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Cluster 7

Lybrook H09-2308

Lease Numbers NMNM 18463 & NMNM 118132

Lybrook H14-2308

Lease Number NMNM 118132

Lybrook I10-2308

Lease Number NMNM 118132

Lybrook L14-2308

Lease Numbers NMNM 118132 & NMNM 76842

Lybrook M11-2308

Lease Numbers NMNM 118132 & NMNM 76842

Chaco Trunk #2 Phase 2

Lybrook Access Road #3

May 2014

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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

TABLE OF CONTENTS

1. Purpose and Need for Action 1

1.1 Background 1

1.2 Purpose and Need for Action 1

1.3 Decision to be Made 1

1.4 Conformance with Applicable Land Use Plan(s) 2

1.5 Relationship to Statutes, Regulations, or Other Plans 2

1.6 Scoping, Public Involvement, and Issues 3

1.6.1 Issues Considered but Not Analyzed 4

2. Description of The Proposed Action and AlternativeS 6

2.1 Proposed Action 6

2.1.1 Design Features 13

2.2 No Action 18

2.3 Alternatives Considered but Eliminated ..... 19~~18~~

3. Affected Environment and Environmental Consequences ..... 21~~20~~

3.1 Air Resources ..... 21~~20~~

3.1.1 Affected Environment ..... 21~~20~~

3.1.2 Impacts from the Proposed Action ..... 24~~23~~

3.2 Soils ..... 27~~26~~

3.2.1 Affected Environment ..... 27~~26~~

3.2.2 Impacts from the Proposed Action ..... 28~~27~~

3.3 Water Resources/Quality – Surface and Groundwater ..... 29~~28~~

3.3.1 Affected Environment ..... 29~~28~~

3.3.2 Impacts from the Proposed Action ..... 31~~30~~

3.4 Upland Vegetation and Noxious Weeds ..... 34~~33~~

3.4.1 Affected Environment ..... 34~~33~~

3.4.2 Impacts from the Proposed Action ..... 35~~34~~

3.5 Wildlife ..... 36~~35~~

3.5.1 Affected Environment ..... 36~~35~~

3.5.2 Impacts from the Proposed Action ..... 36~~35~~

3.6 Special Management Species ..... 38~~37~~

3.6.1 Affected Environment ..... 38~~37~~

3.6.2 Impacts from the Proposed Action ..... 40~~39~~
3.7 Migratory Birds ..... 42~~41~~
3.7.1 Affected Environment ..... 42~~41~~
3.7.2 Impacts from Alternative A (Proposed Action) ..... 42~~41~~
3.8 Cultural Resources ..... 44~~43~~
3.8.1 Affected Environment ..... 44~~43~~
3.8.2 Impacts from the Proposed Action ..... 45~~44~~
3.9 Paleontological Resources ..... 46~~44~~
3.9.1 Affected Environment ..... 46~~44~~
3.9.2 Impacts from the Proposed Action ..... 46~~45~~
3.10 Livestock Grazing ..... 47~~45~~
3.10.1 Affected Environment ..... 47~~45~~
3.10.2 Impacts from the Proposed Action ..... 47~~46~~
4. Supporting Information ..... 49~~48~~
4.1 Tribes, Individuals, Organizations, or Agencies Consulted ..... 49~~48~~
4.2 List of Preparers ..... 49~~48~~
4.3 References ..... 51~~50~~
Appendix A – Maps and Photographs A-1
Appendix B – Applications for Permit to Drill and Right-of-way Grants B-1
Appendix C – Conditions of Approval and Pipeline Stipulations C-1
Appendix D – Biological Survey Reports D-1

LIST OF TABLES

Table 2-1. Legal description for the proposed action components surface location 6
Table 2-2. Summary of proposed disturbance for the proposed action 7
Table 2-3. Proposed Chaco Trunk #2 Phase 2 temporary use areas, size, disturbance acreage, and purpose 9
Table 2-4. Short- and long-term disturbance per land status for the proposed action 10
Table 3-1. Reported ozone values for San Juan County ozone monitoring stations ..... 22~~21~~
Table 3-2. Criteria pollutant design value concentrations monitored in San Juan County ..... 23~~22~~
Table 3-3. Climate normals for the Farmington area, 1981-2010 ..... 24~~23~~
Table 3-4. Criteria pollutant and volatile organic compound emissions estimated for construction of one horizontal oil well (average 25 days to drill and complete) ..... 25~~24~~
Table 3-5. Analysis area human caused emissions in tons/year, 2008 ..... 26~~25~~

Table 3-6. Percent increase in analysis area emissions per well ..... 26~~25~~
Table 3-7. Project Component, ordinary high water mark measurement, and type of waters of the U.S. in the analysis area ..... 30~~29~~
Table 3-8. Vegetation type and approximate acreage affected by the proposed action ..... 35~~34~~
Table 3-9. Species with special management status with potential to occur in the analysis area ..... 38~~37~~
Table 3-10. Brack's hardwall cactus observations ..... 39~~38~~
Table 3-11. Migratory bird species of concern potentially occurring within the analysis area and effects from the proposed action ..... 43~~42~~
Table 3-12. Details of the grazing allotment in the analysis area ..... 47~~46~~

LIST OF FIGURES

Figure 1. Vicinity Map A-2
Figure 2. Proposed Cluster 7 components A-3
Figure 3. Site Detail – 2010 aerial photograph A-4

LIST OF PHOTOGRAPHS

Photograph 1. Proposed Lybrook H14-2308 well pad from corner 3 looking east A-5
Photograph 2. Proposed Lybrook L14-2308 well pad looking southeast from corner 5 ..... A-5
Photograph 3. Proposed Lybrook H09-2308 well pad looking east from corner 6 ..... A-6
Photograph 4. Proposed Lybrook I10-2308 well pad looking west from corner 5 ..... A-6
Photograph 5. Proposed Lybrook M11-2308 well pad from corner 2 looking west A-7
Photograph 6. Proposed Chaco Trunk #2 Phase 2 looking northwest A-7
Photograph 7. Proposed Chaco Trunk #2 Phase 2 looking east along right-of-way from PI 2450 ..... A-8

ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
µg/m³	micrograms per cubic meter
APD	Application for Permit to Drill
AUM	animal unit month
BLM	Bureau of Land Management
BOP	blowout preventer
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	Conditions of Approval
EA	Environmental Assessment
EIS	Environmental Impact Statement

Encana	Encana Oil & Gas (USA) Inc.
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FFO	Farmington Field Office
GHG	greenhouse gases
HAP	hazardous air pollutants
LAC	La Plata Archaeological Consultants
MLA	Mineral Leasing Act
NAAQS	National Ambient Air Quality Standard
NATA	National Scale Air Toxics Assessments
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NMAAQS	New Mexico Ambient Air Quality Standards
NMPIF	New Mexico Partners in Flight
NMPM	New Mexico Principal Meridian
NO_2	nitrogen dioxide
NO_x	nitrous oxides
PL	Public Law
$PM_{2.5}$	particulate matter less than 2.5 micrometers is diameter
PM_{10}	particulate matter between 2.5 and 10 micrometers in diameter
PRMP	Proposed Resource Management Plan
RFDS	Reasonable Foreseeable Development Scenario
PFYC	Potential Fossil Yield Classification
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
SDA	Specially Designated Area
SO_2	sulfur dioxide
TUA	temporary use area
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compounds

1. PURPOSE AND NEED FOR ACTION

1.1 Background

Encana Oil & Gas (USA) Inc. (Encana) is proposing to develop the Lybrook H09-2308, Lybrook H14-2308, Lybrook I10-2308, Lybrook L14-2308, and Lybrook M11-2308 well pads (Cluster 7) in San Juan County, New Mexico. Encana has filed Applications for Permit to Drill (APDs) with the Bureau of Land Management (BLM) Farmington Field Office (FFO) to drill one well (01H) from the Lybrook H09-2308, Lybrook H14-2308, and Lybrook L14-2308 pads, three wells (01H, 02H and 03H) from the Lybrook I10-2308 pad, and two wells (01H and 02H) from the Lybrook M11-2308 pad. The proposed action also includes the Chaco Trunk #2 Phase 2 pipeline construction and upgrading the existing Lybrook Access Road #3 and other existing roads. Encana has also applied for right-of-way (ROW) grants with the BLM/FFO to construct the proposed Lybrook H09-2308, Lybrook H14, 2308, Lybrook I10-02308, and Lybrook M11-2308 well pads, four access roads, five well-tie pipelines, the gathering line, and to upgrade the existing road. The proposed Lybrook L14-2308 well pad would be located on lease and would not require a ROW grant.

Surface disturbance activities associated with drilling the wells would include construction of five well pads, access roads, subsurface well-tie pipelines, one gathering line, temporary use areas (TUA), and improving existing access roads. The proposed project would be located on BLM-managed land and would access federal minerals administered by the BLM/FFO. The proposed action would be located in San Juan County, New Mexico approximately 4 miles southwest of Nageezi and 4 miles west of Lybrook, New Mexico.

1.2 Purpose and Need for Action

The purpose of the proposed action is to provide Encana with reasonable access to BLM-managed federal mineral leases (NMNM 118132, NMNM 18463, and NMNM 76842) to construct the five proposed wells pad, four proposed access roads, and six proposed pipelines, drill the eight proposed wells, and upgrade the existing roads. The need for the action is BLM's responsibility under the Mineral Leasing Act (MLA) of 1920, as amended (30 United States Code [USC] 181 et seq.), to respond to the APDs and ROW applications. The MLA authorizes the BLM to issue oil and gas leases for the exploration of mineral resources and permit the development of those leases. The need for the action is also established by the BLM's authority under the Title V of the Federal Land Policy and Management Act, as amended (43 USC 1761-1771), and Section 28 of the MLA (43 USC 185).

1.3 Decision to be Made

Based on the information in this Environmental Assessment (EA), the BLM/FFO will decide whether to approve the APDs and ROW grants, and if so, under what terms and conditions. In compliance with the MLA, the decision to be made is how resource development should occur. Under the National Environmental Policy Act (NEPA), as amended (Public Law [PL]. 91-90, 42 USC 4321 et seq.), the BLM/FFO must determine if there are any significant environmental impacts associated with the proposed action, warranting further analysis in an Environmental Impact Statement (EIS). The BLM/FFO Field Manager is the responsible officer who will decide one of the following:

- To approve the proposed APDs and ROW grants with design features as submitted
- To approve the proposed APD and ROW grants with additional mitigations
- To analyze the effects of the proposal in an EIS
- To deny the APDs and ROW grants

1.4 Conformance with Applicable Land Use Plan(s)

Pursuant to 40 Code of Federal Regulations (CFR) 1508.28 and 1502.21, this EA incorporates the information and analysis contained in the 2003 Farmington Proposed Resource Management Plan (PRMP)/Final Environmental Impact Statement (FEIS) (USDI/BLM 2003a). The proposed action would be in conformance with the oil and gas leasing and development management actions in the Resource Management Plan (RMP)/Record of Decision (ROD) signed December 2003 and updated in December 2003 (USDI/BLM 2003b). The proposed action would be in conformance with the 2003 RMP/ROD that states, to the extent possible, new ROWs will be located within or parallel to existing ROWs or corridors to minimize resource impacts (USDI/BLM 2003b, page 2-11).

The PRMP/FEIS and ROD are available for review at the FFO in Farmington, New Mexico or electronically at http://www.nm.blm.gov/ffo/ffo_home.html. This project EA addresses site-specific resources and/or impacts that are not covered within the PRMP/FEIS, as required by the NEPA.

Oil and gas development is recognized as an appropriate use of public lands in the FFO planning area (USDI/BLM 2003b). The RMP adheres to the federal mandates contained in the Energy Policy and Conservation Action (42 USC 6217) and Executive Order 13212, that direct federal land managing agencies to expedite the production of the federal mineral estate for the development of reliable domestic sources of energy (USDI/BLM 2003b, pages 1 and 11). The proposed project would not be in conflict with any local, county, or state plans.

A reasonably foreseeable development scenario (RFDS) was developed for the 2003 RMP that estimated foreseeable oil and gas development in the New Mexico portion of the San Juan Basin, beginning in January 2002 and lasting for a 20-year duration. The RFDS also contemplated that technological advances could alter development of the basin during that 20-year period. The Mancos Shale reservoir was analyzed in the RFDS as an emerging gas play over a large part of the basin where it had not been previously developed (Engler et al. 2001). The PRMP/FEIS for the lands managed by the BLM/FFO indicates development of 9,942 new oil and gas wells from 2003 to 2023 in the San Juan Basin, allowing for about 16,100 acres of long-term disturbance. The ROD approving the final plan acknowledged these, and future projected impacts, when balanced against the nation's need for domestic energy sources (USDI/BLM 2003a, 2003b, page 12). The proposed action is within the scale and pace of the RFDS; therefore, cumulative impacts from the proposed action were included and analyzed in the Farmington PRMP/FEIS (USDI/BLM 2003a).

1.5 Relationship to Statutes, Regulations, or Other Plans

Encana would comply with all applicable federal, state, and local laws and regulations, as well as obtain the necessary permits for the installation and operation of the pipeline. These laws and regulations include, but are not limited to:

- Antiquities Act of 1906, as amended (Public Law [PL] 52-209; 16 USC 431-433)
- American Indian Religious Freedom Act of 1978 (PL 95-431; 92 Stat. 469; 42 USC 1996)
- Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC § 470aa et seq.), as amended (PL 100-555; PL 100-588)
- Bald and Golden Eagle Protection Act of 1940, as amended (PL 86-70, PL 87-884, PL 92-535, PL 95-616; USC 668-668d)
- Clean Air Act, as amended (PL 88-206; 42 USC § 7401 et seq.)
- Clean Water Act, as amended (PL 107-303; 33 USC § 1251, et seq.)
- Colorado River Salinity Control Act, as amended (PL 93-320; 7 CFR Part 702)
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (PL 96-510; 42 USC § 9601; 40 CFR Part 307)
- Endangered Species Act of 1973 (PL 93-205; 16 USC § 1531 et seq.)
- Executive Order 11988 Floodplain Management
- Executive Order 11990 Protection of Wetlands
- Executive Order 12898 Environmental Justice
- Executive Order 13007 Indian Sacred Sites
- Executive Order 13112 Invasive Species
- Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds
- Migratory Bird Treaty Act of 1918, as amended (16 USC §§ 703-712; 50 CFR Part 21)
- Native American Graves Protection and Repatriation Act of 1990 (PL 101-601; 104 Stat. 3048; 25 USC 3001; 43 CFR Part 10)
- Paleontological Resources Preservation Act as part of the Omnibus Public Land Management Act (PL 111-011, Title VI, Subtitle D)
- Safe Drinking Water Act, as amended (PL 93-523; 42 USC 300F-300-9), 40 CFR Parts 144 and 147)
- Section 106 of the National Historic Preservation Act of 1966 (PL 89-665; 80 Stat. 915; 16 USC 470 et seq.), as amended (implemented under regulations of the Advisory Council on Historic Preservation, 36 CFR Part 800)

1.6 Scoping, Public Involvement, and Issues

The Council on Environmental Quality (CEQ) defines scoping as “an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action alternative” (40 CFR 1501.7). Scoping is the process by which the BLM solicits internal and external input on the issues, impacts, and potential alternatives that will be addressed in an EIS or EA. As outlined in the BLM NEPA Handbook, it is optional for the BLM to conduct external scoping on actions analyzed by an EA (USDI/BLM 2008a, Section 6.3.2).

The BLM/FFO Interdisciplinary Team was integrally involved in the internal scoping to identify potential issues, understand the proposal, develop the purpose and need, and develop a range of alternatives.

For the purpose of BLM NEPA analysis, an "issue" is a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. Preliminary issues are frequently identified during the development of the proposed action through scoping.

The following issues were identified as potential issues of concern by the Interdisciplinary Team during internal scoping:

- How would the alternatives affect air quality in the area?
- How would the alternatives affect soils?
- How would the alternatives affect water resources?
- How would the alternatives affect upland vegetation and noxious weeds?
- How would the alternatives affect wildlife, BLM special management species, and migratory birds?
- How would the alternatives affect cultural resources?
- How would the alternatives affect paleontological resources?
- How would the alternatives affect livestock grazing?

As outlined in the BLM NEPA Handbook, it is optional for the BLM to conduct external scoping on actions analyzed by an EA (USDI/BLM 2008, Section 6.3.2). External scoping was conducted through posting this project on the BLM/FFO's online NEPA log. The log is located on the BLM New Mexico website (http://www.blm.gov/nm/st/en/prog/planning/nepa_logs.html). The log contains a list of proposed and approved actions in the FFO. The public is encouraged to provide comments or request information on projects listed in the logs.

1.6.1 Issues Considered but Not Analyzed

CEQ regulations (40 CFR § 1501.7) state that the lead agency shall identify and eliminate from detailed study the issues that are not important or that have been covered by prior environmental review, narrowing the discussion of these issues in the document to a brief presentation of why they would not have a significant effect on the human or natural environment, or providing a reference to their coverage elsewhere.

The Interdisciplinary Team identified the following resources during internal scoping as potential issues of concern that would not be significantly impacted or have been evaluated in previous analyses.

