APPENDIX I
USFWS LETTER OF CONCURRENCE
BIOLOGICAL ASSESSMENT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:
ES/CO:BIA
TAILS 65413-2009-TA-0072

May 27, 2009

Memorandum

To: Superintendent, Bureau of Indian Affairs, Southern Ute Agency, Ignacio, Colorado

From: Acting Western Colorado Supervisor, ~~Fish~~ and Wildlife Service, Ecological Services, Grand Junction, Colorado

Subject: Informal Section 7 Consultation for the Proposed 80-Acre Infill Oil and Gas Development on the Southern Ute Indian Reservation

This memorandum responds to your April 24, 2009, letter and corresponding programmatic biological assessment (BA), requesting concurrence with your determination that the proposed 80-acre infill oil and gas development on the Southern Ute Indian Reservation may affect, but is not likely to adversely affect the southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus*), *Pediocactus knowltonii* (Knowlton's cactus), and *Astragalus humillimus* (Mancos milk-vetch).

SUMMARY OF THE PROPOSED ACTION

The Bureau of Indian Affairs (BIA) Southern Ute Agency (SUA), in cooperation with the Bureau of Land Management (BLM) and the Southern Ute Indian Tribe (SUIT), propose to allow for 80-acre spacing of coal bed methane (CBM) wells accessing Tribal minerals on Tribal and fee (privately owned) surface within the action area. Eighty acre spacing for CBM wells is being proposed on lands within the action area, where the Tribe owns the oil and gas minerals, including lands where the surface is owned in fee and the oil and gas mineral rights are owned by the Tribe; contingent upon the imposition of terms and conditions required by the SUIT Tribal Council including:

1. Collocation of infill wells at existing drill pads to the maximum extent feasible.
2. Utilization of the best available air emissions control technology for new compressor installation and the upgrade of existing compressors to contemporary best available emissions control technology to the maximum extent feasible.

The total number of wells drilled would depend largely on environmental, geologic, and economic factors. A typical production life for a CBM well is approximately 25-30 years or longer, depending on economics and reservoir geology; therefore, the life of the project could be

as long as 40 years if wells are drilled at slower rates. To the extent practicable, 95 percent of proposed wells are to be co-located on existing well pad sites. However, in some instances, the development of new well locations may be necessary, due to environmental concerns such as unstable slopes, the presence of jurisdictional wetlands, threatened and endangered species habitat, or culturally sensitive areas.

The proposed action could total up to 770 CBM wells on lands where the Tribe owns the oil and gas minerals. Approximately 731 or 95 percent of these wells would be directionally drilled from existing well pad locations. A reasonable assumption is that approximately 5 percent of the 778 wells (39 wells) would not be co-located due to environmental or cultural restraints on the existing well pad sites. In these cases a new well pad location would be constructed.

The wells would be drilled as optional infill wells based on geology and reservoir qualities in areas of low recovery per well. The Fruitland Formation (average depth of 2,600-3,900 feet) is the primary CBM producing horizon and the only horizon for which this proposed action applies. Due to the programmatic nature of the proposed action, the exact locations and timing of activities, including drilling of wells and installation of equipment and facilities, cannot be known, although they would occur within the areas identified in the BA. The total disturbance under the proposed action would be approximately 966 acres of short-term disturbance and an estimated 452 acres of long-term disturbance.

All construction, drilling, and production operations would be managed within the guidelines and regulations of the BLM and BIA. The following sections describe the phases of production and the infrastructure and facilities required for development of the wells, including the plan of development; operational requirements; hazardous materials management; expected land, water, equipment, and abandonment and reclamation procedures; and additional best management practices to mitigate potential environmental impacts.

Conservation Measures proposed by the Action Agencies:

- Heater-treaters (separators) will be screened to prevent bird mortalities.
- Survey areas are to be developed for rights-of-way (ROWs) and wells for raptor nesting activity or winter roost sites (e.g., eagles) prior to construction.
- Restrict new well locations and rights-of-way to at least 0.25 mile from a raptor nest or winter roost.
- Prohibit construction or other intrusive activities within 0.5 mile of an active raptor nest during the nesting season.
- Tribal wildlife biologists shall conduct yearly nesting surveys to document known nest sites and monitor nesting success. Annual winter roost surveys would also be conducted to identify and record additional winter roost sites. This data would be used to evaluate the effectiveness of mitigation measures for wooded riparian habitat and develop additional mitigation criteria as necessary.
- A migratory bird survey will be conducted prior to construction during the migratory bird breeding season (March through August).

- Bird netting will be suspended and maintained over reserve pits, open tanks, and catchments, if hydrocarbons or toxic chemicals are present in the fluids, until reclamation is complete.
- All power lines will conform to the Service draft "Guidelines for Raptor Conservation in the Western United States", the "Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006", and the "Avian Protection Plan Guidelines" Recommend that power lines be placed below ground, where possible.
- *Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors* (Craig 2002) will be implemented.
- Pre-construction surveys for Gunnison's prairie dogs (*Cynomys gunnisoni*) will be conducted at proposed well pad and access route locations. Direct impacts to prairie dog colonies will be avoided where possible, and in the light of other resource tradeoffs resulting from access road and well pad relocation.
- Minimize construction activities in wooded riparian habitat, or any other potential southwestern willow flycatcher nesting habitat. Conduct southwestern willow flycatcher surveys in accordance with standard protocol within suitable habitat prior to any construction activities to determine presence or absence of willow flycatchers.
- If southwestern willow flycatchers are located during survey efforts, no surface disturbing activities will be conducted from May 1 through August 15.
- Vegetation replacement and restoration will be conducted in any suitable habitat that is lost due to project implementation (e.g., willow loss at pipeline crossings).
- No disturbance will be allowed within 200 meters of known or discovered occupied southwestern willow flycatcher breeding habitat.
- A closed loop system in areas of shallow groundwater and riparian areas, or other areas identified will be required.
- Conduct field surveys for Knowlton's cactus and Mancos milk-vetch prior to all construction activities in the appropriate survey season. Avoid individuals or populations of these plants. Surveys will be conducted between April 1 and May 31.
- No disturbance will be allowed within 20 meters of Knowlton's cactus or Mancos milk-vetch occupied habitat, and any disturbance proposed within 200 meters of occupied habitat would be analyzed in a separate site specific consultation.

DEPLETIONS

This project includes an estimated annual depletion of 18 acre-feet per year, from the San Juan River system. You have determined that water use and associated depletions for this project were previously addressed in the Programmatic Biological Opinion (PBO) for Water Depletions Associated with BLM's Fluid Mineral Program and Other Actions Authorized by BLM on Public Lands within the San Juan River Basin in Colorado (ES/GJ-6-CO-08-F-002). The depletion may affect, is likely to adversely affect the Colorado pikeminnow and razorback sucker and is addressed in the PBO. The Dolores Public Lands Office should include the depletions associated with the subject project in their annual report to the BLM State Office.

DETERMINATION

We concur with your determination that the proposed 80-acre infill oil and gas development on the Southern Ute Indian Reservation may affect, but is not likely to adversely affect the

southwestern willow flycatcher, yellow-billed cuckoo, Knowlton's cactus, and Mancos milk-vetch. Our concurrence is based on the conservation measures proposed in the BA and the fact that all development will be analyzed site specifically in the future, and if it is determined that the actions may affect a listed species, further site specific consultation will occur.

Based on the information you have provided, no further consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended, is required at this time. If you become aware of new information regarding the design of the proposed projects, impacts observed but not considered or the occurrence of other listed species within the action area, please contact us as soon as possible for potential reinitiation of section 7 consultation.

If you have any questions, please feel free to contact Collin Ewing of my staff at (970) 243-2778, extension 18.

Cc: Southern Ute Tribe, Ignacio (Steve Whiteman)
BLM, Durango
Ecosphere Environmental Services, 2243 Main Avenue, Suite 4, Durango, CO 81301

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Biological Assessment
For the Proposed
80-acre Infill Oil and Gas Development on the
Southern Ute Indian Reservation

PREPARED FOR:

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT AND
BUREAU OF INDIAN AFFAIRS

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ECOSPHERE ENVIRONMENTAL SERVICES

REVISED APRIL 8, 2009

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ATTACHMENTS

1.0 INTRODUCTION

In February of 2007, Ecosphere Environmental Services (Ecosphere) was contracted by the Southern Ute Growth Fund (SUGF) to prepare a Biological Assessment (BA) for the proposed programmatic 80-acre infill spacing for oil and gas wells on the Southern Ute Indian Tribe (SUIT) Reservation. A Biological Assessment (BA) is required by law (Endangered Species Act [ESA] of 1973, 16 U.S.C. 1531 et seq.) for projects on Tribal or federally managed lands. A BA is the means to review, analyze, and document the direct, indirect, interrelated, interdependent and cumulative effects on U.S. Fish and Wildlife Service (USFWS) federally listed endangered, threatened, proposed, or candidate species as well as proposed or designated critical habitats thereof, as a result of development actions on federally managed lands.

This is a programmatic consultation and site specific consultation will be conducted at the project phase for any elements of the project that may affect listed species.

1.1 BACKGROUND

The SUIT, U.S. Bureau of Indian Affairs (BIA), U.S. Bureau of Land Management (BLM), and Colorado Oil and Gas Conservation Commission (COGCC) have signed a Memoranda of Understanding (MOU) and Interagency Agreements, as appropriate, that outline how these Tribal and government entities work together to regulate oil and gas operations within the exterior boundaries of the Southern Ute Indian Reservation (Reservation). These Memoranda simplify procedures for the many operators who conduct business on the Reservation and help eliminate duplication of effort by the agencies themselves. The Memoranda state that all matters which would require COGCC approval for actions involving non-Tribal, non-Federal minerals shall be submitted initially to the COGCC. The COGCC must notify the BLM of applications pertaining to Federal or Tribal minerals and may not hear an application regarding Tribal lands without the express consent of the BLM. The BLM is responsible for notifying the SUIT about applications involving Tribal minerals. If the SUIT has an objection or wishes to make stipulations on approval of the application ("conditions of protest"), then the BLM must convey the details thereof to the COGCC. The COGCC must either incorporate the conditions of protest submitted by the BLM (on behalf of the BLM or the SUIT) or relinquish jurisdiction on the issue to the BLM, insofar as it relates to Federal or Tribal lands.

In July of 2002, the BLM and the BIA, in concert with the SUIT, issued the programmatic Final Environmental Impact Statement Oil and Gas Development on the Southern Ute Indian Reservation (USDI 2002) (2002 EIS), which analyzed the environmental impacts of various alternatives for comprehensive development of oil and gas resources within sizeable portions of the Reservation. Following review of the 2002 EIS, the BLM and the BIA, with the concurrence of SUIT, issued a record of decision selecting as the Preferred Alternative, Alternative 3, Enhanced Coalbed Methane Recovery (ECBM), as described in the 2002 EIS Record of Decision, CO-SJFO-01-001 EIS (USDI, Oct. 29, 2002) (2002 EIS ROD).

In 2005 and 2006, several oil and gas operators, including the SUIT d/b/a Red Willow Production Company, submitted applications to the Colorado Oil and Gas Commission (COGCC) for an increase in the density of Fruitland coal bed methane (CBM) wells in 320-acre spacing units from two to four wells. The purpose was to facilitate the increased and efficient recovery of CBM gas from the Fruitland coal seam within La Plata County and portions of the Reservation. Following the review of industry testimony, exhibits and technical reports, the COGCC issued orders that increased the density of wells from two to up to four wells per 320-

acre spacing unit by amending previously issued Order Nos. 112-156 and 112-157. As a result, four wells could be located on 80-acre spacing units.

2.0 DESCRIPTION OF LISTED SPECIES AND CRITICAL HABITAT

According to the USFWS, there are 11 federally listed, proposed, or candidate species with potential to occur on the SUIT Reservation. Endangered, threatened, and proposed species are listed in Section 2.1. Candidate species are listed in Section 2.2.

2.1 USFWS ENDANGERED, THREATENED, AND PROPOSED SPECIES

According to the USFWS, there are six federally endangered (E) and four federally threatened (T) species with potential to occur on the Reservation. The list includes two mammals, two birds, two fish, and three plants. Currently, there are no proposed endangered or proposed threatened species that have potential to occur on the Reservation. The federally endangered and threatened species considered in this BA include:

- Black-footed ferret (*Mustela nigripes*), E
- Canada lynx (*Lynx canadensis*), T
- Colorado pikeminnow (*Ptychocheilus lucius*), E
- Knowlton's cactus (*Pediocactus knowltonii*), E
- Mancos milkvetch (*Astragalus humillimus*), E
- Mesa Verde cactus (*Sclerocactus mesae-verdae*), T
- Mexican spotted owl (*Strix occidentalis lucida*), T
- Razorback sucker (*Xyrauchen texanus*), E
- Southwestern willow flycatcher (*Empidonax traillii extimus*), E

2.2 USFWS CANDIDATE SPECIES

There are two candidate species listed by USFWS with potential to occur on the SUIT Reservation. The list includes one bird and one plant. The candidate species considered in this BA include:

- Pagosa skyrocket (*Ipomopsis polyantha*)
- Yellow-billed cuckoo (*Coccyzus americanus*)

2.3 CRITICAL HABITAT

The action area addressed within this BA does not fall within USFWS Designated Critical Habitat for any federally listed species.

3.0 PROPOSED ACTION

3.1 SUMMARY OF THE PROPOSED ACTION

The proposed action would allow for 80-acre CBM wells accessing Tribal minerals on Tribal and fee surface within the action area. The action area is shown on Figure 1 in Attachment A. The proposed 80-acre infill spacing areas within the action area are shown on Figure 2 in Attachment A. 80-acre spacing for CBM wells is being proposed on lands within the action area, where the Tribe owns the oil and gas minerals, including lands where the surface is owned in fee and the oil and gas mineral rights are owned by the Tribe contingent upon the imposition of terms and conditions required by the SUIT Tribal Council including:

1. Co-location of infill wells at existing drill pads to the maximum extent feasible.

2. Utilization of the best available air emissions control technology for new compressor installation and the upgrade of existing compressors to contemporary best available emissions control technology to the maximum extent feasible.

