

Environmental Assessment

for

Samson Resources Company

Hornbuckle Field Development Program EA Update

Bureau of Land Management

Casper Field Office

Casper, Wyoming

WY-060-EA12-266



The BLM's multiple use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

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ACRONYMS AND ABBREVIATIONS

AAM	Annual Arithmetic Mean
Ac-Ft	Acre-Feet
APD	Application to Drill
AQD	Air Quality Division
AQS	Air Quality System
AUM	Animal Unit Month
BACT	Best Available Control Technology
bb1	Barrel (42 U.S. gallons)
BLM	Bureau of Land Management
BMP	Best Management Practices
CAA	Clean Air Act
CBNG	Coal Bed Natural Gas
CCS	Center for Climate Strategies
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CEQ	Council on Environmental Quality
CFO	Casper Field Office
CFR	Code of Federal Regulations
CH ₄	Methane
CO	Carbon Monoxide
COA	Condition of Approval
CWA	Clean Water Act of 1972
dBA	A-weighted Decibel
DOT	Department of Transportation
EA	Environmental Assessment
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know
ESA	Endangered Species Act
FLPMA	Federal Land Policy Management Act
FONSI	Finding of No Significant Impact
GEIS	Generic Environmental Impact Statement
GHG	Greenhouse Gas
hp	Horsepower
IM	Instruction Memorandum
ISL	In-Situ Leach
LACT	Lease Automatic Custody Transfer
MBTA	Migratory Bird Treaty Act
MD	Measured Depth
MLA	Mineral Leasing Act of 1920
MMt	Million Metric Tons
NAAQS	National Ambient Air Quality Standards

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ACRONYMS AND ABBREVIATIONS (Continued)

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO _x	Nitrogen Oxides
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
O ₃	Ozone
OBM	Oil Based Mud
OSHA	Occupational Safety and Health Administration
PPM	Parts Per Million
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-Way
SARA	Superfund Amendment and Reauthorization Act
SH	State Highway
SHPO	State Historic Preservation Office
SLAMS	State and Local Air Monitoring Site
SO ₂	Sulfur Dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SPM	Special Purpose Monitors
SRC	Samson Resources Company
TDS	Total dissolved solids
USACE	U.S. Army Corps of Engineers
USDI	U.S. Department of the Interior
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
WOGCC	Wyoming Oil and Gas Conservation Commission
W.S.	Wyoming Statute
WSEO	Wyoming State Engineer's Office
WQD	Water Quality Division
WWC	WWC Engineering
WYDOT	Wyoming Department of Transportation
WYNDD	Wyoming Natural Diversity Database
WYPDES	Wyoming Pollutant Discharge Elimination System

1.0 INTRODUCTION

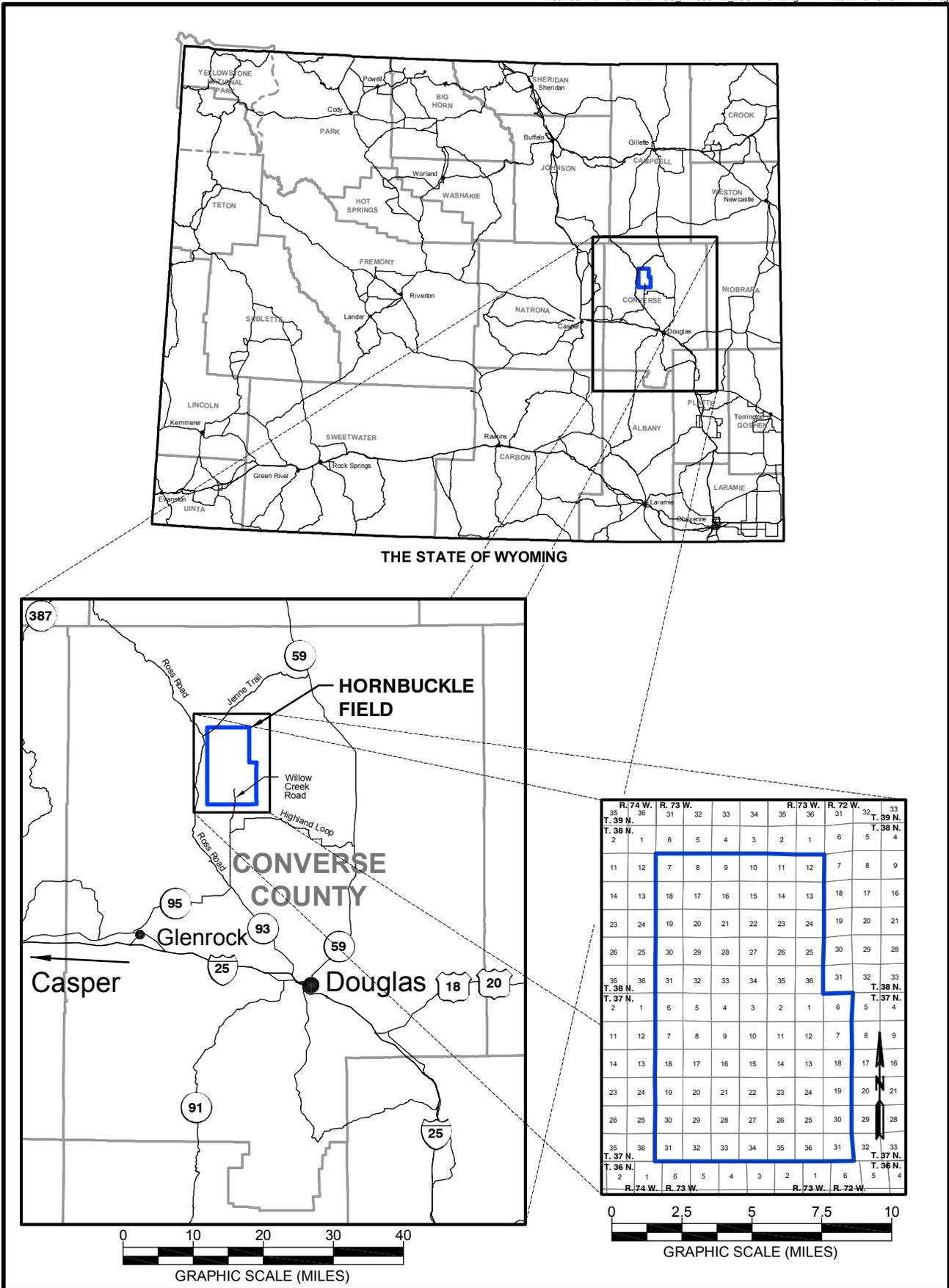
This environmental assessment (EA) is prepared pursuant to the National Environmental Policy Act (NEPA) as amended (42 USC Chapter 55, §4321 *et seq.*), and its implementing regulations found in Title 40 CFR, Parts 1500-1508 and the Bureau of Land Management's (BLM's) National Environmental Policy Act Handbook (H-1790-1) (BLM 2008). This EA assesses the environmental impacts of the Proposed Action and the No Action Alternative and serves to guide the decision-making process.

1.1 Background

In October 2011 the BLM Casper Field Office (CFO) completed EA WY-060-EA11-181 (BLM 2011), referred to herein as the Original Hornbuckle EA, analyzing the effects of an exploratory oil and gas drilling program proposed by Samson Resources Company (SRC). The Proposed Action (selected alternative) was to drill, complete, and potentially produce up to 96 horizontal wells on 48 well pads within the Hornbuckle Field Development Program Area (HFDPA). The HFDPA is located in northern Converse County, approximately 26 miles northeast of the town of Glenrock in T37N and T38N, R72W and R73W (Figure 1-1). The BLM issued a Finding of No Significant Impact (FONSI) for the Proposed Action based on information contained in EA WY-060-EA11-181 and all other available pertinent information.

Following the issuance of the FONSI, SRC realized the need to address measures that could be taken to supplement WY-060-EA11-181 to increase field efficiency and maximize drainage, address limitations of the original Hornbuckle Field Development Program, and increase operational flexibility within the Hornbuckle Field. The areas of change include increasing the number of wells per pad from two to as many as six, increasing the percentage of exploratory wells for formations outside the Sussex, adding oil and water pipelines in the same trench as the currently analyzed gas line if needed, and, in addition to approved overhead and buried power supply, use of gas-powered engines to power pumping equipment within the field. The amount of interim reclamation to be undertaken would also change, based on the increased number of wells per pad, which is addressed herein.

The primary reason for the Hornbuckle EA Update (WY-060-EA12-266) is to analyze the impacts of drilling up to 192 new wells on the 48 approved well pads and construction of associated infrastructure consisting primarily of wellhead processing and pumping equipment. The proposed wells are in addition to the 96 wells that were analyzed in the Original Hornbuckle EA and approved in the associated FONSI. The additional wells would be drilled over a period of 5 to 10 years. These new wells would be drilled horizontally to maximize the potential of the Sussex, Muddy, Frontier, Niobrara and other hydrocarbon-bearing formations for commercial oil and gas production at vertical depths up to 13,000 feet.



The overall HFDPA size has not changed from the Original Hornbuckle EA (Figure 1-1), encompassing approximately 46,080 acres (72 sections) of mixed federal, state and fee (private) lands. Table 1-1 summarizes surface ownership within the project area. Table 1-2 summarizes the mineral ownership within the HFDPA.

Table 1-1. Surface Ownership within the HFDPA

Surface Ownership	Acres	Percent of Total
Federal - Administered by BLM	3,755	8.15
Federal - Administered by USFS	1,620	3.52
Federal - Administered by DOE	80	0.17
State of Wyoming	6,000	13.02
Private (Fee)	34,625	75.14
TOTAL	46,080	100.00

Table 1-2. Mineral Ownership within the HFDPA

Mineral Ownership	Acres	Percent of Total
Federal	29,760	64.58
State of Wyoming	6,000	13.02
Private (Fee)	10,320	22.40
TOTAL	46,080	100.00

The Proposed Action would increase the number of wells per pad and reduce the amount of interim reclamation (increase the amount of long-term disturbance). Potential impacts from the Proposed Action could include deterioration of ambient air quality; an increase in traffic, water use, and noise; and impacts to visual resources. Only those resources analyzed in the Original Hornbuckle EA that may be impacted by the Proposed Action will be analyzed in this Hornbuckle EA update. The other aspects of the analysis normally discussed in depth in an EA are addressed by referencing the Original Hornbuckle EA. Table 1-3 provides a tabulation of the changes included the Hornbuckle EA Update as compared to the Original Hornbuckle EA.

1.2 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to explore for and develop oil and gas resources on federal mineral leases consistent with lease rights where valid, existing rights occur.

The need for exploration and development of oil and gas resources is established by the BLM's responsibility under the Mineral Leasing Act of 1920 (30 U.S.C.188 *et seq.*) (MLA) as amended to promote the mining of oil and gas on the public domain. Deposits of oil and gas owned by the United States are subject to disposition in the form and manner provided by the MLA, where applicable through the land use planning process.

Table 1-3. Tabulation of Changes Included in the Hornbuckle EA Update Compared to the Original Hornbuckle EA

EA Section	Hornbuckle EA Update¹
1.0 Introduction	Revised entire section to discuss changes
2.0 Proposed Action and Alternatives	Revised entire section to discuss changes
3.0 Affected Environment	No changes
3.1 Environmental Elements Considered with Minor Effects	Removed
3.2 Air Quality	Made significant changes to update the baseline air quality discussion
3.3 General Setting	No changes
3.4 Existing Oil and Gas Development in the Overall Project Area	Revised to update and to include a more detailed discussion on oil and gas lease holders
3.5 Cultural Resources	No changes
3.6 Range Management	No changes
3.7 Soils	No changes
3.8 Water Resources	Updated to reflect new proposed action
3.9 Wildlife	No changes
3.10 Environmental Justice	No changes
3.11 Transportation	Added as new section
3.12 Noise	Added as new section
3.13 Visual Resource Management	Added as new section
4.0 Environmental Consequences	Updated to reflect new proposed action
4.1 Introduction	Updated to reflect new proposed action
4.2 Air Quality	Revised to expand and update air quality discussion and revised well numbers
4.3 Cultural Resources	Updated to reflect new proposed action
4.4 Range Management	Updated to reflect new proposed action
4.5 Soils	Updated to reflect new proposed action
4.6 Water Resources	Revised disturbance acres. Groundwater Resources (4.6.1) - added water use and production/disposal discussions
4.7 Wildlife	Updated to reflect new proposed action
4.8 Transportation	Added as new section
4.9 Noise	Added as new section
4.10 Visual Resources	Added as new section
4.11 Cumulative Impacts (Old 4.8)	Revised section # to accommodate new sections and revised disturbance acres and well numbers. Air Quality (4.11.2) – revised air quality cumulative impacts discussion based on updates to Sections 3.2 and 4.2
4.12 Irreversible and Irrecoverable Commitment of Resources (Old 4.9)	Revised section # to accommodate new sections
4.13 Short-Term Use of the Environment Versus Long-Term Productivity (Old 4.10)	Revised section # to accommodate new sections
5.0 Consultation and Coordination	Updated
6.0 References	Updated
7.0 Abbreviations	Updated
8.0 Appendices	Revised Appendices A and B and added new air quality assessment appendix

¹ Where no changes occur section is incorporated by reference.