For the proposed action, identification of Native American Religious Concerns was limited to reviewing existing, published, and unpublished literature (Van Valkenburgh 1941, 1974; Brugge 1993; Kelly et al 2006), the site-specific Class III survey report prepared for the proposed action, and a review by the BLM's cultural resources program regarding the presence of traditional cultural properties identified through ongoing BLM tribal consultation efforts. There are currently no known remains that fall within the purview of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) or the Archaeological Resources Protection Act (16 USC 470) within the analysis area. The proposed action would not impact any known traditional cultural properties, prevent access to sacred sites, prevent the possession of sacred objects, or interfere with or hinder the performance of traditional ceremonies and

rituals pursuant to the American Indian Religious Freedom Act of 1978 (42 USC 1996) or Executive Order 13007.

No federally listed species with the potential to occur in San Juan County or potential habitats for federally listed species were observed within the proposed analysis area. Furthermore, no designated critical habitat for any federally listed species occurs within the proposed analysis area. The BLM/FFO reviewed and determined that the proposed action is in compliance with listed species management guidelines outlined in the September 2002 Biological Assessment (Cons. No. 2-22-01-I-389) (USDI/BLM 2002). Water would be sourced from a private water well located in the SW/NE ¼ of Section 32, of Township 25 North, Range 9 West, NMPM. This well is permitted by the State of New Mexico. The well has been assigned the Point of Diversion Number SJ 01979-S4 by the New Mexico Office of the State Engineer. There will be no new water depletions from this proposed project. No further consultation with the U.S. Fish and Wildlife Service (USFWS) is required.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

Encana is proposing development of the Cluster 7 well pads, well tie pipelines, and roads to access the mineral estate administered by the BLM/FFO. The proposed action includes the construction of the Chaco Trunk #2 Phase 2 gathering pipeline, and upgrading the existing Lybrook Access Road #3. The proposed action would be located in San Juan County, New Mexico approximately 4 miles southwest of Nageezi and 4 miles west of Lybrook, New Mexico. A vicinity map is provided as Figure 1 (Appendix A). Figure 2 shows the proposed action on the Lybrook NW, New Mexico United States Geological Survey (USGS) 7.5-minute topographic map. Figure 3 displays the proposed action on the Lybrook NW, New Mexico 2010 digital photo orthoquad (Appendix A). Photographs of the proposed action components are provided in Appendix A. Legal descriptions of the proposed action components are listed in Table 2-1.

Table 2-1. Legal description for the proposed action components surface location

Component		Legal Description
Lybrook H09-2308	Well Pad	SE¼ NE¼ of Section 9, Township 23 North, Range 8 West, New Mexico Principal Meridian (NMPM)
	Access Road and Pipeline	N½ of Section 9, Township 23 North, Range 8 West, NMPM
Lybrook H14-2308	Well Pad	SE¼ NE ¼ of Section 14, Township 23 North, Range 8 West, NMPM
	Access Road and Pipeline	SE¼ NE¼ of Section 14, Township 23 North, Range 8 West, NMPM
Lybrook I10-2308	Well Pad	NE¼ SE¼ of Section 10, Township 23 North, Range 8 West, NMPM
	Access Road and Pipeline	W½ SW¼ of Section 11 and NE ¼ SE ¼ of Section 10, Township 23 North, Range 8 West, NMPM
Lybrook L14-2308	Well Pad	NW¼ SW¼ of Section 14, Township 23 North, Range 8 West
	Access Road and Pipeline	NW¼ SW¼ of Section 14, in Township 23 North, Range 8 West, NMPM
Lybrook M11-2308	Well Pad	SW¼ SW¼ of Section 11, Township 23 North, Range 8 West, NMPM
	Pipeline	SW¼ SW¼ of Section 11, the NW ¼ NW ¼ of Section 14, and the E ½ NE¼ of Section 15, Township 23 North, Range 8 West, NMPM
Chaco Trunk #2 Phase 2		Sections 3, 4, 9, 13, 14, 15, 16, and 24, Township 23 North, Range 8 West, NMPM
Lybrook Access Road #3 Upgrade		Sections 14, 15, 16, 20, and 21, Township 23 North, Range 8 West, NMPM

Note: NE=northeast; NMPM=New Mexico Principal Meridian; NW=Northwest; SE=southeast; SW=southwest; W=West

From one to three wells are proposed to be horizontally drilled from each well pad. Activities associated with the proposed project would include construction of the access roads and well pads; upgrading existing roads; drilling, stimulation, and completion of the proposed wells; installation of surface facilities necessary to produce the wells; and installation of pipelines to transport natural gas to markets. These activities are detailed below.

The Chaco Trunk #2 Phase 2 is evaluated in this EA; the Chaco Trunk #2 Phase 1 will be evaluated in a separate EA. The Chaco Trunk #2 Phase 2 is proposed to gather production from approximately six wells that are within 1 mile of the existing Elm Ridge-Beeline gathering system. These wells are being drilled to test the productivity of the acreage in Township 23 North Range 8 West.

The gas produced by Encana's proposed wells is dedicated to Enterprise; therefore, Encana is contractually obligated to move all produced gas to Enterprise for further gathering and processing. The proposed Chaco Trunk #2 Phase 2 would move produced gas north to an Elm Ridge pipeline that feeds into an Enterprise gathering system transporting directly to the Chaco Plant. At some point in the future as the field develops, the Elm Ridge line is not expected to have the capacity to gather all production. Elm Ridge's current system would need substantial upgrades to accommodate long-term production in the area. The Chaco Trunk #2 Phase 1 would move produced gas south to connect into pipelines feeding into an Enterprise sales point. As Encana continues long-term development of the field, they would plan to connect Phase 2 to Phase 1.

Construction

Construction for the access roads and well pads would take approximately 1 to 2 weeks per location. Table 2-2 provides a summary of proposed disturbance that would occur under the proposed action.

Table 2-2. Summary of proposed disturbance for the proposed action

Name	Pad Area (acres)	Pipeline/Road Length[(1)] (feet)	Pipeline/Road Area (acres)	Pipeline (feet)	Pipeline Area[(2)] (acres)	New Road Length[(3)] (feet)	Road Area (acres)	Total
Lybrook H09-2308	5.39	1,849	2.12	-	-	271	0.19	7.70
Lybrook H14-2308	5.74	548	0.55	-	-	-	-	6.29
Lybrook I10-2308	6.43	2,843	2.94[(4)]	1,191	1.09	522	0.36	10.82
Lybrook L14-2308	5.74	370	0.43	-	-	-	-	6.29
Lybrook M11-12308	5.74	-	-	1,606	1.47	-	-	7.21
Chaco Trunk #2 Phase 2	-			33,397	30.67			34.44[(5)]
							Total	72.75

[1] 50-foot wide construction corridor where road and pipeline parallel

[2] 40-foot wide construction corridor for pipeline without access road

[3] 30-foot wide construction corridor for road without pipeline

[4] Between approximately Stations 3+16 and 10+23, the pipeline would be located within the center of the proposed road.

[5] Includes Chaco Trunk #2 Phase 2 temporary use area disturbance and TUA associated with upgrading Lybrook Access Road #3

The proposed Lybrook H09-2308 01H well would require constructing an irregularly shaped well pad—375 feet in length on the northern boundary and 400 feet in length on the eastern, southern, and western boundaries. A 50-foot-wide construction zone would surround the well pad except for the eastern boundary. Between corners 6 and B', the construction zone would be restricted (see Appendix B). Maximum cut would be approximately 6.9 feet on the midline between corners 2 and 6 and the maximum fill would be approximately 6.1 feet at corner 3. The proposed well pad would be located off-lease and

would be permitted through a ROW grant. Encana would construct a proposed access road, approximately 2,120 feet in length and would upgrade approximately 500 feet of existing access road. Encana would also construct and operate approximately 1,849 feet of well-tie pipeline. Approximately 271 feet of access road would not be parallel to the proposed pipeline and would be constructed within a 30-foot-wide corridor. The proposed road would be permitted with a 30-foot-wide ROW and the proposed pipeline would be permitted with a 40-foot-wide ROW (Table 2-2).

Drilling of the proposed Lybrook H14-2308 01H well would require constructing a pad measuring 400 feet by 400 feet, with a 50-foot-wide construction zone around the perimeter of the pad. Maximum cut would be approximately 10.3 feet on the south corner (corner 2) and the maximum fill would be approximately 11.9 feet at the north corner (corner 5). The proposed well pad would be located off-lease and would be permitted through a ROW grant. Encana would also construct a new access road approximately 403 feet in length and a well-tie pipeline that would be approximately 548 feet in length. The pipeline would be constructed within a 40-foot-wide ROW on BLM-managed lands. Approximately 50 feet of the proposed pipeline would be located within the proposed well pad. The proposed access road would parallel the proposed pipeline and be permitted with a 30-foot-wide ROW (Table 2-2).

The proposed Lybrook I10-2308 01H, 02H, and 03H wells would require constructing a 400-foot by 460-foot well pad with a 50-foot-wide construction zone. Maximum cut would be approximately 10.6 feet on the east corner (corner 5) and the maximum fill would be approximately 7.2 feet at the south corner (corner 6). The proposed well pad would be located off-lease and would be permitted through a BLM ROW grant. The proposed access road would be approximately 3,365 feet in length consisting of upgrading 2,072 feet of existing road and constructing 1,293 feet of new road. Encana would also construct and operate the approximately 3,996-foot-long well-tie pipeline. The access road would parallel and overlap the proposed pipeline for approximately 2,843 feet. Total construction width of the pipeline and access road where parallel would be 50 feet and would be designated as 20 feet of disturbance adjacent to the road and 30 feet of disturbance on the road. Between approximately Stations 3+16 and 10+23, the proposed pipeline would be located within the center of the proposed road to minimize disturbance. At pipeline Station 28+05, the proposed access road would diverge from the pipeline ROW and continue along an existing two-track road for an additional 522 feet. This portion of the proposed road would be constructed within 30-foot-wide corridor. The remaining 1,153 feet of the proposed pipeline would be constructed within a 40-foot corridor (Table 2-2).

Drilling of the proposed Lybrook L14-2308 01H well would require constructing a well pad measuring 400 feet by 400 feet, with a 50-foot-wide construction zone around the perimeter of the pad. Maximum cut would be approximately 7.8 feet on the northeast corner (corner 6) and the maximum fill would be approximately 5.3 feet at the southwest corner (corner 3). The proposed well pad is on lease and would not require a ROW grant. Encana would construct an approximately 318-foot resource road and a proposed well-tie pipeline approximately 370 feet in length. The pipeline would be permitted with a 40-foot-wide ROW and the access road with a 30-foot-wide ROW on BLM-managed lands. The proposed access road would parallel the proposed pipeline (Table 2-2).

Drilling of the proposed Lybrook M11-2308 01H and 02H wells would require constructing a 400 foot by 400-foot well pad with a 50-foot-wide construction zone around the perimeter of the pad. Maximum cut would be approximately 4.3 feet on the north corner (corner 6) and the maximum fill would be

approximately 6.3 feet at the southwest corner (corner 5). The proposed well pad would be located off-lease and would be permitted through a BLM ROW grant. The proposed well pad is located adjacent to an existing access road. However, Encana would upgrade approximately 1,837 feet of an existing road that would not result in new disturbance. The proposed road upgrade would be permitted with a BLM ROW grant. Encana would construct and operate a proposed well-tie pipeline, which would be approximately 1,606 feet in length and permitted with a 40-foot-wide ROW on BLM-managed lands. The proposed pipeline would parallel the existing access road for its entire length.

The proposed Chaco Trunk #2 Phase 2 pipeline would be approximately 33,397 feet (6.3 miles) in length and permitted with a 40-foot-wide ROW. The proposed pipeline would be constructed adjacent to existing pipelines and a road for its entire length. The entire ROW would be located on BLM/FFO-managed land. Construction disturbance from the pipeline would be approximately 30.67 acres. Fourteen TUAs are proposed. These include two for boring under U.S. Highway 550, six drainage crossings, two pipeline crossings, two terrain feature crossings, one erosional feature crossing, and one leg off. These TUAs would add an additional 2.96 acres of disturbance. The acreage and description for each TUA are listed in Table 2-3.

Table 2-3. Proposed Chaco Trunk #2 Phase 2 temporary use areas, size, disturbance acreage, and purpose

Temporary Use Area	Size (feet)	Area (acres)	Purpose
A	50 by 85	0.098	Pipeline crossing
B	40 by 120	0.110	Erosional feature crossing
C	60 by 225	0.310	Drainage crossing
D	60 by 270	0.372	Drainage crossing
E	40 by 250	0.230	Drainage crossing
F	60 by 90	0.124	Pipeline crossing
G	40 by 420	0.386	Drainage crossing
H	70 by 150	0.241	Drainage crossing
I	40 by 60	0.055	Terrain feature crossing
J	40 by 100	0.092	Terrain feature crossing
K	80 by 80	0.147	Leg off
L	80 by 100	0.184	Highway crossing
M	80 by 190	0.349	Highway crossing
N	80 by 140	0.257	Drainage crossing
	Total	**2.955**	

Approximately 20,145 feet (3.8 miles) of the existing Lybrook Access Road #3 would be upgraded to access the proposed Lybrook H14-2308 well pad. Approximately 8,356 feet of the access road upgrade would be located adjacent to the proposed Chaco Trunk #2 Phase 2 Pipeline. One TUA would be needed for the road upgrade. The TUA would be approximately 215 feet by 25 feet on the south side of the line and between 89 and 73 feet wide by 278 feet in length on the north side. The road upgrade would result in

approximately 0.81 acre of new disturbance associated with the TUA. The road upgrade would include installing 15 24-inch culverts and surfacing with sandstone.

Table 2-4 lists the new, short, and long-term disturbance for the proposed action.

Table 2-4. Short- and long-term disturbance per land status for the proposed action

Land Status	New Disturbance (acres)	Short-Term Disturbance (acres)	Long-Term Disturbance (acres)[1]
Bureau of Land Management	56.25	72.75	10.80

[1] Based on 20-foot-wide access road and 1.6 acres per well pad for operation

Drilling and Completions

After new access road and well pad construction is complete, Encana would mobilize a drilling rig to drill the wells from each pad. During drilling operations, equipment on the site would include:

- The drilling rig
- Stockpiles of drill pipe and casing
- A closed-loop system and aboveground tanks for collecting cuttings and fluid
- Mud shakers to separate the cuttings from the fluid
- Generators to provide power to the drill rig
- Office trailers equipped with sleeping quarters for essential personnel

Drilling operations would be conducted in compliance with all Federal Onshore Oil and Gas Orders, all applicable Federal and State of New Mexico rules and regulations, and BLM Notice to Lessees. The proposed wells would be horizontal wells targeting the Basin Mancos, Basin Mancos/Nageezi Gallup pool. The proposed wells would be drilled to a vertical depth ranging between approximately 5,348 and 5,280 feet and then horizontally drilled.

Using a fresh water-based drilling mud system, surface casing would be set to an approximate measured depth of 500 feet. After the surface casing is installed, the casing would be cemented in place by pumping cement down the casing, circulating the cement back up the outside of the casing to create a cement sheath around the entire casing, and then tested to ensure the quality and integrity of the cement. Prior to drilling below the surface casing, a blowout preventer (BOP) would be installed on the surface casing, and both the BOP and surface casing would be pressure tested for integrity. After installation and testing of the BOP, a string of intermediate casing would be installed. The intermediate casing would be cemented, and then tested to ensure the quality and integrity of the cement.

After cementing the intermediate string, a synthetic oil-based drilling mud system would be used to drill the horizontal portion of the wellbore. Additives may be mixed with the mud system to achieve borehole stability, minimize possible damage to geologic formations, provide adequate viscosity to carry the drill cuttings out of the wellbore, and reduce downhole fluid losses.

After drilling the wellbore to its final depth, a production liner would be run and secured into place utilizing an external swell packer system. The production liner provides additional isolation of the wellbore and creates a pathway for natural gas or liquids to travel from the formation to the surface.

After the production liner has been secured into place, the drilling rig would be removed, and a completion rig moved to the site. The completion rig would run a completions string of the same size, weight, and grade as the production liner into the wellbore to tie-in to the liner/liner hanger, providing a secondary barrier during completions that protects intermediate casing from pressures needed to pump into the formation. During completions activities, the well pads would have completions rigs, completions command centers, steel storage tanks, pump trucks and transports, blending and mixing facilities, and related ancillary completions equipment.

Completing the well would require hydraulic fracturing—the process of injecting water, sand, and a small amount of fluid additives into the wellbore under very high pressure to fracture the formation and release the oil. A series of charges would be set through the producing interval in the horizontal portion of the wellbore to perforate the production liner and casing and create small fractures in the target formation. A fluid and sand mixture would be injected at high pressure into the formation to create cracks or fractures, the sand would act as a proppant to keep the fractures open and allow oil to move more efficiently into the wellbore. The fracturing process would be done in stages, with each stage continuing in the same manner along the horizontal portion of the wellbore, using a series of plugs to isolate portions of the well that were previously fractured. After all of the stages are completed, the plugs would be drilled out to allow gas or oil to flow to the wellhead.

Completions would be designed with nitrogen foam to minimize water usage and improve fluid recoveries post-completions. Water would be sourced from a private water well located in the SW/NE ¼ of Section 32, of Township 25 North, Range 9 West, NMPM. This well is permitted by the State of New Mexico. The well has been assigned the Point of Diversion Number SJ 01979-S4 by the New Mexico Office of the State Engineer. Water would be stored on-site in steel storage tanks (up to 15).