The total number of wells drilled would depend largely on environmental, geologic, and economic factors. A typical production life for a CBM well is approximately 25-30 years or longer, depending on economics and reservoir geology; therefore, the life of the project could be as long as 40 years if wells are drilled at slower rates. To the extent practicable, 95% of proposed wells are to be co-located on existing well pad sites. However, in some instances, the development of new well locations may be necessary, due to environmental concerns such as unstable slopes, the presence of jurisdictional wetlands, threatened and endangered species habitat or culturally sensitive areas.

The proposed action could total up to 770 CBM wells on lands where the Tribe owns the oil and gas minerals. Approximately 731**,** or 95%, of these wells would be directionally drilled from existing well pad locations. Table 1 below shows the potential number of 80-acre infill wells including the number of co-locations. A reasonable assumption is that approximately 5% of the 770 wells (39 wells) would not be co-located due to environmental or cultural restraints on the existing well pad sites. In these cases a new well pad location would be constructed.

The wells would be drilled as optional infill wells based on geology and reservoir qualities in areas of low recovery per well. The Fruitland Formation (average depth of 2,600–3,900 feet is the primary CBM producing horizon and the only horizon for which this proposed action applies.

Due to the programmatic nature of the proposed action, the exact locations and timing of activities, including drilling of wells and installation of equipment and facilities, cannot be known, although they would occur within the areas identified in Figure 2 in Attachment A.

The incremental acreage added to an existing well pad for a proposed co-located well would be approximately 1.15 acres since this acreage would overlap onto an existing pad. Following interim reclamation, the incremental estimated long-term disturbance per co-located well pad would average 0.5 acres. Table 1 below provides the long-term and short-term disturbance in acres for the proposed action.

Table 1. Total Estimated Short- and Long-Term Disturbance in Acres Potentially Resulting from the Proposed Action

	Total Number of Wells	Short-Term Disturbance Acres	Long-Term Disturbance Acres
Anticipated Co-located 80-acre Wells	731	841	365
Anticipated New 80-acre Wells	39	125	86
Total	770	966	452

Notes: Acreage estimates based on an average disturbance per well pad actual disturbance would vary per well. New well pad disturbance based on 3.2 acres short term (2.00 acres for well, 1.2 acres for pipeline/road) resulting in 2.2 acres long-term disturbance. Co-located well pad disturbance based on an average of an incremental increase of 1.15 acres short-term resulting in 0.5 acres long term disturbance

The total estimated short-term disturbance for 731 co-located wells would be approximately 841 acres. After reclamation, the total amount of well pad disturbance from the co-located well sites would be an estimated 365 acres, assuming 0.5 acres long-term disturbance per well. Co-located wells would not require construction of new access roads or pipeline right-of-ways (ROW).

The 39 new well pad locations are evaluated based on a total of 3.2 acres of disturbance per well (2.0 acres for the well pad and 1.2 acres for the access road and pipeline ROW) and total approximately 125 acres of disturbance in the short-term. However, after interim reclamation total disturbance for 39 new well pads would total 86 acres. The actual disturbance for new wells would vary per operator, but is not expected to exceed the average estimate of 3.2 acres per well. The total disturbance under the proposed action would be approximately 966 acres of short-term disturbance and an estimated 452 acres of long-term disturbance.

All construction, drilling, and production operations would be managed within the guidelines and regulations of the BLM and BIA. The following sections describe the phases of production and the infrastructure and facilities required for development of the wells, including the plan of development; operational requirements; hazardous materials management; expected land, water, equipment, and abandonment and reclamation procedures; and additional BMPs to mitigate potential environmental impacts.

3.2 ACTIVITIES ASSOCIATED WITH THE PROPOSED ACTION

The gas field within the action area is currently well developed. The following sections describe the phases of drilling and production of CBM wells from pre-construction, construction to post-construction. The 2002 EIS (USDI 2002) describes in detail the techniques used during the drilling and production of CBM wells. The following sections are summarized and updated where necessary.

3.2.1 Pre-Construction

Upon making the decision to drill a well on a leasehold involving Tribal minerals or surface, permits from the SUIT, BIA, and BLM must be obtained by an operator before any ground disturbance can take place. Agreements have been signed by the SUIT, COGCC, BIA, and BLM to simplify the process of approving actions within the exterior boundaries of the Reservation, without compromising any agency's jurisdiction. There are eight different

ownership possibilities which may occur and each situation requires different processes for completion of all required documentation including the ESA, National Environmental Policy Act (NEPA), Application for Permit to Drill (APD), right-of-ways (ROWs), surface leases, etc.

3.2.2 Construction Phase

Once the APD is approved, well site construction can begin. To the extent practicable, the wells would be co-located on existing well pad locations thus minimizing the amount of disturbance. The following is a description of construction techniques typically used for gas development within the SUIT action area. The techniques and procedures could be applicable to all well pad construction, and well drilling, access road construction; however, operators may use techniques and procedures that vary slightly from those presented here. Determination of the suitability of an operator's design, construction techniques, and procedures is made by the SUIT, BIA, and BLM during the permitting process.

The first step in well pad construction involves clearing and grubbing vegetation and salvaging and stockpiling of topsoil. The typical well pad would be rectangular in size and measure approximately 250 by 220 feet, including a 20-foot wide temporary use area (TUA) around the well pad perimeter occupying approximately 1.5 acres. The well pads would be constructed from the earthen materials present on-site and gravel brought in from off-site. No concrete or other foreign materials would be brought in for use in construction of well pads. Construction would involve preparing a level area for the equipment that would drill and complete the well. Following removal of vegetation and stockpiling of viable soil material, the pad would be graded using standard, cut-and-fill techniques of construction using a bulldozer, grader, front-end loader, and/or backhoe. A small reserve pit (120 by 40 by 20 feet deep, approximately 0.14 acre) would be excavated adjacent to the level pad using heavy equipment.

For construction of a co-located well pad initial activities would vary from those of new well pad construction. The co-located well would be generally drilled a minimum of 90 feet from the originally wellhead on the pad. Some additional disturbance may be necessary, such as for excavating the reserve pit or slight enlargement of the existing pad to accommodate the drilling rig. A second set of dead man anchors would be set in order to secure the drilling rig. After preparation of the well pad, drilling would commence following the standard procedures discussed below. The co-located well would have an individual pump jack, flow lines, separator, and meter run. It would share the same produced water tank, produced water line (if there is not a water tank on site), and gas pipeline as the original well. During drilling of the second co-located well, the original well may be temporarily shut-in, depending on the individual operator. Operators would typically not remove any production equipment used by the original well, but commonly operators would barricade and guard the well head and production equipment during drilling of the second well.

Stockpiles for both topsoil and subsoil would generally occupy approximately 0.10 acre but also would depend on the amount of cut-and-fill required to level each site. The placement of stockpiled material would be determined on a case-by-case basis during the on-site. In general, the stockpiled material would be graded to a stable configuration and seeded, straw mulched and crimped following completion of the well. Backfill for the reserve pits and spoil stockpile would occupy an area adjacent to the pits. A small flare pit (20 by 20 feet) could also be constructed no less than 80 feet from the wellhead.

There would be approximately 39 new roads proposed under the proposed action for those wells that would not be co-located (approximately 5%). New roads would be arterials off of

main roads and would require a 20-foot wide corridor with a 16 to 18-foot wide driving surface. The 20-foot wide corridor would be a maximum surface disturbance associated with drainage ditches, back cuts, or fills. For analysis purposes, the average road is assumed to cause a disturbance of 20 feet in width and 0.25 mile in length (0.60 acres), per well. New road construction for new well sites would result in approximately 24 acres of disturbance. However this number is accounted for under the total acreage figure for long-term disturbance of new wells (total 3.2 acres). Access road construction for the average road requires two days and a crew of three.

Access roads would be constructed using standard equipment and engineering techniques. Heavy equipment, such as bulldozers and road graders would clear vegetation and earthen materials from the road surface. All roads would be constructed with appropriate, adequate drainage and erosion control features/structures (e.g., cut and fill slope and drainage ditch stabilization, relief and drainage culverts, water bars and wing ditches similar to those identified in the BLM/USFS Surface Operating Standards for Oil and Gas Development [BLM and USFS 1989]) as determined by the BLM through analysis of APDs. Also, depending on the road location, the BIA may assign additional site specific stipulations.

The majority of wells would be co-located and would typically allow them to tie into an existing pipeline system. New well-tie pipeline construction consists of a buried pipe 2 to 4 inches in diameter within a 40-foot wide ROW. The additional anticipated incremental disturbance from pipelines would be based on 39 well locations that would not be co-located. New pipeline construction for new well sites would result in approximately 48 acres of disturbance.

3.2.3 Drilling Operations

A drilling rig is transported in sections and erected on the well site following construction of the access road and well pad. Additional equipment and materials needed for drilling operations would be trucked into the well site. Drilling is a 24-hour operation taking an average of 1-2 weeks to drill a CBM well to the required depth. To protect fresh water zone, surface casing is utilized. A 12 ¼-inch (diameter) hole is drilled to a depth of 500 to 1,000 feet, depending on the depth necessary to penetrate the fresh-water zones. Steel casing is lowered into the hole, and then specially designed cement is pumped down inside the casing out the shoe (at the bottom of the pipe) and up the outer annulus of the pipe to protect aquifers above the top of the casing shoe and to secure the base of the pipe. Surface casing is set to below the depth of the nearest potable water well within ½ mile of the surface location. After setting the surface casing, drilling resumes. Depending on well bore conditions, additional strings of casings may be run, using the same cementing practices before the well reaches the objective depth (total depth). Following drilling and completion of the well, the reserve pit is backfilled within 15 months after the drilling of the well and after water has been evaporated or trucked away and the drilling pad contoured and seeded up to the anchors set in the pad during “interim reclamation”. Stored topsoil would be spread over the area to be reclaimed area and then seeded. This practice is considered interim reclamation for the well.

Directional (slant) drilling is the process of drilling a deviated well trajectory, to reach a downhole location that is not directly beneath the drill site. With technological advances from recent years, directional drilling is now economically feasible in a wide variety of basins. The majority (95%) of proposed wells under the proposed action would be co-located on an existing pad and would be directionally drilled. The existing pad would be expanded which could necessitate removal or reconfiguration of some surface facilities. Following expansion for the proposed

location, the drilling rig would be moved onto the location. Drilling would proceed normally through the setting of the surface casing as with the above operation.

After setting the surface casing, directional drilling would begin with a "kick-off" (kick-off point) at which drilling would "build angle" and begin angle drilling which typically cumulates at an angle of 0-50 degrees to reach the bottom hole location and the target formation. For horizontal wells this angle could go to 90 degrees and stay there for the entire length of the horizontal leg (lateral). A pipe casing is then installed from the surface of the bore hole through the production zone and cemented in place to prevent interzonal communication between gas bearing zones and water zones. In horizontal wells the lateral could be open hole or have an uncemented slotted liner installed. Depending on the depth to the Fruitland Coal and the drilling window constraints, the bottom hole location is typically between 0-2,600 feet horizontally from the surface location. Directional drilling and completion activities may take 2-4 weeks, depending on well depth and lateral extent. The drilling pad is then reclaimed to within approximately 10 feet of the drilling rig derrick anchors.

Most of the water used during the life of a producing well is consumed during drilling operations. A small amount of water is used for dust suppression or equipment installation during other phases of development. Up to 126,000 gallons of water may be needed for activities such as mixing drilling mud, cleaning equipment, and cooling the engines for each well. Recirculating-mud systems are used to reduce the total volume of water needed. Drilling mud can be recycled to the next drilling location. Produced water from wells in the area can be used for most drilling operations except mixing cement. The primary source of fresh water is irrigation water, purchased from the owner and trucked or pumped to the well site.

The drilling fluid, called "mud," is a mixture of water, bentonite, caustic soda, barite, and polymers. Drilling mud cools and lubricates the bit, while lifting the well cuttings caused by the bit to the surface for examination and disposal. The mud in the well bore prevents the hole walls from sloughing off into the hole, keeps underground pressures stable, and seals the sides of the well bore through formation of a thin "mud cake". Mud properties are carefully supervised, and several measurements of the mud are made by a mud specialist during daily visits to the well site. The drilling mud is mixed on location and stored in steel pits or lined earthen pits. Drill cuttings are separated from the drilling mud and buried in a trench dug on the well location at the end of the drilling operation. The mud can be recycled to another drilling operation. If not recycled, it remains in the pit until the water has evaporated, and then is buried on location.

Some wells are drilled at least partially with compressed air or natural gas as the circulating fluid. Air serves some of the same purposes as drilling mud. Air drilling is applicable only where little water is encountered in the subsurface and where the pressures of the formations to be penetrated are well known.

In the event formation evaluation determines a well would not be economically feasible to complete, then the well would be a dry hole, and would be plugged and abandoned following the procedure described below.

3.2.4 Completion Operations for CBM Wells

A smaller completion rig is used for the final phase of completing the well. Casing is run to the producing zone and cemented in place. Cementing methods for CBM wells are more stringent. To ensure isolation and protection of all zones between the surface and total depth, the BLM requires cement to be circulated from total depth to surface on the production casing, as well as

on the surface casing. Remedial measures are taken if cement cannot be circulated to the surface.

If formation pressure can raise oil/gas to the surface, the well would be completed as a flowing well. Several downhole acid or fracture treatments may be necessary to enhance the formation permeability, to make the well flow. Water requirements for these treatments range from 1,800 to 3,000 barrels (42 gallons per barrel). At the end of the treatment, the treatment water flows back to the surface and is captured in temporary tanks on location. This fluid is hauled to injection wells or evaporation ponds for disposal with other produced water.

Acidizing a well requires introducing acid in the well bore across the productive interval, which causes the solution of some of the mineral materials (e.g., calcite, dolomite, etc.) around the pore space. Upon solution and removal of these minerals, porosity and permeability are enhanced.

Hydrofracturing is conducted using fluid pumped down the well through perforations in the casing and into the formation. Pressures are increased to the point that the formation fractures or breaks, and sand is added to the injection fluid to “prop open” the crack, once the pressure is released. The pressure required to fracture a given formation is generally predictable. However, some coals require very high pressures to fracture the formation.

