of OHVs across the landscape on non-federal land. This could result in moving the problem from public to non-public land, and could continue to contribute to soil erosion.

Water Resources

The primary cumulative impacts on water quality would result from an increase in the

amount of surface disturbance due to increased oil and gas development activity and other earthmoving activities associated with urban expansion in the planning area. This surface disturbance and increased sediment yields, along with an increase in roads that would direct sedimentation to stream crossings, would occur mainly in the high development area. Other vegetation damaging practices, such as OHV use cross-country and in drainageways, overgrazing, and vegetation management on non-public land, could contribute to increased sedimentation.

Water needed for well drilling on non-federal minerals would be approximately 1,800 acre-feet, using the same assumptions (5600 barrels/well) as described under each alternative. The total quantity of water needed to drill wells on federal and non-federal minerals over the 20-year planning period would be almost 8,750 acre-feet under Alternative D, almost 4,850 acre-feet under Alternative A, almost 11,100 acre-feet under Alternative B, and almost 8,700 acre-feet under Alternative C.

As population increases in the planning area, domestic water consumption would also increase, but no data are available to quantify the amount.

Air Quality

The project near-field dispersion modeling analysis considered the impact of both project emissions and existing emission sources within the planning area. Existing sources were simulated with the use of the highest amount of background pollutant data monitored in the planning area. It is possible that with the increase in gas production associated with the RMP and population growth in the Four Corners region, future background pollutant levels in the region could increase above current levels and those assessed in this EIS. However, as part of the NMAQB air permitting process, RMP sources that require near-field dispersion modeling analyses would consider the cumulative impact of proposed and surrounding future sources to ensure that they would not contribute to an exceedance of an ambient air quality standard.

The project far-field analysis estimated that a conservative scenario of emissions would marginally increase ambient NO_x levels within nearby Class I areas. The majority of the emissions sources would be exempt from a Class I increment analysis under NMAQB regulatory requirements. Nevertheless, emissions from the combined RMP sources in future years would produce elevated levels of NO_x within nearby Class I areas that would be potentially significant. The combination of NO_x emissions from proposed RMP sources and future non-project sources in the region also would produce potentially significant cumulative impacts to nearby Class I areas.

The project far-field analysis also determined that emissions from the combined RMP gas development would have the potential to significantly impair visibility within the Mesa Verde National Park. As a result, the impact of project emission sources, in combination with reasonably foreseeable future emission sources, would potentially produce significant cumulative impacts to visibility resources in this pristine area.

The impact of the RMP emissions would be potentially significant to ambient 8-hour O_3 concentrations within the San Juan County project region. Additionally, the impact of RMP emissions with reasonably foreseeable future emissions would produce potentially significant cumulative impacts to ambient O_3 levels in the project area.

Upland Vegetation

Land disturbance and removal of vegetation would occur during oil and gas development on land with non-federal minerals, in addition to the acreage affected by federal minerals development described above. It is assumed that, on land with non-federal minerals, there would be an increase of 25 percent of the development projected for federal minerals under each alternative. The cumulative impacts on upland vegetation would equal the current disturbance (83,500

acres) plus the projected short-term surface disturbance on land with federal and non-federal minerals. In most cases, the native vegetation would not recover during the 20-year planning period, even if some areas were revegetated, so the total acreage of affected vegetation would be calculated by adding the initially disturbed acreage to the acreage of existing surface disturbance.

Following the above procedure, it is estimated that the cumulative impacts on native vegetation on all land affected by oil and gas development would total approximately 128,000 acres or 5.5 percent of the high development area under Alternative D. The range of cumulative impacts would be 105,000 acres (5.7 percent of the high development area) under Alternative A to 133,000 acres (5.7 percent of the high development area) under Alternative B. The piñon-juniper woodlands and Great Basin Desert Scrub would be the major plant communities most affected by impacts from oil and gas development.

Proposed changes in the locations of permitted cross-country OHV travel may cause impacts on vegetation to be moved from federal to non-federal land, if Alternative D were implemented. The overall impacts on vegetation in the San Juan Basin may be the same under all alternatives, but the effects would occur in different locations, depending on the alternative.

Riparian Areas and Wetlands

Specific protection of riparian areas and wetlands proposed in the San Juan Basin would occur on federally managed land. The designated Riparian Areas that would limit surface disturbing activities, such as oil and gas development, OHV cross-country travel, and grazing, are under the management of the FFO. Restrictions on construction in waterways and wetlands would be required on all land in the San Juan Basin to meet the requirements of the Clean Water Act and its associated permits (404/401) but the actual impacts on non-federal land cannot be predicted. It is possible that some riparian vegetation on non-federal land in the planning area would be damaged by OHV traffic, grazing, and oil and gas development, but the extent and location of these impacts cannot be determined. The acquisition of inholdings within the expanded Riparian Areas in the FFO would mitigate some of this damage by bringing additional land under federal management with a goal of protecting important riparian and wetland resources.

As urban development and oil and gas development increases over the 20-year planning period, it is anticipated that there would be impacts to riparian areas and wetlands from erosion, sedimentation, and damage to vegetation in addition to those impacts described for federal land. However, the location and amount of these impacts and their direct effects on riparian areas and wetlands cannot be specified.

Special Status Species

All actions authorized by the federal government must comply with the ESA of 1973 as amended. FFO has developed management strategies to protect and conserve species and habitats for species that are listed as threatened, endangered, or proposed for listing. In addition, FFO provides special management for seven sensitive species that are not listed under ESA, and reviews sensitive species lists from other agencies. FFO cooperates with other agencies to develop protocols and protective management for other sensitive species, when appropriate. However, the protections listed above and discussed in the RMP apply only to actions in the planning area that are authorized by the FFO.

Impacts to threatened, endangered, proposed, or other sensitive species may occur on private lands with the project area. Private land is concentrated in the river valleys. Much of the private land in the river valleys has been cleared and is used for housing development and agriculture. Private lands in the uplands may be developed for housing or ranchette subdivisions and grazing operations. Most farming operations depend on irrigation water

supplied from the area rivers and may result in lower flows in the river during dry years. The development of private land may result in the loss of riparian, river valley, and upland habitats that may support rare species. Oil and gas development occurs on private lands/ private mineral properties that may impact rare species. Gravel mining on private lands along the rivers has the potential to impact rare species and riparian habitats. FFO has no authority to regulate private land development, and the amount and type of development that may occur on private land in the future is independent of the RMP planning process.

Approximately 2.5 percent of the projected wells will be developed on Navajo Nation surface with federal minerals. The Navajo Nation maintains an autonomous T&E species program and coordinates with BLM to include protective measures and mitigation, to drilling permits to avoid negative impacts to sensitive species. Other Navajo Nation and Jicarilla Apache land with Indian minerals is developed through a tribal T&E species program and coordinated with the BIA. Approximately 7.5 percent of the projected wells will be developed on USFS land. The USFS maintains a T&E program to analyze impacts to T&E species on their surface. The State of New Mexico lands with state minerals are developed under the supervision of the NMOCD.

Fisheries and Wildlife

Wildlife inhabiting the piñon-juniper woodlands and Great Basin Desert Scrub would be the most affected by cumulative impacts. The existing surface disturbance from oil and gas operations plus projected disturbance described under each alternative, in combination with additional disturbance on non-federal minerals, would result in increased direct loss of habitat, habitat fragmentation, and functional habitat loss. The development of new wells on non-federal land would affect wildlife such as mule deer, elk, and antelope through the building of more roads and increased human activity. These increases in road density in the high development area, when considering the existing roads and the new roads projected on land with federal and non-federal minerals (Table 4-22), would be likely to increase the functional habitat loss for many species of wildlife. The greatest such loss would occur under Alternative B, with slightly fewer impacts under Alternative D due to slightly lower predicted road density by the end of the 20-year planning period. The effects of loss of habitat on non-federal land adjacent to federal land would be most pronounced for species with large home ranges that overlap both federal and non-federal land (mule deer, elk, antelope).

Negative impacts on wildlife from OHV cross-country travel would occur where permitted throughout the San Juan Basin and would be compounded if all BLM land were to remain open to OHV access as it is currently managed (Alternative A).

Wilderness

Cumulative impacts from other foreseeable development (mostly of fluid minerals and coal) on non-federal lands could indirectly affect the periphery of Bisti/De-na-zin WA and Ah-shi-sle-pah WSA through visual changes, noise, dust, and additional vehicular activity in surrounding areas. Both these protected areas overlap with coal resources. Over the next 20 years, some mines will be depleted and closed and new mines could come into production. New rail infrastructure could be part of future coal development. Railroad ROWs would likely involve a variety of federal, state and private land and would therefore be subject to NEPA review. Possible designation of Cabezon WSA as a WA would expand wilderness resources regionally.

Rangeland

Much of the land in the San Juan Basin is considered to be suitable for livestock grazing. Although oil and gas development on land with non-federal minerals could add another 25 percent to the amount of surface disturbance predicted for land with federal minerals under each alternative, it would only affect about 1.6

percent of the San Juan Basin. Added to other surface disturbance from urban development and other construction, the overall effect of removing rangeland acreage from production would still be minimal when compared to the acreage of available forage. The impacts would be concentrated in the high development area and would be most significant for ranchers who graze livestock where the highest density of oil and gas development exists.

Other forage damaging activities such as OHV traffic and grazing on USBR and USFS land would continue to be controlled by agency policies. The USFS strictly controls OHV access and manages rangeland by controlling livestock AUMs. Private landowner controls on OHV access, weed management, and rangeland health are variable, so the future impacts on rangeland caused by foreseeable actions in the San Juan Basin are unpredictable. Conflicts between livestock grazers and other land users will continue to occur throughout the planning area.

Lands and Access

The cumulative impacts of actions to acquire and dispose of federal lands should generally favor community development and protect valuable resources. BLM would remain open to suitable proposals under the R&PP Act under any alternative. The development of oil and gas resources in the region is a key component of the economy. Higher levels of new development in the vicinity of urban areas could bring conflicts with residential, community, and some commercial uses, mostly from potential noise sources. These conflicts would likely be most prevalent under Alternative B. Local zoning plans and regulations would provide the basis for controlling incompatible land uses in these areas and should be developed accordingly.

Coordinating and consolidating the use of utility corridors for a variety of users and infrastructure would reduce the potential for a proliferation of bisected land holdings. By concentrating these linear uses, it would preserve flexibility for larger blocks of land for future uses. Under Alternatives C and D, the Western Region Corridor Plan would be adopted and would support better coordination of regional infrastructure and use of common corridors. Approximately 140 miles of additional corridors in the planning area proposed by Public Service Company of New Mexico (PNM) in their 20-year plan could contribute to fragmentation of land holdings, and bisect land use patterns. This trend could be reduced by coordinating corridor siting among all users.

Growth in the region is expected to increase traffic on most roadways. Ongoing and future state and federal highway projects are expected to address major transportation needs. Local effects from production on federal land on US 550, US 64, and US 173 may be considerable.

Visual Resources

On a regional basis, modifications in the landscape will continue as oil and gas resources are developed. Potential for future development on non-federal land will also contribute to visual modification. Within the planning area, standards for mitigating visual impacts are only applied on federal land. It is therefore expected that human modifications will become increasingly noticeable in the landscape. Cumulative impacts on visual resources would be greatest under Alternative B, in which oil and gas development on federal land would represent the largest portion of new development, and cross-county OHV use would continue to affect wide areas. New coal mines in the Four Corners region would also potentially have significant local impacts on sensitive landscapes. Linear features such as new railroad for coal development, oil and gas field roads and pipelines, and other major utility corridors, such as PNM's proposed corridors, could be noticeable manmade features that slowly change the landscape from predominantly natural to more evidently modified. Consolidating major infrastructure into a few corridors would minimize potential changes on a widespread basis. This could be

accomplished through regional planning and coordination.

Cultural Resources

The acreage of initial, short-term surface disturbance on land with federal and non-federal minerals, described under the cumulative impacts in Watersheds above, would vary between alternatives. The greatest potential for impacts to archaeological sites and TCPs would occur under Alternative B because the most wells, roads, and pipelines, disturbing 49,800 acres, would be constructed on federal and non-federal minerals. Alternative D would have slightly less disturbance, 44,300 acres, and therefore slightly less potential for impacts to cultural resources.

An additional 200 miles of new roads on non-federal minerals, added to existing roads and those projected to access federal minerals would affect a greater amount of cultural resources through direct damage and could result in increased vandalism, when considering all oil and gas activities, in combination with surface disturbance and road construction from other possible urban development in the San Juan Basin. There are more recorded sites on federal land than on land under other ownership, and fewer requirements for documenting or avoiding cultural resources on private land, so the surface disturbance caused by all development would result in a greater potential for damage to cultural resources where they are not protected by the enforcement of regulations.

Paleontology

More surface and subsurface disturbance would affect a greater amount of paleontological resources when considering the amount of oil and gas activities on federal minerals, in combination with development on land with non-federal minerals, and disturbance from other construction activities in the San Juan Basin. Excavation, drilling, and OHV traffic that would occur on non-federal land would result in a greater potential for damage to paleontological resources because they are not as well protected by the enforcement of regulations.

Recreation

Cumulative impacts are most likely to occur on dispersed recreation throughout the region. Management of SDAs would generally preserve some of the most favored public recreation areas. Under Alternatives C and D, widespread oil and gas development would add to the level of modification (primarily visual and sound) in the environment that detracts from high quality dispersed recreation. However, expansion of recreation areas would provide some offsetting protection for locations that have the greatest appeal for recreation. Limitations on cross-country OHV use may increase cross-country OHV use on private land. Alternative B would have the greatest potential for cumulative impacts on recreation from high levels of oil, gas, and possibly coal development, and relatively little expansion of specially delineated recreation areas. Under Alternative A, loud and damaging use of OHVs over widespread areas would continue and increase throughout the planning area, as population and popularity of motorized sports increases. Although modifications from oil and gas development (to visual and sound qualities) would be somewhat less than under Alternative A, there would be no expansion of areas protected or facilities provided to meet growing demands for recreational purposes. Overall, Alternatives C and D provide the greatest balance in managing for recreational resources in the planning area.

Noise

Due to the relatively small areas and localized impacts of implementing the Noise Policy, most of the planning area would be exposed to increased noise from oil and gas activities under all alternatives, although they would be less under Alternatives C and D. This exposure would increase in areas of non-federal minerals where oil and gas development occurs, as well as on federal lands not within designated NSAs.

Social and Economic Conditions

Cumulative economic impacts would arise, primarily from additional oil and gas development on federal and non-federal land in the planning area. Annual oil and gas production could more than double over current levels under Alternatives B, C, and D, and increase by about one-third for Alternative A. Coal production in the Four Corners area is not expected to increase significantly over the next 20 years (Hill and Associates 2000), and employment levels are likely to remain at current levels. Oil and gas facilities may displace some grazing, scattered widely over the planning area. This may account for relatively minor reductions in permitted grazing levels, which would have insignificant cumulative impacts.

There would be additional economic benefits in the form of jobs, expenditures, and public revenues from oil and gas development of non-federal minerals. Additional new non-federal development is estimated to generate about 560 additional jobs annually at the end of 20 years. In the local tri-cities area, new oil and gas industry jobs (both federal and non-federal mineral) generated under Alternatives B, C, and D could represent increases of about 2 to 4 percent over current employment levels and have a minor beneficial effect on the local economy, with federal development accounting for about one-half to three-quarters of this benefit. Regionally, job increases (and earnings) or losses (Alternative D only) would range from 1 to 2 percent of current levels and would be insignificant in the long-range timeframe.

An estimated $2 billion in direct and indirect expenditures would produce an average annual expenditure of $98,600,000. This would increase expenditures expected under Alternative A by 50 percent, and would represent about a 20 percent increase annually over Alternative B and 25 percent over Alternatives C and D.

Taxes and royalties could increase in proportion to annual production (see above). A progressive increase over the long-term is expected under all alternatives, with the least gain under Alternative A. Benefits to the state, local jurisdictions, and school districts could result, assuming value of the product does not decline.

Overall, the effect of oil and gas development on land with non-federal minerals over 20 years would benefit economic activity in the planning area. These are expected to far outweigh any changes in jobs, expenditures, or revenues resulting from any other actions expected or likely in the region.

Environmental Justice

In a region where lower paying jobs in retail and service industries have been increasing at a faster rate than others, and where employment fluctuates in bust and boom cycles of the energy industry, continued development of energy resources represents a desirable economic engine, even if it remains subject to cycles. Because these resources are concentrated in Rio Arriba and San Juan counties that both have disproportionately minority population, benefits from growth in resource development both of federal and non-federal interests would provide jobs and therefore benefit these groups. The greatest economic benefit may occur under Alternative B, however, this level of development also has the greatest potential for increasing the level of conflict between extractive operations and other land uses, such as residential, throughout the planning area. These incompatibilities could occur widely and affect residents in the planning area, including low-income and minority groups. Development on non-federal land would need to comply with requirements of local jurisdictions or tribes. Where local controls are minimal, there would be increasing possibility for incompatible development.

MITIGATION AND MONITORING

Mitigation Measures

For the majority of activities occurring on public lands in the planning area, mitigation is implemented via COAs for activities related to and occurring on oil and gas leases and special stipulations, which are attached to grants for rights of way. Similar stipulations are attached, when appropriate, to non-oil and gas related surface disturbing activities. Application of mitigating measures is determined on a site-specific basis. The following section summarizes, by resource, the major mitigating measures typically used to reduce impacts from surface disturbing activities. Mitigation measures listed under one resource may also apply to others. For example, the requirement for reseeding disturbed areas can, depending upon the situation, serve to mitigate impacts to soil, water, air, vegetation, wildlife, visual, and rangeland resources.

Many of these mitigating measures can be linked to BMPs. BMPs cover a broad variety of practices used to reduce or eliminate non-point pollution sources. They can include measures such as reestablishment of vegetation, mulching, terracing, or other activities that reduce raindrop impact, reduce the velocity of or divert runoff, protect the structural integrity of soils, filter contaminants and sediment to protect surface water, and increase water infiltration. The mitigation measures that serve as BMPs are designed to meet the needs of each site and situation.

The following list is not all-inclusive. Many of the measures are abbreviated or summarized from the more extensive list of existing COAs, special stipulations, and other mitigation measures included in Appendix G. Mitigating measures can be added or modified as conditions change or new information and techniques become known.

Soils

Various techniques are employed to reduce soil erosion. Most measures focus on reducing the amount of surface disturbance, protecting disturbed soils from water or wind erosion, and restoring natural vegetation as soon as possible. Depending upon the site-specific situation, major mitigation measures to be employed include the following:

- Operators are required to submit a plan of reclamation to the BLM.
- Clearing, grading, and other disturbance of soil and vegetation is limited to the minimum area required for construction.
- Any roads used exclusively for construction purposes shall be adequately closed to all vehicular travel and rehabilitated after completion of construction.
- Topsoil removed during construction will be stockpiled and used in reclamation (see p. G-9, No. 39.)
- Sidehill cuts of more than 3 feet vertical are not permitted. Areas requiring cuts greater than this will be terraced so none are greater than 3 feet.
- Disturbed areas shall be mulched as designated by the Authorized Officer (see p. G-9, No. 65)
- Disturbed areas will be reseeded following specifications using designated seed mixtures within one year of final construction.
- No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 6 inches deep, the soil shall be deemed too wet to work.
- See also p. G-1, No. 4; p. G-2, No. 14, 16; p. G-3, No. 23, 24; p. G-4, No. 28; p. G-6, No. 13; p. G-7, No. 14, 19, 20; p. G-9, No. 34 38, 39, 40, 41; p. G-10, No. 42, 43; p. G-11, No. 55, 56, 60, 63; p. G-15, all.

Water Resources

In addition to those measures listed under Soils, the following mitigation measures will be applied as appropriate to protect both surface and groundwater from the impacts of surface disturbance:

- Drilling pits will be lined with an impervious material at least 8 mils thick.
- Mud and blow pits will be constructed so as not to leak, break, or allow discharge of liquids or produced solids (see p. G-13, No. 3).
- Washes shall be diverted around well pads.
- Culverts of sufficient size (minimum 18 inches) will be placed where drainages cross access roads.
- Low water crossings shall be constructed in a manner that will prevent any blockage or restriction of the existing channel. Material removed shall be stockpiled for use in rehabilitation of the crossing.
- Full compliance with all applicable laws, regulations and Onshore Orders is required. (Onshore Order No. 2 requires protection of all useable aquifers when casing and cementing oil and gas wells.)

Air Quality

The recent concerns in the San Juan Basin focusing on ozone levels and ozone precursors (which are also contributors to regional haze) have caused concerned citizens, agencies, local governments, and industry to form the Four Corners Ozone Task Force. Working in conjunction with the Task Force steering committee, the NMAQB has identified the need for additional inventory, monitoring, and modeling which are required in order to recommend the most effective air quality mitigation measures. The BLM is a member of the steering committee and will support the state in its monitoring and modeling efforts. The BLM is obligated to approve only those operations that are in compliance with applicable laws and state standards. When specific Task Force recommendations for mitigation are made, the BLM will incorporate as mitigation measures those recommendations that are within its legal authority to require. In the interim, industry is encouraged to employ appropriate technology to limit emissions.

Gas Well Development

Gas well development would produce air quality impacts from combustive equipment, fugitive dust emissions from earthmoving activities, and the operation of vehicles on unpaved and paved surfaces. These activities are expected to produce less than significant air quality impacts within the planning area.

Other mitigation measures specific to air quality to be implemented as dictated by site-specific conditions include the following:

- Cover all truck hauling soil, sand, and other loose material
- Furnish and apply water, chemicals, or use other means satisfactory to the Authorized Officer to minimize dust. In certain specific instances, produced water may be used for dust suppression.
- When appropriate, install windbreaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Exposed stockpiles of dirt or sand will be enclosed, covered, or have non-toxic soil binders applied.

Gas Production Sources

The project air quality impact analyses concluded that emissions from proposed gas production sources would, if not mitigated, produce potentially significant impacts to the following air quality levels:

- Near-field 24-hour NO_2 concentrations,
- Class I area NO_2 increments,
- Class I area visibility, and

- Regional ambient O_3 levels.

The overwhelming majority of NOx emissions from proposed gas production sources would occur from wellhead compressors. These relatively small sources generally are unregulated by the NMAQB permitting process unless they are accumulated as part of a large facility with other substantial emission sources. Central compression units that would occur as part of the development of project alternatives generally would be regulated under NMAQB Construction Permits, Title V Operating Permits, or the PSD regulations. Therefore, the main opportunity to reduce project operational air quality impacts would occur from implementation of measures to control proposed wellhead compressor NOx emissions through this NEPA process.

The near- and far-field modeling analyses evaluated wellhead compressors with a NOx emission factor of 15.8 gm/HP-hr. The annual emission calculations for the proposed wellhead compressors were based on an average NOx emission factor of 13.2 gm/HP-hr, as determined from NMAQB source test data of 12 natural gas-fired engines ranging in size from 65 to 145 HP. Half of these units had NOx emission factors of less than 10 gm/HP-hr and the lowest NOx emission factor of these 12 units was 4.1 gm/HP-hr. Therefore, these source test data show that current engine designs are capable of producing NOx emissions that are less than what was analyzed in this Proposed RMP/Final EIS. Advancements in engine designs are also expected to improve emission rates from small natural gas-fired engines manufactured in future years.

Add-on control technologies, such as catalytic converters, can reduce NOx emissions from natural gas-fired wellhead compressors by up to 95 percent from uncontrolled levels, if they are working properly. Catalytic converters that reduce NOx emissions can also reduce VOC and CO emissions by similar amounts. The cost of these devices for the Caterpillar 3304 engine is about $3,000 (the cost of the 3304 engine ranges from $16-20,000) (Kaufman 2002). More inexpensive catalytic converts can still provide substantial NOx emission reductions. While cost-effective technologies exist to minimize NOx emissions from wellhead compressors, they must be maintained to ensure their efficacy.

One interim mitigation measure would be to limit the NOx emission factor of any proposed wellhead compressor to less than 10 gm/HP-hr. Implementation of this measure would reduce NOx emissions estimated for Alternative B by about 22 percent and would substantially reduce project impacts to the four air quality levels of concern identified above. Since the project region within San Juan County is near the level of nonattainment of the NAAQS for 8-hour O_3 concentrations, BLM would encourage the use of lean burn compressor engines and add-on control devices on wellhead compressors. Additionally, the BLM would recommend the use of larger compression units that could simultaneously serve several wells. This would increase the chance that these units would be large enough to fall under permit review by the NMAQB, which could further reduce emissions from these sources.

Upland Vegetation

In addition to the measures already listed under Soils and Water Resources above, mitigation measures to protect or restore upland vegetation communities include the following:

- No hardwood tree with a diameter of 10 inches or more at the base or any ponderosa pine, Douglas fir, or aspen tree is to be removed or damaged without approval from the Authorized Officer.
- Use of pesticides and herbicides shall comply with applicable federal and state laws (see p. G-14, No. 8).
- Permit holder shall be responsible for weed control and selective control of invasive weeds on disturbed land and reclaimed areas within the limits of the

well pad, associated road, and pipeline ROW.

- Permit holder is responsible for consultation with the Authorized Officer and/or local authorities for acceptable weed control methods within limits imposed in the COAs.

Riparian Areas and Wetlands

- No development activity or surface occupancy shall be permitted in wetland areas (as defined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands) (US Army 1987). Exceptions may be analyzed in a site-specific environmental assessment. Any wetland acreage destroyed shall be mitigated by the acreage ratio as prescribed by the USFWS.
- A buffer strip of vegetation, width determined on a case-by-case basis, shall be left between areas of surface disturbance and riparian vegetation.
- Minerals under areas of critical concern along the San Juan River, and under or close to Navajo Lake, shall be developed using no surface occupancy and directional drilling. Exceptions may be granted on a case-by-case basis in consultation with appropriate agencies.

Special Status Species

- No surface disturbance shall be permitted in bald eagle core areas.
- No construction activities shall be conducted between November 1 and March 31 in bald eagle buffer zones, unless approved on a case-by-case basis.
- All proposed actions within unsurveyed suitable habitat for any proposed T&E (state or federally listed) species will require surveys according to the responsible agency's protocol. Restrictions will be placed on surface disturbing activities in suitable habitat until these inventories are complete. The absence of any T&E species must be confirmed prior to approval of any surface disturbing action that may affect the habitat. If a T&E species is found, appropriate restrictions on new development will be imposed to avoid or mitigate adverse impacts.
- Mitigation for peregrine falcon nest sites will be determined on a site-specific basis using the principle of designating sensitive zones in which disturbance is seasonally restricted as delineated in Johnson 1994.
- When individual plants or suitable habitat for Brack's cactus are found during a biological survey for a ground-disturbing project, the company proposing the project will be required to transplant plants from the project area if well relocation or directional drilling are not feasible. Aztec gilia mitigation measures will be implemented on a case-by-case basis (see Appendix G).

Fisheries and Wildlife

In addition to the surface reclamation mitigation measures listed in the Soil, Water, and Upland Vegetation sections above, the following measures will be applied on a site-specific basis to mitigate impacts to wildlife and wildlife habitats:

- Seasonal restrictions are applied to prohibit surface disturbance in key habitats for deer, elk and antelope (see p. G-5, No. 3).
- Disturbance is restricted in designated elk calving areas from December 1 through July 14.
- Permanent or temporary pipelines for water disposal will be installed as early as possible to eliminate excessive truck traffic in sensitive wildlife areas. Exceptions may be considered on a case-by-case basis.
- All unguarded pits containing liquids will be fenced with woven wire. All fencing must be in accordance with New Mexico State Law.