Drilling activities would occur continuously for approximately 2 weeks per well and would require on-site supervision 24 hours a day. Completions activities are expected to take 1 to 3 weeks per well.

Production

Production facilities at the well pads would consist of wellheads, metering units, separators, aboveground condensate and produced water tanks (two tanks per well), and compressors. If artificial lift is required, conventional pumping units (pump jacks) and/or gas lift systems would be installed.

Tank batteries would be placed within corrugated steel secondary containment berms and would be sized to contain a minimum of 110 percent of the storage capacity of the largest tank within the berm. Containment berms would include an impermeable liner attached to the rings and laid under the tanks. All loading lines would be placed inside the containment berm or would have secondary containment vessels.

Installation of production equipment would take 2 to 3 weeks per well pad. Production facilities would be in place for the life of the wells, which are anticipated to be 30 to 50 years.

Pipeline Installation

The proposed well-tie pipelines would be up to a 6-inch outside diameter buried steel pipelines with a maximum allowable operating pressure of 500 pounds per square inch gauge. Related aboveground appurtenances that would be installed within the pipeline workspace would include cathodic protection equipment, futures, and block valves with blowdowns.

The proposed Chaco Trunk #2 Phase 2 pipeline would be constructed using 8-inch outside diameter steel pipeline. The proposed Chaco Trunk #2 Phase 2 would construct one leg off (where the pipeline is not underground—but on the surface). Typically, leg offs are utilized on steep slopes or in areas where surface disturbance could impact natural resources. The proposed Chaco Trunk #2 Phase 2 would bore under U.S. Highway 550.

The trench line, or ditch, would be excavated and sloped in accordance with Occupational Safety and Health Administration (OSHA) specifications. The cover from top of pipe to ground level would be a minimum of 36 inches through typical soil and rock and a minimum depth of 48 inches at road crossings. Excavated material would be stockpiled at the edge of the workspace.

Leg off construction (Chaco Trunk #2 Phase 2) would not involve trenching. The pipe would be trucked to a staging area at the bottom of the leg off. One or two joints of pipe would be strung end-to-end in the construction corridor in preparation for welding. A cable attached to a dozer at the top of the leg off would be lowered and attached to the welded pipe joints to pull the pipe up the slope. For longer leg offs, the pipe would be pulled up the steep slope and joints added at the bottom until the desired total length is strung. Several sections could be double jointed and strung side by side in the staging area and added as the pull progresses. The pipe would be anchored by burying it at each end of the leg off.

The trenching operation would be followed by pipe installation that would include stringing, bending for horizontal or vertical angles in the alignment, welding pipe segments together, inspection, coating joints to prevent corrosion, and lowering into the trench. Backfilling would begin after a section of the pipe has been successfully placed in the ditch and final inspection has been completed.

Cleanup activities would be initiated as soon as practicable after backfilling activities have been completed. The pipelines would be seeded with the seed mix and rates provided in the Reclamation Plan attached to the APDs for the well pads and the application package for the Chaco Trunk #2 Phase 2 pipeline.

Construction and well-tie pipeline installation activities would take 4 to 6 weeks per pipeline and reclamation activities would take 1 to 2 weeks per well-tie pipeline. The pipelines and related aboveground appurtenances would be in place for the life of the wells, which are anticipated to be 30 to 50 years.

Construction of the Chaco Trunk #2 Phase 2 would take approximately 14 weeks. Aboveground appurtenances for the Chaco Trunk #2 Phase 2 would include, but would not be limited to cathodic protection equipment, futures and block valves with blowdowns, pig launchers and receivers, separator, tank with truck load out, and a meter run with associated equipment.

Interim Reclamation

After production facilities are installed at the pads, the size of the well pads would be reduced to the minimum surface area needed for production facilities and future operations. Interim reclamation would consist of grading and recontouring the portion of the well pad not needed for production facilities/future operations to blend with adjacent natural surroundings as much as practicable, covering with salvaged topsoil material, and seeding to reestablish vegetation. Seed mixtures and rates would be in accordance with the Reclamation Plan for the proposed action. Sediment and erosion control measures would be installed as necessary. Interim reclamation would reduce the disturbed area to approximately 1.6 acres per pad. The proposed pipeline ROWs where they do not overlap the access roads would be reclaimed.

Interim reclamation activities would be initiated within 90 days after completion or 120 days from the well spud date of final operations and would take 2 to 4 weeks per well pad.

Abandonment and Final Reclamation

Upon abandonment of the wells, the wellbores would be plugged with cement and the production facilities would be removed. Federal and State of New Mexico standards would be followed and Encana would provide the BLM with technical and environmental aspects of the final plugging and abandonment and reclamation procedures. The well pads and access roads would be graded and re-contoured to blend with adjacent natural surroundings as much as practicable, covered with salvaged topsoil material, and seeded to reestablish vegetation. Sediment and erosion control measures would be installed as necessary.

2.1.1 Design Features

All areas of proposed surface disturbance were inspected in the field to ensure that potential impacts to natural resources would be minimized through the implementation of design features. For a detailed description of the design and construction practices associated with the proposed action, refer to the APDs and plats in Appendix B. For the proposed action, standard and project-specific design features include but are not limited to the following:

- Roads will be maintained in better condition as what existed prior to the commencement of operations. Road maintenance will continue until final abandonment and reclamation of the well location.
- Dust emissions will be controlled on the roads and locations, as necessary, with the application of dust suppressants (e.g., magnesium chloride) and/or water.
- The access roads will be designed and constructed as a Resource Road in accordance with the BLM Gold Book Standards (USDI/USDA 2007) and BLM 9113-1 (Roads Design Handbook) and BLM 9113-2 (Roads National Inventory and Condition Assessment Guidance and Instructions Handbook). Construction will include ditching, draining, installing culverts, crowning and capping or sloping and dipping the roadbed, as necessary, to provide a well-constructed and safe road.
- All BLM/FFO cultural resources stipulations will be followed as indicated in the Cultural Resource Records of Review, attached to the Conditions of Approval (COA) in the APD/ROW as the case may be. These stipulations may include, but are not limited to temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, reduction and/or

specific construction avoidance zones, and employee education. All employees, contractors, and sub-contractors of the project will be informed by the project proponent that cultural sites are to be avoided by all personnel, personal vehicles, and company equipment. All employees, contractors, and sub-contractors of the project will also be informed that it is illegal to collect, damage, or disturb cultural resources and that such activities are punishable by criminal and/or administrative penalties under the provisions of the Archaeological Resources Protection Act. In the event of a discovery during construction, the project proponent will immediately stop all construction activities in the immediate vicinity of the discovery and then immediately notify the archaeological monitor, if present, or the BLM. The BLM will then evaluate or cause the site to be evaluated. Should a discovery be evaluated as significant (e.g., National Register, Native American Graves Protection and Repatriation Act, Archaeological Resources Protection Act, it will be protected in place until mitigating measures can be developed and implemented according to guidelines set by the BLM.

- Prior to construction, pipeline ROWs will be staked at 100- to 200-foot intervals.
- Grazing permittees will be notified when construction is scheduled to begin. All hazards to livestock would be fenced or contained.
- All project activities would be confined to permitted areas only.
- Where pipeline construction parallels or crosses public roads, warning signs will be placed to alert motorists of construction. Safety measures will also be implemented along the construction workspace by either using the topsoil or subsoil piles or strung pipe as a barrier. Trenches left open at road crossings will be fenced with orange safety fence and barricades will be installed, if needed.
- Clearing, removal of topsoil, and grading will be limited to the permitted area and the minimum area required for safe and efficient construction.
- Trees larger than 3 inches in diameter will be cut at ground level and delimbed. The wood may be donated to the local Chapter houses for the elderly and needy. The operator would need to purchase a commercial wood permit to be able to donate the wood. Stumps will be cut as close to the ground as possible. Stumps and root balls will be hauled to an approved disposal site or stockpiled at the edge of the well pad and buried in the cut slopes of the pad during interim reclamation.
- Trees smaller than 3 inches in diameter, slash, and brush will be chipped, shredded, or mulched and will then be incorporated into the topsoil for later use in interim reclamation.
- Remaining brush will be brush-hogged or scalped at ground level prior to ground disturbance.
- Topsoil will be segregated and stockpiled at the edge of the workspace. Topsoil is defined as the top 6 inches of soil. Vehicle/equipment traffic will be prevented from crossing topsoil stockpiles.
- If a location becomes prone to wind or water erosion, Encana will take appropriate measures to prevent topsoil loss. Such measures may include using tackifiers, blankets, straw bales, straw wattles or water to wet the topsoil stockpile to create a crust across the exposed soil to prevent soil loss.
- Culverts (24 to 36-inch) will be installed, as needed, along the new and upgraded access roads from the well pads to the arterial route. Culverts will be sized and installed in accordance with BLM Gold Book standards (USDI/USDA 2007) and BLM 9113-1 (Roads Design Handbook) and

BLM 9113-2 (Roads National Inventory and Condition Assessment Guidance and Instructions Handbook).

- A closed-loop system will be used for each location. Cuttings will be stored on-site in aboveground storage tanks. Cuttings will be disposed at an approved waste disposal facility.
- The closed-loop system storage tanks will be sized to ensure confinement of all fluids and will provide sufficient freeboard to prevent uncontrolled releases.
- A 20-millimeter thick liner will be installed under tanks, pumps, ancillary facilities, and truck loading/unloading areas associated with the closed-loop system.
- Drilling fluids will be stored on-site in aboveground storage tanks. Upon termination of drilling operations, the drilling fluids will be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse, as practical. Residual fluids will be disposed at an approved waste disposal facility.
- The water-based solution that flows back to the surface during and after completion operations will be placed in storage tanks on the location. Flowback water will be confined to a storage tank for a period not to exceed 90 days after initial production and will be disposed at an approved waste disposal facility.
- Any spills of non-freshwater fluids will be immediately cleaned up and removed to an approved disposal site.
- Self-contained, chemical toilets will be provided for human waste disposal. The toilet holding tanks will be pumped, as needed, and the contents thereof disposed of in an approved sewage disposal facility. Toilets will be on-site during all operations.
- Garbage, trash, and other waste materials will be collected in a portable, self-contained, and fully-enclosed trash container during drilling and completion operations. The accumulated trash will be removed, as needed, and will be disposed of at an authorized sanitary landfill. No trash will be buried or burned on location.
- Immediately after removal of the drilling rig, all debris and other waste materials not contained in the trash container will be cleaned up and removed from the well location.
- No chemicals subject to reporting under SARA Title III in an amount equal to or greater than 10,000 pounds will be used, produced, stored, transported, or disposed of annually in association with the drilling, testing, or completing of this well.
- No extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities, will be used, produced, stored, transported, or disposed of in association with the drilling, testing, or completing of this well.
- The amount of open trench will be minimized ahead of pipe laying and backfilling. No more than ½ mile of trench or the amount of trench that can be worked in a day will be open at any given time. Backfilling operations will be performed within a reasonable amount of time of the lowering operation to ensure the trench is not left open for more than 24 hours. Trenches left open overnight will be fenced with a temporary fence or other methods approved by the Authorized Officer. The ends of the trench will be sloped (3:1) to allow animals to escape.

- Escape ramps/crossovers will be constructed every 1,320 feet. In areas where active grazing is taking place escape ramps/crossovers will be placed every 500 feet. The ends of the open trench will be sloped each night with a 3:1 slope.
- Established livestock and wildlife trails will be left in place as crossovers. Escape ramps/crossovers will be constructed with a minimum 3:1 slope at each end of the crossover. Crossovers will be a minimum of 10 feet wide and not fenced.
- The end of the pipe will be plugged to prevent animals from crawling in.
- Before the trench is closed, it will be inspected for animals. Any trapped wildlife or livestock will be promptly removed and released at least 150 yards from the trench.
- All existing improvements (such as fences, gates, and bar ditches) will be repaired to previous or better than pre-construction conditions. Cut fences will be tied to H-braces prior to cutting and openings will be protected as necessary during construction to prevent the escape of livestock. A temporary closure will be installed on the same day as the fence is cut. Following reclamation, the fence will be reconstructed to BLM specifications.
- Cover from top of pipe to ground level will be a minimum of 36 inches through typical soil and rock and a minimum of 48 inches at drainage of road crossings. Inspection will be conducted to verify that minimum cover is provided, the trench bottom is free of rocks and debris, external pipe coating is not damaged, and the pipe is properly fitted and installed into the ditch.
- Rocks and limbs removed during clearing will be scattered across the workspace in a random arrangement using rubber-tired equipment.
- Open pits will be netted and vent caps placed on all open pipes to prevent bird entry and nesting.
- A migratory bird nest survey will be conducted if any vegetation-disturbing activities occur between May 15 and July 31. The survey must be conducted by a BLM-approved biologist using a survey protocol developed and provided by the BLM/FFO. If active nests are located within the proposed permitted area, project activities will not be permitted without written approval by a BLM/FFO biologist.
- Permanent erosion control measures will be installed after the workspace has been re-contoured. Encana will construct waterbars on all disturbed areas to the spacing and cross sections specified by the Authorized Officer.
- The disturbed areas will then be reseeded with a BLM/FFO approved seed mix. All components of the proposed action would be reseeded with a Sagebrush-Grassland mix. Seeding will be accomplished within 120 days of construction completion, weather permitting. Upon evaluation after the second growing season, seeding will be repeated if a satisfactory stand is not obtained. Cut and fill slopes will be hand seeded with hydro-mulch excelsior netting and/or mulch with netting.
- It will be the operator's responsibility to monitor, control, and eradicate all invasive, non-native plant species within the permitted area throughout the life of the proposed project. The operator will contact the BLM/FFO regarding acceptable weed-control methods. If the operator does not hold a current Pesticide Use Permit, a Pesticide Use Permit will be submitted prior to pesticide application. Only pesticides authorized for use on BLM lands will be used. The use of pesticides will comply with federal and state laws. Pesticides will be used only in accordance with their

registered use and limitations. The operator will contact the BLM/FFO prior to using these chemicals.

- Production equipment will be placed on location in such a manner to minimize long-term disturbance and maximize interim reclamation. As practical, access will be provided by a teardrop-shaped road through the production area so that the center may be re-vegetated.
- A berm will be constructed completely around any production facilities that contain fluids (i.e., production tanks, produced water tanks, etc.). These berms will be constructed of compacted subsoil, corrugated metal or equivalent, that is impervious, and will hold 110 percent of the capacity of the largest tank.
- Production facilities would be painted Covert Green to blend with the natural color of the landscape and would be located, to the extent practical, to reasonably minimize visual impact. Equipment subject to safety considerations would not be painted. The leg off will not be painted so the rusty finish on the pipe will blend in with the surroundings.
- Engines would be equipped with mufflers and barriers or other sound-proofing measures would be implemented, if needed, to meet the requirements of BLM Notice to Lessees and Operators on Onshore Oil and Gas Leases within the jurisdiction of the FFO NTL 03-1 FFO.

Site-Specific Design Features for the Lybrook H09-2308

- Water will be diverted from the high point near corner 6 past corner 2 and into a natural drainage.
- Water will be diverted from the high point near corner 2 and around corner into a natural drainage.
- Water diversions and silt traps will be installed upon interim reclamation.
- Culverts will be installed at the beginning of the existing road, where the proposed access road will cross a shallow drainage, and where the proposed access road enters the proposed well pad.
- Populations of Brack's hardwall cactus (*Sclerocactus cloveriae* ssp. *brackii*) will be avoided by installing temporary fencing and rounding corner 5. No transplanting will be required.

Site-Specific Design Features for the Lybrook H14-2408

- Culverts will be installed where the proposed access road leaves the existing road and where it enters the proposed well pad.
- Corners 3 and 6 will be rounded to minimize impacts to natural resource concerns.
- Water will be diverted from corner 6 toward corner 2 into a silt trap and from corner 6 toward corner 5 into a silt trap. Upon interim reclamation, water will be diverted around the pad and silt traps installed as needed.
- Populations of Brack's hardwall cactus will be avoided by installing temporary fencing. Cactus that cannot be avoided with these measures will be transplanted in compliance with BLM/FFO guidelines (USDI/BLM 2013a).

Site-Specific Design Features for the Lybrook I10-2308

- A culvert will be installed where the access road leaves the pad.
- Water diversions and silt traps will be installed upon interim reclamation.

- Populations of Brack's hardwall cactus will be avoided by installing temporary fencing along the sides of the access road/pipeline ROW. Cactus that cannot be avoided with these measures will be transplanted in compliance with BLM/FFO guidelines (USDI/BLM 2013a).
- Corners 3 and 6 will be rounded to minimize impacts to natural resource concerns.
- Paleontological monitoring will be required during all construction activities.

Site-Specific Design Features for the Lybrook L14-2308

- Culverts will be installed where the proposed access road leaves the existing road and where it enters the proposed well pad.
- A silt trap will be installed on the east edge of the proposed well pad between corners 2 and 6.
- An armored spillway will be installed on the east edge of the pad and south of the silt trap (near corner 2) to divert and drain stormwater away from the pad.
- Water diversions and silt traps installed as needed upon interim reclamation.
- The south-central construction zone would be minimized and corner 6 will be rounded to minimize impacts to Brack's hardwall cactus. Temporary fencing would be constructed as needed to restrict construction activities. Cactus that cannot be avoided with these measures will be transplanted in compliance with BLM/FFO guidelines (USDI/BLM 2013a).