Cavitation is an open hole completion technique that can be used on CBM wells. In the past this completion technique was frequently used, however currently it is not commonly used in the action area. With this completion technique, the well is drilled to the top of the coal zone and the production casing is set and cemented back to surface. The conventional drilling rig is released and a modified completion rig is then brought in to complete the “cavitation” process.

An air/water mixture is injected for one to six hours into the exposed coal interval which creates cavities (tensile/shear failure) in the coal seams. During cavitation pressure builds within the down hole during a shut-in (closed) interval. When pressure is released a flow of gas, fluid, and coal fines moves to the surface via the blooie line. Initially pressure release results in large amounts of gas which is controlled through a flare to burn off the excess gas. Water and coal fines are collected in the lined reserve pit. Approximately 15-100 barrels (bbls) of water are used in the cavitation procedure each time shut-in occurs. Approximately 90-95% of coal fines are collected in the reserve pit, while the remaining 5-10 % is burned or lost to the atmosphere. The well is surged/cleaned out intermittently on a 24-hours basis determined by the amount of coal encountered. The cavitation process typically involves 20-30 injections over a 10 to 15 day period and could take place day and night (USDI 2002).

Before CBM wells begin producing gas for sale, the well bore and surrounding reservoir must be "cleaned up" (e.g., any fluids, sand, coal particles, or drill cuttings within the well bore must be removed). The conventional method for doing this is to pump air down the well bore, which lifts the waste fluids and solids out. The solid and liquid waste materials are then dumped into a pit or tank, and any gas that is removed is flared or vented to the atmosphere. In some flareless or green completions, natural gas, rather than air, is pumped down the well bore to clean it out

The green completion technique is used on some CBM wells in the action area, which eliminates flaring and testing. With the existence of a pipeline onsite for the pad wells, the gas from flowback is run through a special separator and then placed in the pipeline for gathering. This technique reduces flaring and venting overall. The additional equipment for green completion may include considerably more tankage, special gas-liquid-sand separator traps,

and portable gas dehydration. In addition to reducing methane emissions, green completions produce an immediate revenue stream with the produced natural gas and gas liquids, less solid waste and water pollution, and a safer operating practice.

During completion and testing of CBM wells, flaring may be used to safely removed gas from the rig and work area. During the process produced gas is ignited and burned rather than directing that gas to sales. Produced gas is piped away from the well bore into a pit constructed on the well pad, ignited and allowed to burn. A berm is usually constructed around the pit to aid in containing the flame and any materials that might be blown out with the gas. In a cavitation completion, as described above, a CBM well is cycled for days or weeks between periods of pressure build up and periods of flowing. Flaring commonly occurs while the well is flowing.

A free flowing well is closed off with an assemblage of valves, pipes, and fittings to control the flow of oil and gas to other production facilities. If the well is not free flowing, artificial-lift (pump) methods would be used. These are explained, along with well production equipment and procedures, in the following section on production.

3.2.5 Production Facilities

Reservoirs that produce both oil and natural gas require the siting of facilities for the production, cleanup, and storage and/or transportation of the products on the well pad. If the well produces naturally only a series of pipes and valves at the well head is required to regulate the flow of product to the surface. If there is little or no natural pressure a pump is used to lift the product to the surface.

Central deliver points (CDPs) or treatment facilities are used to treat CBM production due to comparatively high volumes of produced water and carbon dioxide. The produced gas is transported to a well site separator, which separates the stream into individual gas and water gathering lines before transportation to the CDP or treatment facility. The separate pipelines are usually contained in the same trench along the right-of-way. At the facility, the produced gas enters a slug catcher for additional separation. The produced water is stored in tanks before being transported to an injection well for disposal.

Pumping jacks powered by electric motors or by gas fired internal combustion engines are used to remove water from a CBM well. Most wells drilled in the action area produce enough water that it must be disposed of during the well operation. When it averages less than five barrels per day, produced water, typically brackish to highly saline, is evaporated from lined surface pits on location. The average amount of produced water for all CBM wells on the Reservation was 89 barrels per day in 1995 and 56 barrels per day in 1996 (USDI 2002). A General National Pollutant Discharge and Elimination System Permit issued by the Environmental Protection Agency (EPA) must be authorized for produced water is to be discharged to surface waters inside the exterior boundaries of the Reservation. Produced water may be trucked or transported via pipeline to a disposal site. A small percentage (5%) of the produced water not evaporated on site is trucked to permitted evaporation ponds. Most of the produced water (95%) from the Reservation is disposed of in deep injection wells.

On the Reservation, injection-disposal wells are authorized by the EPA. BLM engineers and the SUIT have review responsibility for injection proposals, to determine if there would be impacts on other minerals and groundwater; however, they have no approval authority over the well or target zone. Similarly, the BIA and SUIT review the injection well for surface concerns. When water is disposed of underground, it is always introduced into a formation containing water of

equal or lesser quality or into a formation that has been specifically exempted by the EPA or COGCC (USDI 2002). It is anticipated that very few if any additional disposal facilities would be necessary.

Compression is used to increase production pressure to the same level as within the transmission pipeline. Gas under well head pressure is transported through a gathering system to a compressor facility. Compression increases pipeline pressures as necessary to introduce the gas into the existing transmission pipeline. This function is accomplished using natural gas fired engines or electric motors. Other equipment may include dehydration and amine systems for water and carbon dioxide removal.

Compression stations in the action area vary in size from approximately one acre to as large as twenty acres. As production declines in specific areas of the action area, compression facilities are moved to other areas to facilitate production at current levels. Producers typically would move engines or motors from one facility to another existing facility. This eliminates the need for new disturbance resulting from compression. However, additional facilities, to accommodate future compression needs for continued production brought about by the proposed action, may require some new disturbance.

Routine production operations occur throughout the year and require use and maintenance of access roads and well pads on a periodic, as needed basis. Maintenance of the various mechanical components used in production occurs at intervals recommended by manufacturers or as needed, based on site inspections. A pumper visits each producing well to ensure that equipment is functioning properly. Pumpers for some smaller producers may visit each well on a daily basis. For larger producers a pumper visits the well site once a week by utilizing off site computer based automation systems. Solar panels are used to power the radio telemetry equipment. When a problem is identified through the system a pumper is dispatched to the location. Control and monitoring of well production by radio telemetry reduces regular site inspections of each well, and vehicular traffic.

Periodically, a workover on a well is required. A unit similar to a completion rig is used to conduct maintenance procedures for efficient operation. Workovers can include repairs to the well bore equipment (casing, tubing, etc.), the well head, or the production formation itself. These repairs occur during daylight hours only and are usually completed in one day. Some situations may require several days to finish a workover. The frequency for this type of work cannot be accurately projected, since workovers vary well by well and depend on site specific circumstances.

3.2.6 Abandonment-and-Reclamation Phase

Well plugging and abandonment requirements vary with the rock formations, subsurface water, well site, and well. In all cases, all formations bearing useable quality water, oil, gas, or geothermal resources, and/or prospectively valuable deposits of other minerals, would be protected. Generally, in a dry well, the hole below the casing is filled with heavy drilling mud, a cement plug is installed at bottom of the casing, the casing is filled with heavy mud, and a cement cap is installed on top. A pipe monument, giving the location, lease number, operator, and name of the well, is required. In irrigated fields, the casing would be cut off and capped below plow depth (18 to 24 inches).

Plugging of a depleted producing well requires a cement plug in the perforated casing in the producing zone. The cement pump jack foundations, if any, are removed or buried below

ground level. Surface flow and injection lines are removed, but buried pipelines are abandoned in place. Subsurface power lines are also abandoned in place. All surface equipment is removed.

The disturbed surface area is restored to the requirements of the tribe and BIA. This may involve the use of bulldozers and road graders to recontour those disturbed areas associated with the drill pad, plus the access road to the particular pad. The area would be reshaped to an approximation of the original contour, to create a smooth transition with adjacent undisturbed ground, minimize erosion and sedimentation, and establish vegetation. After grading the subsoil and spreading the stockpiled topsoil, the seedbed would be prepared and the site would be seeded with a viable seed mixture. Following seeding, the site would be mulched and crimped with certified weed free straw. A fence may be erected to protect the site until seed germinates and vegetation becomes established, particularly in livestock-concentration areas. Final abandonment would not be approved until noxious weeds were under control (USDI 2002) and vegetation groundcover is sufficient to control erosion.

3.3 DESIGN FEATURES

The SUIT has developed standard environmental protection measures that would be applied to all future development within the action area. These general conditions would be augmented with special conditions for a site specific project whenever conditions warrant. In addition, BLM Onshore Oil and Gas Orders and Notices to Lessees would be applied as standard operating procedures to individual projects and operators. Environmental protection measures are design features (mitigation measures) which will be implemented under the proposed action. These specific design features are outlined below.

3.3.1 Air Quality

- Roads will be surfaced or dust inhibitors will be used (e.g., surfacing materials, non-saline dust suppressants such as magnesium chloride, clean water, etc.) as appropriate, on roads and well locations constructed on soils susceptible to wind erosion, to reduce the amount of fugitive dust generated by traffic or other activities.

- Electric Compression (including solar power): Using electric-powered compressor motors in place of the typical natural gas-fired compressor engines could eliminate direct NO_x emissions from compressor station locations. Increased NO_x emissions are likely to occur at the point of electrical generation however, often burning dirtier fuels and emitting more air pollutants (such as from coal-fired power plants). Using current industrial electrical rates and assuming 100% control due to elimination of 2.0 g/hp-hr NO_x emissions at the compressor site, the cost effectiveness of electric compression is roughly $26,000 per ton of NO_x removed. Photovoltaic (solar) electrical systems cannot provide the needed power requirements for proposed injector well and pipeline compression engines (nearly 118,000 hp).

- All new and replacement internal combustion gas field engines must meet, at minimum, recently promulgated (January 18, 2008, 73FR3568) New Source Performance Standards (NSPS) (40 CFR 60, Subpart JJJJ). Additionally, all new and replacement internal combustion gas field engines greater than or equal to 500 design-rate horsepower (or site de-rated horsepower values, as long as manufacturer de-ration values and emission factors are supplied and current demonstration compliant with appropriate emission rate

requirement) must not emit more than 1 gram of NO_x per horsepower-hour upon issuance of the Decision document, as opposed to being delayed under the NSPS.

- All older compression installations within the Ignacio Blanco field will be upgraded to contemporary best available emissions control technology within five years (2012). All new and replacement internal combustion gas field engines must meet, at minimum, recently promulgated (January 18, 2008, 73FR3568) NSPS (40 CFR 60, Subpart JJJJ). Additionally, all new and replacement internal combustion gas field engines greater than or equal to 500 design-rate horsepower must not emit more than 1 gram of NO_x per horsepower-hour upon issuance of the Decision document, as opposed to being delayed under the NSPS.

- An annual report detailing emissions must be submitted by all oil and gas operators with facilities within the SUIT boundary no later than April 1 of each year to the SUIT Environmental Programs Division (EPD).

3.3.2 Vegetation

- Avoid areas containing sensitive vegetation types, such as wooded riparian vegetation or known sites with culturally important plants, to the fullest extent possible.

- Reclaim and revegetate all disturbed areas of soil with approved, certified weed free seed mixes, fertilizer, and/or mulch.

- Separate topsoil and set aside for reclamation purposes.

- Limit construction activities to dry conditions to reduce soil compaction and rutting, as appropriate.

- Use spark arresters on chainsaws and mufflers on vehicles to prevent wildland fires.

- Burning brush, trash, scrap materials, etc. is restricted by state agency or Reservation rules.

- Apply herbicide only under the supervision of a licensed pesticide applicator, and ensure that application, storage, and disposal procedures meet state and federal requirements.

- Clean up spills of petroleum products or produced water in an appropriate manner as soon as possible to minimize damage to plant materials.

- Control erosion and sedimentation with Best Management Practices (BMPs).

- All oil and gas operators will obtain a permit from the SUIT Department of Forestry prior to the removal of wood materials greater than 4 inches in diameter from well pads or pipelines.

- Avoid construction in wetlands to the fullest extent possible.

- Identify unavoidable direct and indirect impacts on wetland areas during individual project planning. Develop a wetland mitigation/monitoring plan and obtain necessary permits, prior to initiation of construction activities.

- When it is necessary to cross streams and riparian areas, design facilities to cross at right angles, rather than parallel, in order to minimize the area of impact on these resources. Use BMPs at any temporary stream crossings, and rehabilitate wetlands as soon as possible.

- Protect water quality within, and downstream of, the action area from soil erosion and sedimentation by best management practices that include erosion control devices and management procedures, retention of a vegetation buffer strip (minimum of 100 feet) between water bodies and disturbed areas, and spill prevention procedures.

- Conduct equipment fueling, maintenance, and storage operations at least 100 yards from any wetland or stream system.

- Whenever reasonably possible, bore under jurisdictional waters of the U.S. including drainages and wetlands to avoid and/or minimize surface impacts.

- Monitor invasive species populations.

- Use BMPs to minimize the introduction of invasive species.

- Require operators to control noxious weeds in disturbed areas.

- Minimize surface disturbance by accessing new wells via spur roads off existing roadways rather than through construction of new primary roads.

- Use existing rights-of-ways to the extent possible for new roads and pipelines.

- Minimize or avoid development in areas of critically important wildlife habitat, such as elk or deer winter concentration areas and wooded riparian vegetation.

- Conduct on-site inspections of potential development locations to ensure avoidance of wooded riparian areas to the greatest extent possible.

- Minimize the number of well monitoring trips by coordinating well visits to limit traffic, or installing automated monitoring systems.

- Revegetate disturbed areas as soon as possible. Monitor the success of re-vegetation efforts, and re-seed as needed to develop established stands of vegetation. As per requirements under the Mitigation Measures for Vegetation Resources this re-vegetation shall be noted in an annual report.

3.3.4 Wildlife

- Maintain appropriate speed limits on access roads to minimize wildlife injuries or mortalities due to vehicle-wildlife collisions;

- All fences and cattleguards would be removed from well pads once 70% of vegetation has been established on site. Oil and gas operators would install pipe barriers or panels around wellheads, meters, valves and other equipment to minimize impacts to wildlife and livestock;

Migratory Birds

- Heater-treaters (separators) will be screened to prevent bird mortalities.

