United States Department of the Interior
Bureau of Land Management

Environmental Assessment DOI-BLM-NM-F010-2014-0175

Encana Oil & Gas (USA) Inc.'s Lybrook G01-2206 Nos. 01H & 02H, Lybrook N02-2206 Nos. 01H & 02H, & Lybrook P03-2206 Nos. 01H & 02H Oil and Natural Gas Wells Projects

May 2014

U.S. Department of the Interior
Bureau of Land Management
Farmington District
Farmington Field Office
6251 N. College Blvd., Ste. A
Farmington, NM 87402
Phone: (505) 564-7600
FAX: (505) 564-7608

BLM

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 2
    1.3. Decision to be Made 2
    1.4. Conformance with Applicable Land Use Plan(s) 2
    1.5. Relationship to Statutes, Regulations or Other Plans 3
    1.6. Scoping, Public Involvement, and Issues 4
2. Proposed Action and Alternative(s) 7
    2.1. Proposed Action 7
    2.2. No Action 22
    2.3. Alternatives Considered but Eliminated from Detailed Study 22
3. Affected Environment and Environmental Consequences 24
    3.1. Air Resources 24
    3.2. Soil Resources 28
    3.3. Groundwater Resources 30
    3.4. Upland Vegetation 31
    3.5. Noxious Weeds and Invasive Species 33
    3.6. Wildlife 34
    3.7. Special Status Species 37
    3.8. Cultural Resources 39
    3.9. Visual Resources 41
    3.10. Transportation 42
    3.11. Livestock 44
    3.12. Economics 45
    3.13. Public Health and Safety 45
    3.14. Noise 46
4. Supporting Information 48
    4.1. Tribes, Individuals, Organizations, or Agencies Consulted 48
    4.2. List of Preparers 48
    4.3. References 48

Appendix A. Maps 53
Appendix B. Plats 57
Appendix C. Photographs 82
Appendix D. Reclamation Plans 96

This page intentionally left blank.

1. PURPOSE AND NEED FOR ACTION

1.1. Background

Encana Oil & Gas (USA) Inc. (Encana) has submitted six Applications for Permit to Drill (APDs) and four Right-of-Way (ROW) Grant applications to the Bureau of Land Management – Farmington Field Office (BLM-FFO) for the following oil and natural gas well projects:

- Lybrook G01-2206 Nos. 01H – 02H (Lybrook G01)
- Lybrook N02-2206 Nos. 01H – 02H (Lybrook N02)
- Lybrook P03-2206 Nos. 01H – 02H (Lybrook P03)

The proposed action is the approval of the APDs and ROW Grants by the BLM-FFO, located in Farmington, New Mexico.

The proposed projects would involve the horizontal drilling, possible production, and final abandonment of six wells that would be drilled to BLM-FFO-managed minerals. Each of the six wells would be permitted under an approved APD issued by the BLM-FFO. The two proposed wells associated with each project would be twinned with one another on a 500-foot-by-530-foot well pad (including construction zone). Each of the three proposed projects would involve the construction, usage, and reclamation of a well pad, well pad construction zone, access road, and pipeline corridor. The proposed projects are described further below.

Table 1. Proposed Project Details

Proposed Project	Access Road Length (Feet)	Pipeline Corridor Length (Feet)	Mineral Pool	NMNM Lease No.	Land Ownership/ Management
Lybrook G01	946	1260	Lybrook Gallup	109385	BLM-FFO
Lybrook N02	48	106	Wildcat	117562	State of New Mexico (State)
Lybrook P03	183	1953	Wildcat	117562	BLM-FFO and State

The proposed Lybrook G01 well pad and access road would be permitted under the Lybrook G01 approved APDs. The associated pipeline corridor would be permitted under a ROW Grant.

The proposed Lybrook N02 is located on State surface. A Surface Owner Agreement (SOA) would be issued to address permitting on State land.

The proposed Lybrook P03 well pad and access road are located on BLM-FFO surface. The proposed pipeline corridor is located on BLM-FFO and State surface. The associated well pad, access road, and BLM-FFO portion of the pipeline corridor would each be permitted under a ROW Grant. A SOA would be issued to address permitting of the portion of the proposed pipeline corridor that is on State land.

Oil and natural gas, vital components of the nation's energy supply, account for approximately 36 and 25 percent of total energy consumed in the U.S., respectively. These energy sources are used in residential and commercial buildings, in transportation, and by industry (U.S. Energy Information Administration 2012). Common uses for natural gas include space heating, water heating, cooling, cooking, waste treatment and incineration, metals preheating, drying and humidification, glass melting, food processing, fueling industrial boilers, vehicle fueling, and electricity generation. Gases such as butane, ethane, and propane can be extracted from natural gas to be used for products such as fertilizers and pharmaceuticals. Natural gas can also be used to create methanol, which is utilized in the production of formaldehyde, acetic acid, fuel cell sources, and additives for cleaner burning gasoline (Natural Gas Supply Association 2010). Most oil goes into fuels, including gasoline, jet fuel, and home-heating oil. Additionally, non-fuel compounds extracted from oil are used to develop lubricants; asphalt for roads; tar for roofing; waxes for food wrapping; solvents for paints; cosmetics and dry-cleaning products; plastics; and foams (U.S. Energy Information Administration 2012).

Approximately 84 percent of natural gas and 55 percent of oil consumed in the U.S. is produced in the U.S. Additionally, U.S.-produced natural gas and oil are also exported to other countries (U.S. Department of Energy 2011). Within the U.S., oil and natural gas reserves are concentrated within distinct fields. The BLM-FFO management area is within the San Juan Basin, one of the most prolific gas-producing basins in the country. Currently, the San Juan Basin produces small amounts of oil (BLM 2003a, 3-9).

Taxes and royalties on oil, natural gas, and carbon dioxide production contribute approximately 25 percent of New Mexico's general fund, and the oil and gas industry is one of the largest private sector employers in the State (New Mexico Bureau of Geology and Mineral Resources 2012). Additionally, the Federal government receives royalties, or a share of the production income, for extracted Federal minerals. In 2011, Federal natural gas royalties totaled over 2 billion dollars (Office of Natural Resources Revenue 2012).

The proposed project areas are located within the San Juan Basin in Sandoval County, New Mexico. The proposed project areas are approximately 48 to 49 miles southeast of the town of Bloomfield and 18 to 20 miles southeast of the community of Nageezi (see Figure A.1, Appendix A).

1.2. Purpose and Need for Action

The purpose of the proposed action is to allow Encana reasonable access to develop their mineral leases on BLM managed lands.

The need for the proposed action is established by the BLM's responsibility under the Mineral Leasing Act of 1920, as amended (MLA; 30 U.S. Code [USC] 181 et seq.), and the Federal Land Policy and Management Act of 1976 (FLPMA, 43 USC 1701 et seq.). The MLA authorizes the BLM to lease public lands for the development of mineral deposits (including oil, gas, and other hydrocarbons) and permit the development of those leases. The FLPMA authorizes the BLM to grant, issue, or renew ROW grants over public lands for multiple uses. It is the policy of the BLM, as derived from several laws, including the MLA and FLPMA, to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs. Per 43 Code of Federal Regulations (CFR) 3160 (Onshore Oil and Gas Operations), the BLM is required to respond to a request for an APD.

1.3. Decision to be Made

The BLM-FFO will decide whether or not to issue the APDs and ROW Grants associated with the proposed projects, and if so, under what terms and conditions. Under the National Environmental Policy Act (NEPA; Public Law 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 APDs and ROW Grants with design features as submitted
- To approve the APDs and ROW Grants with additional mitigation added
- To analyze the effects of the proposed action in an EIS
- To deny the APDs and ROW Grants

1.4. Conformance with Applicable Land Use Plan(s)

The proposed action is in conformance with the 2003 BLM-FFO Resource Management Plan (RMP). Pursuant to 40 CFR 1508.28 and 1502.21, this site-specific Environmental Assessment (EA) tiers into and incorporates by reference the information and analysis contained in the BLM-FFO Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS; BLM 2003a). The RMP was approved by the September 29, 2003 Record of Decision (ROD; BLM 2003b), and updated in December 2003.

Specifically, the proposed action supports the following BLM policy:

> It is the policy of the BLM to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices. At the same time, the BLM strives to ensure that

mineral development is carried out in a manner that minimizes environmental damage and provides for the rehabilitation of affected lands. (BLM 2003b, 2-2 – 2-3)

Development of energy-related ROWs, including access roads and pipeline corridors, is one of the primary activities of the BLM-FFO lands program. Such ROWs receive environmental review on a case-by-case basis (BLM 2003b 2-11).

As required by NEPA, this EA addresses site-specific resources and effects of the proposed action that were not specifically covered within the PRMP/FEIS.

1.5. Relationship to Statutes, Regulations or Other Plans

Encana would comply with applicable Federal, State, and local laws and regulations. Necessary permits and approvals for the proposed projects would be obtained prior to project implementation.

Many requirements regulating specific environmental elements are found in the appropriate elements sections of this EA (Chapter 3). Several permits, licenses, consultations, or other requirements are discussed below.

1.5.1. Clean Water Act

The proposed action is in conformance with the Clean Water Act, as amended (CWA; 33 USC 1251 et seq.).

Section 401

Under Section 401 of the CWA, an applicant for a Federal license or permit to conduct an activity that may result in a discharge into a water of the U.S. must provide the Federal agency with a Section 401 certification declaring that the discharge would comply with the CWA. The certification would be granted by the New Mexico Environment Department (NMED).

Section 402

Under Section 402 of the CWA, the U.S. Environmental Protection Agency (EPA) regulates storm water discharges from industrial and construction activities under the National Pollution Discharge Elimination System program. Permits are required if discharge results in a reportable quantity for which notification is required (pursuant to 40 CFR 117.21, 40 CFR 302.6, or 40 CFR 110.6) or if the discharge contributes to a violation of a water quality standard.

Section 404

Under Section 404 of the CWA, the EPA regulates the discharge of dredged or fill material into waters of the U.S., including wetlands. The Section 404 program is administered by the EPA and U.S. Army Corps of Engineers (USACE). Under the CWA, the USACE has jurisdiction over waters of the U.S. Waters of the U.S. are considered jurisdictional because they have a “significant nexus” to traditional navigable waters. The BLM-FFO and USACE - Durango Regulatory Office have determined that jurisdictional waters (i.e., waters of the U.S.) within the BLM-FFO planning area may include U.S. Geological Survey (USGS) watercourses (i.e., “blue lines” on USGS 1:24,000 topographic maps) and potentially tributaries to these USGS watercourses.

The proposed Lybrook G01 and Lybrook N02 project areas would not cross a USGS watercourses or tributaries to a USGS watercourse.

The proposed Lybrook P03 pipeline corridor would cross one ephemeral, USGS watercourse. If this watercourse is considered jurisdictional by the USACE, proposed activities associated with this crossing would be permitted under Nationwide Permit No. 12 (for Utility Line Activities).

1.5.2. National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA; 16 USC 470) requires Federal agencies to take into account the effects of their actions on historic properties, and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment. Compliance with the requirements of the NHPA is met by following the Protocol Agreement between the New Mexico BLM and New Mexico State Historic Preservation Officer, which is authorized by the Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (1997).

1.5.3. Clean Air Act

The Clean Air Act of 1972, as amended (CAA; 42 USC 7401 et seq.), establishes national ambient air quality standards (NAAQS) to control air pollution. In New Mexico, the NMED has adopted most of the CAA into the New Mexico Administrative Code (NMAC). The NMED issues construction and operating permits for air quality and enforces air quality regulations and permit conditions.

1.5.4. New Mexico State Regulations

The New Mexico Oil Conservation Division (NMOCD), which is in the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), regulates oil and gas operations in New Mexico. The NMOCD has the responsibility of gathering production data, permitting new wells, establishing pool rules and allowables, issuing discharge permits, enforcing rules and regulations, monitoring underground injection wells, ensuring that abandoned wells are properly plugged, and ensuring that the land is responsibly restored. Oil and gas regulations administered by NMOCD are contained in NMAC 19.15. These regulations include the following, with which Encana would comply:

- The EMNRD requires operators to follow “Pit Rule” guidelines (NMAC 19.15.17) to reduce groundwater contamination from industry-related activities.
- NMAC 19.15.15 establishes requirements for well acreage spacing, obtaining approval of unorthodox well locations, and pooling or communitizing small acreage oil lots.
- NMAC 19.15.16.19 requires the disclosure of hydraulic fracture constituents.

1.6. Scoping, Public Involvement, and Issues

1.6.1. Scoping and Public Involvement

The BLM-FFO publishes a NEPA log for public inspection. This log contains a list of proposed and approved actions within the BLM-FFO. The log is located on the BLM’s New Mexico website (http://www.blm.gov/nm/st/en/prog/planning/nepa_logs.html).

The following on-site meetings, which were attended by Encana, BLM-FFO representatives, and an environmental consultant (Nelson Consulting, Inc. (NCI), were held for the proposed projects:

- Lybrook G01: January 9, 2014
- Lybrook N02: January 16, 2014
- Lybrook P03: January 9, 2014

The Counselor Chapter House of the Navajo Nation was invited to the on-site meetings by the BLM-FFO; no representatives from the Chapter House attended. In an April 5, 2013, letter to the BLM-FFO, the Counselor Chapter House identified several issues (water resources, visual resources, transportation/travel, livestock grazing, economics, public health and safety, and noise) for oil and gas exploration and extraction projects located within the Chapter boundaries.

A public invitation to the on-site meetings was posted online (http://www.blm.gov/nm/st/en/fo/Farmington_Field_Office/ffo_oil_and_gas/ffo_onsites.html); no private citizens or groups attended the on-site meetings. A BLM-FFO Interdisciplinary Team meeting was held for the proposed projects on January 21, 2014, to discuss the proposed action. At the aforementioned meetings, potential issues of concern were identified by the BLM-FFO and NCI.

Based on the size and scale, routine nature, and potential impacts associated with the proposed action, no additional external scoping was conducted. No public comments were received for the proposed action.

1.6.2. Issues

Issues Analyzed

The following issues were identified during internal scoping as potential issues of concern for the proposed action. These issues will be addressed in this EA.

- How would dust and equipment emissions associated with the proposed projects impact air resources?
- How would vegetation clearing, proposed project activities, and final reclamation associated with the proposed projects impact soils?
- Would drilling the proposed wells impact groundwater?
- How would vegetation clearing, proposed project activities, and final reclamation associated with the proposed projects impact upland vegetation?
- How would vegetation clearing, proposed project activities, and final reclamation associated with the proposed projects impact noxious weeds and invasive species?
- How would vegetation clearing, proposed project activities, and final reclamation impact wildlife, including migratory birds?
- How would vegetation clearing, proposed project activities, and final reclamation impact the following BLM Special Status Species (SSS): Bendire's thrasher (*Toxostoma bendirei*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), and pinyon jay (*Gymnorhinus cyanocephalus*)?
- How would surface-disturbing activities associated with construction of the proposed projects impact cultural resources?
- How would vegetation clearing, proposed project activities, and final reclamation associated with the proposed projects impact visual resources?
- How would vehicular traffic associated with the proposed projects impact transportation?
- How would vegetation clearing, proposed project activities, and final reclamation impact livestock?
- How would proposed project activities impact economics?
- How would proposed project activities impact public health and safety?
- How would proposed project construction, drilling, completion, and production impact noise?

Issues Considered but not Analyzed

The following issues were identified during scoping as issues of concern that would not be impacted by the proposed action or that have been covered by prior environmental review. These issues will not be analyzed in this EA.

U.S. Fish and Wildlife Service (USFWS)-Listed Species

Under Section 7 of the Endangered Species Act of 1973 (ESA; 16 USC 1531-1544), all Federal agencies are required to consult with the USFWS or National Marine Fisheries Service if they are proposing an action that may affect listed species or designated habitat. Consultation with the USFWS was conducted as part of the PRMP/FEIS to address the cumulative effects of RMP implementation (Consultation No. 2-22-01-1-389, Appendix M of the PRMP/FEIS). Based on a review of species currently listed by the USFWS as occurring in Sandoval County (USFWS 2013), as well as the location of the proposed project areas and habitat within the proposed project areas, the potential does not exist for USFWS-listed species to occur within the proposed project areas. Water for drilling would be obtained from the permitted SJ-2105 water well; no unaccounted-for water depletions within USFWS-listed fish habitat would occur. Therefore, there is no need for additional Section 7 consultation.

Native American Religious Concerns

For the proposed action, identification efforts for Native American Religious Concerns were limited to a review of existing published and unpublished literature (e.g., Van Valkenburgh 1941, 1974; Brugge 1993; Kelly, et al. 2006), development of the site-specific Class III survey report prepared for the proposed action La Plata Archaeological Consultants [LAC] 2014a, 2014b, 2014c), and a review by the BLM's cultural resources program regarding the presence of Traditional Cultural Properties (TCPs) 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 (NAGPRA; 25 USC 3001) or the Archaeological Resources Protection Act (ARPA; 16 USC 470) within the proposed project area.

2. PROPOSED ACTION AND ALTERNATIVE(S)

2.1. Proposed Action

The proposed action is the BLM-FFO approval of six APDs and four ROW Grants associated with Encana's proposed Lybrook G01, Lybrook N02, and Lybrook P03 projects. The proposed projects would include the drilling, production, and final abandonment of six oil and natural gas wells and the construction, use, and reclamation of three associated well pads (with construction zones), three associated access roads, and three associated pipeline corridors.

The primary objective of the wells would be to produce oil; however, it is likely that natural gas would be a byproduct.

Commencement of the proposed projects is proposed for 2014. The scheduled commencement of the proposed projects could be delayed based on the issuance date of the approved APDs and ROW Grants or drill rig scheduling.

Construction plats associated with the proposed projects are provided in Appendix B. Photographs of the proposed project areas are provided in Appendix C.

2.1.1. Location of Proposed Project Areas

Maps of the proposed project areas are provided in Appendix A. The proposed project areas are plotted on the Counselor, New Mexico, 7.5-minute USGS quadrangle (Figure A.2) and the 2011 Sandoval County National Agriculture Imagery Program aerial photograph (Figure A.3).

The proposed project areas are located on BLM-FFO and State surface within the San Juan Basin in Sandoval County, New Mexico. The proposed project areas are approximately 48 to 49 miles southeast of the town of Bloomfield and 18 to 20 miles southeast of the community of Nageezi. The proposed project areas are located in the vicinity of Venado Canyon. The proposed project areas are located within 2.3 miles of one another.

The general region surrounding the proposed project areas is characterized by low mesas; rolling hills; and broad, flat valleys. The elevation within the proposed project areas ranges from 6,920 to 7,140 feet above mean sea level (AMSL).

The legal location (New Mexico Principal Meridian [NMPM]) and the land ownership/management intersected by the proposed project areas are provided in the table below.

Table 2. Legal Land Description for Project Features

Project Feature	Legal Location			Land Ownership/ Management
	Quarter-Quarter	Section	Township & Range*	
Lybrook G01				
Well Pad, Construction Zone, Access Road, and Pipeline Corridor	southern ½ of northeastern ¼ northeastern ¼ of southeastern ¼	1	T22N, R6W	BLM-FFO
Lybrook N02				
Well Pad and Construction Zone	southern ½ of southwestern ¼	2	T22N, R6W	State
Access Road and Pipeline Corridor	southeastern ¼ of southwestern ¼			
Lybrook P03				
Well Pad and Construction Zone	southern ½ of southeastern ¼	3	T22N, R6W	BLM-FFO

Project Feature	Legal Location			Land Ownership/ Management
	Quarter-Quarter	Section	Township & Range*	
Access Road	southeastern ¼ of southeastern ¼	3	T22N, R6W	BLM-FFO
Pipeline Corridor	eastern ½ of southeastern ¼			
	northwestern ¼ of southwestern ¼	2		State
*T: Township, R: Range, N: North, W: West				

The latitude and longitude and footages of the bottom hole and surface hole locations are provided in the table below.

Table 3. Bottom Hole and Surface Hole Locations for Proposed Wells

Wellhead/ Bottom Hole	Geographical Coordinate System (UTM, NAD83 [1])		Legal Land Description (New Mexico Principal Meridian)		
	Latitude	Longitude	Footages (2)	Section	Township & Range
Lybrook G01					
01H					
Wellhead	36.167462°	-107.415690°	2,406 feet FNL 1,314 feet FEL	1	Township 22 North, Range 6 West
Bottom Hole	36.145616°	-107.418003°	330 feet FSL 1,870 feet FEL	12	
02H					
Wellhead	36.167460°	-107.415588°	2,407 feet FNL 1,284 feet FEL	1	Township 22 North, Range 6 West
Bottom Hole	36.145589°	-107.413026°	330 feet FSL 400 feet FEL	12	
Lybrook N02					
01H					
Wellhead	36.160707°	-107.442083°	359 feet FSL 1,389 feet FWL	2	Township 22 North, Range 6 West
Bottom Hole	36.138618°	-107.445260°	2,349 feet FNL 585 feet FWL	14	
02H					
Wellhead	36.160652°	-107.442008°	339 feet FSL 1,411 feet FWL	2	Township 22 North, Range 6 West
Bottom Hole	36.138521°	-107.440438°	2,349 feet FNL 2,010 feet FWL	11	
Lybrook P03					
01H					
Wellhead	36.161075°	-107.450920°	438 feet FSL 1,222 feet FEL	3	Township 22 North, Range 6 West
Bottom Hole	36.138786°	-107.454246°	2,347 feet FNL 2,070 feet FEL	15	
02H					
Wellhead	36.161075°	-107.450818°	439 feet FSL 1,192 feet FEL	3	Township 22 North, Range 6 West
Bottom Hole	36.138704°	-107.449780°	2,347 feet FNL 750 feet FEL	15	

(1)UTM: Universal Transverse Mercator, NAD83: North American Datum of 1983
(2)FSL: From South Line, FNL: From North Line, FEL: From East Line, FWL: From West Line

During construction, there would be four temporary use areas (TUAs) associated with the proposed projects. The TUAs would be located on previously constructed Encana well pads that have already been permitted by the BLM-FFO. The TUAs for each of the proposed projects are as follows:

- Lybrook G01: Lybrook A01-2206 and Lybrook H01-2206
    - Lybrook A01-2206: This well pad is located less than 1 mile north-northeast of the proposed project area.
    - Lybrook H01-2206: This well pad is located at the start of the proposed access road.
- Lybrook N02 and Lybrook P03: Lybrook A03-2206 and Lybrook H03-2206
    - Lybrook A03-2206: This well pad is located less than 1 mile north-northwest of the proposed project areas.
    - Lybrook H03-2206: This well pad is located less than 1 mile north-northwest of the proposed project areas.

U.S. Highway 550 and existing and proposed oil and gas lease roads, well pads, and pipeline tie corridors are in the general vicinity of the proposed project areas.

Lybrook G01

The proposed Lybrook G01 project area is located on a southeastern slope of Venado Canyon. The proposed project area is on gently rolling terrain with a gentle slope to the north. The elevation of the proposed project area ranges from approximately 6,920 to 6,960 feet AMSL.

Lybrook N02

The proposed Lybrook N02 project area is located on a northwestern slope of Venado Canyon. The proposed project area is on rolling terrain with a gentle to moderate slope to the east-northeast. The elevation of the proposed project area ranges from approximately 7,040 to 7,060 feet AMSL.

Lybrook P03

The proposed Lybrook P03 project area is located on a northwestern slope of Venado Canyon. The proposed project area is on rolling terrain with moderate slopes to the southwest, northeast, and east. The elevation of the proposed project area ranges from approximately 7,040 to 7,140 feet AMSL. One USGS, ephemeral drainage is crossed by the proposed pipeline corridor.

Approximately 1,787 feet of the 1,953-foot-long proposed pipeline corridor would parallel the existing Counselor Indian Service Route 474.

2.1.2. Description of Proposed Projects

For a detailed description of design features and construction practices associated with the proposed projects, refer to the approved APDs and ROW Grant Applications on file at the BLM-FFO. The plats (Appendix B) provide additional details. Encana would comply with BLM guidance and standards established in The Gold Book: Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (The Gold Book; BLM and U.S. Forest Service [USFS] 2007). The Gold Book was developed to assist operators by providing information on the requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on Federal lands and on non-Federal surface over Federal minerals.

Because the proposed Lybrook N02 and Lybrook P03 project areas are located fully or partially on State surface, additional State stipulations could apply to the proposed projects. SOAs would be developed for the proposed Lybrook N02 and Lybrook P03 projects.

Design Features and Best Management Practices

Encana would adhere to the Conditions of Approval (COAs) attached to the approved APDs and stipulations attached to the ROW Grants. The following general design features and best management practices (BMPs) would occur.

Control of Waste

Liquid and solid wastes would be disposed of at an appropriate waste-disposal site. The proposed project areas would be maintained in a sanitary condition. Hazardous substances would be handled and disposed of according to Federal law.

Protection of Paleontological Resources

If a paleontological site is discovered, the BLM would be notified and the site would be avoided by personnel, personal vehicles, and company equipment. Workers would be informed that it is illegal to collect, damage, or disturb some such resources, and that such activities are punishable by criminal and/or administrative penalties.

Protection of Cultural Resources

All cultural resource stipulations would be followed as indicated in the Cultural Resource Records of Review, attached to the COAs and stipulations in the approved APDs and ROW Grants. These cultural resource stipulations could include, but would not be limited to, temporary or permanent fencing or other physical barriers, monitoring of earth-disturbing construction, reduction of the proposed project areas and/or establishment of specific construction avoidance zones, and employee education.

Employees, contractors, and sub-contractors associated with the proposed projects would be informed by Encana that cultural sites are to be avoided by personnel, personal vehicles, and company equipment. These individuals would 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 ARPA.

In the event of a cultural discovery during construction, Encana would immediately stop all construction activities in the immediate vicinity of the discovery and immediately notify the archaeological monitor, if present, or the BLM. The BLM would then evaluate or cause the site to be evaluated. Should a discovery be evaluated as significant (e.g., eligible for the National Register of Historic Places [NRHP] or protected under NAGPRA or ARPA), it would be protected in place until mitigating measures could be developed and implemented according to guidelines set by the BLM.

Protection of Flora and Fauna, including SSS and Livestock

Because the proposed projects would each disturb more than four acres of vegetation, if construction activities associated with any of the proposed projects would occur during the migratory bird breeding season (May 15 through July 31), a migratory bird nest survey of the proposed project area would take place one to two days prior to construction. This survey would be conducted by a BLM-FFO-approved biologist following BLM-FFO protocol. If, during the nest survey or during construction, active nests are located within or adjacent to the proposed project areas, the BLM-FFO biologist would be notified and project activities would not be permitted until fledging has occurred. If postponement is not an option, the operator would contact the USFWS's Migratory Bird Permit Office regarding permitting.

Should any active raptor nests be observed within one-third mile of the proposed project areas or should any SSS (listed by the USFWS or BLM) be observed within the proposed project areas prior to or during project implementation, construction would cease and the BLM-FFO would be immediately contacted. The BLM-FFO would then ensure evaluation of the resource. Should a discovery be evaluated as significant (protected under the ESA, etc.), it would be protected in place until mitigation could be developed and implemented according to guidelines set by the BLM.

Wildlife hazards associated with the proposed projects would be fenced, covered, and/or contained in storage tanks, as necessary. Per BLM Instruction Memorandum No. 2013-033, if any open pits or tanks are associated with the proposed projects, they would be netted to prevent birds from entering them.

Encana would notify the USFWS upon discovery of a dead or injured migratory bird, bald or golden eagle, or USFWS-listed species within or adjacent to the proposed project areas. If the BLM becomes aware of such mortality or injury, the BLM would inform Encana. If Encana fails to notify the USFWS of the mortality or injury, the BLM would notify the USFWS. The BLM and the USFWS would then attempt to determine the cause of mortality and evaluate and identify appropriate mitigation measures to avoid future occurrences.

Livestock grazing operators in the vicinity of the proposed project areas would be contacted by Encana at least 10 days prior to construction. Any range improvements (such as fences, gates, cattleguards, or waterlines) that could be impacted by the proposed projects would be identified and impacts would be mitigated prior to construction. If any fences are damaged during project activities, they would immediately be repaired to their former state or better.

For each proposed pipeline trench, gaps would be made in topsoil and subsoil stockpiles, where necessary, to allow for wildlife or cattle crossings.

No more than the amount of pipeline trench than can be worked on in one day would be open at any given time. Trenches would not be left open for more than 24 hours. If a trench is left open overnight, Encana would provide a night guard to monitor the open trench and ensure that no livestock or wildlife become trapped.

The ends of the proposed pipeline trenches would be sloped (3-to-1, horizontal-to-vertical) each night to allow wildlife and livestock to escape. If present, established wildlife or livestock trails would be left in place as crossovers. Escape ramps or crossovers would be constructed every 1,320 feet within the trenches; if active livestock grazing is occurring in the proposed project areas, these ramps/crossovers would be constructed every 500 feet. The escape ramps/crossovers would be constructed with a minimum 3-to-1 slope at each end. The escape ramps/crossovers would be a minimum of 10 to 12 feet wide and would not be fenced. The ends of the pipes would be plugged to prevent animals from crawling inside them. Before the trenches are closed, they would be inspected for wildlife and livestock. Any trapped wildlife or livestock would be promptly removed and released at least 150 yards from the trenches.

Protection of Water Resources

The USGS watercourses crossed by the proposed Lybrook P03 pipeline corridor would be recontoured to original conditions, as near as possible.

A closed-loop system would be used on the proposed well pads. “Pit Rule” guidelines would be followed.

Protection of Topsoil

Topsoil, which would be stripped from the surface of the proposed project areas during the construction phase of the proposed projects, would be stored and protected until it is redistributed during reclamation. The top 6 inches of topsoil would be segregated and wind-rowed along the edge of the proposed access roads and well pad construction zones; thereby, topsoil would be stored separately from subsoil material. The topsoil would be free of brush, tree limbs, tree stumps, and root balls, but could include chipped or mulched material that is incorporated into the topsoil stockpile. Topsoil would not be stripped when soils are moisture-saturated or frozen below stripping depth. The topsoil would be used during reclamation, as described further below (Interim Reclamation) and within the proposed project reclamation plans (Appendix D).

Vehicle/equipment traffic would not be allowed to cross topsoil stockpiles.

If the proposed project areas becomes prone to wind or water erosion, appropriate measures would be taken to prevent topsoil loss. Such measures could include using tackifiers or water to wet the topsoil stockpile so that a crust is created across the exposed soil.

For the proposed pipe trenches, the topsoil would not be used for padding the pipes and would not be mixed with excavated subsoil. The excavated subsoil would be stockpiled separately along the edge of the proposed pipeline corridors. For the proposed pipeline ties, gaps would be made in topsoil and subsoil stockpiles, where necessary, to avoid ponding or to divert water during storm events.

Protection of the Public

The hauling of equipment and materials on public roads would comply with Department of Transportation regulations. Any accidents involving persons or property would immediately be reported to the BLM-FFO. Encana would notify the public of potential hazards by posting signage (e.g., trucks turning or construction ahead), having flaggers, or using lighted signs, as necessary.

The soil stockpiles and pipe string would also be used as safety barriers during construction of the proposed pipeline ties. If a pipeline trench is left open at a road crossing, orange safety fencing or barricades would be installed, if needed. During construction, access to the proposed pipeline tie corridors would be limited to pipeline construction crews.