- Unless otherwise agreed to by the Authorized Officer in writing, powerlines shall be constructed in accordance to standards outlined in "Suggested Practices for Raptor Protection on Powerlines" (Olendorff et al. 1981) (see p. G-6, No. 12).
- No construction, drilling, or completion activities shall be conducted between March 1 and June 30 in buffer zones surrounding active raptor nests.
- In key areas, where practical, well data may be required to be transmitted electronically to reduce vehicle traffic and wildlife disturbance.

Wilderness

To maintain the area's suitability for preservation as wilderness, the FFO will manage Ah-shi-sle-pah WSA under the nonimpairment mandate required by law. Any activity proposed within the WSA would be required to meet the nonimpairment criteria listed in BLM Manual H-8550-1, Interim Management Policy For Lands Under Wilderness Review. If coal development is pursued near these areas, a thorough NEPA analysis would be warranted.

Rangeland

Various mitigation measures in the Soils, Water, Upland Vegetation, and Wildlife sections above also serve to mitigate impacts to the rangeland components essential for rangeland health. Additional mitigation measures that are intended to reduce impacts to livestock operators on the rangelands include the following:

- Prior to crossing, using, or paralleling any improvement on public land, the operator shall contact the owner of the improvement to obtain mitigating measures to prevent damage to the improvements.
- All cut fences are to be tied to H-braces prior to cutting. The opening will be protected as necessary during construction to prevent the escape of livestock (see p. G-4, No. 26).
- When construction activity in connection with a ROW breaks or destroys a natural barrier used for livestock control, gaps thus opened shall be fenced to prevent drift of livestock.
- The permit holder is responsible to contact the grazing lessee(s) prior to crossing any fence on public land or any fence between public and private land, and to offer the lessee(s) an opportunity to be present when the fence is cut to ensure the fence is adequately braced and secured.
- Cattleguards may be required when new roads cross existing fence lines (see p. G-8, No. 32).

Visual Resources

- Operators may be required, on a case-by-case basis, to leave a tree screen on one or more sides of a location.
- Above-ground structures are required to be painted in one of 5 colors designated to blend with the natural color of the landscape (see p. G-2, No. 15).
- Permit holders are required to coordinate with the Authorized Officer on the design and color of power poles and transmission lines to achieve minimal practicable visual impacts.
- Permit holders may be required to reconstruct rock rims as near as possible to the original (See p. G-13, No. 70).

Cultural Resources

- *Discovery of Cultural Resources in the Absence of Monitoring*: If, in its operations, an operator/holder discovers any previously unidentified historic or prehistoric cultural resources, then work in the vicinity of the discovery will be suspended and the discovery promptly reported to the BLM Field Office Manager. The BLM will then specify what action is to be taken.

If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11

- *Discovery of Cultural Resources During Monitoring*: If monitoring confirms the presence of previously unidentified cultural resources, then work in the vicinity of the discovery will be suspended and the monitor will promptly report the discovery to BLM Field Office Manager. BLM will then specify what action is to be taken. If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11.
- *Damage to Sites*: If, in its operations, operator/holder damages, or is found to have damaged, any previously documented or undocumented historic or prehistoric cultural resources, excluding "discoveries" as noted above, the operator/holder agrees at his/her expense to have a permitted cultural resources consultant prepare and have executed a BLM approved data recovery plan. Damage to cultural resources may result in civil or criminal penalties in accordance with the Archeological Resource Protection Act of 1979 (as amended).

Paleontology

- If in the conduct of operations, paleontological material (fossils) is observed, lessee shall immediately contact the BLM. Lessee shall cease any operations that would result in the destruction of such objects. Further investigation will dictate site-specific stipulations for avoidance or salvage of any significant paleontological resources.

Noise

The Draft NTL concerning management of sound generated by oil and gas production and transportation (presented in Appendix E) will become final upon approval of the Final RMP. Equivalent language will be developed into a special stipulation to be applied to noise generating sources permitted by ROWs.

Roads

Construction and design of roads shall meet the standards specified in BLM Manual 9113 and the "Gold Book."

Monitoring

A variety of monitoring studies are conducted in the FFO to assess the effectiveness of various management and/or mitigation strategies. The amount and extent of monitoring can vary from program to program based on funding and personnel availability. The following is a partial list of ongoing monitoring studies by major program.

Cultural Resources

- A site stewardship program employing volunteers is used to monitor cultural ACECs.
- Annual monitoring of Chacoan Outliers is conducted to detect natural changes as well as potential threats.

Recreation and Wilderness

- Recreation program personnel monitor organized events to ensure compliance with permit stipulations.
- The Ah-Shi-Sle-Pah WSA is monitored monthly as required by Bureau policy.

Wildlife

Wildlife Program personnel conduct the following monitoring studies to provide baseline information for use in impact assessment and evaluation:

- Studies on key browse species to assess the age, form class, and degree of hedging;
- Pellet group studies to assess deer days use and trend in elk use within key areas;
- Point count bird surveys within key habitat types;
- Helicopter surveys to monitor the trend in deer, elk, and antelope numbers;
- Vegetative cover and point count bird studies to monitor the effects of thinning, burning, and seeding in a piñon-juniper plant community;
- Macro-invertebrate and river substrate monitoring on selected portions of the San Juan River.

Special Status Species

Historical inventory and monitoring studies for Mesa Verde cactus, Knowlton's cactus, Mancos milkvetch, bald eagle, southwest willow flycatcher, Mexican spotted owl, and mountain plover are summarized in the BA prepared for the DRMP/EIS. Other species that have been inventoried or monitored include ferruginous hawk, prairie falcon, golden eagle, peregrine falcon, yellow-billed cuckoo and Aztec gilia. As funding and personnel commitments permit, appropriate monitoring of listed T&E species as well as other Special Status Species will continue.

Riparian

Riparian habitats in the FFO are monitored on a 3-year rotating basis to evaluate trends toward proper functioning condition.

Air Quality

Air quality monitoring falls within the authority of the State of New Mexico. The FFO will pursue funding to assist the NMAQB in establishing additional air quality monitoring stations.

Invasive Weed Management

Sites where weed control measures have been implemented will be monitored to assess control effectiveness. Monitoring and mapping of invasive weed locations will occur as funds and personnel permit.

Rangeland

As personnel and funding permit, the rangeland monitoring plan will be implemented. Program personnel will monitor actual use, forage utilization, and rangeland trend. Precipitation data will also be collected.

Oil and Gas Related Surface Reclamation and Compliance

The BLM recognizes the problems associated with surface reclamation in the San Juan Basin. Many of these problems are a legacy of actions that began before present land use policies and regulations were in place. In order to address reclamation issues, the FFO has begun several initiatives including the San Juan Basin Roads Committee and the Rancher/Industry Working Group. Industry has begun voluntary contributions to an offsite mitigation fund which can be used to correct some of the problems associated with past unsuccessful reclamation efforts. The BLM believes that collaborative efforts involving industry and other stakeholders are essential to successful resolution of past reclamation problems.

In order to improve oversight of new projects, the FFO has increased its Inspection and Enforcement staff. Additionally, Petroleum Engineering Technicians will be cross-trained in surface protection topics. Industry is expected to fully comply with the surface protection and hazard reduction aspects of appropriate Onshore Orders as well as COAs and Standard Stipulations. Among the required compliance actions are stack protectors to exclude birds and bats, pit fencing, noxious weed control, and revegetation of well pads and ROWs.

A compliance plan for new well pads and ROWs will be developed by October 1, 2003. The plan will integrate existing initiatives and prioritize areas with outstanding problems. A timeline for correcting problem areas will be included, as will a strategy for assigning

adequate personnel to address the issue. Unless other resources can be brought to bear on the problem, additional time devoted to compliance may reduce personnel available for reviewing new projects. Key aspects of the Compliance Plan will include:

- All new surface disturbing actions will be in compliance with established standards. FFO will complete compliance checks on all new surface disturbance until the compliance rate achieves 95 percent.
- The compliance goal for old (pre-2003) actions will be to achieve full compliance within 10 years.
- The planning area will be subdivided into geographic units. Within each unit, the priority for pre-2003 actions will be assigned in the following order:
  1. Compliance on all actions within designated SDAs (with special emphasis on Angel Peak, Glade Run, and Simon Canyon) and other vulnerable areas (close proximity to Navajo Reservoir, rivers, major washes, areas of high cultural significance, close proximity to T&E species habitat);
  2. Compliance on all actions within close proximity of residences and towns, critical big game areas, areas of high watershed concern, areas of known past non-compliance issues;
  3. Inspection for Final Abandonment Notices and revegetation of plugged and abandoned well sites, roads, and ROWs;
  4. Compliance on all actions within remaining areas of watershed or other resource concerns; and
  5. Compliance on all remaining actions.

A database for compliance will be maintained by the BLM and progress toward meeting compliance objectives will be presented in an annual report available for public review.

Road Improvement

The program to improve existing roads and the development of transportation planning are based on road maintenance agreements. A total of 13 road management units have been established in the FFO area. The AFO will create a similar unit in the Lindrith area.

Transportation plans will be developed for each transportation unit. The goal for road improvement is to have all collector roads meet Gold Book standards within 10 years. An ongoing Department of Energy study in the AFO is examining potential new road standards specific to the geology and soils of the Lindrith area. If this study generates improved, practical standards with applicability elsewhere in the Basin, the FFO will work with the San Juan Basin Roads Committee to incorporate the new standards for appropriate areas.

An additional goal will be to bring all local roads into compliance with appropriate standards within 20 years. This will include identifying, closing, and reclaiming unneeded roads.

Problem roads will be addressed first, even if a transportation plan has not been completed for the unit in which the road occurs.

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CHAPTER 5
CONSULTATION AND COORDINATION

INTRODUCTION

During the planning process for this RMP/EIS, formal and informal efforts were made by the BLM to involve other federal agencies, state, local, and tribal governments, and the public. BLM initiated the planning process in September 2000 by requesting comments to determine the scope of the issues and the concerns that should be incorporated into the action alternatives and impact analysis. A Core Team of BLM, USBR, and USFS staff formed the interdisciplinary team that guided the identification of the issues and the development of the RMP/EIS project description and alternatives.

As part of the data collection and resource inventory process, FFO staff and consultants formally and informally contacted agencies to request information to supplement that provided by the BLM. This included information on fish and wildlife, special status species, and recorded archaeological site and survey data.

This chapter describes the formal consultation with agencies and tribes, the public participation activities and results, and the consistency of this document with other plans in the region. It also lists the next steps in the process, the agencies and organizations that received copies of the Draft RMP/EIS for review, and lists the individuals who prepared and reviewed the document. Comment letters received from reviewing agencies are included in their entirety at the end of this chapter.

CONSULTATION AND COORDINATION

Consultation with the USFWS is required under Section 7 of the ESA of 1973 prior to initiation of projects by BLM that may affect any federally listed threatened or endangered species or habitat. Letters of formal consultation and notes from meetings of BLM, consultants, and USFWS biologists are on file in the FFO. The Final BA that evaluates the impacts of the proposed action on federal threatened and endangered species was delivered to USFWS on September 24, 2002. On October 2, 2002, the USFWS sent a memorandum confirming their concurrence with the effects determinations contained in the BA and concluding Section 7 consultation. A copy of this memo is included with the agency letters at the end of this chapter.

This plan is also consistent with legislation protecting state listed species. BLM and consulting biologists have contacted NMDGF staff, who reviewed the Draft RMP/EIS. Consultation with the state and federal agencies will continue throughout the RMP process and implementation of the plan.

The BLM cultural resource management program operates in accordance with 36 CFR Part 800, which provides specific procedures for consultation between the BLM and the SHPO. The SHPO has been consulted during the development of the RMP/EIS concerning cultural resources that may be affected.

In accordance with the NHPA, letters were sent to 51 different tribal governments and 29 other tribal officials in 2001 to inform them of the project. The letters also requested their input on issues and concerns that should be considered during the planning process and initiated efforts to identify and consider traditional cultural places. The recipients of these letters are listed in **Table 5-1**.

Table 5-1. Recipients of Tribal Consultation Letters

Tribe	Presiding Officer	Other Recipients
Hopi Tribal Council	Wayne Taylor, Jr., Chairman	Leigh Kuwanwisiwma, Director, Cultural Preservation Office
Jicarilla Apache	Claudia J. Vigil-Muniz, President	Melton Sandoval, Cultural Preservation Officer
Pueblo of Acoma	Cyrus J. Chino, Governor	Brian Vallo, NAGPRA Officer
Pueblo of Cochiti	Regis Pecos, Governor	
Pueblo of Isleta	Alvino Lucero, Governor	Lawrence Lucero, Lieutenant Governor
Pueblo of Jemez	Joe Cajero, Governor	Bill Whatley, Cultural Preservation Officer
Pueblo of Laguna	Henry D. Early, Governor	Victor Sarracino, NAGPRA Officer
Pueblo of Nambe	David A. Perez, Governor	Denise Perez, Secretary-Treasurer; Councilman Ernest Mirabel, NAGPRA Representative
Pueblo of Picuris	Charles Chile, Governor	Joe Quanchello, Cacique; Richard Mermejo, Lieutenant Governor
Pueblo of Pojoaque	Jacob Viarrial, Governor	Marcia Martinez, Governor's Secretary; Charlie Tapia, War Chief
Pueblo of San Felipe	Lawrence Trancosa, Governor	Bruce Garcia, Tribal Administrator
Pueblo of San Ildefonso	Perry Martinez, Governor	Myron Gonzales, Cultural Preservation Officer
Pueblo of San Juan	Wilfred Garcia, Governor	Herman Agoyo, Realty Officer
Pueblo of Sandia	Stuwart Paisano, Governor	Jenny Holmes, Historic Preservation Office
Pueblo of Santa Ana	Bruce Sanchez, Governor	
Pueblo of Santa Clara	Denny Gutierrez, Governor	Alvin Warren, Rights Protection Officer
Pueblo of Santo Domingo	Ramon Garcia, Governor	
Pueblo of Taos	Nelson Cordova, Governor	Isidro Mirabel, War Chief
Pueblo of Tesuque	Charlie Dorame, Governor	Gary Moquini, Director, Parks and Wildlife
Pueblo of Zia	William Toribio, Governor	Celestino Gachupin, Natural Resource Department
Pueblo of Zuni	Malcolm Bowekaty, Governor	Jonathan Damp, Heritage and Historic Preservation Office
Southern Ute Tribe	Leonard C. Burch, Chairman	Michael Olguin, Natural Resource Director; Everett Burch, Cultural Preservation Division Director
The Navajo Nation	Kelsey A. Begaye, President	Dr. Alan Downer, Director, Historic Preservation Department
Ute Mountain Ute Tribe	Ernest House, Chairperson	Terry Knight, Tribal Culture Representative

Navajo Chapters	Recipient
Baca Chapter	Rosita Loretto, Coordinator
Becenti Chapter	Juliette Largo, Coordinator
Casamero Lake Chapter	Sharon Wellito, Coordinator
Church Rock Chapter	Leonard Francisco, Jr., Coordinator
Counselor Chapter	Gloria C. Lee, Coordinator
Hogback Chapter	Sara H. Sandoval, Coordinator
Iyanbito Chapter	Jerry L. Frank, Coordinator
Lake Valley Chapter	Etta P. Tso, Coordinator
Little Water Chapter	Tim C. Morgan, Coordinator
Mariano Lake Chapter	Raquel Warber, Coordinator
Nageezi Chapter	Rory Jaques, Coordinator
Nahodishgish Chapter	Eddie F. Morgan, Coordinator
Nenahnezad Chapter	Clarence Hogue, Jr., Coordinator
Ojo Encino Chapter	Elizabeth Stoney, Coordinator
Pinedale Chapter	Louise M. Mariano, Coordinator
Pueblo Pintado Chapter	Sammie Jim, Coordinator
Rock Springs Chapter	Harriett K. Becenti, Coordinator
San Juan Chapter	Rita Slim, Coordinator
Shiprock Chapter	Marilyn Garcia, Coordinator
Smith Lake Chapter	Jackson Gibson, Coordinator
Standing Rock Chapter	Ray C. Billy, Coordinator
Thoreau Chapter	Julia Martinez, Coordinator
To'Ha'ji'lee Chapter	Glen Begay, Coordinator
Torreon Chapter	Wally Toledo, Coordinator
Tsayatoh Chapter	Charles Morrison, Coordinator
Twin Lakes Chapter	Dorothy Denetclaw, Coordinator
Upper Fruitland Chapter	Jimmy Blueeyes, Coordinator
Whitehorse Lake Chapter	Bobby Tsosie, Coordinator
Whiterock Chapter	Robert Martin, Coordinator

CONSISTENCY WITH OTHER PLANS

The BLM planning regulations require that RMPs be "consistent with officially approved or adopted resource-related plans, and the policies and procedures contained therein, of other federal agencies, state and local governments, and Indian tribes, so long as the guidance and RMPs are also consistent with the purposes, policies and programs of federal laws and regulations applicable to public lands…" (43 CFR 1610.3-2). In order to ensure such consistency, finalized plans were solicited from federal, state, and local agencies and groups, as well as from tribal governments.

There are no known inconsistencies between any of the alternatives and other officially approved and adopted resource-related plans of other federal agencies, state and local governments, and Indian tribes. The plan is also consistent with previously developed recovery plans such as the Mexican Spotted Owl Recovery Plan (USFWS 1995), Habitat Management Plans such as those developed by the FFO for Rattlesnake Canyon and Crow Mesa, and activity plans carried forward (listed in Appendix A).

Coordination and consultation took place during the public comment period on the Draft RMP/EIS, and will continue through this Proposed RMP/Final EIS, and the Record of Decision.

PUBLIC PARTICIPATION

The planning issues were developed partly by considering the concerns and comments from people outside the BLM and the cooperating agencies. Comments were received both in formal public scoping meetings and in public interviews conducted for the BLM in the local communities. The comments identified by FFO staff to be related to the RMP process are summarized in the following sections and were used to assist in the development of the alternatives analyzed in the RMP/EIS. The comments determined to be unrelated to the RMP process that could be addressed by FFO staff immediately were directed to the appropriate resource specialist for action.

Public Scoping

Formal public scoping meetings were held in the tri-cities area from September 26 to October 8, 2000. Comments were documented and later grouped into categories in a report created by the FFO (BLM 2001b). The three general categories of comments were: 1) OHV use and general recreational use of the FFO area, 2) commercial development within the FFO area, and 3) comments on the RMP process.

The first category comprised the most public comments at the meetings, with 439 respondents. Most of the comments can be subdivided into those people interested in opening the FFO area to increased OHV use and those who prefer to limit OHV access. Several areas and trails were specifically identified to be set aside for use only by non-motorized recreationists, such as hikers, bicyclists, or horses. Other areas and trails were recommended to be designated for or maintained as open to OHV use. Additional comments included recommendations to designate accessible shooting areas, to prohibit the use of firearms where public safety may be compromised, to develop environmental education areas, and to organize meetings with FFO staff to discuss the concerns of special user groups.

In the second category, comments from five respondents addressed the commercial use of public land and minerals, mostly related to the development of mineral leases including coal leases, the conflicts between coal mining and oil and gas development, concerns over the constraints on the development of oil and gas, and concerns over transferring federal surface ownership without protection of the development rights for mineral lessees (split estate). One comment recommended the development of commercial production of Navajo tea.

The last category contained comments submitted by one respondent and included recommendations for what should be included in the RMP revision. It was stressed that the RMP must comply with federal laws and should employ a collaborative process.

In addition to participating in the formal public scoping meetings, FFO staff specialists met with groups interested in recreation on public lands and received recommendations on trails that should be opened and developed for a variety of activities. While some of these recommended trails appear in the proposed alternatives, others will be reviewed by staff and possibly designated in the future through the development of activity plans, a process that provides opportunities for further public involvement.

Other FFO staff met with municipal officials to request that they identify parcels of land that the municipalities (county, city, school boards) might be interested in acquiring from the BLM through land transfers.

Public Interviews

Public interviews were conducted in the local communities from December 2000 to April 2001. Interviewers made a point of engaging a variety of people in conversation by frequenting community-gathering places, such as restaurants, laundromats, churches, and stores. The groups of people interviewed included residents, local government officials, local and out-of-town recreationists, oil and gas company employees, merchants, and others. In general, the interviews sought descriptions about settlement patterns, work routines, recreation activities, support services, geographic features of importance, changes on the land and in the communities, the use of public land, and ideas for improving BLM land management (Preister 2001).

Many of the comments from these interviews are important to the BLM but were determined by FFO staff to be unrelated to the development of the Draft RMP/EIS. The comments provided but not applied during development of the RMP will be considered by the BLM to help them serve the public, but were not documented in this Draft RMP/EIS or carried into the alternatives. The report that summarizes the interview methodology and lists all of the comments in detail is an unpublished document that can be obtained from the FFO (Preister 2001).

Many of the comments that were considered to be relevant to the development of the Draft RMP/EIS alternatives highlight the potential conflicts between the multiple uses of federal land. The major categories of these comments from the interviews can be grouped into the following categories: 1) oil and gas development, 2) recreation, and 3) community interests and urban development pressures.

Issues raised about oil and gas development include the following:

- Noise generated from oil and gas sites and its impact on recreational and residential land uses, the single most common complaint voiced in the interviews.
- Concerns over the high road density and its effects on watersheds, wildlife, and recreation.
- The use of roads developed by oil and gas companies for increased access by OHVs as a recreation issue, and damage caused to watersheds, wildlife, forestry, cultural and paleontological sites, and rangeland.
- Concerns over inadequate well and pipeline site reclamation causing the spread of weeds and excessive surface disturbance that affect watershed management, wildlife, and grazing land.
- Protection of cultural sites from pot-hunting and other surface disturbances once access is increased and the sites are identified for avoidance and protection.
- Concerns for watershed protection due to the lack of clean-up of spills in areas on or near well sites and the dumping of waste and household trash, partly because remote areas are opened to public access as more roads are constructed.
- Establishment of adequate fencing for livestock to prevent their access to well sites.

As in the public scoping meetings, recreation issues that were raised in the interviews documented the conflicts between different types of users, especially among OHV recreationists, non-motorized vehicle users, horseback riders, and hikers, and the need to designate specific areas for specified uses. Safety concerns were raised where firearms are used. Inadequate law enforcement was voiced as a concern because the BLM has had difficulty enforcing their limitations on use designations and compliance with existing laws

and policies under various programs due to the lack of sufficient resources.

Concerns over development pressures in the tri-cities area resulted in comments that BLM land should be made available for transfer for municipal uses, but the riparian habitat should be protected for its wildlife and recreation benefits.

Newsletter

A newsletter containing brief descriptions of some of the issues to be addressed in the RMP/EIS was prepared and mailed to almost 1,600 individuals, agencies, tribes, and organizations. It contained a coupon for interested people to request a copy of the Draft RMP/EIS or to ask to remain on the mailing list. Approximately 140 people returned coupons in response.

Public Review of the Draft RMP/EIS

Informal coordination with the public has taken place throughout the planning process through personal contacts, phone calls, and attendance at meetings.

Concurrent with the distribution of the Draft RMP/EIS, a BLM Notice of Availability was published in the *Federal Register* announcing the availability of the Draft RMP/EIS for public review and comment. The EPA Notice in the *Federal Register* marked the beginning of the 90-day review and comment period on June 28, 2002, which ended on September 26.

Four public hearings were held during the comment period from August 26 through August 29 in Farmington, Crownpoint, and Cuba, New Mexico and Durango, Colorado.

Written and oral comments received by the end of the 90-day period were reviewed, categorized, analyzed, and summarized. Responses to comments were addressed if they were substantive, related to inadequacies or inaccuracies in the analysis or methodologies used, identified new impacts or mitigation measures, or involved substantive disagreements on interpretations of significance (see 40 CFR 1502.19, 1503.3, 1503.4, 1506.6, and 516 DM 4.17). The summarized comments, names of people who submitted comments, and responses to the comments are included in Appendix P.

Many changes were made in this Proposed RMP/Final EIS as a result of comments submitted. After distribution of the Proposed RMP/Final EIS, a Governor's Consistency Review, and a 30-day public protest period, the BLM will issue a Record of Decision summarizing the findings and decisions regarding the selected alternative and its determination related to compliance with NEPA and other regulations. The RMP will then be prepared to document the resource management decisions and complete the BLM's resource management planning process.

Table 5-2 contains a partial list of federal, state, municipal, and tribal agencies, governments, and other interested organizations who received copies of the Draft RMP/EIS. Private citizens and businesses, including many in the oil and gas industry, also received copies. The Proposed RMP/Final EIS document will be sent to all those who submitted comments included in Appendix P, if their addresses are available. This document will also be obtainable from the FFO upon request, after the Notice of Availability has been published.

Table 5-2. List of Draft RMP/EIS Recipients

Federal Government	
U.S. Department of Agriculture	**U.S. Department of Commerce**
Carson National Forest	National Oceanic and Atmospheric Administration
Natural Resources Conservation Service	National Weather Service
Santa Fe National Forest	
U.S. Department of the Interior	**Other**
Bureau of Indian Affairs	Department of Defense
Bureau of Land Management	Department of Energy
Bureau of Reclamation	Environmental Protection Agency
National Park Service	Federal Energy Regulatory Commission
U.S. Fish and Wildlife Service	U.S. Army Corps of Engineers, Civil Works
U.S. Geological Survey	
State Government	
State of New Mexico	**State of Colorado**
Association of Conservation Districts	Division of Water Resources
Cuba Soil and Water Conservation District	Division of Wildlife
Department of Agriculture	State Parks
Department of Finance and Administration	Water Conservation
Department of Game and Fish	Wildlife Commission
Department of Energy, Minerals, and Natural Resources	Air Pollution Control Division
Environment Department	**State of Utah**
Highway and Transportation Department	Utah Department of Natural Resources
Interstate Stream Commission	Utah Division of Wildlife
Navajo Lake State Park	University of Utah
Oil and Gas Commission	**State of Wyoming**
Rio Arriba County Extension Service	Wyoming State Engineer
Sandoval County Extension Service	
State Engineer	
State Game Commission	
State Land Office	
State Parks	
State Police	
University of New Mexico	

Municipal Officials	
Archuleta County Commissioners	Farmington Public Library
City of Aztec	La Plata County
City of Bloomfield	McKinley County Commissioners
City of Durango	Rio Arriba County Commissioners
City of Farmington	San Juan County
City of Gallup	San Juan County Commissioners
Cuba Chamber of Commerce	San Juan Water Commission
Cuba Economic Development Board	Sandoval County Commissioners
Special Interest Groups	
Bloomfield Irrigation Ditch Association	Oil and Gas Accountability Project
Earthjustice	San Juan Citizens Alliance
Forest Guardians	San Juan College
Hammond Conservancy District	San Juan River Dineh Water Users
Independent Petroleum Association of Mountain States	Sangre de Cristo Audubon Society
Land and Water Fund of the Rockies	Sikes Citizens Review Committee
Lower Valley Water Users	Southwest Consolidated Sportsmen
Natural Resources Defense Council	Southwestern Water Conservation
Natural Resources Library	The Wilderness Society
Navajo Agricultural Products, Inc.	Upper Colorado River Commission
Navajo Dam Water Users	Western Land Exchange Project
NM Cattle Growers Association	Western Organization of Resource Councils
NM Farm and Livestock Bureau	Wildlife Management Institute
NM Oil and Gas Association	Wyoming Outdoor Council
NM Wilderness Alliance	

Tribal Governments and Organizations		
All Indian Pueblo Council	Pueblo of Nambe	Pueblo of Santo Domingo
Eight Northern Pueblos, Inc.	Pueblo of Picuris	Pueblo of Taos
Hopi Tribe	Pueblo of Pojoaque	Pueblo of Tesuque
Jicarilla Apache Tribe	Pueblo of San Felipe	Pueblo of Zia
Pueblo of Acoma	Pueblo of San Ildefonso	Southern Ute Indian Tribe
Pueblo of Cochiti	Pueblo of San Juan	The Navajo Nation
Pueblo of Isleta	Pueblo of Sandia	Ute Mountain Ute Tribe
Pueblo of Jemez	Pueblo of Santa Ana	
Pueblo of Laguna	Pueblo of Santa Clara	
Navajo Chapters		
Nageezi Chapter	Huerfano Chapter	Counselor Chapter

Table 5-3 and **Table 5-4** list the consultants and BLM staff that were directly involved with the preparation of the Draft RMP/EIS. **Table 5-5** lists the BLM and other government staff who reviewed portions of this document.