- Survey areas to be developed (ROWs and wells) for nesting activity or winter roost sites (e.g., eagles) prior to construction.

- Restrict new well locations and rights-of-way to at least 0.25 mile from a raptor nest or winter roost.

- Prohibit construction or other intrusive activities within 0.5 mile of an active raptor nest during the nesting season.

- Tribal wildlife biologists shall conduct yearly nesting surveys to document known nest sites and monitor nesting success. Annual winter roost surveys would also be conducted to identify and record additional winter roost sites. This data would be used to evaluate the effectiveness of mitigation measures for wooded riparian habitat and develop additional mitigation criteria as necessary.

- A migratory bird survey prior to construction during the migratory bird breeding season (March through August) will be conducted.

- All fences and cattleguards will be removed from well pads once 70% of vegetation has been established on site for all wells. Oil and gas operators will install pipe barriers or panels around wellheads, meters, valves and other equipment to minimize impacts to wildlife and livestock.

- Bird netting will be suspended and maintained over reserve pits, open tanks, and catchments, if hydrocarbons or toxic chemicals are present in the fluids until reclamation is complete.

- All power lines will conform to the USFWS draft “Guidelines for Raptor Conservation in the Western United States”, the "Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006" (APLIC 2006), and the "Avian Protection Plan Guidelines" (APLIC 2005).

- Recommend that power lines be placed below ground, where possible.

- *Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors* (Craig 2002) will be implemented.

- Pre-construction surveys will be conducted of proposed well pad and access route locations for Gunnison prairie dogs. Direct impacts to prairie dog colonies will be avoided were possible, and in the light of other resource tradeoffs resulting from access road and well pad relocation.

Bald Eagle Winter Roosting (November 15 to March 15)

- For a construction project planned during the bald eagle winter roosting period and within 0.25 mile of a riparian zone with a mature cottonwood component, a pre-construction survey shall be initiated within 10 days prior to the start of construction to verify the presence

or absence of bald eagle roosting activity. The surveys must be conducted by qualified biologist(s) according to protocol as set forth by the USFWS. Generally, the survey should be performed during dawn and dusk periods on two or more days immediately prior to the construction start date. The survey should be documented and results sent to the Division Head of the SUIT, Division of Wildlife Resource Management.

- If one or no bald eagles are found to be roosting within 0.25 mile of the action area during the pre-construction survey, work may proceed with no time of day restrictions.

- If two or more bald eagles are found to be roosting within 0.25 mile of the proposed construction site action area during the pre-construction survey, the operator will be restricted to working between 10:00AM and 2:00PM on a daily basis.

- If bald eagles continue to occupy or enter the area within 0.25 mile of the construction site between the 10:00AM and 2:00PM time window, work will stop until the bald eagles leave the area. Under no circumstances shall bald eagles be harassed in order to disperse them from the area.

Bald Eagle Spring/Summer Nesting (March 16 to July 1)

- For a construction project planned during the bald eagle nesting period and within 0.5 mile of suitable bald eagle nesting habitat (e.g. a riparian area with a mature cottonwood component), a pre-construction survey shall be initiated within 10 days prior to the start of construction to verify the presence or absence of bald eagle nesting activity. The survey must be conducted by qualified biologist(s) according to protocol as set forth by the USFWS. Generally, the surveys should be performed during dawn and dusk periods on two or more days immediately prior to the construction start date. The survey should be documented and results sent to the Division Head of the Southern Ute Indian Tribe, Division of Wildlife.

- If no bald eagles are found to be nesting within 0.5 mile of the proposed construction site during the pre-construction survey, work may proceed with no restriction. If bald eagles are found to be nesting within 0.5 miles of the construction area, the construction must stop until all signs of nest use have stopped for the year.

- If an active bald eagle nest is known to exist within 0.5 mile of a proposed construction project, the construction project may not proceed until all signs of nest use have stopped for the year.

- Where development in unique habitats cannot be avoided, mitigation, such as habitat enhancement and restoration, would be considered. Tribal Wildlife will coordinate with the operator in the development of appropriate wildlife habitat mitigations and enhancements, and the operator will be responsible for construction of these improvements as a condition of approval in the authorization to proceed with the development activity.

3.3.5 Waterways

- Protect surface waters from oil- and gas-related sedimentation and contaminant releases.

- Minimize the number of stream crossings by roadways and pipelines. Where feasible, cross streams and riparian corridors at right angles to protect additional habitat and minimize erosion.

- Maintain riparian vegetation during construction projects, along stream channels to the fullest extent possible.

- Require closed loop system in areas of shallow groundwater and riparian areas, or other areas identified. The need for a close loop system will be determined on a case by case basis during the on-site evaluation. A closed loop system uses a series of storage tanks that separate liquids and solids during the drilling process. The waste is trucked offsite for disposal.

- Implement BMPs to slow or reduce the flow of surface-water runoff across disturbed areas, including diversion of surface runoff around facilities.

- Install road-grade culverts following best management practices.

- Implement the *Stormwater Recommendations for Oil and Gas Operations on Tribal Lands within the Southern Ute Indian Reservation*.

- Require operators to obtain a crossing permit when pipelines cross Los Piños River Indian Irrigation Project canal or other irrigation ditches, except in instances in which such crossing is already authorized by leases or easements.

- Operators will implement the USEPA Reasonable and Prudent Practices for Stabilization (RAPPS) BMPs to eliminate or minimize adverse impacts to the environmental health of the SUIT natural resources (USEPA 2004).

4.0 ACTION AREA

The action area is within the exterior boundaries of the SUIT Reservation, located in southwestern Colorado in the southern part of La Plata County, with small tracts of southwestern Archuleta County and eastern Montezuma County (Attachment A, Figure 1). The action area ranges between approximately 42 and 46 miles east to west, and 15 miles north to south. It encompasses about 421,454 acres or about 659 square miles. The southern boundary of the action area is the Colorado-New Mexico state line. The 421,454-acre area within the action area is a patchwork of Reservation and non-Reservation land.

4.1 PHYSICAL CHARACTERISTICS OF THE ACTION AREA

The Reservation is located in the northern portion of the San Juan Basin and the eastern area of the Colorado Plateau in southwestern Colorado. The Colorado Plateau is a vast physiographic province extending throughout western Colorado, northwestern New Mexico, most of northern Arizona, and southern and eastern Utah. This physiographic province is characterized by generally flat-lying sedimentary deposits divided by faults and monoclines that form cliffs and individual plateaus. Steep-sided mesas and buttes capped by erosion-resistant rock layers are common (USDI 2002).

The topography of the action area varies from moderately steep to steep mountains, canyons, and mesas in the north-central and south-central portions, to rolling hills and gently sloping river valleys in the eastern and western regions. Elevations range from about 6,000 to 9,000 feet.

The soils in the action area typically consist of loam, silty clay loams, and sandy, gravelly, or cobbly loams. Rock outcrop is also common. The soils have formed from the sandstones and shales of the region. Erosion potential varies based on soil type, slope, and vegetation cover. Some of the soils may be classified as prime farmland if there is a dependable water supply (USDI 2002).

The climate in the area is mild and semi-arid to sub-humid. The summers are dry, and the winters often have heavy snow, particularly in the mountainous areas to the north of the action area. The growing season is about 100 days. Many of the valleys and mesas are irrigated by various irrigation ditches and laterals established in the later 1800s and 1900s by farmer-owned water irrigation districts. The irrigation ditches and laterals carry water from snowmelt and rainfall in the high mountains to these irrigation districts (USDI 2002).

4.2 BIOLOGICAL CHARACTERISTICS OF THE ACTION AREA

Vegetative communities in the action area are based on the Provisional Data Set for the Southwest Regional Gap Analysis Project (USGS 2004). Vegetative communities within the action area can classified into the following general vegetative communities: montane, pinyon-juniper woodlands, semi-desert and salt desert, barren, wetland and riparian, and agriculture. A brief description of each community type is provided below.

4.2.1 Montane

Montane forest communities comprise approximately 14,719 acres of the action area and include ponderosa pine (*Pinus ponderosa*), mixed conifer, and aspen (*Populus tremuloides*). These communities generally occur within a similar elevational range and are often intermixed within forest stands. The majority of the montane forest in the action area is dominated by ponderosa pine. Small patches of mixed conifer also occur, dominated by Douglas fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*), with some ponderosa pine, Engelmann spruce (*Picea engelmannii*), and blue spruce (*P. pungens*) also being present. Small patches of aspen occur along the Animas River corridor in the southern portion of the action area as well as within montane forest stands at the extreme eastern end of the action area.

Montane shrubland communities occur on foothills that are adjacent to but lower in elevation than montane forest communities. Gambel oak dominates the montane shrublands in the action area at approximately 20,969 acres. Other shrub species occurring in these communities may include serviceberry (*Amelanchier* spp.), mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos oreophilus*), big sagebrush (*Artemisia tridentata*), chokecherry (*Prunus virginiana*), three-leaf sumac (*Rhus trilobata*), golden currant (*Ribes cereum*), and soapweed (*Yucca glauca*).

Approximately 3,540 acres of montane grasslands occur within the action area, generally interspersed among forest and woodland communities. These grasslands may be dominated by a variety of oatgrasses (*Danthonia* spp.), fescues (*Festuca* spp.), and muhlys (*Muhlenbergia* spp.), with blue grama (*Bouteloua gracilis*) and Sandberg bluegrass (*Poa secunda*) commonly present.

4.2.2 Pinyon-Juniper

Pinyon-juniper woodlands are the most abundant vegetative community in the action area (~208,865 acres). These communities are dominated by pinyon pine (*Pinus edulis*) and Utah

juniper (*Juniperus osteosperma*); however, Rocky Mountain juniper (*J. scopulorum*) may also be present at higher elevations. Dominant understory species in pinyon-juniper woodlands may include big sagebrush, mountain mahogany, antelope bitterbrush, Gambel oak, blue grama (*Bouteloua gracilis*), and James's galleta (*Pleuraphis jamesii*).

4.2.3 Semi-Desert and Salt Desert

Semi-desert and salt desert grasslands and shrublands are scattered throughout the action area, generally occurring at a lower elevational zone than montane and pinyon-juniper communities. Several distinct vegetative communities are included in the semi-desert and salt-desert category, including sagebrush-dominated, greasewood-dominated, and mixed shrub-steppe and shrub-grassland communities. Of these vegetative communities, sagebrush (*Artemisia* spp.) is the most widespread in the action area (~59,676 acres). Sagebrush shrublands are comprised primarily of big sagebrush; however, some portions of the action area may also include black sagebrush (*Artemisia nova*) and Bigelow sage (*Artemisia bigelovii*).

Mixed shrub-steppe and semi-desert grassland communities make up approximately 11,312 acres of the action area. These vegetative communities generally overlap in species composition; however, they differ in relative abundance and structure. Mixed shrub-steppes are dominated by shrub species with less than 25% herbaceous cover, while semi-desert grassland community is dominated by herbaceous species, with scattered shrubs present. Common shrub species to these two communities include big sagebrush, fourwing saltbush (*Atriplex canescens*), Greene's rabbitbrush (*Chrysothamnus greenei*), Mormon tea (*Ephedra viridis*), rubber rabbitbrush (*Ericameria nauseosa*), broom snakeweed (*Gutierrezia sarothrae*), and winterfat (*Krasheninnikovia lanata*). Common herbaceous species to these communities include Indian ricegrass (*Achnatherum hymenoides*), blue grama, needle-and-thread (*Hesperostipa comata*), James's galleta, and muhly (*Muhlenbergia* spp.).

Greasewood (*Sarcobatus vermiculatus*) flats comprise about 761 acres of the action area and typically occur on stream terraces or other flats near drainages or around playas. Other shrub species occurring in this community may include fourwing saltbush, shadscale (*Atriplex confertifolia*), and winterfat.

Finally, approximately 209 acres of salt desert scrub is present in the action area. This community type is usually dominated by at least one species of saltbush (*Atriplex* spp.) but may also include big sagebrush, rubber rabbitbrush, ephedra, winterfat, and wolfberry (*Lycium* spp.).

4.2.4 Barren

Barren community types generally have less than 10% vegetative cover and include canyon and tablelands, shale badlands, and washes. Collectively, these community types make up about 8,061 acres of the action area. Canyon and tablelands include steep cliffs, narrow canyons, and open tablelands, predominantly of sandstone, shale, and limestone. Vegetation in these areas are characterized as scattered trees and shrubs, including pinyon pine, ponderosa pine, or juniper, with a sparse herbaceous layer. Shale badlands are typically derived from marine shales, siltstone, or mudstone and may support sparse populations of dwarf-shrubs and herbaceous vegetation. Washes are restricted to intermittently flooded streambeds and banks often lined with greasewood, rubber rabbitbrush, and silver sagebrush (*Artemisia cana*).

4.2.5 Wetlands and Riparian

Wetlands in the action area include relatively small, scattered emergent marsh and montane meadow habitats, totaling approximately 185 acres of the action area. Some marshes may be continually inundated with water, while water level in other marches may fluctuate over the course of the growing season. Vegetation includes herbaceous plants that are adapted to saturated soil conditions, such as *Scirpus*, *Schoenoplectus*, *Juncus*, *Typha*, *Potamogeton*, *Polygonum, Nuphar*, and *Phalaris* species. Marshes with relatively deep water may also have floating-leaf plants, such as *Lemna, Potamogeton*, and *Brasenia* species, as well as submergent and floating plants, such as *Myriophyllum, Ceratophyllum*, and *Elodea* species. Montane meadows are higher elevation communities dominated by herbaceous vegetation and often border ponds, lakes, streams, and seeps. These areas may occur as a mosaic of several plant associations, often dominated by sedges (*Carex* spp.) and other graminoids.

Riparian communities are composed of woodlands and shrublands, totaling approximately 6,426 acres along the perennial rivers and streams and many intermittent drainages in the action area. Most, if not all, of these water courses includes a mix of native and exotic vegetation. Dominant native tree species may include boxelder (*Acer negundo*), narrow-leaf cottonwood (*Populus angustifolia*), Rio Grande cottonwood (*P. deltoids*), Douglas fir, blue spruce, or Rocky Mountain juniper. Common shrub species include alder (*Alnus* spp.), chokecherry, three-leaf sumac, and a variety of willow species (*Salix* spp.). Exotic trees commonly occurring in riparian woodlands include Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix* spp.).