1.3 Decision to be Made

Using information presented in this updated EA and all other available pertinent information, the BLM will decide whether or not to allow, and if so under what conditions to allow the development, production, maintenance, and reclamation of additional development on federal lands and the federal mineral estate within the HFDPA.

If the analysis contained in this EA demonstrates no significant impacts resulting from the proposed action, the BLM would issue a Decision Record and FONSI that document the selected alternative and any accompanying mitigation measures. Following the issuance of the Decision Record and FONSI, the BLM must review and authorize site-specific surface-disturbance activities. This is normally accomplished using an Application for Permit to Drill (APD) or right-of-way grant (ROW), with a supporting environmental record of review. The site-specific review and analysis are required before any construction could occur.

1.4 Relationship to Statutes, Regulations, Plans or Other Environmental Analyses

Pursuant to 40 CFR 1508.28 and 1502.21, this EA tiers to and incorporates by reference the information and analysis contained in the *Environmental Assessment of Samson Resources Company's Field Development Program in and Adjacent to the Hornbuckle Field* (WY-060-EA11-181, BLM 2011), which analyzed the impact of developing 48 well pads within the Hornbuckle Field. There is no change in the disturbance footprint between the Original Hornbuckle EA and the Update; consequently only those resources that are affected by the increase in well count are analyzed herein, and the remaining analyses are incorporated into this EA by reference (See Table 1-3).

This EA has been prepared in accordance with NEPA and is in compliance with all applicable regulations and laws subsequently passed, including the Council on Environmental Quality (CEQ) regulations (40 CFR, Parts 1500-1508); U.S. Department of the Interior (USDI) requirements contained in Department Manual 516, Environmental Quality (USDI 1980); guidelines listed in the BLM Manual Handbook, H-1790-1 (BLM 2008); Guidelines for Assessing and Documenting Cumulative Impacts (BLM 1994); Washington Office Instruction Memorandum (IM) 2005-247 (BLM 2005), National Environmental Policy Act Compliance for Oil, Gas, and Geothermal Development (BLM 2009); CEQs Considering Cumulative Effects under the National Environmental Policy Act (CEQ 1997); and the Energy Policy Act of 2005.

BLM planning for the project area is documented in the Casper Resource Management Plan (RMP), approved in December of 2007 (BLM 2007a). The Casper RMP established the following objectives for managing leasable minerals:

- MR: 2.1 - Maintain oil and gas leasing, exploration, and development, while minimizing impacts to other resource values;
- MR: 2.4 - Facilitate the evaluation of public lands for oil and gas potential; and
- MR: 3.1 - Maintain opportunities to explore and develop federal oil and gas resources and other leasable minerals.

Oil and gas leases on federal mineral estate are issued by the BLM consistent with regulations regarding federal oil and gas leasing and operations (43 CFR, Parts 3100 and 3160, respectively). Stipulations may be added as terms of a lease when the lease is issued to reflect management actions established in the Casper RMP.

Once a lease is issued, the leaseholder/operator must apply for and receive site-specific authorization(s) prior to drilling within the leasehold area. To meet required environmental obligations, the leaseholder/operator must submit to the BLM an APD and/or ROW application so that the appropriate environmental review may be conducted. Environmental documents such as an Environmental Assessment, Determination of NEPA Adequacy, or Categorical Exclusion would be prepared and site-specific resource protection measures and mitigation as Conditions of Approval would be placed on the APD approval and ROW grant.

The proposed project would comply with all applicable federal, state, and local laws, plans, and permits required for this activity. Table 1-4 summarizes other relevant authorities, guidance, and permits that may apply, depending on the location of the action and the regulatory authority.

In accordance with 43 CFR, §1610.5-3(a), the Proposed Action has been determined to be in conformance with the Casper RMP. The project area has been leased for oil and gas extraction, and the proposed exploration and development are consistent with the land use decisions and resource management goals and objectives, with incorporated mitigation measures to reduce impacts to other resource values.

1.5 Scoping, Public Involvement, and Issues

Since the Proposed Action involves an update to a recently evaluated EA (WY-060-EA11-181) and the key issues are not significantly different from the original EA, there were no public scoping meetings.

Comments were solicited on the Original Hornbuckle EA and within the 30-day comment period only two comments were received, neither of which was substantive or objected to the project. Due to the nature of the Hornbuckle Update it is expected that this action would result in similar comments, so external public scoping was not conducted.

Key issues and concerns identified during the internal scoping process include:

- **Water Resources:** The potential project and cumulative impacts on fresh water use, disposal of produced water, and the potential for contamination of shallow groundwater.
- **Noise:** The potential project and cumulative noise-related impact from project development primarily related to gas powered generators.
- **Air Quality:** The potential project and cumulative impacts on air quality.
- **Transportation:** The potential project and cumulative traffic impacts, and due to construction, drilling, and hauling of oil and produced water.
- **Visual Resource Management (VRM):** The potential project impacts to visual resources due to increased infrastructure on each well pad.

Table 1-4. Major Laws, Regulations, and Permits that May Apply for the Hornbuckle EA Update Project Proposal

Agency	Permit, Approval, or Action	Authority
Bureau of Land Management (BLM)	Oil and Gas Leasing: <i>Federal regulations governing oil and gas leasing</i>	Mineral Leasing Act of 1920 (30 USC 181 <i>et seq.</i>): 43 CFR Part 3100
	Permit to Drill, Deepen or Plug Back (APD Process): <i>Controls drilling for oil and gas on federal onshore lands</i>	Mineral Leasing Act of 1920 (30 USC 181 <i>et seq.</i>): 43 CFR Subpart 3162
	Right-of-Way grants and temporary use permits: <i>Issue right-of-way grants on BLM managed lands</i>	Mineral Leasing Act of 1920 (30 USC 185); 43 CFR, Parts 2800 & 2880; FLPMA (43 USC 1761-1771)
	Antiquities, Cultural, and Historic Resource Permits: <i>Issue antiquities and cultural resources use permits to inventory, excavate or remove cultural or historic resources from BLM managed lands</i>	Antiquities Act of 1906 (16 USC 431- 433); Archaeological Resources Public Protection Act of 1979 (16 USC 470aa – 470ll); Preservation of American Antiquities (43 CFR, Part 3); National Historic Preservation Act (NHPA) Section 106 (36 CFR, Part 800)
	Approval to Dispose of Produced Water: <i>Controls disposal of produced water from federal leases</i>	Mineral Leasing Act of 1920 (30 USC 181 <i>et seq.</i>); 43 CFR Subpart 3164; Onshore Oil and Gas Order No. 7
U.S. Forest Service (USFS)	Memorandum of Understanding Between United States Department of the Interior Bureau of Land Management and United States Department of Agriculture Forest Service Concerning Oil and Gas Leasing and Operation: <i>Establishes joint BLM and USFS policies and procedures for managing oil and gas leasing and operational activities pursuant to National Forest Service lands.</i>	Mineral Leasing Act of 1920 (30 USC 181 <i>et seq.</i>), Mineral Leasing Act of Acquired Lands (30 USC 351 <i>et seq.</i>), Federal Onshore Oil and Gas Leasing Reform Act of 1987 (30 USC 226, and the Energy Policy Act of 2005, Section 363
U.S. Fish and Wildlife Service (USFWS)	<i>Protects federally listed threatened and endangered species through coordination and consultation process</i>	Section 7 of the Endangered Species Act (ESA) of 1973, as amended (Public Law [P.L.] 93-205)
	<i>Determine compliance through internal review or external review with the USFWS</i>	Migratory Bird Treaty Act (MBTA) of 1918, as amend; Bald and Golden Eagle Protection Act of 1940
U.S. Army Corps of Engineers (USACE)	Section 404 Permit (Nationwide and Individual): <i>Controls discharge of dredged or fill materials into waters of the United States</i>	Section 404 of the Clean Water Act of 1972 (CWA)

Table 1-4. Major Laws, Regulations, and Permits that May Apply for the Hornbuckle EA Update Project Proposal (continued)

Agency	Permit, Approval, or Action	Authority
Wyoming Department of Agriculture	<i>Controls introduction and spread of weeds and pests</i>	Wyoming Weed and Pest Control Act (Wyoming Statute WS 11-5-102)
Wyoming Department of Environmental Quality (WDEQ) -Air Quality Division (AQD)	Permits to construct and operate certain emissions sources	Clean Air Act (CAA) of 1990 and implementing regulations in 40 CFR, Part 70; Wyoming Environmental Quality Act (WS 35-11-201 through 35-1-21)
WDEQ – Water Quality Division (WQD)	Wyoming Pollutant Discharge Elimination System (WYPDES) Permit: <i>Controls offsite storm water runoff from construction activities resulting in 1 acre or more of disturbance and any discharges to “waters of the State”.</i>	Wyoming Environmental Quality Act; Section 405 of the CWA (40 CFR, Parts 122, 123, and 124); WDEQ Water Quality Rules and Regulations, Chapters 1, 2, and 18
Wyoming Oil and Gas Conservation Commission (WOGCC)	Permit to drill, deepen, or plug back (APD process): <i>Regulates drilling of oil and gas wells in the state</i>	WOGCC Regulations Chapter 3, Section 8 WS 30-5-104 (d)(i)(C); WS 30-5-115
	Well location (part of the APD process): <i>Regulates downhole well location of all oil gas wells by reservoir or pool</i>	WOGCC Rule: Chapter 3, Section 2; WS 30-5-109
	Protection of surface waters and productive formations (part of APD process): <i>Provides general drilling, casing, and cementing rules oil and gas wells</i>	WOGCC Rule: Chapter 3, Section 22
	Well control (part of APD requirements for blowout process): <i>Provides requirements for blowout preventers</i>	WOGCC Rule: Chapter 3, Section 23
	Authorization approving drilling and spacing units: <i>Regulates well spacing and pooling of interests by reservoir or pool</i>	WS 30-5-104(d)(ii)(F)(iv); WS 30-5-109(a),(b),(c) and (f)
	Permit to drill to a nonstandard Location: <i>Provides for well relocation while maintaining existing well spacing</i>	WOGCC Rule: Chapter 3, Section 3; WS 30-5-109,
	Permit to directionally drill: <i>Provides the notification requirements for controlled directional drilling</i>	WOGCC Rule: Chapter 3, Section 25
	Plugging and abandonment of a well (applies to non-federal lands): <i>Provides procedures and regulates the plugging and abandonment of oil and gas wells</i>	WOGCC Rule: Chapter 3, Section 18, Chapter 4, Section 2; WS 30-5-104(d)(vi)(B)
	Measurement of oil and gas production: <i>Regulates the measurement and reporting of oil and gas production</i>	WOGCC Rule: Chapter 3, Sections 30 and 31; WS 30-5-104 (d)(vi)(B)

Table 1-4. Major Laws, Regulations, and Permits that May Apply for the Hornbuckle EA Update Project Proposal (continued)