Prevention and Control of Weeds

It would be Encana's responsibility to monitor, control, and eradicate all invasive, non-native plant species within the proposed project areas throughout the life of the proposed projects. Encana would contact the BLM-FFO regarding acceptable weed-control methods. If Encana does not hold a current Pesticide Use Permit, a Pesticide Use Permit would be submitted prior to pesticide application. Only pesticides authorized for use on BLM lands would be used. The use of pesticides would comply with Federal and State laws. Pesticides would be used only in accordance with their registered use and limitations. Encana would contact the BLM-FFO prior to using these chemicals.

Protection of Air Resources

The BLM's regulatory jurisdiction over field production operations has resulted in the development of BMPs designed to reduce impacts to air quality by reducing all emissions from field production and operations. Typical measures could include flaring hydrocarbons and gases at high temperatures in order to reduce emissions of incomplete combustion, requiring that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored, ensuring that compressor engines 300 horsepower or less have nitrogen oxide (NO_x) emissions limited to 2 grams per horsepower hour, revegetating areas not required for production facilities to reduce the amount of dust, and watering dirt roads during periods of high use in order to reduce fugitive dust emissions. Magnesium chloride, organic-based compounds, or polymer compounds could be also be applied to roads or other surfaces to reduce fugitive dust. Neither petroleum-based products nor produced water would be used.

Noise

Production would comply with noise standards outlined in Notice to Lessees (NTL) 04-2 FFO (BLM 2004). Encana would adhere to the noise stipulations, if any, included in the COAs attached to the approved APDs and/or stipulations attached to the ROW Grants.

Additional Design Features and BMPs

Worker safety incidents would be reported to the BLM-FFO as required under NTL-3A (USGS 1979). Encana would adhere to company safety policies, Occupational Safety and Health Administration regulations, Department of Transportation regulations, and pipeline safety regulations (per 49 CFR 190 and 192). The proposed pipeline trenches would be excavated and sloped in accordance with OSHA specifications.

Vehicles would be restricted to proposed disturbance areas and existing areas of surface disturbance, such as existing roads.

Encana would comply with Onshore Oil and Gas Order No. 2, issued under Onshore Oil and Gas Operations (43 CFR 3160).

The well locations would have informational signs, as required by Onshore Oil and Gas Operations regulations (43 CFR 3160).

Construction and maintenance activities would cease when soil or road surfaces become saturated to the extent that construction equipment is unable to stay within the proposed project areas and/or when activities would cause irreparable harm to roads, soils, or streams. If equipment creates ruts deeper than six inches, the soil would be deemed too wet for construction or maintenance. No frozen soils would be used for construction purposes or trench backfilling. Encana would use the six-step frozen ground procedure during frozen ground conditions.

During reclamation, stockpiled rocks, if available, would be placed within the reclamation area for erosion control and/or OHV control (if requested by the BLM-FFO), and/or in a manner that visually blends with the adjacent, undisturbed landscape.

Erosion-control features, such as waterbars along the proposed pipeline corridors, would be applied as specified by the BLM-FFO Authorized Officer. If waterbars are constructed, the spacing requirements by hillslope grade are provided in the table below. The waterbars would follow the horizontal contour of the hillslope on which they would be placed.

Table 4. Waterbar Spacing Requirements by Percent Grade of Hillslope

Hillslope Percent Grade (%)	Waterbar Spacing (feet)
Less than 1	400
1-5	300
5-15	200
15-25	100

Proposed Project Phases

Proposed project phases would be similar for the proposed Lybrook G01, Lybrook N02, and Lybrook P03 projects. The general phases described below would apply to each individual project. Where differences between the projects would exist, these differences are specified at the end of the appropriate section.

During all project phases, vehicles would use proposed access roads, as well as developed BLM roads and highways in the region. Traffic would include light vehicles (such as cars and pick-up trucks) and heavy vehicles (such as water trucks and large tractor-trailers hauling equipment).

Upgrade of Existing Roads

If the proposed wells are commercially viable, Encana would schedule a meeting with the BLM-FFO to discuss which portions of the existing roads would require upgrades and/or surfacing to prevent soil erosion and accommodate year-round traffic.

Construction of Access Roads and Well Pads

Access road and well pad construction would take two to three weeks at each proposed project site. During construction of the proposed access roads and well pads, the following equipment could be utilized onsite: chainsaw, brush hog, scraper, maintainer, excavator, and dozer.

The proposed access roads and well pads would be cleared of vegetation and leveled. Vegetation removed during construction, including trees that measure less than 3 inches in diameter (at ground level) and slash/brush, would be chipped, shredded, or mulched and incorporated into topsoil for later use in interim reclamation. When chipping slash and brush, the “chips” would be distributed in a manner that would not impede seeding with machinery or the establishment of successful revegetation. Trees 3 inches in diameter or greater (at ground level) would be cut to ground level and delimbed.

The top 6 inches of topsoil would be salvaged and stockpiled along the proposed access roads and within the proposed well pad construction zone. The protection of topsoil is discussed in “Design Features and Best Management Practices – Protection of Topsoil,” above.

The proposed access roads and well pads would be constructed from the native borrow soil and subsoil accumulated during construction activities. The excavated material from well pad cuts would be used on the fill portions of the proposed well pads in order to create a level well pad surface. If additional fill or surfacing material, such as sandstone for road surfacing, would be needed, Encana would obtain the material from an existing permitted or private source and haul the material by truck utilizing existing access roads.

The proposed well pads would be leveled using cut-and-fill techniques; excavated materials from cuts would be used on fill portions to create a level working surface.

Each of the proposed well pads would measure 530 feet by 500 feet, including the 50-foot well pad construction zone around the perimeter of the pad. The well pad construction zones could be limited in areas if specified by COAs and stipulations attached to the approved APDs and ROW Grants. The size of the proposed well pads is slightly larger than typical well pads in the BLM-FFO area because the equipment (such as tanks) associated with the new hydraulic fracturing design requires a larger area.

The 30-foot-wide workspace associated with the proposed access roads would include a 14-foot-wide running surface with adequate crowning. The proposed access roads would be designed (e.g., drainage design, culvert sizing, and culvert installation) and constructed as resource roads in accordance with *The Gold Book* (BLM and USFS 2007). If the wells associated with the proposed access roads are commercially viable, Encana would upgrade the proposed access roads, as necessary, to accommodate year-round traffic and meet all-weather standards. The proposed access roads would be maintained for the life of the proposed projects in accordance with *The Gold Book* (BLM and USFS 2007).

Water diversions and silt traps (if needed) would be installed during interim reclamation; please see the “Interim Reclamation” section, below. Additional sediment- and/or erosion-control features would be installed, as necessary. Additional resource-protection design features and mitigation associated with construction are listed above, in “Design Features and Best Management Practices”.

<u>Lybrook G01</u>
The proposed access road would be 946 feet long. The maximum road grade would be 5 percent.

The maximum well pad cut would be 18.3 feet on the southeastern corner (corner 3). The maximum fill would be 19.1 feet on the northwestern side (corner 6).

Tree trunks (left whole) and cut limbs would be hauled to the Navajo Nation - Counselor Chapter House.

<u>Lybrook N02</u>
The proposed access road would be 48 feet long. The maximum road grade would be 3 percent.

The maximum well pad cut would be 15.9 feet on the western corner (corner 2). The maximum fill would be 15.0 feet on the eastern corner (corner 5).

Tree trunks (left whole) and cut limbs would be stacked along the proposed access road, well pad, and/or pipeline corridor for wood gathering.

<u>Lybrook P03</u>
The proposed access road would be 183 feet long. The maximum road grade would be 3 percent.

The maximum well pad cut would be 14.9 feet on the southwestern corner (corner 2). The maximum fill would be17.1 feet on the northeastern corner (corner 5).

Tree trunks (left whole) and cut limbs would be stacked along the proposed access road, well pad, and/or pipeline corridor for wood gathering.

Drilling and Completion

Drilling

Once well pad and access road construction is completed, a drilling rig would be transported to the well pads and assembled. Drilling activities would take place around the clock for approximately two to three weeks per well; during this phase, there would be constant onsite supervision. During drilling, the following equipment would be on site: drilling rig, stockpiles of drill pipe and casing, closed-loop system for collection cuttings and fluid, above-ground tanks for collecting cuttings and fluid, mud shakers to separate cuttings from fluid, generators to provide power to the drill rig, light towers, toilet facilities, trash containers, and office trailers equipped with sleeping quarters for essential personnel.

Water for drilling would be obtained from an existing, private water well located in the southwestern quarter of the northeastern quarter of Section 32, Township 25 North, Range 9 West (NMPM). The New Mexico Office of the State Engineer-assigned permit number for this water well is SJ-2105. Water for drilling would be hauled by truck using existing and proposed access roads.

The proposed projects include directional wells. The proposed wells would be targeting natural gas and oil within the formations provided in Table 1 in Section 1.1 (Background). The wells would be drilled from the proposed wellheads to the proposed bottom holes provided in Table 3 in Section 2.1.1 (Location of Proposed Project Areas).

Utilizing a fresh water-based drilling mud system, the surface casings would be installed at an approximate depth of 500 feet. After a surface casing is installed, the casing would be cemented in place by pumping cement down the casing and circulating the cement back up the outside of the casing to create a cement sheath around the entire casing. The casing would then be tested to ensure the quality and integrity of the cement. The casing and cementing would stabilize the wellbore. In addition, the casing and cementing would isolate hydrocarbon zones from overlying freshwater aquifers, thereby providing protection to any overlying freshwater aquifers.

Prior to drilling below the surface casing, a blowout preventer (BOP) would be installed on the surface casing. 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 then be cemented and tested to ensure the quality and integrity of the cement.

Once the intermediate string is cemented, a synthetic oil-based and/or freshwater-based drilling mud system would be used to drill the horizontal portion of the wellbore. A downhole mud motor would be used to increase the penetration rate during drilling. The drill rig would pump drilling fluids to drive the mud motor, cool the drill bit, and remove cuttings from the wellbore. Additives could be mixed with the mud system to achieve borehole stability, minimize potential damage to geologic formations, provide adequate viscosity to carry the drill cuttings out of the wellbore, and reduce downhole fluid losses.

After the wellbores have been drilled to their final depths, production liners would be installed and secured into place utilizing an external swell packer system. The production liners would provide additional isolation of the wellbores and create a pathway for natural gas and oil to travel from mineral formation to the surface.

Completion

After the production liners have been secured into place, the drilling rig would be removed from the proposed well pads, and a completion rig would be moved to the proposed well pads. Completion is the process in which a well is enabled to produce natural gas and oil. Completion typically takes one to two weeks for each well. During completion, the following equipment would be onsite: completions rig, completions command center, steel storage tanks, pump trucks and transports, blending and mixing facilities, and related ancillary completions equipment.

A completion rig would run a completion string into a wellbore for tying it into the liner/liner hanger. The completion string would be of the same size, weight, and grade as the production liner. The completions string tie in would provide a secondary barrier during completion operations for protecting the intermediate casing from pressures needed to pump into the formation.

Completion would require hydraulic fracturing, which is the process of injecting water, sand, and a small amount of fluid additives into the wellbore, under very high pressure, to fracture the targeted formations and release natural

gas and oil. During this process, within the horizontal portion of the wellbores, a series of charges would be set through the producing interval to perforate the production liner and casing and create small fractures in the formation. A fluid and sand mixture would be injected into the formation, at high pressure, to create cracks or fractures. The sand would act as a proppant to keep the fractures open and allow natural gas and oil to move more efficiently into the wellbore. The hydraulic fracturing process utilizes a series of plugs to isolate portions of a well that have been fractured. Once hydraulic fracturing has been completed, these plugs would be drilled out to allow the natural gas and oil to flow to a wellhead.

The completions would be designed with nitrogen foam for minimizing water usage and improving fluid recoveries following the completion phase. Water for completions would be obtained from the existing private water well (SJ-2105, described above) described above and trucked to the locations. Water would be stored in steel storage tanks within the proposed project areas. After the completion phase, a portion of the water injected for hydraulic fracturing would flow back to the wellheads and be collected in steel storage tanks stationed within the proposed project areas. This flowback water would be disposed of at a State of New Mexico-permitted wastewater facility.

The final step of the completion phase would be the installation of tubing in the wellbores. This tubing would enhance production by creating a more efficient path for natural gas and oil to travel to the wellheads. At the wellheads, the flow of natural gas and oil would be regulated and controlled by a series of valves and instruments..

Construction of Pipeline Ties

If the proposed wells prove to be productive, three pipeline ties would be constructed and installed to carry natural gas from the six proposed wells to Encana pipeline systems; the lifetime of each pipeline tie is anticipated to be 30 to 50 years. Pipeline construction would take three to four weeks for each project location.

The proposed pipeline ties would be up to 6-inch-diameter steel pipes. The proposed pipeline corridors would be 40 feet in width. The length of each pipeline tie would be as follows:

- Lybrook G01: 1,260 feet
- Lybrook N02: 106 feet
- Lybrook P03: 1,953 feet

The maximum allowable operating pressure of the proposed pipeline ties would be 500 pounds per square inch gauge. Additional, related aboveground appurtenances (i.e., cathodic protection equipment, futures, and block valves with blowdowns) would be installed within the pipeline corridors.

For each proposed pipeline tie, site preparation would include clearing vegetation from the proposed corridor, salvaging and stockpiling topsoil, and excavating the pipe trench. The site preparation activities would be limited to the minimum area required for safe and efficient construction.

Vegetation clearing activities would be similar to those described in the “Proposed Project Phases - Construction of Well Pads and Access Roads” section, above. Topsoil would be stockpiled along the edge of the proposed pipeline corridor.

For each proposed pipe trench, the cover from the top of the pipe to ground level would be a minimum of 36 inches deep when located within typically encountered soil and rock and a minimum of 48 inches deep at road crossings. Where rock is encountered within the pipe trench, tractor-mounted mechanical rippers or rock trenching equipment could be used during trenching excavation activities.

Pipeline tie construction and installation would include stringing the pipe, bending the pipe for horizontal or vertical angles in the pipeline alignment, welding pipeline segments together, inspecting the pipe, coating the pipe to prevent corrosion, and lowering the pipe into the trench. The pipe inspection would include the verification that the minimum pipe cover has been provided, the trench bottom is free of rocks/debris, the external pipe coating has not been damaged, and the pipe has been properly fitted and installed in the trench. The fine soil would be sifted from the subsoil stockpile in order to provide rock-free pipeline padding and bedding. In rocky areas, a padding material or rock shield would be used to protect the pipe. After a section of pipe has been lowered into the pipeline trench

and inspected, the pipeline trench would be backfilled. Once the pipeline trench has been backfilled, cleanup activities would be initiated and interim reclamation would take place within the workspace, as described in the following section (Interim Reclamation).

Additional resource-protection design features and mitigation associated with construction are listed above, in “Design Features and Best Management Practices”.

Interim Reclamation

If the wells associated with the proposed projects prove to be productive, portions of the proposed project areas that would not be required for production (non-working areas [areas not necessary for the routine, long-term operation and maintenance of an authorized site]) would be reclaimed. Interim reclamation would be initiated within 120 days of construction. Interim reclamation would take two to four weeks for each project’s well pad and access road and one week for each pipeline tie corridor. The BLM-FFO would be notified at least 48 hours prior to the start of interim reclamation activities at each location. Interim reclamation could occur simultaneously with production.

During interim reclamation, the following equipment could be utilized onsite: pick-up trucks, dozer, blade, farm tractor with a disc, trackhoe, and scraper.

Areas reclaimed during interim reclamation would include the new surface disturbance associated with the pipeline ties, the non-driving surface of the access roads, well pad construction zones, and non-working portions of the well pads. Approximately 16.8 acres of new surface disturbance would be reclaimed at this time. Areas that would be fully reclaimed during this phase are described further in Section 2.1.3 (Proposed Surface Disturbance).

In areas that would be reclaimed within the proposed project areas, slopes would be re-contoured to pre-construction topographical contours, if possible. Encana would diminish the evidence of cuts, fills, and flat well pad surfaces.

After the proposed pipeline corridors have been recontoured, permanent erosion-control measures, such as waterbars, would be installed within the proposed pipeline corridors, where needed and as described in “Design Features and Best Management Practices”.

The subsurface portion of the trees (tree stumps) would be hauled to an approved disposal site or buried within the cut slopes of the proposed well pad during interim reclamation.

<u>Lybrook G01</u>

Within the proposed construction zone, stormwater would be diverted from the southern edge of the proposed Lybrook G01 well pad to a silt trap at the southwestern corner (Corner 5) of the proposed well pad. Stormwater would also be diverted from the eastern edge of the proposed well pad to a silt trap at the northeastern corner (Corner 2) of the proposed well pad. Stormwater would flow beneath the proposed access road via 24-inch-diameter culverts that would be installed where the proposed access road leaves the existing access road and where the proposed access road enters the proposed well pad. Additional water diversions, if needed, would be installed during reclamation.

The reclamation standards would comply with BLM-FFO Bare Soil Reclamation Procedure B (BLM 2013c). Details of the interim reclamation process are provided in the reclamation plans (Appendix D). Reclaimed areas would be seeded using the BLM-FFO, weed-free Piñon-Juniper Community Seed Mixture.

Under the BLM-FFO Bare Soil Reclamation Procedures (BLM 2013c), Encana and the BLM-FFO would monitor reclaimed surfaces to document successful interim reclamation; monitoring and reporting are discussed in the reclamation plans (Appendix D).

Lybrook N02

Water diversions, if needed, would be installed during reclamation.

Since the proposed Lybrook N02 project is located on State surface, the BLM-FFO Bare Soil Reclamation Procedures would not apply to this proposed project. Therefore, a reclamation plan has not been prepared for this proposed project location. However, similar reclamation standards would be used for the proposed Lybrook N02 project as those described in the reclamation plans provided in Appendix D, unless the State specifies otherwise in the SOA. Reclaimed areas would be seeded using the BLM-FFO, weed-free Sagebrush/Grass Community Seed Mixture.

Lybrook P03

Stormwater would be diverted from the southwestern corner (Corner 2) of the proposed well pad around the southeastern corner (Corner 6) of the proposed well pad to the northeastern corner (Corner 5) of the proposed well pad. The diverted stormwater would flow beneath the proposed access road via 24-inch-diameter culverts that would be installed at approximate stationing 0+00.00 and 1+82.83. Additional water diversions, if needed, would be installed during reclamation.

For portions of the proposed project area that are on BLM-FFO surface, reclamation standards would comply with BLM-FFO Bare Soil Reclamation Procedure B (BLM 2013c). Details of the interim reclamation process are provided in the reclamation plans (Appendix D). Reclaimed areas would be seeded using the BLM-FFO, weed-free Sagebrush/Grass Community Seed Mixture

Under the BLM-FFO Bare Soil Reclamation Procedures (BLM 2013c), Encana and the BLM-FFO would monitor reclaimed surfaces to document successful interim reclamation; monitoring and reporting are discussed in the reclamation plans (Appendix D).

For the State portion of the proposed project area, reclamation standards would be the same as those described for the BLM-FFO surface, unless the State specifies otherwise in the SOA. Production

Production

The production phase of wells varies; the lifetime is anticipated to be 30 to 50 years. The installation of production equipment would take approximately three to four weeks at each project location. The proposed access roads and the working areas of the proposed well pads would be maintained for the life of the proposed projects.

Production equipment that would remain on the well pads during production would include the following: wellheads, metering units, separators, aboveground condensate tanks, water tanks (tank battery), meter(s), and VRU compressor(s). If artificial lift would be required, pump jack(s) and/or gas skid lift(s) would also be installed.

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

At the proposed well sites, site security guidelines would be followed, as identified in 43 CFR 3162.7-5 and Onshore Oil and Gas Order No. 3. Production facilities would be painted Juniper Green to blend with the natural environment. Equipment that would be subject to safety requirements would not be painted Juniper Green. Production facilities would be placed, to the extent practical, to minimize visual impacts.

Occasionally, work-over or recompletion of the proposed wells would be necessary to ensure efficient production is maintained. Work-overs and recompletions would be scheduled as needed to improve and maintain production of the proposed wells. Work-over activities could include repairs to the wellbore equipment (e.g., casing, tubing, rods, pump), wellheads, or production facilities.

Final Reclamation and Abandonment

If the wells prove to be unproductive, or when the wells are no longer commercially viable, the wells would be abandoned and final reclamation would take place. The final abandonment phase typically takes two to four weeks per project location.

During final reclamation, the following equipment could be utilized onsite: dozer, blade, farm tractor with a disc, trackhoe, and scraper.

Encana would provide the BLM-FFO with technical and environmental aspects of the final plugging, abandonment, and reclamation procedures.

Downhole well abandonment would be carried out under current BLM-FFO and State regulations. The bores would be plugged with cement and the production facilities would be removed. An aboveground marker would be placed over each plugged hole. Each marker would contain individual well identification information.

The underground pipeline ties would typically be plugged and left in place.

If the BLM-FFO and/or State does not consider the retention of the proposed well pads and/or access roads, as well as existing access road(s) to the locations, necessary for the management and multiple uses of natural resources, they would be reclaimed. The goal of final reclamation would be to return the disturbed areas associated with the proposed projects to pre-construction conditions, if possible, by diminishing the evidence of cuts, fills, and flat well pad surfaces. Disturbed areas would be re-contoured to pre-construction topographical contours, covered with salvaged topsoil, and seeded, as described in the reclamation plans (Appendix D). Erosion-control measures, if needed, would be installed at this time.

<u>Lybrook G01</u>

Under the BLM-FFO Bare Soil Reclamation Procedures (BLM 2013c), Encana and the BLM-FFO would monitor reclaimed surfaces to document successful interim reclamation; monitoring and reporting are discussed in the reclamation plans (Appendix D). Reclaimed areas would be seeded using the BLM-FFO, weed-free Piñon-Juniper Community Seed Mixture.

<u>Lybrook N02</u>

Similar reclamation standards would be used for the proposed Lybrook N02 project as those described in the reclamation plans provided in Appendix D, unless otherwise specified by the State in the SOA. Reclaimed areas would be seeded using the BLM-FFO, weed-free Sagebrush/Grass Community Seed Mixture.

<u>Lybrook P03</u>

Under the BLM-FFO Bare Soil Reclamation Procedures (BLM 2013c), Encana and the BLM-FFO would monitor reclaimed surfaces within BLM-FFO portions of the proposed project area to document successful interim reclamation; monitoring and reporting are discussed in the reclamation plans (Appendix D). Reclaimed areas within BLM-FFO portions of the proposed project area would be seeded using the BLM-FFO, weed-free Sagebrush/Grass Community Seed Mixture. Similar reclamation standards would apply to the State portion of the proposed project area, unless the State specifies otherwise in the SOA.

2.1.3. Proposed Surface Disturbance

New surface disturbance associated with the proposed projects would total 21.4 acres. Of this, approximately 6.2 acres would be located on State surface and 15.2 would be located on BLM-FFO-managed surface. Of the 21.4 acres, 0.4 acre would be reseeded (but not recontoured) and 16.4 acres would be fully reclaimed during interim reclamation. The remainder (4.6 acres) would remain disturbed throughout the life of the proposed projects. This disturbance is summarized in the below table.

Table 5. Surface Disturbance Associated with Proposed Projects

Feature	Total Disturbance (acres)	New Surface Disturbance (acres)	Portion of New Surface Disturbance Reclaimed during Interim Reclamation (acres)	New Surface Disturbance Remaining Disturbed (Barren and Level) for the Life of Proposed Project (acres)
Lybrook G01				
Access Road	0.7	0.7	0.4	0.3
Well Pad	3.9	3.9	2.5	1.4
Well Pad Construction Zone	2.1	2.1	2.1	-
Pipeline Corridor	1.2	0.8	0.8	-
Total	**7.9**	**7.5**	**5.8**	**1.7**
Lybrook N02				
Access Road	<0.1	<0.1	<0.1	<0.1
Well Pad	3.9	3.9	2.5	1.4
Well Pad Construction Zone	2.1	2.1	2.1	-
Pipeline Corridor	0.1	0.1	0.1	-
Total	**6.1**	**6.1**	**4.7**	**1.4**
Lybrook P03				
Access Road	0.1	0.1	<0.1	0.1
Well Pad	3.9	3.9	2.5	1.4
Well Pad Construction Zone	2.1	2.1	2.1	-
Pipeline Corridor	1.8	1.7	1.7	-
Total	**7.9**	**7.8**	**6.3**	**1.5**
Total	**21.9**	**21.4**	**16.8**	**4.6**

Lybrook G01

New disturbance associated with the proposed Lybrook G01 project would be 7.5 acres; the entire new disturbance area is located on BLM-FFO-managed surface. Of the 7.5 acres, 0.4 acre would be reseeded (but not recontoured) and 5.4 acres would be fully reclaimed during interim reclamation. The remainder (1.7 acres) would remain disturbed throughout the life of the project. Project facilities are described further below:

- Access Road: The proposed access road corridor would be 946 feet long and 30 feet wide (0.7 acre).
    - The 14-foot-wide running surface of the road and the bottoms of the bar ditches alongside the road (approximately 0.3 acre, total) would remain disturbed for the lifetime of the project. No reclamation would occur within this area during interim reclamation.
    - The remainder of the access road corridor (approximately 0.4 acre) would be reseeded during interim reclamation.
- Well Pad: The proposed well pad would measure 400 by 430 feet (3.9 acres).
    - Working Area: A 250-by-250-foot (1.4-acre) working area would be required for long-term operations and maintenance of the site. This acreage would remain disturbed for the lifetime of the project. No reclamation would occur within this area during interim reclamation.
    - The remainder of the well pad (2.5 acres) would be fully reclaimed during interim reclamation.

- Construction Zone: A 50-foot-wide (2.1-acre) construction zone would surround the proposed well pad. Less than 0.1 acre of the construction zone would overlap the access road. All of this new disturbance would be fully reclaimed during interim reclamation.

- Pipeline Corridor: The proposed pipeline corridor would be 1,260 feet long and 40 feet wide (1.2 acres). Approximately 866 feet of the corridor would travel parallel and adjacent to the proposed Lybrook G01-2206 access road. Along this portion of the corridor, 15 feet of the corridor's width would overlap the access road; the remaining 25 feet (0.5 acre) would be new disturbance. The remainder of the pipeline corridor (314 feet [0.3 acre]) would travel cross-country. Therefore, there would be 0.8 acre of new surface disturbance associated with the pipeline corridor. All of this new disturbance would be fully reclaimed during interim reclamation.

Lybrook N02

New disturbance associated with the proposed Lybrook N02 project would be 6.1 acres; the entire new disturbance area is located on State surface. Of the 6.1 acres, less than 0.1 acre would be reseeded (but not recontoured) and 4.7 acres would be fully reclaimed during interim reclamation. The remainder (1.4 acres) would remain disturbed throughout the life of the project. Project facilities are described further below:

- Access Road: The proposed access road would be 48 feet long and 30 feet wide (less than 0.1 acre).
    - The 14-foot-wide running surface of the road and the bottoms of the bar ditches alongside the road (less than 0.1 acre, total) would remain disturbed for the lifetime of the project. No reclamation would occur within this area during interim reclamation.
    - The remainder of the access road corridor (less than 0.1 acre) would be reseeded during interim reclamation.
- Well Pad: The proposed well pad would measure 400 by 430 feet (3.9 acres).
    - Working Area: A 250-by-250-foot (1.4-acre) working area would be required for long-term operations and maintenance of the site. This acreage would remain disturbed for the lifetime of the project. No reclamation would occur within this area during interim reclamation.
    - The remainder of the well pad (2.5 acres) would be fully reclaimed during interim reclamation.
- Construction Zone: A 50-foot-wide (2.1-acre) construction zone would surround the proposed well pad. Less than 0.1 acre of the construction zone would overlap the access road. All of this new disturbance would be fully reclaimed during interim reclamation.

- Pipeline Corridor: The proposed pipeline corridor would be 106 feet long and 40 feet wide (0.1 acre). The entirety of the corridor length would travel adjacent to the proposed access road. Fifteen feet of the proposed pipeline corridor's width would overlap the access road; the remaining 25 feet (0.01 acre) would be new disturbance. All of this new disturbance would be fully reclaimed during interim reclamation.

Lybrook P03

New disturbance associated with the proposed Lybrook P03 project would be 7.8 acres. Of this, approximately 7.7 acres would be located on BLM-FFO surface and 0.1 acre would be located on State surface. Less than 0.1 acre would be reseeded (but not recontoured) and 6.3 acres would be fully reclaimed during interim reclamation. The remainder (1.5 acres) would remain disturbed throughout the life of the project. Project facilities are described further below:

- Access Road: The proposed access road corridor would be 183 feet long and 30 feet wide (0.1 acre). The 183-foot-long access road would be located on BLM-FFO surface.

    - The 14-foot-wide running surface of the road and the bottoms of the bar ditches alongside the road (approximately 0.1 acre, total) would remain disturbed for the lifetime of the project. No reclamation would occur within this area during interim reclamation.
    - The remainder of the access road corridor (less than 0.1 acre) would be reseeded during interim reclamation.

- Well Pad: The proposed well pad would measure 400 by 430 feet (3.9 acres). The 3.9-acre well pad would be located entirely on BLM-FFO surface.
    - Working Area: A 250-by-250-foot (1.4-acre) working area would be required for long-term operations and maintenance of the site. This acreage would remain disturbed for the lifetime of the project. No reclamation would occur within this area during interim reclamation.
    - The remainder of the well pad (2.5 acres) would be fully reclaimed during interim reclamation.

- Construction Zone: A 50-foot-wide (2.1-acre) construction zone would surround the proposed well pad; this 2.1-acre construction zone would be located entirely on BLM-FFO surface. Less than 0.1 acre of the construction zone would overlap the access road. All of this new disturbance would be fully reclaimed during interim reclamation.

- Pipeline Corridor: The proposed pipeline corridor would be 1,953 feet long and 40 feet wide (1.8 acres). Approximately 131 feet (0.1 acre) of the proposed pipeline corridor would be located on State surface. The remainder of the proposed pipeline corridor (approximately 1,822 feet, or 1.7 acres), would be located on BLM-FFO surface. Approximately 166 feet of the corridor would travel parallel and adjacent to the proposed Lybrook P03-2206 access road. Along this portion of the corridor, 15 feet of the corridor's width would overlap the access road; the remaining 25 feet (0.1 acre) would be new disturbance. The remainder of the proposed pipeline corridor (1,787 feet) would travel parallel and adjacent to the existing Indian Service Route 474; however, the pipeline corridor would not overlap this road. Therefore, there would be 1.7 acres of new surface disturbance associated with the proposed pipeline corridor. All of this new disturbance would be fully reclaimed during interim reclamation.

2.2. No Action

Under the No Action Alternative, the APDs and ROW Grants would not be approved. The proposed wells would not be drilled and the proposed well pads, access roads, and pipeline ties would not be constructed. Current land and resource uses would continue to occur in the proposed project area.

2.3. Alternatives Considered but Eliminated from Detailed Study

Natural gas and oil wells can be drilled vertically or directionally/horizontally. Vertical drilling places a well pad directly above the bottom hole, while directional/horizontal drilling allows for flexibility in the placement of the well pad and associated surface facilities. Directional/horizontal drilling often allows for "twinning," or drilling two or more wells from one shared well pad. Directional/horizontal drilling applications throughout the San Juan Basin have become relatively routine. Generally, the use of this technology is applied when it is necessary to avoid or minimize impacts to surface resources.