Site-Specific Design Features for the Lybrook M11-2308

- Corner 5 will be rounded to minimize impacts to natural resource concerns.
- Paleontological monitoring will be required during all construction activities.
- Corner 2 will be rounded.
- A drainage channel with a silt trap will be installed between corner 6 and mid-point 1 to divert water around corner 6.
- Culverts will be installed at low water crossings.
- Temporary fencing would be constructed as needed to restrict construction activities where cactus populations occur around the perimeter of the well pad. Cactus that cannot be avoided with these measures will be transplanted in compliance with BLM/FFO guidelines (USDI/BLM 2013a).

Site-Specific Design Features for the Chaco Trunk #2 Phase 2 Pipeline

- Cactus that cannot be avoided with temporary fencing will be transplanted in compliance with BLM/FFO guidelines (USDI/BLM 2013a). A transplant and monitoring plan will be developed in coordination with the BLM/FFO Threatened and Endangered Species Biologist.

2.2 No Action

The BLM NEPA Handbook (H-1790-1; USDI/BLM 2008a) states that for EAs on externally initiated proposed actions, the no action alternative is generally to reject the proposal or deny the application. This option is provided in 43 CFR 3162.3-2 (h) (2). This alternative would deny the approval of the APDs and ROW grants and the current land and resource uses would continue to occur in the area. The no action alternative provides a useful baseline for comparison of environmental effects (including cumulative effects) and demonstrates the consequences of not meeting the need for the action.

2.3 Alternatives Considered but Eliminated

The applicant analyzed several scenarios to determine how to best develop Sections 10 and 14, Township 23 North, Range 8 West. Rough topography and numerous cultural sites make this area challenging to develop. Several configurations of the proposed well pads, pipelines, and roads were considered and evaluated by the applicant, BLM, and natural and cultural resources experts using desktop tools and in-field examination. These alternatives were considered but have been eliminated from further consideration as they would have resulted in greater environmental impacts.

Lybrook H09-2308

The proposed pipeline and road alignment was modified to minimize impacts to Brack's hardwall cactus. The original alignment has been eliminated from detailed consideration. An alternative well pad location was identified during the on-site but was eliminated based on topography and the presence of cultural resources and Brack's hardwall cactus.

Lybrook H14-2308

During the on-site, an alternative was identified southeast of proposed location. However, this site contained cultural resources that could not be avoided. The potential alternative was eliminated from detailed consideration.

Lybrook I10-2308

The original location at 2533 FSL and 321 FEL of Section 10 (BHL 1880 FNL and 330 FWL of Section 10) was eliminated from detailed consideration because it would have impacted Brack's hardwall cactus and possibly cultural and paleontological resources. A large ephemeral drainage was also located in the area. Two alternatives were identified during the on-site evaluation, one of which was eliminated from detailed consideration as it would have impacted cultural resources and unique topography. The second alternative is presented as the proposed action.

Lybrook L14-2308

An alternative was identified during the on-site evaluations. During surveys of the location more Brack's hardwall cactus were recorded than on the original location. Additionally, the alternative site would have impacted cultural resources; therefore, the alternative was eliminated from detailed consideration.

Lybrook M11-2308

The original pipeline route was modified to parallel existing disturbance associated with the road. The original route was eliminated from detailed consideration.

Lybrook A15-2308

The proposed Lybrook A15-2308 well pad was dropped from consideration and the well will be twinned with the proposed Lybrook M11-2308 well.

Chaco Trunk #2 Phase 2

The original alignment extended cross country in several locations. The alignment was modified to follow existing disturbance for its entire length. The original alignment was eliminated from detailed consideration.

No other alternatives were identified that would create less disturbance and still achieve the purpose and need of the proposed action.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the environment that would be affected by implementation of the alternatives described in Chapter 2. Aspects of the affected environment described in this section focus on the relevant major resources or issues.

Under the no action alternative, the proposed action would not be implemented. The no action alternative would result in the continuation of the current land and resource uses in the area. This alternative will not be evaluated further in this EA.

Field resource investigations of the proposed action were conducted on February 27, July 19 and 22, August 1, 7, 15, 16, 20, and 21, October 2 and 3, and November 7, 2013 by Ecosphere Environmental Services biologists. Cultural resource surveys were conducted by La Plata Archaeological Consultants, LLC (LAC) on various dates between March 2012 and January 2014. On-sites were conducted on February 27, August 7, and November 7, 2013 and attended by representatives from Encana and the BLM/FFO.

The analysis area for this EA is defined as the project footprint of the proposed well pads, access roads, and pipelines.

3.1 Air Resources

3.1.1 Affected Environment

The proposed pipeline would be located in San Juan County, New Mexico. Additional general information on air quality in the area is contained in Chapter 3 of the Farmington PRMP/FEIS. In addition, new information about greenhouse gases (GHG) and their effects on national and global climate conditions have emerged since this document was prepared. Ongoing scientific research has identified the potential impacts of GHG emissions such as carbon dioxide, methane, nitrous oxide, water vapor, and several trace gases on global climate. Through complex interactions on a global scale, GHG emissions may cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and burning of fossil carbon sources have caused GHG concentrations to increase measurably, and may contribute to overall climatic changes, typically referred to as global warming.

Much of the information referenced in this section is incorporated from the Air Resources Technical Report for BLM Oil and Gas Development in New Mexico, Kansas, Oklahoma, and Texas (herein referred to as Air Quality Technical Report; USDI/BLM 2013b). This document summarizes the technical information related to air resources and climate change associated with oil and gas development, and the methodology and assumptions used for analysis.

The U.S. Environmental Protection Agency (USEPA) has the primary responsibility for regulating air quality, including six nationally regulated ambient air pollutants (criteria pollutants). These criteria

pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter (PM) PM_{10} and $PM_{2.5}$, sulfur dioxide (SO_2), and lead. The USEPA has established National Ambient Air Quality Standards (NAAQS) for criteria air pollutants. The NAAQS are protective of human health and the environment. The USEPA has approved the New Mexico's State Implementation Plan and New Mexico enforces state and federal air quality regulations on all public and private lands within the state, except for tribal lands within Bernalillo County. Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology, and terrain; included are applications of noise, smoke management, and visibility. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. The USEPA has proposed or completed actions recently to implement Clean Air Act requirements for greenhouse gas emissions. Climate has the potential to influence renewable and non-renewable resource management.

Air Quality

Criteria Air Pollutants

The Air Quality Technical Report describes the types of data used for describing the existing conditions of criteria pollutants, how criteria pollutants are related to the activities involved in oil and gas development, and providing a table of current national and state standards (USDI/BLM 2013b). The USEPA Green Book web page reports that all counties in the analysis area—San Juan, McKinley, Rio Arriba, and Sandoval Counties in New Mexico and La Plata County, Colorado—are in attainment of all NAAQS, as defined by the Clean Air Act. The area also does not violate any New Mexico Ambient Air Quality Standards (NMAAQS). The current criteria pollutant "design concentrations" in the analysis area are described below. Design concentrations are the concentrations of air pollution at a specific monitoring site that can be compared to the NAAQS. Table 3-1~~Table 3-1~~ shows monitored design values for ozone in recent years for each of the three San Juan County ozone monitoring stations.

Table 3-1. Reported ozone values for San Juan County ozone monitoring stations

State Air Monitoring Station	8-hour Ozone Design Value (parts per million)				NAAQS
	2007-2009	2008-2010	2009-2011	2010-2012	2008
Substation	0.067	0.063	0.063	0.067	0.075
Bloomfield	0.061	0.060	0.061	0.067	0.075
Navajo Lake	0.069	0.066	0.068	0.071	0.075

Note: NAAQS = National Ambient Air Quality Standard Standards

Source: USEPA 2012

Table 3-2 summarizes monitored design values for other criteria pollutants in San Juan County.

Table 3-2. Criteria pollutant design value concentrations monitored in San Juan County

Pollutant	Design Value	Averaging Time	NAAQS	NMAAQS
NO_2	13 parts per billion (ppb)	Annual	53 ppb	50 ppb
NO_2	39 ppb	1-hour	100 ppb[1]	0.10 ppm (24-hour)
PM_{10}	Data incomplete	24-hour	150 µg/m[3, 3]	150 µg/m[3, 4]
$PM_{2.5}$	4.5 µg/m^3	Annual	12 µg/m[3, 5]	60 µg/m[3, 4]
$PM_{2.5}$	14 µg/m^3	24-hour	35 µg/m[1, 3]	
SO_2	0.001 ppm	Annual	None	0.02 ppm
SO_2	20 ppb	1-hour	75 ppb[6]	None
SO_2	0.008 ppm	24-hour	None	0.10 ppm

Note: NAAQS = National Ambient Air Quality Standard Standards; NMAAQS = New Mexico Ambient Air Quality Standards; NO_2 = nitrogen dioxide; ppb = parts per billion; PM_{10} = particulate matter between 2.5 and 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than 2.5 micrometers in diameter; µg/m = micrograms per cubic meter; SO2 = sulfur dioxide; ppm = parts per million

Source: USEPA 2012

[1] 98th percentile, averaged over 3 years.

[2] Not to be exceeded more than once per year.

[3] µg/m^3 refers to micrograms per cubic meter of air. Not to be exceeded more than once per year, on average over 3 years.

[4] The NMAAQS is a standard for total suspended particulate matter.

[5] Annual mean, averaged over 3 years.

[6] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

In 2005, the USEPA estimated that there was less than 0.01 ton of lead per square mile emitted in the analysis area, which is less than 2 tons total (USDI/BLM 2013b). There is no monitoring conducted for lead and CO in northwestern New Mexico. However, concentrations of these pollutants are expected to be low in rural areas; therefore, not monitored.

Hazardous Air Pollutants

The Air Quality Technical Report discusses the relevance of hazardous air pollutants (HAPs) to oil and gas development and the particular HAPs that are regulated in relation to these activities (USDI/BLM 2013b). The USEPA has identified 187 toxic air pollutants as HAPs. In March 2011, the USEPA published the fourth in a series of National Scale Air Toxics Assessments (NATAs) that quantifies HAP emissions for 2005 by U.S. counties. The purpose of the NATA is to identify areas where HAP emissions result in high health risk. Computer models are used to develop estimates for risk of cancer or other health impacts. NATA presents risk hazard indexes for cancer, neurological, and respiratory problems for each county and census tract. Because techniques have changed over the years, the NATA is not comparable to those previously issued. USEPA also cautions that because data availability varies from state to state, the results are not necessarily comparable from one geographic area to another. The 2005 NATA estimated the total cancer risk for the analysis area as 25 to 50 per one million and the estimated tract level total respiratory hazard index was 0 to 1. The USEPA estimates the average national cancer risk for 2005 was 50 per one million, meaning 1 person out of every 20,000 had an increased likelihood of contracting cancer from breathing air toxics from outdoor sources if exposed to 2005 emission levels over their

lifetime. A respiratory hazard index below 1 indicates that exposures in the area do not exceed reference levels that would have adverse effects for human health.

Climate

The analysis area is located in a semi-arid climate regime, typified by dry windy conditions and limited rainfall. Summer maximum temperatures are generally in the range of 80 or 90 degrees Fahrenheit (°F), and winter minimum temperatures are generally in the teens to 20s. Temperatures occasionally reach above 100°F in June and July, and have dipped below 0°F in December and January. Precipitation is divided between summer thunderstorms associated with the southwest monsoon and winter snowfall as Pacific weather systems drop south into New Mexico.

Table 3-3 shows climate normals for the 30-year period from 1981 to 2010 for the Farmington, New Mexico area.

Table 3-3. Climate normals for the Farmington area, 1981-2010

Month	Average Temperature[1]	Average Maximum Temperature[1]	Average Minimum Temperature[1]	Average Precipitation (inches)
January	30.5	40.8	20.3	0.53
February	35.8	46.8	24.8	0.59
March	43.2	56.1	30.3	0.78
April	50.4	64.7	36.2	0.65
May	60.4	74.8	46.1	0.54
June	69.8	85.1	54.5	0.21
July	75.4	89.6	61.2	0.90
August	73.2	86.5	59.8	1.26
September	65.4	79.1	51.7	1.04
October	53.3	66.4	40.1	0.91
November	40.5	52.2	28.8	0.68
December	31.0	41.2	20.7	0.50

Source: USDI/BLM 2013b

[1] Degrees Fahrenheit

3.1.2 Impacts from the Proposed Action

Methodology and assumptions for calculating air pollutant and GHG emissions are described in the Air Resources Technical Report (USDI/BLM 2013b). This document incorporates the sections discussing the modification of calculators developed by the BLM to address emissions for one horizontal oil well. The calculators give an approximation of criteria pollutant, HAPs, and GHGs emissions to be compared to regional and national emissions levels (USDI/BLM 2013b). Also incorporated into this document are the sections describing the assumptions used in developing the inputs for the calculator (USDI/BLM 2013b).

Direct and Indirect Impacts

Criteria Pollutants

Table 3-4 shows estimated emissions from one proposed horizontal oil well for criteria pollutants, volatile organic compounds (VOC) and GHGs (USDI/BLM 2013b). For comparison, Table 3-5 shows total human-caused emissions for each of the counties in the FFO planning area and La Plata County, Colorado, based on USEPA's 2008 emissions inventory (USEPA 2011).

Table 3-4. Criteria pollutant and volatile organic compound emissions estimated for construction of one horizontal oil well (average 25 days to drill and complete)

Activity	NO_X	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2
One-time operations (tons)								
Construction	5.5	1.5	0.5	2.5	0.25	0.1	0.007	598.85
Completion	0.5	0.1	0.03	0.025	0.025	-	-	55.00
Interim Reclamation	0.006	0.006	0.006	0.001	-	0.003	-	1.24
Final Reclamation	0.006	0.006	0.006	0.001	-	0.004	-	1.66
Ancillary Operations (tons)								
Workover	0.129	0.04	0.01	0.01	0.01	-	-	10.59
Road Maintenance	-	-	-	-	-	-	-	0.26
Road Traffic	-	-	-	-	-	-	-	0.06
Annual operations (tons/year)								
Oil Haul Truck and small truck (100 bbl/day)	0.009	0.006	0.0012	0.0009	0.0008	-	0.0001	3.88
Total	**6.13**	**1.64**	**0.55**	**2.54**	**0.29**	**0.11**	**0.01**	**671.54**

Note: NO_X = nitrous oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} = particulate matter between 2.5 and 10 micrometers in diameter; $PM_{2.5}$ = particulate matter with less than 2.5 micrometers in diameter; SO_2 = sulfur dioxide; CH_4 = methane; CO_2 = carbon dioxide; bbl = barrels

Source: USDI/BLM 2013

Oil storage tanks on the well location may result in venting of VOC. Oil well production is generally presented as barrels per day produced. The emissions calculator estimated that for every barrel per day produced there may be 0.12 tons of VOC vented per year.

The average horizontal oil well in the planning area produces approximately 100 barrels per day. One hundred barrels per day is estimated to result in 12 tons of VOC emissions per year. Oil storage tanks would be subject to current USEPA regulations regarding the capture or flaring of VOC emissions.

Table 3-5. Analysis area human caused emissions in tons/year, 2008

County	NO_X	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2
McKinley	12,595.0	31,885.2	37,509.0	66,590.7	6,977.5	1,659.8
Rio Arriba	4,276.6	27,352.9	45,841.5	46,321.6	4,746.2	89.1
San Juan	35,651.7	54,549.5	46,994.9	69,655.7	8,108.3	11,471.0
Sandoval	4,780.1	33,290.5	31,733.6	36,232.3	4,056.3	123.4
Total	**57,303.4**	**147,078.1**	**160,079**	**218,800.3**	**23,897.3**	**13,343.3**

Note: NO_X = nitrous oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} = particulate matter between 2.5 and 10 micrometers in diameter; $PM_{2.5}$ = particulate matter with less than 2.5 micrometers in diameter; SO_2 = sulfur dioxide

Source: USEPA 2008 National Emissions Inventory

Table 3-6 displays the percent increase in total emissions in the analysis area from the proposed action to construct and operate one horizontal oil well.

Table 3-6. Percent increase in analysis area emissions per well

	NO_X	CO	VOC	PM_{10} (1)	$PM_{2.5}$ (1)	SO_2 (1)
Total Emissions tons/year	57,303.4	147,078.1	160,079.0	218,800.3	23,897.3	13,343.3
Horizontal Oil Well Emissions tons/year	6.13	1.64	12.55 (2)	2.54	0.29	0.11
Percent Increase	**0.011**	**0.0011**	**0.0078**	**0.0012**	**0.0012**	**0.00082**

Note: NO_X = nitrous oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM_{10} = particulate matter between 2.5 and 10 micrometers in diameter; $PM_{2.5}$ = particulate matter with less than 2.5 micrometers in diameter; SO_2 = sulfur dioxide

[1] Values derived from average emissions for any well drilling in the analysis area. Calculated results available upon request.

[2] Current USEPA regulations require operators to reduce VOC emissions by 95 percent if their oil storage tanks emit over 6 tons of VOC emissions per year.