Agency	Permit, Approval, or Action	Authority
Wyoming Oil and Gas Conservation Commission (WOGCC)	Permit to complete a well in multiple zones or pools (commingling): <i>Regulates the production of oil and gas from more than one pool in one well</i>	WOGCC Rule: Chapter 3, Section 35
	Authorization to flare or vent safe venting or flaring of gas: <i>Regulates the safe venting or flaring of gas to prevent waste</i>	WOGCC Rule: Chapter 3, Section 40
	Permit to use an earthen pit (applies to nonfederal lands): <i>Regulates construction, use and closure of noncommercial reserve, production and emergency pits on drilling and producing locations</i>	WOGCC Rule: Chapter 4, Section 1; WS 30-5-104(d)(vi)(A)
	Spills and fires: <i>Requires notification, with a prevention and cleanup plan, of accidental deaths, fires, or releases of 10 or more barrels of non-potable fluids that enter or threaten the waters of the State</i>	WOGCC Rule: Chapter 4, Section 3
	Workmanlike operations: <i>Regulates environmental protection of well facilities</i>	WOGCC Chapter 4, Section 4
	Permit underground disposal of water: <i>Regulates the noncommercial underground disposal of non-potable water and oil field wastes</i>	WOGCC Chapter 4, Section 5; WS 30-5-104 (d)(vi)(B)
	Permit to close a natural gas processing facility: <i>Regulates closure of infield gas gathering and processing facilities</i>	WOGCC Rule: Chapter 4, Section 13 (b)
Wyoming State Historic Preservation Office (SHPO)	<i>Cultural resource protection</i>	NHPA and Advisory Council Regulations (36 CFR, Part 800)
Wyoming State Engineer (SEO)	Water well permit: <i>Issue permit to appropriate groundwater</i>	WS 41-3-938
Converse County	Compliance with the International Fire Code	WS 35-9-121
	Construction/Use Permit: <i>Ensure all structures comply the health, safety and welfare standards of Converse County Development Code</i>	WS 18-5-201 <i>et seq.</i>
	Zone Change: <i>If necessary, to ensure that the proposed use of the land is coordinated with the Converse County Zoning Map and Land Use Plan</i>	WS 18-5-201 <i>et seq.</i> and 9-8-301 <i>et seq.</i>
	County Road Permits and Licenses including road access and road crossings	WS 24-3-101 <i>et seq.</i>

Table 1-4. Major Laws, Regulations, and Permits that May Apply for the Hornbuckle EA Update Project Proposal (continued)

Agency	Permit, Approval, or Action	Authority
Converse County	Coordination with Converse County Engineering Department regarding movement of heavy equipment on county roads and the proper use and maintenance of said roads	WS 24-3-101 <i>et seq.</i>
Converse County Office of Special Projects	Small wastewater permits	WS 35-11-101 <i>et seq.</i>
Converse County Weed and Pest District	Control of Noxious Weeds	WS 11-5-101 <i>et seq.</i>
Local Emergency Planning Committee	Hazardous Materials Inventory: <i>To ensure the storage of the hazardous materials is properly coordinated with emergency providers</i>	Emergency Planning and Community Right-to-Know (EPCRA) 42 USC 116

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the components of the Proposed Action and the No Action alternative. In compliance with NEPA guidance, the analysis must consider at least No Action and Proposed Action alternatives. The BLM considers alternatives to the Proposed Action based on issues, concerns, and opportunities raised during interdisciplinary interaction between resource professionals and collaboration with cooperating and other interested agencies. The only other alternative considered feasible or reasonable in this analysis is the No Action Alternative.

2.1 The Proposed Action

SRC is proposing to drill a maximum of 192 additional wells on the 48 well pads previously evaluated in the Original Hornbuckle EA. Under the Proposed Action, some of the existing 48 pads could be used to drill up to six horizontal wells per pad resulting in up to 192 additional wells. The total number of wells drilled from each pad would depend on variables such as the number of formations targeted, optimal well density in a given area, production success, commodity prices, lease stipulations, and permit availability. Increasing the number of wells drilled from a well pad would expand commercial oil and gas production from the Sussex Formation within the HFDPA while also allowing for exploration and development of other geologic formations within the Project Area. The Parkman, Niobrara, Frontier, Muddy, and other formations have proven productive in this area of the Powder River Basin. Since the Proposed Action involves drilling the 192 additional wells from existing or approved pads, there would be no additional short-term disturbance when compared to what was approved in the Original Hornbuckle EA. Long-term disturbance would increase due to the larger area needed to accommodate installation and operation of the additional wells (the amount of interim reclamation would be decreased). Table 2-1 summarizes the initial and long-term surface disturbance associated with the Original Hornbuckle EA and with the Proposed Action.

Table 2-1. Surface Disturbance Associated with the Proposed Action

	Wells	Pads	Initial Surface Disturbance* (Acres)	Long-Term Surface Disturbance (Acres)
Original Hornbuckle EA (No Action Alternative)	96	48	821.15	177.23
Added by Hornbuckle EA Update	192	0	0	43.20

*See Table 4-4 in Original Hornbuckle Field EA (BLM 2011)

Drilling operations would be initiated as soon as all of the necessary permits have been obtained. It is anticipated that these wells would add from 5 to 10 years to the Original Hornbuckle Field Development Program, subject to a combination of drilling success, rig availability, permit approvals, and market conditions. The average life of a productive well is expected to be 40 years.

Oil would continue to be transported via trucks from storage facilities at each pad to bulk handling facilities in Casper or Douglas. Gas would be transported via subsurface pipelines to centralized compression and treatment facilities. Produced water would be transported by truck to approved water-disposal wells or evaporation ponds, or would be used for potential beneficial use (e.g., drilling operations). Existing arterial roads would provide the main access to and within the project area.

Lease operations would be conducted in full compliance with all applicable laws, regulations (43 CFR, Part 3100 et al.), Onshore Oil and Gas Orders (43 CFR, Part 3160; March 7, 2007), the approved plan of operations, and any applicable Notices to Lessees. Operations on federal lands would be conducted in compliance with 43 CFR, Part 2800 et al.

2.1.1 Construction Activities

As outlined in the Original Hornbuckle EA, construction activities for the currently approved access road routes and well locations would follow practices and procedures outlined in individual APDs and any appended Conditions of Approval (COAs). Access road and well pad construction activities would follow guidelines and standards set forth in the joint BLM/U.S. Forest Service (USFS) publication: *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition) (BLM 2007b) and/or the contractual requirements of any affected private (fee) surface owner(s).

2.1.1.1 Access Roads

Access to the project area would generally be obtained using the Ross Road (Converse County Road #31) and then, to the extent possible, by existing, upgraded oilfield roads (crowned and ditched with gravel running surfaces).

No additional new access roads would be required for the Proposed Action since all new wells would be drilled on existing or approved well pads.

2.1.1.2 Well Pads

Average disturbance for the 48 evaluated and approved pads would not change from the 5.93 acres analyzed in the Original Hornbuckle EA (not including a road). Well pad construction methods are outlined in the Original Hornbuckle EA. As of July 2012, SRC has completed the construction of four approved pads. The Proposed Action does not include any new well pads.

2.1.2 Drilling Operations

Well-drilling and completion activities will be in compliance with BLM Onshore Oil and Gas Order No. 2. These guidelines specify the following:

...proposed casing and cementing programs shall be conducted as approved to protect or isolate all usable water zones, potentially productive zones, lost-circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use (BLM 1988).

SRC would drill each well with a rotary drilling rig. Up to five rigs could be operating at any particular time to achieve development objectives. Drilling operations, including mobilization, demobilization, and drilling to the target depth, would require approximately 30 days per well. SRC would drill year-round, subject to environmental considerations. Based on SRC's existing experience in the Hornbuckle Field, two to three rigs would typically be running continuously and, on average, 30 wells per year would be completed and produced.

Drilling operations require an average of 20 personnel and seven vehicles on location at any given time each day during the course of the 30-day drilling period. The average values account for higher traffic during periods of mobilization and demobilization. An additional 10 to 15 personnel and six vehicles would be required on location during the installation of production casing. Technicians and service personnel would commute to the project site daily.

On average, SRC would utilize approximately 2,540 barrels (bbl) of water to drill the initial 2,000 feet of hole on each well. Following installation of surface casing, a water based mud would be used to drill to the intermediate casing point, which is typically the base of the Fox Hills Formation, the deepest geologic formation with the potential to contain fresh water (i.e. TDS concentration < 10,000 mg/L). Water use for the drilling and installation of the intermediate casing would be approximately 2,500 bbl. Drilling water would be obtained from an approved source in the immediate project area. The specific source of this fresh water used in drilling operations for each well would be identified at the time of APD submittal. If conditions allow, SRC may recycle any water remaining in the freshwater mud system for use during drilling of additional wells on a pad. Upon completion of surface drilling operations on a pad, any water remaining in the mud tanks would be available for re-use on additional wells, transferred to a reserve pit for evaporation or trucked to an approved disposal facility, as appropriate.

Upon installation of the intermediate casing, SRC would switch to an oil-based mud (OBM) system to complete the drilling process. Approximately 400 bbl (16,800 gallons) of water would be used in the OBM system. Following the completion of drilling operations, any remaining oil-based fluids would be removed from the well location and either recycled into the OBM system for subsequent wells or disposed of in accordance with appropriate BLM and WOGCC rules and regulations.

Reserve pits would be used to contain water-based drilling fluids, cuttings, and wastewater produced from the well-drilling operations. The reserve pits would be constructed with an impermeable liner to prevent seepage and possible contamination of surface and groundwater. Fresh water may be stored in lined pits or tanks in accordance with WOGCC regulations. Leakage of pit fluids would only occur if the liners were installed incorrectly or the liners were damaged during drilling operations.

As indicated above, surface casing would be set at an approximate depth of 2,000 feet and cemented back to the surface during the drilling operations. This would serve to isolate all near-surface fresh water zones or aquifers in the immediate Project Area. Intermediate casing would be set to a measured depth (MD) between 7,000 and 12,000 feet and would also be cemented in place, with the top of cement designed to be above the top of the Fox Hills Formation. This procedure would isolate potential hydrocarbon bearing zones below the Fox Hills Formation from near-surface freshwater aquifers. Cementing operations would be conducted in compliance with Onshore Oil and Gas Order Number 2.

Once production casing has been installed, completion operations would begin. In general, completion consists of perforating the production casing, pressure testing, stimulation of the formation utilizing hydraulic fracturing technology, flow-back of fracturing fluids, flow testing to determine post-fracture productivity, and installation of production equipment to facilitate hydrocarbon recovery. Hydraulic fracturing, which is currently regulated by the BLM and WOGCC, is discussed in detail in Section 2.1.3 of the Original Hornbuckle EA. Discussions regarding possible impacts from defects in either casing installation or cementing are included in Chapter 4 of this EA.

These completion operations would generally require an average of 30 days per well. Following completion, the well would be allowed to flow under natural pressure for one to four months, at which time a pumping system would be installed.

A freshwater pit may be constructed at each well pad to hold the estimated 50,000 bbl (2.1 million gallons) of water required for the hydraulic fracturing operation on each horizontal well. This water would be obtained from existing groundwater wells or private water right sources within the Project Area. Under the Proposed Action no water would be diverted from the North Platte River or its tributaries.

Approximately 55,440 bbl of water would be required for drilling and completion of each well, for a total of approximately 10.6 million bbl (approximately 1,370 acre-feet) of water required for all 192 wells, as discussed in Chapter 4.

2.1.3 Production Operations

2.1.3.1 Oil Production

Oil production facilities for multiple wells per pad are essentially a small central facility capable of processing the oil, gas, and water produced from each well. Typical

oil production equipment required at the individual well locations would include the following:

- An artificial lift system (e.g., rod pump unit at the well head, typically powered by a gas engine, generator or commercial electric power);
- Combustion chambers; and
- Line heaters.

Each well pad would have:

- A tank battery for the storage of oil and produced water. Total oil storage capacity is anticipated to be 2,000 bbl per well. Total produced water storage capacity is anticipated to be 400 bbl per well. Therefore, for a six well pad configuration, storage capacity would typically be 12,000 bbl of oil and 2,400 bbl of water in up to 36 400-bbl tanks.
- A heater/treater;
- A flare stack for situations where commercial quantities of natural gas are not encountered and the product must be flared;
- A connection point for loading tanker trucks used in hauling oil and water produced by each well;
- A portable lease automatic custody transfer (LACT) unit if an electrical supply is available for the metering system); and
- Up to six metering houses for measuring the natural gas from each well.

Oil would be trucked to the purchaser's designation or to a pre-existing oil terminal for sales. The frequency of trucking activity would depend upon the amount of oil being produced from each individual well. Water would also be required for dust suppression on access and county roads. These needs would increase as a result of the additional traffic generated as a consequence of well service activities for the 192 new wells. Annual water use for dust suppression is estimated at 15,000 bbl.

There is potential for a future interstate oil pipeline to be constructed in the vicinity of the Hornbuckle Field. If that occurs, oil gathering lines may be installed in existing pipeline and road ROWs if feasible. The Original Hornbuckle EA analyzed 60 miles of 25' wide pipeline ROW, 40 miles of 50' wide pipeline ROW and 22.52 miles of 40' wide road ROW (See Table 4-1). SRC anticipates that any oil gathering lines would be installed in existing or previously analyzed ROW, creating no additional disturbance.