Table 5-3. List of Preparers— Science Applications International Corporation

Name	Responsibility	Education	Experience
Neal Ackerly (Dos Rios Consultants, Inc.)	Cultural Resources	Ph.D., Anthropology, Arizona State University, Tempe M.A., Anthropology, University of Arizona, Tucson B.A., International Relations, Florida State University, Tallahassee	28 years, Vice President, Dos Rios Consultants, Inc., Senior Archaeologist
Kate Bartz	Water Resources	M.S., Landscape Architecture and Environmental Planning, Utah State University B.S., Environmental Studies, Utah State University	15 years, Environmental Specialist
Robin M. Brandin, A.I.C.P.	Program Manager, Quality Control	M.R.C.P., City and Regional Planning, Rutgers University B.A., History of Art, Bryn Mawr College	26 years, Senior Program Manager
Charles Burt	Biological Resources	M.S., Forest Zoology, SUNY B.S., Biology, Hope College	27 years, Senior Biologist
Bonnie Carson	Oil and Gas, Geology	M.S., Environmental Science and Engineering, Colorado School of Mines B.S., Geology and Geophysics, Missouri School of Mine B.S., Applied Mathematics and Computer Sciences, Washington University	14 years, Senior Project Engineer
Rob Cavallaro	Fisheries	B.S., Forestry and Wildlife, Virginia Polytechnic Institute and State University	12 years, Wildlife Ecologist

Name	Responsibility	Education	Experience
Jonathan Cohen	Document Production	B.A., Communication Arts, University of Wisconsin, Madison	7 years, Word Processor
Chris Crabtree	Air Quality	B.A., Environmental Studies, University of California, Santa Barbara	16 years, Senior Air Quality Meteorologist
David Dean	GIS, Biology	B.S., Biology, University of Wisconsin, La Crosse	2 years, Environmental Scientist
Ellen Dietrich	Project Manager, Soils, Rangeland, Noise, Coal	B.A., Anthropology, University of Illinois	26 years, Senior Environmental Analyst
Susan Goodan	Land Use, Recreation, Wilderness, Socioeconomics, Environmental Justice	M. Architecture, University of New Mexico B.A. Philosophy/ Archaeology, University of Cape Town, South Africa	14 years, Senior Environmental Planner
Heather Gordon	GIS	B.A., Environmental Studies and Planning, California State University, Sonoma B.A., Liberal Studies, California State University, Sonoma	5 years, GIS Specialist
Ken Heil	Vegetation, Weeds	M.S., Botany, Washington State University B.S., Biology, Fort Lewis College	18 years, Professor of Geology and Biology, San Juan College
Jon Marin	Coal	M.S., Geology, South Dakota School of Mines and Technology B.S., Earth Science, University of South Dakota	19 Years, Senior Geologist
Richard McEldowney	Biological Resources	M.S., Rangeland Ecosystem Science, Colorado State University, 1999 B.S., Wildlife Biology, University of Montana, 1993	6 Years, Wetlands Scientist

Table 5-4. List of Preparers— Bureau of Land Management

Name	Responsibility	Education	Experience
Elizabeth C. Allison	Technical Coordinator	B.S., New Mexico State University	BLM: 28 years, Planning and Environmental Coordinator/ Environmental Specialist
Charlie Beecham, P.E.	Solid Minerals (Coal)	B.S., Colorado School of Mines	BLM: 17 years, Mining Engineer Branch Chief, Solid Minerals Industry; 5 Years, Mining/Oil and Gas.
Kelly Castillo	Fire/Forestry	B.S., Northern Arizona University	BLM: 4 years, Fire Management USFS: 8 years, Fire Management
James M. Copeland	Cultural Resources	M.A., Colorado State University	BLM: 11 years, Lead Archaeologist Navajo Nation: 5.5 years, Archaeologist NPS: 2 years, Archaeologist BIA: 1.5 years, Archaeologist Private Contracting: 5 years
John Hansen	Wildlife Management	M.S., (in progress) Entomology, University of Nebraska B.S., Idaho State University	BLM: 24 years, Wildlife Biologist, Range Conservationist NRCS: 3.5 years, Soil/Range Conservationist Idaho Fish and Game: 2 years
Steve Henke	Field Office Manager, Initial Team Leader	B.S., New Mexico State University	BLM: 25 years, Field Office Manager, Supervisory Range Conservationist, Range Conservationist
Terry Johnson	Roads	A.A.S., Bemidji Technical College	BLM: 2 years, Civil Engineer Technician USFS: 25 years, Civil Engineer Technician
Jim Lovato	Oil and Gas	B.S., New Mexico Institute of Mining and Technology	BLM: 18 years, Petroleum Engineer MMS: 2 years, Petroleum Engineering Technician
Robert Moore	Land Use, Team Leader	B.S., Colorado State University	BLM: 31 years, Natural Resource Specialist

Name	Responsibility	Education	Experience
Jackie Neckels	Recreation/Wilderness	B.A., New Mexico State University	BLM: 12 years, Environmental Protection Specialist, Outdoor Recreation Planner
Bruce Prater	Noise Policy	B.S., University of Alabama	BLM: 5 years, Bureau Safety Manager Dept. of Army: 23 years, Safety Specialist
James Ramakka	RMP Project Manager	B.S., Cornell University M.S., University of Maine	BLM: 23 years, Planning Coordinator, Wildlife Biologist NPS: 1 year, Natural Resource Specialist USFS: 1 year, Wildlife Biologist
Ray Sanchez	Range Management	B.S., New Mexico State University	BLM: 20 years, Range Management USFS: 4 years, Range Management NRCS: 2 years, Range Management
Richard Simmons	Recreation/Wilderness	B.S., Utah State University	BLM: 8 years, Outdoor Recreation Planner NPS: 19 years, Resource Management, Visitor Protection/ Interpretation
Dave Simons	Cultural Resources	B.A., University of New Mexico	BLM: 17 years, Archaeologist
Bill Walsh	Bureau of Reclamation Representative	B.S., California State College	BOR: 25 years, Supervisory Resource Management Specialist, Geologist
Barney Wegener	Threatened and Endangered Species/ Riparian	B.S., Ft. Lewis College	BLM: 9 years, Natural Resource Specialist
Dale Wirth	Soil, Air, Water, Coal	B.S., Colorado State University	BLM: 13 years, Natural Resource Specialist BIA: 7 years, Soil Scientist OSM: 3 years, Project Manager
Support Staff			
Vera Bee	GIS		
Luanne Crow	Mailing		

Table 5-5. List of BLM Reviewers

Farmington Field Office	Albuquerque Field Office	New Mexico State Office
Mary Jo Albin	John Bristol	Mark Blakeslee
Elizabeth C. Allison	Kent Hamilton	Bernard Chavez
Ilyse K. Auringer	Pat Hester	Stephen Fosberg
Charlie Beecham		Mark Hakkila
Kelly Castillo		Clarence Hougland
James M. Copeland		James Olsen
Joel Farrell		Joan Resnick
Peggy Gaudy		Paul Sawyer
John Hansen		John Selkirk
Steve Henke		James Silva
Shannon Hoefeler		Jay Spielman
Terry Johnson		Gary Stephens
Jim Lovato		Ida Viarreal
Dave Mankiewicz		John W. Whitney
Ralph Mason		
Robert Moore		
Jackie Neckels		
James Ramakka		
Ray Sanchez		
Rich Simmons		
Dave Simons		
Brian Watts		
Barney Wegener		
Dale Wirth		

AGENCY COMMENT LETTERS ON THE DRAFT RMP/EIS

On the following pages are copies of the original letters from state and federal agencies and one tribal government that submitted comments on the Draft RMP/EIS during the public comment period.

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United States Department of the Interior

FARMINGTON INDIAN MINERALS OFFICE
1235 La Plata Highway Suite B
Farmington, New Mexico 87401-1805

IN REPLY REFER TO:
RMP/EIS

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

JUL - 9 2002

To: RMP Project Manager
Farmington Field Office

From: Director
Farmington Indian Minerals Office

Date: July 5, 2002

Subject: Draft Farmington Resource Management Plan and Environmental Impact Statement

After careful review of the Draft Farmington Resource Management Plan and Environmental Impact Statement (RMP/EIS) I have several concerns with land use activities near or on the Navajo allotted lands. My main concerns stem from the fact that the Navajo allotted lands are interspersed with the Federal, State, Tribal, and Fee lands in the San Juan Basin. Consequently, the outcome of this study will have an impact on the people living in the basin.

My first concern is the consultation with Huerfano Chapter, Nageezi Chapter and the Farmington Indian Minerals Office. In chapter 5 there is discussion as to who received copies of the draft RMP/EIS. The community chapters, which are centrally located in the reviewed areas as well as having the largest Navajo populations living in remote locations, never received a copy of the document. These chapters are very active in community planning and should be included in the distribution list. In addition, the Farmington Indian Minerals Office was not a recipient. This office is a multi-bureau office, works closely with the Navajo individuals living in the San Jaun Basin, and is trustee for mineral development on the Navajo allotted lands that are interspersed with federal lands. As such, this office needs to know the land issues discussed in the draft RMP/EIS.

I have a concern with lack of analysis on the dangers of hydrogen sulfide, especially in areas that use water-flooding techniques. The Northern part of the San Juan Basins has high concentrations of hydrogen sulfide. This is major health concern and should be included in this report.

This report appears to overlooks the demographics of the San Juan Basin. The Native American population is one of the fastest growing populations in the country and the dominant culture in this part of New Mexico. As a result, new housing development and home site leases have significantly increased in remote areas of the San Juan Basin that are co-located in the oil and gas development zones. This document does not address land use impacts on these cultures.

Should you have any questions, please contact me at (505) 599-8961.

Sincerely,

Kevin Lane Gambrell
Director

CC: Wilson Ray, President Huerfano Chapter
Calvert Garcia, President Nageezi Chapter
Irvin Chavez, President, Shii Shi Keyah Allottee Association

NAME / UNIT
FM
FM-L&R
R&R
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FM-Admin
IRM
Ranger
Remarks

United States Department of the Interior

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070 FARMINGTON, NM

BUREAU OF LAND MANAGEMENT
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, New Mexico 87401

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EAO
HISTORIC PRESERVATION DIVISION

IN REPLY REFER TO: 1610 (07200)

065278

Dear Reader:

Enclosed for your review and comment is the Draft Farmington Resource Management Plan (RMP) and Environmental Impact Statement (EIS). Your input is an important element in the effective management of the public land in northwestern New Mexico. We ask for your assistance and participation in evaluating these draft documents. Your review and comments are needed to ensure that your concerns have been considered in the planning process.

The Draft RMP/EIS outlines alternatives for managing all the uses of the public lands within the Farmington Field Office (FFO) boundaries. In addition, the management of the federal oil and gas resources within the New Mexico portion of the San Juan Basin are being considered.

There are four management alternatives described in this document, each with a different emphasis and each addressing the planning issues that were identified early in the planning process. The environmental consequences of implementing each of the alternatives have also been analyzed.

Your comments are invited on the alternatives and the adequacy of the impact analyses. Comments will be fully considered and evaluated in developing the Proposed RMP and final environmental impact analysis. Comments are most useful when they address one or more of the following:

- Errors in the analysis;
- New information that would have a bearing on the analysis;
- Misinformation that could affect the outcome of the analysis;
- Requests for clarification;
- Identification of a substantive new alternative that provides a different mix of allocations from any of the existing alternatives.

Where possible, refer to the pages and paragraphs on which you are commenting.

Comments on this document will be accepted during the 90-day comment period and must be postmarked no later than September 26, 2002. Public hearings and meetings will be held during the comment period to discuss the management alternatives, answer questions and to receive comments. All meeting notifications will be published on the FFO web site, www.nm.blm.gov, under "Field Offices, Farmington Field Office" (subject to internet availability), and in the Farmington Daily Times and the Albuquerque Journal newspapers. Please call 505-599-6307 for clarification of information on the hearings, meetings or comment period.

Comments on this document should be addressed to:

RMP Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Comments will be fully evaluated and considered in preparation of the Proposed Resource Management Plan and Final Environmental Impact Statement (PRMP/FEIS). If changes are minor, the PRMP/FEIS will include only the changes and will not be a full reprint of the Draft RMP/EIS. For this reason, reviewers are asked to retain their copy of the Draft RMP/EIS for use in conjunction with the PRMP/FEIS.

Through your participation in this planning effort, we can move forward toward a common goal of improved public land management. We appreciate your interest in the multiple use management of BLM-administered lands.

for Steve Henke
Field Manager

NO COMMENT
8/22/02
NMSHPO

SAN • JUAN • BASIN
HEALTH
DEPARTMENT

RMP Project Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

23 August, 2002

RE: Comments on Draft Farmington RMP and EIS

Dear Project Managers:
Please consider the following comments and items that I have addressed in response to your Public Comment Period. Thank you for your time and consideration.

1) The Alternatives B, C and D are strikingly similar. They appear to be a rather coarse, computer-generated approach that does not give adequate consideration towards alternatives 10% to 50% between Alternative A and D. These Alternatives should be re-evaluated.
2) The Alternatives do not consider the economic downfall that may occur to tourist-based economies confronted with air quality degradation. Cumulative environmental impacts need additional attention, as do cumulative economic impacts.
3) No mention is made of the possibility of future air quality enhancement, and the benefits that clean air generate—economically and environmentally. The RMP assumes that air quality will get worse, and that efforts should be evaluated to figure out how bad things might get.
4) The Alternatives barely recognize or acknowledge regional air pollution. The importance of collaborating with the Colorado Air Pollution Control Division, the Southern Ute Tribe, Colorado-based county health departments and regional government entities cannot be understated. Air quality management plans, pollution prevention strategies, monitoring programs and potential mitigation all deserve additional attention.
5) The net increase in air pollutant emissions from gas compressors of 99.7%, when compared to a 1% increase in jobs (in a neighboring tri-city area) appears to support environmental injustice.
6) The Environmental Justice criteria presented is woefully poor, and refuses to admit that the greatest proportion of air pollutants will affect citizens in the local and regional vicinity.
7) Respiratory health studies need to be undertaken as soon as possible. One must identify if existing oil and gas production has already resulted in elevated cases of respiratory distress. Additional development activities could then project adverse human health impacts.

281 Sawyer Drive • P.O. Box 140 • Durango, CO 81302 • (970) 247-5702 • Fax (970) 247-9126

8) The Planning Criteria were under-developed and short-sighted. The "5 Planning Issues" have exacerbated an approach that needs better direction. I suggest not focusing on several site-specific issues, but paying greater attention to regional resources, ecosystem management and best available technologies.
9) Chapt.2. The Continuing Management Guidance section pays inadequate attention to visual resource management. Nearby Class I and Class II areas will be impacted by the proposed development, unless better mitigation plans are drawn up.
10) This RMP needs to better address concerns over ambient air quality. The elevated levels of ground level ozone in the Bloomfield area need to be confronted, not circumvented.
11) The RMP should strongly encourage the classification of presently unclassified areas for air quality, and improve the monitoring and evaluation of areas for NOX, SOX, Particulates and Ozone.
12) The RMP should research existing meteorologic stations for scientific information. Comments on "generally,.." or "rarely,.." is not good science. Voids in data need to be addressed by a request for additional air monitoring. Temperature, inversions, wind speed, wind direction, and other met data is extremely important with regards to regional air quality.
13) Chapt. 3. The Affected Environment section ignores the current condition of local and regional air quality resources. The statement regarding "Region of influence" (ROI) is very misleading. In many circumstances, ROI is not limited to "a few miles downwind". Better science is needed in this area.
14) PM 2.5 needs additional attention. Limiting 2.5 conversation to a historical court decision is a strange way to address the importance of fine particulate matter.
15) Table 3-14 shows Max Pollutant concentrations by year—this data needs to be accompanied by an additional table showing Average concentrations, by month and by year. This will enable us to scrutinize levels, determine trends and focus on incremental levels of air pollutants.
16) The RMP needs to mention the contribution of the proposed development to CO2 levels and greenhouse gas concerns. A few gas companies have gone to great lengths to reduce greenhouse gases. They and their technology should be promoted.
17) Stronger language is needed regarding Class I air resources. The RMP's concern for protecting vistas from outside influences should be translated into a decisive action plan to prohibit activity that would cause Class I air degradation. BLM's efforts should also be directed towards improving already-impacted vistas in Class I and Class II areas.
18) Under the Demographics section in Chapt. 3, public health was neglected from discussion. As a major employer in the area, I suggest that San Juan Regional Medical Center be contacted to assist with the provision of pertinent health status information such as asthma, emphysema, CPD and other respiratory illnesses.
19) Under Environmental Justice in Chapt. 3, I believe that the RMP lacks understanding of what environmental justice is. Expertise in this area should discuss disproportionate health risks.
20) Under Environmental Consequences in Chapt.4, the RMP dismisses the importance of air quality impacts and concentrates on surface disturbance. This may be due to the BLM's area of expertise. Air quality is of greater regional importance.

21) As previously stated, the 5 issue areas chosen by the RMP are inadequate to address the seriousness of the air quality concerns.

22) Table 4-17 needs better explanation. The comments decline to comment on human health impacts of increased air pollution. The RMP assumes that a 5-fold increase in air pollutants is an acceptable health risk to local populations. The USFS may disagree, and may mention scenic quality-of-life values as well. The State of New Mexico Health Department can assist the RMP in educating the public about additional health risks for additional pollutant levels below the EPA exceedance levels.

23) Under Incremental Risks from Hazardous Air Pollutants in Chapt. 4, key health concerns are raised, and this is appreciated. These concerns should be expanded upon for NOX, PM 10 & 2.5, and Ozone.

24) Page 4-61: "PSD" raises concerns over pollution loopholes. The RMP should get assistance in addressing these loopholes.

25) Page 4-64: "The potential exists for gas production emissions under Alternative B to significantly impact visibility in the Mesa Verde National Park". All "Potential" for significant impact should be further evaluated and mitigated prior to "potential" approval.

26) Page 4-64: The RMP conclusion should state that minor emissions sources result in major air pollutant emissions. Rather than mentioning "potential possibilities", the RMP should state that, based on these studies, significant cumulative impacts to visibility resources in the Mesa Verde and San Pedro Parks Class I areas will occur.

27) Page 4-65: The suggestion that NOX emissions levels for each compressor not exceed 10 gm/hp/hr. is beneficial. Much greater efforts can be made in the pollution prevention arena. (Note that BP is the largest U.S. producer of solar technology.). Best available technologies should be required in the field.

28) Page 5-7: Under Table 5.2, List of Draft Recipients, why wasn't the Colorado Air Pollution Control Division included?

End of initial comments on the Farmington RMP.
As I will be unable to attend the August meeting in Durango, please add me to your mailing list for future drafts and updates. Thank you.

Wano Urbonas, Environmental Health Director
San Juan Basin Health Dept.
Box 140
Durango, CO 81302

United States Department of the Interior

NATIONAL PARK SERVICE

INTERMOUNTAIN REGION
Intermountain Support Office - Denver
12795 West Alameda Parkway
Post Office Box 25287
Denver, Colorado 80225-0287

IN REPLY REFER TO

September 16, 2002

RMP Project Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Ste A
Farmington, NM 87401-8754

RE Comments on Farmington Resource Management Plan/Environmental Impact Statement (RMP/EIS)

Dear RMP Project Manager

Thank you for the opportunity to review the Farmington Resource Management Plan/Environmental Impact Statement The following comments were drafted based on review of the Draft RMP/EIS, the accompanying Air Quality Modeling Analysis Technical Report, and attendance at the public meeting for this plan in Durango on August 29th These comments have been compiled from those of two National Park Service units including Chaco Culture National Historic Park and Mesa Verde National Park You will see below that comments from these two units have been left separate (and may overlap to some degree), so as to accurately and adequately relay their concerns

COMMENTS FROM CHACO CULTURE NATIONAL HISTORIC PARK

General Comments·

1 The National Park Service does not appear to have been included in initial public scoping and would like to participate in future scoping and planning efforts in the BLM Farmington Field Office area (Chaco Culture NHP is 34,000+ acres in the center of the planning area)

2 The overall format and verbiage of the document is difficult to read The layperson will likely have difficulties understanding the document and distinguishing between the four given action alternatives and the associated impacts

3 Within the impacts summary, each alternative appears at a glance to be nearly identical, and perhaps not sufficiently discrete A more detailed description explaining why the alternatives are carried forward should be included

4 The "conservation alternative" title seems misleading as if impacts will be restricted and the act of conservation of resources will be implemented After reading the alternatives, the current management or no action alternative has the least impacts to resources (current actions) rather than

the "conservation alternative " Perhaps Alternative C should be re-titled to more accurately describe the action proposed

5 Page 4-48 The Socioeconomic impact analysis appears to be missing some information We recommend that the following be analyzed for each alternative

-Estimated time periods of viable oil and gas extraction (How long will it take to deplete resources under each alternative?—this analysis is essential when discussing the most environmentally friendly alternative for this EIS)

-Industry growth and revenue increases

-Property values and costs and expected increases or decreases

-Health care costs expected increases or decreases

-Analysis of costs of breaching industry contracts versus maintaining industry contacts should be included

6 The cumulative impacts analysis should be more thorough We recommend including a broader temporal scope of projects (perhaps BLM and other projects within the past 20-30 years), and maps where possible to illustrate monitored impacts over time in comparison with current activities and project activities by alternative

Air Quality

7 Air quality information appears to be insufficient with regards to sampling/monitoring Air quality (AQ) modeling was not completed on a cross boundary (state, federal, reservation, etc) macro-scale No specific sites/ locations were identified as places where AQ data will be collected Chaco Culture NHP is willing to assist with quantitative AQ monitoring before during and after the implementation of the 2002 EIS

8 No specific sources of air pollution were mentioned or located, therefore as a result, the process of mitigating potential impacts will be increasingly difficult to isolate once the FFO EIS implementation begins What are the rates of transient sources? What are local sources? How much have they decreased or increased during and after implementation of the EIS? What mitigation will be implemented if needed?

9 The cultural landscape of the designated Wilderness areas, NPS lands, and "cultural areas" were not described or analyzed for potential impacts under each alternative in the EIS, nor was it described on page 3-60 under "visual resources "

10 12,500 additional well pads can affect the night sky as a resource The night sky as a viewshed was not described or analyzed within the EIS under page 3-60 the description of visual resources The Mesa Verde viewshed (Class I viewshed) was not discussed or considered -- presumably because its location is outside the FFO area -- however, the analysis should include potential impacts across this arbitrary line

11 Should AQ decrease or increase, AQ monitoring will be continued, but no mitigation is identified or discussed within the FFO EIS

Map Comments:

12 The National Forest boundaries, Wilderness Areas, and Reservation boundaries are present, however, Chaco culture NHP is not delineated on maps 2-1 through 2-11 (within the back pockets of the EIS), or in some maps within the certain chapters of the EIS EX map on page 3-36 delineates tribal and reclamation lands, but no NPS lands

13 Highway 57 is no longer a "through access" highway across NPS/Chaco Culture NHP lands and needs to be updated/deleted as shown from all of the maps within the EIS

14 County roads are inconsistently labeled and shown on the maps For example, see 3-59 vs 2-228 map

15 A map showing all well locations over time (50 years) should be included to discuss and illustrate the cumulative impacts over time

Additional Comments:

16 The document contains little or no analysis of HAZMAT planning for spill prevention or Action Plans for accidental spills should oil and Gas extraction operations go awry We recommend including this information in the EIS

17 The EIS states that 1800 archaeological sites will be mitigated or avoided under the preferred alternative, however there is little discussion on what "mitigation" entails There is no analysis or discussion of ethnographic resources including compliance with NAGPRA (Native American Graves Patriation and Repatriation Act) issues If 1600 archaeological sites are mitigated / or excavated and destroyed, then what are the precautions for inadvertent discovery archaeological sites or of human remains under NAGPRA? How will the BLM enforce NAGPRA law on industry development on public lands?

18 Since there has been renewed interest in coal mining around the perimeter of Chaco Culture NHP, the National Park Service and Park staff would like to participate in the planning for the Coal Leasing Suitability Assessment as described on 4-86 The boundary of Chaco Culture National Historical Park is not shown in proximity to the discussed leased coal belts (PRLA tracts or the Coal Belt SMA on map 2-4), however, we recommend showing Chaco Culture NHP with it's 3 outlying units on all associated maps (not only Map 4-1 on page 4-25) including labels for Penasco Blanco, Kin Ya'a, and Pueblo Pintado on these maps

19 On page 3-15 McKinley County has soil maps available at a resolution of I 24,000 Chaco Culture NHP has a soil map nearing completion at a resolution of 1 12,000 We are happy to share information as it relates to your project, so that the most up-to-date data can be used for the impact analysis

COMMENTS FROM MESA VERDE NATIONAL PARK

General Comments:

1. The National Park Service (NPS) believes that the BLM should have made direct contact with Mesa Verde National Park at the start of this plan's external scoping process. The BLM initiated planning on the Draft RMP/EIS without NPS input regarding air quality concerns over the park's Class I status and how the plan could adversely affect the mission of the NPS and that of Mesa Verde (see also comment #1 from Chaco Culture NHP).

2. On August 29, 2002, National Park Service staff attended a public meeting (workshop followed by the open hearing) in Durango to learn more about the proposals and impacts from the BLM representatives and from participating citizens. The BLM did a nice job with this combination of public participation forums. The concerns of the public should be addressed in the RMP/EIS including more discrete alternatives; inclusion of a 'low impact' alternative; impacts related to wildfires; adequate cumulative analyses that covers all four states; hazardous material spills; sufficient wildlife analyses; improved public involvement program; impacts to watersheds from increased air pollution; depletion of groundwater; quality of life for citizens (social impacts); public health (cancer) including impacts to children from air pollution; impacts to the National Park Service (particularly Mesa Verde) and tourism; mitigation (destruction?) of archaeological sites; the gas/oil company's responsibility for impacts to the environment and people's health and how BLM will ensure mitigation is carried out; degradation of forage for livestock; and alternative energy sources and conservation (solar power).