Factors such as reservoir depth, angle of deviation, lateral displacement, completion technique, and risk are considered before deciding on the use of directional drilling applications. In addition, operating factors such as production efficiency; rod, pump, and tubing wear; and workover frequency is also a consideration. Generally, directional well completion and operating costs are 20 to 25 percent higher than vertical well drilling costs. The primary economic factors that determine the feasibility of directional applications include, but are not limited to, incremental drilling, completion, and operating costs; oil and gas reserves; rates of production; oil and gas prices; royalties and taxes; and return on investment.

For each well pad location, a *SHL Polygon & Feasibility Map* was created to provide Encana, its surveyors, and its environmental consultants with information that was used in determining the best well pad location based on

environmental considerations (topography, hydrology, wildlife habitats, etc), technical limitations associated with horizontal drilling, resource recovery considerations, and correlative rights issues. No alternative well pad locations were identified for the proposed projects that would result in less surface disturbance than the proposed well pad locations.

2.3.1. Lybrook G01

A different Lybrook G01 access road and pipeline corridor route were originally considered. The originally proposed access road would have been 749 feet long (0.5 acre). The originally proposed pipeline corridor would have been 1,140 feet long (1.0 acre). All other features associated with the proposed Lybrook G01 project would have remained the same. The start and end points of the originally proposed access road and pipeline corridor were slightly modified to reduce the gradients of these features.

2.3.2. Lybrook P03

A different Lybrook P03 access road route was originally considered. The originally proposed access road would have been the same length as the currently proposed access road route. All other features associated with the proposed Lybrook P03 project would have remained the same. The originally proposed access road was modified to reduce safety and visual resource issues.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Under the No Action alternative, current land and resource issues within the proposed project areas would continue; there would be no new impacts from oil and gas development. The No Action alternative will serve as the baseline for comparing the environmental impacts of the analyzed alternatives, and will not be further evaluated in this EA (BLM 2008b).

3.1. Air Resources

3.1.1. Affected Environment

The proposed project areas are located in Sandoval County, New Mexico. General information on air quality in the area is contained in Chapter 3 of the PRMP/FEIS (BLM 2003a, 3-48 – 3-53). New information about greenhouse gases (GHGs) and their effects on national and global climate conditions has emerged since this document was prepared. Ongoing scientific research has identified the potential impacts of GHG emissions such as carbon dioxide (CO_2), methane (CH_4), 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 back 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. These changes are 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 the Air Resource Technical Report; BLM 2013a). 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 EPA has the primary responsibility for regulating air quality, including the regulation of six nationally regulated ambient air pollutants (criteria pollutants). These criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} & $PM_{2.5}$), sulfur dioxide (SO_2) and lead (Pb). The EPA has established NAAQS for criteria air pollutants. The NAAQS are protective of human health and the environment. The EPA has approved New Mexico’s State Implementation Plan, and the State enforces State and Federal air quality regulations on all public and private lands within the State, with the exception of tribal lands and Bernalillo County.

Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology, and terrain. Air quality also includes 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 EPA has proposed or completed actions recently to implement CAA requirements for GHG emissions. Climate has the potential to influence renewable and non-renewable resource management.

Air Quality

Criteria Air Pollutants

The Air Resource Technical Report describes the types of data used in the description of the existing conditions of criteria pollutants, describes how the criteria pollutants are related to the activities involved in oil and gas development, and provides a table of current national and State standards (BLM 2013a). The EPA Green Book web page reports that all counties in the BLM-FFO analysis area, including San Juan, McKinley, Rio Arriba, and Sandoval Counties in New Mexico and La Plata County in Colorado, are in attainment of all NAAQS as defined by the CAA (EPA 2012). In addition, the area 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 6 shows monitored design values for O_3 in recent years for each of the three San Juan County O_3-monitoring stations.

Table 6. Reported Ozone Values for San Juan County Ozone Monitoring Stations

State Air Monitoring Station	8-hour Ozone Design Value (ppm*)				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

Source: NMED 2012
* parts per million

Table 7 summarizes monitored design values for other criteria pollutants in San Juan County.

Table 7. Criteria Pollutant Design Value Concentrations monitored in San Juan County

Pollutant	Design Value	Averaging Time	NAAQS	NMAAQS
NO_2	13 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 (3,4)	150 µg/m(3,4)
$PM_{2.5}$	4.5µg/m(3)	Annual	12 µg/m(3,5)	60 µg/m(3,4)
$PM_{2.5}$	14µg/m(3)	24-hour	35 µg/m(1,3)	--
SO_2	0.001ppm(7)	Annual	None	0.02 ppm
SO_2	20 ppb(8)	1-hour	75 ppb(6)	None
SO_2	0.008 ppm	24-hour	None	0.10 ppm

Source: EPA 2012
(1) 98th percentile, averaged over 3 years
(2) Not to be exceeded more than once per year
(3) 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
(7) ppm: parts per million
(8) ppb: parts per billion

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

Hazardous Air Pollutants

The Air Resources 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 (BLM 2013a). The EPA has identified 187 toxic air pollutants as HAPs. In March 2011, the EPA published the fourth in a series of National Scale Air Toxics Assessments (NATA) that quantifies HAP emissions for 2005 by U.S. county. The purpose of the NATA is to identify areas where HAP emissions result in high health risk. Computer models are used to develop estimates of risk of cancer or other health impacts. NATA presents risk hazard indexes for cancer, neurological problems, and respiratory problems for each county and census tract. Because techniques have changed over the years, each NATA is not comparable to those previously issued. The EPA 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 analysis estimated tract level total cancer risk for the analysis area as 25 to 50 per one million; the estimated tract level total respiratory hazard index was zero to 1. The EPA 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 semiarid 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 zero 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 8 shows climate normals for the 30-year period from 1981 to 2010 for the Farmington, New Mexico, area.

Table 8. Climate Normals for the Farmington Area, 1981-2010

Month	Average Temperature (°F*)	Average Maximum Temperature (°F)	Average Minimum Temperature (°F)	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: BLM 2013a; data collected at New Mexico State Agricultural Science Center - Farmington *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. 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, HAP, and GHG emissions to be compared to regional and national emissions levels. Also incorporated into this document are sections describing the assumptions used in developing the inputs for the calculator (BLM 2013a).

Direct and Indirect Impacts

Table 9 shows estimated emissions from one proposed horizontal oil well for criteria pollutants, volatile organic compounds (VOCs), and GHGs. For comparison, Table 10 shows total human-caused emissions for each of the counties in the BLM-FFO management area and La Plata County, Colorado, based on the EPA's 2008 emissions inventory (EPA 2011).

Table 9. Criteria Pollutant and VOC Emissions Estimated for Construction of One Horizontal Oil Well; Average 25 Days to Drill and Complete

Activity	NOx*	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

Activity	NOx*	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2
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/yr)								
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**
*nitrogen oxide								

Table 10. Analysis Area Emissions in Tons per 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**
Source: EPA 2008						

Oil storage tanks on the well locations may result in venting of VOCs. Oil well production is generally presented as barrels per day produced. The emissions calculator estimated that for every barrel per day produced there could be 0.12 tons of VOC vented per year. The average horizontal oil well in the BLM-FFO management 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 EPA regulations regarding the capture or flaring of VOC emissions.

Table 11 displays the percent increase in total emissions expected in the analysis area as a result of constructing and operating one horizontal oil well.

Table 11. Percent Increase in Analysis Area Emissions from the Proposed Action

	NO_X	CO	VOC	PM_{10} *	$PM_{2.5}$ *	SO_2 *
Total Emissions	57,303.4	147,078.1	160,079.0	218,800.3	23,897.3	13,343.3
Horizontal Oil Well Emissions	6.13	1.64	12.55(8)	2.54	0.29	0.11
Percent Increase	**0.01**	**0.001**	**0.009**	**0.001**	**0.001**	**0.0008**
*Values derived from average emissions for any well drilling in the analysis area. Calculated results available upon request.						

Hazardous Air Pollutants

The formulas used for calculating HAPs in the calculators are very imprecise. For many processes it is assumed that emission of HAPs will be equivalent to 10 percent of VOC emissions. Therefore, the estimated HAP emissions of 1.25 tons per 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 EPA 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 tons per year.

Total Greenhouse Gases

The available statewide GHG summary combines GHG emissions from CO_2 and CH_4 (NMED 2010). To compare the GHG emissions from the proposed action (estimated by the calculator) with statewide GHG emissions, equivalent CO_{2e} emissions for both CH_4 and CO_2 were summed. The total statewide GHG emission estimate for

2007 was 76,200,000 metric tons of 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. 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 reasonable development scenarios and reasonably foreseeable development scenarios for oil and gas wells on public lands in the BLM-FFO was presented in the RMP. This included modeling of impacts on air quality (BLM 2003b). A more detailed discussion of cumulative effects can be found in the Air Resources Technical Report (BLM 2013a).

The primary sources/activities that contribute to levels of air pollutants and GHG emissions in the Four Corners area are electricity-generation stations, fossil fuel industries, and vehicle travel. The Air Resources 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 (BLM 2013a). It includes a summary of emissions on the national and regional scale by industry source. Sources/activities 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 action 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 Earth's 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 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 (BLM 2013a). It is currently not feasible to know with certainty the net impacts from particular emissions associated with activities on public lands.

3.2. Soil Resources

3.2.1. Affected Environment

Soils in the San Juan Basin were formed primarily from two kinds of parent material: alluvial sediment and sedimentary rock. The alluvial sediment is material that was deposited in river valleys and on mesas, plateaus, and ancient river terraces. This material has been mixed and sorted in transport and has a wide range of mineralogy and particle size. The parent material of sedimentary rock consists mainly of sandstone and shale bedrock. These shale and resistant sandstone beds form prominent structural benches, buttes, and mesas bounded by cliffs.

The Natural Resources Conservation Service (NRCS) mapped the soils in the proposed project areas. Complete soil information is available in the NRCS's *Soil Survey of Sandoval County, New Mexico: Parts of Los Alamos, Sandoval, and Rio Arriba Counties*. Within the proposed project areas, two soil map units are present: Orlie-Sparham association (0- to 5-percent slopes) and Vessilla-Menefee-Orlie association (0- to 30-percent slopes; NRCS 2008).

Orlie-Sparham Association (0- to 5-Percent Slopes)

The Orlie-Sparham Association is found within the southwestern Lybrook G01 well pad/construction zone, western portion of the Lybrook G01 access road and pipeline corridor, northeastern Lybrook P03 well pad/construction zone, and majority of the Lybrook P03 pipeline corridor.

This association is composed of 45 percent Orlie and similar soils and 35 percent Sparham and similar soils. The parent material of this soil association primarily consists of stream alluvium and shale eolian deposits derived from sandstone and shale. This soil is considered a well-drained soil, with the depth to water table and restrictive layer being more than 80 inches. Available water capacity for the Orlie-Sparham association is high (approximately 9.5 to 10.1 inches). This soil type has a low potential for water erosion and high potential for wind erosion. This soil type is typically found along alluvial fans, hill, valley side, mesa, floodplains, and cuesta landscapes and gravelly loam and clay ecological sites (NRCS 2008).

Vessilla-Menefee-Orlie Association (0- to 30-Percent Slopes)

The Vessilla-Menefee-Orlie Association is found within the majority of the Lybrook G01 project area, entire Lybrook N02 project area, majority of the Lybrook P03 well pad/construction zone, entire Lybrook P03 access road, and southwestern and northeastern ends of the Lybrook P03 pipeline corridor.

This association is composed of 35 percent Vessilla and similar soils, 30 percent Menefee and similar soils, and 25 percent Orlie and similar soils. The parent material of this soil association primarily consists of eolian, colluvium, deposits derived from sandstone and shale. This soil is considered a well-drained soil, with the depth to water table being more than 80 inches and depth to restrictive layer ranging from 4 to more than 80 inches. Available water capacity for this soil association is very low to high (approximately 1.8 to 11.9 inches). This soil type has a high potential for water erosion and very high potential for wind erosion. This soil type is typically found along mesa, hill, break, ridge, mountainside, and cuesta landscapes and gravelly loam, piñon pine (*Pinus edulis*)-skunkbush sumac (*Rhus trilobata*)-blue grama (*Bouteloua gracilis*), and piñon pine-oneseed juniper (*Juniperus monosperma*)-Gambel oak (*Quercus gambelii*)-blue grama ecological sites (NRCS 2008).

3.2.2. Impacts from the Proposed Action

Direct and Indirect Impacts

New surface disturbance associated with the proposed projects would be approximately 21.4 acres. Of this, 4.6 acres would remain as bare, compacted surface for the life of the proposed projects. The remaining 16.8 acres would be reclaimed during interim reclamation.

Construction activities would result in the mixing, displacement, and compaction of soils within the proposed project areas. Soils within the proposed project areas are classified as having a high to very high potential for wind erosion and a low to high potential for water erosion (NRCS 2008). The removal of vegetation within the proposed project areas could result in increased soil erosion within and downstream of the proposed project areas. The degree of erosion would be dependent upon precipitation and wind. Following construction, the compaction of soils, reclamation of portions of the proposed project areas, and implementation of erosion-control measures would limit soil impacts due to erosion.

Cumulative Impacts

The spatial analysis area includes the proposed project areas (proposed well pads, access roads, and pipeline corridors) and points directly downstream of these areas. Currently, erosion within the spatial analysis area is caused by wind, sheet flow along hillslopes, and drainage within watercourses. This area is relatively undisturbed by direct vegetation removal. Direct soil disturbance within the spatial analysis area has occurred within the following locations:

- Along existing roads at the eastern end of the Lybrook G01 pipeline corridor, the eastern end of the Lybrook N02 access road/pipeline corridor, and along the majority of the Lybrook P03 pipeline corridor
- At Encana's Lybrook H01-2206 well pad at the start of the Lybrook G01 access road

These existing, unvegetated roads and well pads could be a source of erosion in the immediate area.

Within this area, the proposed projects would contribute to direct soil disturbance and could potentially increase soil erosion in the area and soil sedimentation downstream of the proposed project areas.

3.3. Groundwater Resources

3.3.1. Affected Environment

Lybrook G01

Within a 1-mile radius of the proposed Lybrook G01 well pad, there are no recorded water wells (New Mexico Office of the State Engineer 2011). Therefore, there is no depth-to-groundwater data available for this proposed project.

Lybrook N02 and Lybrook P03

Within a 1-mile radius of the proposed Lybrook N02 and Lybrook P03 well pads, there is one recorded water well. This water well is the SJ00681; there is no depth-to-groundwater data available for this well (New Mexico Office of the State Engineer 2011).

3.3.2. Impacts from the Proposed Action

Direct and Indirect Impacts

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 fracking (EPA 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 fracking is completed, a portion of the injected fracking fluids returns to the wellbore and is recovered for future fracking operations (EPA 2004) or disposal. Stimulation techniques have been used in the U.S. since 1949 and in the San Juan Basin since the 1950s. Over the last 10 years, advances in multi-stage and multi-zone fracking have allowed for the development of gas fields that previously were uneconomic, including the San Juan Basin.

Fracking is a common process in the San Juan Basin and applied to nearly all wells drilled. The producing zone targeted by the proposed project 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, which is located above both the Mancos Shale and Mesaverde formations. The Lewis Shale formation provides an impermeable layer that isolates the Mancos Shale and Mesaverde formations from both identified sources of drinking water and surface water. On average, the total depth of the proposed well bores would be about 5,000 feet below the ground surface. Fracking in the Basin Mancos formation is not expected to occur above depths of 4,000 feet below the ground surface. Fracking 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 relatively high levels of total dissolved solids. No impacts to surface water or freshwater-bearing groundwater aquifers are expected to occur from fracking of the proposed wells.

Cumulative Impacts

As no direct or indirect impacts to groundwater are anticipated as a result of the proposed projects, there would be no cumulative impacts.

3.4. Upland Vegetation

3.4.1. Affected Environment

The proposed project areas are located within the Arizona/New Mexico Plateau ecological region. This ecological region occurs primarily in Arizona, Colorado, and New Mexico; a small portion is located within Nevada. This ecological region encompasses approximately 45,870,500 acres (185,632 square kilometers), and the elevation ranges from 2,165 to 11,949 feet AMSL. The ecological region's landscapes include low mountains, hills, mesas, foothills, irregular plains, alkaline basins, some sand dunes, and wetlands. This ecological region is a large transitional region between the semiarid grasslands to the east; the drier shrublands and woodlands to the north; and the lower, hotter, less-vegetated areas to the west and south. Vegetation communities include shrublands with big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus* spp.), winterfat (*Krascheninnikovia lanata*), shadscale saltbush (*Atriplex confertifolia*), and greasewood (*Sarcobatus vermiculatus*); and grasslands of blue grama, western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), and needleandthread grass (*Hesperostipa comata)*. Higher elevations may support piñon pine and juniper (*Juniperus* spp.) woodlands. This ecological region includes the urban areas of Santa Fe and Albuquerque, New Mexico. Important land uses within this ecological region include irrigated farming, recreation, rangeland, wildlife habitat, and some natural gas production (Griffith, et al. 2006).

Within the proposed project areas, the vegetation communities include sagebrush shrubland and open piñon-juniper woodlands.

Within sagebrush shrublands, the dominant species are big sagebrush, broom snakeweed (*Gutierrezia sarothrae*), galleta (*Pleuraphis jamesii*), and blue grama. Additional species include piñon pine, oneseed juniper, Gambel oak, longflower rabbitbrush (*Chrysothamnus depressus*), scarlet hedgehog cactus (*Echinocereus coccineus*), spinystar (*Escobaria vivipara*), banana yucca (*Yucca baccata*), rubber rabbitbrush (*Ericameria nauseosa*), hairy false goldenaster (*Heterotheca villosa*), Russian thistle (*Salsola tragus*), rock goldenrod (*Petradoria pumila*), cryptantha (*Cryptantha* sp.), nodding buckwheat (*Eriogonum cerneum*), Indian ricegrass (*Achnatherum hymenoides*), purple threeawn (*Aristida purpurea*), and plains pricklypear (*Opuntia polyacantha*).

Within open piñon-juniper woodlands, the dominant species are piñon pine, oneseed juniper, big sagebrush, and blue grama. Additional species include wolfberry (*Lycium* sp.), rabbitbrush, broom snakeweed, hairy false goldenaster, leastdaisy (*Chaetopappa* sp.), daisy (*Hymenopappus* sp.), ragwort (*Senecio* sp.), galleta, purple threeawn, dropseed (*Sporobolus* sp.), plains pricklypear, and spectaclepod (*Dimorphocarpa* sp.).

The proposed project areas are described in detail below.

Lybrook G01

The vegetation community within the proposed Lybrook G01 project area is open piñon-juniper woodland. There are approximately 125 to 150 trees (90 percent mature, 5 percent juvenile, 5 percent standing dead) within the proposed project area. The big sagebrush within the proposed project area has been treated and a large percentage of the sagebrush is dead. Ground cover within the proposed project area is approximately 50 to 60 percent.

Lybrook N02

The vegetation community within the proposed Lybrook N02 project area is sagebrush shrubland with scattered oneseed juniper and piñon pine trees. There are 100 to 150 trees (80 percent mature, 15 percent juvenile, 5 percent standing dead) within the proposed project area. Ground cover within the proposed project area is approximately 60 to 70 percent.

Lybrook P03

The vegetation community within the proposed Lybrook P03 project area is sagebrush shrubland with scattered oneseed juniper and piñon pine trees. There are approximately 25 trees (10 percent mature and 90 percent juvenile) within the proposed project area. The big sagebrush within the proposed project area has been treated

and a large percentage of the sagebrush is dead. Ground cover within the proposed project area is approximately 60 to 70 percent.

In addition, approximately 1,787 feet of the proposed pipeline corridor would travel parallel and adjacent to the existing Indian Service Route 474, which is devoid of vegetation.

3.4.2. Impacts from the Proposed Action

Direct and Indirect Impacts

During the construction phase of the proposed project, all vegetation within the 21.4 acres associated with the proposed project areas would be cleared. This would include the removal of 250 to 325 trees. During interim reclamation, approximately 16.8 acres of the proposed project areas would be reclaimed. The remaining 4.6 acres would remain as compacted, barren surface for the life of the proposed wells. During final reclamation, Encana would reclaim all portions of the proposed project areas that were not reclaimed during interim reclamation.

During interim and final reclamation, the BLM Piñon-Juniper Community Seed Mixture would be utilized for the proposed Lybrook G01 project area and the BLM Sagebrush/Grass Community Seed Mixture would be utilized (unless the State requests otherwise) for the proposed Lybrook N02 and Lybrook P03 project areas. Re-established vegetation would consist of native grass, forb, and shrub species included in the seed mixture, as well as native species that are not deliberately planted. It is also possible that invasive, non-native species could become established within the proposed project areas, as such species could be transported by project equipment and tend to thrive in disturbed areas. Following the reclamation process, the resulting vegetation community could differ from the native plant community surrounding the proposed project areas. Within reclaimed areas, it is not expected that the vegetation community would return to native conditions within 20 years (BLM 2003a, 4-18).

The deposition of fugitive dust generated during vegetation-clearing activities, during the use of the proposed well pads and access roads, and during wind events could reduce photosynthesis and productivity of the surrounding vegetation (Thompson, et al. 1984; Hirano, et al. 1995), increase water loss in plants near the proposed project areas (Eveling and Bataille 1984), and result in injury to leaves of surrounding vegetation.

Cumulative Impacts

The spatial analysis area includes the proposed project areas and immediately adjacent lands. The existing disturbances within this spatial analysis area include the following:

- There is an existing access road located at the end of the proposed Lybrook G01 pipeline corridor.
- Encana's Lybrook H01-2206 well pad is located at the start of the proposed Lybrook G01 access road.
- There is an existing access road located at the eastern end of the proposed Lybrook N02 access road/ pipeline corridor.
- Indian Service Route 474 is located immediately east of the proposed Lybrook P03 well pad/construction zone, at the start of the proposed Lybrook P03 access road, and along the majority of the proposed Lybrook P03 pipeline corridor.
- Active wildlife and livestock grazing occurs in the spatial analysis area. The spatial analysis area is within a grazing allotment (Venado, Allotment No. 5112), which is permitted for year-round grazing by 79 head of cattle.

Aside from the proposed projects, no reasonably foreseeable disturbances are anticipated within the spatial analysis area.

Indirectly, fugitive dust or deposition associated with existing and proposed roads and well pads in the immediate area could impact the vegetation within the spatial analysis area, and could continue to do so throughout the life of the proposed projects. The proposed projects would contribute to direct vegetation disturbance and fugitive dust and/or deposition within the spatial analysis area.

3.5. Noxious Weeds and Invasive Species

3.5.1. Affected Environment

Management of noxious weeds and invasive plant species is mandated under several pieces of legislation, including the Lacey Act, as amended (16 USC 3371-3378); the Federal Noxious Weed Act of 1974, as amended (7 USC 2801 et seq.); the New Mexico Noxious Weed Management Act of 1998; and Executive Order (EO) 13112 regarding Invasive Species. Under EO 13112, Federal agencies are ordered not to authorize or carry out actions that would cause or promote the introduction of invasive species.

In the San Juan Basin, noxious weeds and invasive species are frequently found in areas that have been disturbed by surface activities. A mission of the BLM-FFO is to detect new noxious weeds and invasive plant species populations, prevent the spread of these new populations, manage existing populations, and eradicate these populations. This is to be accomplished in a timely manner, using the safest environmental methods available. For all actions on BLM-FFO lands that involve surface disturbance or reclamation, reasonable steps are required to prevent the introduction or spread of noxious weeds and invasive species (BLM 2003a, 3-34 – 3-35).

The U.S. Department of Agriculture (USDA) has designated certain plants as federally listed noxious weeds (NRCS 2010). The New Mexico Department of Agriculture (NMDA) has designated certain plants as State-listed noxious weeds (NMDA 2009). A total of 212 invasive and poisonous weed species have been identified on BLM-FFO lands. The PRMP/FEIS lists the invasive, non-native plant species of concern in the BLM-FFO area (BLM 2003a, 3-34 – 3-35). During the site survey of the proposed project areas, no USDA-, NMDA-, or BLM-FFO-listed noxious weeds or invasive species were identified within the proposed project areas.

3.5.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Noxious weeds and invasive species are generally tolerant of disturbed conditions, and disturbed soils within the proposed project areas may provide an opportunity for the introduction and establishment of noxious weeds and invasive species. Seeds or other propagules of noxious weeds and invasive species may be transported to a the proposed project areas from infested areas by heavy equipment or other vehicles that are used at the proposed project areas. Noxious weeds and invasive species may also spread from established populations near the proposed project areas and colonize soils disturbed by proposed project activities. The longer time periods required for the re-establishment of plant communities in arid regions may create an increased potential for the establishment and spread of noxious weeds and invasive species. Noxious weeds and invasive species typically develop high population densities and tend to exclude most other plant species, thereby reducing species diversity and potentially resulting in long-term effects. The establishment of noxious weeds and invasive species may greatly reduce the success of native plant community restoration efforts in the proposed project areas and create a source of future colonization and degradation of adjacent undisturbed areas.

The establishment of invasive species, particularly annual grasses, such as cheatgrass (*Bromus tectorum*), which produce large amounts of easily ignitable fuel over large contiguous areas, may also alter fire regimes. This situation may result in an increase in the frequency and intensity of wildfires, and in some areas, such as in some desert-scrub communities, a fire regime may be created where none was present before. In plant communities that are not adapted to frequent or intense fires, native species, particularly shrubs and trees, may be adversely affected, and their populations may be greatly reduced, creating opportunities for greater increases in noxious weeds and invasive species populations (Brooks and Pyke 2001). Increases in fire frequency or severity may thus result in a reduction of biodiversity and may promote the conversion of some habitats (e.g., forest, shrubland, or shrub-steppe) to other types, prolonging or preventing the development of mature native habitats (BLM and U.S. Department of Energy 2010).

Cumulative Impacts

The spatial analysis area includes the proposed project areas and immediately adjacent lands. Within the spatial analysis area, there is existing disturbance. This disturbance is described in detail in Section 3.4.2 (Upland Vegetation – Impacts from the Proposed Action – Cumulative Impacts).

The proposed projects would contribute to surface disturbance and ongoing activity within the spatial analysis area, and thus potentially contribute to the introduction/spread of noxious weeds and invasive species within the spatial analysis area.

3.6. Wildlife

3.6.1. Affected Environment

General Wildlife

The vegetation communities found within the proposed project areas provide habitat for a variety of vertebrate and invertebrate species. The objectives of the BLM wildlife management program are to "ensure optimum populations and a natural abundance and diversity of fish and wildlife values by restoring, maintaining, and enhancing habitat conditions for consumptive and non-consumptive uses" (BLM 2003a, 2-24). The significance of the general region to the overall Lybrook/Upper Largo ecosystem is that it represents a metapopulation with respect to mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*).

No prairie dog colonies have been recorded by the BLM-FFO within or adjacent to the proposed project areas (BLM 2012b); the closest recorded colony is approximately 15 miles south-southwest of the proposed project areas. No sign of prairie dogs was observed during the site surveys.

Lybrook G01

The following terrestrial wildlife species and/or sign were observed/heard during the proposed Lybrook G01 site survey:

- coyote (*Canis latrans*), tracks
- desert cottontail (*Sylvilagus audubonii*), droppings and skeleton
- mule deer, tracks and droppings
- ant (species unknown) mounds

Lybrook N02 and Lybrook P03

The following terrestrial wildlife species and/or sign were observed/heard during the two site surveys of the proposed Lybrook N02and Lybrook P03 project areas:

- fox (*Vulpes* sp.), droppings
- mule deer, droppings and tracks
- desert cottontail, droppings and tracks
- rodent (species unknown), burrows

Migratory Birds

EO 13186, dated January 17, 2001, calls for increased efforts to more fully implement the Migratory Bird Treaty Act of 1918. In keeping with this mandate, the BLM-FFO has issued an interim policy to minimize unintentional take, as defined by the EO, and to better optimize migratory bird efforts related to BLM-FFO activities. In keeping with this policy, a list of priority birds of conservation concern which occur in ecological regions similar to the proposed project area was compiled through a review of existing bird conservation plans, including the following:

- USFWS Birds of Conservation Concern
- New Mexico Partners in Flight New Mexico Bird Conservation Plan
- Comprehensive Wildlife Conservation Strategy for New Mexico
- Gray Vireo Recovery Plan
- The North American Waterbird Conservation Plan
- Recovery plans and conservation plans/strategies prepared for federally listed candidate species

The selected species have a known distribution in the BLM-FFO area and may be affected by various types of perturbations. These species with the potential to occur in the proposed project areas and a brief description of their habitat are provided in the table below.

Table 12. Migratory Birds with Potential to Occur in the Project Areas

Species Name	Habitat Associations
Bendire's thrasher (*Toxostoma bendirei*)	On the Colorado Plateau, inhabits open sagebrush with scattered junipers; sparse or degraded understory, lower elevations. Avoids riparian areas and arroyos with dense shrub cover
Brewer's sparrow (*Spizella breweri*)	Closely associated with sagebrush, preferring dense stands broken up with grassy areas.
Gray vireo (*Vireo vicinior*)	In northern NM, stands of piñon pine and Utah juniper 5800 – 7200 feet AMSL open with a shrub component and mostly bare ground; antelope bitterbrush, mountain mahogany, Utah serviceberry and big sagebrush often present. Broad, flat or gently sloped canyons, in areas with rock outcroppings, or near ridge-tops.
Loggerhead shrike (*Lanius ludovicianus*)	Open country interspersed with improved pastures, grasslands, and hayfields. Nests in sagebrush areas, desert scrub, and woodland edges.
Mountain bluebird (*Sialia currucoides*)	Open piñon-juniper woodlands, mountain meadows, and sagebrush shrublands; requires larger trees and snags for cavity nesting.
Mourning dove (*Zenaida macroura*)	Open country, scattered trees, and woodland edges. Feeds on ground in grasslands and agricultural fields. Roost in woodlands in the winter. Nests in trees or on ground.
Sage thrasher (*Oreoscoptes montanus*)	Shrub-steppe dominated by big sagebrush.
Swainson's hawk (*Buteo swainsoni*)	A mixture of grassland, cropland, and shrub vegetation; nests on utility poles and in isolated trees in rangeland. Nest densities higher in agricultural areas.
Vesper sparrow (*Pooecetes gramineus*)	Dry montane meadows, grasslands, prairie, and sagebrush steppe with grass component; nests on ground at base of grass clumps.

Based on habitat and range, the potential exists for numerous migratory birds to occur within the proposed project areas.

Lybrook G01

The following species were observed/heard during the proposed Lybrook G01 site survey:

- common raven (*Corvus corax*)
- juniper titmouse (*Baeolophus ridgwayi*)
- pinyon jay (*Gymnorhinus cyanocephalus*)
- Townsend's solitaire (*Myadestes townsendi*)

Lybrook N02

No bird species were identified during the proposed Lybrook N02 site survey.

Lybrook P03

A common raven was observed during the proposed Lybrook P03 site survey.

3.6.2. Impacts from the Proposed Action

Direct and Indirect Impacts

There is available, similar habitat in the region surrounding the proposed project areas that wildlife could utilize. However, the clearing of vegetation and the transformation of the proposed project areas to a reseed community would remove potential habitat and result in habitat fragmentation for numerous wildlife species, including priority bird species.