SRC is proposing to utilize a tiered approach for supplying power to well pad facilities. As outlined in the Original Hornbuckle EA, SRC would utilize a combination of overhead and buried power lines and temporary generators on well pads to power electric pumping units (when used), the portable LACT unit if utilized, and safety equipment for the production vessels. In instances where electrical power is not available and portable LACT units are not used, oil would be measured manually by

measuring tank volumes and gas would be measured using meters that do not require electric power.

To minimize disturbance and for the purposes of safety, buried power lines would be installed in existing road ROW, on the opposite side of gas/oil/water corridors that utilize road ROW.

The pumping units on the majority of the new wells would be powered by natural gas engines utilizing gas produced by the wells. SRC anticipates the use of 115 horsepower (hp) Ajax® gas engines, using the best available control technology (BACT) for stack emissions and noise control. These gas pump engines would be permitted and approved by WDEQ/AQD under standard air permitting practices.

2.1.3.2 Natural Gas Production

Commercial quantities of natural gas may be expected from horizontal completions in the target formations. Meter houses to facilitate gas sales from each individual well bore would be installed at a centralized pad location (see Appendix A). SRC anticipates that all activity necessary to accommodate additional gas production from the Proposed Action would be accomplished in the approved pipeline or road ROW (See discussion on ROW in Section 2.1.3.1, above).

Some of the produced natural gas may be used to power equipment on the well location including the heater-treater and pumping unit. In situations where commercial quantities of gas are not encountered, small volumes of gas would be flared in accordance with USDI Notice to Lessees 4A (USDI 1980).

2.1.3.3 Produced Water Disposal

Water produced along with the oil and gas would be separated on the pad and temporarily stored in tanks at the well site prior to transport by trucks to a permitted collection/disposal facility. Anticipated average water production is estimated to be 30 bbl per day per well (annual production of 10,950 bbl per well). At peak, 2.1 million bbl of water may be produced per year from 192 wells. Produced water would be disposed of via subsurface injection, surface evaporative pits, or would be used for potential beneficial use (e.g., drilling operations). Depending on the method of disposal, permits are required from WDEQ/Water Quality Division (WQD) (surface) or WOGCC (subsurface) for disposal of produced water. SRC may rely on approved and permitted third-party vendors for produced water disposal.

2.1.4 Interim Reclamation During Production

Interim reclamation of each well location would be conducted in accordance with Onshore Order #1, IM WY-2012-007, Management of Oil and Gas Exploration and Production Pits and IM WY-2012-032, Wyoming Bureau of Land Management Reclamation Policy, and The Gold Book, prepared by the U.S. Forest Service and BLM for Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (BLM 2007c). Interim reclamation is required to be performed within 6

months of completion of the well, weather permitting. However, the BLM's Authorized Officer may grant an exception and more time for performing interim reclamation on a case-by-case basis with a properly filed Sundry Notice and qualifying circumstances.

It is possible that some interim reclamation would be performed after the 6-month time frame, if an exception were applied for and granted. The proposed co-location of multiple wells on each well pad has the potential to combine both drilling and production activities simultaneously. When more than one well for the same location are approved at the same time, interim reclamation would be performed within 6 months of the completion of the last well or the expiration of the APD, whichever occurs first.

Solidification, back filling, and capping of the cuttings pits would be accomplished within 6 months following the completion of each individual well. Erosion control measures for the road, pad, and topsoil pile would be performed within 30 days of the initial disturbance. Reseeding of stockpiled topsoil would occur within 6 months following the initial disturbance, regardless of exceptions. Approximately 1.3 acres of each well pad would be reclaimed in the manner indicated above.

2.1.5 Abandonment and Final Reclamation

Final reclamation would be performed in accordance with BLM IM No. WY-2012-032 within 6 months of completion of plugging each well as explained in the Original Hornbuckle EA.

2.1.6 Ancillary Facilities

No changes as a result of the update – refer to Original Hornbuckle EA.

2.2 Alternative I - The No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented and the additional wells proposed in the existing Hornbuckle Field would not be approved at this time. Current land use practices would be maintained and minerals within the overall analysis area would continue to be available for oil and gas exploration and development. The well pads and wells previously approved in the Project Area would continue to be permitted and developed. Should future development be proposed, those actions would require individual NEPA analyses on a case-by-case basis. This alternative constitutes documentation of the current and future state of the environment in the absence of the Proposed Action.

2.3 Other Action Alternatives

No other action alternatives were recommended during the internal scoping period.

2.4 Alternatives Considered but Not Analyzed in Detail

No other alternatives were considered during the internal scoping period.

3.0 AFFECTED ENVIRONMENT

This chapter describes the affected environment in Project Area as it exists today, where pertinent existing development, impacts, and disturbances are described. This description is organized by resource with descriptive information obtained from a wide range of sources including the BLM and various other federal and state agencies as appropriate. Only those resources that would potentially be impacted by the Proposed Action included in this updated EA are discussed in detail. The reader is referred to the original Hornbuckle Field Development Program EA (Original Hornbuckle EA) in those instances of no change.

Table 3-1 presents critical elements of the human environment, their status in the Project Area, if they were addressed in the Original Hornbuckle EA, and if they are addressed in the EA Update.

Table 3-1. Critical Elements of the Human Environment

Critical Element¹	Status on the Project Area	Addressed in Text of Original EA	Addressed in Text of EA Update
Air Quality	Potentially Affected	Yes	Yes
Areas of Critical Environmental Concern	None Present	No	No
Cultural Resources	Potentially Affected	Yes	Yes
Environmental Justice	Not Affected	Yes	No
Farmlands, prime or unique	None Present	No	No
Floodplains	Not Affected	No	No
Native American Religious Concerns	Not Affected	Yes	Yes
Noise	Potentially Affected	No	Yes
Invasive Non-Native Species	Potentially Affected	Yes	Yes
Public Health and Safety	Potentially Affected	No	Yes
Threatened and Endangered Species	Potentially Affected	Yes	Yes
Transportation	Potentially Affected	No	Yes
Visual Resources	Potentially Affected	No	Yes
Wastes and Hazardous Materials	Potentially Affected	No	Yes
Water Quality (surface and groundwater)	Potentially Affected	Yes	Yes
Wetland/Riparian Zones	Not Affected	No	No
Wild and Scenic Rivers	None Present	No	No
Wilderness	None Present	No	No

¹ From the BLM NEPA Handbook H-1790-1 (BLM 2008, 1999a).

3.1 Environmental Elements Considered with Minor Effects

The following resources would not be adversely affected by implementation of the Proposed Action. Section 3.1.3 (Visual Resources) was included in the Environmental Elements Considered with Minor Effects in the Original Hornbuckle EA; it is now included in this document as Section 3.13.

3.1.1 Recreation

No changes as a result of the update – refer to Original Hornbuckle EA.

3.1.2 Socio-Economics

No changes as a result of the update – refer to Original Hornbuckle EA.

3.2 Air Resources

For the purposes of this environmental analysis, air resources include air quality and global warming and climate change. Global warming is a theory suggesting that certain gases in the atmosphere impede the radiation of heat from the earth back into space, trapping heat like the glass in a greenhouse. An increase in the levels of certain gases raises the average temperature of the surface of the earth and the lower atmosphere, which contributes to climate change. On-going scientific research has identified the potential impacts of greenhouse gases (GHGs) emissions on global climate. GHGs are not currently regulated, but there is a consensus in the international scientific community that the global climate change is occurring and that it should be addressed in governmental decision making.

3.2.1 Air Quality

The Clean Air Act requires the EPA to set National Ambient Air Quality Standards for six common air pollutants (criteria pollutants). Current national and Wyoming air quality standards for these criteria pollutants are presented in Table 3-2.

No site-specific air quality data are available from the proposed Project Area; however, applicable air quality data are available from EPA's Air Quality System (AQS) and the WDEQ utilizing WDEQ Wyoming State and Local Air Monitoring Sites (SLAMS) and WDEQ special purpose monitor (SPM) sites. Not all six criteria pollutants are monitored at the SLAMS and SPM sites. The nearest SLAMS site is located in the city of Casper (approximately 42 miles southwest of the Project Area). The Casper SLAMS site measures PM₁₀ (particulate matter less than 10 microns in size) and PM_{2.5} (particulate matter less than 2.5 microns in size). The SPM sites include the Antelope Coal Mine in Converse County (approximately 23 miles northeast of the Project Area), the Thunder Basin Grassland site (approximately 98 miles north of the Project Area), and the south Campbell County site (approximately 75 miles north/northeast of the Project Area). The Antelope Coal Mine SPM site monitors PM_{2.5} and NO_x (nitrogen oxides), the Thunder Basin Grassland SPM site monitors ozone (O₃) levels and NO_x,

Table 3-2. Selected National and Wyoming Ambient Air Quality Standards

Criteria Air Pollutant		Averaging Time Period	NAAQS ¹	WAAQS ²
Particulate Matter	PM ₁₀ (µg/m ³)	24-hour	150	150
		AAM ³	ns ⁴	50
	PM _{2.5} (µg/m ³)	24-hour	35	35
		AAM	15	15
Lead (µg/m ³)		Rolling 3-month	0.15	ns
		Quarterly	1.5	1.5
Ozone (O ₃) (ppm)		1-hour	0.12	ns
		8-hour	0.075	0.08
Nitrogen dioxide (NO ₂) (ppm)		1-hour	0.10	ns
		AAM	0.053	0.05
Sulfur dioxide (SO ₂) (ppm)		1-hour	0.075	ns
		3-hour	0.50	0.50
		24-hour	0.14	0.10
		AAM	0.03	0.02
Carbon monoxide (CO) (ppm)		1-hour	35	35
		8-hour	9	9

¹ NAAQS = National Ambient Air Quality Standards (adapted from 40 CFR §50.5-50.12). Primary standard unless otherwise noted. National Primary Standards establish the level of air quality necessary to protect public health from any known or anticipated effects of a pollutant, allowing a margin of safety to protect sensitive members of the population.

² WAAQS = Wyoming Ambient Air Quality Standard (adapted from WDEQ/AQD 2010).

³ AAM = annual arithmetic mean.

⁴ ns = no standard.

and the south Campbell County SPM site measures O₃ levels, in addition to PM₁₀ and NO_x. Additional air quality data (NO₂, O₃, and SO₂) were obtained from the Sinclair Refinery, approximately 33 miles southwest of the Hornbuckle Field.

The principal air-borne pollutant within the proposed Project Area is particulate matter in the form of fugitive dust (uncontrolled wind-carried particulates) generated from natural and human sources. Visibility in the region is typically very good (>70 miles) and fine particulates are generally considered to be the main source of visibility degradation (BLM 1985).

As of July 2012, both Converse County and the overall Project Area are considered to be in attainment with National and State of Wyoming Ambient Air Quality Standards (EPA 2012 and WDEQ/AQD 2010).

3.2.2 Greenhouse Gases

Greenhouse gases that are included in the US Greenhouse Gas Inventory are: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). CO₂ and CH₄ are typically emitted from combustion activities or directly emitted into the atmosphere through natural processes.

Currently, the WDEQ/AQD does not regulate greenhouse gas emissions, although these emissions are regulated indirectly by various other regulations. Some greenhouse gases such as CO₂ occur naturally and are emitted to the atmosphere through both natural processes and human activities. Other greenhouse gases (e.g., fluorinated gases) are created and emitted solely through human activities.

Several activities occur within the region that may generate greenhouse gas emissions including oil, gas, and coal development; large fires; livestock grazing; and recreation using combustion engines, which can potentially generate CO₂ and methane. Oil and gas development activities can generate CO₂ and CH₄. CO₂ emissions result from the use of combustion engines, while methane can be released during processing. Wildland fires also are a source of other GHG emissions, while livestock grazing is a source of CH₄. A description of the potential impacts from greenhouse gas emissions associated with the Proposed Action is included in Chapter 4.

3.3 General Setting of the Project Area

No changes as a result of the update – refer to Original Hornbuckle EA

3.4 Existing Oil and Gas Development in the Overall Project Area

According to July 2012 electronic records of the WOGCC, approximately 180 oil or gas wells had been approved in the Project Area (WOGCC 2012). The records indicate that 154 wells were actually drilled. Of this total, 125 permits are still valid (not permanently abandoned). A breakdown of these valid well permits is as follows:

- 75 Producing wells;
- 17 Unknown status wells;
- 18 Inactive wells (shut-in, dormant, suspended operations, or temporarily abandoned);
- 6 Wells that have been spudded;
- 7 Wells permitted but not drilled;
- 1 Flowing well; and
- 1 Active injector well.