4.2.6 Agriculture

Agricultural lands make up roughly 84,127 acres within the action area. Typically crops within the action area are alfalfa, wheat, winter wheat, and mixed grasses.

4.2.6 Hydrology

The three major rivers in the action area are the La Plata, the Animas (including its major tributary, the Florida), and Los Piños. These rivers, along with Trail Canyon (an approximately 33 square mile sub watershed on the Reservation), are tributary to the San Juan River. The three main watersheds roughly cover equal areas of the action area, and are fed by run-off from the mountains north of the Reservation, reservoirs, irrigation return flows, and precipitation. The characteristics for each of the main watersheds within the Reservation are summarized in Table 2.

Table 2. Characteristics of Watershed in the Action area (USGS 2008).

Watershed	Watershed Acreage in action area (mi^2)	Average Annual Streamflow (AF/yr)	Reservoirs	Major Tributaries	Primary Water Uses
La Plata River	257	25,200 at Stateline	Mormon Reservoir	Cherry Creek, Long Hollow, Hay Gulch	Irrigation, Stock, Residential wells, Fish and wildlife
Animas River	196	592,100 at Durango	Lemon Reservoir (via the Florida River)	Florida River	Irrigation, Municipal, Industrial, Recreation, Residential wells, Fish and wildlife
Los Piños River	181	81,200 at Ignacio	Vallecito Reservoir	Spring Creek	Irrigation, Municipal (Ignacio), Recreation, Residential wells, Fish and wildlife
Trail Canyon	33	Not available	None	None	None

The streamflows of the La Plata, Animas and Los Piños rivers are monitored instantaneously by the U. S. Geological Survey (USGS). The monthly average streamflows for these rivers, over the period of record, is summarized in Figure 3-3. According to the USGS data, the average annual streamflows on the rivers is as follows (USGS 2008):

- Animas at Durango: 593,100 AF/yr
- Florida at Bondad 55,200 AF/yr
- Los Piños near Ignacio: 70,000 AF/yr
- La Plata at the Stateline: 25,300 AF/yr

Peak streamflows occur from May through June due to meltwater from the San Juan Mountains, and gradually decrease throughout the rest of the year.

According to the SUIT EPD, surface water quality in the action area is generally good, based on water quality standards set by the Colorado Department of Public Health and Environment (CDPHE) and the SUIT Water Quality Program (Burns, Michiko, SUIT EPD, pers. comm. 5/24/07). However, there is concern about potential impacts to water quality due to historical and current uses of the land within these watersheds, specifically mining, agriculture, municipal discharge, and oil and gas production. To address these concerns and monitor the health of the ecosystem, water quality data is collected by SUIT at several locations along the La Plata, Animas and Los Piños rivers and other surface waters on the Reservation. This data includes measurements of total and dissolved metals, nutrients and macro invertebrates as well as field parameters of dissolved oxygen, conductivity, pH, temperature, and turbidity. This is input into

the USEPA's water quality database, STORET (Michiko Burns, SUIT EPD, pers. comm. 5/24/07).

Urban and fertilizer runoff, wastewater effluent, decaying plants and animals, watershed geology, and soils influence the TDS concentrations in surface waters. Concentrations of TDS may be increased in heavily irrigated areas along the La Plata and the Florida rivers. The SUIT Water Quality Monitoring Program is monitoring non-point sources that are detrimental to water quality on Los Piños River. The program promotes new agricultural and watering practices to decrease impacts to water quality. The program also has begun monitoring water quality and benthic macro-invertebrates in select wetlands adjacent to the major rivers (Michiko Burns SUIT EPD, pers. comm. 5/24/07).

Currently no surface waters within the action area are listed as impaired. The La Plata River is impaired for dissolved oxygen, sedimentation/siltation, and fecal coliform from McDermott Arroyo to the San Juan River primarily from animal feeding operations, drought, water diversions, loss of riparian habitat, rangeland grazing, onsite treatment systems (septic systems) and stream bank modifications. The San Juan River from the Animas River upstream to Largo Canyon is impaired for mercury in fish tissue, sedimentation/siltation and fecal coliform. The Animas River from the confluence with the San Juan upstream to Estes Arroyo is impaired for nutrients (eutrophication) and fecal coliform (SWQB 2005).

5.0 FEDERALLY ENDANGERED, THREATENED, AND CANDIDATE SPECIES DESCRIPTIONS AND STATUS IN THE ACTION AREA

5.1 FEDERALLY LISTED/CANDIDATE SPECIES ELIMINATED FROM DETAILED EVALUATION

Due to the absence of suitable habitat within the action area, five of the 11 federally listed or candidate species are eliminated from detailed evaluation in this BA. These species include black-footed ferret (*Mustela nigripes*), Canada lynx (*Lynx canadensis*), Mexican spotted owl (*Strix occidentalis lucida*), Mesa Verde cactus (*Sclerocactus mesae-verdae*), and Pagosa skyrocket (*Ipomopsis polyantha*). Table 3 provides the reasoning for eliminating each species from further evaluation.

Table 3. Flora/fauna listed by the USFWS as Threatened, Endangered, or Candidate with the Potential to Occur on the SUIT Reservation but Eliminated from Detailed Evaluation (E = Endangered; T = Threatened; C = Candidate).

SPECIES	STATUS	HABITAT DESCRIPTION	REASON FOR ELIMINATION FROM CONSIDERATION
Black-footed ferret (*Mustela nigripes*)	E	Open grasslands with large prairie dog colonies year-round.	Ferrets have been extirpated throughout most of its range and are not known to occur in southwest Colorado. No potential to occur.
Canada lynx (*Lynx canadensis*)	T	High elevation (>8,000 ft) mixed coniferous forests.	The action area includes only very small, isolated patches of mixed conifer forest. No potential to occur.
Mexican spotted owl (*Strix occidentalis lucida*)	T	Mature ponderosa pine or mixed conifer forests in canyon or cliff habitat.	Only small, isolated patches of mixed conifer and ponderosa pine occurs in the action area; these areas are absent of canyons/cliffs. No potential to occur.
Mesa Verde cactus (*Sclerocactus mesae-verdae*)	T	Salt desert scrub habitats on soils derived from the Fruitland and Mancos Shale formations.	Only small, isolated patches of salt desert scrub exist in the action area. No Mancos Shale geology occurs within the action area. This species is extremely unlikely to occur.
Pagosa skyrocket (*Ipomopsis polyantha*)	C	Fine soils derived from the Mancos formation; in barren shale ponderosa pine, pinyon-juniper or scrub oak communities.	No Mancos Shale geology occurs within the action area. No potential to occur.

5.2 FEDERALLY LISTED/CANDIDATE SPECIES WARRANTING DETAILED EVALUATION

Habitat for six federally listed or candidate species occurs in the action area. These species include southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus*), Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), Knowlton's cactus (*Pediocactus knowltonii*), and Mancos milkvetch (*Astragalus humillimus*). Detailed consideration of these species is provided in this section.

5.2.1 Southwestern Willow Flycatcher

The southwestern willow flycatcher is a Neotropical migrant that winters in Central and South America and breed in the southwestern U.S. Typical breeding habitat consists of relatively dense riparian vegetation along steams or other wetlands, near or adjacent to surface water or underlain by saturated soils (Sogge et al. 1997, USFWS 2002a). Historically, southwestern willow flycatchers nested in native riparian vegetation such as willows and boxelder. Following changes in vegetation patterns, flycatchers still nest in native vegetation where available, but they also nest in riparian exotics such as salt cedar and Russian olive (USFWS 2002a). Suitable habitat, as defined by the southwestern willow flycatcher recovery plan (USFWS 2002a) consists of mesic riparian shrub and tree communities 1 ha (0.2 acres) or greater in size

within floodplains large enough to accommodate riparian patches at least 10 m (32 ft) wide. Other sub species (*Empidonax traillii adastus*) of flycatchers are known in the study area and potentially a hybrid species of *adastus* and *extimus.* However, from a regulatory standpoint all species of southwestern willow flycatchers within the study area are treated as the *extimus* subspecies.

Suitable breeding and migratory habitat for southwestern willow flycatcher occurs in the action area along portions of the La Plata, Animas, Florida, Los Piños, Piedra and San Juan Rivers. Annual surveys on the Reservation have identified six breeding territories (annual average) on the Los Piños River near Ignacio, Colorado (Steve Whiteman, SUIT Division of Wildlife Resources Management [DWRM], pers. comm., 4/19/2007). Additionally, USFWS protocol surveys on U.S. Bureau of Reclamation (BOR) portions of the La Plata River from 2003 to 2006 have documented annual migratory use of the La Plata River by willow flycatchers.

5.2.3 Yellow-billed Cuckoo

Yellow-billed cuckoo is a Neotropical migratory bird that breeds throughout the U.S. The breeding range of the western populations historically occurred in southwest British Columbia, western Washington, northern Utah, central Colorado, and western Texas south and west to southern Baja California, Sinaloa, and Chihuahua in Mexico (American Ornithologists' Union 1957 in Hughes 1999). Western populations declined sharply in the 20th century, however, due to destruction of riparian habitat and pesticide use; and, this species appears to be extirpated from much of its range in the west including British Columbia, Washington, Oregon, and possibly Nevada (Hughes 1999). Cuckoos are generally found in open woodlands with dense, scrubby understory vegetation; and, in the southwest, associated with watercourses. Typical habitat in the west includes a cottonwood overstory with a dense understory of native (e.g., willow) or exotic (e.g., saltcedar) vegetation.

Potential migratory and breeding habitat for yellow-billed cuckoo in the action area may occur in patches along the Animas, Los Piños, Piedra, and San Juan Rivers. In general, these river corridors provide marginal habitat for cuckoos at best; although, there are patches of suitable stopover and breeding habitat (Chris Kloster, Wildlife Biologist, CDOW, pers comm., 4/2/2007). A single yellow-billed cuckoo was detected along the Piedra River within the last 10 years (Steve Whiteman, DWRM, pers. comm., 3/22/2007) however, this detection was outside of the action area

5.2.4 Colorado Pikeminnow

The Colorado pikeminnow is North America's largest minnow species and can reach up to 1.8 m (~6 feet) in length and weigh as much as 36 kg (~ 80 pounds) (Miller 1961 in USFWS 2002b). This species prefers fast, muddy rivers with quiet backwaters, pools, deep runs, and eddies maintained by high spring flows (USFWS 2002b). They can tolerate a broad range of water temperatures from 35˚ C (95 ˚ Fahrenheit [F]) in the summer to 50º C (10˚ F) in the winter. Pikeminnows migrate hundreds of kilometers to and from their spawning grounds. Spawning occurs after spring runoff in riffles with gravel or cobble substrates at water temperatures typically between 2 and 18º C (64 and 73° F). After hatching and emerging from the spawning substrate, pikeminnow larvae drift downstream to nursery backwaters that are restructured by high spring flows and maintained by relatively stable base flows. Wild, reproducing populations of Colorado pikeminnow occur in the Green River and upper Colorado River sub-basins of the Upper Colorado River Basin as well as the San Juan River sub-basin (upstream from Glen Canyon in New Mexico and Utah). Populations in the San Juan River sub-basin are small with

limited reproduction occurring (USFWS 2002b). Pikeminnows have been extirpated from the Lower Colorado River Basin but have been reintroduced into the Gila River sub-basin (USFWS 2002b).

Potential habitat for Colorado pikeminnows in the action area exists in the largest action area river, the San Juan; however, there are no known Colorado pikeminnow populations in this section or in upstream sections of the San Juan River. Other large rivers in the action area, the Los Piños and Piedra, also provide habitat for this species. However, due to the present distribution of the species and stocking efforts by the CDOW, this species is unlikely to establish populations in these rivers in the near future.

The lower portion of the Animas River in the action area provides potential habitat for Colorado pikeminnows. In 2004, six stocked Colorado pikeminnow were collected from the lower 5 miles of the Animas River during the course of a fishery survey not directly tied to the San Juan Recovery Program indicating that the range of the Colorado pikeminnow may be expanding. The Colorado pikeminnow captured during this survey effort were not wild pikeminnow, but were USFWS hatchery-raised fish that had been recently stocked by the San Juan River Basin Recovery Implementation Plan (SJRBRIP) at the Animas-San Juan confluence. This was the first fully documented occurrence of this species occurring in the Animas River (Zimmerman 2005).

5.2.5 Razorback Sucker

Razorback sucker, one of North America's largest suckers, can reach 1 m (3 feet) in length and up to a weight of 5-6 kg (11−13 pounds) (USFWS 2002c). This species can be found in large rivers with depths ranging from 4 to 10 feet as well as some reservoirs. Habitat for razorback sucker varies seasonally, with deep runs, eddies, backwaters, and flooded off-channels utilized in spring, runs and shallow pools in summer, and low-velocity runs, pools, and eddies in winter (USFWS 2002c). Turbidity can range from clear to muddy, and substrate can range from mud to sand to gravel. This species may spawn in a variety of river or reservoir habitats, and young require nursery environments with quiet, warm, shallow waters (USFWS 2002c). Historically, razorback sucker was widespread in warm-water reaches of large rivers within the Colorado River Basin, from Wyoming south to Mexico to Wyoming (USFWS 2002c). The species is currently found in small numbers in the Green River, upper Colorado River, and San Juan River sub-basins; lower Colorado River between Lake Havasu and Davis Dam; reservoirs of Lakes Mead and Mohave; tributaries of the Gila River sub-basin; and in local areas under intensive management such as Cibola High Levee Pond, Achii Hanyo Native Fish Facility, and Parker Strip (USFWS 2002c).

Potential habitat for razorback sucker exists in the larger action area rivers, including the Animas, Los Piños, Piedra, and San Juan. This species has not been documented on SUIT lands.