During the construction phase of the proposed projects, all vegetation, including 250 to 325 trees, within the 21.4 acres associated with the proposed project areas would be cleared. Approximately 4.6 acres would remain barren of vegetation for the long term. Reclaimed portions of the proposed project areas would be converted to a reseed community following interim reclamation and final reclamation. The impacts to the vegetation communities are described in detail in Section 3.4 (Upland Vegetation). If interim and final reclamation are successful, a sagebrush shrubland and open piñon-juniper woodland community would become re-established within the proposed project areas. However, as discussed in Section 3.4, the re-establishment of a mature, native plant community could require decades, and it is possible that the plant community could never fully recover from disturbance (BLM 2003a, 4-18).

Habitat loss and fragmentation likely reduce the carrying capacity for wildlife, although the exact level of reduction cannot be quantified (BLM 2003a, 4-26 – 4-27). Fragmentation would result from construction within areas that are not adjacent to existing surface disturbance. There would be approximately 6,086 linear feet (1.2 miles) of initial habitat fragmentation resulting from the proposed project; this fragmentation would exist until interim reclamation is deemed successful. Initial habitat fragmentation would result from the following:

- Proposed Lybrook G01 project features
    - Access road: 946 feet
    - Well pad/construction zone: 530 feet (along longest side)
    - Pipeline corridor: 1,260 feet
- Proposed Lybrook N02 project features
    - Access road: 48 feet
    - Well pad/construction zone: 530 feet (along longest side)
    - Pipeline corridor: 106 feet
- Proposed Lybrook P03 project features
    - Access road: 183 feet
    - Well pad/construction zone: 530 feet (along longest side)
    - Pipeline corridor: 1,953 feet

For the long term, the proposed access roads and the working areas of the proposed well pads (250 feet along longest sides) would result in 1,927 linear feet (0.4 mile) of long-term habitat fragmentation.

For the long term, occasional human and vehicle presence within the vicinity of the proposed project areas would increase above present levels. Additional well equipment could also cause increased noise levels in the vicinity. Audial and visual disturbances associated with the proposed projects could cause indirect habitat loss by deterring wildlife from using available habitat adjacent to the proposed project areas.

General Wildlife

It is possible that burrowing animals could be killed or injured during the construction phase of the proposed projects, as equipment digs into the earth and rolls over the surface of the ground.

During the construction phase of the proposed pipeline ties, terrestrial wildlife could fall into the open pipeline trenches and be injured, stressed, or killed. The presence of open trenches could also disrupt normal wildlife movements to and from water and/or food sources. Wildlife could have to skirt the open-trench portions of the proposed pipeline corridors to access water and/or food. This disruption could stress wildlife and result in the loss of valuable energy resources. As discussed in Section 2.1.2 (Description of Proposed Project – Protection of Flora and Fauna, Including SSS and Livestock), design features and BMPs would be implemented during the construction phase of the proposed pipeline ties to assist in the prevention of injury, stress, or death of wildlife.

Migratory Birds

Due to the mobility of adult birds, they would be unlikely to be directly harmed by the proposed projects. If the vegetation-clearing phase of construction for any of the proposed projects is scheduled to occur during migratory bird breeding season, a pre-construction nest survey would take place, as discussed in Section 2.1.2 (Description of Proposed Project – Protection of Flora and Fauna, Including SSS and Livestock). Therefore, it is unlikely that

any nests, eggs, or young birds would be directly harmed by the proposed projects. Birds nesting outside of but near the proposed project areas could abandon existing nests as a result of visual and audial disturbances.

It is difficult to predict the effects of the proposed projects on migratory birds. The increased activity, noise, and disturbed vegetation associated with the proposed projects could result in the increased usage of the immediate area by some migratory bird species, while decreasing usage by other species. Studies have shown mixed impacts of oil and gas development on nesting migratory birds. According to a study by Ortega and Francis (2007), the presence of oil and gas compressors affected bird species differently; however, there was no difference in overall nest density on plots with and without compressors. A study by Holmes and King (2006) found that the sage sparrow had lower nest survival in an area with ongoing gas development; however, the Brewer's sparrow had higher nest survival rates in a developed gas field when compared with populations in an undeveloped control area.

Cumulative Impacts

The spatial analysis area for wildlife includes the proposed project areas and an approximately two-mile radius around the proposed project areas. Within the spatial analysis area, there is existing and proposed disturbance, and the region has been fragmented. Existing and reasonably foreseeable future disturbance within the spatial analysis area includes the following:

- 12 new or active oil and/or gas wells and associated well pads
- 8 inactive oil and/or gas wells and associated well pads (some reclaimed)
- 8 proposed oil and/or gas well pads and associated roads and utility corridors
- Approximately 7 miles of existing Indian Service Roads/Routes (including Indian Service Road/Routes 474, 46, and 471)
- Approximately 59 miles of unnamed existing roads
- Numerous existing and proposed utility ROWs
- Active wildlife and livestock grazing; the spatial analysis area is within grazing allotments Gallo Canyon (Allotment No. 5124, permitted for year-round grazing by 13 head of cattle), Venado (Allotment No. 5112, permitted for year-roudn grazing by 79 head of cattle), and Counselor Community (Allotment No. 6015, permitted for year-round grazing by 2435 head of livestock [146 cattle, 2 horses, and 2287 sheep])

Habitat disturbance and fragmentation in the spatial analysis area is primarily the result of oil and gas development (including well pads, access roads, and pipeline corridors). The direct and indirect habitat disturbance, fragmentation, and human activities associated with these disturbances could deter wildlife from utilizing portions of the spatial analysis area. The proposed action would contribute to direct and indirect habitat disturbance and fragmentation in the spatial analysis area.

3.7. Special Status Species

3.7.1. Affected Environment

The BLM manages certain species which are not federally listed as threatened or endangered in order to prevent or reduce the need to list them as threatened or endangered in the future. BLM SSS include BLM Sensitive Species and BLM-FFO Special Management Species (SMS).

New Mexico BLM State Directors have developed a list of BLM Sensitive Species for the State (BLM 2011a, BLM 2011b, BLM 2011c, BLM 2012a). In accordance with BLM Manual 6840, the BLM-FFO has prepared a list of BLM-FFO SMS to focus species management efforts toward maintaining habitats under a multiple-use mandate (BLM 2008a, BLM 2008c). BLM-FFO SMS include some BLM Sensitive Species and other species for which the BLM-FFO has determined special management is appropriate (BLM 2008c). The authority for this policy and guidance is

established by the ESA; Title II of the Sikes Act, as amended (16 USC 670a-670o, 74 Stat. 1052); FLPMA; and Department of Interior Manual 235.1.1A.

Based on known range and habitat, four BLM SSS have the potential to occur within the proposed project areas. These species with the potential to occur in the proposed project areas and a brief description of their habitat are provided in the table below.

Table 13. BLM SSS with Potential to Occur within BLM-FFO

Species	Status	Occurrence Within Region	Habitat
Bendire's thrasher (*Toxostoma bendirei*)	Sensitive	Summer range (Sibley 2000). Known to occur within BLM-FFO (BLM 2011a).	Sparse desert shrublands, degraded grasslands, and open woodlands with scattered shrubs. On the Colorado Plateau, open sagebrush shrublands with scattered junipers. Avoids riparian areas and arroyos with dense shrub cover (NMPIF 2007).
Ferruginous hawk (*Buteo regalis*)	Sensitive & SMS	Year-round range (NMPIF 2007). Known to nest in BLM-FFO (BLM 2012c).	Open areas with broad expanses of prairie grassland or shrub-steppe vegetation, areas with low to moderate agricultural coverage, transitional edges between grasslands and piñon-juniper woodlands, sagebrush shrublands, and desert scrub (NMPIF 2007, NatureServe 2012). Nests in elevated locations on the ground (if in grasslands), in isolated tree stands, on rock outcrops/spires, or on utility poles (NMPIF 2007).
Golden eagle (*Aquila chrysaetos*)	SMS	Year-round range (Sibley 2000). Known to nest in BLM-FFO (BLM 2012c).	Open to semi-open country with elevated perches, including grasslands, prairies, open woodlands, shrublands, and barren areas. Prefers hilly or montane regions. Nests on rock ledges on cliffs or in large trees (NatureServe 2012, NMPIF 2007, Wheeler 2003).
Pinyon jay (*Gymnorhinus cyanocephalus*)	Sensitive	Year-round range (Sibley 2000). Known to occur within BLM-FFO (BLM 2011a).	Piñon-juniper woodlands. Occasionally areas dominated by ponderosa pine, sagebrush, or chaparral (NMPIF 2007).

Bendire's Thrasher

There is potential foraging and nesting habitat for Bendire's thrashers within and adjacent to the proposed Lybrook G01, Lybrook N02, and Lybrook P03 project areas. No Bendire's thrashers were observed during the site surveys of the proposed project areas.

Pinyon Jay

Pinyon jays were observed during the site survey of the proposed Lybrook G01 project area. Within and adjacent to this proposed project area there is potential foraging and nesting habitat for pinyon jays.

There is potential pinyon jay nesting habitat adjacent to, but not within, the proposed Lybrook N02 and Lybrook P03 project areas. However, there is potential foraging habitat within and adjacent to these two proposed project areas.

Ferruginous Hawk and Golden Eagle

There is potential ferruginous hawk and golden eagle foraging habitat within and adjacent to the proposed Lybrook G01, Lybrook N02, and Lybrook P03 project areas. There is no suitable nesting habitat within or adjacent to the proposed project areas; the closest raptor nest to the proposed projects is approximately eight miles to the north (BLM 2012c).

No ferruginous hawks or golden eagles were observed during the site surveys of the proposed project areas.

3.7.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Bendire's Thrasher and Pinyon Jay

Impacts to Bendire's thrashers and pinyon jays would be similar to those described for migratory birds (Section 3.6.2 [Wildlife– Impacts from the Proposed Action – Migratory Birds]).

Ferruginous Hawk and Golden Eagle

Due to the mobility of adult raptors and the lack of appropriate nesting sites for these raptors in the vicinity of the proposed project areas, it is unlikely that these raptors would be directly harmed by activities associated with the proposed projects.

The clearing of vegetation would result in the removal of foraging habitat and the creation of habitat fragmentation for raptors. In addition, audial and visual disturbances associated with the proposed projects could cause indirect habitat loss. Habitat loss and fragmentation are described in detail in Section 3.6.2 (Wildlife – Impacts from the Proposed Action - Direct and Indirect Impacts).

Cumulative Impacts

The spatial analysis area for wildlife SSS includes the proposed project areas and an approximately two-mile radius around the proposed project areas. Within the spatial analysis area, there is existing disturbance and reasonably foreseeable future disturbance is anticipated. This disturbance is described in detail in Section 3.6.2 (Wildlife – Impacts from the Proposed Action – Cumulative Impacts). Habitat disturbance in the area is primarily the result of oil and gas development (including well pads, access roads, and pipeline corridors).

Cumulative impacts to these wildlife SSS would be similar to those described for wildlife (Section 3.6.2 [Wildlife - Impacts from the Proposed Action – Cumulative Impacts]).

3.8. Cultural Resources

3.8.1. Affected Environment

The proposed project areas are located within the archaeologically rich San Juan Basin of northwestern New Mexico. In general, the history of the San Juan Basin can be divided into five major periods: PaleoIndian (circa [ca.] 10000 B.C. to 5500 B.C.); Archaic (ca. 5500 B.C. to A.D. 400); Basketmaker II-III and Pueblo I-IV (aka Anasazi; A.D. 1-1540); and historic (A.D. 1540 to present), which includes Native American as well as later Hispanic and Euro-American settlers. Detailed descriptions of these various periods are provided in the BLM-FFO PRMP/FEIS (BLM 2003a, pp. 3-65 – 3-84) and will not be reiterated here. Additional information can also be found in an associated documented, the Cultural Resources Technical Report (Science Applications International Corporation 2002).

Cultural sites vary considerably, and can include but are not limited to simple artifact scatters, domiciles of various types with a myriad of associated features, rock art and inscriptions, ceremonial/religious features, and roads and trails.

The entire Area of Potential Effect (APE) for the proposed action was archaeologically surveyed by LAC at a BLM Class III (100-percent) level. The archaeological 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* (BLM 2005).

For the proposed action, identification efforts for Native American Religious Concerns were limited to a review of existing published and unpublished literature (e.g., Van Valkenburgh 1941, 1974; Brugge 1993; Kelly, et al. 2006), development of the site-specific Class III survey reports prepared for the proposed action (LAC 2014a, 2014b, 2014c), and a review by the BLM's cultural resources program regarding the presence of TCPs identified through ongoing BLM tribal consultation efforts.

Lybrook G01

The Class III inventory identified no cultural sites within the APE (LAC Report 2012-1yyy [2014a], BLM Report 2014[II]030F). No TCPs are known to exist in the APE.

Lybrook N02

The Class III inventory identified one cultural site within the APE. The cultural site is recommended as eligible for nomination to the NRHP (LAC Report 2013-7ee [2014b]; BLM 2014(III)011F). No TCPs are known to exist within or adjacent to the APE.

Lybrook P03

The Class III inventory identified no cultural sites within the APE (LAC Report 2012-1xxx [2014c], BLM Report 2014[II]034F). A reported TCP, Sis Naateel (Sisnathyelo Mesa, Wide Belt Mesa), is located adjacent to the western portion of the Lybrook P03 APE.

The Sis Naateel (Sisnathyel Mesa, Wide Belt Mesa), is a TCP that is reported to be the home to holy beings important in Blessingway and the location where the Navajo acquired sheep and horses. There is some ambiguity on the identification of this mesa. It is clearly described by Van Valkenburgh (1941:171) as a "*large quasi-rectangular mesa standing isolated in the southwestern township of the Jicarilla Apache Indian reservation… 10 miles east of Counselors trading post*." See also Van Valkenburgh (1974:32-37). Brugge (1993:18) encountered the problems of Navajo toponymy and correlating names recorded on recent USGS maps. Brugge (1993:18) went on to state that "*the work of Van Valkenburgh has been of value. His descriptions are usually more detailed than those of other students of Navajo culture…"* The mesa shown on the current USGS map as Sisnathyel Mesa does not seem to conform to Van Valkenburgh's description. It is not expected that the proposed action, located along a major county road would 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 (AIRFA; 42 USC 1996) or EO 13007.

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 of or other alteration to cultural sites in the area.

Significant cultural sites (e.g., sites eligible for the NRHP) would be avoided with the implementation of design features such as, but not limited to, reduction of construction areas, installation of temporary barriers, and site monitoring. These design features are detailed in the Cultural Resource Record of Review, attached to the COAs

in the approved APDs and ROW Grants. The proposed action would not be expected to physically threaten any TCPs, prevent access to sacred sites, prevent the possession of sacred objects, or interfere with or otherwise hinder the performance of traditional ceremonies/rituals pursuant to the AIRFA (42 USC 1996), EO 13007, or the NAGPRA (25 USC 3001). The proposed action would have no direct or indirect impact on significant cultural sites.

Cumulative Impacts

There would be 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 survey.

3.9. Visual Resources

3.9.1. Affected Environment

The BLM classifies visual resources through a Visual Resource Inventory (VRI). The VRI has three components: scenic quality, sensitivity, and distance zone.

Scenic quality is a measurement of the visual appeal of a tract of land. In the VRI process, BLM-managed lands are given an A, B, or C rating based on the apparent scenic quality. Scenic quality is determined by using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification. Areas with the most visual appeal are rated A, while areas with the least visual appeal are rated C. The proposed project areas are within the Sisnathyel No. 30 area, which is rated C for scenic quality. The Sisnathyel No. 30 area contains a band of badland landscape in the middle of a large, open complex of rolling hills and dry drainages. The low buttes and mesas of the badlands add diagonal lines to the otherwise horizontal landscape. Scattered clusters of piñon/juniper add greens and grays to the browns, reds, whites, and yellows of the soils.

Sensitivity is a measure of the public concern for scenic quality. During the sensitivity rating, public lands are assigned high, medium, or low sensitivity by analyzing six indicators of public concern: type of user, amount of use, public interest, adjacent land uses, special areas, and other factors. The proposed project areas are within an area rated “medium” for sensitivity.

The distance zone analysis is conducted to determine the relative visibility from travel points or observation points. The distance zone for the analysis area is foreground/middleground, meaning the analysis area can be seen from travel routes or observation points within a distance of 3 to 5 miles. The distance zone analysis indicates activities and development may be able to be viewed in detail. This distance analysis resulted in the analysis area in which the proposed project areas are located being assigned a VRI Class 4.

Visual resources are managed by assigning a Visual Resource Management (VRM) Class. The objective for each VRM Class describes how that area should be managed. The proposed project areas are within a VRM Class III/IV. The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the landscape can be moderate and should repeat the basic elements found in the natural landscape. Management activities may attract attention, but should not dominate the view of the casual observer. The VRM Class IV is to provide for activities that require major modification of the landscape. The level of change to the landscape can be high, and management activities may dominate the view and be the major focus of attention (BLM 2003a, 2-8).

3.9.2. Impacts from the Proposed Action

Direct and Indirect Impacts

During the construction phase of the proposed projects, all vegetation, including 250 to 325 trees, within the 21.4 acres associated with the proposed project areas would be cleared. Approximately 4.6 acres would remain barren of vegetation for the long term. Reclaimed portions of the proposed project areas would be converted to a reseed community following interim reclamation and final reclamation. The impacts to the vegetation communities are described in detail in Section 3.4 (Upland Vegetation). If interim and final reclamation are successful, a sagebrush shrubland and open piñon-juniper woodland community would become re-established within the proposed project areas. However, as discussed in Section 3.4, the re-establishment of a mature, native plant community could

require decades, and it is possible that the plant community could never fully recover from disturbance (BLM 2003a, 4-18).

The conversion of approximately 4.6 acres of the proposed project areas to barren surface and approximately 16.8 acres of the proposed project areas to a reseed community would result in an alteration in the texture and color of the ground and a reduction in the roughness and complexity of the surface. Additionally, the proposed well facilities would be visible on the proposed well pads, creating possible color contrasts, a change in the texture of the landscape due to the smooth surface of tanks, and a break in the horizontal landscape plane.

The proposed projects are congruent with viewer expectation, as the proposed wells and facilities would be located in an area known for oil and gas production. Proposed project activities could attract attention but would not dominate the view of the casual observer. The proposed wells and associated facilities would not be visible from designated recreation areas, residences, commercial areas, or major roads. The C scenic quality rating, the medium sensitivity rating, VRI Class 4 rating, and VRM Class III/IV criteria would be met.

Cumulative Impacts

The spatial analysis area for visual resources includes the proposed project areas and an approximately two-mile radius around the proposed project areas. Within the spatial analysis area, there is existing disturbance. This disturbance is described in detail in Section 3.6.2 (Wildlife – Impacts from the Proposed Action – Cumulative Impacts). Visual resource disturbances in the area are primarily the result of oil and gas development (including well pads, access roads, and pipeline corridors).

The proposed projects would contribute to the cumulative visual resources impacts within the spatial analysis area.

3.10. Transportation

3.10.1. Affected Environment

Within the BLM-FFO, there are approximately 15,000 miles of roads. Most of the roads are unpaved and provide access to resources on Federal lands, predominantly oil and gas facilities. In areas with a high level of oil and gas development, there are approximately 4 miles of roads per square mile. In areas outside of oil and gas development areas, there are approximately 1 mile of roads per square mile. The major roads within the BLM-FFO are U.S. Highways 550, 64, and 491 and State Highways 96, 170,173, 371, 511, 537, 544, 574, and 595 (BLM 2003a, 3-57 – 3-58).

The county roads within the BLM-FFO have been categorized (BLM 2003a, 3-58):

- Full county-maintained: maintained at best level possible with resources available
- Lesser county-maintained: bladed twice a year
- Unmaintained roads

There are existing roads within the general vicinity of the proposed project areas; these are listed below.

The government entity that owns a road is responsible for maintenance (BLM 2003a, 3-58). During the onsite meetings, neither the BLM-FFO nor the State assigned Encana any existing roads for upgrading.

Lybrook G01

There is an existing, unnamed road located at the end of the proposed Lybrook G01 pipeline corridor.

Lybrook N02

There is an existing, unnamed road located at the eastern end of the proposed Lybrook N02 access road/ pipeline corridor.

Lybrook P03

Indian Service Route 474 is located immediately east of the proposed Lybrook P03 well pad/construction zone, at the start of the proposed Lybrook P03 access road, and along the majority of the proposed Lybrook P03 pipeline corridor.

3.10.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Approximately 1,177 feet of new access roads would be constructed for the proposed projects. The 30-foot-wide workspace (0.8 acre) associated with the proposed access roads would include a 14-foot-wide running surface (0.4 acre) with adequate crowning. The proposed access roads would be designed and constructed as resource roads in accordance with *The Gold Book* (BLM and USFS 2007). If the wells associated with the proposed access roads are commercially viable, Encana would upgrade the proposed access roads, as necessary, to accommodate year-round traffic and meet all-weather standards.

During all proposed project phases, vehicles would use proposed access roads, as well as developed BLM roads and highways in the region. Traffic would include light vehicles (such as cars and pick-up trucks) and heavy vehicles (such as water trucks and large tractor-trailers hauling equipment), as described in Section 2.1.2 (Description of Proposed Projects – Proposed Project Phases).

During all proposed project phases, the proposed projects would result in increased traffic on area roads; therefore, there would be an increased potential for traffic accidents. The table below lists the average traffic estimates (i.e., number of days, total number of round trips, and average daily round trips) that would occur during the proposed construction, drilling, completion, flow testing, pipeline tie construction, and reclamation phases associated with an Encana oil and gas well project. Depending on the variability of a project, traffic levels could vary from the averages provided in the table below. The traffic estimates would likely increase during mobilization/demobilization phases, which would include the movement of equipment, tanks, pipes, sand, and other materials in/out of a project well pad area using heavy vehicles. The traffic estimates provided for access road construction, pipeline tie construction, and reclamation would not likely increase.

Table 14. Average Traffic Estimates Associated with an Encana Oil and Gas Well Project

Activity	Length (Days)	Total Number of Round Trips	Average Daily Round Trips
Construction	18	40	2
Drilling	12	354	30
Completion	10	1,240	124
Flow Testing	20	489	24
Pipeline Tie Construction	21	180	9
Reclamation	30	257	9

Roads would be maintained in the same or better condition as existed prior to the commencement of proposed operations. The maintenance activities would continue until final abandonment and reclamation of the proposed project areas. The proposed access roads would be maintained for the life of the proposed projects in accordance with *The Gold Book* (BLM and USFS 2007). Encana would inspect and maintain the roads as outlined in their Road Maintenance Plan attached to the approved APDs and ROW Grant permit applications.

BMPs to be utilized along the proposed and existing access roads and the proposed access road construction and reclamation methods are described further in Section 2.1 (Proposed Action).

The roads in the general region of the proposed project area are currently utilized for accessing oil and gas development and residences.

None of the major BLM-FFO roads listed above would be directly impacted by the proposed projects. One major BLM-FFO road, U.S. Highway 550, is located approximately 2 to 5 road-miles north-northeast of the proposed project areas. This major road could be utilized to access the proposed project areas.

Cumulative Impacts

The spatial analysis area for transportation includes the proposed access roads and the existing roads between U.S. Highway 550 and the proposed project areas. Within the spatial analysis area, the existing roads are used to access existing oil and gas development and residences.

The proposed projects would contribute to the cumulative transportation impacts within the spatial analysis area.

3.11. Livestock

3.11.1. Affected Environment

Proposed Project Areas

The proposed project areas are located in the Venado Allotment, Allotment Number 5112 (Authorization Number 3000238). The vegetation communities within the allotment are sagebrush shrubland and piñon-juniper woodland. The Venado Allotment has a grazing authorization that permits 79 head of cattle with a year-round grazing period. The term grazing authorization permits the utilization of 806 active Animal Unit Months (AUMs) of forage. An AUM is the amount of forage needed to sustain a cow (1000-pound) or cow/calf pair for one month. The allotment is 13,634 acres and consists of 85-percent BLM-authorized AUMs. The average rangeland carrying capacity for the Venado Allotment is 16.9 acres per AUM.

There are no range improvements within the proposed project areas.

3.11.2. Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed projects would result in the surface disturbance of 21.4 acres within the Venado Allotment. The estimated short-term impact to range carrying capacity would be a loss of 1.3 AUM (assuming an average rangeland carrying capacity of 16.9 acres per AUM and a disturbance area of 21.4 acres). After successful interim reclamation, the long-term-loss would be 0.3 AUM (assuming an average rangeland carrying capacity of 16.9 acres per AUM and a long-term working area of 4.6 acres).

Additional short-term impacts could include displacement of permitted livestock during construction activities or exposure of livestock to hazards. After construction, livestock should become acclimated to the wells and traffic associated with their maintenance. Vehicle traffic associated with the wells could pose impacts to livestock, considering that the area is open range and livestock may be found on roads in the area.

Direct impacts to livestock could occur if holes or ditches are not excluded properly. Any type of hole or ditch is potentially a hazard to livestock while grazing. Cow or calf injuries could occur if these animals fall into or try to get out of a ditch-type cavity. Cow or calf leg injuries could also occur if a small hole is left uncovered. Livestock could step into the hole and break a leg. Mitigation associated with the protection of livestock during pipeline trenching is discussed in detail in Section 2.1.2 (Description of Proposed Projects – Design Features and Best Management Practices - Protection of Flora and Fauna, including SSS and Livestock).

Cumulative Impacts

The spatial analysis area for livestock is the Venado Allotment. Within this allotment, the following existing and reasonably foreseeable disturbances are present:

- 35 active oil and/or gas wells and associated well pads
- 15 inactive oil and/or gas wells and associated well pads (some reclaimed)
- 19 proposed oil and/or gas wells and associated well pads, roads, and utility corridors
- 41 miles of roads (including Indian Service Road/Route 474 and State Highway 44)

- Several existing utility corridors, primarily paralleling roads

The proposed projects would contribute to cumulative disturbance within the allotment.

3.12. Economics

3.12.1. Affected Environment

Within the BLM-FFO there are three major economic sectors: public land grazing, recreation, and oil and gas development. The BLM-FFO area is directly affected by oil and gas development, as the area provides many employment opportunities to the local communities and the tax receipts from oil and gas development are distributed to local governments (BLM 2003a, 3-93 – 3-94).

Sandoval County is partially located within the BLM-FFO planning area; the San Juan Basin oil and gas development area within this county is relatively small (BLM 2003a, 3-94). In 2010, Sandoval County had lower unemployment than State and U.S. averages. In 2012, the county had 8.1-percent unemployment. The State and the U.S. had 9.3- and 9.1-percent unemployment, respectively (U.S. Census Bureau 2012).

3.12.2. Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed projects would not negatively affect economics in the region. Indirectly, there could be positive, short- and/or long-term effects to economics associated with the proposed projects. The proposed projects could contribute to employment opportunities in the oil and gas industry. In addition, there could be taxes and royalties to local, State, and Federal governments as a result of the proposed projects.

Cumulative Impacts

The spatial analysis area for the proposed projects is the BLM-FFO planning area. In the BLM-FFO planning area, the oil and gas industry is the dominant force in the economy. In New Mexico, the oil and gas industry provides nearly one billion dollars per year in taxes, royalties, and interest to the State; at least half of this is related to oil and gas production in the San Juan Basin. This industry is a primary employer and provides higher paying jobs than many other job sectors available to the population. As of 2000, over 11,000 people in northwestern New Mexico were employed in the industry. Overall, the positive effects of oil and gas development in the spatial analysis area are expected to outweigh any changes in jobs, expenditures, or revenues resulting from any other actions expected or likely in the region (BLM 2003a). The proposed projects would contribute to this positive economic cumulative impact.

3.13. Public Health and Safety

3.13.1. Affected Environment

Worker safety is regulated under the Occupational Safety and Health Act of 1970, as amended (29 USC 651). Additional safety regulations found in Pipeline Safety Programs and Rulemaking Procedures (49 CFR 190) and Transportation of Natural and Other Gas by Pipeline: Minimal Federal Safety Standards (40 CFR 192) apply to natural gas pipelines.

The proposed project areas are fairly remote. The nearest town/community, Nageezi (population 286 [U.S. Census Bureau 2012]), is approximately 18 to 20 miles to the northwest, and U.S. Highway 550 is located approximately 2 to 5 road-miles north-northeast of the proposed project areas. There are no designated recreation areas, commercial areas, or residential areas within 1 mile of the proposed project areas. However, the locations are accessible to the public by dirt roads.

The nearest hospital is in Farmington, New Mexico. This hospital is approximately 50 air miles or approximately 70 road miles from the proposed well pads.

3.13.2. Impacts from the Proposed Action

Direct and Indirect Impacts

The proposed projects would affect transportation. During construction, the proposed projects would result in increased traffic on area roads; some vehicles would be hauling heavy equipment, as described in Section 2.1.2 (Description of Proposed Projects – Proposed Project Phases). Therefore, there would be an increased potential for traffic accidents. Transportation impacts are discussed further in Section 3.10 (Transportation).

Dust associated with construction activities or travel on existing and proposed dirt access roads could result in poor visibility in the proposed project areas. The increased use of dirt access roads during muddy conditions could worsen the roads' conditions. Following proposed construction, traffic levels would be similar to current levels.

During proposed construction, drilling, and maintenance activities, the operation of heavy equipment could pose potential safety concerns. Existing facilities (such as oil and gas wells, pipelines, and powerlines) could be damaged or ruptured, which could pose a risk to human safety.

During operation of the proposed wells, facility failure (such as pipeline ruptures) could represent a potential danger to the public.

Health and safety BMPs associated with the proposed projects are described in detail in Section 2.1.2 (Description of Proposed Projects - Design Features and Best Management Practices).

Cumulative Impacts

The spatial analysis area for the proposed projects is the BLM-FFO planning area. The general BLM-FFO region has been experiencing oil and gas development for several decades. This extensive development could contribute to public health and safety concerns in the general proposed project areas. Transportation issues are a primary safety concern. Vehicles associated with oil and gas development utilize the developed highway and county road systems in the spatial analysis area. In addition, the oil and gas industry constructs and utilizes dirt access roads in the spatial analysis area. These roads, most of which are accessible by the public, are often hazardous, particularly during and following periods of inclement weather.

Additional safety concerns in the spatial analysis area include wildfire; oil and gas facility leakage or rupture; moving equipment (such as pump jacks); oil and gas explosions; and the handling, storage, and disposal of wastes, chemicals, or condensate.

The proposed projects would contribute to the cumulative public safety impacts in the spatial analysis area.

3.14. Noise

3.14.1. Affected Environment

Increases in noise have the potential to affect natural resource values and management in BLM-FFO Specially Designated Areas, such as Special Management Areas, Areas of Critical Environmental Concern, and Research Natural Areas. The BLM has designated certain areas within the BLM-FFO planning area as Noise Sensitive Areas (NSAs), which include some visitor use areas, wilderness areas, semi-private recreation areas, habitat for SSS, raptor nesting/roosting sites, recreational trails, and sites where people live and work. Within NSAs, noise-control measures are either receptor or boundary focused, as determined by BLM-FFO management guidelines for each NSA.

According to NTL 04-2 FFO, for oil and gas operations that operate on a continual (greater than 8 hours per day), long-term (greater than one week in duration) basis, sound levels at designated receptors or boundaries must be less than or equal to 48.6 A-weighted decibels over a continuous 24-hour period. The NTL 04-2 FFO sound level requirement does not apply to transient operations (e.g., construction, drilling, completion, workover activities), short-term events (e.g., venting a well, compressor start-ups), or temporary non-oil and gas sound sources. The NTL 04-2 FFO provides further detail on noise standards related to oil and gas activities (BLM 2004).