Past conventional oil and gas drilling activity in the Project Area has tested various geological horizons for hydrocarbon production at depths ranging between 8,400 and

15,100 feet. The electronic records of the WOGCC report oil/gas wells completed in the Sussex, Parkman, Morrison, Lakota, Dakota, and Frontier Formations, with the Sussex Formation being the most prolific oil producing formation in the Project Area (WOGCC 2012). A breakdown of the 83 wells still producing by formation is as follows:

- 60 - Sussex Formation;
- 9 - Parkman Formation;
- 9 - Unknown;
- 2 - Morrison Formation;
- 1 - Lakota Formation;
- 1 - Muddy Formation; and
- 1 - Teapot Formation.

According to WOGCC records as of July 2012, there were two shut-in coal bed natural gas (CBNG) wells and one permanently abandoned CBNG well in the Project Area.

A list of current federal oil and gas leases within the Project Area is provided in Appendix B. Figure 3-1 presents the federal oil and gas estate by lease number.

3.5 Cultural Resources

No changes as a result of the update – refer to Original Hornbuckle EA

3.6 Range Management

No changes as a result of the update – refer to Original Hornbuckle EA

3.7 Soils

No changes as a result of the update – refer to Original Hornbuckle EA

3.8 Water Resources

3.8.1 Existing Water Uses

Surface water and groundwater resources are described in the Original Hornbuckle EA. Since that document was prepared, additional water wells have been drilled in the Project Area, which are listed in Table 3-3. Also, more detail is available on the water resources utilized by SRC for operations within the Hornbuckle Field. Water used in the Project Area by SRC is from the wells permitted for miscellaneous uses listed in Table 3-3. The new wells are completed in the same aquifers as the wells listed in the Original Hornbuckle EA. Currently, SRC has access to an annual permitted volume of nearly 550 acre-feet (ac-ft).

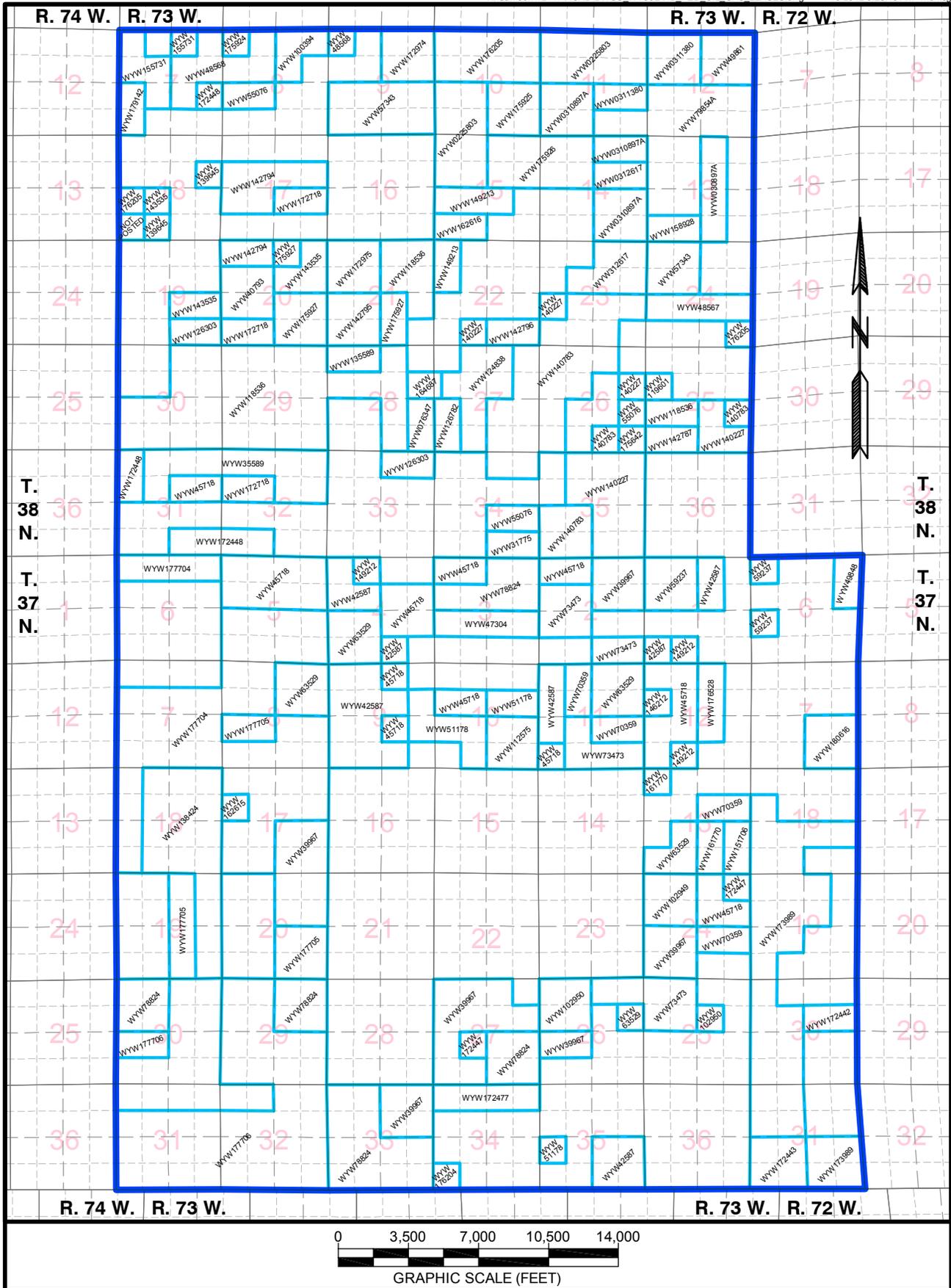


Figure 3-1. Hornbuckle Field Federal Oil and Gas Leases.

Table 3-3. Groundwater Permits in the Project Area Added Since Evaluation Under the Original Hornbuckle EA

Well Name or Enlargement (Enl.)	Sec	QQ	TNS	RNG	Applicant	Surface Owner	Permit No.	Permit Date	Permitted Annual Volume (ac-ft)	Permitted Use	T.D.¹ (ft)
Reynolds #25 (Enl.)	25	NWNW	38	73	Samson Resources Co.	Reynolds Ranches, Inc.	UW195335	4/20/11	193	Misc.	N/A
DCR #27 (Enl.)	27	NWNE	37	73	Samson Resources Co.	Duck Creek Ranches, Inc.	UW195231	3/30/11	260	Misc.	N/A
Spook No. 1 (Enl.)	27	NWSW	38	73	Samson Resources Co.	Hornbuckle Ranch, Inc.	UW195233	3/30/11	14.5	Misc.	370
Baker #9 (Enl.)	9	SENE	37	73	Samson Resources Co.	Brushy Creek Ranch	UW195234	3/30/11	8.7	Misc.	330
West Fish Pond #3	15	SWNW	38	73	Shaun W. Musselman	Hardy Enterprises, LP	UW197015	11/29/11	4.6	Stock/Misc	N/A
Glenn No. 1 (Enl.)	20	SWNW	38	73	Hornbuckle Ranch, Inc.	Hornbuckle Ranch, Inc.	UW196122	7/19/11	69	Stock/Misc	830
Smuck NO ₂	20	NWNW	37	73	Hornbuckle Ranch, Inc.	Hornbuckle Ranch, Inc.	UW195606	5/2/11	69	Stock	700

¹ Total Depth

3.9 Wildlife

No changes as a result of the update – refer to Original Hornbuckle EA.

3.10 Environmental Justice

No changes as a result of the update – refer to Original Hornbuckle EA.

3.11 Transportation

Primary access to the Project Area is along four county roads: the Ross Road (County Road #31), the Highland Loop Road (County Road # 32), the Willow Creek Road (County Road # 33), and the Jenne Trail Road (County Road #34). Access to the Ross Road from Glenrock is via State Highway (SH) 95, and via SH 93 from Douglas. SH 93 also provides access to the Willow Creek Road. The Highland Loop Road connects SH 93 with SH 59 (Figure 1-1). The Ross Road is 42.2 miles in length, of which 24.2 miles are paved. The Highland Loop Road is 23.5 miles in length, of which 2.0 miles are paved. The entire 6.5 mile length of the Willow Creek Road is gravel, as is the entire length of the 19.2 mile Jenne Trail Road. The paved and gravel road sections are in good to fair condition (CCRB 2012). The county roads are maintained by the Converse County Road and Bridge Department. Posted speed limit for the paved portions of the county roads is 55 mph, while the gravel portions have posted speed limits of 40 mph (35 mph for the Willow Creek Road). Local resource roads link the county roads with existing well pads.

County roads are generally described as high traffic volume, two-lane traffic capable roads. Resource roads in the area are typically one-lane roads that provide access to the well pads and are not as capable of high volume traffic. Previously constructed roads accessing federal well locations are constructed to BLM standards (BLM 2007b), with rights-of-way less than 40 feet, wherever possible.

SH 93 begins in Douglas (MP 0.0) and ends at the Willow Creek Road (MP 26.14). At MP 8.67 SH 93 crosses the North Platte River via a bridge (38 ton rating) and then crosses the BNSF railroad at a grade crossing. SH 93 pavement age is 10 to 13 years old, with the exception of a section between MP 18.2 and MP 26.1 that was resurfaced during 2011. Shoulders on this highway are generally 3 feet or narrower and one section between mile posts 9.26 to 14.38 has no shoulder. SH 93 has one reach that is four lanes and several passing sections that are three lanes, just northwest of Douglas, WY. There are no anticipated improvements to be made as of August 2012.

SH 95 begins in Glenrock (MP 0.0) and ends at its intersection with SH 93 (MP 18.88). At MP 2.82 the highway crosses the North Platte River by bridge and the BNSF Railroad by overpass. The bridge and overpass have weight ratings of 38 and 36 tons, respectively. The SH 95 pavement is 13 years old. The narrowest shoulders on the highway are between mile posts 4.68 to 15.981 and are 2 feet wide on either side of the road. SH 95 has three reaches that are four lanes and one passing section that is three lanes. SH 95 is subject to WYDOT weight and speed restrictions, as necessary.

Due to increasing energy development activity in the southeastern portion of the State, (Converse, Platte, Goshen and Laramie Counties), the Wyoming State Legislature funded a rural road impact study in this area (WYDOT - In Preparation). Part of the study included traffic counts in the vicinity of the Project Area. A station located on the Ross Road 2 miles north of SH 93 recently recorded an average of 967 vehicles per day during the period from June 25 to June 28, 2012 of which 73 percent were cars and 27 percent were trucks (CCRB 2012). Highest traffic flow is in the morning between 5:00 am and 6:00 am, with an average of 123 vehicles per hour. A second count with a shorter time period was conducted on the Ross Road 2 miles north of the Jenne Trail Road. This count was conducted on June 25, 2012 and resulted in a daily average 384 vehicles, comprised of 210 cars (54 percent) and 174 trucks (46 percent). The difference in the two counts indicates that much of the southern traffic is local and leaves the Ross Road prior reaching the Jenne Trail Road. The local traffic is likely associated with oilfield activity in the Project Area and uranium ISR operations at the Smith Ranch Highlands facility located north of the project area.