Air Quality:

3. The NPS is most concerned about how the proposed expansion of natural gas production would harm the park's air quality. Although only qualitative, the description of air quality impacts to Mesa Verde in the Draft RMP/EIS is alarming to the NPS. Unless these impacts are prevented and mitigated, these impacts probably would prevent the park from achieving progress under the Regional Haze Rule and Congressional Federal Register 209. The Draft RMP/EIS has a range of action alternatives that are virtually identical in terms of the emission of air pollutants from gas production. The NPS believes there should be a serious alternative developed for the Final RMP/EIS that would result in far less new air quality degradation or no new increase at all.

4. Mesa Verde National Park already has two decades of air quality monitoring data. The NPS believes that this and other regional data needs to be used in developing a "far-field" model to quantitatively determine regional and cumulative impacts to the park's Class I airshed. In developing this model, the NPS would like to see the BLM inventory the regional sources of air pollution including existing point sources, proposed new point sources, other existing and predicted sources, and develop and utilize a growth formula for the region. The NPS Air Resources Division should review and comment on the protocols for the "near-field" model and for a "far-field" model. The NPS needs to know what the model would predict for impacts to Mesa Verde such as the average number of miles of visibility reduced during each season and the increased levels of individual pollutants including nitrous oxides, ozone, sulfur dioxide, and particulates.

5. Currently, the BLM suggests that future monitoring by the New Mexico Air Quality Bureau would determine if air pollution impacts were harming Mesa Verde as the new wells and compressors went on line, thus triggering the need to find ways to reduce pollutants after the air quality has been degraded. The NPS believes that the scale of the proposed increase in gas production alone indicates that the BLM does not need to wait for the results from monitoring. Minimizations and mitigations need to be built in up front. The key concept is to prevent air quality degradation to a Class I area.

6. The NPS believes that the scale and scope of this plan also requires the need for an enhanced regional air quality monitoring program with more stations and all data analyzed in a coordinated manner. Project revenues could cover the costs.

7. The NPS is interested in knowing if the gas production described in the Draft RMP/EIS would be covered under the "New Source Review" pollution credit plan and, if so, how the pollution credits would be used and analyzed for the gas production program and how this would be covered under NEPA.

Visual Resources:

8. The NPS believes that the Final RMP/EIS needs to address night lighting impacts on visual resources. The NPS is concerned that the natural dark night sky at Far View in Mesa Verde National Park would be degraded from the implementation of the proposed action. The final plan needs to describe how light pollution would be mitigated by such means as light shielding, directional lighting, and the use of less intense lighting and/or more subdued light colors.

Wildlife:

9. The NPS would like to see the impacts from the proposed actions reduced to far ranging mammals and migratory birds, ecosystem resources that are shared with Mesa Verde National Park. Habitat damage needs to be kept to a minimum during construction and production and, just as important, post-construction landscape rehabilitation, weed control, and revegetation with native species of disturbed areas needs to be pursued until fully successful. Use of project revenues should be able to ensure good quality efforts and results. Please also include information pertaining to compliance with the Migratory Bird Treaty Act.

Again, we appreciate the opportunity to comment on the Draft RMP/EIS, and to share with you our initial thoughts and concerns on the project. Because of the controversial nature of this project, and the potential impacts to National Park Service resources, we hope to become more involved throughout the remainder of the project. If you have any questions regarding these comments, please feel free to contact me to discuss in more detail.

Sincerely,

Cheryl Eckhardt
NEPA/106 Specialist

cc: Chaco Culture National Historic Park
Mesa Verde National Park
Regional Files

From: Bill Walsh
To: jim_Ramakka@nm.blm.gov
Date: 9/24/02 9:28AM
Subject: Farmington BLM June 2002 Draft RMP/EIS, Reclamation review comments

To: Jim Ramakka
RMP Project Manager
BLM Farmington Field Office

From: Bill Walsh
Southern Land and Recreation Management Team Leader
Western Colorado Area Office, Durango

Subject: Farmington BLM June 2002 Draft RMP/EIS, Reclamation review comments, Navajo Unit, CRSP.

Thank you for allowing us the opportunity to review the subject document. The attached comments are a result of a review and discussions amoung our Land Management and Environmental staff, and Navajo Lake New Mexico State Park staff.

Please contact me at (970) 385-6554 or bwalsh@uc.usbr.gov with any questions concerning comments.

CC: dbryant@state.nm.us; Francis, Michael; Ozga, Kathleen; Waldman, Rob

Farmington Resource Management Plan
And
Environmental Impact Statement
June 2002 Draft
Bureau of Reclamation Review comments
Bill Walsh
9/23/02

Pg. 1-2, 2nd column, 1st paragraph, (2), change to read, "Upper Colorado Region, Western Colorado Area Office, Durango Colorado."

Page 1-5, tables 1-1 and 1-2. Reclamation total surface acres = 31,035. Reclamation total surface acres overlying federal minerals = 15,875. Meaning 49% of Reclamation land is over private/state mineral estate that is not controlled by BLM. This DEIS, by not clearly pointing out this situation, gives the general impression to the public that it describes the total oil and gas development projected to take place on Reclamation land. Decision makers using this EIS for input should be aware that the impacts identified in this document may represent only 50% of the total impact of oil and gas development on Reclamation land.

Pg. 2-30, 1st column, last paragraph, "Oil and gas development on the land around Navajo Reservoir..." This statement is used in each alternative description and we assume it refers to lands under Reclamation jurisdiction.

Pg. 2-236, 1st column, 1st complete bullet, "closed loop mud systems" are mentioned as mitigation to minimize surface disturbance and intrusion into undisturbed areas. These systems would be most applicable in the vicinity of surfaces waters such as Navajo Reservoir and could add protection against spills resulting from reserve pit leaks. Closed loop mud systems should be listing under New Technology on page 2-235 due to industry comments on the unavailability of these systems in the San Juan Basin.

Page 2-237, 1st column, last paragraph. Increasing the VRM classification for Reclamation lands from IV to II seems warranted to protect the view shed around the reservoir.

Page 2-237, 1st column, last paragraph. Reclamation supports the timing limitation but needs the flexibility to allow variances to it.

Page 3-24, 1st column, last paragraph. "This section discusses.....and waters of the United States." The expectation is a discussion specific to the Clean Water Act, but there is no other reference to waters of the United States in the section.

Page 3-54, 2nd column, last paragraph. USBR administers a total of 38,324 acres in both states, rather than the 31,025 acres stated. Decision makers should keep in mind that 40% of Reclamation administered land at Navajo Reservoir is below the high water line.

Increases in surface disturbance from oil and gas development will be concentrated on the remaining 60%.

Page 4-105, 2nd column, first full paragraph. Stronger evidence or cited research is needed to support the biological justification for making the assumption that habitat fragmentation thresholds will not be passed.

Page 4-106, 2nd column, under Oil and Gas Leasing and Development. "Implementation of the conservation alternative..." This is the lead in statement for discussions of impacts for Alternative D. This is an example of the editorial confusion sometimes found in the document.

Page E-1, paragraph IV, 1st sentence. Refers to Appendix B which is not included.

Page E-2, 2nd paragraph. 1st sentence. Refers to Appendix A which is not included. Reclamation will assume there is an asterisk next to our NSA designation in Appendix A to have prior approval status.

Page E-5, paragraph IV, 1st sentence. Refers to Appendix B which is not included.

Page E-6, paragraph V. States Reclamation land will be receptor focused while on page 2-236 Reclamation is listed as boundary focused for alternative D.
Reclamation wishes to be receptor focused and requires prior approval to placing compressors.

Page E-7, paragraph VI, 3rd sentence. Refers to Appendix A which is not included. Reclamation will assume there is an asterisk next to our NSA designation in Appendix A.

Page E-7, paragraph V (which follows paragraph VI?), 4th sentence should read "Prior approval is required before setting a noise source that could effect the threatened or endanger, raptor, **or other NSA indicated with an asterisk** in Appendix A.

RMP Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

RE: Letter of Support to BLM for Inclusion of Alien Run and Aztec Trails into RMP Final Draft

To Whom It May Concern:

The Friends of the Aztec Library has been working with the Bureau of Land Management (BLM) to adopt into their Resource Management Plan (RMP), a mountain bike trail system located near the City of Aztec. This trail system includes the *Alien Run Mountain Bike Trail*, which is located in Hart Canyon and *Aztec Trails,* which starts at the corner of Main & Blanco and meanders out to Hart Canyon. Another trail under construction and will become known as *Area 51*, takes the rider further into Hart Canyon and will be rated as "extreme". The three trails connect in Hart Canyon, making a trail system that is contiguous with the City of Aztec and covering close to 40 miles of trails.

The Aztec City Commission voted unanimously on Sept. 11, 2002, in City Commission Meeting, in support of the BLM adopting these trails into the RMP Final Draft, and recognize that this inclusion would in effect "put us on the BLM map" and create a mountain bike trail system that could be utilized by all levels of mountain bikers, including beginning, intermediate, and advanced and have great potential for economic development for the City.

There are four alternatives outlined in the RMP Draft located on pages 159-161, under the heading of Alien Run. The Aztec Commission supports Alternative C, which gives us the maximum right-of-way on the trail system and this is the FOL's preferred choice as well.

Also *Aztec Trails*, which makes the trail system contiguous with the city limits, was not included in the RMP Draft even though it has been mapped, GPS'ed and the Archaeological Studies have been done and we would like it included in the RMP Final Draft as well.

Thank you for your consideration in this matter.

Sincerely,

Gail Aspromonte, Mayor
City of Aztec

SOUTHERN UTE INDIAN TRIBE

VIA HAND DELIVERY

September 30, 2002

Mr. Steve Henke
Field Office Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

RE: Comments on the Farmington Resource Management Plan (RMP) and Environmental Impact Statement (EIS)

Dear Mr. Henke:

Thank you for allowing the Southern Ute Indian Tribe ("Environmental Programs Division") to comment on the draft RMP and EIS for management of public lands and resources under jurisdiction of the Farmington Field Office. The Southern Ute Indian Tribe offers the following comments for your consideration.

Comments Regarding Specific AIR Issues

Page 3-48
In general, information regarding the National Ambient Air Quality Standards (NAAQS) is well described. Despite standards for both fine particles ($PM_{2.5}$) and ozone (8-Hr.) being recently promulgated (1997) by the United States Environmental Protection Agency, description and analysis of both pollutants is recommended for inclusion in the final EIS. This will allow for a more comprehensive study of air pollution within the project area.

Table 3-14, Page 3-50
Pollutant concentrations for ozone (1998/2000) collected at the Shiprock substation exceed the 1-hr. (NAAQS) standard of 120 ppb. Data represented in Table 3-14 contradicts statements (pg. 3-50, Column 2) made to the effect that "pollutant levels within the project region have not exceeded any ambient air quality standard during the 1994 through 2000 monitoring period." We recommend that either the table or the statement be modified for consistency and accuracy.

Page 4-61, PSD
Based on modeling analysis (under Alternative B) Nitrogen Dioxide impacts consumed and surpassed the allowable annual PSD Class II increments ($33 > 25\ \mu g/m^3$).

P.O. Box 737 ✦ Ignacio, CO 81137 ✦ Phone: 970-563-0100

The Environmental Programs Division recognizes the complexity in preparing an EIS that would describe the project's potential impacts before the exact number of operational wells and their exact locations are known. Upon review of the conservative analysis used in the impact analysis, we concur that actual impacts during the time of development are most likely to be less then modeled. However due to the significance of NO_2 impacts, under Alternative B, at 2.0 g/hp-hr; we recommend serious consideration of utilizing well compressor units that have a lower emission factor rating of 1.0 or 1.5 g/hp-hr. Despite minor sources (wellhead compressors) not being regulated for PSD purposes they are still considered during a PSD review if they should fall within the impact area and are operating after the minor source baseline date has been triggered.

Comments Regarding General AIR Issues

NAAQS

The Southern Ute Indian Tribe has been monitoring air pollutants for the past twenty years. Although we have not exceeded the National Ambient Air Quality Standard for ozone we are currently studying the "somewhat" elevated levels of ozone in this area. As you may be aware ozone is a complex pollutant, formed chemically in the atmosphere due to pollution sources of nitrogen oxides and volatile organic compounds. Ozone is also known for its long-range transport characteristics. Ambient ozone levels should be considered due to the project area being within close proximity to major emitters of nitrogen oxides and volatile organic compounds.

Additionally, due to the magnitude of the project we recommend additional monitoring for the project area. It is highly recommended that monitoring include sensors for ozone and nitrogen dioxide, including operation of a PSD-quality meteorological tower.

Air Quality Modeling

Due to the possible magnitude of air quality emissions, but also due to the fact that the project area encompasses terrain features of long valleys and high hills it is highly recommended that terrain features be part of the near-field modeling analysis for the project area. Utilization of a flat-terrain grid system for this particular project area may misrepresent modeled emission concentrations.

Mitigation Measures

The mitigation measures listed on page 4-64 regarding gas well development are encouraging, but implementation and compliance issues for each of the mitigation measures should seriously be considered as part of the study. Despite surface area disturbance being insignificant and temporary for emissions of particulate matter, it is usually a public nuisance issue (i.e. visibility,

noise). Mitigation efforts should also involve odor suppression activities throughout all project development and operation phases.

If you have any questions regarding the comments provided, please call Virgil Frazier (Air Quality Program Manager) or myself at (970) 563-0135.

Respectfully submitted,

Fran King Brown
Division Head - Environmental Programs Division
Southern Ute Indian Tribe

STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

September 26, 2002

RMP Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Re: "Farmington Resource Management Plan and Environmental Impact Statement (DRAFT), U.S. Department of Interior, Bureau of Land Management, June 2002."

"Air Quality Modeling Analysis Technical Report – Revision to the BLM Farmington Resource Management Plan and Amendment of the Rio Puerco Resource Management Plan," Prepared by Science Applications International Corporation, Prepared for Bureau of Land Management, Farmington, NM, May 2002

Dear Sir/Madam:

The technical modeling approach has not been reviewed in detail since the impacts from the emission sources discussed in the EIS primarily affect New Mexico. Thus, the focus of these comments is on ozone precursors that could realistically impact Colorado. The Division defers to the expertise of the New Mexico Air Quality Bureau for comments on the near-field air quality modeling.

The primary concern with the proposed development is the large projected increase in the emissions of nitrogen oxides (NOx). The DEIS states that the majority of the emissions increase will be from wellhead compression. For example, Table 4-15 on page 4-58 states that in project year 20, wellhead compression emissions will be about 68,000 tons per year, even though the text states that "the net change in annual emissions from current levels would be offset somewhat due to the abandonment of existing production." Since the magnitude of the offset is not quantified, the affect of the abandonment is unclear. Thus, the comments in this memo are based on the assumption that the emission reductions in year 20 from "abandonment" would not be large with respect to the overall emission estimate. Various mechanisms for improving emissions controls on wellhead compression engines should be investigated.

One of the primary concerns is that the increase in NOx emissions will increase regional ozone levels in some locations. Table 3-13 on page 3-49 of the draft RMP/EIS does not include the 8-hour ozone National Ambient Air Quality Standard. A review of ozone observations at several western sites suggests that the federal 8-hour ozone standard may be threatened in some areas.

It is strongly recommended that additional ozone, NOx, and meteorological monitoring stations be installed and operated in SW Colorado to improve our understanding of ozone levels in the Four Corners area. At a minimum, a permanent monitoring site near Durango is recommended.

We appreciate this opportunity to comment on the DEIS. If you have any questions regarding these comments, please feel free to contact me directly.

Regards,

Mark McMillan
Air Quality Planner
Colorado Air Pollution Control Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 25 2002

Mr. Steve Henke
Field Office Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Dear Mr. Henke:

In accordance with the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, Environmental Protection Agency (EPA) Region 6 has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed revisions to the management plan for Federal lands in San Juan, McKinley, Rio Arria, and Sandoval counties, New Mexico.

EPA rates the DEIS as "**EC-2,**" i.e., EPA has "**Environmental Concerns and Requests Additional Information in the Final EIS** (FEIS)." EPA has identified environmental concerns and informational needs to be included in the FEIS to complement and to more fully insure compliance with the requirements of NEPA and the CEQ regulations. Areas requiring additional information or clarification include: project purpose and need, mitigation, alternative selection, and air quality.

Our classification will be published in the Federal Register according to our responsibility under Section 309 of the Clean Air Act to inform the public of our views on proposed Federal actions. Detailed comments are enclosed with this letter, which more clearly identify our concerns and the informational needs requested for incorporation into the FEIS. As we agreed, additional comments are being developed by our Regional air program staff on project related air quality issues and will be provided soon and must be responded to and incorporated into the FEIS. If you have any questions, please contact Mike Jansky of my staff at 214-665-7451 for assistance.

EPA appreciates the opportunity to review the DEIS. Please send our office five copies of the FEIS when it is sent to the Office of Federal Activities, EPA (Mail Code 2252A), Ariel Rios Building, 1200 Pennsylvania Ave, N.W., Washington, D.C. 20460.

Sincerely yours,

Robert D. Lawrence

Robert D. Lawrence, Chief
Office of Planning and
Coordination (6EN-XP)

Enclosure

DETAILED COMMENTS
ON THE
BUREAU OF LAND MANAGEMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FARMINGTON FIELD OFFICE RESOURCE MANAGEMENT PLAN

Background

The Farmington Field Office (FFO) of the Department of the Interior's Bureau of Land Management (BLM) and cooperating federal agencies are proposing to identify the projected development of federal oil and gas reserves and public lands administration and management over the next 20 years within the San Juan Basin of New Mexico. The planning area encompasses approximately 8,274,100 acres in northwestern New Mexico, and includes a mix of federal, state and private land ownership. The planning area includes all of San Juan County, most of McKinley County, western Rio Arriba County, and northwestern Sandoval County.

A Draft Resource Management Plan (RMP) Revision and a Draft Environmental Impact Statement (DEIS), which fulfill the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA) requirements for comprehensive land use planning for public lands, has been prepared to analyze the proposed changes in the management of federal lands under the jurisdiction of the FFO.

The Draft RMP/DEIS establishes and analyzes areas for limited, restricted or exclusive uses; levels of production; allowable resource uses; resource condition objectives; program constraints; and general management direction. The Draft RMP/DEIS has been developed using the principles of multiple use and sustained yield.

The land use planning and management direction addressed in the Draft RMP/DEIS pertains to public federal lands and federal mineral rights within the FFO boundaries. The Draft RMP/DEIS addresses the impacts of federal oil and gas leasing and development regardless of the surface ownership (i.e., state, tribal and private). When approved, the RMP will replace the existing land use management plan currently used to guide resource decisions in the FFO planning area.

Alternatives

The four alternatives considered in detail are:

Alternative A - Current Management (No Action Alternative): The Draft RMP/DEIS states that, under this alternative, the FFO would continue to manage oil and gas leasing and other resource responsibilities as it does currently. This alternative describes what environmental effects could result if none of the specific management activities proposed in the Draft RMP/DEIS would occur, although other environmental analysis of all or parts of the same area could occur.

Management guidance, implementation procedures, and special management designations would remain as they currently exist under the1998 RMP, the 1991 Amendment for oil and gas leasing and development, the 1995 RMP Amendment for OHV use, the 1995 RMP Amendment for OHV use in the Glade Run Trail System, the 1998 RMP Amendment addressing coal leasing, the 1998 Amendment for cultural resources, the 2000 Final EIS for Riparian and Aquatic Habitat Management in the FFO, and the 2000 RMP Amendment providing standards for public land health and guidelines for livestock grazing. This alternative is considered to provide a baseline comparison of predicted environmental consequences associated with taking no action versus implementing any of the action alternatives.

Alternative B - Resource Production Focus: The Draft RMP/DEIS states that under this alternative, the Farmington RMP would be amended to allow for maximum oil and gas development in the planning area and maximization of other public uses of FFO land. Access and land limitations would be minimized, consistent with the Continuing Management Guidance. In the event of land use conflicts, priority would be given to minerals recovery.

Alternative C - Resource Conservation Focus: This alternative emphasizes conservation, protection, and enhancement of natural and cultural resources through management measures that provide limitations on surface disturbing activities. Additional areas would be delineated for special management designation.

Alternative D - Balanced Approach (Preferred Alternative): This alternative includes aspects of the other two alternatives, as well as the status quo, with the goal of balancing extraction of the mineral resource, multiple uses of public lands, and protection of natural and cultural resources. The goal of this alternative is to have full field subsurface development, as described in the Reasonable Foreseeable Development Scenario (RFDS), while minimizing surface disturbance to the extent possible.

COMMENTS

Meeting the Project Purpose

The Draft RMP/DEIS states a purpose of providing a comprehensive framework for managing the public lands and for allocating resources during the next 20 years using the principles of multiple use and sustained yield. According to the Draft RMP/DEIS, Alternative D, the preferred alternative, provides a comprehensive framework for managing public lands through balancing the extraction of the mineral resource, multiple uses of public lands, and the protection of natural and cultural resources. It can be assumed from the Draft RMP/DEIS text that Alternative D, the preferred alternative, meets the project objective as stated. However, the document provides no information regarding the need for increased oil and gas production or land use management revisions. Therefore, it is difficult to determine how the Preferred Alternative was chosen over the other alternatives evaluated, including the No Action Alternative. The range of variability between the action alternatives is minimal and therefore all of the action alternatives generate similar impacts. Please address the project need and the rationale for selection of the preferred action. This concern should be fully addressed in the Final

EIS (FEIS).

Proposed Mitigation Measures

Generally, mitigation is not addressed in the Draft RMP/DEIS text. Within Chapter 4, Environmental Consequences, discussions of some activities to reduce environmental impacts are included, but not specifically identified as mitigation commitments. An example of mitigation mentioned can be seen on Page 4-8, Paragraph 1, where the Draft RMP/DEIS mentions seeding and Best Management Practices (BMPs) as means to reduce erosion and sedimentation to watersheds. Mitigation information should be easily identified and discussed to establish a direct correlation between identified environmental impacts and proposed mitigation to minimize those impacts. Please dedicate a section in the FEIS specifically addressing all mitigation measures. This concern should be fully addressed in the FEIS.

State of New Mexico
ENVIRONMENT DEPARTMENT
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GARY E. JOHNSON
GOVERNOR

JOHN D'ANTONIO, Jr.
SECRETARY

September 26, 2002

RPM Project Manager
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Dear RPM Project Manager:

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT: FARMINGTON MANAGEMENTE PLAN AND ENVIRONMENTAL IMPACT STATEMENT; US DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT; FARMINGTON FIELD OFFICE, FARMINGTON, NM; JUNE 2002

This transmits New Mexico Environment Department (NMED) comments concerning the above-referenced Draft Environmental Impact Statement (DEIS).

WATER QUALITY

The Bureau of Land Management Farmington Field Office (FFO) has prepared a DEIS for a Resource Management Plan (RMP) that would guide the agency in managing the resources of approximately two million acres of federal land and three million acres of other land with federal subsurface management. As the jurisdiction of FFO with regards to management of the surface is broader on federal land, the issues addressed are broader in scope for these lands, while the RMP addresses primarily gas and oil development on the remaining lands.

The five management issues addressed by the RMP are gas and oil leasing and development, land ownership adjustments, off-highway vehicle use (which includes all vehicle use off of pavement), specially designated areas (e.g., cultural resources, special habitat areas, recreation sites), and coal leasing suitability.

Gas and oil development is the management issue with greatest potential to negatively impact other resources, including water quality. Currently, nearly eighteen thousand active gas or oil wells are present within the planning area (p. 3-3). Approximately fifteen thousand miles of dirt roads serve these wells (p. 2-6), and the wells and roads themselves cover over 150 thousand acres (1.8%) within the planning area (p. 3-3).

The management alternative that would permit the smallest amount of new surface disturbance, and which FFO is proposing as the "no action" alternative, is Alternative A – Current Management. Under this alternative, approximately 4,438 new wells would be established over twenty years (Table 4-1, p. 4-5), and 14,128 acres of new surface disturbance would be associated with these and existing wells. During this period, it is also projected that 13,194 acres would be reclaimed. (See the comment below regarding the effectiveness of reclamation).

The preferred alternative, Alternative D – Balanced Approach, would permit establishment of 9,970 new wells over twenty years, approximately 31,771 acres would be disturbed, and 13,194 acres would be reclaimed.

Under either of these alternatives, "direct impacts to surface waters would result from an increase in surface disturbance, which could result in an increase in sedimentation in water bodies" (p. 4-12), and Alternative D would produce an "increase in sedimentation and salt yields due to more surface disturbance than under Alternatives [sic] A" (p. 4-101). These statements are probably true.

The New Mexico Standards for Interstate and Intrastate Surface Waters found at 20.6.4 NMAC state that "surface waters of the State shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom" (20.6.4.12.A NMAC). Furthermore, the New Mexico 2000-2002 Clean Water Act (CWA) Section 303(d) List includes three reaches of the San Juan River (Navajo Nation boundary to the Animas River, Animas River to Cañon Largo, and Cañon Largo to Navajo Dam) as currently impacted by stream bottom deposits. The San Juan River between Cañon Largo and Navajo Dam is also listed for turbidity. Two reaches of the Animas River (San Juan River to Estes Arroyo, Estes Arroyo to the Colorado border) are also listed for stream bottom deposits.

For the sake of completeness, and to supplement or replace information provided in Table 3-7 (which was probably derived from the 303(d) List), the La Plata River is listed for plant nutrients, the San Juan River between the Animas River and Cañon Largo is listed for fecal coliform, the Rio Puerco above the Rito Olguin is listed for stream bottom deposits and temperature, and the Rio San Jose is listed for temperature, pH, and stream bottom deposits. Navajo Reservoir and Lake Farmington (part of Farmington's water supply, the watershed of which is currently protected as a special management area, but would not be so protected under the preferred alternative) both contain fish with sufficient levels of mercury to be on the 303(d) List. Though not on the 303(d) List, the New Mexico State Departments of Environment, Health, and Game and Fish have developed fish consumption guidelines for the San Juan River below the Hammond Diversion due to mercury contamination.

All of these waters are also protected by the Antidegradation Policy found at 20.6.4.8 NMAC, which states (in part):

> Where the quality of a surface water of the state exceeds levels necessary to support the propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect

> existing uses fully. Further, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control. Additionally, the state shall encourage the use of watershed planning as a further means to protect surface waters of the state.

Other than the statements cited above that the preferred alternative would increase sedimentation and salt loading into water bodies (which alone may constitute water quality standards violation), no information is provided regarding other water quality parameters of interest. Mercury, turbidity, and the other parameters that limit water quality in the planning area are not mentioned in any analysis of water quality impacts of the alternatives.

Because reclamation practices and other best management practices may reduce or (conceivably) eliminate impacts to water quality of implementing any of the alternatives, scrutiny of the reclamation procedures (primarily presented in Appendix G: Conditions of Approval) is warranted. None of the alternatives as described would alter the current reclamation practices. Appendix G provides a list of procedures that a producer must agree to carry out as a condition of the lease. That a reclaimed state be attained is not a requirement. For example, guidelines for stockpiling topsoil prior to construction and re-spreading the topsoil on reclaimed portions of the well pad (p. G-1), and re-seeding of the re-spread topsoil (p. G-15) are provided, but there is no mention of criteria by which FFO can certify that the site has been reclaimed. A producer could potentially satisfy the requirements of FFO, and the reclaimed site could still be mostly barren or colonized by weeds. Although FFO may not be actively approving such reclamations, examples of well sites that have ostensibly been reclaimed but are actually still quite disturbed are abundant in the planning area under current management.