The proposed project areas are not located within 400 feet of an NSA (BLM 2003c), within 100 feet of an occupied dwelling or building, or within an incorporated city or township. The proposed projects are located more than two miles from the nearest residence.

3.14.2. Impacts from the Proposed Action

Direct and Indirect Impacts

Sound levels within NSAs, occupied dwellings/buildings, or incorporated cities or townships would not be affected by the proposed projects.

During the construction and drilling phases of the proposed projects, sound levels would be elevated above pre-existing levels for 24 hours per day. During the operation phase of the proposed projects, noise levels would vary depending on equipment used for the proposed projects. Operational noise could be produced by oil and gas equipment, such as compressors and pump jacks, and by vehicles periodically visiting the well sites for maintenance activities. Noise levels associated with oil and gas activities are described above and in the PRMP/FEIS (2003a).

Cumulative Impacts

The spatial analysis area for the proposed project areas is the BLM-FFO planning area. Increases in the level of sound generated from the extraction, production, and transportation of oil and gas development has occurred in the San Juan Basin over the last several decades. Increased sound levels are associated with oil- and gas-operation activities, including well drilling, pump jack operations, produced water injection facilities, and gas compressor facilities. The proposed project would contribute to noise in the spatial analysis area.

4. SUPPORTING INFORMATION

4.1. Tribes, Individuals, Organizations, or Agencies Consulted

The following tribes, individuals, organizations, and/or agencies were consulted during the development of this EA:

- Brenda Linster, Encana
- Jason Eckman, Encana
- Steven Merrell, Encana
- Leslie Sesler, LAC
- Steve Fuller, LAC

4.2. List of Preparers

This EA was prepared by NCI in conformance with the standards of and under the direction of the BLM-FFO. The following individuals assisted in the preparation of this EA:

- Amber Ballman, Environmental Scientist, NCE
- Jenny Holmen, Senior Environmental Scientist, NCI
- Catherine Roy, Environmental Scientist, NCI
- Eric Creeden, Environmental Scientist, NCI
- Amanda Nisula, Planning and Environmental Specialist, BLM-FFO
- Barney Wegener, Natural Resources Specialist, BLM-FFO
- Sheila Williams, District Botanist, BLM-FFO
- Stanley Dykes, Noxious Weed Coordinator, BLM-FFO
- John Hansen, Wildlife Biologist, BLM-FFO
- John Kendall, Wildlife Management Biologist, BLM-FFO
- Jim Copeland, Archaeologist, BLM-FFO
- Esther Willetto, Tribal Program Coordinator, BLM-FFO
- Jeff Tafoya, Range Specialist, BLM-FFO
- Darlene Baker, Realty Specialist, BLM-FFO
- Roger Herrera, Environmental Protection Specialist, BLM-FFO
- Janelle Alleman, Recreation Specialist, BLM-FFO
- Dale Wirth, Branch Chief, Natural Resources BLM-FFO
- Shane Trautner, Range Specialist, BLM-FFO

4.3. References

Brooks, M.L. and D. Pyke. 2001. Invasive Plants and Fire in the Deserts of North America. In Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: The First National Congress on Fire, Ecology, Prevention and Management, ed. K. Galley and T. Wilson, 1-14. Miscellaneous Publications No. 11. Tallahassee, Florida: Tall Timbers Research Station.

Brugge, David M. 1993. An Investigation of AIRFA [American Indian Religious Freedom Act] Concerns Relating to the Fruitland Coal Gas Development Area. Albuquerque, New Mexico: Office of Contract Archaeology, University of New Mexico. Ms. on file at BLM-FFO.

Bureau of Land Management (BLM). 2003a. Farmington Proposed Resource Management Plan and Final Environmental Impact Statement (PRMP/FEIS). Farmington, New Mexico: BLM-FFO.

_____. 2003b. Farmington Resource Management Plan with Record of Decision. (RMP and ROD). Farmington, New Mexico: BLM-FFO.

_____. 2003c. Shapefile: ffo_sda (BLM-FFO SDAs, Noise Sensitive Policy Attribute).

_____. 2004. Notice to Lessees and Operators on Onshore Oil and Gas Leases Within the Jurisdiction of the Farmington Field Office - Management of Sound Generated by Oil and Gas Production and Transportation (NTL 04-2 FFO). Farmington, New Mexico: BLM-FFO.

_____. 2005. *Procedures for Performing Cultural Resources Fieldwork on Public Lands in the Area of New Mexico BLM Responsibilities.* BLM Manual Supplement H-8100-1. New Mexico, Oklahoma, and Texas.

_____. 2008a. BLM Manual 6840: Special Status Species Management.

_____. 2008b. BLM National Environmental Policy Act Handbook H-1790-1. Washington, D.C.: BLM National Environment Policy Act Program Office of the Assistant Director, Renewable Resources and Planning.

_____. 2008c. Memorandum: Farmington Field Office (FFO) Special Management Species Policy 2008 Update. Farmington, New Mexico: BLM-FFO.

_____. 2010. Climate Change Supplementary Information Report for Montana, North Dakota, and South Dakota, Bureau of Land Management. Report on Greenhouse Gas Emissions and Climate Change for Montana, North Dakota, and South Dakota. Technical report prepared for the Montana/Dakotas BLM by URS Corporation. URS Project 22241790.

_____. 2011a. BLM New Mexico Sensitive Birds List. Revised August 2011.

_____. 2011b. BLM New Mexico Sensitive Mammals List. Revised July 2011.

_____. 2011c. BLM New Mexico Sensitive Molluscs, Crustaceans, and Arthropods List. Revised August 2011.

_____. 2012a. BLM New Mexico Sensitive Plants List. January.

_____. 2012b. prairie_dog_colonies.shp (Shapefile of recorded prairie dog colonies within the general BLM-FFO region). Provided by BLM-FFO 2012.

_____. 2012c. ffo_raptors_12122012.shp (Shapefile of recorded golden eagle, peregrine falcon, prairie falcon, and ferruginous hawk nests on BLM-FFO lands). Updated December 2012.

_____. 2013a. Air Resources Technical Report for Oil and Gas Development. New Mexico, Oklahoma, Texas, and Kansas. Santa Fe, New Mexico: Bureau of Land Management, New Mexico State Office.

_____. 2013b. aztec_gilia_habitat (Shapefile of the new Aztec gilia and Brack's fishhook cactus potential habitat "zone"). Provided by the BLM-FFO September 26, 2013.

_____. 2013c. BLM-FFO Bare Soil Reclamation Procedures. Available at: http://www.blm.gov/nm/st/en/fo/Farmington_Field_Office/ffo_planning/surface_use_plan_of.html. Accessed April 2013.

Bureau of Land Management (BLM) and U.S. Department of Energy. 2010. Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States. Chapter 5 (Impacts and Mitigation).

Bureau of Land Management (BLM) and U.S. Forest Service (USFS). 2007. The Gold Book: Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development – 4th Edition, revised in 2007.

Bureau of Land Management, Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers. 1997. Programmatic Agreement Among the Bureau of Land Management, the Advisory Council On Historic Preservation, and the National Conference Of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet its Responsibilities Under the National Historic Preservation Act. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/coop_agencies.Par.88790.File.dat/PA_Final_03_1997.pdf.

Enquist, Carolyn and Gori, Dave. 2008. Implications of Recent Climate Change on Conservation Priorities in New Mexico. April 2008.

Environmental Protection Agency (EPA). 2004. Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reserves. Office of Ground Water and Drinking Water (4606M). EPA 816-R-04-003.

_____. 2008. National Emissions Inventory. http://www.epa.gov/ttn/chief/net/2008inventory.html.

_____. 2009. Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2007. Washington, D.C.: EPA. April 2009.

_____. 2011. 2005 National-Scale Air Toxics Assessment. Summary of Results. http://www.epa.gov/ ttn/atw/nata2005.

_____. 2012. Air Trends: Design Values. http://www/epa.gov/airtrends/values.html.

Eveling, D.W., and A. Bataille. 1984. The effect of deposits of small particles on the resistance of leaves and petals to water loss. Environmental Pollution. 36:229-238.

Goddard Institute for Space Studies. 2007. Annual Mean Temperature Change for Three Latitude Bands. Datasets and Images. GISS Surface Temperature Analysis, Analysis Graphs and Plots. New York, New York. http://data.giss.nasa.gov/gistemp/graphs/Fig.B.lrg.gif.

Griffith, G.E., J.M. Omernik, M.M. McGraw, G.Z Jacobi, C.M. Canavan, T.S. Schrader, D. Mercer, R. Hill, and B.C. Moran. 2006. Ecoregions of New Mexico (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia: U.S. Geological Survey (map scale 1:1,400,000).

Hirano, T., M. Kiyota, and I. Aiga. 1995. Physical effects of dust on the leaf physiology of Cucumber and Kidnekbean plant. Environmental Pollution 89(3):225-261.

Holmes, A.L. and A.V. King. 2006. Vital Rates of Sagebrush Obligate Songbirds in Relation to Natural Gas Development and Weather. Abstract Oral Presentation to IV North American Ornithological Congress. Veracruz, Mexico.

Intergovernmental Panel on Climate Change (IPCC). 2007a. Climate Change 2007: The Physical Basis (Summary for Policymakers). New York, New York and Cambridge, England: Cambridge University Press. http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf.

_____. 2007b, Synthesis Report. A Report of the Intergovernmental Panel on Climate Change.

Kelly, Klara, Rena Martin, Richard Begay, Ted Neff, and Clifford Werito. 2006. We Will Help You With What We Know: Diné Traditional Cultural Places In Dinétah. Flagstaff, Arizona: Museum of Northern Arizona Environmental Solutions, Inc. Ms. on file at BLM-FFO.

La Plata Archaeological Consultants (LAC). 2014a. A Cultural Resources Survey of Encana Oil and Gas (USA) Inc.'s Lybrook G01-2206 Number 01H-02H Dual Well Pad, Access Road, and Pipeline, Sandoval County, New Mexico. LAC Report 2012-1yyy.

_____. 2014b. A Cultural Resources Survey of Encana Oil and Gas (USA) Inc.'s Lybrook N02-2206 Number 01H-02H Dual Well Pad, Access Road, and Pipeline, Sandoval County, New Mexico. LAC Report 2013-7ee.

_____. 2014c. A Cultural Resources Survey of Encana Oil and Gas (USA) Inc.'s Lybrook P03-2206 Number 01H-02H Dual Well Pad, Access Road, and Pipeline, Sandoval County, New Mexico. LAC Report 2012-1xxx.

National Academy of Sciences. 2006. Understanding and Responding to Climate Change: Highlights of National Academies Reports. Washington, D.C.: Division on Earth and Life Studies. National Academy of Sciences. http://dels.nas.edu/basc/Climate-HIGH.pdf.

Natural Gas Supply Association. 2010. NaturalGas.org – Uses of Natural Gas. Available at: http://www.naturalgas.org/overview/uses.asp.

Natural Resources Conservation Service (NRCS). 2008. Soil Survey of Sandoval County Area, New Mexico: Parts of Los Alamos, Sandoval, and Rio Arriba Counties. Web Soil Survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

_____. 2010. Federal Noxious Weeds. http://plants.usda.gov/java/noxious?rptType=Federal. Accessed: March 2014.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life. Version 7.1. NatureServe, Arlington, VA. http://www.natureserve.org/explorer. Accessed: May 2013.

New Mexico Bureau of Geology and Mineral Resources. 2012. Available at: http://geoinfo.nmt.edu/.

New Mexico Department of Agriculture (NMDA). 2009. New Mexico Noxious Weed List. http://nmdaweb.nmsu.edu/quick-reference/New%20Mexico%20Noxious%20Weed%20List%20Update.html. Accessed: March 2014.

New Mexico Environment Department (NMED). 2010. Inventory of New Mexico Greenhouse Gas Emissions: 2000-2007. http://www.nmenv.state.nm.us/cc/index.html.

_____. 2012. Northwest New Mexico Monitoring Network Presentation to BLM. June 26, 2012. Presented by Mark Jones New Mexico Environment Department.

New Mexico Office of the State Engineer. 2011. GIS shapefile: ose_wells_July2011. http://www.ose.state.nm.us/water_info_data.html.

New Mexico Partners in Flight (NMPIF). 2007. New Mexico Bird Conservation Plan Version 2.1. Compiled by C. Rustay and S. Norris. Albuquerque, New Mexico.

Office of Natural Resources Revenue. 2012. Reported Royalty Revenue by Category – Fiscal Year 2011. Available at: http://www.onrr.gov/ONRRWebStats/Disbursements_Royalties.aspx?report=ReportedRoyaltyRevenuebyCategory&yeartype=FY&year=2011&datetype=AY.

Ortega, C.P. and C.D. Francis. 2007. Effects of Gas Well Compressor Noise on Breeding Birds in the Rattlesnake Canyon Habitat Management Area, San Juan County, New Mexico. Report to the Bureau of Land Management, Farmington Field Office. Final Report.

Science Applications International Corporation. 2002. Cultural Resources Technical Report: Background Information on Cultural Resources for the Farmington Draft RMP/EIS. Ms. on file at BLM-FFO, Farmington, New Mexico.

Thompson, J. R., P.W. Mueller, W. Fluckiger, A.J. and Rutter. 1984. The effects of dust on photosynthesis and its significance for roadside plants. Environmental Pollution 34(2):171-190.

U.S. Census Bureau. 2012. American Fact Finder (2008 - 2012 Census Data). Available at: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.

U.S. Department of Energy. 2011. Natural Gas Regulation. Available at: http://www.fossil.energy.gov/programs/gasregulation/index.html.

U.S. Energy Information Administration. 2012. Energy in Brief. Available at: http://www.eia.gov/energy_in_brief/major_energy_sources_and_users.cfm.

U.S. Fish and Wildlife Service (USFWS). 2013. New Mexico Listed and Sensitive Species Lists. New Mexico Ecological Services Field Office. Available at: http://www.fws.gov/southwest/es/NewMexico/SBC.cfm. Accessed November 2013.

U.S. Geological Survey (USGS). 1979. Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases (NTL-3A). Reporting of Undesirable Events.

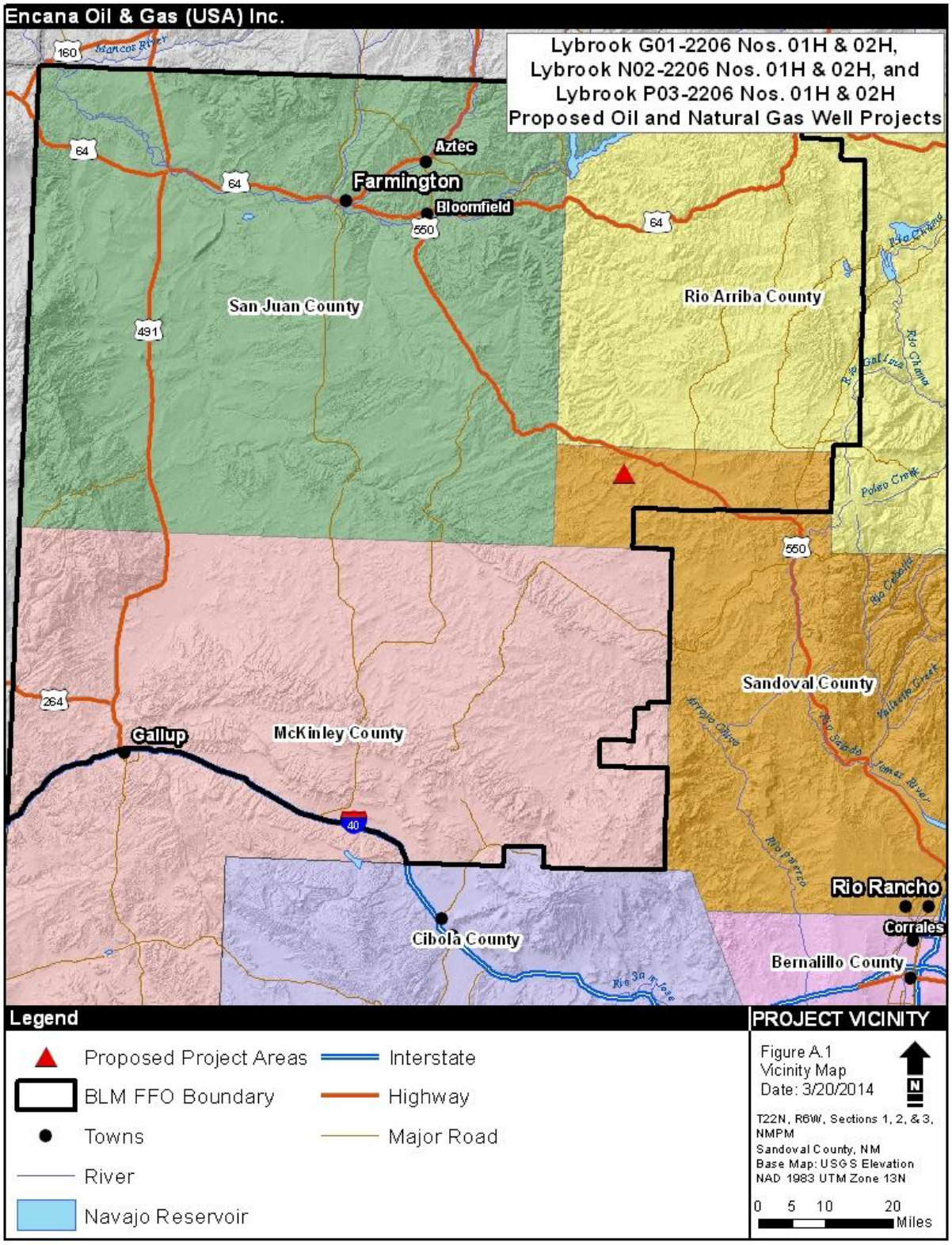
Van Valkenburgh, Richard F. 1941.Diné Bikeyah. Window Rock, Arizona: Department of the Interior, Office of Indian Affairs, Navajo Services. Ms. on file at BLM-FFO.

_____. 1974. Navajo Sacred Places. Edited by Clyde Kluckhohn. Garland American Indian Ethnohistory Series, Navajo Indians, 3 Vols. New York, New York: Garland Publishing.

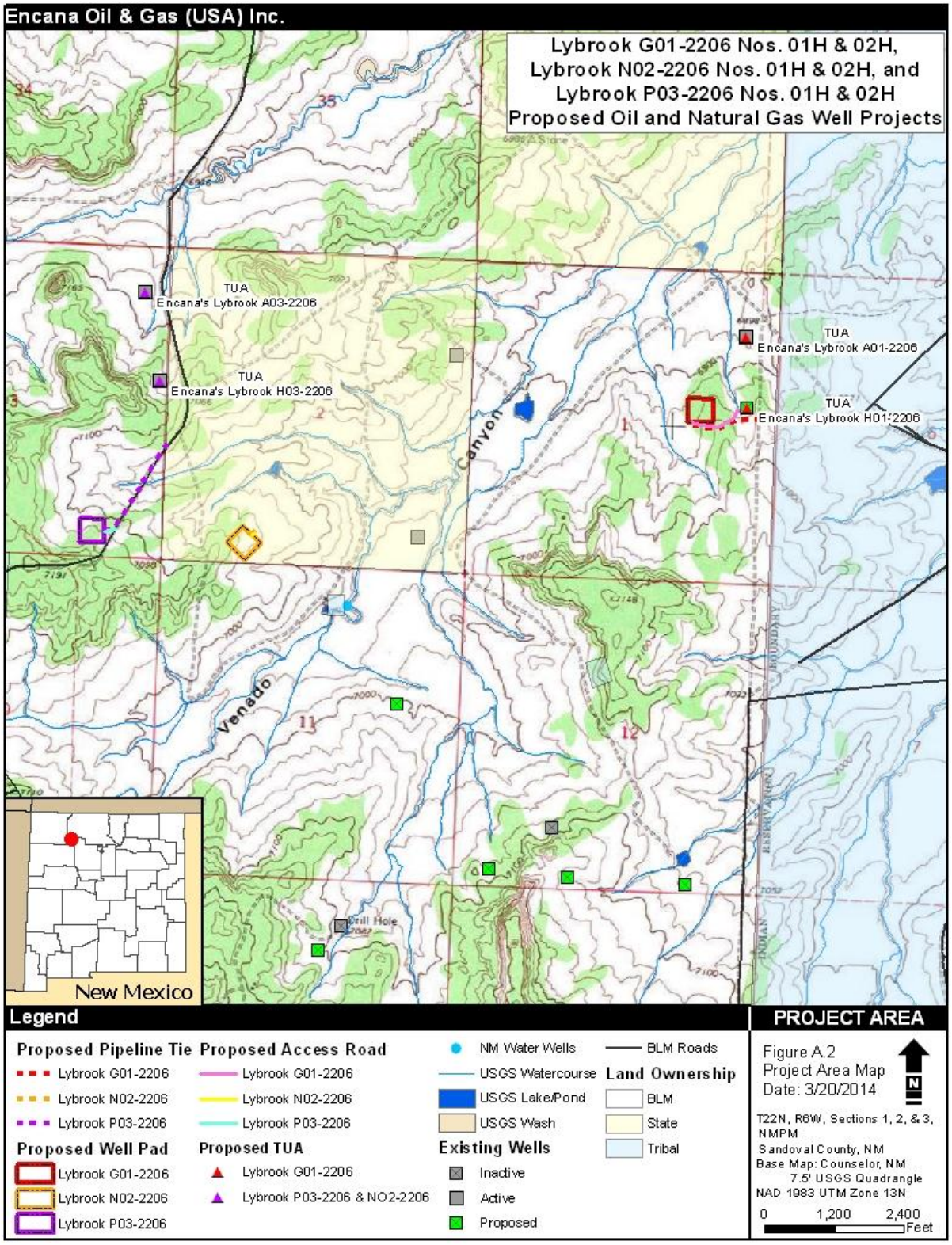
Wheeler, Brian K. 2003. Raptors of Western North America. Princeton, New Jersey: Princeton University Press.

APPENDIX A. MAPS

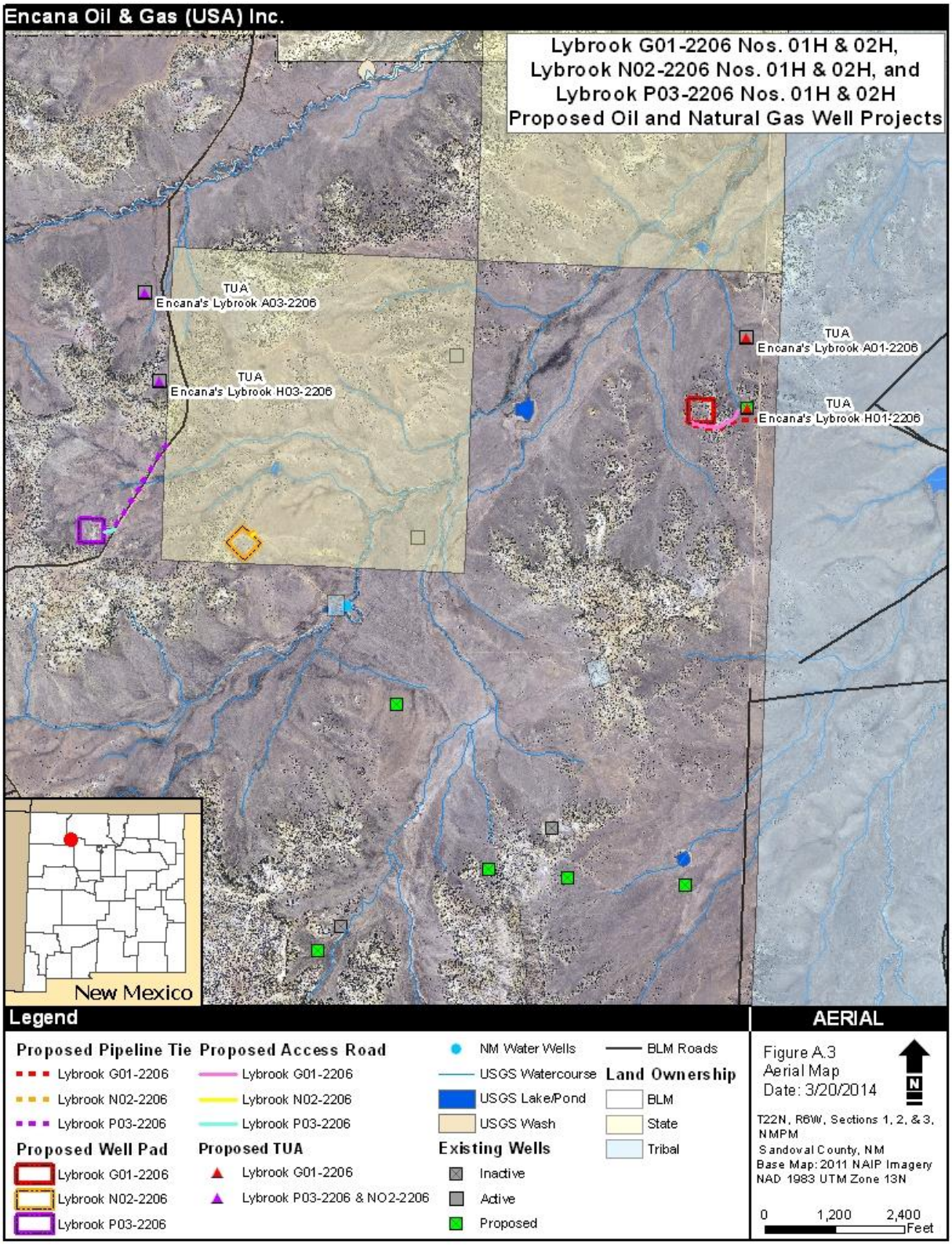
A.1. **Vicinity Map**



A.2. **Project Area Map**



A.3. **Aerial Map**



APPENDIX B. PLATS

B.1. **Proposed Lybrook G01**

State of New Mexico
Energy, Minerals & Natural Resources Department

Form C-102
Revised August 1, 2011

Submit one copy to appropriate District Office

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	42289	LYBROOK GALLUP

[4] Property Code	[5] Property Name	[6] Well Number
	LYBROOK G01-2206	01H

[7] OGRID No.	[8] Operator Name	[9] Elevation
282327	ENCANA OIL & GAS (USA) INC.	6938.8'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
G	1	22N	6W		2406'	NORTH	1314'	EAST	SANDOVAL

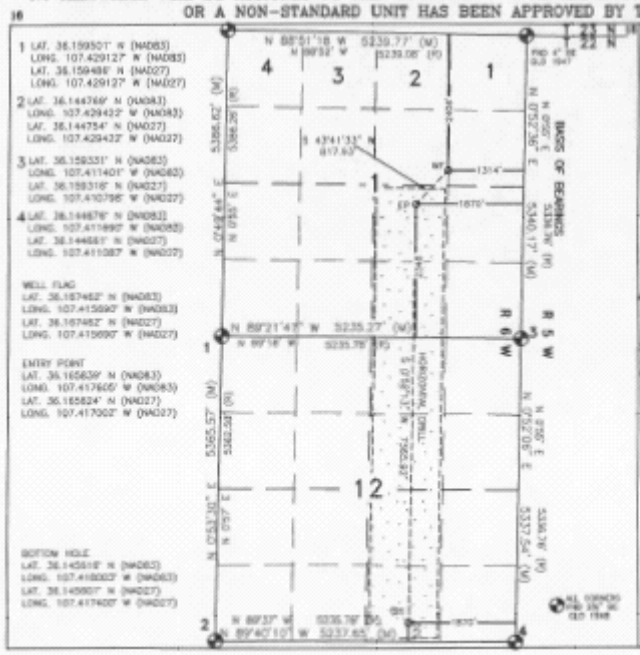
[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
O	12	22N	6W		330'	SOUTH	1870'	EAST	SANDOVAL

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
PROJECT AREA 80.00 ACRES W/2 SE/4 OF SEC. 1 160.00 ACRES W/2 E/2 OF SEC. 12			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16



[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

SEPTEMBER 19, 2013

Date of Survey

Signature and Seal of Professional Surveyor

DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID RUSSELL

Certificate Number 10201

State of New Mexico
Energy, Minerals & Natural Resources Department

Form C-102
Revised August 1, 2011

Submit one copy to appropriate District Office

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
	42289	LYBROOK GALLUP

[4] Property Code	[5] Property Name	[6] Well Number
	LYBROOK G01-2206	02H

[7] OGRID No.	[8] Operator Name	[9] Elevation
282327	ENCANA OIL & GAS (USA) INC.	6938.8'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	WEST/West line	County
H	1	22N	6W		2407'	NORTH	1284'	EAST	SANDOVAL

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	WEST/West line	County
P	12	22N	6W		330'	SOUTH	400'	EAST	SANDOVAL

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
PROJECT AREA 80.00 ACRES E/2 SE/4 OF SEC. 1 160.00 ACRES E/2 E/2 OF SEC. 12			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16

1 LAT. 36.158501° N (NAD83)
LONG. 107.429127° W (NAD83)
LAT. 36.158489° N (NAD27)
LONG. 107.429127° W (NAD27)

2 LAT. 36.144769° N (NAD83)
LONG. 107.429422° W (NAD83)
LAT. 36.144754° N (NAD27)
LONG. 107.429422° W (NAD27)

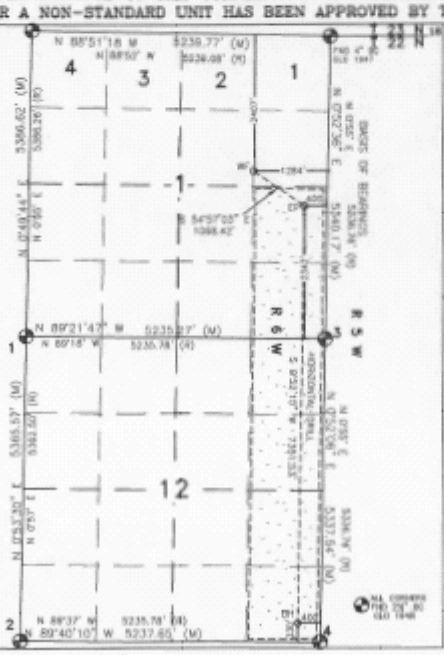
3 LAT. 36.159331° N (NAD83)
LONG. 107.411401° W (NAD83)
LAT. 36.159318° N (NAD27)
LONG. 107.410798° W (NAD27)

4 LAT. 36.144676° N (NAD83)
LONG. 107.411687° W (NAD83)
LAT. 36.144661° N (NAD27)
LONG. 107.411687° W (NAD27)

WELL FLAG
LAT. 36.167467° N (NAD83)
LONG. 107.415588° W (NAD83)
LAT. 36.167445° N (NAD27)
LONG. 107.414985° W (NAD27)

ENTRY POINT
LAT. 36.165773° N (NAD83)
LONG. 107.412828° W (NAD83)
LAT. 36.165758° N (NAD27)
LONG. 107.412225° W (NAD27)

BOTTOM HOLE
LAT. 36.145568° N (NAD83)
LONG. 107.413028° W (NAD83)
LAT. 36.145574° N (NAD27)
LONG. 107.413028° W (NAD27)



17 OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief and that this organization, either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

SEPTEMBER 19, 2013
Date of Survey

Signature and Seal of Professional Surveyor

DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID RUSSELL
Certificate Number 10201

WELL FLAG
LATITUDE: 36.167462° N
LONGITUDE: 107.415690° W
DATUM: NAD83

ENCANA OIL & GAS (USA) INC.