3.12 Noise

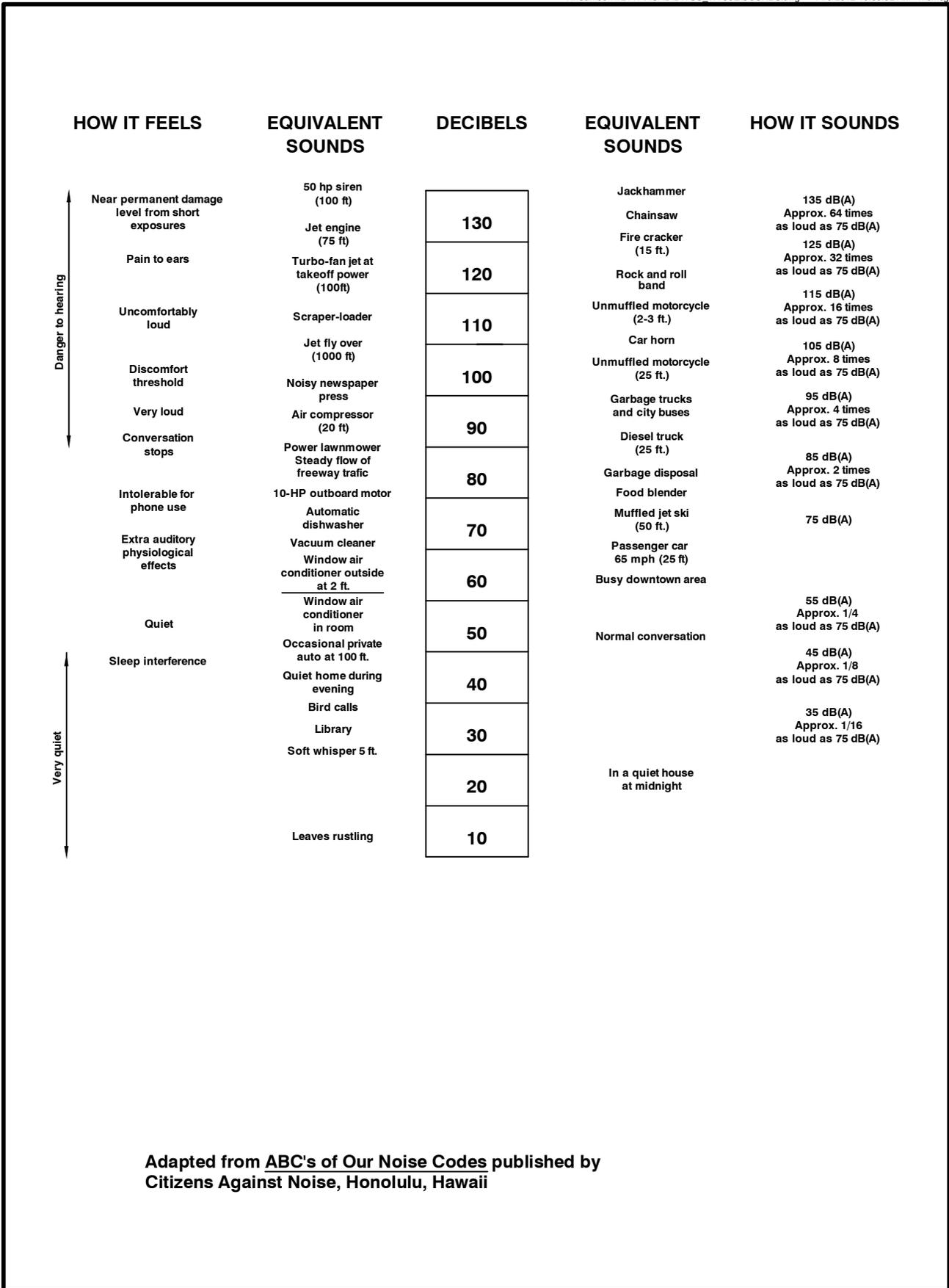
Current background noise comes from numerous sources in the Project Area including drilling, completion, and construction activities; pumping equipment; and traffic associated with well service and maintenance. Additional noise is caused by wind. The nearest noise receptors are six residences within or adjacent to the proposed Project Area.

For purposes of noise impacts evaluations, sound pressure levels (measured in decibels) are represented using the dBA (A-weighted decibel) scale. This measure is designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies. Figure 3-2 presents noise levels associated with some commonly heard sounds.

WWC Engineering conducted a baseline noise survey within the Project Area on July 24, 2012. Baseline noise measurements were collected at one residence and three existing well pads, with various configurations of pumping equipment operating, using a Quest SoundPro DL-2 sound level meter, which measures noise between 0 and 140 dBA. One well pad had three pumping jacks, powered by Ajax® gas engines. The Ajax® engines were equipped with Vanec® industrial silencers, which are considered BACT. Figure 3-3 shows a three-well installation utilizing Vanec® silencers.

A single unmuffled Ajax engine and a pump jack powered by an electric motor were also measured. Sound measurements were taken at the property boundary of the Blaylock Residence. Residences within and adjacent to the Project Area are depicted on Figure 3-4. Results of the sound surveys are presented in Table 3-4.

Discussion of transportation and traffic are included in Section 3.11. Table 3-5 presents typical noise levels from vehicles at a distance of 45 feet and speeds ranging from 50 to 75 mph (DOT 1995).



Adapted from ABC's of Our Noise Codes published by Citizens Against Noise, Honolulu, Hawaii

Figure 3-2. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life.



Figure 3-3. Typical Well Installation

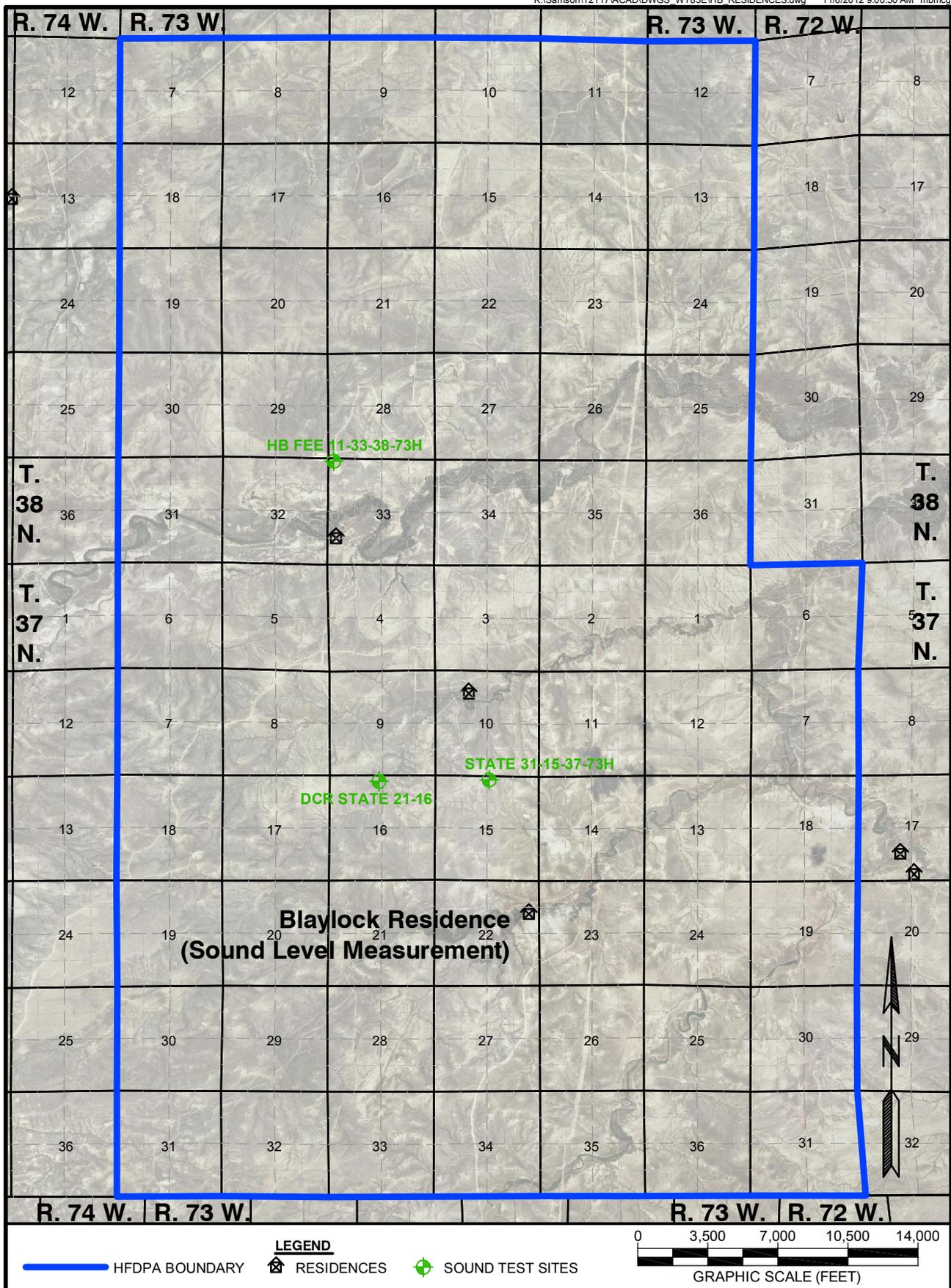


Figure 3-4. Residences and Test Sites Within and Adjacent to Project Area.

Table 3-4. Baseline Sound Readings within Project Area

Source/Site/Well Name	Average dBA at 40 ft	Average dBA at 1,280 ft
Three-well Pad (with Vanec® muffled Ajax® engines)(DCR State 21-16H)	64.7	30.3
One-well Pad (with unmuffled Ajax engine)(Hornbuckle Fee 11-33 -38-73H)	64.7	41.3
One-well Pad (with electric motor)(State 31-15 37-73H)	58.2	32
Blaylock Residence Fence Line	31 (min) 52 (max) ¹	NA

¹ Max value due to wind gust

Table 3-5. Typical Vehicle Noise Levels

Speed (mph)	Noise Level at 45 ft (dBA)		
	Automobiles	Medium Trucks	Heavy Trucks
45*	61	73	79
50	62	74	80
55	64	76	81
60	65	77	82
65	67	78	83
70	68	79	84

Notes: Automobiles: All vehicles with two axles and four wheels
 Medium Trucks: All vehicles with two axles and six wheels
 Heavy Trucks: All vehicles with three or more axles
 *Noise levels for 45 mph were extrapolated to include current speed limits
 Source: DOT (1995)

A natural baseline was established when sound level readings were consistent and did not vary as distance increased from the source being measured. Baseline readings are dependent upon atmospheric conditions that cause variations in sound patterns and wind that causes an increase in decibel values.

3.13 Visual Resources

Visual sensitivity levels are determined by people’s response to what they see and the frequency of travel through an area. The Hornbuckle analysis area is primarily an area of rolling plains (short-grass prairie) that is predominantly used for livestock grazing. Man-made intrusions on the natural landscape in the area include oil and gas development (oil well pad facilities, pipeline and utility ROWs, and access roads), transportation facilities (public and private roads, road signage, power and utility transmission lines, and railroads), ranching activities (fences, ranch buildings, and livestock), and environmental monitoring installations. The current natural scenic quality in and near the Project Area is fairly low because of the industrial nature of the oil and gas field development.

The Visual Resource Management (VRM) system is the basic tool used by BLM to inventory and manage visual resources on public lands. The Project Area is within a Class IV visual resource management area where the level of change to the

characteristic landscape can be high. In a Class IV management area landscape modifications may dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impacts of these activities through careful location, minimal disturbance, and repeating basic elements.

3.14 Waste and Hazardous Materials Management

Oil and gas exploration, production, gas-gathering, processing wastes, and releases of hazardous materials into the environment are generally considered to be Resource Conservation and Recovery Act (RCRA)-exempt and are regulated by the WOGCC or WDEQ and the BLM. The management of non-exempt hazardous and non-hazardous (solid) wastes is regulated under RCRA (40 CFR Part 260-268) while the management of releases of hazardous materials into the environment is regulated under the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA) (40 CFR Part 300-374).

Non-hazardous solid waste typically includes wastes from oil and gas exploration, production, and gas-gathering, as well as processing wastes and is considered RCRA-exempt. These materials are variously regulated by WDEQ, WOGCC, and the BLM.

Transportation of hazardous materials to the well location is regulated by the Department of Transportation (DOT) under 49 CFR, Parts 171–180. Potentially hazardous substances used in the development or operation of wells will be kept in limited quantities on well sites and at the production facilities for short periods of time.

The concentration of nonexempt hazardous substances in the reserve pit at the time of pit backfilling would not exceed the standards set forth in CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA). All oil and gas drilling-related CERCLA hazardous substances removed from a location and not reused at another drilling location would be disposed of in accordance with applicable federal and state regulations. Only those hazardous wastes that qualify as exempt under RCRA will be disposed of in the reserve pit.

3.15 Public Health and Safety

SRC has a safety plan in place that addresses workplace safety and emergency response. All SRC personnel and contractors that are on site receive training in the plan as well as task-specific safety training, including driver training and safe driving policies.

The roads within the project area see a wide variety of use. BLM and county roads have historically been built to the appropriate standards for the anticipated use, as have the private roads in the area. Single-lane roads provide access to individual well sites and are used primarily by site workers but may be used by ranchers. The project area is accessed by county roads, which in turn are accessed by two state highways which provide access to the project area for contractors, drilling crews, production personnel, and the general public. Travel and road hazards are more fully discussed in Section 3.11, Transportation.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The potential environmental consequences (impacts) of construction, drilling, completion, and maintenance activities associated with the Proposed Action and No Action Alternative are discussed for each potentially affected resource. An environmental impact is defined as a change in the quality or quantity of a given resource due to a modification in the existing environment resulting from project-related activities. Impacts can be beneficial or adverse; a primary (direct) result or a secondary (indirect) result of an action; long-term (more than five years) or short-term (less than five years) in duration; and can vary in degree from a slightly discernible change to a total change in the environment.