5.2.6 Knowlton's Cactus

Knowlton's cactus occurs on gravelly hills formed from alluvial deposits at elevations of approximately 6,400 feet (Spackman et al. 1997). Vegetative substrates associated with this species include pinyon-juniper woodlands and sagebrush shrubland. This species is extremely difficult to locate due to its exceptionally small size, less than 2.5 cm (0.9 inches) wide, unless during the flowering and fruiting period occurring between April and early May and late May to early June, respectively (Spackman et al. 1997). Flowers are short-lived lasting only for about

two or three days, and have yellow centers with white to pale pink flowers that are open by mid-morning and close by late afternoon (Spackman et al. 1997). Populations of this species occur within the Los Piños River corridor, mainly south of La Boca at the New Mexico border (USDI 2002). No populations of this species have been documented on the Reservation (Steve Whiteman, DWRM, pers. comm., 3/12/2007). This species is one of the rarest of its genus and one of the rarest plants in the United States, with illegal collections contributing to its decline (Ecosphere 1995). Exact locations of these populations are not provided in this BA in order to protect the species. Figure 3 in Attachment A shows areas of potential habitat within the action area.

5.2.7 Mancos Milkvetch

Mancos milkvetch occurs on exfoliating rock ledges and mesas, formed from the Mesa Verde Group, at elevations from 5,500 to 5,850 feet and is associated with pinyon-juniper woodlands (USFWS 1989). This species forms clumps up to 30 cm (11 inches) across with unique persistent spiny leaf petioles (Spackman et al. 1997). The flowering period is from late April through early June and the fruiting period is from June through early July. Flowers are lavender to purplish with 2 to 4.5 mm (0.07 inches long to 0.17 inches) wide seed pods (Spackman et al. 1997). Species distribution occurs from northwest New Mexico to Colorado, occurring in scattered populations between the town of Towaoc, Colorado, and the Chaco River of New Mexico (USFWS 1989). No observations of this species have occurring within the action area; however, appropriate geologic substrates do exist in minor amounts. Figure 3 in Attachment A shows areas of potential habitat within the action area.

6.0 EFFECTS ANALYSIS

6.1 DIRECT AND INDIRECT EFFECTS

6.1.1 Southwestern Willow Flycatcher

Construction and drilling in riparian habitats could result in a loss or modification of potential nesting habitat for southwestern willow flycatcher. Other direct impacts could include the destruction of nests, nest abandonment or decreased nesting success in areas adjacent to construction and drilling. Habitat removal or modification could also result in fragmentation of riparian habitats thereby increasing edge effects. Fragmentation creates habitat edges, which can be an ecological trap for many bird species, as edges attract predators and the brood parasitic brown-headed cowbird (*Molothrus ater*). Some research suggests that nesting success decreases near edges due to higher rates of nest predation and/or cowbird parasitism (Whitcomb et al.1981, Yahner and Wright 1985, Andren and Angelstam 1988, Brittingham and Temple 1983, Ortega 1998). Potential impacts to Southwestern willow flycatchers could include injury or mortality. The most probable cause of death or injury would be open reserve pits or heater-treaters. It is unlikely that flycatchers would be killed by potential coal fires occurring near the Fruitland outcrop, because they are highly mobile.

Overall, potential direct and indirect impacts to southwestern willow flycatcher would be minimized by the proposed co-location of 95% of the CBM wells under the action. Potential direct impacts would be also be avoided or minimized following the implementation of species specific design features which include:

- Minimize construction activities in wooded riparian habitat, or any other potential southwestern willow flycatcher nesting habitat;

- Conduct Southwestern willow flycatcher surveys in accordance with standard protocol within suitable habitat prior to any construction activities to determine presence or absence of willow flycatchers. Survey schedule. Current standard protocol requires a minimum of one survey during the 1st survey period of May 15 to May 31, a minimum of one survey during the 2nd survey period of June 1 to June 21, and a minimum of three surveys during the 3rd survey period of June 22 to July 17, each at least five days apart (USFWS 2000).

- If Southwestern willow flycatchers are located during survey efforts, no surface disturbing activities will be conducted from May 1 through August 15.

- Vegetation replacement and restoration will be conducted in any suitable habitat that is lost due to project implementation (e.g., willow loss at pipeline crossings).

- No disturbance will be allowed within 200 meters of known or discovered occupied southwestern willow flycatcher breeding habitat.

Standard design features would include that heater-treaters (separators) will be screened to prevent bird mortalities. Bird netting will be suspended and maintained over all pits and/or open tanks and catchments until reclamation is complete. A closed loop system in areas of shallow groundwater and riparian areas, or other areas identified will be required.

The proposed action would not result in changes in streamflows therefore; no indirect effects from the potential alteration of riparian habitats or stream channel morphology would be expected. There is the potential that sedimentation or accidental spills or leaks of hazardous materials could indirectly affect the quality of potential habitat and prey base for Southwestern willow flycatchers. These impacts would be avoided or minimized by the implementation of design features including the preparation and implementation of Stormwater Pollution Prevention Plans and Spill Prevention Control and Countermeasure plans, and the implementation the of Best Management Practices. Water quality within, and downstream of, the action area will be protected from soil erosion and sedimentation through the use of best management practices that include erosion control devices and management procedures and retention of a vegetation buffer strip (minimum of 100 feet) between water bodies and disturbed areas. Equipment fueling, maintenance, and storage operations will be conducted at least 100 yards from any wetland or stream system. Whenever reasonably possible, jurisdictional waters of the U.S. including drainages and wetlands will be bored under. Additional design features that would minimize potential effects to southwestern willow flycatcher are listed in Section 3.3.

6.1.2 Yellow-billed Cuckoo

Because there have been no yellow-billed cuckoos documented within the study area in recent years, direct and indirect impacts to this species are expected to be negligible. Wooded riparian habitats in the study area would be minimally impacted under the proposed action. Therefore direct impacts from potential habitat loss for yellow-billed cuckoo would be minimal. Cuckoos that may be present in the study area could avoid construction, production, or reclamation areas due to human and vehicle presence and associated noise. If cuckoos were to nest adjacent to construction areas, human disturbance could cause nest abandonment.

Like other birds in the study area, yellow-billed cuckoos could be injured or killed by a variety of causes. Reserve pits or heater-treaters would be the most probable cause of death or injury. Vehicle collisions during all phases of the proposed action are possible but unlikely due to

cuckoos' high mobility. It is also unlikely that cuckoos would be killed by potential coal fires occurring near the Fruitland outcrop, because they are highly mobile.

Overall, potential direct and indirect impacts to yellow-billed cuckoo would be minimized by the proposed co-location of 95% of the CBM wells under the action. No specific design features were developed for yellow-billed cuckoo.

Potential direct and indirect impacts to yellow-billed cuckoo would also be eliminated or minimal following the implementation of design features which include minimizing construction activities in wooded riparian habitat and conducting migratory bird surveys prior to construction during the migratory bird breeding season (March through August). Heater-treaters (separators) will be screened to prevent bird mortalities. Bird netting will be suspended and maintained over all pits and/or open tanks and catchments until reclamation is complete. A closed loop system in areas of shallow groundwater and riparian areas, or other areas identified will be required.

The proposed action would not result in changes in streamflows therefore; no indirect effects from the potential alteration of riparian habitats or stream channel morphology would be expected. There is the potential that sedimentation or accidental spills or leaks of hazardous materials could indirectly affect the quality of potential habitat and prey base for yellow-billed cuckoos. These impacts would be avoided or minimized by the implementation of design features including Stormwater Pollution Prevention Plans and Spill Prevention Control and Countermeasure plans and implementation the of Best Management Practices. Water quality within, and downstream of, the action area will be protected from soil erosion and sedimentation through the use of best management practices that include erosion control devices and management procedures, and retention of a vegetation buffer strip (minimum of 100 feet) between water bodies and disturbed areas. Equipment fueling, maintenance, and storage operations will be conducted at least 300 feet from any wetland or stream system. Whenever reasonably possible, jurisdictional waters of the U.S. including drainages and wetlands will be bored under. Additional design features that would minimize potential effects to yellow-billed cuckoo are listed in Section 3.3.

6.1.3 Colorado Pikeminnow

No direct impacts to Colorado pikeminnow are anticipated due to the absence of populations in the Reservation. Indirect impacts could include contamination of water downstream in the Animas and San Juan rivers, where known populations occur, from accidental spills or leaks of petroleum products, produced water, or other environmental contaminants. Other indirect impacts could include alteration of potential habitats from erosion and sedimentation, resulting from increased surface disturbances associated with well pads and ROWs. Habitats could be impacted directly from sedimentation of gravel spawning beds, as well as indirectly by depletion of food sources (i.e., invertebrates) that inhabit the interstitial spaces of streambeds.

As part of the SJRBRIP, on September 21, 1999, the USFWS issued an *Intra-Service Section 7 Consultation for Minor Depletions of 100 Acre-feet or Less from the San Juan River Basin*. This opinion provides for a cumulative total of 3,000 AF/yr of new minor depletions in the basin. The minor depletion allowance increases the efficiency of and streamlines the section 7 process, benefiting water development and water management activities included in the biological opinions on minor depletions, while protecting the endangered and native fish community. A minor depletion is defined as a depletion of 100 AF/yr or less under the guidelines.

Potential water depletions to rivers feeding into habitat for this species would result in indirect impacts. Based on previous studies, incremental depletions due to CBM well downspacing from 160-acre to 80-acre within the San Juan River basin in Colorado are inferred to be small and would peak at 18 AF/yr by 2025. The hydrologic modeling of stream depletions conducted for CBM development estimate that maximum basin-wide depletions are less than 0.02% of the total streamflow of affected rivers in the study area (Cox et al. 2001, SSPA 2006).

Overall, potential impacts to Colorado pikeminnow would be minimized by the proposed co-location of 95% of the CBM wells under the action. No specific design features were developed for Colorado pikeminnow.

Potential indirect impacts to Colorado pikeminnow and habitat would also be eliminated or minimized through the implementation of design features. These design features will include preparation and implementation of Stormwater Pollution Prevention Plans and Spill Prevention Control and Countermeasure plans. Water quality within, and downstream of, the action area will be protected from soil erosion and sedimentation by best management practices that include erosion control devices and management procedures, and retention of a vegetation buffer strip (minimum of 100 feet) between water bodies and disturbed areas. A closed loop system in areas of shallow groundwater and riparian areas, or other areas identified will be required. Equipment fueling, maintenance, and storage operations will be conducted at least 300 feet from any wetland or stream system. Whenever reasonably possible, jurisdictional waters of the U.S. including drainages and wetlands will be bored under. Additional design features are provided in Section 3.3.

Water depletions as a result of CBM production will be incurred at a rate of approximately 18 acre-feet per year. These depletions from the San Juan River system may affect, are likely to adversely affect the Colorado pikeminnow. The water use and associated depletions from the San Juan River system for this project were previously addressed by the Programmatic Biological Opinion (PBO) for Water Depletions Associated with BLM's Fluid Mineral Program and Other Actions Authorized by BLM on Public Lands within the San Juan River Basin in Colorado (ES/GJ-6-CO-08-F-002). The depletion may affect, is likely to adversely affect the Colorado River Fishes and is addressed in the PBO. The Dolores Public Lands Office will include the depletions associated with the subject project in their annual report to the BLM State Office..

6.1.4 Razorback Sucker

No direct impacts to razorback sucker are anticipated due to the absence of populations in the Reservation. Indirect impacts could include contamination of water downstream in the Animas and San Juan rivers, where known populations occur, from accidental spills or leaks of petroleum products, produced water, or other environmental contaminants. Other indirect impacts could include alteration of potential habitats from erosion and sedimentation, resulting from increased surface disturbances associated with well pads and ROWs. Habitats could be impacted directly from sedimentation of gravel spawning beds, as well as indirectly by depletion of food sources (i.e., invertebrates) that inhabit the interstitial spaces of streambeds.

As part of the SJRBRIP, on September 21, 1999, the USFWS issued an *Intra-Service Section 7 Consultation for Minor Depletions of 100 Acre-feet or Less from the San Juan River Basin*. This opinion provides for a cumulative total of 3,000 AF/yr of new minor depletions in the basin. The minor depletion allowance increases the efficiency of and streamlines the section 7 process, benefiting water development and water management activities included in the biological

opinions on minor depletions, while protecting the endangered and native fish community. A minor depletion is defined as a depletion of 100 AF/yr or less under the guidelines.

Potential water depletions to rivers feeding into habitat for this species would result in indirect impacts. Based on previous studies, incremental depletions due to CBM well downspacing from 160-acre to 80-acre within the San Juan River basin in Colorado are inferred to be small and would peak at 18 AF/yr by 2025. The hydrologic modeling of stream depletions conducted for CBM development estimate that maximum basin-wide depletions are less than 0.02% of the total streamflow of affected rivers in the study area (Cox et al. 2001, SSPA 2006).

Overall, potential impacts to razorback sucker would be minimized by the proposed co-location of 95% of the CBM wells under the action. No specific design features were developed for razorback sucker.

Potential indirect impacts to razorback sucker and habitat would be also eliminated or minimized through the implementation of design features. These design features will include preparation and implementation of Stormwater Pollution Prevention Plans and Spill Prevention Control and Countermeasure plans. Water quality within, and downstream of, the action area will be protected from soil erosion and sedimentation by best management practices that include erosion control devices and management procedures, and retention of a vegetation buffer strip (minimum of 100 feet) between water bodies and disturbed areas. A closed loop system in areas of shallow groundwater and riparian areas, or other areas identified will be required. Equipment fueling, maintenance, and storage operations will be conducted at least 100 yards from any wetland or stream system. Whenever reasonably possible, jurisdictional waters of the U.S. including drainages and wetlands will be bored under. Additional design features are provided in Section 3.3.

Water depletions as a result of CBM production will be incurred at a rate of approximately 18 acre-feet per year. These depletions from the San Juan River system may affect, are likely to adversely affect the razorback sucker. The water use and associated depletions from the San Juan River system for this project were previously addressed by the PBO for Water Depletions Associated with BLM's Fluid Mineral Program and Other Actions Authorized by BLM on Public Lands within the San Juan River Basin in Colorado (ES/GJ-6-CO-08-F-002). The Dolores Public Lands Office will include the depletions associated with the subject project in their annual report to the BLM State Office.