LYBROOK G01-2206 #01H
2406' FNL & 1314' FEL
LOCATED IN THE SW/4 NE/4 OF SECTION 1,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 6939', NAVD 88
FINISHED PAD ELEVATION: 6938.8', NAVD 88

MN TN 9.96° E
50' 0 50' 100'
SCALE = 100'

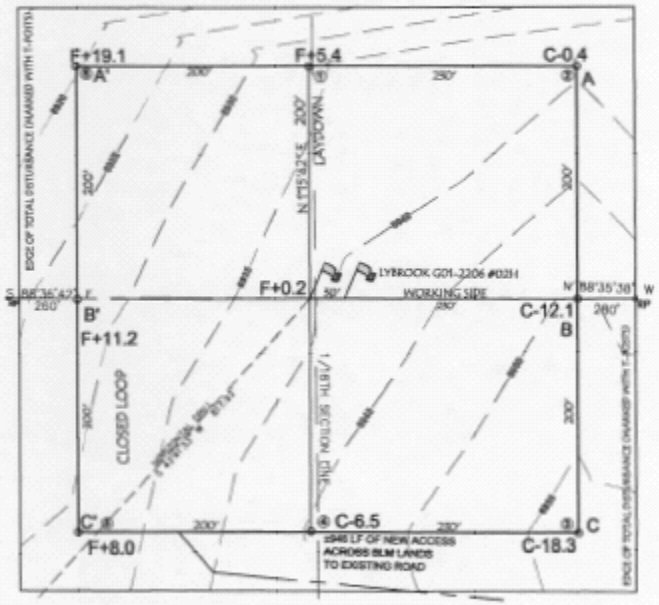
NOTES:

1.) BASIS OF BEARING BETWEEN FOUND MONUMENTS AT THE NORTHEAST CORNER AND THE SOUTHEAST CORNER OF SECTION 1, TOWNSHIP 22 NORTH, RANGE 6 WEST, N.M.P.M., SANDOVAL COUNTY, NEW MEXICO.
LINE BEARS N 0°57'36" E A DISTANCE OF 5280.77' FEET AS MEASURED BY G.P.S.

2.) LATITUDES, LONGITUDES AND ELEVATIONS ARE BASED ON NAD83 USING L1 PHASE CENTER.
DISTANCES SHOWN ARE GROUND DISTANCES USING A TRANSVERSE MERCATOR PROJECTION FROM A WGS84 ELLIPSOID, CONNECTED TO NAVD83.
NAVD83 ELEVATIONS AS PREDICTED BY GEOID03.

3.) LOCATION OF UNDERGROUND UTILITIES DEPICTED ARE APPROXIMATE, PRIOR TO EXCAVATION UNDERGROUND UTILITIES SHOULD BE FIELD VERIFIED. ALL CONSTRUCTION ACTIVITIES SHOULD BE FIELD VERIFIED WITH NEW MEXICO ONE-CALL AUTHORITIES AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

4.) T-POSTS HAVE BEEN SET TO DEFINE THE EDGE OF DISTURBANCE LIMITS WHICH ARE 50' OFFSETS FROM THE EDGE OF THE STAKED WELL PAD.



– SURFACE OWNERSHIP –
BUREAU OF LAND MANAGEMENT

SLOPES TO BE CONSTRUCTED TO MATCH THE ORIGINAL CONTOURS AS CLOSE AS POSSIBLE.

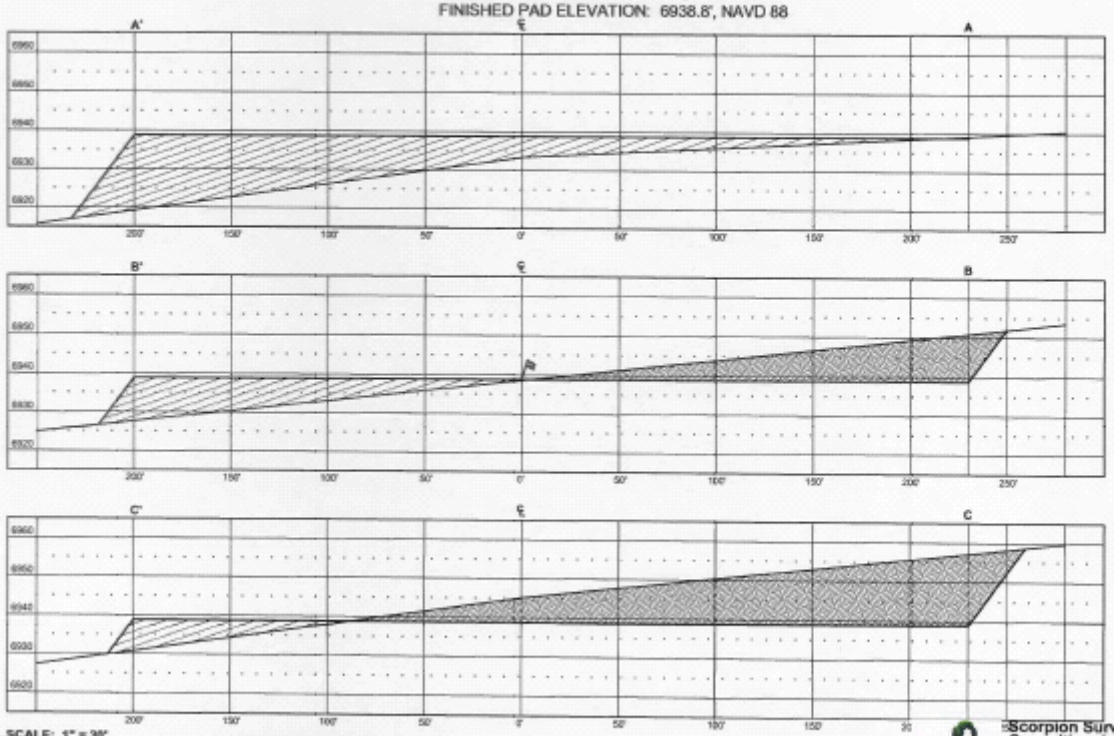
TOTAL PERMITTED AREA
530' x 500' = 6.08 ACRES
SCALE: 1" = 100'
JOB No.: ENC105_REV1
DATE: 01/13/14
DRAWN BY: TWT

NOTE:
SCORPION SURVEY & CONSULTING, L.L.C. IS NOT LIABLE FOR UNDERGROUND UTILITIES OR PIPELINES. CONTRACTOR SHOULD CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED, BURIED PIPELINES OR CABLES ON WELL PAD, IN CONSTRUCTION ZONE AND/OR ACCESS ROAD AT LWEST TWO (2) WORKING DAYS PRIOR TO CONSTRUCTION.

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4037

LATITUDE: 36.167462° N
LONGITUDE: 107.415690° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK G01-2206 #01H
2406' FNL & 1314' FEL
LOCATED IN THE SW/4 NE/4 OF SECTION 1, T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 6939', NAVD 88
FINISHED PAD ELEVATION: 6938.8', NAVD 88



VERT. SCALE: 1" = 30'
HORZ. SCALE: 1" = 60'
JOB No.: ENC105
DATE: 07/18/13

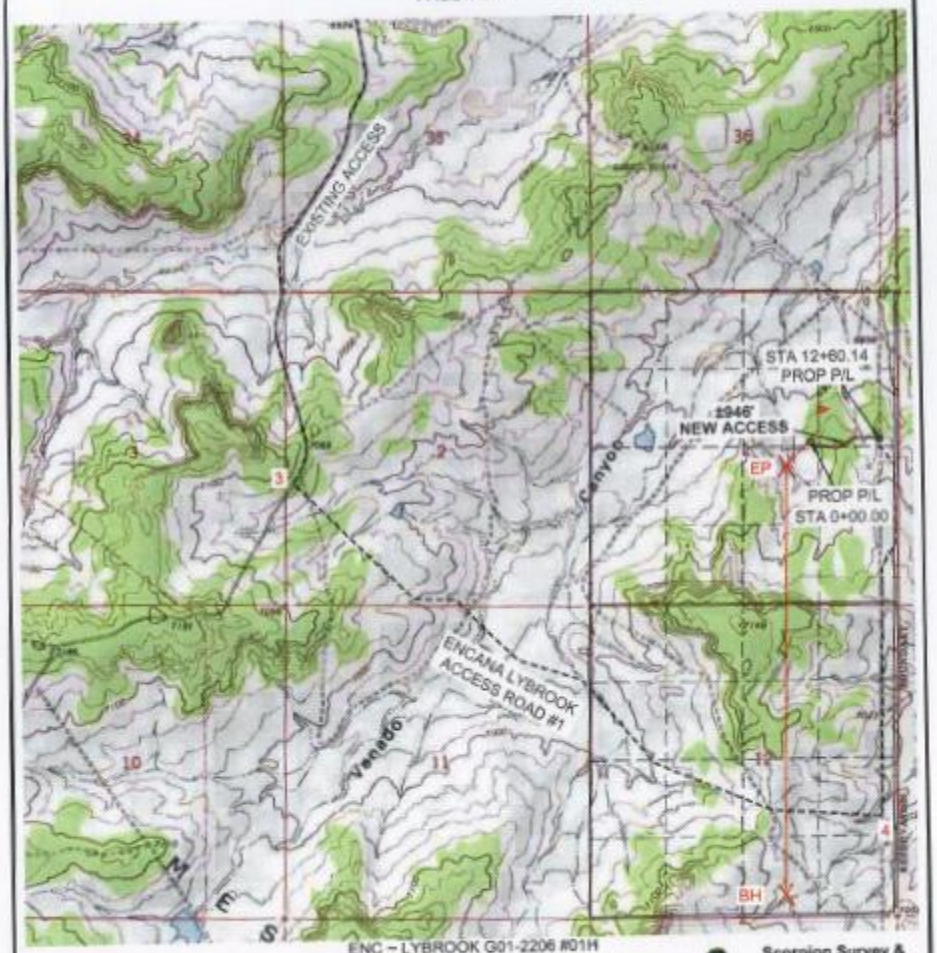
THIS DIAGRAM IS AN ESTIMATE OF DIRT BALANCE AND IS NOT INTENDED TO BE AN EXACT MEASURE OF VOLUME

FILL CUT

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

LATITUDE: 36.167462° N
LONGITUDE: 107.415690° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK G01-2206 #01H
2406' FNL & 1314' FEL
LOCATED IN THE SW/4 NE/4 OF SECTION 1,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 6939', NAVD 88
±946' OF NEW ACCESS ACROSS BLM LANDS
PAGE 1 OF 2



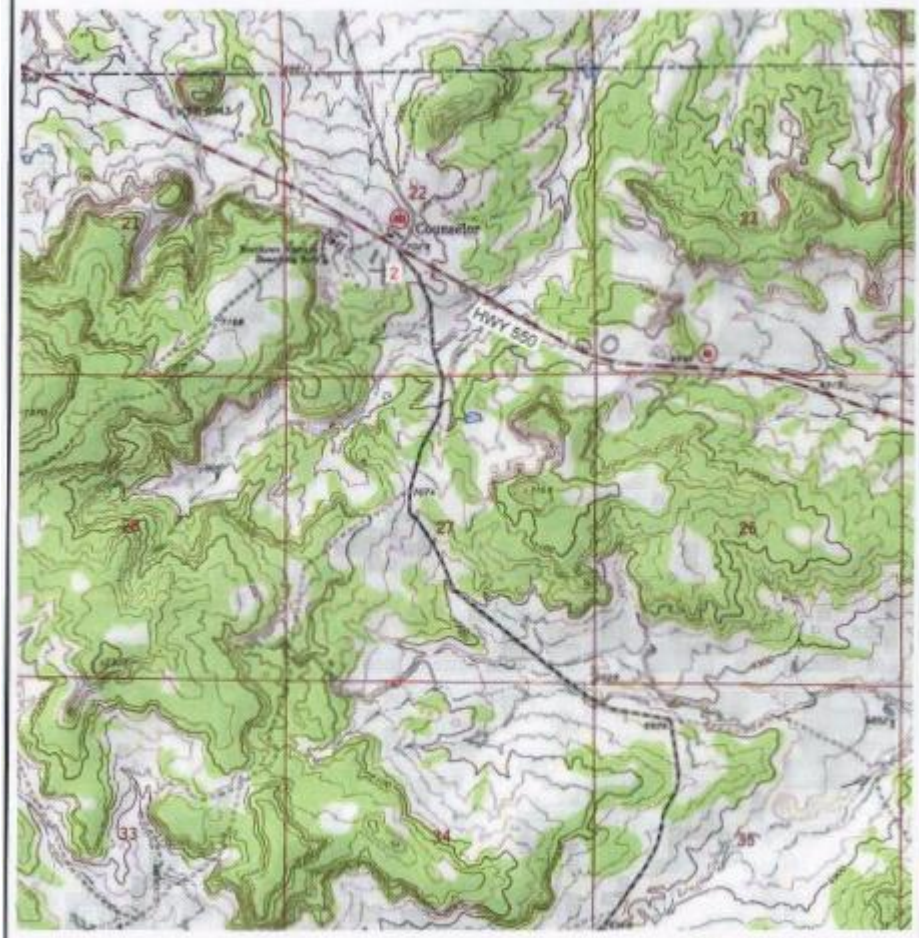
U.S.G.S. QUAD: COUNSELOR
SCALE: 1" = 2000' (1:24,000)
JOB No.: ENC105_REV1
DATE: 01/13/14

ENC – LYBROOK G01-2206 #01H
±946' OF NEW ACCESS
INSTALL NEW 24" CMP
STA. 0+00 - BEGIN ACCESS
STA. 9+46.38 @ PAD

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

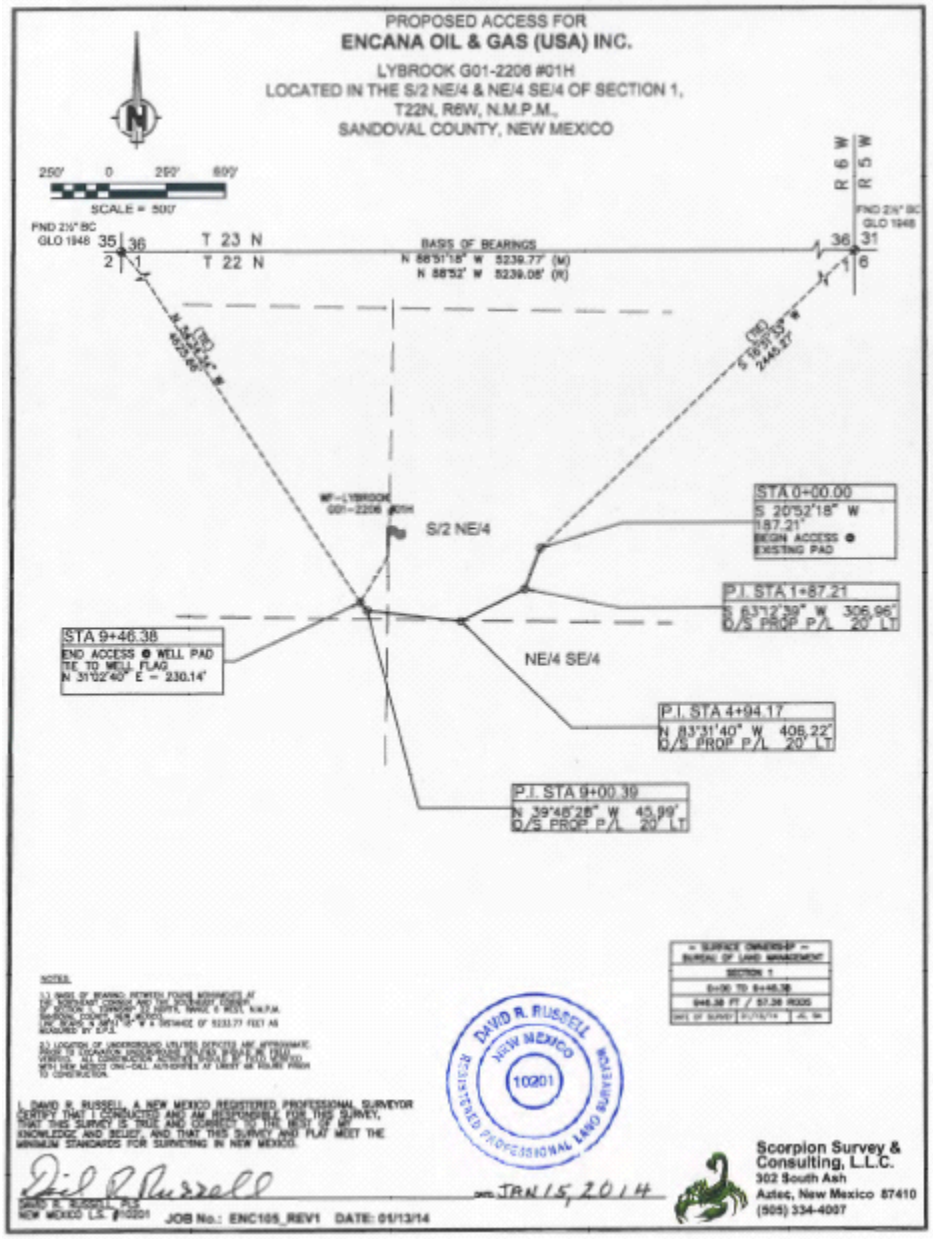
LATITUDE: 36.167462° N
LONGITUDE: 107.415690° W
DATUM: NAD 83

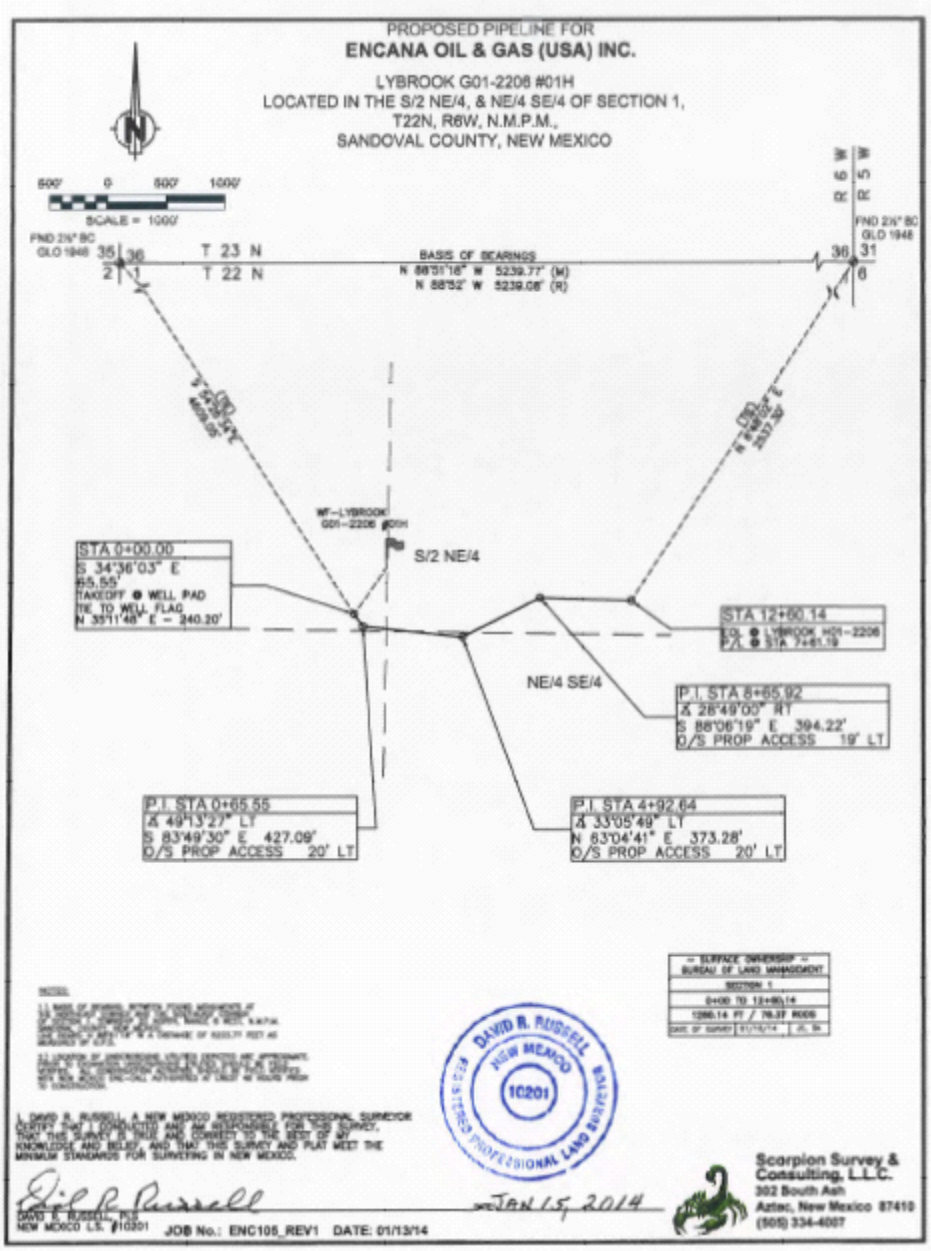
ENCANA OIL & GAS (USA) INC.
LYBROOK G01-2206 #01H
2406' FNL & 1314' FEL
LOCATED IN THE SW/4 NE/4 OF SECTION 1,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 6939', NAVD 88
±946' OF NEW ACCESS ACROSS BLM LANDS
PAGE 2 OF 2



U.S.G.S. QUAD: COUNSELOR
SCALE: 1" = 2000' (1:24,000)
JOB No.: ENC105_REV1
DATE: 01/13/14

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007


PROPOSED ACCESS FOR
ENCANA OIL & GAS (USA) INC.
LYBROOK G01-2206 #01H
LOCATED IN THE S/2 NE/4 & NE/4 SE/4 OF SECTION 1,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
SCALE = 500'
T 23 N
T 22 N
BASIS OF BEARINGS
N 88°51'18" W 5239.77' (M)
N 88°52' W 5239.08' (R)
S/2 NE/4
NE/4 SE/4
STA 0+00.00
S 20°52'18" W
187.21'
BEGIN ACCESS
EXISTING PAD
P.I. STA 1+87.21
S 63°12'39" W 306.96'
O/S PROP P/L 20' LT
STA 9+46.38
END ACCESS WELL PAD
TIE TO WELL FLAG
N 31°02'40" E - 230.14'
P.I. STA 4+94.17
N 83°31'40" W 406.22'
O/S PROP P/L 20' LT
P.I. STA 9+00.39
N 39°46'28" W 45.99'
O/S PROP P/L 20' LT
DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR
JAN 15, 2014
JOB No.: ENC105_REV1 DATE: 01/13/14
Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007


PROPOSED PIPELINE FOR
ENCANA OIL & GAS (USA) INC.
LYBROOK G01-2208 #01H
LOCATED IN THE S/2 NE/4, & NE/4 SE/4 OF SECTION 1,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
500' 0 500' 1000'
SCALE = 1000'
FND 2½" BC GLO 1948
T 23 N
T 22 N
BASIS OF BEARINGS
N 88°51'16" W 5239.77' (M)
N 88°52' W 5239.08' (R)
WT-LYBROOK G01-2208 #01H
S/2 NE/4
NE/4 SE/4
STA 0+00.00
S 34°36'03" E
85.55'
TAKEOFF ● WELL PAD
TIE TO WELL FLAG
N 35°11'48" E - 240.20'
STA 12+60.14
END ● LYBROOK H01-2208
P.I. STA 8+65.92
Δ 28°49'00" RT
S 88°06'19" E 394.22'
O/S PROP ACCESS 19' LT
P.I. STA 0+65.55
Δ 49°13'27" LT
S 83°49'30" E 427.09'
O/S PROP ACCESS 20' LT
P.I. STA 4+92.64
Δ 33°05'49" LT
N 63°04'41" E 373.28'
O/S PROP ACCESS 20' LT
DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR
JAN 15, 2014
DAVID R. RUSSELL, PLS
NEW MEXICO L.S. #10201
JOB No.: ENC105_REV1 DATE: 01/13/14
Scarpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

B.2. **Proposed Lybrook N02**

State of New Mexico
Energy, Minerals & Natural Resources Department

Form C-102
Revised August 1, 2011

Submit one copy to appropriate District Office

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
		WILDCAT

[4] Property Code	[5] Property Name	[6] Well Number
	LYBROOK N02-2206	01H

[7] OGRID No.	[8] Operator Name	[9] Elevation
282327	ENCANA OIL & GAS (USA) INC.	7047.8'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
N	2	22N	6W		359'	SOUTH	1389'	WEST	SANDOVAL

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
E	14	22N	6W		2349'	NORTH	585'	WEST	SANDOVAL

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
PROJECT AREA 160.00 ACRES W/2 W/2 OF SEC. 11 80.00 ACRES W/2 NW/4 OF SEC. 14			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16

1 LAT. 36.159600° N (NAD83)
LONG. 107.446799° W (NAD83)
LAT. 36.159795° N (NAD27)
LONG. 107.446195° W (NAD27)

2 LAT. 36.145101° N (NAD83)
LONG. 107.447099° W (NAD83)
LAT. 36.145099° N (NAD27)
LONG. 107.446490° W (NAD27)

3 LAT. 36.137751° N (NAD83)
LONG. 107.447260° W (NAD83)
LAT. 36.137738° N (NAD27)
LONG. 107.446855° W (NAD27)

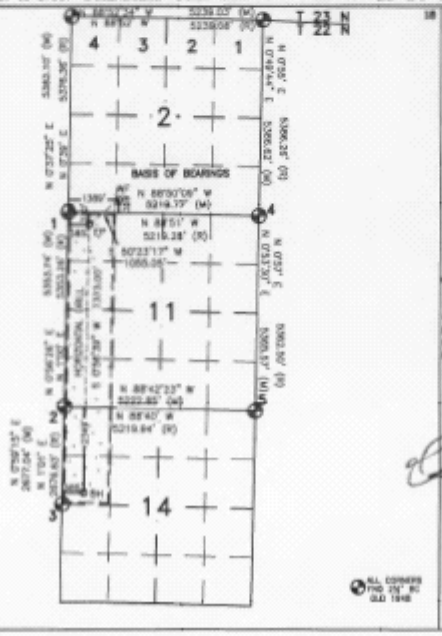
4 LAT. 36.159601° N (NAD83)
LONG. 107.429127° N (NAD83)
LAT. 36.159400° N (NAD27)
LONG. 107.428524° W (NAD27)

5 LAT. 36.144759° N (NAD83)
LONG. 107.429422° W (NAD83)
LAT. 36.144754° N (NAD27)
LONG. 107.428818° W (NAD27)

WELL FLAG
LAT. 36.160707° N (NAD83)
LONG. 107.442082° W (NAD83)
LAT. 36.160692° N (NAD27)
LONG. 107.441479° W (NAD27)

ENTRY POINT
LAT. 36.158661° N (NAD83)
LONG. 107.444837° W (NAD83)
LAT. 36.158646° N (NAD27)
LONG. 107.444233° W (NAD27)

BOTTOM HOLE
LAT. 36.138618° N (NAD83)
LONG. 107.445380° W (NAD83)
LAT. 36.138603° N (NAD27)
LONG. 107.444836° W (NAD27)



17 OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

JANUARY 16, 2014

Date of Survey

Signature and Seal of Professional Surveyor:

DAVID RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID RUSSELL

Certificate Number 10201

State of New Mexico
Energy, Minerals & Natural Resources Department

Form C-102
Revised August 1, 2011

Submit one copy to appropriate District Office

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
		WILDCAT

[4] Property Code	[5] Property Name	[6] Well Number
	LYBROOK N02-2206	02H

[7] OGRID No.	[8] Operator Name	[9] Elevation
282327	ENCANA OIL & GAS (USA) INC.	7047.8'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
N	2	22N	6W		339'	SOUTH	1411'	WEST	SANDOVAL

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
F	14	22N	6W		2349'	NORTH	2010'	WEST	SANDOVAL

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
PROJECT AREA 160.00 ACRES E/2 W/2 OF SEC. 11 80.00 ACRES E/2 NW/4 OF SEC. 14			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16

1 LAT. 36.159800° N (NAD83)
LONG. 107.446799° W (NAD83)
LAT. 36.159788° N (NAD27)
LONG. 107.446198° W (NAD27)

2 LAT. 36.145101° N (NAD83)
LONG. 107.447099° W (NAD83)
LAT. 36.145069° N (NAD27)
LONG. 107.446449° W (NAD27)

3 LAT. 36.137751° N (NAD83)
LONG. 107.447297° W (NAD83)
LAT. 36.137738° N (NAD27)
LONG. 107.446697° W (NAD27)

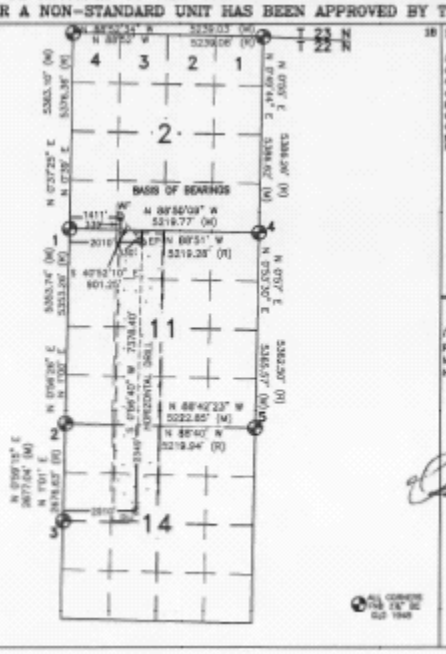
4 LAT. 36.159601° N (NAD83)
LONG. 107.429127° W (NAD83)
LAT. 36.159469° N (NAD27)
LONG. 107.428524° W (NAD27)

5 LAT. 36.144769° N (NAD83)
LONG. 107.429423° W (NAD83)
LAT. 36.144754° N (NAD27)
LONG. 107.428819° W (NAD27)

WELL FLAG
LAT. 36.160707° N (NAD83)
LONG. 107.442083° W (NAD83)
LAT. 36.160692° N (NAD27)
LONG. 107.441479° W (NAD27)

ENTRY POINT
LAT. 36.158661° N (NAD83)
LONG. 107.444837° W (NAD83)
LAT. 36.158646° N (NAD27)
LONG. 107.444235° W (NAD27)

BOTTOM HOLE
LAT. 36.138521° N (NAD83)
LONG. 107.440438° W (NAD83)
LAT. 36.138506° N (NAD27)
LONG. 107.439834° W (NAD27)