In accordance with 40 CFR §1502.16, this chapter includes a discussion of the potential environmental consequences of the Proposed Action and the No Action Alternative on each of the affected resources. Potential impacts are quantified when possible; however, when impacts are not quantifiable appropriate adjectives are used to best describe the level of impact and appropriate mitigation measures are suggested, where appropriate.

The Proposed Action for the Hornbuckle EA Update proposes adding 192 additional wells on 48 wells pads previously evaluated under the Original Hornbuckle Field Development Environmental Assessment (Original Hornbuckle EA). Since the Proposed Action involves drilling 192 additional wells from existing or approved pads, there would be no additional short-term surface disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance would increase due to the larger area needed to accommodate production of the additional wells (the amount of interim reclamation would be decreased).

4.2. Air Resources

4.2.1 Air Quality

4.2.1.1 Proposed Action

Construction and operations air quality related emissions associated with the Proposed Action would include PM₁₀, sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), and ozone (O₃), which is created by chemical reactions between NO_x and volatile organic compounds (VOCs) in the presence of sunlight. These emissions would result primarily from construction, drilling and completion activities; from handling of produced oil (product flashing and tank truck loading); and from emissions from gas engines used to operate well pumping equipment.

While no air quality analyses have been conducted in this specific area, there are several environmental analyses for projects proposed in or related to Converse County, Wyoming, including the Original Hornbuckle EA (BLM 2011), the *High Plains District*

Portions Of the February 2013 Lease Sale (BLM 2012a) and the Proposed Douglas Quarry Mineral Materials Expansion Project, Converse County, Wyoming (BLM 2012b). These analyses concluded that no significant impacts would occur to the airshed as a result of the activities proposed in conjunction with these respective environmental assessments.

As of 2010, there were approximately 5,000 producing oil and gas wells in the CFO jurisdictional area (BLM 2012a). Converse County, which includes the Project Area, is currently considered to be in attainment with National and State of Wyoming Ambient Air Quality Standards (EPA 2012 and WDEQ/AQD 2010). The Proposed Action would add a maximum of 192 wells to the CFO jurisdictional area, which represents an increase in the number of wells of approximately 3.8 percent. Potential air quality impacts from the Proposed Action would result from the additional oil field related traffic on access and county roads that would create extra particulate matter (PM₁₀ and PM_{2.5}) and the added wells and associated gas-powered production equipment would generate additional air quality related emissions (primarily NO_x, CO, VOLs, and O₃) but these potential impacts are not significantly different than air quality impacts from current oil and gas production. The Proposed Action would have direct, short- and long-term adverse impacts on air quality but, based on the relatively slight increase in the total number of wells within the CFO jurisdictional area and if mitigation measures included in Section 4.2.3 are implemented, the Proposed Action would not result in violations of air quality standards.

4.2.1.2 The No Action Alternative

The footprint for short-term (maximum) disturbance would not change compared to the Proposed Action but there would be fewer wells on each pad and the long-term disturbance acres would be less than the Proposed Action. The air quality impacts would be less than the Proposed Action.

4.2.2 Greenhouse Gas Emissions

4.2.2.1 Proposed Action

The Proposed Action would add 192 additional wells on the 48 well pads previously evaluated in the Original Hornbuckle EA. The pumping units on the majority of the new wells would be powered by natural gas-powered engines utilizing gas produced by the wells. SRC anticipates the use of 115 horsepower (hp) Ajax® gas engines, using the BACT for stack emissions. These gas pump engines would be permitted and approved by WDEQ/AQD under standard air permitting practices.

The Center for Climate Strategies prepared the Wyoming Greenhouse Gas Inventory and Reference Case Projection 1990-2020 (Inventory) for the WDEQ through an effort of the Western Regional Air Partnership (CCS 2007). This report presented a preliminary draft GHG emissions inventory and forecast from 1990 to 2020 for Wyoming.

The 2007 report estimated that the 2010 total gross carbon dioxide equivalent (CO₂e) emissions for Wyoming would be 60.3 million metric tons (MMt), with the oil and gas industry contributing approximately 12.1 MMt of CO₂e emissions (CCS 2007). The annual oil and gas associated GHG emissions are expected to increase slightly to 12.5 MMt by 2020 (CCS 2007).

As of 2010, there were approximately 59,500 producing oil and gas wells in the state (BLM 2012a). Therefore, based on the above information, the 2010 per well CO₂e emissions from oil and gas wells within Wyoming amounted to approximately 0.0002 MMt annually (12.1 MMt ÷ 59,500 = .0002 MMt) assuming steady production and emissions venting.

Based on this emissions factor, if the Proposed Action were selected and if all 192 oil wells were in production, the Proposed Action could result in additional GHG emissions of approximately 0.038 MMt of CO₂e annually. This represents a 0.06 percent increase over the estimated 2010 annual CO₂e emission for Wyoming. The actual amount of CO₂e resulting from the Proposed Action would likely be significantly less since the above calculations are based on conventional and natural gas wells, which typically produce a much greater amount of CO₂e than oil wells (CCS 2007).

4.2.2.2 The No Action Alternative

The footprint for maximum disturbance would not change compared to the Proposed Action but there would be fewer wells on each pad, which would result in a slight reduction in GHG emissions.

4.2.3 Mitigation and Monitoring

To minimize the overall impacts to air resources associated with the Proposed Action that could result from additional oil/gas exploration and development activities and production, the following mitigation measures would be utilized.

1. SRC would comply with all applicable Wyoming Ambient Air Quality Standards and Regulations including those for fugitive dust suppression presented in Wyoming Air Quality Standards and Regulations, Chapter 3, Section 2(f): Emission Standards for Particulate Matter (WDEQ/AQD 2010).

Fugitive dust would be managed by a number of measures, including application of water or chemical dust suppressants to disturbed surfaces and traffic management in consultation with the BLM and WDEQ (Note: both water application and the application of magnesium chloride are currently used by SRC in the project area).

2. SRC would utilize BACTs during drilling and completion activities and during production.
3. As soon as is practical, SRC would revegetate disturbed areas (e.g. pipeline corridors, areas of pads not required for production, and roadside slopes) to hold topsoil and reduce the amount of airborne dust.

4.3 Cultural Resources

4.3.1 The Proposed Action

Refer to Sections 3.5 and 4.3 of the Original Hornbuckle EA for an in-depth discussion of the cultural resources within the project area. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance acres would increase due to the larger area needed to accommodate the additional wells and subsequent production equipment (the amount of interim reclamation would be decreased). The Original Hornbuckle EA resulted in a finding of no significant impacts to cultural resources. Since there would be no increase in the maximum amount of surface disturbance when compared to the Original Hornbuckle EA, impacts to cultural resources resulting from the Proposed Action would be negligible.

4.3.1.1 Native American Religious Concerns

Refer to Sections 3.5.1 and 4.3.1.1 of the Original Hornbuckle EA for in-depth discussions of Native American concerns within the project area. The Original Hornbuckle EA resulted in a finding of no significant impacts to Native American religious concerns. Since there would be no increase in the maximum amount of surface disturbance when compared to the Original Hornbuckle EA, impacts to sites potentially sensitive to Native Americans would be negligible.

4.3.2 The No Action Alternative

Since the footprint for maximum disturbance would not change compared to the Proposed Action, the impacts to cultural resources from the No Action Alternative would be the same as the Proposed Action.

4.3.3 Mitigation and Monitoring

Since there would be no additional impacts affecting cultural resources when compared to the Original Hornbuckle EA, the mitigation measures included in the original EA would apply. Refer to Section 4.3.3 of the Original Hornbuckle EA for mitigation and monitoring associated with cultural resources.

4.4 Range Management

4.4.1 Proposed Action

Refer to Sections 3.6 and 4.4.1 of the Original Hornbuckle EA for in-depth discussions related to range management impacts within the project area. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance acres would increase due to the larger area needed to accommodate the additional wells (the amount of interim reclamation would

be decreased). The extra oilfield-related traffic on access and county roads would create additional dust, could result in added collisions with domestic livestock, and could result in continued disruptions to ranching activities on the affected properties. The Original Hornbuckle EA resulted in an overall finding of no significant impacts to the range resource. The Proposed Action would increase dust, could cause additional collisions with domestic livestock, and could cause disruptions to ranching activities beyond those currently experienced. These increased impacts would be slightly more than impacts generated from current activities.

4.4.2 The No Action Alternative

The footprint for maximum disturbance would not change compared to the Proposed Action but there would likely be less traffic associated with the No Action Alternative, which would reduce the potential traffic related impacts. The range management impacts from the No Action Alternative would be slightly less than the Proposed Action.

4.4.3 Mitigation and Monitoring

The mitigation measures included in the original EA would be sufficient to address additional impacts from the Proposed Action. Refer to Section 4.4.3 of the Original Hornbuckle EA for mitigation and monitoring associated with range management.

4.5 Soils

4.5.1 Proposed Action

Refer to Sections 3.7 and 4.5.1 of the Original Hornbuckle EA for in-depth discussion of the soils resources within the project area. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance acres would increase due to the larger area needed to accommodate the additional wells (the amount of interim reclamation would be decreased). The Original Hornbuckle EA resulted in an overall finding of no significant impacts to the soil resource. Since there would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA, impacts to soils resulting from the Proposed Action would be negligible.

4.5.2 The No Action Alternative

Since the footprint for maximum disturbance would not change compared to the Proposed Action, the impacts to soils resources from the No Action Alternative would be the same as the Proposed Action.

4.5.3 Mitigation and Monitoring

The mitigation measures included in the Original Hornbuckle EA would be sufficient to address additional impacts from the Proposed Action. Refer to Section 4.5.3 of the Original Hornbuckle EA for mitigation and monitoring measures designed to reduce impacts to soils.

4.6 Water Resources

Refer to Sections 3.8 and 4.6 of the Original Hornbuckle EA for discussions of water resources within the project area. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance acres would increase due to the larger area needed to accommodate the additional wells (the amount of interim reclamation would be decreased). The Proposed Action includes drilling 192 additional wells on the 48 pads evaluated in the Original Hornbuckle EA.

4.6.1 Groundwater Resources

Refer to Sections 3.8.1 and 4.6.1 of the Original Hornbuckle EA for discussions of groundwater resources within the project area. Groundwater could be affected during construction of wells or by other subsurface project-development activities. The most likely pathway for groundwater contamination would be undetected spills and leachate from leaking produced-water facilities or mud pits. Additionally, undetected defects in either casing installation or cementing would be the most likely scenario for groundwater contamination to occur from actual oil well drilling and completion activities. Leakage from freshwater storage pits (used in hydraulic fracturing operations) or other storage pits needed for well completion has the potential to leach salts from soils and impact shallow groundwater. Chemicals used for production drilling could cause local contamination of groundwater if not managed properly.

As stated in Section 3.8.1 of the Original Hornbuckle EA and Section 3.8 of this document, a review of the electronic records of the office of the Wyoming State Engineer (WSEO) revealed that there are 53 permitted water wells within the overall project area (WSEO 2012). Six of these wells are permitted for use by SRC or are available to SRC, with a combined annual volume of permitted water use of approximately 550 ac-ft (see Table 3-3 of this EA). The average depth of the 53 water wells is 344 feet, with actual depths ranging from a minimum of 44 feet to a maximum depth of 1,000 feet.

As stated in Section 2.1.2.2, SRC intends to drill the surface hole (approximately 2,000 feet) and intermediate section (approximately 9,000 feet) for each oil well with a fresh water mud system and then set steel surface casing to these depths. Following installation of the surface casing, intermediate casing would be installed through the Parkman Formation and overlying formations. Each casing string would be cemented in place from bottom to top, thereby significantly reducing any potential

communication between and/or cross-contamination of the near surface water aquifers in the project area. The use of a fresh-water mud system to drill the surface and intermediate portions of each well would reduce any potential for contamination of fresh-water aquifers from the oil-based mud system utilized for drilling operations below 9,000 feet.