Some procedures found in the Conditions of Approval are disregarded by the producers and operators. For example, based on observations made by Surface Water Quality Bureau staff during reconnaissance for water quality survey work, the requirement that "drainage control shall be ensured over the entire road" is often disregarded. Quite often in the planning area, long stretches of road lie below grade and function as channels, accumulating large flows before discharging to gullies or arroyos. Similarly, the standard for location of access roads (p. G-13) that states, "surface disturbance and vehicular traffic will be limited to the approved location and approved access road" seems to often be disregarded. Many well sites have two or more access roads, when probably only one road was approved. Also, many intersections of roads are probably much larger than approved.

Until FFO can develop effective reclamation techniques, and consistently enforce their implementation, no decision that relies on the assumption that current reclamation procedures are effective will be valid.

Water quality impacts evaluated in the DEIS seem to be limited primarily to those affecting surface water. Potential impacts to ground water quality should be addressed by the appropriate state agency as part of implementation of the selected alternative. State regulations and standards for ground water quality in New Mexico can be found in the New Mexico Water Quality Control Commission Regulations, 20.6.2 NMAC.

The impacts of the preferred and other alternatives are not described sufficiently to evaluate their effects on water quality. A more thorough analysis of impacts and revision of reclamation policies appear to be required before an informed decision can be made by FFO whether to implement any of the alternatives.

AIR QUALITY

Coal:

Tables 2-11 and 2-12 [pgs 2-243 through 2-245] compare options and impacts of the four resource management alternatives. The potential impact from coal extraction, processing, and use should be included in these tables including, but not limited to, surface disturbance, erosion, loss of native vegetation, wildlife habitat loss, air quality over 20 years, ground water, visibility, cultural sites, paleontology, noise, and employment. Map 2.9 shows suitable areas for Alternative B. It should be retitled if it is also applicable to Alternatives C and D. Otherwise, add maps that indicate coal development areas under Alternatives C and D.

To the extent that coal development occurs, the end-to-end impacts to air quality, including extraction, processing, transportation, and potential use would have to be considered. The NMED's Air Quality Bureau (AQB) has some jurisdiction over coal mining when processing, loading, or transport are involved. The applicability of air quality regulations would be assessed at such time as a new mine was proposed. The RMP should identify the potential air quality impact of coal development under each proposed alternative and discuss how those issues will be addressed. The following paragraph would clarify these points:

"For any proposed new coal development, increase in current extraction, or use, the BLM will coordinate with all appropriate agencies of State, Federal and Tribal Governments to ensure compliance with laws and regulations. Project specific modeling and an environmental assessment will be prepared with the opportunity for public input. Air quality will be examined in conjunction with the NMED-AQB, following applicable permit procedures."

Oil and Gas:

The RMP projects a significant increase in Gas production. These VOCs will be added on top of the current baseline. Ozone levels, already near the EPA non-attainment threshold, will likely increase, since ozone results from the combination of NOx and VOCs. If the area is declared non-attainment for ozone, much stricter limitations will be applied to new and existing sources. The non-attainment designation is long term, lasting a minimum of 10 years. The RMP should address this issue, perhaps with a statement like:

"The BLM will work cooperatively with Air Quality Bureau monitoring efforts and support future mitigation activities needed to keep the planning area in compliance with state and federal air quality standards."

Ozone and Particulates:

Sources within the FFO planning area must comply with both state and federal air quality laws. EPA has added a new 8-hour standard for ozone of .084 ppm. There is also an EPA requirement for smaller particulate matter, PM2.5. The implementation language for these NAAQS has not been established yet. The old standards for 1-hour ozone and PM10 may be repealed once the implementation language is in place; however, at this time both are in effect. The RMP does not address the 8-hour ozone or PM2.5 requirements. They should be added to Table 3-14, 3-14, with an additional year (2001) column to show the monitored levels. Section 4, Air Quality, should discuss the potential impact of the proposed development on these two pollutants. Additional analysis is not required.

OHV Use:

Road construction, traffic, and OHV activity are a significant air quality issue. Particulate matter is a criteria pollutant, and the Four Corners area is susceptible to high levels. Unpaved roads increase the potential for vehicle-generated dust. Insufficient planning has been submitted to enable an assessment of the environmental impact. The RMP should consider some of the following alternatives:

- -minimize road construction,
- -require construction techniques that minimize traffic-generated dust,
- -consider dust mitigation measures for problem areas,
- -restrict road access/use,
- -develop estimating rationale for the number of road miles driven each year
- -include a statement: "In areas where blowing dust becomes a significant problem or engenders complaints, the BLM will take steps to mitigate the problem, consider closing or restricting access to roads, and coordinate with the AQB to determine the effectiveness of the steps taken."

Misstatements

Page 3-48 says "State standards, established by the NMAQB..." This is incorrect. The AQB merely enforces the state standards established by the Environmental Improvement Board (EIB).

Page 3-49 says: "The NMAQB also designates areas of the state as either in attainment or nonattainment of the NMAAQS. At the present time, the entire project region attains all national and state ambient air quality standards." AQB does not designate areas. The EPA designates areas as Attainment, Nonattainment, OR "Unclassified," (meaning that data are not available for federal standards). Based on our four monitoring stations in the Farmington area, San Juan County is currently considered in attainment for all national ambient air quality standards, although ozone is approaching the nonattainment threshold. McKinley and Rio Arriba Counties would be "unclassified" because there are presently no monitors in those locations. We are concerned about the extent of the ozone problem and are applying for funding to do temporary monitoring to evaluate the need for permanent stations.

Table 3-14 (page 3-50) contains errors on the second line under ozone. The Shiprock Substation reading should be 0.08 for 1998 and 0.09 for 2000.

Page 3-52 states: "An emission inventory is not available for the planning area within McKinley, Rio Arriba, San Juan, and Sandoval counties." This statement is untrue. We do have emissions inventories for all permitted sources and mobile sources within each county. For more information you may contact Jim Shively at (505)955-8068.

Air Quality Modeling

1. The modeling analysis doesn't include a complex terrain analysis. Most of the terrain in the project area is rugged, with substantial elevation changes, so it is likely that any single module within the proposed development will be located in an area with complex terrain. Although the analysis claims there are other conservative assumptions made, these

assumptions may not "offset" the use of simple terrain over the use of complex terrain. The submitted analysis does not necessarily provide a conservative estimate of air quality impacts from a module. While the AQB concurs that such an analysis may be impractical at this phase of the project, the RMP-DEIS should clearly state that this modeling does not include complex terrain and that the impact of these sources would likely be significantly greater in complex terrain than in simple terrain. It should also note that complex terrain modeling will be required by the AQB for each future source as part of the air quality permit process.

2. On page 13 of the Modeling Analysis Technical Report, there is a discussion of the PSD increment. This discussion seems to assume that only PSD-major sources consume PSD increment. This is not the case in the project area, as the minor source baseline date for NO2 was established in 1989. All sources in the project area, both major and minor, consume PSD increment. Additionally, the majority of existing sources in the project area consume PSD increment. Within the project area, there are several localized areas where the available PSD Class II increment is nearly exhausted (e.g. the Bloomfield gas corridor). A permit application for a module in one of these areas would be denied, as 20.2.72 NMAC requires that new and modifying sources meet all applicable PSD increments.

3. It appears that the NMAAQS may have been incorrectly calculated for the project area elevation on pages 10 and 12. For example, assuming an average elevation in the Farmington area of around 5000 feet, the calculated 24-hour NO2 NMAAQS should be 158.6 μg/m3 instead of 188 μg/m3 and the annual NO2 NMAAQS should be 79.3 μg/m3 instead of 94.3 μg/m3. The AQB's Dispersion Modeling Guidelines provides the temperature and elevation correction factor for gaseous pollutants. The conclusion from table 6 on page 12 is that a single module would cause impacts that exceed the 24-hour NMAAQS for NO2. It is possible that use of the ozone-limiting approach will bring NO2 marginally into compliance.

4. The modeling analysis used a monitored background to represent existing concentrations.The AQB concurs that this may be appropriate for the DEIS analysis due to the very preliminary stage of this project; however, this would not be an acceptable method for a permitting analysis. It should also be recognized that the maximum monitor value may or may not be representative of the maximum NO2 concentrations in the project area. The monitor is located in an area where there are several large sources of NOx and CO emissions; however, the monitor may not be sited to capture the maximum concentrations from these sources. The sources in this area are on an east-west line, so maximum impacts will likely be directly to the east or west of the sources. The monitor is northwest of this group of sources. The monitor also may not be representative of all allowable (or permitted) emissions in the project area. Minor source air quality permits allow up to two years for commencement of construction from issuance of the permit and major source permits allow 18 months from issuance for commencement of construction. There are many sources that have been permitted in the project area in the last several years that may not yet be operational. This means that the monitored concentrations may not be representative of all existing allowable emissions in the project area.

5. There is no analysis of the impact of the project, existing and proposed new sources on the Class I PSD increment. The cumulative impact of existing and proposed sources on Class I areas would likely be significant. An analysis of the PSD cumulative increment consumption in Class I areas within 100 km of the project area should be completed. To make the DEIS more comprehensive, an analysis of Air Quality Related Values (AQRVs) in Class I areas should also be completed with input from the appropriate Federal Land Managers. These analyses would include, but are not limited to, visibility and deposition in the Class I areas.

6. There is no mention of other HAPs besides formaldehyde. Since there will be other HAPs emitted including BTEX, the DEIS should include a listing of these HAPs and the estimated levels of emissions, even if the emissions are so insignificant that a modeling analysis of impacts is not warranted.

7. There is no mention of the cumulative impact of all of the modules; the analysis focus is only on the local impact of a single module. The cumulative impact of the entire project could be significant enough to increase the background concentration, increase ozone concentrations and reduce visibility in the project area. Additionally, the cumulative impact of these sources could cause significant impacts on air quality related values in nearby Class I areas. Given that there exist air quality concerns in the project area, mention of cumulative impact analysis seems appropriate for this EIS. Perhaps a statement like: "A cumulative impact analysis will be required for each future source as part of the air quality permit process." BLM is not required to conduct such an analysis, either now or later, but such a statement would indicate BLM's awareness, and define when such an analysis will be conducted.

8. This comment is for BLM awareness and requires no action or response. The overall impact of many small NOx and VOC sources associated with the proposal has the potential significantly contribute to the formation of ozone in the region. Elevated ozone concentrations have been measured in the project area. The module emissions may also contribute to the formation of regional haze since both NOx and some VOCs have a role in the formation of secondary aerosol.

Please note that for questions or clarifications on air quality modeling, you should contact Dave DuBois (955-8016) or Mary Uhl (955-8086).

We appreciate the opportunity to comment on this document.

Sincerely,

Gedi Cibas, Ph.D.
Environmental Impact Review Coordinator

NMED File No. 1627ER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

October 2, 2002

Cons. # 2-22-01-I-389

Memorandum

To: Field Office Manager, Bureau of Land Management, Farmington Field Office, Farmington, New Mexico

From: Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico

Subject: Section 7 Consultation for the Resource Management Plan Revision, BLM Farmington Field Office

Thank you for your Biological Assessment (BA) for the Resource Management Plan Revision, Bureau of Land Management (BLM) Farmington Field Office, New Mexico, received on September 24, 2002. You request concurrence that the activities proposed in the management plan "may affect, are not likely to adversely affect" the endangered Knowlton cactus (*Pediocactus knowltonii*), the threatened Mesa Verde cactus (*Sclerocactus mesae-verde*), the endangered Mancos milkvetch (*Astragalus humillimus*), the endangered Colorado pikeminnow ((*Ptychocheilus lucius*) and its critical habitat, the endangered razorback sucker (*Xyrauchen texanus)*, the threatened bald eagle (*Haliaeetus leucocephalus*), the proposed threatened mountain plover (*Charadrius montanus*), the threatened Mexican spotted owl (*Strix occidentalis lucida*) and its critical habitat, and the endangered southwestern willow flycatcher (*Empidonax trailii extimus*).

The Resource Management Plan/Environmental Impact Statement presents four alternatives of which Alternative D is the preferred alternative. Under this alternative it is anticipated that 9,942 new oil and gas wells will be developed on land overlaying Federal minerals over the next 20 years. These include surface lands managed by BLM, Bureau of Reclamation, the State of New Mexico, and private land. Approximately 805 miles of new roads will be needed for the new well development.

Specially Designated Areas and Areas of Critical Environmental Concern would protect riparian resources, and Mexican spotted owl critical habitat. Most of these would limit Off-Highway Vehicle (OHV) use. The coal program would drop the existing Coal Belt Special Management Area because all areas that are suitable for coal mining would be available for consideration for

extraction under the lease by application process. Approximately 378,875 acres of Federal land would be available for coal leasing.

The management plan revision proposes to change the OHV designation on BLM surface lands from open to limited. Currently the majority of BLM surface lands have an open designation permitting cross-country travel. Because of the high density of oil field roads in the San Juan Basin (15,000 to 20,000 miles), the change in designation should have little impact on accessibility to any area. However, because of the public desire for OHV areas, two recreational areas previously designated for open OHV use will remain open areas. Approximately 94 miles of OHV trails are identified in the preferred alternative. Future development of OHV trails will be determined in OHV management plans.

A coordination meeting was held between our respective staffs on July 30, 2002, to discuss the threatened and endangered species present in the planning area, and how they might be affected by the proposed actions. A primary concern of my staff regarded the amount of water that would be needed for the drilling of the oil and gas wells in relationship to the minor depletions limit present within the San Juan Basin. However, because BLM is requiring that the water acquired for oil and gas development must be purchased from a business with a legal water rights permit, and the amount of water allotted to water haulers is monitored by the State, we are satisfied that the amount of water used will not exceed that allowed by the minor depletions limit.

The U.S. Fish and Wildlife Service (Service) concurs with the BLM's determination in the BA of "may affect, not likely to adversely affect" Knowlton cactus, Mesa Verde cactus, Mancos milkvetch, Colorado pikeminnow and its critical habitat, razorback sucker, bald eagle, mountain plover, Mexican spotted owl and its critical habitat, and the southwestern willow flycatcher. Please contact the Service if: 1) future surveys find threatened or endangered species in areas where they have not been previously observed; 2) the management activities change, or new information reveals effects of the actions to the listed species or their habitat to an extent not considered in the BA; or 3) a new species is listed that may be affected by these projects.

This concludes section 7 consultation on the proposed Resource Management Plan Revision, BLM Farmington Office. We appreciate your staff's cooperation, coordination, concern for threatened and endangered species, and timely responses to our requests for additional information. If you have any questions, please contact Marilyn Myers at the letterhead address or at (505) 346-2525, ext. 154.

Shirley Mondy

for Joy E. Nicholopoulos

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
State Director, Bureau of Land Management, Sante Fe, New Mexico

USDA Forest Service
San Juan National Forest
http://www.fs.fed.us/r2/sanjuan

San Juan Public Lands Center
15 Burnett Court
Durango, CO 81301
Ph (970) 247-4874 Fax (970) 385-1243

USDI Bureau of Land Management
San Juan Center
http://www.co.blm.gov/

File Code: 2580-2
Date: October 10, 2002

Jim Ramakka
RMP Project Manager
Farmington BLM Field Office
1235 La Plata Highway
Suite A
Farmington, NM 87401-8754

Dear Jim:

We have reviewed the Farmington Draft Resource Management Plan and EIS. Our comments primarily relate to impacts management activities analyzed in the EIS may have on air quality and the Weminuche Wilderness. As you may know, the Weminuche Wilderness is a Class I area that receives the highest level of visibility protection provided by Congress, the Clean Air Act, and the State of Colorado. It is also documented as having among the most pristine air quality in the United States.

The San Juan National Forest has several comments and questions we feel would be helpful if addressed by the Farmington Field Office:

1. There is no analysis of the effects oil and gas development will have on the Weminuche Wilderness Class I Area. The EIS acknowledges there will be significant impacts to the Mesa Verde National Park Class I Area. In this light, it is critical to have some disclosure of the potential impacts to the nearby Weminuche Wilderness on the San Juan National Forest.

2. The alternative having the highest potential impact to air quality (Alt. B), was the only alternative analyzed in detail. This alternative was shown to have large air quality impacts to Class I Areas that exceed levels allowed by the Clean Air Act. It is not possible to assess the potential impacts of any other alternative that may have lower, more acceptable impacts, since modeling did not occur and impacts were not disclosed. It is critical to have visibility impacts to Class I Areas, including the Weminuche Wilderness, disclosed for each alternative.

3. There is no documentation of a detailed emissions inventory in either the Draft EIS or the Air Quality Modeling Analysis Technical Report. Were the cumulative impacts of the oil and gas development associated with the Southern Ute EIS and Northern San Juan Basin EIS of Colorado used when analyzing cumulative impacts to Class I Areas? It is difficult to assess whether existing and reasonably foreseeable emissions sources in the Four

Corners area were analyzed for cumulative effects. For example, the proposed Mustang Energy coal-fired power plant south of Farmington is currently undergoing the PSD permitting process. Was this large future emissions source included in the emissions inventory?

4. The far field analysis is only qualitative, and inadequate to accurately disclose impacts to Class I Areas. Again, given the disclosure that large air quality impacts are predicted for Mesa Verde National Park, a quantitative far field analysis for each alternative is critical to disclose legal compliance to visibility protection in the Weminuche Wilderness Class I Area.

Detailed comments regarding modeling protocol and modeling results compiled by air quality staff in our Regional Office are attached to this correspondence. We appreciate the opportunity to comment, and to work cooperatively with air quality analyses for all the NEPA documents in the San Juan Basin. If there are any questions, please feel free to contact Kelly Shanahan at (970) 385-1232.

Sincerely,

Michael G. [signature]

for RICK BRAZELL
Acting Forest Supervisor

cc: Walter A Brown, Christopher T Hockett

Kelly, your letter looks very good. I have a few comment and concerns identified below. If you can incorporate them into your letter, please feel free to do so. I tried to get these to you last week, but it was just not possible with all that is going on right now. I'm sorry about that. Have a great afternoon, Chris

1. The installation and operation of this source may have a substantial impact on the air quality and visibility in nearby wilderness areas administered by the Forest Service. As evidenced by the potential increase in emissions identified in the EIS, this project could have a significant impact on air quality related values (AQRV) over a substantial geographic area. In fact, the EIS states that the project "would potentially produce significant cumulative impacts to visibility resources in Mesa Verde and San Pedro Parks Class 1 areas." Given increases in emissions (e.g. NOx will increase nearly 70,000 tons per year) modeling could potentially identify impacts hundreds of kilometers away from this source. However, no such refined modeling was performed nor was a PSD increment or other AQR analysis included in the EIS. Furthermore, and of great concern is the treatment of the Clean Air Act Prevention of Significant Deterioration (PSD) regulatory requirements. On page 4-61 of the EIS, BLM states that, even though this project will exceed the threshold for PSD applicability and the allowable annual the PSD Class II increment, no PSD review is necessary. The basis for this statement seems to relate to BLM's determination that each wellhead compressor, and other sources, will be reviewed on an individual basis.

   However, this approach may be contrary to both the PSD implementing regulations and EPA permitting policy. With respect to the PSD rules, 40 CFR 52.21 states that a regulated stationary source is "any building, structure, or installation that emits or may emit any air pollutant subject to regulation under the Clean Air Act." Moreover, the regulations go on to define a "building, structure or installation as all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control) except the activities of any vessel. Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same ``Major Group" (i.e., which have the same first two digit code) as described in the Standard Industrial Classification Manual, 1972, as amended by the 1977 Supplement (U. S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0, respectively). Furthermore, an emissions unit is defined as "any part of a stationary source which emits or would have the potential to emit any pollutant subject to regulation under the Act. Because the language in the PSD implementing regulations state that "all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person" constitute a single source, we believe that this project should be reviewed as such.

   In light of the information above, coupled the very large amounts of criteria pollutants that will be emitted and the potential PSD increment impact, we believe the minimal modeling and reliance on the Southern Ute Oil and Gas EIS for the purpose of inferring impacts on the surrounding area is inappropriate. Also, this approach seems lack

sufficient environmental analysis to determine if BLM's action on this project will meet it affirmative obligation under section 176 of the Clean Air Act. It appears that a full air quality impact analysis, including PSD increment and AQRV impacts should be performed for this project.

2. On page 3-48 of the EIS, BLM states that volatile organic compounds, nitrogen oxides, nitrogen dioxide, carbon monoxide, and particulate matter less than 10 microns in diameter are pollutants of concern. EPA identifies each of these pollutants as criteria or precursors for criteria pollutants. The EIS goes on to identify all pollutants except ozone and its precursors as "inert." Inert is defined as displaying no chemical activity. Section 108 of the Clean Air Act states that "For the purpose of establishing national primary and secondary ambient air quality standards, the Administrator shall within 30 days after the date of enactment of the Clean Air Amendments of 1970 publish, and shall from time to time thereafter revise, a list which includes each air pollutant (A) emissions of which, in his judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare..." The pollutants identified in the EIS fall into this category. Calling them "inert" seems to be misleading and inappropriate.

   Moreover, the EIS states that the region of influence for "inert" pollutants is limited to a few miles downwind of the source. On what modeling did BLM base this statement? Additionally, does BLM have data that shows that the nitrogen-based and sulfur-based pollutants will not impact acid deposition, visibility or other AQRVs in nearby wilderness areas?

3. On page 3-50, table 3-14 identifies the current air quality status for project region. Furthermore, BLM states that the data in Table 3-14 indicates that ambient air quality for the project region is in attainment with state and federal ambient air quality standards. However, the Shiprock Substation indicates that ozone concentrations were measured as high as .90 microgram per cubic meter. This is considerable higher than the NAAQS (approximately 650% above the NAAQS). Is this area at risk for being redesignated to nonattainment or was that a single event?

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
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OCT 24 2002

Mr. Steve Henke
Field Office Manager
Bureau of Land Management
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401-8754

Dear Mr. Henke:

Thank you for the opportunity to extend our comments on the Draft Environmental Impact Statement (DEIS) for the proposed revisions to the management plan for Federal lands in San Juan, McKinley, Rio Arria, and Sandoval counties, New Mexico. The attached comments reiterate certain aspects of the discussion that took place in Santa Fe, New Mexico on September 16, 2002. This letter is the extent of comments on air quality contemplated in the comment letter from the Environmental Protection Agency dated September 25, 2002.

If you have any questions or need further clarification on the attached comments feel free to contact me or Mr. Quang Nguyen of my staff at 214-665-7238.

Sincerely,

Thomas Diggs, Section Chief
Air Planning

Comments on the Air Quality Near-Field Modeling for The Revised Farmington and Rio Puerco RMPS EIS

1. Air dispersion modeling is very sensitive to the relationship between emission source locations and terrain features. The Industrial Source Complex Short-Term Model 3 (ISCST3), recommended for use only in simple terrain situations, was used in the current analysis to estimate the maximum impact from the proposed emission sources. Because the project area is located in or close to complex terrain (i.e. substantial elevation changes), EPA recommends that BLM conduct a complex terrain modeling analysis to estimate the maximum impact from the proposed emission sources to augment the current modeling analysis. The proposed emissions module in the current analysis, based on the Dakota formation, is reasonable and conservative. These same assumptions can be used in the complex terrain modeling analysis since the spatial allocation of any single module within the proposed development is not known at this time. This modeling analysis should still address increments in the Prevention of Significant Deterioration and NAAQS attainment concerns for all criteria pollutants. EPA is concerned about the volume of possible emissions on a cumulative basis.

2. Oxide of Nitrogen (NO_x) is one of the main pollutants emitted from natural gas combustion. In certain areas NO_x has been identified as the dominant pollutant contributing to ozone nonattainment. The current analysis does not resolve this question, but nearby sources are emitting NO_x and are reasonably suspected of inducing elevated ozone levels that have been recorded in the area. EPA recommends that a cumulative impact analysis be conducted to prevent violations of the ozone NAAQS. As in the existing study, we recommend that the modeling project future emissions under different development scenarios.

3. No cumulative impact analyses of the proposed new sources and existing sources on Class I areas was conducted. Since the project area is within 100 km of Class I areas, EPA recommends a Class I area impact analysis (i.e., Air Quality Related Values (AQRV) analysis) be conducted to ensure that the proposed emissions module will not cause adverse impacts on Class I areas. Appropriate Federal Land Managers should be consulted for inputs necessary for a complete AQRV impact analysis of the proposed emissions module.

Glossary

GLOSSARY

Abandonment—Termination of fluid minerals operations, production operations, removal of facilities, plugging of the well bore, and reclamation of surface disturbances.

Affected Environment—Surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that potentially could be affected by gas development and production activities. The environment of the area to be affected or created by the alternatives under consideration (40 CFR 1502.15).

A-weighted—A weighting function applied to the noise spectrum, which approximates the response of the human ear.

Allotment (range)—A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under management of an authorized agency.

Alternative—A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of a number of plans or projects proposed for decision-making.

Ambient (air)—The surrounding atmospheric conditions to which the general public has access.

Animal Unit Months (AUM)—Amount of forage required to sustain a cow/calf unit (one cow and one calf) for one month.

Application for Permit to Drill (APD)—A written request, petition, or offer to lease lands for the purpose of fluid minerals exploration and/or right-of-extraction.

Aquifer—A water-bearing layer of permeable rock, sand or gravel. A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to conduct groundwater and yield large quantities of water to wells and springs.

Area of Critical Environmental Concern (ACEC)—A BLM designation pertaining to areas where specific management attention is needed to protect and prevent irreparable damage to important historical, cultural, and scenic values, fish or wildlife resources, or other natural systems or processes, or to protect human life and safety from natural hazards.

Arroyo—A term applied in the arid and semiarid regions of the southwestern United States to the small, deep, flat-floored channel or gully of an ephemeral stream or of an intermittent stream usually with vertical or steeply cut banks of unconsolidated material at least 2 feet (60 centimeters) high; it is usually dry, but may be transformed into a temporary watercourse or short-lived torrent after heavy rainfall.

Aspect—The direction in which a slope faces.

Basin—*See* **San Juan Basin**.

Bentonite—A naturally occurring clay used to keep the cuttings in suspension as they move up the borehole.

Best Management Practices (BMPs)—Measures that are installed on the land to reduce erosion and sedimentation before starting and during ground-disturbing activities.

Big Game—Large species of wildlife that are hunted, such as elk, deer, bighorn sheep, and pronghorn antelope.

Biodiversity—The diversity of living organisms considered at all levels of organization including genetics, species, and higher taxonomic levels, and the variety of habitats and ecosystems, as well as the processes occurring therein.

Cambrian—The oldest of the periods of the Paleozoic Era; also the system of strata deposited during that period.

Carbonaceous—Coaly; pertaining to, or composed largely of, carbon.

Casing—Steel pipes of varying diameter and weight, joined together by threads and couplings, "inserted" into the well bole for the purpose of supporting the walls of the well and preventing them from caving in. Surface casing is inserted from the ground surface to approximately 250 feet (76 metes), production casing is inserted to the total depth of the well (smaller diameter pipe than surface casing), cemented in place and latter perforated for production.