18

[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

JANUARY 16, 2014

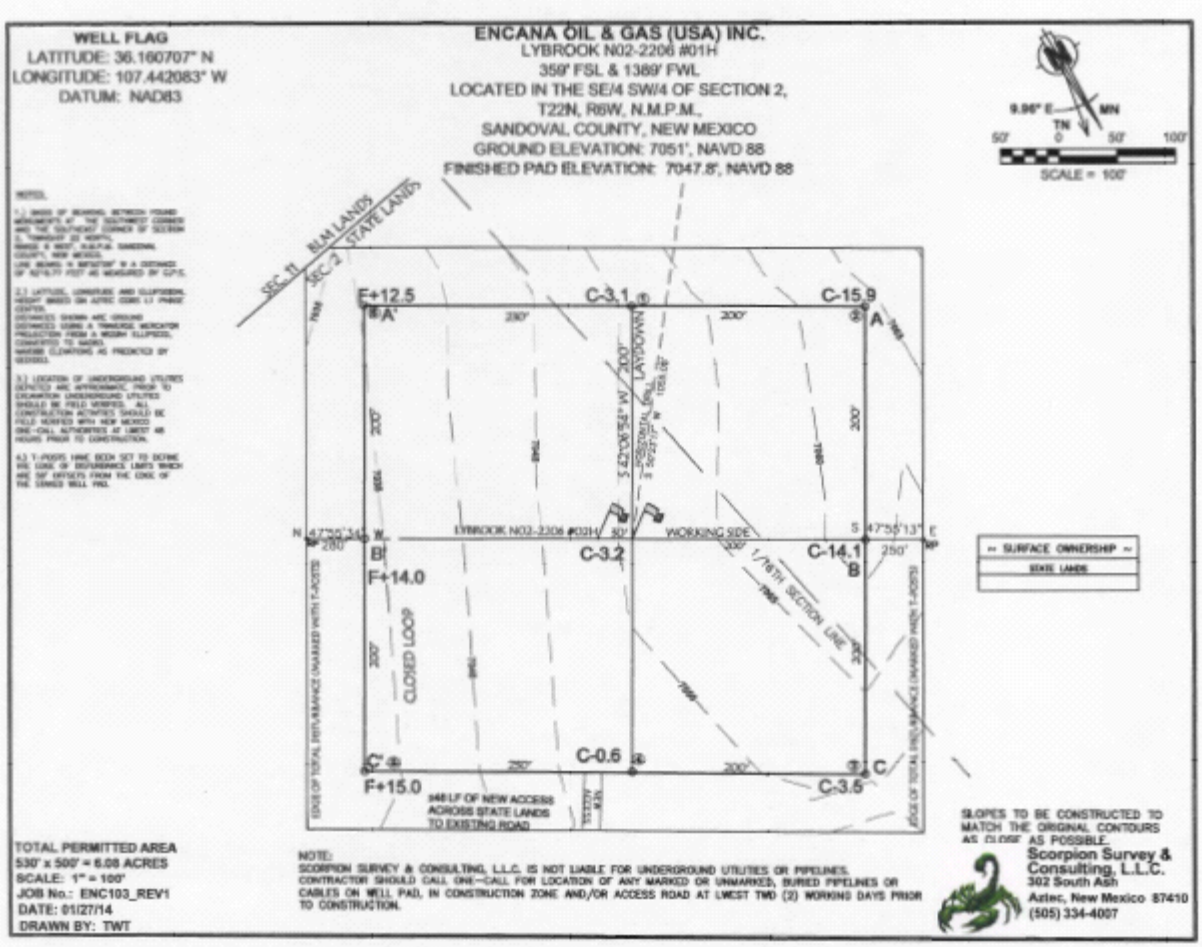
Date of Survey

Signature and Seal of Professional Surveyor:

DAVID RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

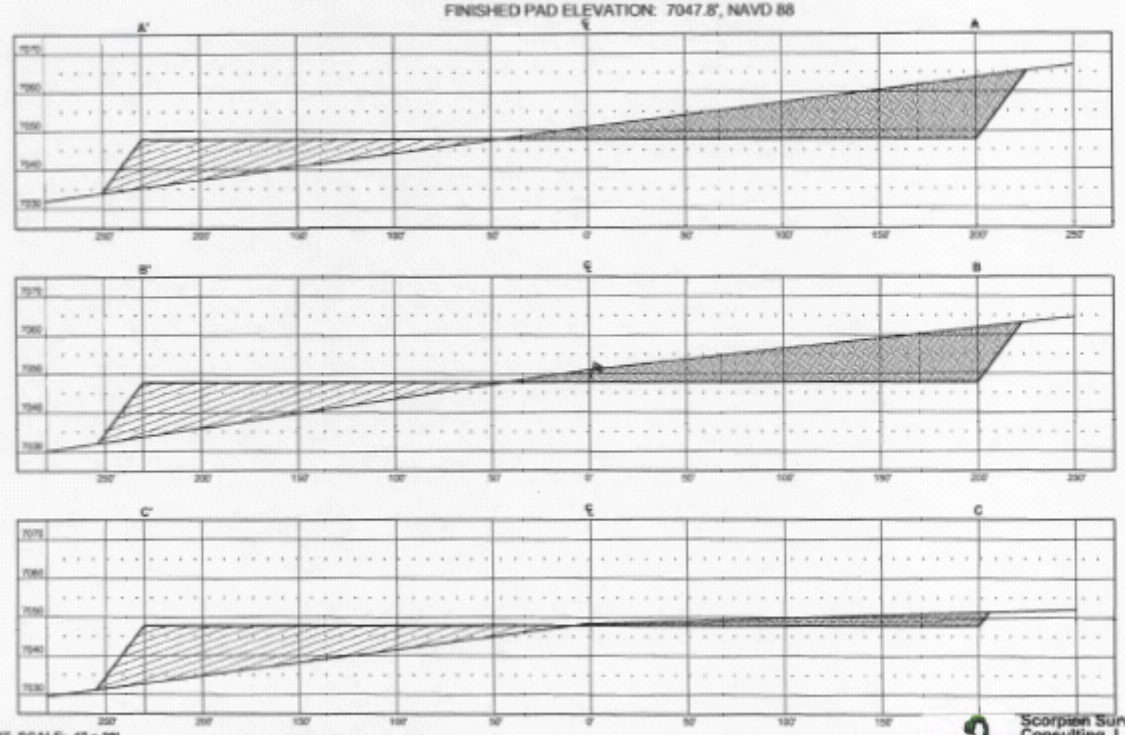
DAVID RUSSELL

Certificate Number 10201


WELL FLAG
LATITUDE: 36.160707° N
LONGITUDE: 107.442083° W
DATUM: NAD83
ENCANA OIL & GAS (USA) INC.
LYBROOK N02-2206 #01H
359' FSL & 1389' FWL
LOCATED IN THE SE/4 SW/4 OF SECTION 2,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7051', NAVD 88
FINISHED PAD ELEVATION: 7047.8', NAVD 88
9.96° E
MN
TN
SCALE = 100'
SEC. 11
BLM LANDS
SEC. 2
STATE LANDS
F+12.5
A'
C-3.1
C-15.9
A
LAYDOWN
S 42°06'54" W
200'
LYBROOK N02-2206 #02H
WORKING SIDE
N 47°55'13" W
S 47°55'13" E
B'
C-3.2
C-14.1
B
F+14.0
CLOSED LOOP
1/16TH SECTION LINE
C'
C-0.6
C
F+15.0
C-3.5
146 LF OF NEW ACCESS ACROSS STATE LANDS TO EXISTING ROAD
SURFACE OWNERSHIP
STATE LANDS
TOTAL PERMITTED AREA
530' x 500' = 6.08 ACRES
SCALE: 1" = 100'
JOB No.: ENC103_REV1
DATE: 01/27/14
DRAWN BY: TWT
NOTE:
SCORPION SURVEY & CONSULTING, L.L.C. IS NOT LIABLE FOR UNDERGROUND UTILITIES OR PIPELINES. CONTRACTOR SHOULD CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED, BURIED PIPELINES OR CABLES ON WELL PAD, IN CONSTRUCTION ZONE AND/OR ACCESS ROAD AT LMEST TWO (2) WORKING DAYS PRIOR TO CONSTRUCTION.
SLOPES TO BE CONSTRUCTED TO MATCH THE ORIGINAL CONTOURS AS CLOSE AS POSSIBLE.
Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

LATITUDE: 36.160707° N
LONGITUDE: 107.442083° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK N02-2206 #01H
359' FSL & 1389' FWL
LOCATED IN THE SE/4 SW/4 OF SECTION 2, T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7051', NAVD 88
FINISHED PAD ELEVATION: 7047.8', NAVD 88



VERT. SCALE: 1" = 30'
HORZ. SCALE: 1" = 60'
JOB No.: ENC103_REV1
DATE: 07/18/13

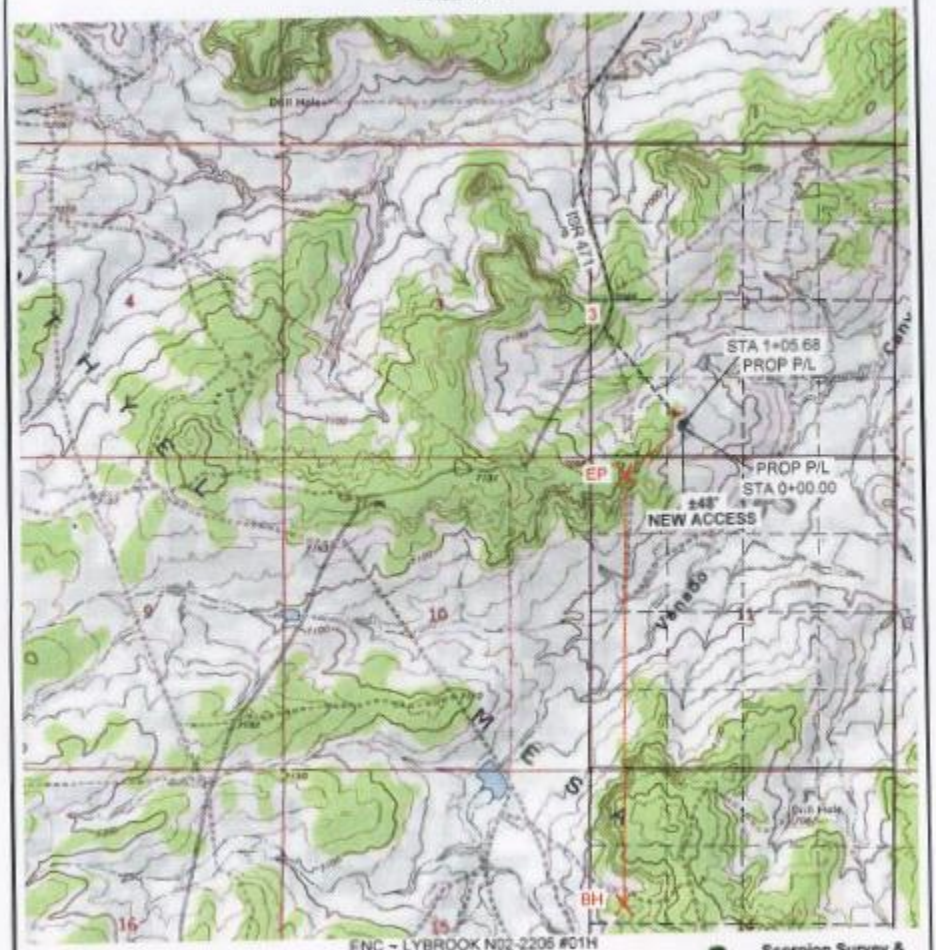
THIS DIAGRAM IS AN ESTIMATE OF DIRT BALANCE AND IS NOT INTENDED TO BE AN EXACT MEASURE OF VOLUME

FILL CUT

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

LATITUDE: 36.160707° N
LONGITUDE: 107.442083° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK N02-2206 #01H
359' FSL & 1389' FWL
LOCATED IN THE SE/4 SW/4 OF SECTION 2,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7051', NAVD 88
±48' OF NEW ACCESS ACROSS BLM LANDS
PAGE 1 OF 2



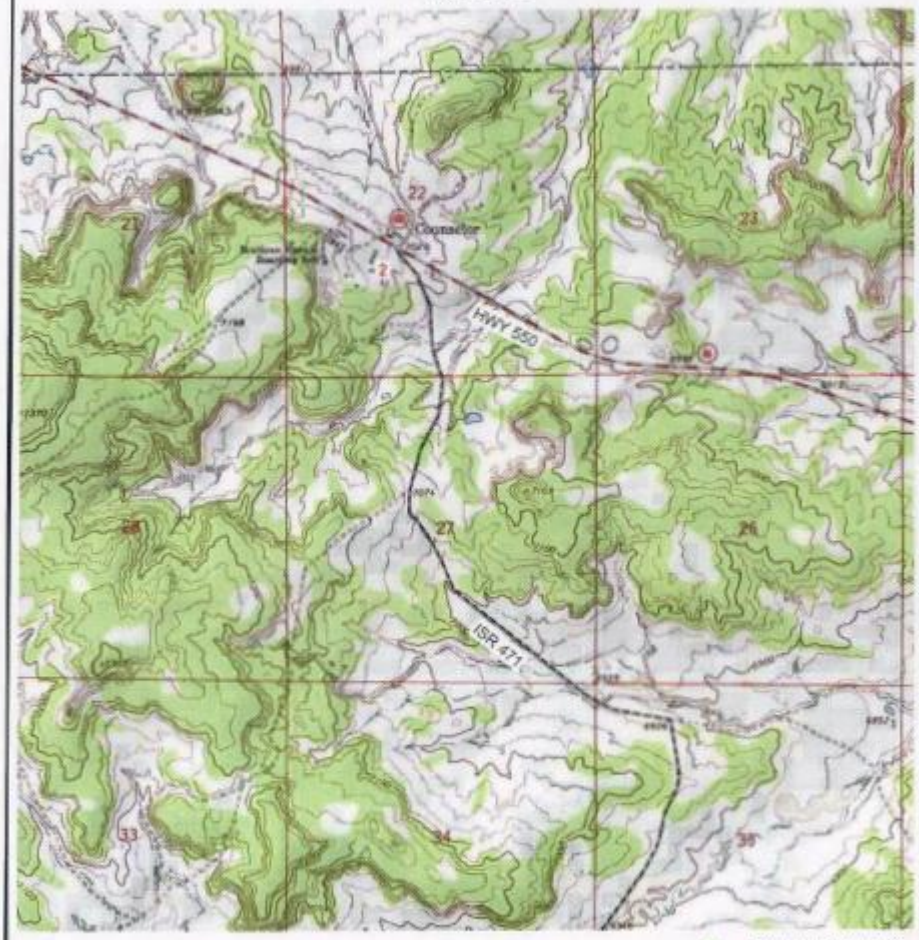
U.S.G.S. QUAD: COUNSELOR
SCALE: 1" = 2000' (1:24,000)
JOB No.: ENC103_REV1
DATE: 01/27/14

ENC ~ LYBROOK N02-2206 #01H
±48' OF NEW ACCESS
INSTALL NEW 24" CMP
STA. 0+00 - BEGIN ACCESS
STA. 1+73.32 @ PAD

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

LATITUDE: 36.160707° N
LONGITUDE: 107.442083° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK N02-2206 #01H
359' FSL & 1389' FWL
LOCATED IN THE SE/4 SW/4 OF SECTION 2,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7051', NAVD 88
±48' OF NEW ACCESS ACROSS BLM LANDS
PAGE 2 OF 2



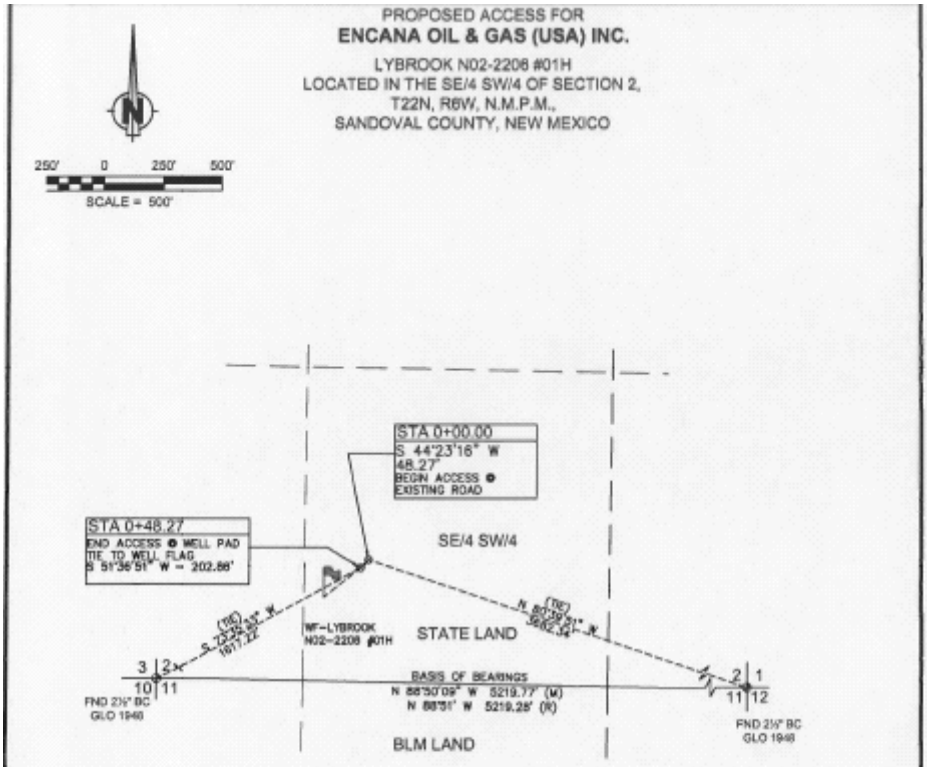
U.S.G.S. QUAD: COUNSELOR
SCALE: 1" = 2000' (1:24,000)
JOB No.: ENC103_REV1
DATE: 01/27/14

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

PROPOSED ACCESS FOR

ENCANA OIL & GAS (USA) INC.

LYBROOK N02-2206 #01H
LOCATED IN THE SE/4 SW/4 OF SECTION 2,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO



= SURFACE OWNERSHIP =		
STATE LANDS		
SECTION 2		
0+00 TO 0+48.27		
48.27 FT / 2.93 RODS		
DATE OF SURVEY	01/15/14	JC, SA

NOTES:

1.) BASIS OF BEARING: REPORTED FOUND MONUMENTS AT THE SOUTHWEST CORNER AND THE SOUTHEAST CORNER SECTION 2, T22N, R6W, N.M.P.M. BEARING: S 88°51' E ON THE NORTH LINE OF SECTION 2, T22N, R6W, N.M.P.M. BEARING: N 88°51' W A DISTANCE OF 5219.77 FEET AS MEASURED WITH GPS.

2.) LOCATION OF UNDERGROUND UTILITIES DEPICTED ARE APPROXIMATE. PRIOR TO EXCAVATION UNDERGROUND UTILITIES SHOULD BE FIELD VERIFIED. ALL CONSTRUCTION ACTIVITIES DURING THE USE OF THIS SURVEY WILL HAVE NEW MEXICO ONE-CALL AUTHORIZED AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

I, DAVID R. RUSSELL, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I CONDUCTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID R. RUSSELL, PLS
NEW MEXICO L.S. #10201 JOB No.: ENC103_REV1 DATE: 01/27/14

DATE JAN 30, 2014

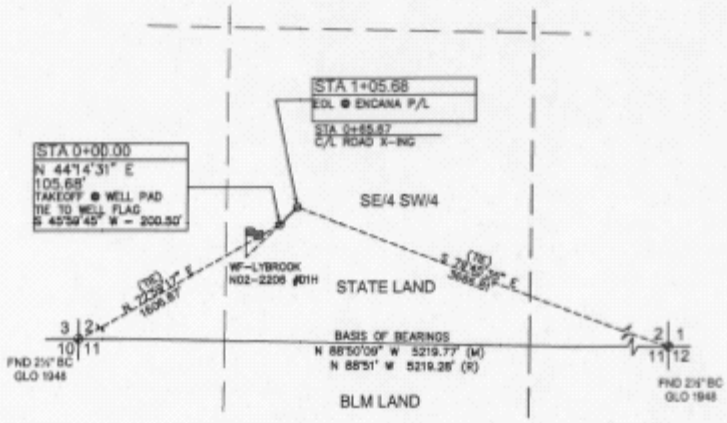
Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

PROPOSED PIPELINE FOR

ENCANA OIL & GAS (USA) INC.

LYBROOK N02-2206 #01H
LOCATED IN THE SE/4 SW/4 OF SECTION 2,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO

500' 0 500' 1000'
SCALE = 1000'



~ SURFACE OWNERSHIP ~ STATE LANDS	
SECTION 2	
0+00 TO 1+05.68	
105.68 FT / 6.40 RODS	
DATE OF SURVEY: 01/16/14	JS, SK

NOTES:

1.) BASIS OF BEARINGS DERIVED FROM MONUMENTS AT THE WEST 1/4 CORNER AND THE SW CORNER OF SECTION 2, T22N, R6W, N.M.P.M., SANDOVAL COUNTY, NEW MEXICO. BEARING = N 88°50'09" W DISTANCE OF 5219.77 FEET AS SHOWN ON PLAT.

2.) LOCATION OF UNDERGROUND UTILITIES ARE NOT ACCURATE. PRIOR TO EXCAVATION CONTACT THE APPROPRIATE UTILITY COMPANIES TO LOCATE UTILITIES. CALL 811 FOR NEW MEXICO ONE-CALL. ATTENTION: IT CAN AT LEAST AS HOURS PRIOR TO EXCAVATION.

I, DAVID R. RUSSELL, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I CONDUCTED OR MADE RESPONSIBLE FOR THIS SURVEY, THE PLAT SHOWN HEREON AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

David R. Russell
DAVID R. RUSSELL, PLS
NEW MEXICO L.S. #10201

JAN 30, 2014

JOB No.: ENC103_REV1 DATE: 01/27/14

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

B.3. **Proposed Lybrook P03**

DISTRICT I
1625 N. French Dr., Hobbs, N.M. 88240
Phone: (575) 393-6161 Fax: (575) 393-0720

DISTRICT II
811 S. First St., Artesia, N.M. 88210
Phone: (575) 748-1283 Fax: (575) 748-9720

DISTRICT III
1000 Rio Brazos Rd., Aztec, N.M. 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-102
Revised August 1, 2011

Submit one copy to appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
		WILDCAT

[4] Property Code	[5] Property Name	[6] Well Number
	LYBROOK P03-2206	01H
[7] OGRID No.	**[8] Operator Name**	**[9] Elevation**
282327	ENCANA OIL & GAS (USA) INC.	7124.1'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
P	3	22N	6W		438'	SOUTH	1222'	EAST	SANDOVAL

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	West/East line	County
G	15	22N	6W		2347'	NORTH	2070'	EAST	SANDOVAL

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
PROJECT AREA 160.00 ACRES W/2 E/2 SEC. 10 80.00 ACRES W/2 NE/4 SEC. 15			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16

1 LAT. 36.160110° N (NAD83)
LONG. 107.464533° W (NAD83)
LAT. 36.160095° N (NAD27)
LONG. 107.464533° W (NAD27)

2 LAT. 36.145423° N (NAD83)
LONG. 107.464846° W (NAD83)
LAT. 36.145408° N (NAD27)
LONG. 107.464242° W (NAD27)

3 LAT. 36.138078° N (NAD83)
LONG. 107.465026° W (NAD83)
LAT. 36.138063° N (NAD27)
LONG. 107.464423° W (NAD27)

4 LAT. 36.159600° N (NAD83)
LONG. 107.446799° W (NAD83)
LAT. 36.159785° N (NAD27)
LONG. 107.446195° W (NAD27)

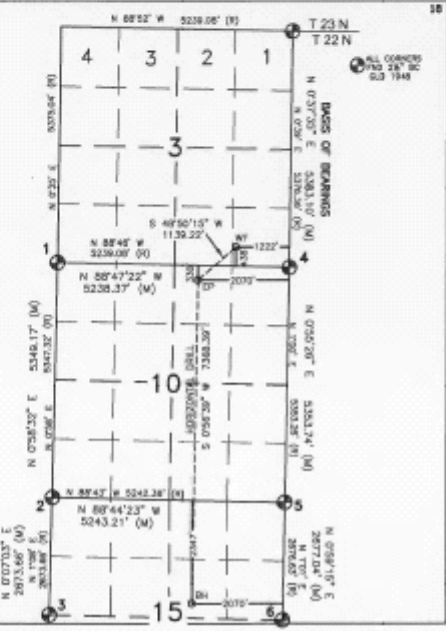
5 LAT. 36.145101° N (NAD83)
LONG. 107.447099° W (NAD83)
LAT. 36.145095° N (NAD27)
LONG. 107.446495° W (NAD27)

6 LAT. 36.137751° N (NAD83)
LONG. 107.447260° W (NAD83)
LAT. 36.137736° N (NAD27)
LONG. 107.446656° W (NAD27)

WELL FLAG
LAT. 36.161075° N (NAD83)
LONG. 107.450820° W (NAD83)
LAT. 36.161060° N (NAD27)
LONG. 107.450316° W (NAD27)

ENTRY POINT
LAT. 36.159017° N (NAD83)
LONG. 107.453825° W (NAD83)
LAT. 36.159002° N (NAD27)
LONG. 107.453221° W (NAD27)

BOTTOM HOLE
LAT. 36.138786° N (NAD83)
LONG. 107.454246° W (NAD83)
LAT. 36.138771° N (NAD27)
LONG. 107.453642° W (NAD27)



18

17 OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

SEPTEMBER 9, 2013
Date of Survey

Signature and Seal of Professional Surveyor:

DAVID RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

3/25/2014

DAVID RUSSELL

Certificate Number 10201

State of New Mexico
Energy, Minerals & Natural Resources Department

Form C-102
Revised August 1, 2011

Submit one copy to appropriate District Office

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
		WILDCAT

[4] Property Code	[5] Property Name	[6] Well Number
	LYBROOK P03-2206	02H

[7] OGRID No.	[8] Operator Name	[9] Elevation
282327	ENCANA OIL & GAS (USA) INC.	7124.1'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	WEST/East line	County
P	3	22N	6W		439'	SOUTH	1192'	EAST	SANDOVAL

[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	WEST/East line	County
H	15	22N	6W		2347'	NORTH	750'	EAST	SANDOVAL

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
PROJECT AREA 160.00 ACRES E/2 E/2 SEC. 10 80.00 ACRES E/2 NE/4 SEC. 15			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16

1 LAT. 36.160110° N (NAD83)
LONG. 107.464533° W (NAD83)
LAT. 36.160095° N (NAD27)
LONG. 107.464533° W (NAD27)

2 LAT. 36.145423° N (NAD83)
LONG. 107.464846° W (NAD83)
LAT. 36.145408° N (NAD27)
LONG. 107.464242° W (NAD27)

3 LAT. 36.138075° N (NAD83)
LONG. 107.465028° W (NAD83)
LAT. 36.138063° N (NAD27)
LONG. 107.464422° W (NAD27)

4 LAT. 36.139800° N (NAD83)
LONG. 107.446793° W (NAD83)
LAT. 36.139785° N (NAD27)
LONG. 107.446195° W (NAD27)

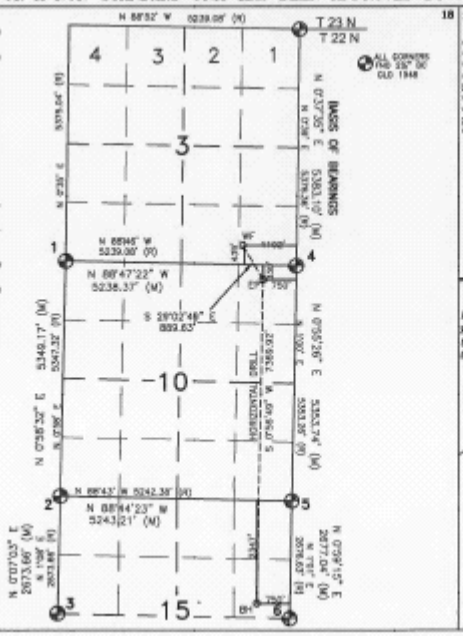
5 LAT. 36.145101° N (NAD83)
LONG. 107.447069° W (NAD83)
LAT. 36.145085° N (NAD27)
LONG. 107.446485° W (NAD27)

6 LAT. 36.137751° N (NAD83)
LONG. 107.447260° W (NAD83)
LAT. 36.137735° N (NAD27)
LONG. 107.446656° W (NAD27)

WELL FLAG
LAT. 36.161075° N (NAD83)
LONG. 107.450818° W (NAD83)
LAT. 36.161060° N (NAD27)
LONG. 107.450214° W (NAD27)

ENTRY POINT
LAT. 36.156939° N (NAD83)
LONG. 107.449356° W (NAD83)
LAT. 36.156924° N (NAD27)
LONG. 107.448752° W (NAD27)

BOTTOM HOLE
LAT. 36.138704° N (NAD83)
LONG. 107.446780° W (NAD83)
LAT. 36.138689° N (NAD27)
LONG. 107.446176° W (NAD27)



18

[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature Date

Printed Name

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

SEPTEMBER 9, 2013

Date of Survey

Signature and Seal of Professional Surveyor

DAVID RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

3/29/2014

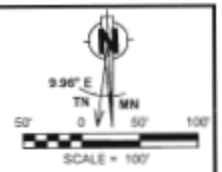
DAVID RUSSELL

Certificate Number 10201

WELL FLAG
LATITUDE: 36.161075° N
LONGITUDE: 107.450920° W
DATUM: NAD83

ENCANA OIL & GAS (USA) INC.

LYBROOK P03-2206 #01H
438' FSL & 1222' FEL
LOCATED IN THE SE/4 SE/4 OF SECTION 3,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7127', NAVD 88
FINISHED PAD ELEVATION: 7124.1', NAVD 88



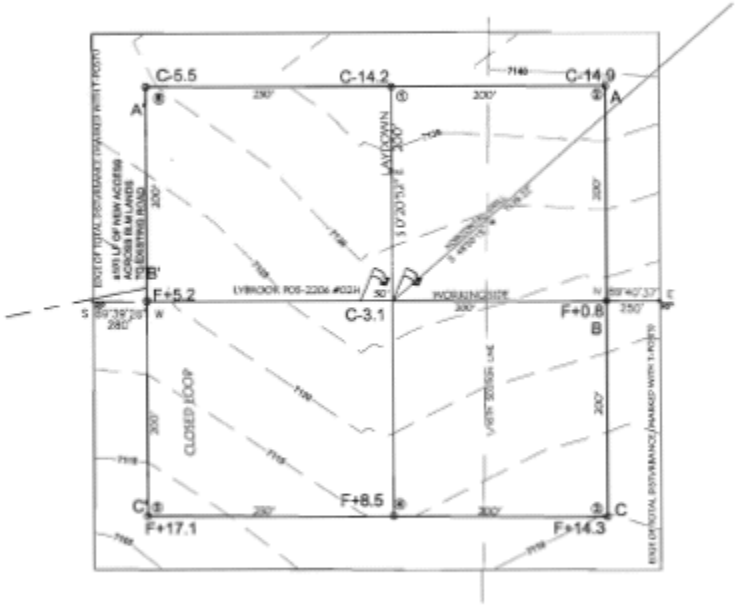
NOTES:

1.) BASIS OF BEARING BETWEEN FOUND MONUMENTS AT THE NORTHEAST CORNER AND THE SOUTHEAST CORNER OF SECTION 3, TOWNSHIP 22 NORTH, RANGE 6 WEST, N.M.P.M., SANDOVAL COUNTY, NEW MEXICO.
LINE BEARING N 01°17'25" E A DISTANCE OF 5283.10 FEET AS MEASURED BY G.P.S.