6.1.5 Knowlton's Cactus

Direct impacts to Knowlton's cactus could potentially include loss of individuals and a reduction of potential habitat resulting from well pad, access road, or ROW construction. Human or vehicular activity outside permitted areas may trample individuals or disrupt soils. Seedbed disturbance in population areas, and areas that may not currently support live individuals, could potentially result in a loss of seed viability and decrease the success of recolonization. Potential impacts would be greatest during construction.

Since the exact locations of wells and other facilities proposed under the action are not known, a Geographic Information System (GIS) analysis was conducted to estimate the number of potential wells that might be located in Knowlton's cactus habitat. A detailed description of the GIS analysis is included in Attachment B. The GIS analysis estimated that four (4) wells could be expected to occur within potential habitat for this species; however the actual number may be slightly more or less.

Overall, potential direct and indirect impacts to Knowlton's cactus would be minimized by the proposed co-location of 95% of the CBM wells under the action. Potential impacts to Knowlton's cactus would also be avoided or minimized by design features of the proposed action. Species specific design features developed for Knowlton's cactus include:

- Conduct field surveys for Knowlton's cactus prior to all construction activities in the appropriate survey season. Avoid individuals or populations of Knowlton's cactus which may be impacted by activities. Surveys will be conducted between April 1 and May 31.

- No disturbance will be allowed within 20 meters of Knowlton's cactus occupied habitat, and any disturbance proposed within 200 meters of Knowlton's cactus occupied habitat would be analyzed in a separate site specific consultation.

Additional design features that could minimize potential impacts to this species are provided in Section 3.3.

6.1.6 Mancos Milkvetch

Direct impacts to Mancos milkvetch could potentially include loss of individuals and a reduction of potential habitat resulting from well pad, access road, or ROW construction. Human or vehicular activity outside permitted areas may trample individuals or disrupt soils. Seedbed disturbance in population areas, and areas that may not currently support live individuals, could potentially result in a loss of seed viability and decrease the success of recolonization. Potential impacts would be greatest during construction.

The potential for these impacts would be minimal given the limited amount of potential habitat on the Reservation (Figure 3). It is unlikely that any proposed wells would be located within potential habitat for Mancos milkvetch.

Overall, potential direct and indirect impacts to Mancos milkvetch would be minimized by the proposed co-location of 95% of the CBM wells under the action. Potential impacts to Mancos milkvetch would also be avoided or minimized by design features of the proposed action. Species specific design features developed for Mancos milkvetch include:

- Conduct surveys for Mancos milkvetch prior to all construction activities in the appropriate survey season. Avoid individuals or populations of Mancos milkvetch located during surveys. Surveys will be conducted between April 1 and July 1.

- No disturbance will be allowed within 20 meters of Mancos milkvetch occupied habitat, and any disturbance proposed within 200 meters of Mancos milkvetch occupied habitat would be analyzed in a separate site specific consultation.

Additional design features that could minimize potential impacts to this species are provided in Section 3.3.

6.1.7 Migratory Birds

In general, all native, non-game bird species, regardless of migratory status, are protected under the Migratory Bird Treaty Act (MBTA). The MBTA and the international migratory bird treaties implemented through the Act, impose substantive obligations on federal agencies to conserve migratory birds and their habitats (16 U.S.C. 703-711).

During construction activities, bird mortalities could occur if vegetation containing active bird nests (i.e., with eggs or young) are removed or damaged. Migratory birds would experience long-term habitat loss and fragmentation from implementation of the proposed action. However, migratory birds are mobile and could readily move to adjacent habitats to compensate for habitat loss and fragmentation. Roads fragment habitats, acting as a movement barrier to some species and disrupting natal dispersal, migration patterns, and gene flow among populations potentially leading to inbreeding and reduction in genetic variation. However, some bird species have a high tolerance for human and vehicle presence and could occupy habitats adjacent to roads and well pads. There is particular concern for the loss of large trees suitable for raptor perching, roosting, and nesting substrates. Removal of large cottonwood trees in wooded riparian habitats would reduce potential perching, roosting, and nesting habitat for bald and golden eagle, red-tailed hawk, Cooper's hawk, and several owl species. Similarly, loss of mature ponderosa pine, Douglas-fir, or other conifers would reduce the available perching, roosting, and nesting trees for the forest dwelling birds of prey and numerous owl species. In addition, the removal of snags would reduce available nesting habitat for primary (e.g., woodpeckers) and secondary (e.g., chickadees) cavity nesting birds.

Some individuals could be temporarily displaced during construction, maintenance, or reclamation activities or when vehicles are in construction areas, but would likely return when humans and vehicles have left the area. Others could be permanently displaced, moving to areas farther removed from disturbances. Human disturbance could cause some nest abandonment in birds (Fort 2002, Ralph et al. 1993). Some nesting raptors have exhibited reduced nesting success (e.g., nest abandonment/failure, reduced productivity) as a response to human disturbance from recreational or industrial activities. Examples include bald eagle (Fraser at al. 1985, Anthony et al. 1994), golden eagle (Watson 1997), ferruginous hawk (White and Thurow 1985, Olendorff 1993, in Bechard et al. 1995), northern goshawk (Speiser 1992, Boal and Mannan 1994), sharp-shinned hawk (Delannoy and Cruz 1988), and prairie falcon (Boyce 1982 and Harmata et al. 1978, in Steenhoff 1998).

There are only a very small number of known, active bald eagle nests within the action area, and none on SUIT land. Wintering concentrations of bald eagles occur on the Los Piños River, Animas, Florida, and La Plata River within the action area. There are likely several active golden eagle nests within the action area, but available data on these are sparse to non-existent. SUIT DWRM is currently working to conduct surveys on Reservation lands to obtain an accurate database on the occurrence of nesting raptors within the action area (Steve Whiteman, personal communication 4/6/09). Gunnison prairie dogs (*Cynomys gunnisoni)* are a source of prey for bald and golden eagles. Prairie dog colonies do occur within the action area and are assumed to be random and widespread in distribution. The occurrence of prairie dog colonies near active bald or golden eagle nests is currently unknown given available data. Since 95 percent of the proposed wells would be co-located, it is possible, but unlikely, that the proposed action would result in ground disturbance and appreciable impacts to prairie dog colonies and subsequently the prey base. Pre-construction surveys to evaluate the presence of prairie dog colonies and raptor nests would minimize or avoid any potential effects to raptor prey base from the proposed action.

Overall, potential impacts to migratory birds would be minimized by the proposed co-location of 95% of the CBM wells under the action. Design features would also minimize impacts to migratory birds and would include a migratory bird survey prior to construction during the migratory bird breeding season (March through August). *Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors* (Craig 2002) will be implemented. Power lines will be placed below ground, where possible. New well locations and rights-of-way will be restricted to at least 0.25 mile from a raptor nest or winter roost. Construction or other intrusive activities

will be prohibited within 0.5 mile of an active raptor nest during the nesting season. Construction activities would be minimized in wooded riparian habitat. Pre-construction surveys will be conducted of proposed well pad and access route locations for Gunnison prairie dogs. Direct impacts to prairie dog colonies will be avoided were possible, and in the light of other resource tradeoffs resulting from access road and well pad relocation. Heater-treaters (separators) will be screened to prevent bird mortalities. Bird netting will be suspended and maintained over reserve pits if hydrocarbons or toxic chemicals are present in the fluids until reclamation is complete. All power lines will conform to the USFWS draft "Guidelines for Raptor Conservation in the Western United States", the "Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006" (APLIC 2006), and the "Avian Protection Plan Guidelines" (APLIC 2005). Additional design features that would minimize impacts to migratory birds are provided in Section 3.3.

6.2 CUMULATIVE EFFECTS

Cumulative impacts include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this BA. Future federal actions that are unrelated to the proposed action are not considered because they would be subject to separate consultation pursuant to section 7 of the ESA.

Of State, Tribal, local or private actions, community expansion is likely the greatest cumulative impact reasonably certain to occur in the action area. Continued development of residential and commercial establishments is expected along the Animas River corridor, along the US Highway 160 corridor, and around the Bayfield area. Several residential areas are currently proposed within the county. On Florida Mesa approximately 280 acres would be developed as residential home sites (La Plata County Planning Department 2008). Associated with new home sites would be new roads, electric lines and other infrastructure.

The SUGF is proposing development of a 160-acre and adjoining 320-acre residential development located southwest of Ignacio, Colorado within the next five to twenty years. SUGF has been developing Three Springs Neighborhood which encompasses 681 acres in Grandview located within the city limits of Durango. The Three Springs Neighborhood currently includes a hospital complex (Mercy Medical Center), SUGF administrative buildings, and residences. By 2030, Three Springs would be fully built out encompassing a 76 acre park and over 300 acres of open space and trails, a middle school, and approximately 2,000 home sites (Three Springs 2008). The SUGF is proposing the Rock Creek II Subdivision located just east of Ignacio which would encompass 80 acres and 200 home sites. This property would be completely developed by 2011. SUGF is also building Tranquilo Court located in the eastern part of Ignacio which will include 23 home sites on four acres. This property is currently being developed and will be completed by 2009.

Reasonably foreseeable highway projects in La Plata County include the expansion of US Highway 550 from the New Mexico border north to Durango from two to four lanes in 2008 through 2009. US Highway 550 south of the New Mexico border has previously been upgraded from two to four lanes. The intersection of US Highway 160 at Grandview and US Highway 550 is currently being widened. The first phase of a new interchange with US 550, including building four (4) bridges and ramps east of the current intersection, are currently being constructed. The project is scheduled for completion by September 2010 (CDOT 2008). The traffic levels in the action area would be expected to increase from expanded community development and population growth.

Cumulative impacts to southwestern willow flycatcher and yellow-billed cuckoo could occur from potential habitat removal or modification from private developments in riparian areas. The amount of development cannot be quantified for this assessment, however it would be expected to be minimal given that development on private lands would be subject to La Plata County zoning and building regulations and development on Tribal lands would be subject to regulatory oversight and pre-project planning. Therefore, potential cumulative impacts would be avoided or minimized.

Impacts to Colorado pikeminnow and razorback sucker could occur from potential water contamination by accidental spills or leaks of hazardous products from commercial enterprises. This could result in indirect impacts from a reduction of food resources resulting from changes in water quality. Indirect impacts to fisheries could also include habitat alteration or destruction due to increase sedimentation from associated surface disturbance. Colorado pikeminnow and razorback sucker would continue to be protected by regulatory oversight and pre-project planning.

Knowlton's cactus and Mancos milkvetch could be cumulatively impacted by development in potential habitat. In occupied habitat future development could result in the direct mortality and habitat destruction. These impacts would likely be minimal as potential habitat in the action area is limited the range of this species is extremely small. Development on private lands would be subject to La Plata County zoning and building regulations and development on Tribal lands would be subject to regulatory oversight and pre-project planning, which would avoid or minimize potential cumulative impacts.

7.0 DETERMINATION OF EFFECT

For southwestern willow flycatcher, yellow-billed cuckoo, Knowlton's cactus, and Mancos milkvetch, a determination of "may affect, not likely to adversely affect" is concluded for the proposed action. For Colorado pikeminnow and razorback sucker a determination of "may affect, likely to adversely affect" is concluded. The proposed action would have "no effect" on the remaining five species, based on the absence of suitable habitat within the action area. Table 4 summarizes the expected effects of the proposed action on federally listed endangered, threatened, and candidate species.

Table 4. Summary of the determination of effect on federally listed and candidate species.

SPECIES	STATUS	DETERMINATION OF EFFECT
MAMMALS		
Black-footed ferret	E	No effect
Canada lynx	T	No effect
BIRDS		
Mexican spotted owl	T	No effect
Southwestern willow flycatcher	E	May affect, not likely to adversely affect
Yellow-billed cuckoo	C	May affect, not likely to adversely affect
FISH		
Colorado pikeminnow	E	May affect, likely to adversely affect
Razorback sucker	E	May affect, likely to adversely affect
PLANTS		
Knowlton's cactus	E	May affect, not likely to adversely affect
Mancos milkvetch	E	May affect, not likely to adversely affect
Mesa Verde cactus	T	No effect
Pagosa skyrocket	C	No effect

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John Pecor, BLM; 4/12/2007

Al Spencer, Retired, (Herps); 3/27/2007

Mark Torres, Tribal Employment Rights Office; 3/12/2007

Steve Whiteman, Division Head, SUIT DWRM; 2/21/2007, 2/22/1007, 3/12/2007, 3/13/2007, 3/22/2007, 4/12/2007; 4/19/2007, 2/12/2008, 2/15/2008, 4/6/2009