Clean Air Act—Federal legislation governing air pollution. The Clean Air Act established National Ambient Air Quality Standards for carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead.

Coal—A readily combustible rock containing more than 50 percent weight and more than 70 percent by volume of carbonaceous material including inherent moisture, formed from compaction and induration of variously altered plant remains similar to those in peat. Differences in the kinds of plant materials (type), in degree of metamorphism (rank), and in the range of impurity (grade) are characteristic of coal and are used in classification.

Coalbed Methane—A gas associated with a coal seam.

Completion—The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

Compressor (large)—Range from 500 to 10,000 horsepower, located on oil and gas distribution pipelines.

Compressor (small) —About 100 horsepower, generally located at the wellhead.

Compressor Station—Any location along an oil and gas trunk line with one or more large compressors.

Conditions of Approval (COA)—Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

Controlled Surface Use (CSU)—A fluid minerals leasing constraint under which use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational limitations that may modify lease rights.

Corridor—For purposes of this environmental assessment, a wide strip of land within which a proposed linear facility could be located.

Council on Environmental Quality (CEQ)—An advisory council to the President of the United States established by the national Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the president on environmental matters.

Critical Habitat—An area occupied by a threatened or endangered species "on which are found those physical and biological features (1) essential to the conservation of the species, and (2) which may require special management considerations or protection" (16 USC 1532 [5][A][I]1988). Unoccupied by suitable habitat for the threatened or endangered species is not automatically included unless such areas are essential for the conservation of the species (50 CFR 424.12(e)).

Cultural Resources—Remains of human activity, occupation, or endeavor, as reflected in districts, sites, buildings, objects, artifacts, ruins, works of art, architecture, and natural features important in human events.

Cumulative Impact—The impact on the environment that results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Dewatering—The act of removing water.

Directional Drilling—The intentional deviation of a wellbore from vertical to reach subsurface areas off to one side from the drilling site.

Discretionary Closure—Those lands where the BLM has determined that fluid minerals leasing, even with the most restrictive stipulations, would not adequately protect other resources, values, or land uses.

Disposal Well—A well into which produced water from other wells is injected into an underground formation for disposal.

Diversity—The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

Drilling Fluids—The circulating fluid used to bring cuttings out of the wellbore, cool the drill bit, provide hole stability, and pressure control.

Drilling Rig—The derrick, draw-works, and attendant surface equipment of a drilling or workover unit.

Drilling—The operation of boring a hole in the earth, usually for the purpose of finding and removing subsurface formation fluids such as oil and gas.

Dry Hole—Any well incapable of producing oil or gas in commercial quantities. A dry hole my produce water, gas, or even oil, but not enough to justify production.

Easement—A right afforded a person or agency to make limited use of another's real property for access or other purposes.

Emission—Effluent discharge into the atmosphere, usually specified by mass per unit time.

Endangered Species—Any animal or plant species in danger of extinction throughout all or a significant portion of its range.

Environmental Impact Statement (EIS)—A document prepared to analyze the impacts on the environment of a proposed action and released to the public for review and comment. An EIS must meet the requirements of NEPA, CEQ, and the directives of the agency responsible for the proposed action.

Erosion—The group of processes whereby earthy or rocky material is worn away by natural sources such as wind, water, or ice and removed from any part of the earth's surface.

Ephemeral Stream—A stream that flows only in direct response to precipitation.

Exploration Well—A well drilled in the area where there is no oil or gas production (also known as wildcat well).

Federal Candidate Species—Sensitive wildlife species currently under consideration for inclusion to the list of federal threatened or endangered species.

Federal Listed Species—Animal or plant species listed by the USFWS as threatened or endangered.

Floodplain—The flat ground along a stream that is covered by water when the stream overflows its banks at flood stages.

Fluid Minerals—In this case, oil, gas, and geothermal resources.

Forage—All browse and herbaceous foods available to grazing animals, which may be grazed or harvested for feeding.

Foreground View—The landscape area visible to an observer within a mile.

Formation—A body of rock identified by lithic characteristics and stratigraphic position; it is prevailingly, but not necessarily tabular, and is mappable at the earth's surface or traceable in the subsurface (NACSN, 2984, Art. 24).

Fossil—Any remains, trace, or imprint of a plant or animal that has been preserved by natural processes in the earth's crust since some past geologic time.

Fractured—Fissured, broken, or cracked. See also Hydraulic Fracturing.

Fragmentation—See Habitat Fragmentation.

Fugitive Dust—Airborne particles emitted from any source other than through a stack or vent.

Habitat—A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Habitat Fragmentation—The disruption (by division) of extensive habitats into smaller habitat patches. The effects of habitat fragmentation include loss of habitat area and the creation of smaller, more isolated patches of remaining habitat.

Habitat Management Plan (HMP)—A written and officially approved plan for a specific geographical area of public land that identifies wildlife habitat and related objectives, establishes the sequence of actions for achieving objectives, and outlines procedures for evaluating accomplishments.

Habitat Type—An aggregation of all land areas potentially capable of producing similar plant communities at climax.

High Development Area—An area of approximately 7,000 square miles located in northwest New Mexico with a high level of oil and gas production, as delineated by the New Mexico Institute of Mining and Technology in the RFDS study for the San Juan Basin.

Historic—Archaeological and archivally known sites related to the activities of non-native peoples, whether they are of Euro-American, Afro-American or Asian-American origin, in the period after the European discovery of the New World (ca. A.D. 1492).

Hummocky—Like a hummock, full of hummocks (a low, rounded hill, knoll, hillock; a tract of wooded land higher than a nearby swamp or marsh).

Hydraulic Fracturing—A method of stimulating production by increasing the permeability of the producing formation.

Hydrocarbons—Organic compounds of hydrogen and carbon, whose densities, boiling points, and freezing points increase as their molecular weights increase. Although composed mostly of carbon and hydrogen, hydrocarbons exist in a great variety of compounds, owing to the strong affinity of the carbon atom for other atoms and itself. The smallest molecules are gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

Impact—A modification of the existing environment caused by an action (such as construction or operation of facilities).

Increments—Maximum allowable increases over legally established baseline concentrations of pollutants covered by the Prevention of Significant Deterioration (PSD) provisions designated as Class I, II, and III areas.

Indirect Impacts—Secondary effects that occur in locations other that the initial action or later in time.

Infrastructure—The facilities, services, and equipment needed for a community to function including roads, sewers, water lines, police and fire protection, and schools.

Injection—The forcing, under abnormal pressure, of material (downward from above, upward from below, or laterally) into a pre-existing deposit or rock, either along some plane or weakness or into a pre-existing crack or fissure.

Injection Well—A well used to inject fluids into an underground formation to increase reservoir pressure.

Insignificant or Nonsignificant Impacts—Impacts that are perceptible or measurable relative to those occurring naturally or due to other actions, and would not exceed significance criteria.

Intermittent Stream—A stream or reach of a stream that is below the local water table for at least some part of the year.

Jurisdiction—The legal right to control or regulate use of land or a facility. Jurisdiction requires authority, but not necessarily ownership.

Landscape—An area composed of interacting ecosystems that are repeated because of geology, landform, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern that are determined by interacting ecosystems.

Landscape Character—Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique.

Leasable Minerals—Those minerals or materials designated as leasable under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium, and sodium minerals, and oil, gas, and geothermal.

Lease—(1) A legal document that conveys to an operator the right to drill for oil and gas; (2) the tract of land, on which a lease has been obtained, where producing wells and production equipment are located.

Lease Notice—Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, and operational orders. A Lease Notice also addresses special items the lessee would consider when planning operations, but does not impose new or additional restrictions.

Lease Stipulation—A modification of the terms and conditions on a standard lease form at the time of the lease sale.

Lithic Scatter—A scatter of chipped stone materials, which may include fragments, flakes, or stone tools.

Management Situation Analysis—Assessment of the current management direction. It includes a consolidation of existing data needed to analyze and resolve identified issues, a description of current BLM management guidance, and a discussion of existing problems and opportunities for solving them.

Middleground View—One of the distance zones of a landscape being viewed. This zone extends from the limit of the foreground to three to five miles from the observer.

Migration (oil and gas)—the movement of liquid and gaseous hydrocarbons from their source or generating beds, through permeable formations into reservoir rocks.

Mineral Estate (Mineral Rights) – The ownership of minerals, including rights necessary for access, exploration, development, mining, ore dressing, and transportation operations.

Mineral Reserves—Known mineral deposits that are recoverable under present conditions but are as yet undeveloped.

Mineral Rights—Mineral rights outstanding are third-party rights, an interest in minerals not owned by the person or party conveying the land to the United States. It is an exception in a deed that is the result of prior conveyance separating title of certain minerals from the surface estate.

Reserved mineral rights are the retention of ownership of all or part of the mineral rights by a person or party conveying land to the United States. Conditions for the exercising of these rights have been defined in the Secretary of the Interior's "Rules and Regulations to Govern Exercising of Mineral Rights Reserved Conveyance to the United States" attached to and made a part of deeds reserving mineral rights.

Mitigation—The abatement or reduction of an impact on the environment by (1) avoiding a certain action or parts of an action, (2) employing certain construction measures to limit the degree of impact, (3) restoring an area to preconstruction conditions, (4) preserving or maintaining an area throughout the life of a project, or (5) replacing or providing substitute resources to the environment or (6) gathering archaeological and paleontological data before disturbance.

Modification—A fundamental change in the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may, therefore, include an exemption from or alteration to a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which restrictive stipulation applies.

Multiple Use—Multiple use as defined by the Multiple Use—Sustained Yield Act 1960 means the management of all the various renewable surface resources so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will given the greatest dollar return or the greatest unit output.

National Ambient Air Quality Standards (NAAQS)—The allowable concentrations of air pollutants in the air specified by the federal government. The air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and

allowing an adequate margin of safety and requisite to protect the public welfare) from any unknown or expected adverse effects of air pollutants.

National Environmental Policy Act of 1969 (NEPA)—An Act that encourages productive and enjoyable harmony between man and his environment and promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enriches the understanding or the ecological systems and natural resources important to the Nation, and establishes the Council on Environmental Quality.

National Register of Historic Places (National Register, NRHP)—A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance. The list of sites was established by the Historic Preservation Act of 1966 and is maintained by the National Park Service.

Negligible Impact—Impact that is small in magnitude and importance and are difficult or impossible to quantify relative to those occurring naturally or due to other actions.

Nondiscretionary Closure—Those lands that must be closed to leasing for reasons beyond the discretion of the BLM. These are lands specially precluded from fluid minerals leasing by law, regulations, Secretarial or Executive Order, or that otherwise have been closed formally by decisions reached beyond the scope of the BLM.

No Surface Disturbance—In general, this applies to an area where an activity is allowed so long as it does not disturb the surface.

No Surface Occupancy (NSO)—A fluid minerals leasing constraint that prohibits occupancy or disturbance on all or part of the lease surface to protect special values or uses. Lessees may exploit the fluid mineral resources under the leases restricted by this constraint through use of directional drilling from sites outside the NSO area.

Notice to Lessees (NTL)—A written notice issued by the BLM to implement regulations and operating orders, and serve as instructions on a specific item(s) of importance within a state, district, or area.

Noxious Weed—An undesirable weed species that can crowd out more desirable species.

Off-Highway Vehicle (OHV)—A vehicle (including four-wheel drive, trail bikes, all-terrain vehicles, and snowmobiles but excluding helicopters, fixed-wing aircraft, and boats) capable of traveling off road over land, water, ice, snow, sand, marshes, and other terrain.

Off-Highway Vehicle (OHV) Designations

- Closed—Applies to areas and trails where the use of OHVs is permanently or temporarily prohibited. Emergency use of vehicles is allowed.
- Limited—Applies to areas and trails where the use of OHVs is subject to restrictions such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads or trails. Under the designated roads and trails designation, use is allowed only on roads and

trails that are signed or designated for use. Combinations of restrictions, such as limiting use to certain types of vehicles during certain times of the year, are possible.

- Open—Applies to areas and trails where OHVs may be operated subject to operating regulations and vehicle standards set forth in BLM Manuals 8341 and 8343.

Operator—Any person who has taken formal responsibility for the operations conducted on the leased lands.

Paleontology—A science dealing with the life of past geological periods as known from fossil remains.

Particulate Matter—Particular matter is regulated under the Clean Air Act. PM_{10} is particulate matter that is 10 microns or less than in effective diameter (also called Fine Particulate Matter). $PM_{2.5}$ is particulate matter that is 2.5 microns or less in effective diameter.

Patent—A grant made to an individual or group conveying fee simple title to public lands.

Perennial Stream—A stream receiving water from both surfaces and underground sources that flows throughout the entire year.

pH—A numeric value that gives the relative acidity or alkalinity of a substance on a 0 to 14 scale with the neutral point at 7. Values lower than 7 show the presence of acids, and values greater than 7 show the presence of alkalis.

Planning Area—Located in northwest New Mexico, encompasses an area of about eight million acres, including all of San Juan County, most of McKinley County, western Rio Arriba County, and northwestern Sandoval County.

Plan of Development—A mandatory plan, developed by an applicant of a mining operation or construction project, that specifies the techniques and measures to be used during construction and operation of all project facilities on public land. The plan is submitted for approval to the appropriate federal agency before any construction begins.

Plug—Any object or device that serves to block a hole or passageway, as a cement plug in a borehole.

Prehistoric—Archaeological sites resulting from the activities of aboriginal peoples native to this region, and because dating is often difficult, extending up to the reservation era (ca. A.D. 1868).

Prevention of Significant Deterioration (PSD)—A regulatory program based not on the absolute levels of pollution allowable in the atmosphere but on the amount by which a legally defined baseline condition will be allowed to deteriorate in a given area. Under this program, geographic areas are divided into three classes, each allowing different increases in nitrogen dioxide, particulate matter, and sulfur dioxide concentrations. Prevention of Significant Deterioration above legally established levels include the following:

- Class I—minimal additional deterioration in air quality (certain national parks and wilderness areas).
- Class II—moderate additional deterioration in air quality (most lands).

- Class III—greater deterioration for planned maximum growth (industrial areas).

Prime Farmland—Land that is best suited for producing food, feed, forage, fiber, and oilseed crops. The inventory of prime agricultural land is maintained by the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service).

Production Well—A well drilled in a known field that produces oil or gas.

Proposed Action—Construction activities, alignments, and other activities proposed by the applicant.

Quaternary—The younger of the two geologic periods or systems in the Cenozoic Era.

Rangeland—Land used for grazing by livestock and big game animals on which vegetation is dominated by grasses, grass-like plants, forbs, or shrubs.

Raptor—Bird of prey with sharp talons and strongly curved beak; e.g., hawk, owl, vulture, eagle.

Rare or Sensitive Species—Species that have no specific legal protection under the Endangered Species Act as threatened or endangered species, but are of special concern to agencies and the professional biologic community due to low populations, limited distributions, ongoing population decline, and/or human or natural threats to their continued existence.

Reasonable Foreseeable Development Scenario (RFDS)—The prediction of the type and amount of oil and gas activity that would occur in a given area. The prediction is based on geologic factors, past history of drilling, projected demand for oil and gas, and industry interest.

Reclamation—The process of converting disturbed land to its former use or other productive uses.

Recreation and Public Purposes (R&PP) Act—This act authorizes the Secretary of the Interior to lease or convey public lands for recreational and public purposes (R&PP), under specified conditions, to states or their political subdivisions and to nonprofit corporations and associations.

Resource Management Plan (RMP)—A land use plan that establishes land use allocations, multiple-use guidelines, and management objectives for a given planning area. The RMP planning system has been used by the BLM since 1980.

Record of Decision—A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action.

Reserve Pit—(1) Usually an excavated pit that may be lined with plastic that holds drill cuttings and waste mud. (2) Term for the pit that holds the drilling mud.

Reservoir (oil and gas)—A naturally occurring, underground container of oil and gas, usually formed by deformation of strata and changes in porosity.

Riparian—Situated on or pertaining to the bank of a river, stream, or other body of water. Normally used to refer to the plants of all types that grow along, around, or in wet areas.

Riverine—A system of wetlands that includes all wetland and deep-water habitats contained within a channel that lacks trees, shrubs, persistent emergents, and emergent mosses or lichens.

Roads—Vehicle routes that are improved and maintained by mechanical means to ensure relatively regular and continuous use. (A way maintained strictly by the passage of vehicles does not constitute a road.)

Rotation—A technique performed while cementing, whereby casing is rotated in the hole in order to move the cement slurry uniformly around the casing to eliminate channeling and provide an effective cement bond on the casing and formation walls.

Salinity—A measure of the amount of dissolved salts in water.

San Juan Basin—A large geologic basin located in northwestern New Mexico and southwestern Colorado that has been extensively drilled for oil and gas and is reportedly the second largest gas-producing basin in the continental United States.

Scoping—A term used to identify the process for determining the scope of issues related to a proposed action and for identifying significant issues to be addressed in an EIS.

Sediment—Soil or mineral transported by moving water, wind, gravity, or glaciers, and deposited in streams or other bodies of water, or on land.

Sediment Yield—The amount of sediment produced in a watershed, expressed in tons, acre feet, or cubic yards, of sediment per unit of drainage area per year.

Sedimentary Rock—Rock resulting from consolidation of loose sediment that has accumulated in layers.

Sensitive Plant Species—Those plant or animal species susceptible or vulnerable to activity impacts or habitat alterations.

Significant—An effect that is analyzed in the context of the proposed action to determine the degree or magnitude of importance of the effect, either beneficial or adverse. The degree of significance can be related to other actions with individually insignificant but cumulatively significant impacts.

Significance Criteria—Criteria identified for specific resources used to determine whether or not impacts would be significant.

Slope—The degree of deviation of a surface from the horizontal.

Soil Horizon—A distinct layer of soil, approximately parallel to the land surface, and different from adjacent, genetically related layers in physical, chemical, and biological properties or characteristics.

Soil Productivity—The capacity of a soil to produce a plant or sequence of plants under a system of management.

Soil Series—A group of soils having genetic horizons (layers) that, except for texture of the surface layer, have similar characteristics and arrangement in profile.

Soil Texture—The relative proportions of sand, silt, and clay particles in a mass of soil. Basic textural classes, in order of increasing proportions of fine particles, are: sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, and clay.

Split Estate—Refers to land where the mineral rights and the surface rights are owned by different parties. Owners of the mineral rights generally have a superior right.

Standard Lease Terms and Conditions (STC)—Areas may be open to leasing with no specific management decisions defined in a Resource Management Plan; however, these areas are subject to lease terms and conditions as defined on the lease form (Form 3100-11, Offer to Lease and Lease for Oil and Gas; and Form 3200-24, Offer to Lease and Lease for Geothermal Resources).

Stipulations—Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all federal leases. Other stipulations may be applied to the lease at the discretion of the surface management agency to protect valuable surface resources and uses.

Stratigraphy—The arrangement of strata, especially as to geographic position and chronological order of sequence.

Suitability—As used in the Wilderness Act and the Federal Land Policy and Management Act, refers to a recommendation by the Secretary of the Interior or the Secretary of Agriculture that certain federal lands satisfy the definition of wilderness in the Wilderness Act. These lands have been found appropriate for designation as wilderness on the basis of an analysis of their existing and potential uses.

Sundry Notice—Standard form to notify of or propose change of approved well operations subsequent to an Application for Permit to Drill in accordance with 43 CFR 3162.3-2.

Syncline—A fold of stratified rock inclining upward in opposite directions from both sides of its axis (opposed to anticline).

Tertiary—The older of the two geologic periods comprising the Cenozoic Era; also the system of strata deposited during that period.

Threatened or Endangered Species—Animal or plant species that are listed under the federal Endangered Species Act of 1973, as amended (federally listed), or under the Colorado or New Mexico Endangered Species Act (state listed).

Threatened Species—Any plant or animal species likely to become endangered within the foreseeable future throughout all or part of its range.

Timing Limitation (TL) (Seasonal Restriction)—A fluid minerals leasing constraint that prohibits surface use during specified time periods to protect identified resource values. The constraint does not apply to the operation and maintenance of production facilities unless analysis demonstrates that such constraints are needed and that less stringent, project- specific constraints would be insufficient.

Total Suspended Particulates (TSP)—All particulate matter less than 70 microns in effective diameter.

Valid Existing Rights—Legal interests that attach a land or mineral estate and cannot be divested from the estate until those interests expire or are relinquished.

Vandalism—Willful or malicious destruction or defacement of public property (e.g., cultural or paleontological resources).

Vegetation Manipulation—Planned alteration of vegetation communities through use of prescribed fire, plowing, herbicide spraying, or other means to gain desired changes in forage availability or wildlife cover.

Vegetation Type—A plant community with distinguishable characteristics described by the dominant vegetation present.

Viewshed—Total visible area from a single observation point, or total visible area from multiple observation points. Viewsheds are accumulated seen-areas from viewer locations. Examples are corridors, feature, or basin viewsheds.

Visual Resources—the visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

Visual Resource Management (VRM)—The inventory and planning actions taken to identify visual resource values and to establish objectives for managing those values. Also, management actions taken to achieve the established objectives.

Visual Resource Management Classes—VRM classes identify the Visual Quality Objectives (VQOs) as the degree of acceptable visual change within a particular landscape. A classification is assigned to public lands based on guidelines established for scenic quality, visual sensitivity, and visibility.

- VRM Class I—This classification preserves the existing characteristic landscape and allows for natural ecological changes only. Includes Congressionally authorized areas (wilderness) and areas approved through an RMP where landscape modification activities should be restricted.
- VRM Class II—This classification retains the existing characteristic landscape. The level of change in any of the basic landscape elements (form, line, color, texture) due to management activities should be low and not evident.
- VRM Class III—This classification partially retains the existing characteristic landscape. The level of change in any of the basic landscape elements due to management activities may be moderate and evident.
- VRM Class IV—This classification applies to areas where the characteristic landscape has been so disturbed that rehabilitation is needed. Generally considered an interim short-term classification until rehabilitation or enhancement is completed.

Visual Sensitivity—Visual sensitivity levels are a measure of public concern for scenic quality and existing or proposed visual change.

Waiver—Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

Wellbore—The hole made by the drilling bit.

Wellhead—The equipment used to maintain surface control of a well. It is formed of the casing head, tubing head, and 'Christmas tree'. Also refers to various parameters as they exist at the wellhead, such as wellhead pressure, wellhead price of oil, etc.

Wetland—Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wilderness, Wilderness Area (WA)—An area formally designated by Congress as a part of the National Wilderness Preservation System. Qualities identified by Congress in the Wilderness Act of 1964, include: size; naturalness; outstanding opportunities for solitude or a primitive and unconfined type of recreation; and supplemental values such as geological, archaeological, historical, ecological, scenic, or other features.

Wilderness Study Area (WSA)—An area determined to have wilderness characteristics as described in section 603 of the Federal Land Policy and Management Act and Section 2C of the Wilderness Act of 1964 (78 Stat. 891). WSAs are subject to interdisciplinary analysis through the BLM's land use planning system and public comment to determine their wilderness suitability. Suitable areas are recommended to the President and Congress for designation as wilderness.

Withdrawal—An action that restricts the use of public land and segregates it from the operation of some or all of the public land and mineral law. Withdrawals also are used to transfer jurisdiction of management of public lands to other federal agencies.

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Appendix H
Potential R&PP Locations Identified

Potential R&PP Locations Identified

T. 24 N., R. 9 W.
Sec. 25

T. 25 N., R. 11 W.
Sec. 18

T. 27 N., R. 11 W.
Sec. 35

T. 28 N., R. 11 W.
Sec. 10 & 15

T. 29 N., R. 10 W.
Sec. 17 & 18

T. 29 N., R. 11 W.
Sec. 3, 10, 29 & 31

T. 29 N., R. 12 W.
Sec. 2, 10, 11, 17, 18, 33 & 34

T. 30 N., R. 9 W.
Sec. 27 & 28

T. 30 N., R. 10 W.
Sec. 17 & 18

T. 30 N., R. 11 W.
Sec. 2, 3, 5, 6, 7, 10, 11, 14, 15, 17, 20, 21, 23, 26, 27 & 28

T. 30 N., R. 12 W.
Sec. 1, 2, 11, 12 & 20

T. 30 N., R. 13 W.
Sec. 26, 27 & 34

T. 30 N., R. 14 W.
Sec. 26 & 34

T. 30 N., R. 14 W.
Sec. 31

T. 31 N., R. 8 W.
Sec. 3, 4, 9 & 10

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T. 32 N., R. 6 W.
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T. 32 N., R. 7 W.
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T. 32 N., R. 10 W.
Sec. 21

T. 32 N., R. 13 W.
Sec. 10, 15 & 22

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Appendix I
OHV Management

Implementing Area Designations and Guidance for Site-Specific Planning

Introduction

Background

The off-highway portion of the Draft EIS for the FFO is a programmatic planning document and is intended to provide the environmental analysis and disclosure needed to amend OHV area designations in the proposed resource management plan.

The Draft EIS addresses the impacts of motorized wheeled OHV travel on areas currently available to cross-country travel. The proposed decision would amend the resource management plan OHV designations on approximately 1.4 million acres of public land within the FFO. This designation limits/restricts motorized wheeled cross-country travel yearlong under BLM regulations (CFR 8342). The proposed action does not change the current limited/restricted yearlong or closed designations, or designated OHV intensive use areas within the existing Special Management Areas. Site specific planning would address OHV use in each OHV Management Unit.

The programmatic Draft EIS is not intended to change existing site-specific direction to close areas or trails to the traffic types causing considerable adverse effects (43 CFR 8341.2). Identifying affected areas or trails may occur through normal administration and monitoring or may be the result of public input.

Planning Process

EIS/Plan Amendment: Planning for BLM lands involves two levels of decision. The first level, often referred to as programmatic planning, is the development or amendment of the resource management plan, which provides management direction for the various resource programs, uses, and protection measures. The resource management plan and associated amendments are intended to set out management prescriptions with goals, objectives, standards, guidelines, and terms and conditions for future decision-making through site-specific planning. This includes the designation of areas as closed, open, or restricted/limited to motorized wheeled cross-country travel.

Site-Specific Planning: The second level of planning involves the analysis and implementation of management practices designed to achieve goals and objectives of the resource management plan. This is referred to, as project, activity, or site-specific planning that requires detailed information, including the location, condition, and current use of individual roads, trails, routes, and areas. This allows the identification of when and where individual roads, trails, routes and areas will be open or closed to various types of use. This step is accomplished through the site-specific planning process at the local level, and is dependent on the availability of funds and resources. A prioritized list of areas for site-specific planning would be completed within six months after the signing of the Record of Decision for the Final EIS.

This would be consistent with the land use planning manual and handbook (Manual 1600 and Handbook H-1600-1) and any future OHV planning policy.

Prioritization for Site Specific Planning

Introduction

To ensure that site-specific planning is initiated in areas of the most need, areas would be identified by three categories to provide appropriate emphasis for their completion. Prioritization for site-specific planning would be done by OHV management unit or by SMA and would be rated as high, moderate, or low based on several factors.

Prioritization of Areas

The FFO would complete a prioritized list of areas for site-specific planning within six months of the signing of the ROD in close coordination with the public.