Hazardous Air Pollutants

The formulas used for calculating HAPs are very imprecise. For many processes, it is assumed that HAP emissions will be equivalent to 10 percent of VOC emissions. Therefore, the estimated HAP emissions of 1.25 tons/year should be considered a very gross estimate. Most of the VOC emissions estimated for one horizontal oil well result from venting from oil storage tanks. Current USEPA regulations require operators to reduce VOC emissions by 95 percent if their oil storage tanks emit over 6 tons of VOC emissions per year. A reduction of 95 percent of oil storage tank VOC emissions would reduce the estimated HAP emissions to 0.12 ton/year.

Total Greenhouse Gases

The available statewide GHG summary (NMED 2010) combines GHG emissions from CO_2 and CH_4. To compare the GHG emissions from the proposed action estimated by the calculator with statewide GHG emissions, CO_2e (carbon dioxide equivalent) emissions for both CH_4 and CO_2 were summed. The total statewide GHG emission estimate for 2007 was 76,200,000 metric tons CO_2e (76.2 million metric tons; NMED 2010). The estimated CO_2e metric tons emissions from one horizontal oil well (609.2 metric tons) would represent a 0.0008 percent increase in New Mexico CO_2 emissions.

Cumulative Impacts

The BLM/FFO manages federal hydrocarbon resources in San Juan, Sandoval, Rio Arriba, and McKinley counties in New Mexico. There are approximately 23,522 wells in the San Juan Basin. About 16,435 of the wells in these counties are federal wells. Analysis of cumulative impacts for the reasonable development scenario of oil and gas wells on public lands managed by the BLM/FFO was presented in the 2003 RMP. This included modeling of impacts on air quality. A more detailed discussion of Cumulative Effects can be found in the Air Resources Technical Report (USDI/BLM 2013b).

The primary activities that contribute to levels of air pollutant and GHG emissions in the Four Corners area are electricity generation stations, fossil fuel industries, and vehicle travel. The Air Quality Technical Report includes a description of the varied sources of national and regional emissions that are incorporated here to represent the past, present, and reasonably foreseeable impacts to air resources (USDI/BLM 2013b). It includes a summary of emissions on the national and regional scale by industry source. Sources that are considered to have notable contributions to air quality impacts and GHG emissions include electrical generating units, fossil fuel production (nationally and regionally), and transportation.

The emissions calculator estimated that there could be very small direct and indirect increases in several criteria pollutants, HAPs, and GHGs as a result of implementing the proposed alternative. The very small increase in emissions that could result would not be expected to result in exceeding the NAAQS for any criteria pollutants in the analysis area.

The very small increase in GHG emissions that could result from implementing the proposed alternative would not produce climate change impacts that differ from the no action alternative. This is because climate change is a global process that is impacted by the sum total of GHGs in the atmosphere. The incremental contribution to global GHGs from the action alternatives cannot be translated into effects on climate change globally or in the area of this site-specific action. It is currently not feasible to predict with certainty the net impacts from the action alternatives on global or regional climate.

The Air Resources Technical Report (USDI/BLM 2013b) discusses the relationship of past, present, and future predicted emissions to climate change and the limitations in predicting local and regional impacts related to emissions. It is currently not feasible to know with certainty the net impacts from particular emissions associated with activities on public lands.

3.2 Soils

3.2.1 Affected Environment

Surficial geology in the analysis area is composed of the Nacimiento Formation and soils are classified as Badland, Blancot-Notal-association, Doak-Sheppard-Shiprock association, and Fruitland-Persayo-Sheppard complex (New Mexico Bureau of Geology and Mineral Resources 2003, USDA/SCS 1980). The Nacimiento Formation consists of non-marine fluvial depositions created during the Paleocene in the San Juan Basin (Williamson and Lucas 1992, New Mexico Bureau of Geology and Mineral Resources 2003). The formation is comprised mostly of shale, interbedded with medium to fine grained sandstone

and conglomeratic sandstone (McLemore et al. 1986). The Nacimiento Formation is well-known for containing a significant early Paleocene vertebrate fossil record (Williamson and Lucas 1992).

Badland soils are moderately sloping to extremely sloping, nonstony, barren shale. All soils are well drained shallow soils that are formed in alluvial and eolian materials on upland slopes. Blancot-Notal soils are nearly level to gently sloping. These soils are deep well drained to somewhat excessively drained soils that formed in alluvium; on valley sides, valley bottoms, and alluvial fans. Doak-Sheppard-Shiprock soils are nearly level to moderately steep. These soils are deep somewhat excessively drained soils that formed in alluvial and eolian material found on upland slopes. Persayo-Fruitland-Sheppard soils are nearly level to very steep soils. These soils are shallow to deep well drained to somewhat excessively drained that were formed in alluvial, residual and eolian materials on upland slopes and alluvial fans (USDA/SCS 1980). The texture of the soils was found to be a combination of loam, clay loam to fine sandy loam. Biological soil crusts were observed at the Lybrook M11-2308 (1 to 2 percent cover), Lybrook I10-2308 (5 percent cover), and Lybrook H09-2308 (5 percent cover).

3.2.2 Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed action would affect approximately 72.75 acres of disturbed and undisturbed soils that have been classified as highly erodible. Construction would result in temporary displacement, compaction, and mixing of soils. The well pads and access roads (approximately 10.8 acres) would remain as bare, compacted soil for the life of the project (approximately 30 years) and would be subject to an undetermined amount of wind and water erosion until the well pads and roads are completely reclaimed. Following installation of the proposed pipelines, the ROWs, with the exception of where they overlap existing roadways or well operations, would be reseeded with a Sagebrush-Grass community type seed mix.

Compaction of the soils during construction and operation of the proposed project, coupled with the implementation of design features such as reseeding, would limit soil impacts from erosion. The most susceptible period for soil erosion impacts is during construction, when strong winds or precipitation events during soil-disturbing activities could mobilize soils. The impact on soils would be localized and short to long term.

Industry-related vehicle and pedestrian traffic would be restricted to proposed disturbance areas and existing roads. Following construction activities, unused areas on the well pads and the pipeline ROWs would be reseeded with A Sagebrush-Grass community type seed mix to stabilize soils and prevent erosion. Following construction, vehicle traffic would be restricted to existing bladed roads to prevent erosion, soil mixing, and compaction in adjacent areas. Implementation of proper soil salvage, storage, and reclamation will retain adequate infiltration and permeability rates that will allow for maintenance of soil moisture, which is necessary for plant growth and vigor, and minimize surface runoff.

Cumulative Impacts

The proposed action falls within the development that was assessed in the 2003 RMP EIS cumulative impacts analysis. The PRMP/FEIS determined that “cumulative impacts on soils in the San Juan Basin would comprise the total amount of short-term and long-term surface disturbance due to all new oil and

gas development and other activities" (USDI/BLM 2003a, page 4-123). The PRMP/FEIS projected that 264 acres of initial surface disturbance would occur in the Chaco sub-watershed (USDI/BLM 2003a, page 4-7). The reasonable foreseeable construction of the proposed Chaco Trunk #2 Phase 1 pipeline is anticipated to disturb approximately 5.5 acres of previously undisturbed soils. Past, present, and future developments are expected to result in a range of short- and long-term impacts to soils including disturbance, temporarily or permanently increasing erosion prior to reclamation, and reducing soil loss to erosion where reclamation and re-vegetation occurs. Given that about approximately 61.75 acres of undisturbed soil would be disturbed by the proposed action along with the Chaco Trunk #2 Phase 1 pipeline and the large extent of these soils in the San Juan Basin, any impact from the proposed action is not expected to contribute appreciably to cumulative impacts to soils when added to past, present, and reasonably foreseeable actions.

3.3 Water Resources/Quality – Surface and Groundwater

3.3.1 Affected Environment

The analysis area is located in the Upper Colorado River Hydrologic Region and is within of the Chaco sub-watershed. The analysis area is characterized by flat lowlands surrounded by badland hills, dissected by many intermittent drainage channels. Surface drainage flows to Betonnie Tsosie Wash and its unnamed tributaries. There are no perennial surface water resources such as rivers, lakes, ponds, or streams nor any wetlands, or springs within the analysis area. Seasonal stock ponds are located 100 feet west of the proposed Lybrook I10-2308 pipeline ROW, 120 feet east of Station 20+62 and 1,200 feet east of Station 269+72 of the proposed Chaco Trunk #2 Phase 2 pipeline ROW.

The analysis area was surveyed for the presence of jurisdictional wetlands and other waters of the U.S. Where the proposed project would potentially impact "bluelines," as obtained from the USGS High-resolution National Hydrography Dataset (NHD), a field determination was made on whether the drainage feature supported a defined bed-and-bank feature (based on scour and deposition processes). If scour and deposition features were present, an assessment was made to determine which geomorphic features were representative of an ordinary high water mark. Waters of the U.S. and other wetlands are regulated by the U.S. Army Corps of Engineers. Table 3-7 provides a description of jurisdictional waters of the U.S. that were identified in the analysis area.

Table 3-7. Project Component, ordinary high water mark measurement, and type of waters of the U.S. in the analysis area

Project Component	Ordinary High Water Mark		Type
	Width (inches)	Height (inches)	
Lybrook H09-2308 well pad	132	2	Ephemeral
Lybrook H09-2308 pipeline/access	48	2	Ephemeral
Lybrook I10-2308 well pad	60	3	Ephemeral
Lybrook I10-2308 pipeline/access	24	2	Ephemeral
	84	1.5	Ephemeral/NHD “blueline”
	24	0.5	Ephemeral
	12	0.25	Ephemeral
	30	1.5	Ephemeral
Lybrook M11-2308 well pad	24	1.5	Ephemeral
Chaco Trunk #2 Phase 2 pipeline	12	2	Ephemeral
	24	2	Ephemeral
	48	4	Ephemeral/NHD “blueline”
	30	5	Ephemeral
	24	6	Ephemeral
	60	6	Ephemeral
	36	6	Ephemeral
	36	2	Ephemeral
	42	3	Ephemeral
	48	3	Ephemeral/NHD “blueline”
	60	3	Ephemeral/NHD “blueline”
	102	4	Ephemeral/NHD “blueline”
	36	5	Ephemeral/NHD “blueline”
	60	5	Ephemeral/NHD “blueline”
	12	3	Ephemeral
Lybrook Access Road #3	12	3	Ephemeral
	60	5	Ephemeral/NHD “blueline”
	36	5	Ephemeral/NHD “blueline”
	84	4	Ephemeral/NHD “blueline”
	96	12	Ephemeral/NHD “blueline”
	84	3	Ephemeral/NHD “blueline”

Aquifers in the San Juan Basin are generally considered to be confined and artesian due to the overlying low hydraulic conductivity formations and the regional geologic structure. Groundwater recharge occurs along the topographic high outcrops along the basin margins. Discharge from groundwater aquifers generally occurs in topographic low areas such as the San Juan River in the northwestern part of the basin and the Rio Grande in the southeast. Vertical leakage across fine-grained formations is also a source of recharge and discharge due to variations in hydraulic head. Regionally vertical leakage is assumed to be low however fracturing in particular around structural features in the basin could result in higher rates of vertical permeability (Stone et al. 1983).

The primary aquifers in the BLM/FFO area are the sandstone based Uinta-Animas and the Mesaverde. Groundwater is readily available in most of the BLM/FFO area and is of fair to poor quality. A search of the New Mexico State Engineers Office—Water Administration and Technical Engineering Resource System database for the proposed analysis area and vicinity (1-mile radius) was performed. A water well is located approximately 5,000 feet north of the proposed Lybrook I10-2308 well pad and 3,800 feet east of the proposed Chaco Trunk #2 Phase 2 end of the line (NMOSE 2013).

3.3.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Potential impacts to surface water and shallow groundwater resources could occur from stormwater runoff and the accidental spill of chemicals, produced water, or flowback fluids. The potential for these impacts would be long term for the life of the proposed action.

The proposed action would temporarily expose an estimated 72.75 acres of soil as a sediment source entering area drainage ways in the short term, and approximately 10.8 acres would remain exposed at well pads and access roads after interim reclamation. Vegetation cover is generally low throughout the analysis area. Exposure of soils, particularly on slopes, would lead to an increase in an undetermined but likely small amount of sediment transport, particularly during and following storm events. Slight alterations in analysis area drainage patterns may also lead to an increase in sediment transport. These increases in sediment transport would persist for several years until the disturbed areas are stabilized. The potential for sediment transport into the drainages would be minimized through the implementation of best management practices and other preventive measures, such as re-establishment of vegetation and proper site hydrological diversions. The disturbance created by the proposed Lybrook H09-2308, Lybrook I10-2308, and M11-2308 well pads, the Lybrook Access #3 upgrade and the Lybrook H09-2308 and M11-2308 access roads, The Lybrook I10-2308 well-tie pipeline, and the Chaco Trunk #2 Phase 2 pipeline within the ordinary high water mark of waters of the U.S. and would be covered under the U.S. Army Corps of Engineers Nationwide Permits #12 (for Utility Line Activities), #14 (Linear Transportation Crossings), or Permit #39 (for Commercial and Institutional Developments). Encana would consult with the U.S. Army Corps of Engineers and provide pre-construction notifications, as needed, prior to disturbance.

Water for drilling and completions would be sourced from a private water well that has been permitted by the State of New Mexico. The well has been assigned the POD Number SJ 01979-S4 by the New Mexico Office of the State Engineer. Approximately 1.3 million gallons of water would be used for drilling and completions per well.

Minimal amounts of hazardous materials (i.e., gas, diesel, etc.) would be used and stored on the well pad locations. There would be the potential for accidental spills or releases of these materials that could impact local water quality. The proposed wells would be drilled using a closed-loop system to contain drill cuttings and fluids. All chemicals stored on-site would be properly contained. Containment structures sufficiently impervious to prevent a discharge to waters of the U.S., such as containment dikes, containment walls, drip pans, or equivalent protective structures would be installed and maintained. Any spills of non-freshwater fluids would be immediately cleaned up and removed to an approved disposal site in accordance with federal and state regulations.

Stimulation (i.e., hydraulic fracturing or "fracking") is a process used to maximize the extraction of underground resources by allowing oil or natural gas to move more freely from the rock pores to production wells that bring the oil or gas to the surface. Fluids, commonly made up of water (99 percent) and chemical additives (1 percent), are pumped into a geologic formation at high pressure during hydraulic fracturing (USEPA 2004). Chemicals added to stimulation fluids may include friction reducers, surfactants, gelling agents, scale inhibitors, acids, corrosion inhibitors, antibacterial agents, and clay stabilizers. When the fracking pressure exceeds the rock strength, the fluids open or enlarge fractures that typically extend several hundred feet away from the well bore, and may occasionally extend up to 1,000 feet from the well bore. After the fractures are created, a propping agent (usually sand) is pumped into the fractures to keep them from closing when the pumping pressure is released. After fracturing is completed, a portion of the injected fracturing fluids returns to the wellbore and is recovered for future fracturing operations (USEPA 2004) or disposal. Stimulation techniques have been used in the United States since 1949 and in the San Juan Basin since the 1950s. Over the last 10 years, advances in multi-stage and multi-zone hydraulic fracturing have allowed development of gas fields that previously were uneconomic, including the San Juan Basin.

Hydraulic fracturing is a common process in the San Juan Basin and applied to nearly all wells drilled. The producing zone targeted by the proposed action is well below any underground sources of drinking water. The Mancos Shale formation is also overlain by a continuous confining layer. The geological confining layer is the Lewis Shale formation that is located above both the Mancos Shale and Mesaverde formations and provides an impermeable layer that isolates the Mancos Shale and Mesaverde formations from both identified sources of drinking water and surface water. On average, total depth of the proposed well bore would be about 5,000 feet below the ground surface. Fracturing in the Basin Mancos formation is not expected to occur above depths of 4,000 feet below the ground surface. Fracturing could possibly extend into the Mesaverde formation overlying the Basin Mancos; however, the formation has not been identified as an underground source of drinking water based on its depth and relative high levels of total dissolved solids. No impacts to surface water or freshwater-bearing groundwater aquifers are expected to occur from hydraulic fracturing of this proposed well.

Potential impacts to groundwater resources could occur from the proposed well bores. The potential for impacts to groundwater from the well bore would be long term for the life of the well. Adherence to COA and design features, such as adequate casing, cementing, and other drilling and completion methods, would minimize effects to water quality.

Casing specifications would be designed by Encana and a casing program would be submitted to the New Mexico Oil Conservation Division. Surface casing would be set to 500 feet. The casing and cementing

would stabilize the wellbore and provide protection to any overlying freshwater aquifers by isolating hydrocarbon zones from overlying freshwater aquifers. Prior to approving an APD, a BLM geologist would identify all potential subsurface formations that would be penetrated by the wellbore. This includes all groundwater aquifers and any zones that would present potential safety or health risks that may need special protection measures during drilling, or that may require specific protective well construction measures.

Once the geologic analysis is completed, the BLM would review the company's proposed casing and cementing programs to ensure the well construction design is adequate to protect the surface and subsurface environment, including potential risks identified by the geologist and all known or anticipated zones with potential risks.

During drilling, the BLM would be on location during the setting of critical casing and cementing intervals. Before hydraulic fracturing takes place, all surface casings and some deeper, intermediate zones are required to be cemented from the bottom of the cased hole to the surface. The cemented well would be pressure tested to ensure there are no leaks and a cement bond log is run on certain strings of casing to ensure the cement has bonded to the casing and the formation.