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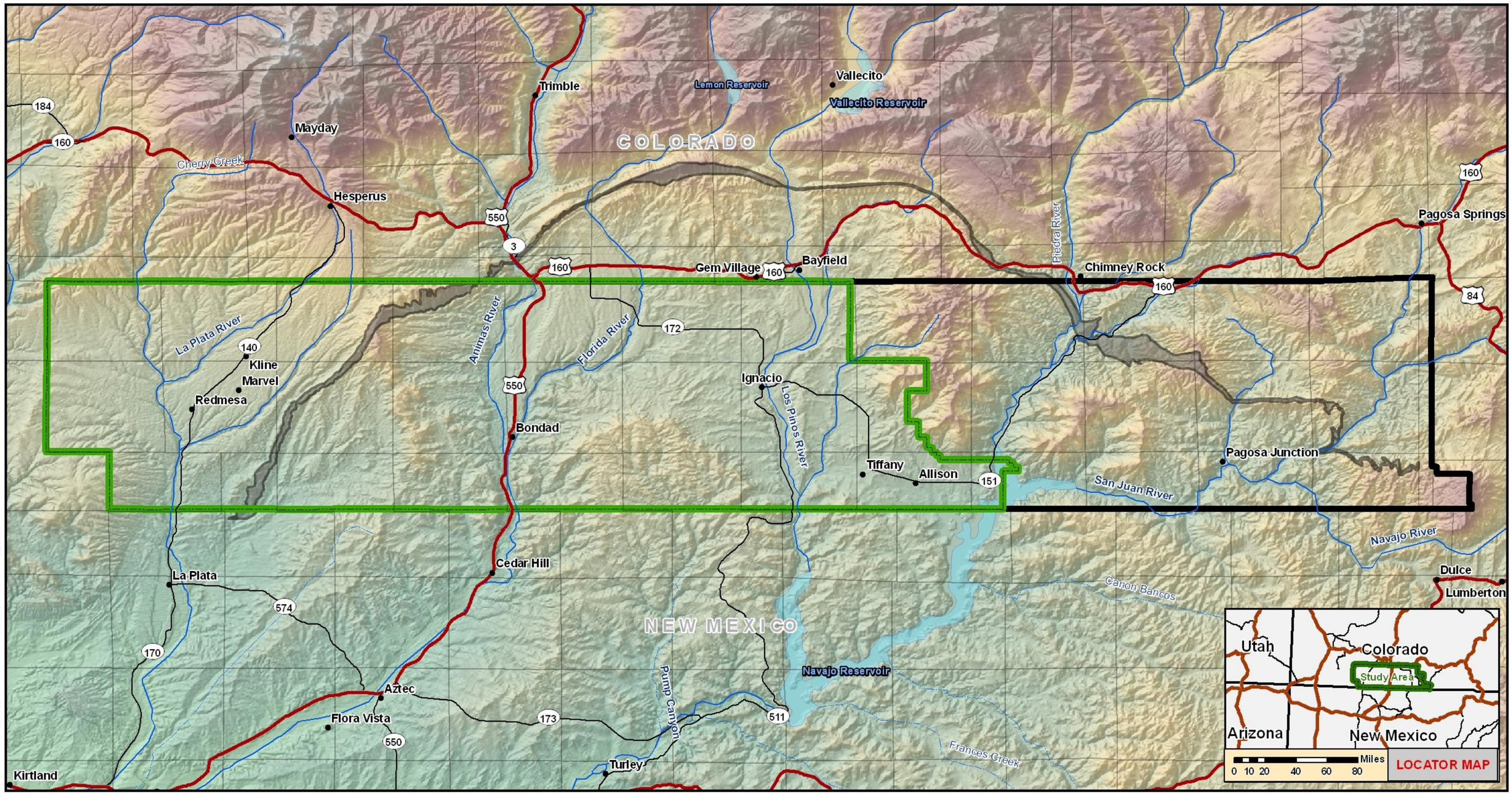
ATTACHMENT A

MAPS



ECOSPHERE
ENVIRONMENTAL SERVICES

ACTION AREA MAP

BIOLOGICAL ASSESSMENT

SOUTHERN UTE INDIAN TRIBE | PROJECTION: GCS WGS 1984

MONTEZUMA, LA PLATA, AND ARCHULETA COUNTIES, COLORADO | 12/1/2008

Miles
0 3 6 12

Tribal Boundary Acreage:
680,308 acres, 1063.5 square miles

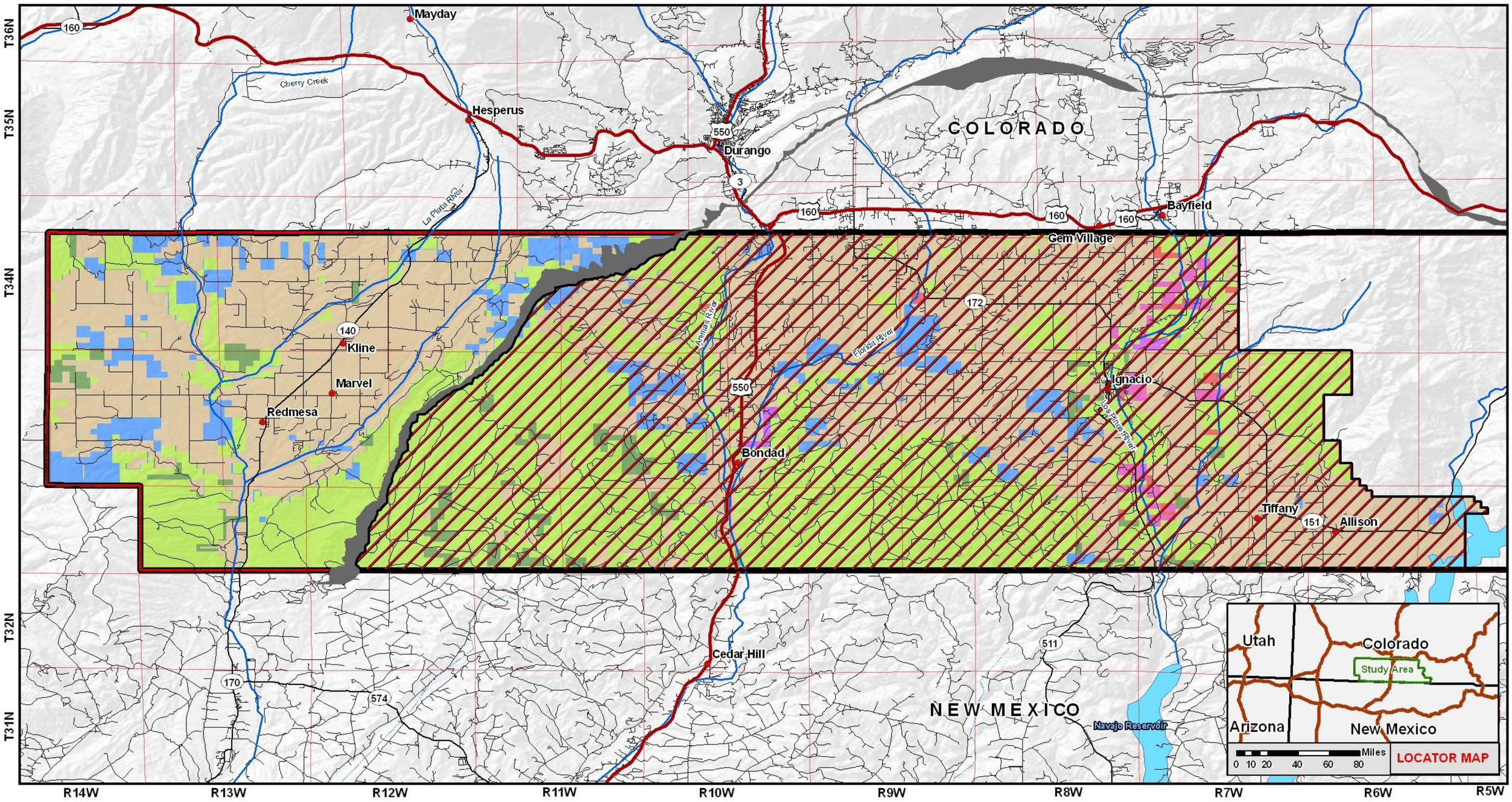
Study Area Acreage:
421,450 acres, 658.5 square miles

- Cities
- Highway
- Major Road
- Stream
- Stream Intermittent
- Study Area Boundary
- Tribal Boundary
- Lakes
- Fruitland Outcrop

FIGURE 1

N

1:381,572



PROPOSED INFILL AREA

BIOLOGICAL ASSESSMENT

SOUTHERN UTE INDIAN TRIBE | PROJECTION: GCS WGS 1984

MONTEZUMA, LA PLATA, AND ARCHULETA COUNTIES, COLORADO | 12/1/2008

ECOSPHERE
ENVIRONMENTAL SERVICES

Miles
0 2 4 8

Tribal Boundary Acreage:
680,308 acres, 1063.5 square miles

Study Area Acreage:
421,450 acres, 658.5 square miles

- Cities
- Highway
- Major Roads
- Stream
- Stream Intermittent
- Other Roads
- Fruitland Outcrop
- Infill Area
- Study Area Boundary
- Tribal Boundary
- Lakes

Ownership - Surface / Gas
- Allotted / Allotted
- Alotted / Fee
- Allotted / Tribal
- Fee / Allotted
- Fee / Fee
- Fee / Tribal
- Tribal / Allotted
- Tribal / Fee
- Tribal / Tribal

FIGURE 2

N

1:254,935

R13W R12W R11W R10W R9W R8W R7W R6W R5W

T36N T35N T34N T33N T32N T31N

ZOOM WINDOW

POINT LOOKOUT FORMATION

1:82,158

SEE ZOOM WINDOW

Mayday
Hesperus
Durango
550
3
La Plata River
160
COLORADO
Bayfield
Gem Village
172
Animas River
Florida River
140
Kline
Marvel
Redmesa
Ignacio
Los Pinos River
Bondad
Tiffany
151
Allison
Cedar Hill
170
574
511
NEW MEXICO
Navajo Reservoir

Utah
Colorado
Study Area
Arizona
New Mexico
0 10 20 40 60 80 Miles
LOCATOR MAP

R14W R9W R8W R7W R6W R5W

POTENTIAL HABITAT FOR FEDERALLY LISTED AND COLORADO NATURAL HERITAGE PROGRAM PLANTS

BIOLOGICAL ASSESSMENT

SOUTHERN UTE INDIAN TRIBE | PROJECTION: GCS WGS 1984

MONTEZUMA, LA PLATA, AND ARCHULETA COUNTIES, COLORADO | 12/1/2008

ECOSPHERE ENVIRONMENTAL SERVICES

0 2 4 8 Miles

Tribal Boundary Acreage:
680,308 acres, 1063.5 square miles

Study Area Acreage:
421,450 acres, 658.5 square miles

Cities
Stream
Stream Intermittent
Fruitland Outcrop

Geology
Habitat
Point Lookout (Mancos Milkvetch)
Quarternary Alluvium (Knowlton's Cactus)

Elevation
GRIDCODE
< 6400 ft
6400 - 6500
6500 - 7000
> 7000 ft

Highway
Major Roads
Other Roads
Study Area Boundary
Tribal Boundary
Lakes

FIGURE 3

N

1:254,935

ATTACHMENT B

GEOGRAPHIC INFORMATION SYSTEMS ANALYSIS

Geographic Information System Analysis

Programmatic environmental documents are written to analyze impacts on a broad scale. Inherently it is difficult to assess impacts in a programmatic document without the exact details of the proposed action (i.e., location of well sites). Although the majority (95%) of proposed 80-acre infill wells analyzed would be co-located, the exact location of those wells cannot be determined at this point due to specific reservoir drainage issues and the number of 160-acre CBM wells that have not yet been developed. Each well under the proposed action would be subject to individual environmental analysis when an APD has been submitted. For this analysis, an impact assessment methodology was developed for the proposed action to consistently evaluate surface resource impacts.

In this document the amount of disturbance to various resources from the drilling of natural gas wells is estimated. Additionally, the exact well locations are unknown. It is assumed that well locations could occur anywhere within the study area and that every point within the study area would have an equal probability of having a well location. A record of locations for both the entire past history of oil and gas well drilling as well as more recent oil and gas activities approved under the 2002 EIS has been incorporated into this analysis. Therefore, a statistical test of how well the observed patterns of past oil and gas activities conform to the expectation that the distribution of well drilling will be proportional to the availability of resources can be performed. The analysis also considers that conventional wells can be drilled anywhere but CBM wells would only be drilled on areas overlaying the Fruitland coal formation. Finally, the proposed action pertains to drilling wells that access Tribal mineral or surface estate, so the potential analysis area can be narrowed down further.

To determine the suitability of an analysis based on the proportion of area four statistical tests were performed. Test I analyzed the hypothesis that the recent patterns of conventional well locations (those approved and drilled under the 2002 EIS) are proportional to the area. For example, if prime farmland occupies 35% of the Tribal mineral estate in the study area it would be expected that 35% of the wells drilled since Nov 1, 2002 would be located on prime farmland. A chi-square analysis was completed comparing the number of observed well locations to the expected number of well locations to determine if the null hypothesis were true. This hypothesis concluded that conventional wells drilled under the 2002 EIS were not distributed proportional to area (P=0.01). This P value can be interpreted as the probability that, if the hypothesis of proportional use were true, a random sample of 30 well locations (the number of conventional gas wells dug since Nov 1, 2002) could be chosen that would deviate as much from the expected values and observed locations.. Since the probability is very small it is highly unlikely that wells are distributed proportional to their availability and the hypothesis is rejected.

Test II analyzed the hypothesis that recent patterns of CBM well drilling are proportional to the area and this hypothesis was also rejected (P=0.004). For this analysis the area used was restricted to calculate proportions to the Tribal mineral estate overlaying the Fruitland coal formation because that is the only part of the study area subject to CBM development.

Due to the fact that 95% of the wells expected to be drilled under the proposed action will be co-located on existing well pads a test was conducted to hypothesize that existing well pads were distributed proportional to area and this hypothesis was also rejected (Test III, $P < 0.001$).

As a result, the past patterns of oil and gas well development are not proportional to area and thus, this would be an inappropriate assumption to make. The mechanism behind this conclusion is not known, however, it is reasonable that given a choice of locations to drill an operator will choose the location that can be drilled at the least cost in order to maximize profits. For instance, it appears that well locations are more likely than expected to occur on barren land, desert shrub, and grassland habitats than montane forest, piñon juniper, or wetland habitats.

The final analysis (Test IV) tests the hypothesis that past development (existing well pads) outside the Fruitland coal layer is distributed the same as past development inside the Fruitland coal layer. This hypothesis failed to be rejected (P=0.65), thus it was concluded that there is no evidence that past patterns of development of conventional wells outside the Fruitland coal outcrop differs from development inside and therefore, this was not included in the analysis.

On the basis of this analysis it was determined that future development will likely follow existing patterns. In addition because it is known that 95% of the development proposed under Alternative 2 in this document will occur on existing well pads. Therefore it was determined that rather than estimating future impacts to a resource based on the proportion of area that resource occupies, future impacts would be estimated to a resource based on the proportion of existing well pads that currently exist in that resource. For example, if prime farmland occupies 35% of the Tribal mineral estate in the study area, but 50% of the existing well pads on Tribal mineral estate are located on prime farmland it is assumed that 50% of the future development will also occur on prime farmland.

GIS was also used to derive information about the presence of a particular resource and the extent of potential surface impacts to that resource. Quantitative analysis of impacts for surface resources was obtained by proportional analysis, then multiplying the number of wells by a construction disturbance factor consisting of 1.15 acres for co-located wells and 3.2 acres for new well locations. Impacts of surface disturbance were calculated and presented in two ways: (1) impacts of all new well locations, and (2) impacts if available existing pads are used (co-location).