Factors: When determining the priorities for site-specific planning, the FFO will consider the effects of the Final EIS; Executive Orders 11644 and 11989; the National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands; coordination with the public; other partners, agencies, and tribal governments; and the factors listed below:

- Opportunity to provide a variety of OHV recreational experiences, while minimizing resource damage and conflicts.
- Risk of, or current damage to, soil watersheds, vegetation, or other natural, cultural or historic resources on public land.
- Potential to spread noxious weeds.
- Avoidance of riparian/wetland areas.
- Need to minimize harassment of wildlife or significant degradation of wildlife habitats.
- Concern for safety of all users.
- Resolution of conflicts between various user groups.
- Current or potential impacts to federally listed threatened or endangered, and sensitive species.
- Amount of public land within the disposal zone.

Categories: OHV management units and applicable SMAs will be included in one of the following categories:

HIGH PRIORITY AREAS – Areas that currently have a high level of OHV use, which has resulted in resource damage and/or user conflicts. There is the need to address all or most of the factors listed above. Site-specific planning would be initiated within two years of the resolution of any protests to the Final EIS or administrative appeals to the ROD.

MODERATE PRIORITY AREA – These areas may address some of the factors listed above, as well as identifying areas that provide OHV opportunities, and at the same time minimize user conflicts and resource damage. Site-specific planning would be started within five years (same guidelines as above).

LOW PRIORITY AREAS – Areas where the majority of the public land is in the disposal zone and/or there is low OHV use due to remoteness and distance from the major population centers. Any resource problems can be solved with emergency closures until they are resolved. There are no specific requirements for initiation of site-specific planning.

Road/Trail/Route/Area Inventory

Through site-specific planning, roads, routes, trails, and areas would be inventoried, mapped and designated as open, limited by season or type of vehicle, or closed.

Site-specific planning would identify appropriate locations and types of allowable use based on resource management plan desired conditions and management conditions. In addition, site-specific planning may identify areas for trail construction and/or improvement, or specific areas where intensive OHV use may be appropriate. Integration of other resource objectives and other types of recreational use would be incorporated at this time.

User Needs

Site-specific planning would identify issues needing resolution at the site-specific level. The following procedure would be followed:

1. Define the scope of the analysis. The boundaries of the area to be analyzed would be the prioritized OHV Management Unit and/or the Special Management Area.

2. Identify and describe vehicle travel needs for individual roads, routes, trails and areas. Consider the reasons for needing access to the area, what travel mode is needed or desired, and why people choose to participate in a specific activity in a particular place. Is access needed for:

   - Meeting recreation opportunities and demand?
   - Commodity production?
   - Water production?
   - Special use permits?
   - Rights-of-way, legal access, easements, cost-share or prescriptive rights?
   - Private in holdings?
   - Hazardous waste remediation or watershed restoration?
   - Fire protection or law enforcement?
   - Barrier-free recreation opportunities or special access accommodations as needed by individuals?
   - Other access needs?

3. Identify and describe needs and/or reasons to limit travel in the OHV Management Unit. Consider the potential effects of different uses on:

   - Wildlife habitat
   - Grazing allotments
   - Soils
   - Water quality
   - Riparian areas
   - Threatened and endangered species habitat
   - Cultural resources
   - Native vegetation
   - Conflicting uses
   - Public safety
   - Special management areas
   - Lessees and permittees
   - Other access restriction needs

Development of Alternatives

Alternatives should reflect a range of distribution strategies for agency and public land users. The distribution strategies must balance requirements for restrictions with the needs for vehicle travel. They must also address the objectives for the area. Planning prescriptions should be developed for roads, routes, trails, and areas within the analysis area.

Decision

Completion of site-specific planning for an area will establish a permanent management plan for that particular area through the designation of roads, routes, trails, and areas open, limited, or closed for a particular use.

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Appendix J
Air Quality Data

Table J-1. Annual Gas Production Data and Emissions for the BLM Farmington/Rio Puerco RMPs—Alternative A

Project Year	Wells in Production[1]	Annual Production (Bscf)[2]	Tons per Year			
			VOC	CO	NOx	PM_{10}
1	221	23.4	51	1,195	1,225	1
2	442	46.8	102	2,390	2,451	1
3	663	70.1	153	3,584	3,676	2
4	884	93.5	204	4,779	4,901	2
5	1,105	116.9	254	5,974	6,127	3
6	1,326	140.3	305	7,169	7,352	3
7	1,547	163.7	356	8,363	8,578	4
8	1,768	187.0	407	9,558	9,803	4
9	1,989	210.4	458	10,753	11,028	5
10	2,210	233.8	509	11,948	12,254	5
11	2,431	257.2	560	13,143	13,479	6
12	2,652	280.6	611	14,337	14,704	6
13	2,873	304.0	662	15,532	15,930	7
14	3,094	327.3	712	16,727	17,155	7
15	3,315	350.7	763	17,922	18,381	8
16	3,536	374.1	814	19,116	19,606	8
17	3,757	397.5	865	20,311	20,831	9
18	3,978	420.9	916	21,506	22,057	9
19	4,199	444.2	967	22,701	23,282	10
20	4,420	467.6	1,018	23,896	24,507	10
Totals	46,410	4,910				

Notes: (1) Assumes an annual growth rate of $1/20^{th}$ of the total wells assumed for the alternative, or 4,420 wells/20 years = 221 wells per year and all wells stay in production once developed.

(2) Annual production = wells in production per year * annual well production.
Annual well production = total production for the alternative/total well-years, or 4,910 billion standard cubic feet (Bscf)/46,410 well-years = 0.106 Bscf/well-year.

Table J-2. Emission Factors for Sources Associated with the BLM Farmington/Rio Puerco RMPs

Equipment Type	Emission Factor (Grams/Hp-Hr)				Source
	VOC	CO	NOx	PM_{10}	
Wellhead Compressor	0.30	13.05	13.15	0.0001	(1)
Separator Unit	5.50	40.00	94.00	7.60	(2)
Central Compressor	0.47	1.29	1.64	0.0001	(3)

Notes: (1) VOC data for a Caterpillar G3304 unit (Kaufman 2001). CO and NOx data from source test survey of units from 65-145 Hp (AQB 2001a). PM_{10} data from AP-42 (EPA 2000), Section 3.2, Table 3.2.2.

(2) AP-42 Section 1.4, residential furnaces. Units in pounds per million cubic feet of gas.

(3) VOC data for a Caterpillar G3312 unit (Caterpillar Inc., 2001). CO and NOx data from source test survey of units from 2,500-4,500 Hp (AQB 2001a). PM_{10} data from AP-42 (EPA 2000), Section 3.2, Table 3.2.2.

Table J-3. Operational Data for Emission Sources Associated with the BLM Farmington/Rio Puerco RMPs—Alternative A

Scenario/Equipment Type	Horse-power	Load Factor	Hourly Hp-Hr	Annual Hp-Hr	Hourly Fuel Use (scf)	Annual Fuel Use (Mscf)
Average Producing Well						
Wellhead Compressor - Cat G3304[1]	95	0.43	40	353,685	341	2.99
Separator Unit[2]	250,000	0.25	62,500	N/A	69	0.60
Annual Central Compression Needs						
Central Compressor - Cat 3612[3]	6,040	0.90	5,436	47,619,360	40,605	355.70

Notes: (1) Wellhead compressors expected at 50% of the proposed wells and would operate at 100% load and 85% of the year. Therefore, the annualized load factor per well is 42.5%. Gas heating values = 905 BTUs.

(2) Separator units expected at 50% of proposed wells and would operate at 100% load and 50% of the year. Therefore, the annualized load factor per well is 25%. Horsepower = unit firing rate of 250,000 BTUs/Hr and Hourly Hp-Hr = hourly firing rate of 62,500 BTUs/Hr.

(3) Central compression would reach 120,800 Hp by the end of the 20-year project period. Implementation assumed to be at a rate of 120,800 Hp/20 years = 6,040 Hp/year. The annualized load factor is 90%.

Table J-4. First Year Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative A

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	25.8	1,124.4	1,133.0	0.0
Separator Units	0.4	2.7	6.3	0.5
Central Compression	24.7	67.7	86.1	0.0
Alternative A - Tons per Year	**50.9**	**1,194.8**	**1,225.4**	**0.5**
P&A Wells - Tons per Year	**(8.3)**	**(340.9)**	**(344.9)**	**(0.2)**
Alternative A Net Change (Alt A - P&A)	**42.6**	**853.8**	**880.5**	**0.4**

Table J-5. Year 20 Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative A

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	517.0	22,487.8	22,660.1	0.2
Separator Units	7.4	53.5	125.7	10.2
Central Compression	493.4	1,354.3	1,721.7	0.1
Alternative A - Tons per Year	**1,017.7**	**23,895.5**	**24,507.5**	**10.4**
P&A Wells - Tons per Year	**(273.7)**	**(11,273.8)**	**(11,404.7)**	**(5.1)**
Alternative A Net Change (Alt A - P&A)	**744.1**	**12,621.7**	**13,102.7**	**5.3**

Table J-6. Reduction of Annual Production and Emissions for the BLM Farmington/Rio Puerco RMPs—P&A Wells

Project Year	New Wells P&Aed[1]	Cumulative Wells P&Aed[1]	Annual Production Loss (Bscf)[2]	Tons per Year			
				VOC	CO	NOx	PM_{10}
1	133	133	3.7	8	341	345	0
2	140	273	7.6	17	699	707	0
3	147	419	11.7	26	1,075	1,087	0
4	154	573	16.1	36	1,470	1,487	1
5	162	735	20.6	46	1,884	1,906	1
6	170	905	25.3	56	2,319	2,346	1
7	178	1,083	30.3	67	2,776	2,808	1
8	187	1,270	35.6	79	3,256	3,294	1
9	197	1,467	41.1	91	3,759	3,803	2
10	206	1,673	46.8	104	4,288	4,338	2
11	217	1,890	52.9	118	4,844	4,900	2
12	227	2,117	59.3	132	5,427	5,490	2
13	239	2,356	66.0	147	6,039	6,109	3
14	251	2,607	73.0	162	6,682	6,760	3
15	263	2,870	80.4	179	7,357	7,443	3
16	276	3,146	88.1	196	8,066	8,160	4
17	290	3,437	96.2	214	8,810	8,913	4
18	305	3,742	104.8	233	9,592	9,703	4
19	320	4,062	113.7	253	10,412	10,533	5
20	336	4,398	123.1	274	11,274	11,405	5
Totals	**4,398**	**39,153**	**1,096**				

Notes: (1) Assumes an annual growth rate of 5%.

(2) Annual production loss = wells in production per year * annual well production. Annual well production = total production for the alternative/total well-years, or 11,158 Bscf/139,556 well-years = 0.07995 Bscf/well-year.

Table J-7. Operational Data for Emission Sources Associated with P&A Wells—BLM Farmington/Rio Puerco RMPs

Scenario/Equipment Type	Horse-power	Load Factor	Hourly Hp-Hr	Annual Hp-Hr	Hourly Fuel Use (scf)	Annual Fuel Use (Mscf)
Average Producing Well						
Wellhead Compressor - Cat G3304[1]	95	0.21	20	177,259	171	1.50
Separator Unit[2]	250,000	0.13	31,250	N/A	35	0.30
Annual Central Compression Needs						
Central Compressor - Cat 3612[3]	0.68	0.90	1	5,361	5	0

Notes: (1) Wellhead compressors expected at 25% of the proposed wells and would operate at 100% load and 85% of the year. Therefore, the annualized load factor per well is 21.3%. Gas heating values = 905 BTUs.

(2) Separator units assumed at 25% of P&A wells and would operate at 100% load and 50% of the year. Therefore, the annualized load factor/well is 12.5%. Horsepower = unit firing rate of 250,000 BTU/Hr and Hourly Hp-Hr = hourly firing rate of 62,500 BTUs/Hr.

(3) Represents central compression associated with one P&A well-year.

Table J-8. First Year Annual Emissions Associated with P&A Wells—BLM Farmington/Rio Puerco RMPs

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	7.8	339.1	341.7	0.0
Separator Units	0.1	0.8	1.9	0.2
Central Compression	0.4	1.0	1.3	0.0
P&A Wells - Tons per Year	**8.3**	**340.9**	**344.9**	**0.2**

Table J-9. Year 20 Annual Emissions Associated with P&A Wells—BLM Farmington/Rio Puerco RMPs

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	257.8	11,213.7	11,299.6	0.1
Separator Units	3.7	26.6	62.5	5.1
Central Compression	12.2	33.5	42.6	0.0
P&A Wells - Tons per Year	**273.7**	**11,273.8**	**11,404.7**	**5.1**

Table J-10. Annual Gas Production Data and Emissions for the BLM Farmington/Rio Puerco RMPs—Alternative B

Project Year	Wells in Production[1]	Annual Production (Bscf)[2]	Tons per Year			
			VOC	CO	NOx	PM_{10}
1	664	53.1	152	3,587	3,678	2
2	1,328	106.3	305	7,174	7,357	3
3	1,991	159.4	457	10,760	11,035	5
4	2,655	212.5	609	14,347	14,713	6
5	3,319	265.7	761	17,934	18,391	8
6	3,983	318.8	914	21,521	22,070	9
7	4,646	371.9	1,066	25,108	25,748	11
8	5,310	425.1	1,218	28,694	29,426	13
9	5,974	478.2	1,370	32,281	33,104	14
10	6,638	531.3	1,523	35,868	36,783	16
11	7,301	584.5	1,675	39,455	40,461	17
12	7,965	637.6	1,827	43,042	44,139	19
13	8,629	690.7	1,979	46,628	47,818	20
14	9,293	743.9	2,132	50,215	51,496	22
15	9,956	797.0	2,284	53,802	55,174	24
16	10,620	850.1	2,436	57,389	58,852	25
17	11,284	903.3	2,588	60,976	62,531	27
18	11,948	956.4	2,741	64,562	66,209	28
19	12,611	1,009.5	2,893	68,149	69,887	30
20	13,275	1,062.7	3,045	71,736	73,565	31
Totals	**139,388**	**11,158**				

Notes: (1) Assumes an annual growth rate of 1/20th of the total wells assumed for the alternative, or 13,275 wells/20 years = 664 wells per year and all wells stay in production once developed.

(2) Annual production = wells in production per year * annual well production. Annual well production = total production for the alternative/total well-years, or 11,158 Bscf/139,388 well-years = 0.08 Bscf/well-year.

Table J-11. Operational Data for Emission Sources Associated with the BLM Farmington/Rio Puerco RMPs—Alternative B

Scenario/Equipment Type	Horse-power	Load Factor	Hourly Hp-Hr	Annual Hp-Hr	Hourly Fuel Use (scf)	Annual Fuel Use (Mscf)
Average Producing Well						
Wellhead Compressor - Cat G3304[1]	95	0.43	40	353,685	341	2.99
Separator Unit[2]	250,000	0.25	62,500	N/A	69	0.60
Annual Central Compression Needs						
Central Compressor - Cat 3612[3]	18,000	0.90	16,200	141,912,000	121,008	1,060

Notes: (1) Wellhead compressors expected at 50% of the proposed wells and would operate at 100% load and 85% of the year. Therefore, the annualized load factor per well is 42.5%. Gas heating values = 905 BTUs.

(2) Separator units expected at 50% of proposed wells and would operate at 100% load and 50% of the year. Therefore, the annualized load factor per well is 25%. Horsepower = unit firing rate of 250,000 BTU/Hr and Hourly Hp-Hr = hourly firing rate of 62,500 BTUs/Hr.

(3) Central compression would reach 360,000 Hp by the end of the 20-year project period. Implementation assumed to be at a rate of 360,000 Hp/20 years = 18,000 Hp/year. The annualized load factor is 90%.

Table J-12. First Year Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative B

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	77.6	3,377.0	3,402.9	0.0
Separator Units	1.1	8.0	18.9	1.5
Central Compression	73.5	201.8	256.5	0.0
Alternative B - Tons per Year	**152.3**	**3,586.8**	**3,678.3**	**1.6**
P&A Wells - Tons per Year	**(8.3)**	**(340.9)**	**(344.9)**	**(0.2)**
Alternative B Net Change (Alt B - P&A)	**144.0**	**3,245.9**	**3,333.4**	**1.4**

Table J-13. Year 20 Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative B

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM^{10}
Wellhead Compressors	1,552.6	67,539.6	68,057.2	0.5
Separator Units	22.1	160.6	377.5	30.5
Central Compression	1,470.4	4,035.9	5,130.9	0.3
Alternative B - Tons per Year	**3,045.1**	**71,736.1**	**73,565.5**	**31.3**
P&A Wells - Tons per Year	**(273.7)**	**(11,273.8)**	**(11,404.7)**	**(5.1)**
Alternative B Net Change (Alt B - P&A)	**2,771.5**	**60,462.3**	**62,160.7**	**26.2**

Table J-14. Annual Gas Production Data and Emissions for the BLM Farmington/Rio Puerco RMPs—Alternative C

Project Year	Wells in Production[1]	Annual Production (Bscf)[2]	Tons per Year			
			VOC	CO	NOx	PM_{10}
1	492	52.4	113	2,658	2,726	1
2	984	104.8	226	5,316	5,451	2
3	1,475	157.2	339	7,973	8,177	3
4	1,967	209.6	451	10,631	10,902	5
5	2,459	262.0	564	13,289	13,628	6
6	2,951	314.3	677	15,947	16,353	7
7	3,443	366.7	790	18,604	19,079	8
8	3,934	419.1	903	21,262	21,805	9
9	4,426	471.5	1,016	23,920	24,530	10
10	4,918	523.9	1,129	26,578	27,256	12
11	5,410	576.3	1,242	29,235	29,981	13
12	5,902	628.7	1,354	31,893	32,707	14
13	6,393	681.1	1,467	34,551	35,432	15
14	6,885	733.5	1,580	37,209	38,158	16
15	7,377	785.9	1,693	39,866	40,884	17
16	7,869	838.2	1,806	42,524	43,609	19
17	8,361	890.6	1,919	45,182	46,335	20
18	8,852	943.0	2,032	47,840	49,060	21
19	9,344	995.4	2,144	50,497	51,786	22
20	9,836	1,047.8	2,257	53,155	54,511	23
Totals	**103,278**	**11,002**				

Notes: (1) Assumes an annual growth rate of 1/20th of the total wells assumed for the alternative, or 13,275 wells/20 years = 664 wells per year and all wells stay in production once developed.

(2) Annual production = wells in production per year * annual well production. Annual well production = total production for the alternative/total well-years, or 11,158 Bscf/139,388 well-years = 0.08 Bscf/well-year.

Table J-15. Operational Data for Emission Sources Associated with the BLM Farmington/Rio Puerco RMPs—Alternative C

Scenario/Equipment Type	Horse-power	Load Factor	Hourly Hp-Hr	Annual Hp-Hr	Hourly Fuel Use (scf)	Annual Fuel Use (Mscf)
Average Producing Well						
Wellhead Compressor - Cat G3304[1]	95	0.43	40	353,685	341	2.99
Separator Unit[2]	250,000	0.25	62,500	N/A	69	0.60
Annual Central Compression Needs						
Central Compressor - Cat 3612[3]	13,350	0.90	12,015	105,251,400	89,747	786

Notes: (1) Wellhead compressors expected at 50% of the proposed wells and would operate at 100% load and 85% of the year. Therefore, the annualized load factor per well is 42.5%. Gas heating values = 905 BTUs.

(2) Separator units expected at 50% of proposed wells and would operate at 100% load and 50% of the year. Therefore, the annualized load factor per well is 25%. Horsepower = unit firing rate of 250,000 BTU/Hr and Hourly Hp-Hr = hourly firing rate of 62,500 BTUs/Hr.

(3) Central compression would reach 267,000 Hp by the end of the 20-year project period. Implementation assumed to be at a rate of 267,000 Hp/20 years = 13,350 Hp/year. The annualized load factor is 90%.

Table J-16. First Year Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative C

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	57.5	2,502.1	2,521.3	0.0
Separator Units	0.8	6.0	14.0	1.1
Central Compression	54.5	149.7	190.3	0.0
Alternative C - Tons per Year	**112.9**	**2,657.8**	**2,725.6**	**1.2**
P&A Wells - Tons per Year	**(8.3)**	**(340.9)**	**(344.9)**	**(0.2)**
Alternative C Net Change (Alt C - P&A)	**104.6**	**2,316.8**	**2,380.7**	**1.0**

Table J-17. Year 20 Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative C

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM^{10}
Wellhead Compressors	1,150.4	50,042.9	50,426.4	0.4
Separator Units	16.4	119.0	279.7	22.6
Central Compression	1,090.6	2,993.3	3,805.4	0.2
Alternative C - Tons per Year	**2,257.3**	**53,155.2**	**54,511.4**	**23.2**
P&A Wells - Tons per Year	**(273.7)**	**(11,273.8)**	**(11,404.7)**	**(5.1)**
Alternative C Net Change (Alt C - P&A)	**1,983.7**	**41,881.4**	**43,106.7**	**18.1**

Table J-18. Annual Gas Production Data and Emissions for the BLM Farmington/Rio Puerco RMPs—Alternative D

Project Year	Wells in Production[1]	Annual Production (Bscf)[2]	Tons per Year			
			VOC	CO	NOx	PM_{10}
1	497	53.0	114	2,686	2,755	1
2	994	106.0	228	5,373	5,510	2
3	1,491	158.9	342	8,059	8,265	4
4	1,988	211.9	456	10,746	11,020	5
5	2,486	264.9	571	13,432	13,775	6
6	2,983	317.9	685	16,119	16,530	7
7	3,480	370.8	799	18,805	19,285	8
8	3,977	423.8	913	21,492	22,040	9
9	4,474	476.8	1,027	24,178	24,795	11
10	4,971	529.8	1,141	26,865	27,550	12
11	5,468	582.7	1,255	29,551	30,305	13
12	5,965	635.7	1,369	32,238	33,060	14
13	6,462	688.7	1,483	34,924	35,815	15
14	6,959	741.7	1,598	37,611	38,570	16
15	7,457	794.6	1,712	40,297	41,325	18
16	7,954	847.6	1,826	42,984	44,081	19
17	8,451	900.6	1,940	45,670	46,836	20
18	8,948	953.6	2,054	48,356	49,591	21
19	9,445	1,006.5	2,168	51,043	52,346	22
20	9,942	1,059.5	2,282	53,729	55,101	23
Totals	**104,391**	**11,125**				

Notes: (1) Assumes an annual growth rate of 1/20th of the total wells assumed for the alternative, or 13,275 wells/20 years = 664 wells per year and all wells stay in production once developed.

(2) Annual production = wells in production per year * annual well production. Annual well production = total production for the alternative/total well-years, or 11,158 Bscf/139,388 well-years = 0.08 Bscf/well-year.

Table J-19. Operational Data for Emission Sources Associated with the BLM Farmington/Rio Puerco RMPs—Alternative D

Scenario/Equipment Type	Horse-power	Load Factor	Hourly Hp-Hr	Annual Hp-Hr	Hourly Fuel Use (scf)	Annual Fuel Use (Mscf)
Average Producing Well						
Wellhead Compressor - Cat G3304[1]	95	0.43	40	353,685	341	2.99
Separator Unit[2]	250,000	0.25	62,500	N/A	69	0.60
Annual Central Compression Needs						
Central Compressor - Cat 3612[3]	13,500	0.90	12,150	106,434,000	90,756	795

Notes: (1) Wellhead compressors expected at 50% of the proposed wells and would operate at 100% load and 85% of the year. Therefore, the annualized load factor per well is 42.5%. Gas heating values = 905 BTUs.

(2) Separator units expected at 50% of proposed wells and would operate at 100% load and 50% of the year. Therefore, the annualized load factor per well is 25%. Horsepower = unit firing rate of 250,000 BTU/Hr and Hourly Hp-Hr = hourly firing rate of 62,500 BTUs/Hr.

(3) Central compression would reach 270,000 Hp by the end of the 20-year project period. Implementation assumed to be at a rate of 270,000 Hp/20 years = 13,500 Hp/year. The annualized load factor is 90%.

Table J-20. First Year Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative D

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM_{10}
Wellhead Compressors	58.1	2,529.1	2,548.5	0.0
Separator Units	0.8	6.0	14.1	1.1
Central Compression	55.1	151.3	192.4	0.0
Alternative D - Tons per Year	**114.1**	**2,686.5**	**2,755.0**	**1.2**
P&A Wells - Tons per Year	**(8.3)**	**(340.9)**	**(344.9)**	**(0.2)**
Alternative D Net Change (Alt D - P&A)	**105.8**	**2,345.5**	**2,410.1**	**1.0**

Table J-21. Year 20 Annual Emissions Associated with the BLM Farmington/Rio Puerco RMPs—Alternative D

Equipment Type	Tons per Year			
	VOC	CO	NOx	PM^{10}
Wellhead Compressors	1,162.8	50,582.2	50,969.8	0.4
Separator Units	16.5	120.3	282.7	22.9
Central Compression	1,102.8	3,026.9	3,848.1	0.2
Alternative D - Tons per Year	**2,282.2**	**53,729.4**	**55,100.7**	**23.5**
P&A Wells - Tons per Year	**(273.7)**	**(11,273.8)**	**(11,404.7)**	**(5.1)**
Alternative D Net Change (Alt D – P&A)	**2,008.5**	**42,455.6**	**43,695.9**	**18.3**

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Appendix K
Summary of Major Federal, State, and County Authorizing Actions

ACTS OF AUTHORITY AND MANDATES

A series of statutes establish and define the authority of the Secretary of the Interior to make decisions regarding fluid minerals leasing and development. The major relevant statutes are briefly described below.