During operation, the proposed pipelines could potentially leak or rupture, which could impact groundwater quality. The proposed pipelines would be tested to ensure integrity prior to operation. Cathodic protection systems would be installed to protect the pipelines from corrosion, which could affect the integrity of the pipe. Potential impacts to groundwater quality from leaks or ruptures during pipeline operation would be long term.

Cumulative Impacts

Reasonably foreseeable development within the Chaco sub-watershed may include an estimated additional 71 oil and gas wells and related facilities. Surface-disturbing activities that would be associated with these actions may affect an estimated 264 acres (USDI/BLM 2003a, page 4-7). The Chaco Trunk #2 Phase 1 would also be located in the sub-watershed and would result in approximately 5.5 acres of new disturbance. The PRMP/FEIS determined that the primary cumulative impacts on water quality would result from surface disturbance, which would generate increased sediment yields (USDI/BLM 2003a, pages 4-123 and 4-124). Cumulative effects to water resources from the proposed action would be maximized shortly after construction begins and would decrease over time as reclamation efforts progress.

The proposed action would cumulatively contribute approximately 10.8 acres of long-term disturbance in the watershed. Cumulative impacts to surface waters would be related to short-term sedimentation or flow changes. Surface-disturbing activities other than the proposed action that may cause accelerated erosion include (but are not limited to) construction of roads, other facilities, and installation of trenches for utilities; road maintenance such as grading or ditch-cleaning; public recreational activities; vegetation manipulation and management activities; prescribed and natural fires; and livestock grazing.

3.4 Upland Vegetation and Noxious Weeds

3.4.1 Affected Environment

The analysis area is located within the Arizona/New Mexico Plateau ecoregion and is further classified as San Juan/Chaco Tablelands and Mesas (Griffith et al. 2006). Two vegetation community types occur within the analysis area—Great Basin desert scrub sagebrush series and Great Basin desert scrub saltbush series (Dick-Peddie 1993). Approximately 16 acres of existing disturbance associated with roads and pipeline corridors occurs within the analysis area.

The proposed Lybrook H09-2308 well pad, access road, and pipeline ROW are located in a Great Basin desert scrub sagebrush series community. The vegetation is dominated by big sagebrush (*Artemisia tridentata*), James' galleta (*Pleuraphis jamesii*), blue grama (*Bouteloua gracilis*), and four-wing saltbush (*Atriplex canescens*). Ground cover ranged from 0 to 30 percent with patchy areas of barren soils overlain with alluvial gravels. Four Utah juniper (*Juniperus osteosperma*) trees are located within the proposed project area. No noxious weeds were observed in the project area.

The Lybrook H14-2308 well pad, access road, and pipeline ROW are located in a sagebrush series community type that contains widely scattered piñon pine and Utah juniper trees. Dominant species in the project area include sagebrush, James' galleta, blue grama, and broom snakeweed (*Gutierrezia sarothrae*), piñon (*Pinus edulis*) and Utah juniper. Ground cover was visually estimated at 10 to 35 percent. Approximately 100 piñon and juniper trees of varying sizes and ages are located within the proposed well pad, access road, and pipeline ROW. No noxious weeds were observed.

The proposed Lybrook I10-2308 well pad, access road, and pipeline ROW are located in sagebrush series community with widely scattered Utah juniper and piñon pine. The dominant species in the area are big sagebrush, shadscale saltbush (*Atriplex confertifolia*), broom snakeweed, blue grama, greasewood (*Sarcobatus vermiculatus*) and rabbitbrush (*Ericameria nauseosa*). Ground cover was visually estimated at 0 to 25 percent. Fifty-two Utah juniper trees are located within the proposed project area. No noxious weeds were observed.

The proposed Lybrook L14-2308 well pad, access road, and pipeline ROW are located in sagebrush series community. Dominant species in the project area include big sagebrush, blue grama, and broom snakeweed. Ground cover was visually estimated at 10 to 30 percent. Patches of alluvial gravels with minimal vegetation occur on low mounds in the project area. Two short-stature juniper trees occur in the project area. No noxious weeds were observed.

The proposed Lybrook M11-2308 well pad, access road, and pipeline ROW are located in a sagebrush series community with widely scattered Utah juniper and to a lesser extent piñon. Big sagebrush is the dominant species. Ground cover was estimated at 0 to 30 percent. Fifteen piñon/juniper trees are located with the project area. No noxious weeds were observed.

The Chaco Trunk #2 Phase 2 pipeline project ROW is dominated by the sagebrush series community type with small scattered patches of piñon-juniper woodland, and salt desert scrub mainly associated with nearly barren badlands. Dominant species in the project area include big sagebrush, broom snakeweed, blue grama, James' galleta, and alkali sacaton (*Sporobolus airoides*). Ground cover was visually

estimated at 0 to 40 percent. Approximately 280 piñon pine and juniper trees of varying sizes and ages are located within the proposed pipeline ROW. One noxious weed species was observed within the proposed project area. Halogeton (*Halogeton glomeratus)* is a BLM-listed Class B species and was observed scattered along the north end of the proposed pipeline.

The vegetation type and approximate acreage affected by the proposed action are listed in Table 3-8.

Table 3-8. Vegetation type and approximate acreage affected by the proposed action

Vegetation Community Type	Acreage
Sagebrush grassland series	54.0
Saltbush series	2.0
Previously disturbed	16.25
Total	**72.25**

3.4.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Direct impacts would include removal of vegetation during site clearing activities. Construction of the proposed action would result in the removal and modification of approximately 56.25 acres of undisturbed vegetation including an estimated 450 piñon and juniper trees. Potential impacts pertain to changes in species composition and density, and an increased potential for invasive species to establish. Following reclamation, there would be long-term changes in the density and composition of analysis area vegetation communities. Trees may not re-establish in the area for several decades. Disturbed areas would be expected to re-vegetate in 2 or more years. There would be a long-term loss of approximately 10.8 acres of vegetation for project access and operation.

Halogeton, an invasive, non-native weed species was identified along the northern end of the proposed Chaco Trunk #2 Phase 2 ROW. Invasive species are generally tolerant of disturbed conditions, and disturbed soils at project sites may provide an opportunity for the introduction and establishment of non-native invasive species. During construction and operation, noxious weed sources could be introduced to disturbed areas from vehicles, equipment, people, wind, water, or other mechanisms. There would be a long-term potential for non-native invasive weeds to establish in the area. Encana would be responsible for monitoring and controlling any non-native invasive weed species within the ROWs and well pads for the life of the project.

Re-vegetation of well pad construction zones and the pipeline ROWs would be initiated by Encana within 120 days of well completion and pipeline construction. All vegetation removed during site-clearing activities would be mowed and incorporated into stockpiled topsoil. Trees that are 3 inches or greater in diameter would be cut and de-limbed. The area would be reseeded the BLM piñon-juniper vegetation community seed mix. Encana would be responsible for monitoring and controlling any non-native invasive weed species in the area for the life of the project.

Cumulative Impacts

Within the FFO planning area, there are approximately 435,500 acres of Great Basin desert scrub (USDI/BLM 2003a, page 3-31). Based on the acres of plant community types within the planning area and the estimated total disturbance of future activities, approximately 2.7 percent of Great Basin desert scrub communities would be disturbed within the planning area over 20 years from reasonably foreseeable future actions (USDI/BLM 2003a, page 3-31 and 4-7). The proposed action would cumulatively contribute 10.8 acres of long-term vegetative disturbance in the planning area.

3.5 Wildlife

3.5.1 Affected Environment

The proposed action is not located within a BLM wildlife specially designated area (SDA). There are no unique habitats within the analysis area. The analysis area is dominated by Great Basin desert scrub communities. Wildlife common to these habitats include elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), fox (*Vulpes* sp.), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and reptiles (snakes and lizards). Coyote (*Canis latrans*), mule deer, desert cottontail, North American porcupine (*Erethizon dorsatum*), kangaroo rat (*Dipodomys* spp.), and woodrat (*Neotoma* sp.) sign (burrows, tracks, scat) were observed. New Mexico whiptails (*Cnemidophorus neomexicanus*) were also observed during the biological surveys.

3.5.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Two parameters are considered when evaluating habitat loss—direct habitat loss and effective habitat loss. Direct habitat loss occurs through the removal of vegetation, which reduces the extent or quality of habitat in terms of food and cover. Vegetation removal strips the affected area of its value to wildlife; therefore, direct habitat loss can be quantified by comparing the area of habitat lost to the amount retained. The amount of habitat available to wildlife is called effective habitat. The effectiveness of habitat is lost when a species reduces use or avoids an area. Loss of effective habitat area can exceed direct habitat loss. Effective habitat loss can occur from habitat fragmentation, disturbance, and interference with movement. The impacts of habitat fragmentation are related to the loss of large contiguous areas of habitat and the relative increase in habitat “edge” in smaller areas. Construction of roads and other development, as well as human and vehicular traffic on existing roads, can cause habitat fragmentation. Such disturbance can cause animals to shift their activity or alter their behavior.

The proposed action would result in the removal and modification of approximately 56.25 acres of undisturbed vegetation including an estimated 450 piñon and juniper trees of varying ages and sizes that are widely scattered within the analysis area. Vegetation communities within the proposed analysis area provide forage and cover for big game and other wildlife species. Since the vegetation removed would not be replaced with the same species and because the removal of vegetation in previously undisturbed areas would result in habitat fragmentation, an alteration of available wildlife habitat and utilization is anticipated. Impacts to wildlife habitat would include short-term loss of natural vegetation and long-term changes in composition of vegetation. The majority of direct habitat loss would be short term as areas reclaimed would recover their value as wildlife habitat. However, there would be a long-term loss of

approximately 10.8 acres for well operation and access. Most species observed or expected to inhabit the area are generalists and would be minimally affected by the changes in vegetation composition.

Mule deer and elk have been shown to avoid natural gas wells, roads, and areas immediately surrounding them, resulting in a loss of effective habitat. Hebblewhite summarized that the average zone of influence reported in eight different studies extended about 1,000 meters (3,281 feet) from roads and wells. The nature and extent of this avoidance is dependent upon the type of vegetation—particularly the amount of cover present, topography, the volume of traffic, and whether or not vehicles stop or continue moving; however, responses varied within seasons and among species (2011). Disturbance is a primary factor in effective habitat loss as it can alter the ways wildlife use or move through an area and could push individual animals from preferred habitat into less suitable habitat. Such displacement would likely be localized around the source of the disturbance (i.e., equipment noise, human presence, etc.). Data collected by the BLM and New Mexico Department of Game and Fish in the Rosa Wildlife SDA between 1994 and 2012 indicate a positive correlation between the increasing number of gas wells and accompanying roads and the decline in mule deer fawn to doe ratios.

Since there is so much variability between studies, and no studies specific to the FFO have been completed, a conservative buffer of 400 meters (1,312 feet) was selected to quantify the potential effective habitat loss resulting from the proposed action. Based on a 400 meter buffer of the proposed action, indirect wildlife habitat loss would affect approximately 1,138 acres. Avoidance by wildlife would depend on the species, time of day, time of year, human activity level, topography, and cover type. It should also be noted that the zone of influence around roads and well pads does not imply 100 percent avoidance (Hebblewhite 2011). Impacts from effective habitat loss would be greatest during construction and drilling and would decrease over time in correlation to human and vehicular activity levels.

During construction, drilling, and completion, there would be short-term impacts to area wildlife because of human and vehicular activity and associated noise. Wildlife in the area would be displaced to adjacent habitat or may temporarily avoid the area during construction activities. Once the project is complete, wildlife would likely return to the area. It is possible that small wildlife, particularly burrowing species, may be killed during construction, drilling, and completion. During operation, the level of human and vehicular activity in the analysis area would decrease substantially. However, one light-duty vehicle would continue to access the area on near daily basis. Heavy-duty vehicles (semi-trucks) would access the well sites 1 to 2 times a day for approximately 6 months after which traffic trips would decrease to approximately 1 trip per month. Long-term impacts from vehicle traffic on roads could include incidental mortality to wildlife. Animal-vehicle collisions are variable depending on the time of day, speed and volume of traffic, local topography, structural features of the road, and the size and behavior of the individual species. The proposed access roads would also facilitate entry to areas not previously open to vehicular travel, potentially resulting in increases in legal and illegal hunting.

Wildlife could come into contact with chemicals or fluids stored on site. Use of a closed-loop system would minimize potential impacts to wildlife from exposure to chemicals or fluids during drilling and completion. During operation, any open pits would be netted and vent caps placed on all open pipes to prevent bird entry and nesting. Any spills would be promptly cleaned up, and Encana maintains an emergency response plan. All chemicals or fluids stored on-site would be properly contained and would have secondary containment.

Construction activities would be confined to the permitted area to avoid further disruption to wildlife. Re-vegetation would be initiated immediately following construction or at the direction of the BLM/FFO. Gaps would be made, as needed, in topsoil or subsoil stockpiles to allow for wildlife crossings and to avoid ponding or excessive diversion of natural runoff during storm events. Trenches would be inspected for wildlife prior to laying pipe and back filling; trenches would not be left open more than 24 hours. Adherence to BLM reclamation and sanitation measures would also minimize potential impacts to wildlife.

Cumulative Impacts

Reasonably foreseeable development within the Chaco sub-watershed may include an estimated additional 71 oil and gas wells and related facilities, and 6 miles of new roads. Surface-disturbing activities that would be associated with these actions may affect an estimated 264 acres of wildlife habitat (USDI/BLM 2003a, page 4-7 and 4-8). Other reasonably foreseeable actions such as continued livestock grazing, vegetation treatments, and community development would cumulatively impact wildlife through direct and effective habitat loss. The proposed action would cumulatively contribute approximately 10.80 acres of habitat loss in the long term and up to approximately 1,138 acres of indirect wildlife habitat loss in the planning area.

3.6 Special Management Species

3.6.1 Affected Environment

In accordance with BLM Manual 6840, the BLM manages certain sensitive species not federally listed as threatened or endangered in order to prevent or reduce the need to list the species as threatened or endangered in the future. There are also state-listed threatened or endangered species with potential to occur in San Juan County, New Mexico. Table 3-9 lists the special management species that have the potential to occur in the analysis area. A Biological Survey Report for each proposed well pad project was prepared and is provided in Appendix C. The Biological Survey Reports provide the basis for the findings listed in Table 3-9.

Table 3-9. Species with special management status with potential to occur in the analysis area

Species	Habitat Associations
Mammals	
Spotted bat (*Euderma maculatum*)	Meadows in subalpine coniferous forests are the preferred habitats for this species; rocky cliffs are important for roosting. Also recorded in a wide variety of habitats, from riparian and piñon-juniper woodlands to ponderosa pine and spruce-fir forests.
Townsend's big-eared bat (*Corynorhinus townsendii*)	Roosts mostly in caves or mines; can roost in abandoned buildings at night. In summer, this species occurs widely across the state and can be found over desert-scrub, desert-mountains, oak-woodland, piñon-juniper, and coniferous forests.
Birds	
American peregrine falcon (*Falco peregrinus anatum*)	Located in rugged terrain with rocky cliffs and canyons (30 to-1,000+ feet high), typically adjacent to rivers, lakes, or streams. Urban areas with towers and buildings also inhabited.

Species	Habitat Associations
Bendire's thrasher (*Toxostoma bendirei*)	Typically inhabits sparse desert shrubland and open woodland with scattered shrubs.
Chestnut-collared longspur (*Calcarius ornatus*)	A native prairie specialist. Winters in grasslands, deserts and plateaus dominated by low grasses and forbs, where most vegetation is less than 2 feet high.
Ferruginous hawk (*Buteo regalis*)	Flat or rolling terrain in grasslands, shrub-steppes, deserts, and badlands; prefers elevated nest sites, but may nest on the ground.
Golden eagle (*Aquila chrysaetos*)	In the West, mostly open habitats in mountainous, canyon terrain. Nests primarily on cliffs and in trees.
Piñon jay *(Gymnorhinus cyanocephalus)*	Primarily associated with piñon-juniper habitat.
Prairie falcon (*Falco mexicanus*)	Arid, open regions of grassland or scrub vegetation with cliff formations that are at least 30 feet high. Breeding cliffs are sometimes in semi-open regions with scattered conifer trees and occasionally dense woodlands.
Plants	
Aztec gilia (*Aliciella formosa*)	Salt desert scrub communities in soils of the Nacimiento Formation (5,000 to 6,000 feet).
Brack's hardwall cactus (*Sclerocactus cloveriae* ssp. *brackii*)	Sandy clay of the Nacimiento Formation in sparse shadscale scrub (5,000 to 6,000 feet).

Source: USDI/BLM 2008b; 2012.

Two special-status species were observed within the analysis area during the biological surveys—piñon jay and Brack's hardwall cactus. Table 3-10 provides the number of individual Brack's hardwall cactus recorded during project-related biological surveys that could be impacted after the implementation of design features.