2.) LATITUDE, LONGITUDE AND ELEVATION HEIGHT BASED ON NAD83 USING L1 PHASE CORRECTIONS.
DISTANCES SHOWN ARE GROUND DISTANCES USING A TRANSVERSE MERCATOR PROJECTION FROM A MODIFIED SULPHIDE, CONVERTED TO NAD83.
NAVD88 ELEVATIONS AS PROVIDED BY SUDDEC.

3.) LOCATION OF UNDERGROUND UTILITIES DEPICTED ARE APPROXIMATE. PRIOR TO EXCAVATION UNDERGROUND UTILITIES SHOULD BE FIELD VERIFIED. ALL CONSTRUCTION ACTIVITIES SHOULD BE FIELD VERIFIED WITH NEW MEXICO 811—CALL AUTHORITIES AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

4.) T-POSTS HAVE BEEN SET TO DEFINE THE EDGE OF DISTURBANCE. LAMS WHICH ARE SET OFFSETS FROM THE EDGE OF THE STAKED WELL PAD.



— SURFACE OWNERSHIP —
BUREAU OF LAND MANAGEMENT

TOTAL PERMITTED AREA
530' x 500' = 6.08 ACRES
SCALE: 1" = 100'
JOB No.: ENC109
DATE: 10/10/13
DRAWN BY: TWT

NOTE:
SCORPION SURVEY & CONSULTING, L.L.C. IS NOT LIABLE FOR UNDERGROUND UTILITIES OR PIPELINES. CONTRACTOR SHOULD CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED, BURIED PIPELINES OR CABLES ON WELL PAD, IN CONSTRUCTION ZONE AND/OR ACCESS ROAD AT LMEST TWO (2) WORKING DAYS PRIOR TO CONSTRUCTION.

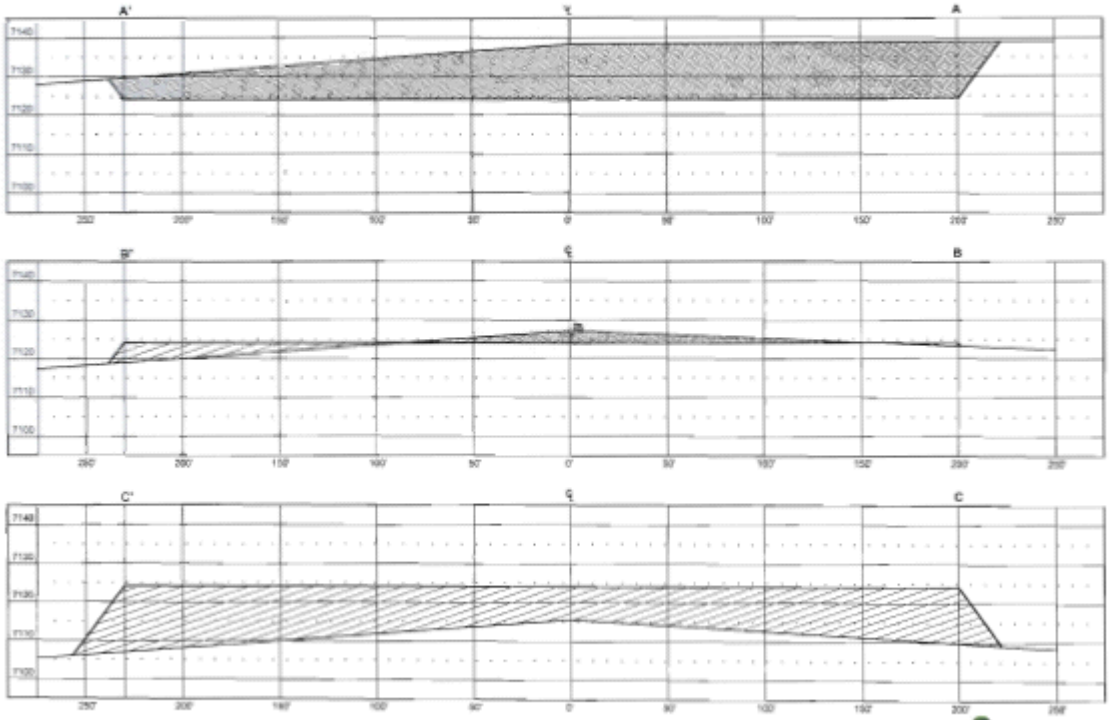
SLOPES TO BE CONSTRUCTED TO MATCH THE ORIGINAL CONTOURS AS CLOSE AS POSSIBLE.

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

ENCANA OIL & GAS (USA) INC.

LYBROOK P03-2206 #01H
438' FSL & 1222' FEL
LOCATED IN THE SE/4 SE/4 OF SECTION 3, T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7127', NAVD 88
FINISHED PAD ELEVATION: 7124.1', NAVD 88

LATITUDE: 36.161075° N
LONGITUDE: 107.450920° W
DATUM: NAD 83



VERT. SCALE: 1" = 30'
HORZ. SCALE: 1" = 50'
JOB No.: ENC109
DATE: 10/10/13

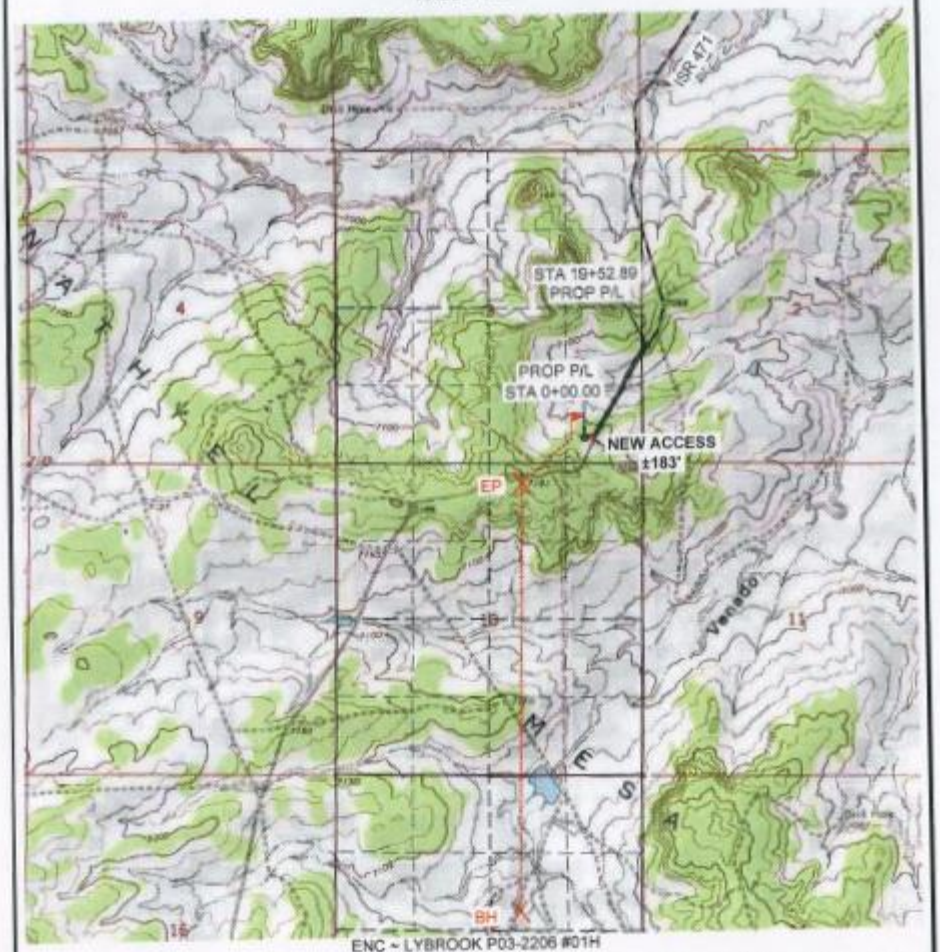
THIS DIAGRAM IS AN ESTIMATE OF DIRT BALANCE AND IS NOT INTENDED TO BE AN EXACT MEASURE OF VOLUME

FILL CUT

Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

LATITUDE: 36.161075° N
LONGITUDE: 107.450920° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK P03-2206 #01H
438' FSL & 1222' FEL
LOCATED IN THE SE/4 SE/4 OF SECTION 3,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7127', NAVD 88
±183' OF NEW ACCESS ACROSS BLM LANDS
PAGE 1 OF 2



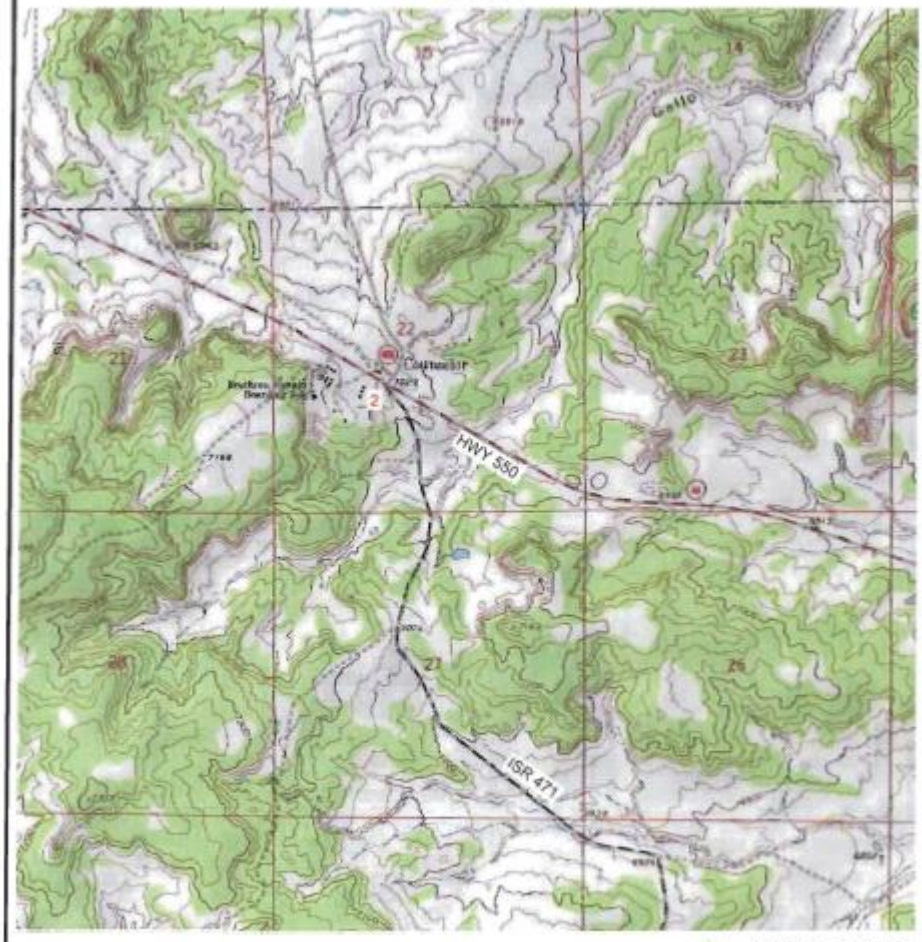
U.S.G.S. QUAD: COUNSELOR
SCALE: 1" = 2000' (1:24,000)
JOB No.: ENC169_REV1
DATE: 03/21/14

ENC ~ LYBROOK P03-2206 #01H
±183' OF NEW ACCESS
INSTALL NEW 24" CMP
STA. 0+00 - BEGIN ACCESS
STA. 1+82.83 @ PAD

Scorpion Survey & Consulting, L.L.C.
302 S. Ash
Aztec, New Mexico 87410
(505) 334-4007

LATITUDE: 36.161075° N
LONGITUDE: 107.450920° W
DATUM: NAD 83

ENCANA OIL & GAS (USA) INC.
LYBROOK P03-2206 #01H
438' FSL & 1222' FEL
LOCATED IN THE SE/4 SE/4 OF SECTION 3,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
GROUND ELEVATION: 7127', NAVD 88
±183' OF NEW ACCESS ACROSS BLM LANDS
PAGE 2 OF 2



U.S.G.S. QUAD: COUNSELOR
SCALE: 1" = 2000' (1:24,000)
JOB No.: ENC109
DATE: 10/10/13

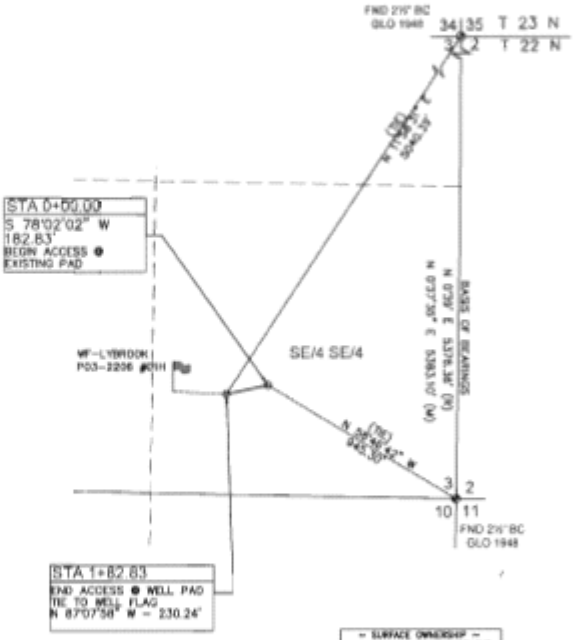
Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007

PROPOSED ACCESS FOR

ENCANA OIL & GAS (USA) INC.

LYBROOK P03-2206 #01H
LOCATED IN THE SE/4 SE/4 OF SECTION 3,
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO

250' 0 250' 500'
SCALE = 500'



— SURFACE OWNERSHIP — BUREAU OF LAND MANAGEMENT		
SECTION 3		
0+00 TO 1+82.83		
182.83 FT / 11.08 RODS		
DATE OF SURVEY	09/09/13	JC WR

NOTES:

1) WELL IS BASED ACCORDING TO GPS MEASUREMENTS AT THE WELL FLAG CORNER WITH A GPS ACCURACY OF ±3 FEET. BEARINGS ARE BASED ON THE NEW MEXICO STATE PLANE COORDINATE SYSTEM, NAD27 & WEST N.M.P.M. GRID, WITH A CUT OR FILL DISTANCE OF 337.123 FEET AS SHOWN BY CYZ.

2) LOCATION OF UNDERGROUND UTILITIES WERE NOT APPROVED. PRIOR TO CONSTRUCTION, CONTACT ALL UTILITY COMPANIES FOR LOCATIONS OF UTILITIES AND ANY OTHER STRUCTURES, AND CALL NEW MEXICO 811 FOR FIELD MARKING OF UTILITIES PRIOR TO CONSTRUCTION.

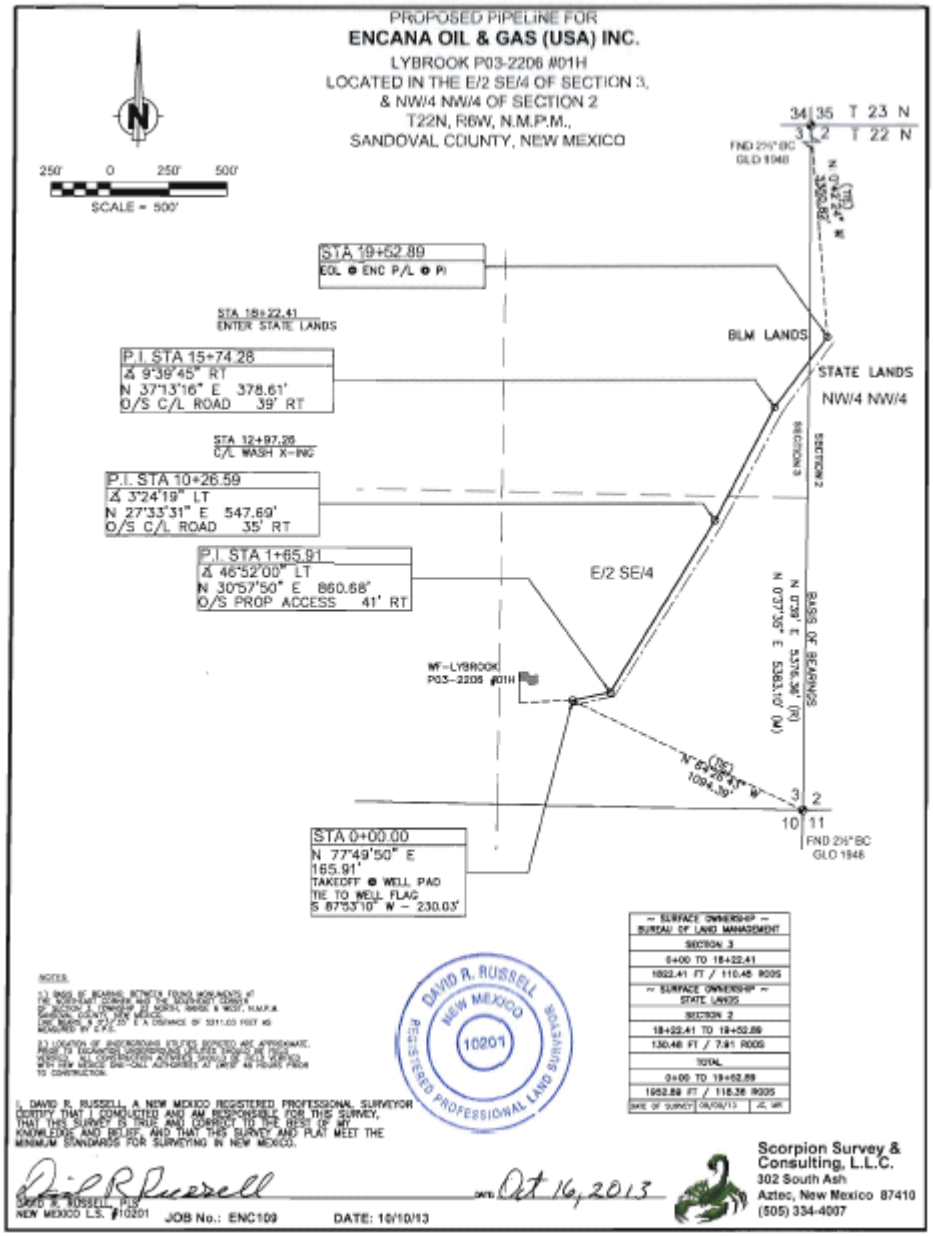
I, DAVID R. RUSSELL, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR HEREBY CERTIFY THAT I CONDUCTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR

David R. Russell Oct 16, 2013

DAVID R. RUSSELL, P.S.
NEW MEXICO L.S. #10201 JOB No.: ENC109 DATE: 10/10/13

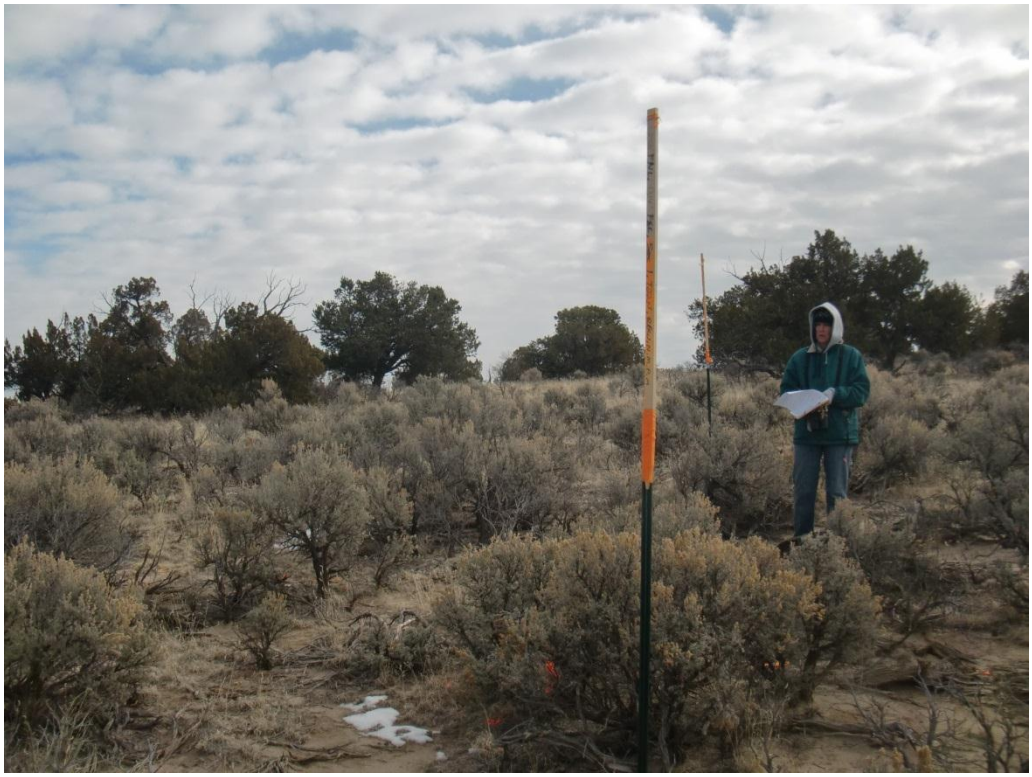
Scorpion Survey & Consulting, L.L.C.
302 South Aah
Aztec, New Mexico 87410
(505) 334-4007


PROPOSED PIPELINE FOR
ENCANA OIL & GAS (USA) INC.
LYBROOK P03-2206 #01H
LOCATED IN THE E/2 SE/4 OF SECTION 3,
& NW/4 NW/4 OF SECTION 2
T22N, R6W, N.M.P.M.,
SANDOVAL COUNTY, NEW MEXICO
SCALE = 500'
STA 19+52.89
EOL ● ENC P/L ● PI
STA 18+22.41
ENTER STATE LANDS
P.I. STA 15+74.28
Δ 9°39'45" RT
N 37°13'16" E 378.61'
O/S C/L ROAD 39' RT
STA 12+97.26
C/L WASH X-ING
P.I. STA 10+26.59
Δ 3°24'19" LT
N 27°33'31" E 547.69'
O/S C/L ROAD 35' RT
P.I. STA 1+65.91
Δ 46°52'00" LT
N 30°57'50" E 860.68'
O/S PROP ACCESS 41' RT
STA 0+00.00
N 77°49'50" E
165.91'
TAKEOFF ● WELL PAD
TIE TO WELL FLAG
S 87°53'10" W – 230.03'
BLM LANDS
STATE LANDS
NW/4 NW/4
E/2 SE/4
WF-LYBROOK
P03-2206 #01H
BASIS OF BEARINGS
FND 2½" BC
GLO 1948
DAVID R. RUSSELL
NEW MEXICO
10201
REGISTERED PROFESSIONAL LAND SURVEYOR
Scorpion Survey & Consulting, L.L.C.
302 South Ash
Aztec, New Mexico 87410
(505) 334-4007
JOB No.: ENC109
DATE: 10/10/13

APPENDIX C. PHOTOGRAPHS

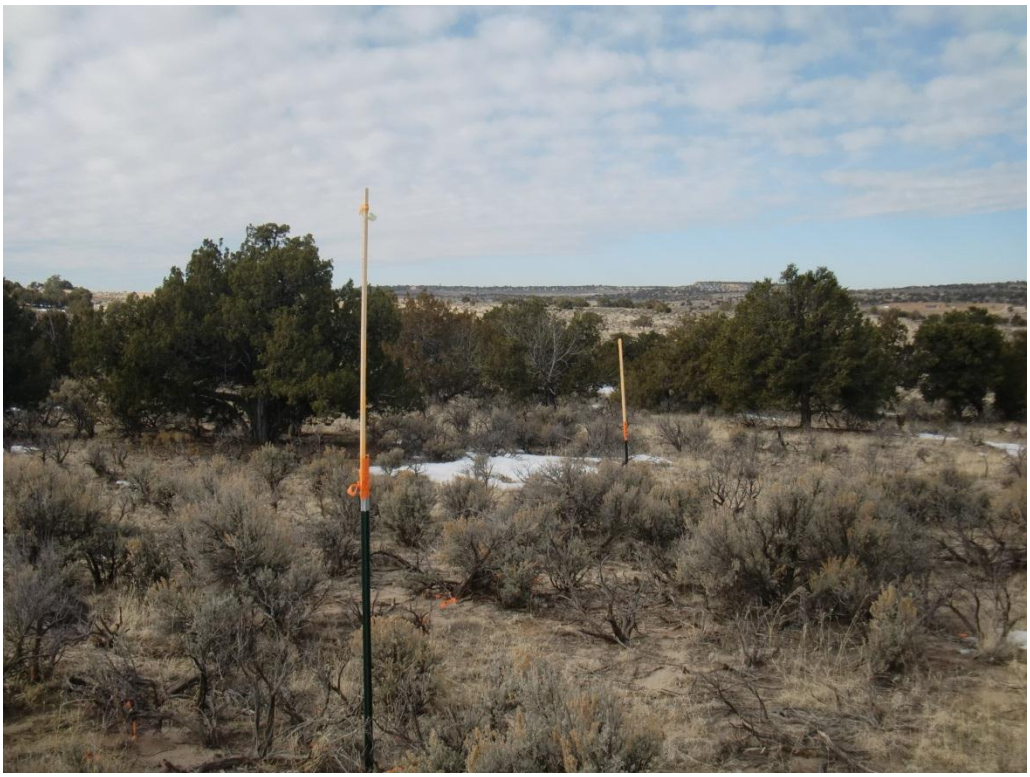
C.1 Proposed Lybrook G01

Proposed Well Pad: View from proposed wellheads, looking northward



Proposed Well Pad: View from proposed wellheads, looking eastward

Proposed Well Pad: View from proposed wellheads, looking southward



Propsoed Well Pad: View from proposed wellheads, looking westward

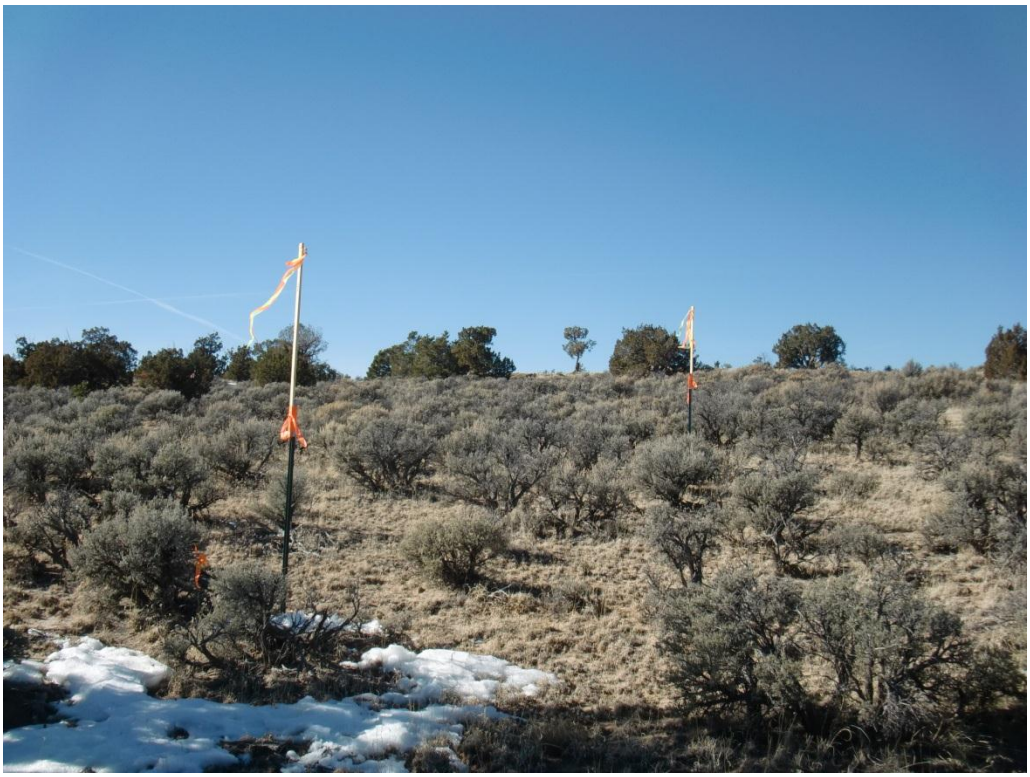
Proposed Access Road and Pipeline Corridor: Western end, looking eastward

C.2 Proposed Lybrook N02

Proposed Well Pad: View from proposed wellheads, looking northward

P)roposed Well Pad: View from proposed wellheads, looking eastward

Proposed Well Pad: View from proposed wellheads, looking southward



Pproposed Well Pad: View from proposed wellheads, looking westward

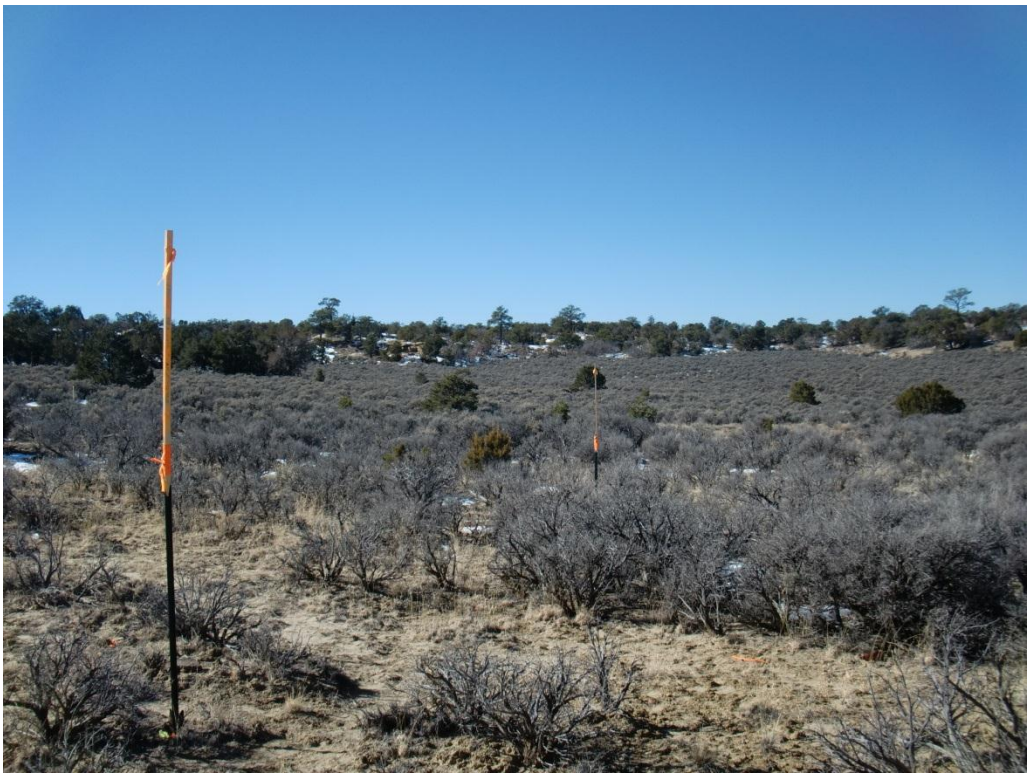
Proposed Access Road and Pipeline Corridor: Southwestern end, looking northeastward

C.3 Proposed Lybrook P03

Proposed Well Pad: View from proposed wellheads, looking northward

Proposed Well Pad: View from proposed wellheads, looking eastward

Proposed Well Pad: View from proposed wellheads, looking southward



Proposed Well Pad: View from proposed wellheads, looking westward

Proposed Access Road and Pipeline Corridor: Western end, looking eastward

Proposed Pipeline Corridor: Northeastern end, looking southwestward

APPENDIX D. RECLAMATION PLANS