Table K-1. Major Federal, State, and County Authorizing Actions

Agency and Permit/Approval	Nature of Action	Authority	Application
BLM			
Decision Record for proposed action	Evaluate environmental impacts of proposed action	National Environmental Policy Act (NEPA)	Proposed Federal Action
Permit to Drill	Provide for compliance with regulations and requirements during drilling and completion phases of the well	Mineral Leasing Act of 1920; Federal Oil and Gas Royalty Management Act of 1982; Secretarial Order No. 3087; Amendment No. 1, February 7, 1983; Regulatory controls under 43 Code of Federal Regulations (CFR) 3160	Proposed injection wells and oil and gas wells
Rights-of-way	Grant right-of-way and potentially evaluate the environmental impacts of proposed action	NEPA, Federal Land Policy and Management Act (FLPMA), Mineral Leasing Action of 1920	Pipeline, electrical lines, access roads
Notice of Intent to conduct geophysical exploration	Protect resource values during geophysical exploration activities	FLPMA, Mineral Leasing Act of 1920	Proposed action
Approval to dispose of produced water	Controls disposal of produced water from Federal leases	Mineral Leasing Act of 1920, Regulatory controls under 43 CFR 3160	Well
Permit to use earthen pit (part of Application for Permit to Drill)	Regulates reserve pits on drilling location	Mineral Leasing Act of 1920, Regulatory controls under 43 CFR 3160	Well
Authorization for flaring and venting of gas	Regulates flaring and venting of gas	Mineral Leasing Act of 1920, Regulatory controls under 43 CFR 3160	Well testing and Evaluation
Temporary abandonment of a well	Regulates temporary abandonment of wells	Mineral Leasing Act of 1920, Regulatory controls under 43 CFR 3160	Successful well
Plugging and abandonment of a well	Establishes procedures for permanent abandonment	Mineral Leasing Act of 1920, Regulatory controls under 43 CFR 3160	Dry hole

Agency and Permit/Approval	Nature of Action	Authority	Application
U.S. Army Corps of Engineers			
Section 404 permit	Issue a permit for placement of fill or dredge materials in waters of the United States or adjacent wetlands	Section 404, Clean Water Act (CWA)	Pipeline, road, proposed actions in waters of the United States
U.S. Fish and Wildlife Service			
Consultation process, threatened or endangered species	Review potential impacts on Federally listed and candidate threatened and endangered species	Section 7 of the Endangered Species Act	Federal action
U.S. Environmental Protection Agency			
(Administered by New Mexico Water Quality Control Commission) Stormwater discharge permits (National Pollutant Discharge Elimination System permits)	Regulate discharge to surface waters from point sources	Federal Water Pollution Control Act Amendments and Section 404(p) of CWA	Construction activities disturbing one or more acres
Permit for approval to dispose produced water (also must be approved by the surface management agency)	Issue permit to allow underground injection of produced water	Federal Safe Drinking Water Act, 40 CFR Parts 144 and 147	Underground injection control
(Administered by the Oil Conservation Division of the New Mexico Energy and Minerals Department) Underground Injection Control permit	Ensure potable aquifers are not adversely affected by injection of produced water	Federal Safe Drinking Water Act Underground Injection Control program (40 CFR Parts 144 and 146.22 and 40 CFR Parts 100 to 149, July 1, 1991 revision), Onshore Order No. 7	New injection well
Spill prevention, control, and countermeasure plan	Pollution control	40 CFR Part 112	Drilling operations
New Mexico State Historic Preservation Officer			
Cultural resource Clearance	Review and consultation	Historic Preservation Act of 1966, State Cultural Properties Act of 1977	All proposed action components
New Mexico State Engineer Office			
Permit to appropriate groundwater within declared groundwater basins; approval to use surface water rights	Regulate groundwater use, permit for water wells; regulate surface water use, surface water right	New Mexico Oil and Gas Act, Water Quality Act, NM State Constitution (surface water rights)	All well development

Agency and Permit/Approval	Nature of Action	Authority	Application
New Mexico Energy, Minerals, and Natural Resources Department – Oil Conservation Division			
Permit to drill, re-enter, deepen, plugback, or add a zone (Form C-101)	Permit new wells	New Mexico Oil and Gas Act	New well development
Request for allowable and authorization to transport oil and natural gas (Form C-104)	Permit new wells	New Mexico Oil and Gas Act	New well development
Spill report	Notification of fire, breaks, leaks, spills, and blowouts	OCD Rule 116	In the event of fire, breaks, leaks, spills, and blowouts at drilling operations
New Mexico Environment Department – Air Quality Bureau			
Air emission permits	Permit new sources	Clean Air Act	Combustion sources, compressors, volatile chemical handling, storage piles, and storage tanks

Source: BLM 2000.

REFERENCES

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Appendix L
A Broad Comparison of Coalbed Methane Operations in the San Juan Basin and Powder River Basin

A BROAD COMPARISON OF COALBED METHANE OPERATIONS IN THE SAN JUAN BASIN AND POWDER RIVER BASIN

The following discussion is an overview of coalbed methane (CBM) operations in the San Juan basin of northwestern New Mexico and the Powder River basin of central Wyoming. It includes a brief description of how CBM is formed and provides the basis examining why production operations may vary from play to play.

The production of CBM gas varies according to the physical nature of the gas reservoir and its hydrogeologic setting. CBM is a natural gas that is generated during the conversion of plant materials to coal and is associated with coal beds. It is formed as plant material accumulated in swamps and bogs was subsequently buried in an anoxic environment. The plant material was initially converted to peat as a result of increasing heat and pressure, then to higher grades of coal such as lignite, subbituminous and bituminous coal, and finally, to anthracite. This process is called coalification. Geologic conditions determine the quality of coal that is formed. Thermogenic methane is formed when the temperature in the coalbed exceeds that in which bacteria can live. Secondary, biogenic gas is that gas that is generated by microbes at the coal cleat-water interface. CBM can be adsorbed on the coal, absorbed within the micropores of the coal, stored as free gas in natural fractures called cleats, or contained within water occupying the cleats as solution gas. As coalification takes place, volatile hydrocarbons (usually ethane), carbon dioxide, nitrogen, and water are accumulated. Some gas may escape to the surface or migrate into adjacent rock reservoirs. CBM consists of more than 98 percent methane.

CBM production depends upon the degree of water saturation in the coal cleats and the formation pressure. Considerable CBM is absorbed to the surfaces of the coal matrix and is not free to migrate until water pressure is relieved by lowering the hydrostatic head. Coal that is gas-saturated yields gas upon initial production. Coal that is water-saturated must be depressurized, or dewatered, to facilitate gas desorption. Initial production from water-saturated reservoirs consists of water and little commercial gas (Ayers 2002). Over time, volumes of water produced from a wellbore typically decrease, and CBM production increases as coalbeds near the wellbore are dewatered (USGS 2000).

FRUITLAND FORMATION IN THE SAN JUAN BASIN

Coalbed gas in the San Juan Basin is produced from the Cretaceous Fruitland formation. Production of CBM from the Fruitland coalbeds began in the late 1980s. As of 2000, more than 80 percent of the CBM production in the United States originated from the San Juan basin. The Fruitland coalbeds formed in coastal plain settings and consist of many interfingering deposits. The coalbeds exhibit a net thickness of 50 to 70 feet. A typical wellbore may encounter 6 to 12 coalbeds with a maximum thickness of 20 to 30 feet for any particular coalbed (Ayers 2002).

Studies conducted in the late 1980s determined that coalbed gas occurrence could be defined as three distinct trends, each exhibiting different gas compositions and production characteristics. Trend 1, in the northeastern part of the basin, is named the "fairway" and is the most productive trend. Trend 2 extends from the central part of the basin to its western edge, and Trend 3 includes the eastern and southern part of the basin. Trend 1 is an overpressured area containing thermogenic CBM and up to 30 percent secondary biogenic gas. Trends 2 and 3 result from coalbeds that are less thermally mature and exhibit a lower gas content. Trend 3 is characterized by low permeability coal and limited coalbed gas production.

Groundwater recharge occurs at the northern edge of the San Juan basin. Trend 1 water is characterized by sodium bicarbonate and low chlorides. Total dissolved solids range from moderately to high values. Both chlorides and total dissolved solids (TDS) increase in waters contained in the coalbeds of Trend 3. A hydrochemical boundary occurs at the boundary of the overpressured Trend 1 and underpressured Trends 2 and 3. Waters in Trends 2 and 3 are high chloride waters. The amount of water produced in association with coalbed gas is greatest with fairway wells. In 1992, the average amount of water produced with a CBM well in the northern part of the basin was approximately 250 barrels of water daily. Average daily water production decreases toward the south (Ayers 2002).

There are approximately 3,100 Fruitland wells, 600 of which are in the fairway. Fruitland wells are drilled on 320-acre spacing to an average depth of 2,600 feet. Fruitland coalbed wells in the fairway are usually completed as open-hole cavities at depths that range from 750 to 3,600 feet and produce up to 6 million cubic feet (MMcf) gas per day. Permeability in the Fruitland is facilitated by two face-cleat systems and is highest in the fairway. Fracture stimulation with water may be required to enhance producibility. Parts of the basin in Trends 2 and 3 may require fracture simulation through a cased wellbore. These wells produce from 50 to 500 thousand cubic feet (Mcf) gas per day (Ayers 2002). A few horizontal wells have been drilled in the Fruitland; however, the incremental amount of production did not offset the increased cost of drilling and completion (Palmer et al. 1993).

FORT UNION FORMATION IN THE POWDER RIVER BASIN

Coalbed gas in the Powder River basin is produced from the Tertiary Fort Union formation. Although some CBM drilling in the Powder River basin was initiated in the late 1980s, it was in the late 1990s that the potential of the Fort Union CBM play was recognized. The Powder River basin is currently the most active area of CBM drilling in the United States. These coalbeds are shallow (less than 3,000 feet) and thermally immature (subbituminous coal). The net thickness of the coalbeds ranges from 50 to greater than 215 feet. The center of the basin is overpressured because of greater adsorbed gas content. There are two depositional theories that describe the formation of the Fort Union coalbeds; however, both models reflect thick, extensive coal beds that split and pinch out from the basin center.

The Fort Union contains an abundance of low concentrations of biogenic methane and is considered a major aquifer. Groundwater recharge occurs primarily along the eastern outcrop of the formation. Biogenic methane and carbon dioxide are generated by microbes within the dynamic formation water. When water is produced in association with CBM production, it can sometimes be disposed of into surface drainages, streams, or ponds for beneficial use (Ayers 2002). Water quality is considered good. TDS levels for water released on the surface for beneficial uses range from 1,000 to 2,000 milligrams per liter (mg/L) (USGS 2000).

Although very thick, the low gas content, low pressure, high permeability coals of the Powder River were not at first thought to be good candidates for CBM development. The Powder River basin currently contains approximately 8,167 CBM wells, with 3,655 wells being drilled in 2001 (Ayers 2002). Fort Union wells are drilled on 80-acre spacing. Most wells are less than 750 feet deep. In the Powder River basin, operators have learned to complete shallow wells, pump large quantities of water to move low-pressure gas at a low cost. Some operators are examining the possibility of drilling horizontal wells although the shallow total vertical well depth would make drilling and production difficult (Lang 2000). Fort Union coalbeds are usually produced through open hole completions in a single thick coal seam. Light water fracture stimulation is sometimes required to facilitate production. Average gas production of the wells ranges from 130 to 350 Mcf gas per day after the well has been depressurized for several months. The average amount of water

produced from a typical CBM well ranges from approximately 200 barrels to 500 barrels of water daily. Deeper wells in the more central part of the basin may produce greater than 1,000 barrels of water per day. Average daily water production decreases toward the southern part of the basin (Ayers 2002). The average economic life of a Fort Union CBM well is approximately seven years.

COMPARISIONS BETWEEN FRUITLAND AND FORT UNION CBM PRODUCTION

Operators have discovered that rules of thumb determined while drilling for CBM in the San Juan basin cannot be universally applied to other CBM reservoirs. According to reservoir engineers who work with CBM, "The one thing coalbed methane plays in the US have in common is that they are all different. You have to consider the complete package of coal characteristics, regional geology, and infrastructure" (Lang 2000). Analyzing geologic and hydrogeologic controls along with appropriate production techniques define the key elements of CBM occurrence and producibility. Structural and depositional history determines the thermal maturation of a coalbed, cleat characteristics, and hydrology. The degree of thermal maturation corresponds to the CBM saturation in the coalbed. Cleat characteristics determine the degree of permeability. Hydrological constraints determine the amount and the chemical composition of the subsurface water contained in the coalbed formations (Avery 2002).

Horizontal drilling and completion techniques may be more successful when accessing a single extensive coalbed rather than accessing multiple vertical layers of coalbeds. Although horizontal drilling has been economically prohibitive in the San Juan basin, it may be a feasible technology to employ in the Powder River basin.

Dewatering the coal seam to release and produce CBM through the wellbore has also been known to release methane to the surface in areas where the coalbed is located relatively near the surface (Merschat 1999). Shallow coalbeds are more likely to vent methane to the surface as the coalbeds are dewatered. The average depth of a Fruitland coalbed is much deeper the average depth of a Powder River coalbed; however, gas seepage has been noted in both the Powder River basin and the rim of the San Juan basin near Fruitland coals outcrop. Gas seepage can result in dead vegetation, an increase in the methane content of surface soils, and an apparent increase in the occurrence of methane in domestic water wells (BLM 1999). Dewatering the producing formation can also result in the lowering of the water table, adversely impacting water production from water wells producing from the Fort Union formation.

CBM wells producing from the Fruitland formation in the San Juan basin produce, in general, less water than the average amount of water produced in association with CBM in the Powder River basin. Because the water in the Powder River basin is potable (less than 500 mg/L TDS), a large portion of CBM-produced water could be stored or released on the surface.

Although research is being performed to investigate remediation of San Juan basin CBM-produced water for beneficial use, the high-TDS water produced in the San Juan basin will continue to be injected into deep subsurface formations until an alternative disposal technology is substantiated.

CBM-produced water is not typically reinjected into the producing formation to enhance recovery through fracture stimulation (USGS 2000).

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Appendix M
Summary of Section 7 Consultation for Threatened/Endangered/Proposed Species

SUMMARY OF SECTION 7 CONSULTATION FOR THREATENED/ENDANGERED/PROPOSED SPECIES

Section 7 (a) (2.) of the Endangered Species Act requires that Federal agencies proposing any activities which may affect Federal listed Threatened or Endangered species consult with the U.S. Fish and Wildlife Service to ensure that they are not likely to jeopardize the existence of listed species or adversely modify designated critical habitat. As part of the consultation process, a biological assessment (BA) was prepared to determine potential effects of activities proposed in the Draft Farmington Resource Management Plan (DRMP) on listed species and critical habitat. The following summarizes the consultation process and provides key excerpts from the BA prepared for the DRMP. The full document contains 109 pages, excluding maps, and is on file at the FFO.

CONSULTATION HISTORY

The Farmington Field Office sent a letter to the U.S. Fish and Wildlife Service on April 25, 2001, requesting a list of Federal Threatened, Endangered, or Proposed species for the project area. A response was received on May 30, 2001 (Cons. #2-22-01-I-389). A draft Biological Assessment was prepared and sent to USFWS for preliminary review. A coordination meeting between the USFWS Albuquerque Field Office and BLM Farmington Field Office staffs was held on July 30, 2002, to discuss the species present in the area and how they might be affected by the actions proposed in the DRMP. The Final BA was delivered to USFWS on September 24, 2002. On October 2, 2002, the USFWS sent a memorandum confirming their concurrence with the effects determinations contained in the BA and concluding Section 7 consultation.

BIOLOGICAL ASSESSMENT EXCERPTS

Eight federally listed and one proposed species are known to occur or have the potential to occur within the planning area (**Table M-1**). In addition, designated critical habitat for the Mexican spotted owl (*Strix occidentalis lucida*) occurs on FFO land. Critical habitat for the Colorado pikeminnow includes part of the San Juan River and the 100-year floodplain from the State Highway 371 Bridge in Farmington down to Lake Powell. This includes all FFO river tracts along the San Juan River between West Farmington and the border of The Navajo Nation. All nine species and the critical habitat will be assessed for the FFO land. Fewer species will be assessed on other federal land because fewer species occur or have the potential to occur on these lands. No designated critical habitat exists outside of the FFO area. The effects of oil and gas development are analyzed for the Knowlton's cactus (*Pediocactus* knowltonii) and bald eagle (*Haliaeetus lecocephalus*) on USBR land, and the mountain plover (*Charadrius montanus*) and southwestern willow flycatcher on AFO land.

Biological Evaluations (BEs), prepared for the grazing allotments on FFO land (BLM 1999a,b,c,d; 2000b; 2001a), addressed BLM's grazing program and evaluated its potential impacts on federally listed and proposed species and critical habitat. It was determined that grazing in six allotments bordering Navajo Reservoir may affect, but is not likely to adversely affect, wintering bald eagles in five allotments, Colorado pikeminnow in one allotment, and Knowlton's cactus in one allotment. It was determined that grazing in these allotments would have no effect on the remaining species. USFWS concurred with these determinations (BLM 1999a) (Cons. #2-22-99-1-419). The BE determined that on 16 riparian grazing allotments along intermittent and ephemeral drainages, and on 117 upland allotments, grazing may affect, but is not likely to adversely affect, the Colorado pikeminnow and razorback sucker, and have no effect on the remaining species (BLM 1999b), to

which the USFWS concurred (Cons. #2-22-99-1-419A). On seven upland allotments, the BE determined that grazing may affect, but is not likely to adversely affect, the Colorado pikeminnow and razorback sucker in all seven allotments, the bald eagle in one allotment, the southwestern willow flycatcher in two allotments, the Mancos milkvetch in one allotment, and the Mesa Verde cactus in three allotments (BLM 1999c). It was determined that grazing would have no effect on the remaining species, with concurrence from the USFWS (Cons. #2-22-99-1-419B). On six allotments in riverine riparian habitat, the BE found that the BLM grazing program may affect, but is not likely to adversely affect, the bald eagle, southwestern willow flycatcher, Colorado pikeminnow, and razorback sucker, and would have no effect on the remaining species (BLM 1999d). The USFWS concurred with these determinations (Cons. #2-22-99-1-419C). In 18 upland allotments containing potential mountain plover habitat, it was determined that the BLM's grazing program may affect, but is not likely to adversely affect, the mountain plover and would have no effect on the other species (BLM 2000b), to which the USFWS concurred (Cons. #2-22-99-1-419D).

Table M-1. Effects Determination for Federally Listed and Proposed Species and Critical Habitat Known to Occur or Potentially Occurring within the Planning Area

Species/Critical Habitat		Status[a]	Effects Determination
Common name	Scientific name		
Knowlton's cactus	*Pediocactus knowltonii*	E	May affect-not likely to adversely affect
Mesa Verde cactus	*Sclerocactus mesae-verdae*	T	May affect-not likely to adversely affect
Mancos milkvetch	*Astragalus humillimus*	E	May affect-not likely to adversely affect
Colorado pikeminnow	*Ptychocheilus lucius*	E	May affect-not likely to adversely affect
Razorback sucker	*Xyrauchen texanus*	E	May affect-not likely to adversely affect
Colorado pikeminnow critical habitat	—		May affect-not likely to adversely affect
Bald eagle	*Haliaeetus leucocephalus*	T	May affect-not likely to adversely affect
Mountain plover	*Charadrius montanus*	PT	May affect-not likely to adversely affect
Mexican spotted owl	*Strix occidentalis lucida*	T	May affect-not likely to adversely affect
Mexican spotted owl critical habitat	—		May affect-not likely to adversely affect
Southwestern willow flycatcher	*Empidonax trailii extimus*	E	May affect-not likely to adversely affect

Notes: (a) E = Endangered, T = Threatened, PT = Proposed Threatened.

A BE that addressed three grazing allotments containing Mexican spotted owl critical habitat was submitted to the USFWS in 2001 (BLM 2001a). It assessed the potential effects of the BLM grazing program and determined that this program may affect, but is not likely to adversely affect, Mexican spotted owl critical habitat, to which the USFWS agreed (Cons. #22-22-02-I-240).

EFFECTS DETERMINATION RATIONALE

Knowlton's Cactus

Implementation of the Preferred Alternative may affect, but is not likely to adversely affect, Knowlton's cactus for the following reasons:

- Mineral development and OHV activities are not allowed within the fenced population on FFO land.
- Preconstruction surveys are required in all potential Knowlton's cactus habitat prior to construction.
- No oil and gas well pads and roads would be allowed in potential Knowlton's cactus habitat.
- Pipeline ROWs would be allowed contingent on conducting extensive biological surveys and adhering to stringent rehabilitation requirements.
- Monitoring surveys will continue to provide natural resource personnel with the necessary information to manage and protect FFO and USBR natural and transplant populations.

Mesa Verde Cactus

Implementation of the Preferred Alternative may affect, but is not likely to adversely affect, the Mesa Verde cactus for the following reasons:

- Oil and gas development in potential Mesa Verde cactus habitat cannot proceed without preconstruction surveys. BLM protects Mesa Verde cactus and potential habitat from development. If a project was proposed that would impact the Mesa Verde cactus and could not be relocated, consultation with the Service would be initiated.
- OHV traffic would be allowed only on graded and maintained roads in The Hogback ACEC. Measures have been taken to protect the Mesa Verde cactus from unauthorized OHV activity, such as placement of signs, closing roads, and public education.
- Coal mining would not be allowed in known or potential Mesa Verde cactus habitat consistent with Unsuitability Criterion 9.

Monitoring surveys of the Mesa Verde cactus populations will continue. This will provide BLM natural resource personnel the necessary information to manage this species.

Mancos Milkvetch

Implementation of the Preferred Alternative may affect, but is not likely to adversely affect, the Mancos milkvetch for the following reasons:

- Proposed oil and gas development in the area of potential Mancos milkvetch habitat cannot proceed without preconstruction surveys. The loss of potential Mancos milkvetch habitat is not allowed.
- OHV traffic would be allowed only on graded and maintained roads in The Hogback ACEC. This measure, and other measures specified above, have been taken to protect The Hogback ACEC from unauthorized OHV activity.
- Coal mining would not be allowed in known or potential Mancos milkvetch habitat, consistent with Unsuitability Criterion 9.

Monitoring surveys of the Mancos milkvetch populations will continue to provide natural resource personnel the necessary information to manage this species.

Colorado Pikeminnow

Based on the analysis of potential impacts from FFO programs under the Preferred Alternative assessed in this BA, the BLM has determined that these programs may affect, but are not likely to adversely affect, the Colorado pikeminnow or its critical habitat for the following reasons:

- The conclusion of a study regarding PAHs generated by oil and gas development and operations activities is that PAHs are not entering the San Juan River or its tributaries via groundwater or surface water flows.
- The use of water for oil and gas development and any other federally permitted project that would require the purchase of water would be limited to water acquired under an established legal water rights permit.
- OHV use would not occur in the River Tracts; all vehicles would be restricted to graded and maintained roads. Therefore, there would be no degradation of Colorado pikeminnow habitat due to OHV use in these areas.
- Coal mining would not be permitted in riparian areas and along major waterways.

Minor water depletions from stock ponds on FFO land would not jeopardize the continued existence of the Colorado pikeminnow or result in the adverse modification or destruction of its critical habitat because total stock pond depletions are below 100 acre-feet at any one time and the aggregate annual depletion is less than 3,000 acre-feet.

Razorback Sucker

Based on the analysis of potential impacts from FFO programs under the Preferred Alternative assessed in this BA, the BLM has determined that these programs may affect, but are not likely to adversely affect, the razorback sucker or its habitat for the following reasons:

- The conclusion of a study regarding PAHs generated by oil and gas development and operations activities are that PAHs are not entering the San Juan River or its tributaries via groundwater or surface water flows.
- The use of water for oil and gas development and any other federally permitted project that would require the purchase of water would be limited to water acquired under an established legal water rights permit.
- OHV use would be restricted to existing maintained roads, so OHV use would not result in the degradation of the razorback sucker potential habitat.
- Coal mining would not be allowed in critical habitat or riverine 100-year floodplains, consistent with Unsuitability Criteria 9 and 16.
- Minor water depletions from stock ponds on FFO land would not jeopardize the continued existence of the razorback sucker or affect its potential habitat because these depletions would be less than 100 acre-feet at any one time and the aggregate annual depletion is less than 3,000 acre-feet.

Bald Eagle

The BLM has determined that implementation of the Preferred Alternative may affect, but is not likely to adversely affect, the bald eagle because:

- No new oil and gas wells, service roads, or any habitat disturbance would be authorized in Bald Eagle ACEC core areas, and construction activities in buffer zones would be strongly discouraged. In addition, the USBR would not authorize new wells within 1,500 feet of

Navajo Dam and its appurtenant structures, within 500 feet of the maximum high water line of Navajo Reservoir, or within 500 feet of the San Juan River.

- If wells were constructed in the buffer zone of the ACEC units on BLM land, construction activity would not be allowed between November 1 and March 31.

OHV traffic would not be allowed on any trails, two-tracks, or off-road in the ACEC units. In addition, OHV traffic is not allowed in the Bald Eagle ACEC units from November 1 to March 31.

Mountain Plover

The FFO and AFO conclude that the implementation of the Preferred Alternative may affect, but is not likely adversely affect, the mountain plover for the following reasons:

- Little oil and gas development activities would take place in the potential mountain plover habitat.
- Operators proposing an oil and gas facility such as a pipeline in potential mountain plover habitat would be required to conduct preconstruction surveys if activities would take place during the mountain plover breeding season.
- Site-specific constraints would be developed if the mountain plover were found in a proposed project area, to ensure that the project would not have a negative impact on the plover.
- Projects that would create a permanent noise source that would impact nesting plovers would be subject to noise level mitigation.
- Oil and gas facilities such as pipelines would be required to be revegetated with native plant species.

In addition, the FFO concludes that other activities addressed under the Preferred Alternative may affect, but are not likely to adversely affect, the mountain plover for the following reasons:

- There are currently no plans for coal mining to take place in or near potential mountain plover habitat. If such development were proposed, the BLM would initiate the ESA consultation process.

OHV use of potential mountain plover habitat would be limited under the Preferred Alternative.

Mexican Spotted Owl

The BLM concludes that the Preferred Alternative may affect, but is not likely to adversely affect, the Mexican spotted owl or its critical habitat on FFO land for the following reasons:

- The cutting down of large ponderosa pine and Douglas fir would not be allowed, thus protecting the primary Mexican spotted owl potential habitat.
- Mexican spotted owl nocturnal surveys would be required if construction activities would occur within one-half mile of potential habitat during the breeding season. These surveys can take place for 1 year if they occur within 3 years after the completion of the formal protocol surveys. If more than 3 years have passed since completion of the formal protocol surveys, the developer would be required to conduct 2 years of surveys following the USFS protocol.
- If the Mexican spotted owl has occupied a territory in the area, no drilling or other human activity would take place within a buffer zone of one-quarter mile around the nest site during the breeding season.

- No oil and gas development would be allowed in the mixed conifer forest that is the primary potential habitat of this species.
- Coal leasing and development activities would be very unlikely in or near the Mexican spotted owl critical habitat or other marginally potential Mexican spotted owl habitats. If coal leasing and development were proposed in these areas, the NEPA process would be followed and a consultation with USFWS would be initiated.
- OHV activity would be restricted to graded and maintained roads under the Preferred Alternative in all potential Mexican spotted owl habitat.
- A Mexican spotted owl critical habitat ACEC would be implemented under the Preferred Alternative.
- No Mexican spotted owl nesting has been documented on BLM lands, and no PACs have been established on BLM lands.

Southwestern Willow Flycatcher

The BLM has determined that the Preferred Alternative may affect, but is not likely to adversely affect, the southwestern willow flycatcher on FFO and AFO land for the following reasons:

- All oil and gas development projects such as wells, roads, and pipelines are discouraged in potential habitat. Since the listing of the southwestern willow flycatcher, no projects that impact designated potential habitat have been authorized. Proposed projects have been moved or rerouted to avoid habitat impacts. In the future, if a proposed project could not be moved or rerouted, the appropriate NEPA document would be prepared and consultation with the USFWS would be initiated.
- The FFO has completed the Southwestern Willow Flycatcher Habitat Management Plan (BLM 1988) and the Riparian and Aquatic Habitat Management Plan (BLM 2000c) to provide protection for all designated riparian habitats, including all of the designated potential southwestern willow flycatcher habitat. Cadastral land surveys have been conducted and fences have been constructed on the River Tracts.
- The FFO will retain all lands that support potential southwestern willow flycatcher habitat. The AFO has placed a high priority on the restoration and protection of riparian areas under its jurisdiction, including the potential southwestern willow flycatcher habitat on AFO within the project boundary.
- Coal leasing and development in potential southwestern willow flycatcher habitat is unlikely and would not be allowed, consistent with Unsuitability Criteria #9, to protect habitat of essential value for T&E species.
- OHV use is restricted to graded and maintained roads in and in the area of potential southwestern willow flycatcher habitat.