Table 3-10. Brack's hardwall cactus observations

Location	Planning Measures Implemented	Design Features	Approximate Number of Cacti
Lybrook H09-2308	The pipeline and road alignment were modified to avoid cactus.	Temporary fencing along the mid-pit side and corner 5. Corner 5 will be rounded.	25 on the well pad and access road
Lybrook H14-2308		Corners 3 and 6 will be rounded.	60 on the well pad and access road
Lybrook I10-2308	The original location was moved. After moving the pad, the pipeline route modified to bring the pipeline into the center of the road between stations 3+16 and 10+22.	Temporary fencing along the pipeline/road alignment. Corner 3 will be rounded.	8 in the well pad 22 scattered along access and pipeline
Lybrook L14-2308		Construction zone can be pulled in on the south central end and the corner 6 rounded.	50 in the well pad

Location	Planning Measures Implemented	Design Features	Approximate Number of Cacti
Lybrook M11-2308	Pipeline route modified.	Corners 2 and 6 on the proposed well pad would be rounded. Temporary fencing.	24 in the well pad
Chaco Trunk #2 Phase 2	The alignment was modified to follow existing disturbance for its entire length.		1,380

3.6.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Impacts to special management species resulting from the proposed action may affect individuals and habitats, but are not expected to result in population-level impacts.

The analysis area provides potential foraging habitat for spotted bat and Townsend's big-eared bat. No potential roosting habitat would be removed by the proposed action. Impacts to these bat species would be limited to avoidance of the area during nighttime drilling activities when they may incidentally forage in the area. These impacts would be short term.

The analysis area provides suitable habitat nesting for Bendire's thrasher suitable wintering habitat for chestnut-collared longspur, and nesting and foraging habitat for piñon jay. The proposed action would result in the modification of approximately 56.25 acres, including the loss of an estimated 450 piñon and juniper trees of varying size and age. Long-term loss of Bendire's thrasher nesting, chestnut-collared longspur wintering, and piñon jay foraging habitat would be approximately 10.8 acres. Pre-construction surveys would be conducted to identify any active nests within the proposed disturbance area should construction occur between May 15 and July 31. This design feature would avoid or minimize impacts to nesting sensitive avian species.

The analysis area contains open desert scrub, providing potential foraging habitat for golden eagle, ferruginous hawk, American peregrine falcon, and prairie falcon. No potential nesting habitat for these species would be removed or modified by the proposed action. Direct impacts would include the modification of 56.25 acres of undisturbed foraging habitat for these raptor species. Approximately 450 piñon and juniper trees of various ages and sizes would be removed by the proposed action, resulting in a long-term loss of potential perch sites. This loss of perch habitat is not expected to adversely affect the foraging abilities of these raptor species, given the abundance of suitable sites in the surrounding area. After reclamation, there would be a short- to long-term change in vegetation density and composition. This could affect the prey base for these raptors. Additional impacts may include avoidance of the analysis area by these raptor species during construction, drilling, and operation due to disturbance and activity from human and vehicle presence and associated noise. Impacts from the loss of 10.8 acres would be long term.

The exposed Nacimiento Formation soils in the analysis area provide potential habitat for the Aztec gilia. No Aztec gilia were observed during field surveys and no direct impacts to Aztec gilia are anticipated

from the proposed action. The proposed action would result in long-term impacts to 50 acres of suitable, but unoccupied, Aztec gilia habitat.

Approximately 1,550 individual Brack's hardwall cacti were recorded during biological surveys of the proposed project sites. The following design features would be implemented to minimize or avoid impacts to Brack's hardwall cacti. Following the implementation of these design features there would be long-term impacts to approximately 50 acres of suitable Brack's hardwall cactus.

- Lybrook H09-2308 – Temporary fencing would be erected to protect populations along proposed access road and pipeline. Corner 5 of the proposed pad would be rounded and temporary fencing erected. No transplanting required.
- Lybrook H14-2308 – Temporary fencing would be erected along the northeast boundary and along where the access road enters the proposed well pad. Cacti that cannot be avoided will be transplanted into adjacent suitable habitat.
- Lybrook I10-2308 – Temporary fencing would be erected along proposed access road/pipeline and perimeter of the proposed well pad. Cacti that cannot be avoided will be transplanted into adjacent suitable habitat.
- Lybrook M11-2308 – Populations will be protected by employing temporary fencing. Corners 2 and 6 will be rounded and temporarily fenced.
- Lybrook L14-2308 – The southern well pad construction zone would be eliminated as much as possible and corner will be rounded. Temporary fencing will be applied as necessary.
- Chaco Trunk #2 Phase 2 – An advanced transplanting and monitoring plan would be developed in coordination with the BLM/FFO. A percentage of the cacti would be transplanted and multi-year monitoring conducted

Cumulative Impacts

The BLM/FFO would continue to manage non-federally listed species according to BLM policies and guidelines, with the goal of contributing to the conservation of these species to reduce the potential for being listed under the Endangered Species Act (ESA) of 1973, as amended (USDI/BLM 2003a, 4-111). For reasonably foreseeable actions on federal lands, direct impacts to nesting special status raptor species would be avoided through the BLM's siting criteria. Development on federal and private lands would result in the removal or modification of potential foraging habitat. These effects would be related to availability of undisturbed habitat and the amount of disturbance that would occur within the analysis area.

The PRMP/FEIS determined that up to 5.5 percent (128,000 acres) of vegetation in the planning area could be impacted cumulatively by oil and gas development (USDI/BLM 2003a, page 4-125). Other reasonably foreseeable actions within the planning area that could impact special status species would include livestock grazing, agriculture, commercial and residential development, mining, and vegetation management. The proposed action would not contribute appreciably to a cumulative habitat loss for BLM special management species within the planning area. Additional information may be gained by monitoring transplanted Brack's hardwall cactus populations.

3.7 Migratory Birds

3.7.1 Affected Environment

Under the Migratory Bird Treaty Act and Executive Order 13186, federal agencies are required to consider impacts to migratory birds from management activities. The BLM migratory bird conservation policy for the planning area is detailed in Instruction Memorandum No. NM-F00-2010-001 (USDI/BLM 2010). This management policy establishes a consistent approach for addressing migratory bird populations and habitats when by making project level implementation decisions. The management policy also outlines best management practices and design features to avoid or minimize impacts.

While all migratory songbirds are protected by law, certain species have been determined to be at greater risk than others. More than 350 avian species occur in San Juan County and the surrounding area administered by the BLM/FFO, which includes portions of Sandoval County. Data collected through breeding bird surveys coordinated by the USFWS and private sector efforts have provided the basis for the New Mexico Partners in Flight (NMPIF) organization to develop bird "watch lists" and the USFWS list of Birds of Conservation Concern. The NMPIF has also identified priority species of birds by habitat type for the state of New Mexico. The FFO area lies within the Colorado Plateau physiographic region, as identified by the NMPIF. The analysis area contains Great Basin desert shrub (sage-grass) habitat.

The Bird Conservation Plan developed for the State of New Mexico by the NMPIF lists the sage thrasher (*Oreoscoptes montanus*) and sage sparrow (*Amphispiza belli*) as a "highest priority" species for conservation in the Great Basin desert shrub habitat. Most of the priority bird species identified by the NMPIF also occur on the USFWS Division of Migratory Bird Management list of "Birds of Conservation Concern 2008" within the Bird Conservation Region 16–Southern Rockies/Colorado Plateau. Birds included on this list are those "species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973" (USFWS 2008).

3.7.2 Impacts from Alternative A (Proposed Action)

Direct and Indirect Impacts

Executive Order 13186 calls for increased efforts to fully implement the Migratory Bird Treaty Act. In keeping with this mandate, the BLM consulted the NMPIF Bird Conservation Plan for the State of New Mexico and the USFWS list of Birds of Conservation Concern. A review of these documents—specifically as they pertain to the Colorado Plateau physiographic area—indicates there are three "priority" avian species with a known range of distribution in the FFO planning areas that utilize the piñon-juniper woodland habitat and eight priority species that utilize the sage-grass habitat within the Great Basin desert shrub habitat.

Various types of perturbations and/or anthropogenic activity may affect these species. These species and a brief assessment of the effects of the proposed action on their habitat are provided in Table 3-11.

Table 3-11. Migratory bird species of concern potentially occurring within the analysis area and effects from the proposed action

Species	Habitat Type	Effects
Grasshopper sparrow (*Ammodramus savannarum*)	Sage-grass	May be positively affected due conversion to grassland
Sage sparrow[1] (*Amphispiza belli*)	Sage-grass	May be positively affected due conversion to grassland
Burrowing owl (*Athene cunicularia*)	Sage-grass	No effect; nests in abandoned prairie dog burrows
Ferruginous hawk (*Buteo regalis*)	Sage-grass/piñon-juniper interface	Short- and long-term loss of foraging habitat
Mountain plover (*Charadrius montanus*)	Sage-grass	No effect; no suitable habitat in the analysis area
Long-billed curlew (*Numenius americanus*)	Sage-grass	May be positively affected due to conversion to grassland
Sage thrasher[1] (*Oreoscoptes montanus*)	Sage-grass	May be positively affected due to conversion to grassland
Bendire's thrasher (*Toxostoma bendirei*)	Sage-grass	May be positively affected due to conversion to grassland

[1] "High Priority" bird species that are on the NMPIF Priority Species List, but not on the USFWS Birds of Conservation Concern 2008 list. Source: NMPIF 2007.

Direct impacts to migratory birds would include the disturbance and modification of approximately 56.25 acres of undisturbed desert scrub vegetation. There would be a long-term loss of approximately 10.8 acres of habitat that would be converted to an industrial use. Migratory birds would be impacted by disturbance during construction, drilling, and completion; these impacts would be short term. During production impacts to migratory birds would be related to an increase in habitat fragmentation and disturbance from periodic traffic for maintenance and fluid removal.

Impacts to migratory birds would be greater should construction occur during the breeding season of May 15 through July 31. Construction, drilling, and completions during this period could result in nest destruction or may cause some nest abandonment in adjacent areas. Pre-construction surveys would be conducted to identify any active nests should construction occur between May 15 and July 31. Migratory birds could come into contact with chemicals or fluids stored on-site. Open pits will be netted and vent caps placed on all open pipes to prevent bird entry and nesting. Any spills would be promptly cleaned up. Although individual migratory birds could be impacted by the proposed action, no population level impacts are expected.

Cumulative Impacts

Other reasonably foreseeable actions within the planning area that could impact migratory birds would include livestock grazing, agriculture, commercial and residential development, mining, wildfire, and vegetation management. Cumulative impacts to migratory birds from the proposed action would result from the long-term changes in density and composition of approximately 56.25 acres of Great Basin desert scrub and open canopy piñon-juniper woodland habitat. The proposed action would contribute to cumulative habitat fragmentation within the planning area from the construction of approximately 1.1 miles of new road. The Chaco Trunk #2 Phase 1 pipeline would contribute approximately 5.5 acres of

disturbance to migratory bird habitat in the Chaco sub-watershed in addition to the proposed action. The proposed action would contribute negligible impacts to migratory birds when combined with past, present, and future actions.

3.8 Cultural Resources

3.8.1 Affected Environment

The proposed analysis area is located within the archaeologically rich San Juan Basin of northwestern New Mexico. In general, the prehistory of the San Juan Basin can be divided into five major periods: PaleoIndian (ca. 10000 B.C. to 5500 B.C.), Archaic (ca. 5500 B.C. to A.D. 400), Basketmaker II-III and Pueblo I-IV periods (A.D. 1 to 1540), and the historic (A.D. 1540 to present) that includes Native American as well as later Hispanic and Euro-American settlers. A detailed description of these various periods and select phases within each period is provided in the Farmington PRMP/FEIS (USDI/BLM 2003a).

The entire area of potential effect for the proposed action was archaeologically surveyed by LAC at a BLM Class III level (100 percent). Seven reports were prepared and submitted to the BLM in accordance with the *Procedures for Performing Cultural Resources Fieldwork on Public Lands in the Area of New Mexico BLM Responsibilities* (USDI/BLM 2005). The cultural resource survey results are described below .

Prior to all field surveys of the proposed action, a Class I investigation of records at the BLM/FFO and an online search of Archeological Records Management Services was conducted to determine if any sites have been recorded within 0.25 mile of the survey area.

Lybrook H09-2308 (LAC 2013-7r; BLM 2013(IV)042F)—No sites were encountered during the cultural surveys and there are no records of any sites occurring within 0.25 mile of the proposed project.

Lybrook H14-2308 (LAC 2013-6ee; BLM 2014(I)015F)—Four sites were encountered during the cultural surveys and all reflect 20th century use and occupation of the area by Navajos, though one also has a lithic component. Three of the sites are recommended as eligible for nomination to the National Register of Historic Places (National Register).

Lybrook I10-2308 (LAC2013-7j; BLM 2014(I)054F)— One previously recorded site and five previously unrecorded sites were encountered and registered during the cultural resource surveys. Three of the six sites are historic Navajo sites with structural remains. The other three sites are lithic artifact scatters of unknown affiliation. All six sites are recommended as eligible or potentially eligible for nomination to the National Register.

Lybrook L14-2308 (LAC 2013-7LL; BLM 2014(I)017F) —Two newly recorded sites were encountered within the survey area. Neither of the sites meets the criteria for National Register eligibility and both are recommended as not eligible for inclusions in the NRHP.

Lybrook M11-2308 (LAC 2012-2k; BLM 2014(I)037F) —three new sites were encountered and recorded. All three are historic Navajo sites and are recommended as being eligible or potentially eligible for nomination to the National Register.

Chaco Trunk #2 Phase 2 (LAC 2013-14b; BLM 2014(II)028F)—Four newly recorded sites were encountered within the area surveyed. The four sites include two recommended as National Register eligible and two that are recommended as ineligible. Fourteen isolated occurrences were also recorded. Subsequent to report submission BLM cultural resources staff discovered that LA178071, a National Register eligible site, appears to extend into the r-o-w/APE of the Chaco Trunk #2 Phase 2 pipeline. Additional site evaluation is ongoing to determine the integrity and significance of the potentially effected portion of the site.

Lybrook Access Road #3 upgrade (LAC 2014-2a; BLM 2014(II)035F) —There are approximately 17 previously recorded sites within ¼ mile of the proposed Lybrook Access Road #3 upgrade. Five of these sites were encountered during the cultural resource surveys. Two are recommended as National Register eligible and three as not eligible.

3.8.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Direct impacts normally include alterations to the physical integrity of a cultural site. If a cultural site is significant for other than its scientific information, direct impacts may also include the introduction of audible, atmospheric, or visual elements that are out of character for the cultural site. A potential indirect impact from the proposed action is the increase in human activity or access to the area with the increased potential of unauthorized removal or other alteration to cultural sites in the area.

Significant cultural sites associated with the well locations/associated facilities and Access #3 (e.g., National Register eligible/listed) are being avoided with the implementation of design features, such as but not limited to, reduction of construction areas, temporary barriers, and site monitoring. These design features are detailed in the BLM Cultural Resource Record of Review, attached to the COA in the APDs and ROW grants. The proposed action is not known to physically threaten any traditional cultural property, prevent access to sacred sites, prevent the possession of sacred objects, or interfere or otherwise hinder the performance of traditional ceremonies/rituals. The proposed action would have no direct or indirect impact on significant cultural sites.

Impacts to significant cultural sites from the Chaco Trunk #2 Phase 2 pipeline are not completely identified at this time. The presence of cultural remains within the r-o-w and APE of the Chaco Trunk #2 Phase 2 pipeline is undergoing evaluation. If that portion of LA178071 within the r-o-w/APE is found not have integrity, then there will be no impact. If that portion of the site within the r-o-w/APE is found have integrity and can be avoided by project redesign (e.g. reroute), then there will be no impact. In the event the site cannot be avoided by project redesign, then there will be an impact, and that impact can be mitigated by scientific investigation and recovery of important information. Cumulative Impacts

The proposed action for the ~~the~~ well locations/associated facilities and Access #3 would have no negative cumulative impact on cultural resources, as significant cultural sites would be avoided. A positive cumulative effect is the additional scientific information yielded by the archaeological surveys.

Cumulative impacts from the Chaco Trunk #2 Phase 2 pipeline are not completely identified at this time. If that portion of LA178071 within the r-o-w/APE is found not to have integrity or found to have integrity and can be avoided by project redesign (e.g. reroute), then there will be no negative cumulative impact. In the event that portion of LA178071 within the r-o-w/APE having integrity cannot be avoided by project redesign (e.g. reroute), then there will be a negative cumulative physical impact to the site. That impact will be mitigated by scientific investigation and recovery of important information from the impacted area prior to construction.

3.9 Paleontological Resources

3.9.1 Affected Environment

The proposed project is located within the paleontological rich area of the San Juan Basin of northwestern New Mexico. The BLM uses the Potential Fossil Yield Classification (PFYC) system to identify areas with a high potential to produce significant fossil resources. The BLM's PFYC system is a predictive modeling tool that was developed to provide baseline guidance for assessing and mitigating paleontological resources. It is intended to be used at an intermediate point in analyses and to assist in determining the need for further mitigation assessment or actions. This system has ranked all lands within the BLM/FFO planning area as a Class 5 designation. Class 5 designations are described as being "Very High Potential" paleontological resource areas, thus requiring an assessment at the project level.

The BLM/FFO recognized eight paleontological specially designated areas in the RMP in order to preserve important paleontological resources for scientific study, protection, and other public benefits (USDI/BLM 2003b, page 4-117). The BLM has determined that these areas require special management attention in order to protect and prevent irreparable damage to important paleontological resources. The proposed project is located in the Lybrook Fossil Area SDA. The Lybrook Fossil Area is one of the earliest paleontology study areas found in the San Juan Basin, with E.D. Cope working there in 1874 (USDI/BLM 2003a: Appendix C, p. C87). The Lybrook Fossil Area is managed by the BLM, which contains approximately 26,000 acres of land within its boundary. The explicit management goal for the area is to promote scientific study and protect fossil resources. Pursuant to the BLM RMP (USDI/BLM 2003a), ROWs in the SDA are granted on a case-by-case basis with stipulations that protect paleontological values.

3.9.2 Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed project was assessed individually based on analyses conducted for the 2003 RMP using the BLM's PFYC system, geographic information system-based locality data, known paleontological locality information, existing paleontological reports for the area, aerial photos, soils maps, existing reports, and scientific publications for the area. No paleontological resources were identified in the analysis area.

During siting of project components, paleontological resources were identified at various locations. They were mitigated during the on-sites by modifying the proposed well pad locations or pipeline/road alignments. One leg off (surface line) would be located at Station 239+99 to minimize potential impacts

to paleontological resources that might be located in that area. In this area, the pipeline would not be buried, decreasing the chance of encountering unidentified paleontological resources.

Effects to fossil localities could result from the ground disturbing activities or the disturbance of the stratigraphic context in which they are located. Alterations to the physical integrity of bedrock or potentially fossil-yielding alluvium may occur and would have a direct effect on unidentifiable or irretrievable fossil resources. The proposed action could also create indirect impacts to areas by changing erosion patterns. Additionally, an increase in human activity in the area could result in accessibility to remote areas and could lead to looting or vandalism of paleontological resources in the area

Cumulative Impacts

The proposed action is not expected to impact significant paleontological resources or contribute to cumulative impacts.

3.10 Livestock Grazing

3.10.1 Affected Environment

The BLM/FFO manages 167 grazing allotments with 351 grazing authorizations that permit cattle, sheep, and horse grazing within the planning area. Of the 351 grazing authorizations, 317 are permitted under Section 3 of the Taylor Grazing Act. Additional authorizations under Section 15 permit grazing on 30 allotments in the Lindrith, New Mexico area.

The proposed action would be located within the boundary of the Largo Community (5083) grazing allotment. Table 3-12 lists details of this allotment.

Table 3-12. Details of the grazing allotment in the analysis area

Allotment Number	Livestock Number	Livestock Type	Period Begin Date	Period End Date	AUM[1]
5083	145	Cattle	03/01	02/28	1676
5083	596	Sheep	03/01	02/28	1370

[1]Animal Unit Month

3.10.2 Impacts from the Proposed Action

Direct and Indirect Impacts

Surface disturbance associated with construction of the proposed action would remove approximately 56.25 acres of vegetation, resulting in a reduction in forage and a change to the vegetative species composition. Impacts to grazing resources would occur from the direct short-term loss of about 2.25 animal unit month (AUM) at an estimated 25 acres per AUM. Reclaimed areas would be expected to re-vegetate within 1 to 2 years following reclamation. There would be a long-term loss of approximately 0.4 AUM resulting from the conversion of 10.8 acres to an industrial use for the well pads and access roads. Reseeding of disturbed areas with the approved seed mix that is composed of grasses and palatable

shrubs, may result in an increase in available forage within the affected allotments. This increase is not expected to be measurable.

Cattle, sheep and the occasional horse may occur in or near the proposed analysis area, depending on the time of year. Livestock could also become trapped in the open trench and long sections of the open trench could present barriers to livestock movement. There would be a potential for livestock collisions with equipment and vehicles working in the area. However, livestock would be expected to avoid the area due to increased noise and activity. Gaps would be made as needed in topsoil or subsoil stockpiles to allow for livestock crossing. Pipeline trenches would be inspected for livestock prior to laying pipe and back filling; trenches would not be left open for more than 24 hours.

Livestock could come into contact with chemicals or fluids stored on site. Use of a closed-loop system would minimize potential impacts to livestock from exposure to chemicals or fluids during drilling and completion. Any spills would be promptly cleaned up and Encana maintains an emergency response plan. All chemicals or fluids stored on-site would be properly contained and would have secondary containment.

Cumulative Impacts

Other reasonably foreseeable activities within the planning area that would impact forage resources include off-highway vehicle traffic, vegetation treatments, and grazing. The PRMP determined that total surface disturbance from oil and gas development in the planning area would affect about 1.6 percent of the San Juan Basin. Added to other surface disturbance from urban development, the overall effect of removing rangeland acreage from production would still be minimal when compared to the acreage of available forage (USDI/BLM 2003a, pages 4-126 to 4-127). When added to past, present, and reasonable foreseeable activities within the grazing allotments, the proposed action would not result in measurable changes to the allotments carrying capacity or to available AUMs.

4. SUPPORTING INFORMATION

4.1 Tribes, Individuals, Organizations, or Agencies Consulted

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Johnny Stinson, Adobe Contractors, Inc.

Benny Benfield, Encana

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David Russell, Scorpion Survey and Consulting, LLC

Jacob Brown, NCE Surveying

Zebulon Salveson, NCE Surveying

Johnny Stinson, Adobe

4.2 List of Preparers

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Appendix A – Maps and Photographs

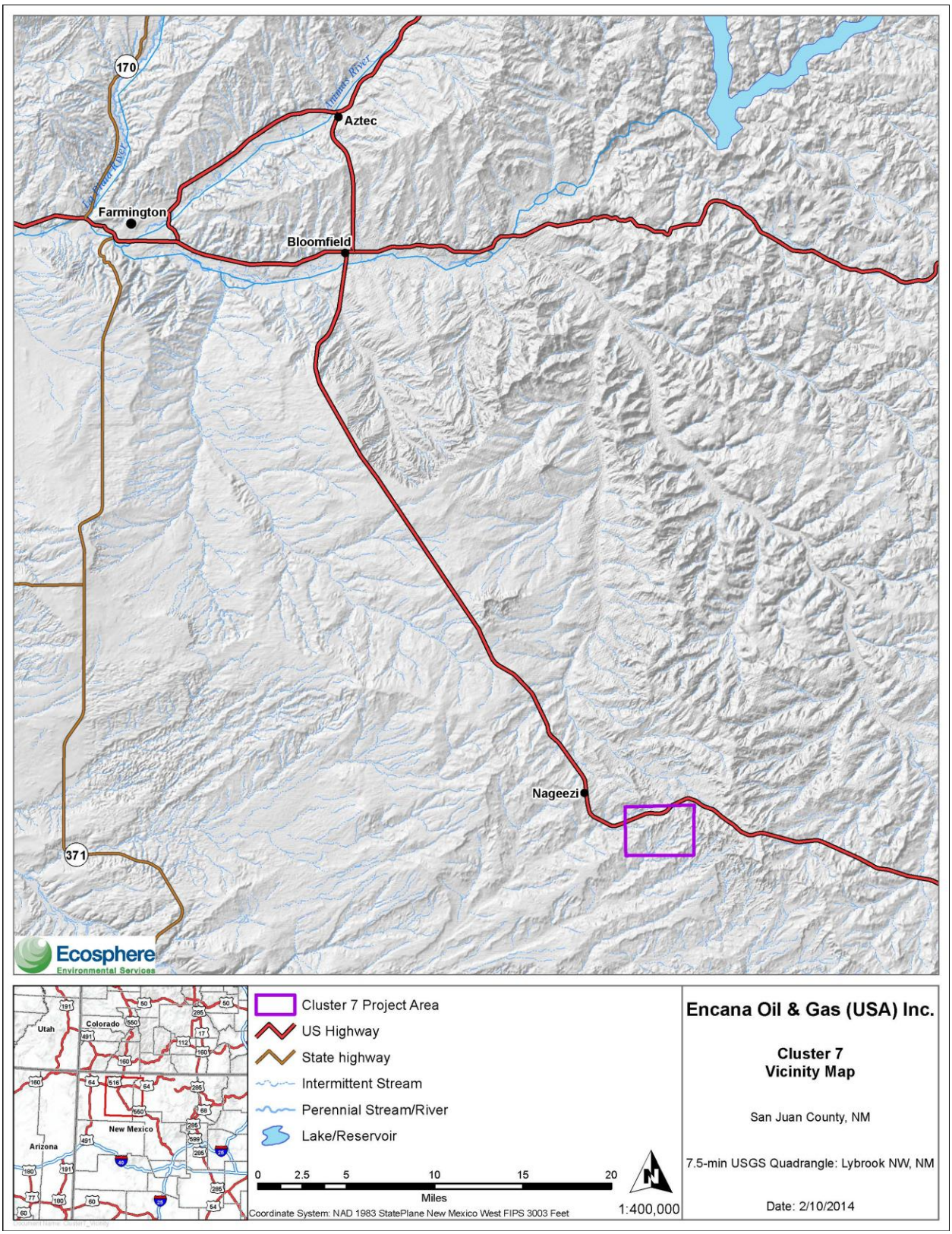

Figure 1. Vicinity Map

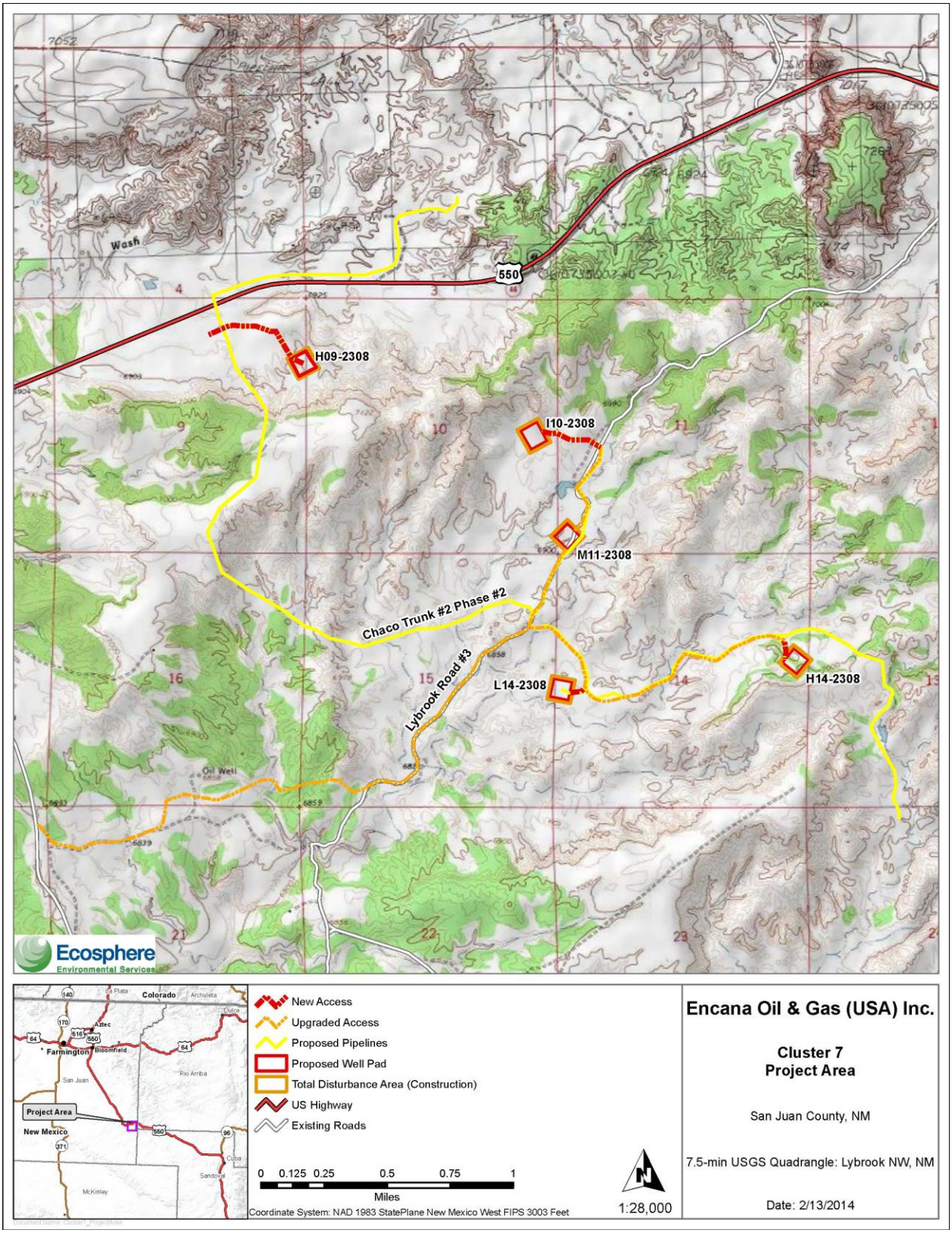

Figure 2. Proposed Cluster 7 components

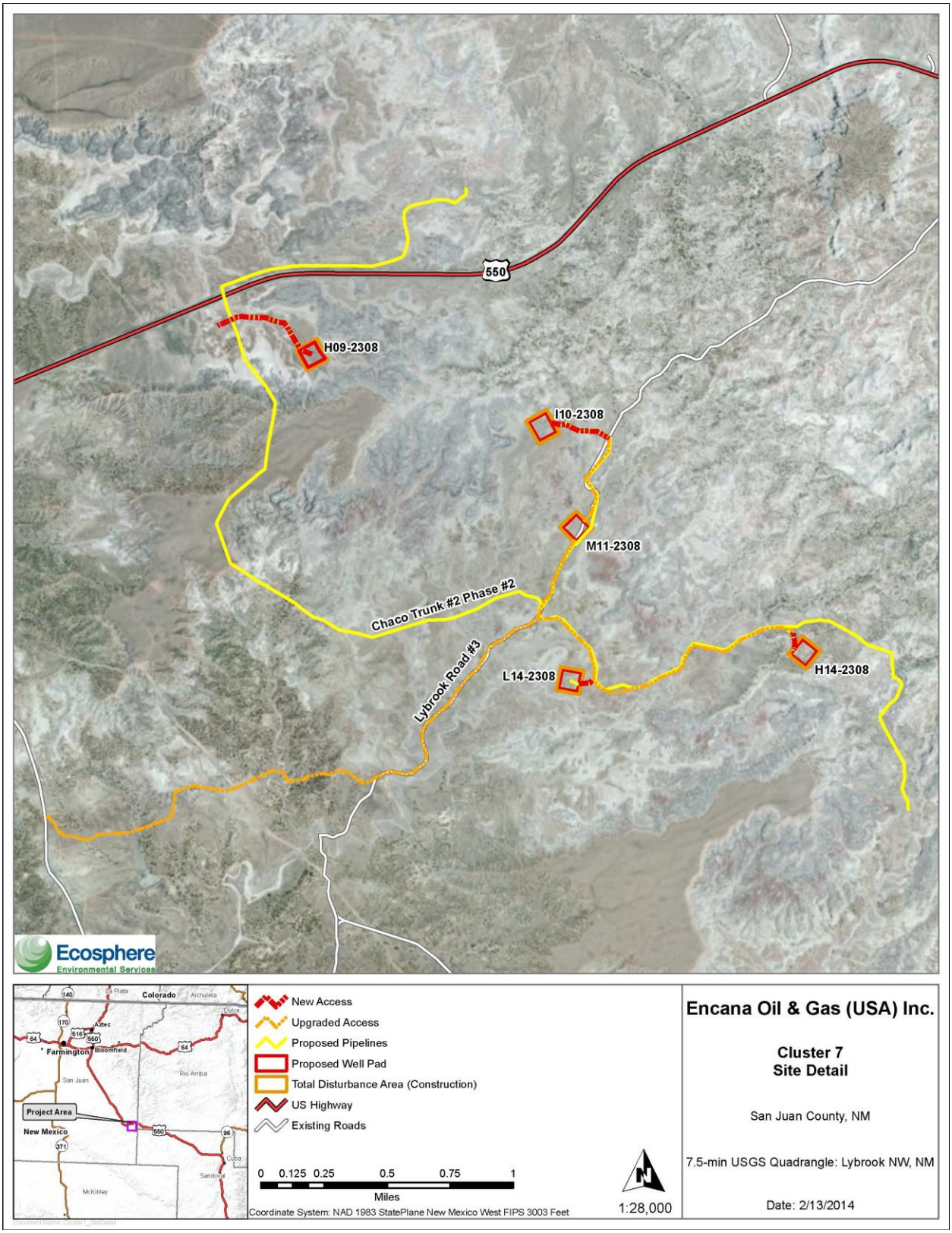

Figure 3. Site Detail – 2010 aerial photograph

Photograph 1. Proposed Lybrook H14-2308 well pad from corner 3 looking east

Photograph 2. Proposed Lybrook L14-2308 well pad looking southeast from corner 5

Photograph 3. Proposed Lybrook H09-2308 well pad looking east from corner 6

Photograph 4. Proposed Lybrook I10-2308 well pad looking west from corner 5

Photograph 5. Proposed Lybrook M11-2308 well pad from corner 2 looking west

Photograph 6. Proposed Chaco Trunk #2 Phase 2 looking northwest

Photograph 7. Proposed Chaco Trunk #2 Phase 2 looking east along right-of-way from PI 2450

Appendix B– Applications for Permit to Drill and Right-of-way Grants

Appendix C – Conditions of Approval and Pipeline Stipulations

Appendix D – Biological Survey Reports