The potential for the contamination of near-surface aquifers from the use of OBM in the mud system has been eliminated through the techniques outlined in Section 2.1.2.1, which include the use of a semi-closed mud system during the drilling operation combined with recycling of the OBM fluids and the solidification of the “contaminated” cuttings upon completion of operations. SRC would drill a test hole on the well location in those rare instances where groundwater may be encountered within 20 feet of the surface to determine the depth to groundwater. Should groundwater be encountered within 20 feet of the surface in the test hole, a closed mud system would be used during the drilling operation to prevent any shallow groundwater contamination in accordance with Chapter 1, Section 2(nn) and Chapter 4, Section 1(j) of the rules and regulations of the WOGCC (WOGCC 2010).

By design, the BLM approves APDs and associated drilling plans to protect potential potable/usable groundwater intervals. The construction of well pads, proper disposal practices, proper well casing and cementing, and recycling of drilling fluids would be in accordance with BLM guidelines, which would minimize adverse effects on groundwater quality.

Using the estimates of water required for the various phases of well drilling and completion, the total per well water requirement would be approximately 55,440 bbl (6.9 ac-ft). Annual maximum water requirements would be well below the 550 ac-ft per year available through SRC-permitted wells available to SRC.

4.6.2 Surface Water Resources

Refer to Sections 3.8.2 and 4.6.2 of the Original Hornbuckle EA for in-depth discussions of surface water resources within the project area. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance acres would increase due to the larger area needed to accommodate the additional wells (the amount of interim reclamation would be decreased). Impact from the additional amount of long-term disturbance could increase the potential for erosion and off-site sedimentation. The Original Hornbuckle EA resulted in an overall finding of no significant impacts. The Proposed Action would result in the potential to increase impacts related to erosion and off-site sedimentation but these additional impacts are expected to be negligible.

4.6.3 The No Action Alternative

The footprint for maximum disturbance would not change compared to the Proposed Action but the amount of long-term disturbance acres would decrease. The surface

water impacts from the No Action Alternative would be slightly less than the Proposed Action. Impacts to the groundwater resource would be also be less than under the Proposed Action, due to a decrease in groundwater withdrawals for drilling purposes.

4.6.4 Mitigation and Monitoring

Impact from the additional amount of long-term disturbance could increase the potential for erosion and off-site sedimentation compared to the Original Hornbuckle EA. The mitigation measures included in the original EA would be sufficient to reduce the impacts to surface water resulting from the Proposed Action. Refer to Section 4.6.4 of the Original Hornbuckle EA for mitigation and monitoring measures designed to reduce impacts to water resources.

4.7 Wildlife

4.7.1 The Proposed Action

4.7.1.1 Big Game Species

Refer to Sections 3.9.1 and 4.7.1.1 of the Original Hornbuckle EA for in-depth discussions related to big game within the project area. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA. Long-term disturbance acres would increase due to the larger area needed to accommodate the additional wells (the amount of interim reclamation would be decreased). Impact from additional oilfield-related noise and traffic on access and county roads could result in additional impacts to big game. The Original Hornbuckle EA resulted in an overall finding of no significant impacts. The Proposed Action would result in the potential to increase impacts to big game. These potential impacts would be related to additional noise that could cause animal avoidance of the areas near development and additional collisions with big game associated with the increased traffic. The additional impacts to big game would be negligible.

4.7.1.2 BLM Sensitive Species

Refer to Sections 3.9.2 and 4.7.1.2 of the Original Hornbuckle EA for in-depth discussions related to BLM sensitive species within the project area. The Original Hornbuckle EA resulted in an overall finding of no significant impacts. Since there would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA, impacts to BLM sensitive species resulting from the Proposed Action are anticipated to be the same as the impacts discussed in the Original Hornbuckle EA.

4.7.1.3 Raptor Species

Refer to Sections 3.9.3 and 4.7.1.3 of the Original Hornbuckle EA for in-depth discussions related to raptor species within the project area. The Original Hornbuckle EA resulted in an overall finding of no significant impacts. The Proposed Action would

result in the potential to increase impacts to raptors. These potential impacts would be related to additional noise that could cause displacement of bird species to adjacent undisturbed habitat, and avoidance of the areas near development. These impacts would be relatively short-term in nature and would be negligible.

4.7.1.4 Threatened and Endangered Species

Refer to Sections 3.9.4 and 4.7.1.4 of the Original Hornbuckle EA for in-depth discussions related to threatened and endangered species within the project area. The Original Hornbuckle EA resulted in an overall finding of no significant impacts. Since there would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA, impacts to threatened and endangered species resulting from the Proposed Action are anticipated to be the same as the impacts discussed in the Original Hornbuckle EA and would be negligible.

4.7.1.5 Migratory Bird Species

Refer to Sections 3.9.5 and 4.7.1.5 of the Original Hornbuckle EA for in-depth discussions related to migratory bird species within the project area. The Original Hornbuckle EA resulted in an overall finding of no significant impacts. The Proposed Action would result in the potential to increase impacts to migratory bird species. These potential impacts would be related to additional noise that could cause displacement of bird species to adjacent undisturbed habitat, and avoidance of the areas near development. These impacts would be relatively short-term in nature and are anticipated to be negligible.

4.7.2 The No Action Alternative

The footprint for maximum disturbance would not change compared to the Proposed Action but the amount of long-term disturbance acres would decrease. The wildlife impacts from the No Action Alternative would be slightly less than the Proposed Action.

4.7.3 Mitigation and Monitoring

The mitigation measures included in the Original Hornbuckle EA would be sufficient to address additional impacts from the Proposed Action. Refer to Section 4.7.3 of the Original Hornbuckle EA for mitigation and monitoring measures designed to reduce impacts to wildlife.

4.8 Transportation

4.8.1 The Proposed Action

Under the Proposed Action, traffic levels would likely increase for the next 5-10 years. The amount of traffic would be dependent on a number of factors, including the success of future drilling, energy prices, rig availability, etc. When development is

complete, light duty vehicle (crew trucks, consultant vehicles, etc.) use would decline, but truck traffic associated with oil and water transport would continue into the foreseeable future or until an oil pipeline is brought into the project area.

Drilling operations require an average of 20 personnel and seven vehicles on location at any given time each day during the course of the 30-day drilling period. The average values account for higher traffic during periods of mobilization and demobilization. An additional 10 to 15 personnel and six vehicles would be required on location during the installation of production casing. Technicians and service personnel would commute to the project site daily.

As discussed in Section 3.11 of this EA, June 2012 daily traffic on the Ross Road averaged 967 vehicles per day, of which 706 (73 percent) were light duty and 261 vehicles (27 percent) were trucks.

Assuming that the 96 wells approved in the Original Hornbuckle EA and the 192 wells under the Proposed Action are successful, and produce on average 150 bbl/day of oil and 30 bbl/day of water, daily production in the field could reach a maximum 43,200 bbl/day oil and 8,640 bbl/day water. Based on completion of 30 wells per year, and the use of transport trucks with 200 bbl capacity, daily truck traffic could be calculated with the number of additional wells that reach production status on an annual basis.

Assuming that an average of 30 wells per year are completed, and production rates are in line with projections, daily haulage traffic would increase by 27 truckloads each year. Tanker trucks with 200 bbl capacity would be the primary mode of transportation for produced oil and water until field-wide production becomes economically feasible to support installation of a pipeline gathering system.

During drilling operations daily light duty traffic could range from 7 to 13 trips for each well, depending on the activity. With five operating rigs this would equate to a maximum of 65 trips per day. This increase in amount of traffic could cause deterioration of existing roadways; however potential deterioration could be offset by increased repair and maintenance.

4.8.2 The No Action Alternative

Under the No Action Alternative, development activity would end at the completion of the 96 wells evaluated in the Original Hornbuckle EA. Development-related traffic would decline, while haulage traffic would remain. Using the same per well production and hauling parameters for No Action Alternative as in the Proposed Action, the daily haulage traffic would also increase by 27 truckloads each year but the increase in traffic related to haulage would peak in just over 3 years.

4.8.3 Mitigation and Monitoring

Fugitive dust due to increased traffic would be managed by a number of measures, including application of water or chemical dust suppressants to disturbed surfaces) in consultation with the BLM and WDEQ to mitigate dust on gravel roads. Improvements to county roads could also mitigate increases in traffic.

4.9 Noise

4.9.1 The Proposed Action

Under the Proposed Action, 192 new wells would be added resulting in additional short-term noise from construction activity, drilling and completion activity, and traffic. Long-term noise would result from traffic and production equipment.

Noise in the workplace is under the regulation of the Occupational Safety and Health Administration (OSHA). OSHA safety standards have been adopted by the State of Wyoming. However, there are no regulations specified by the WOGCC for the amount of resonating noise from drilling operations. These operations could last from 5-10 years.

Noise can be directionally modified by atmospheric differences in temperature, humidity, and wind. The general topography of the area also affects how noise is perceived away from the source. Well pad locations within the project area located in draws would emanate less noise than locations that are situated on higher ground, due to the absorption of noise by the surrounding hillsides. This will provide some relief from higher dBA values associated with heavy machinery or production equipment. Under the authority of the Noise Control Act of 1972, the EPA has indicated that exposure to noise levels of less than 70 dBA for a continuous 24 hours prevents auditory damage and 55 dBA does not pose a risk for impact (EPA 1974). A noise level of 65 dBA is considered unacceptable at a place of residence and noise levels should not exceed this value (HUD 1996). A predetermined acceptable decibel value should range from 30 to 55 dBA and may need to be modified during nighttime hours. Also, any resonating sound that is 10 dBA over the background noise level is considered a major hindrance (EPA 1974).

As discussed in Section 3.12, there are six residences within and adjacent to the proposed project area. Since the actual pad locations for the 48 pads evaluated in the Original Hornbuckle EA have not been determined at this time, only general noise related impacts to residences from construction and drilling activities associated with the Proposed Action will be discussed.

Standard construction techniques using appropriate heavy equipment would be used to build well fields and buildings and to grade access roads for well pads. Drill rigs, construction vehicles, heavy trucks, bulldozers, and other equipment used to construct and operate the well fields, drill the wells, develop the necessary access roads, and build the production facilities would generate noise that would be audible

above the current background levels. Representative noise ranges at 50 and 2,500 feet are presented in Table 4.1.

Table 4-1. Noise Levels for Construction/Production Equipment

Equipment Type	Noise Level at 50 feet¹ (dBA)	Noise Level at 2,500 feet² (dBA)
Heavy Truck	82-96	24-38
Bulldozer	92-109	34-51
Grader	79-93	21-35
Excavator	81-97	23-39
Crane	74-89	16-31
Concrete Mixer	75-88	17-30
Compressor	73-88	15-30
Backhoe	72-90	14-32
Front Loader	72-90	14-32
Generator	71-82	13-24
Jackhammer/Rock Drill	75-99	17-41
Drill Rig ³	63	29
Three Ajax® Engines/Pad Configuration ⁴	65	26
Six Ajax® Engines/Pad Configuration (estimate) ⁴	66	31

¹ At 50 feet and from ISR GEIS (NRC 2009) Table 4.2-1 unless indicated otherwise.

² At 2,500 feet and based on ISR GEIS Table 4.2-1 unless indicated otherwise.

³ Based on 1999 BLM Noise Analysis (BLM 1999b).

⁴ At 40 feet and based on SRC 2012 noise study

Based on results from the baseline measurements, a series of three muffled Ajax® gas motors and pumping equipment emits noise at 64.5 dBA at a distance of 40 feet. At 1,280 feet, noise dissipates to 31 dBA, which is the natural daytime baseline. Using noise compounding formulas, six Ajax® units with silencers would produce an average of 66 dBA at 40 feet compared to 65 dBA at 40 feet from a three well installation.

Utilization of up to six muffled motors per pad could increase the distance for dissipation to noise to baseline levels from 1,280 feet to a theoretical maximum of 2,500 feet, which does not account for mitigation by terrain or atmospheric variables.

Based on the dissipation of noise at distance from the source, noise levels at distances greater than 2,500 feet from a well location would not exceed 55 dBA. Upon completion of drilling and construction, the short-term noise levels would diminish. Long-term noise would remain. Short- and long-term impacts from noise resulting from the Proposed Action would likely be negligible with implementation of the noise-related mitigation measures listed below.

4.9.2 The No Action Alternative

Under the No Action alternative, the number of wells on each pad would remain at two, with the associated pumping equipment. Long-term noise emission from two wells powered by Ajax® motors and pumping equipment would be 61 dBA at 40 feet.

4.9.3 Mitigation and Monitoring

The EPA has indicated that exposure to noise levels of less than 55 dBA do not pose a risk for impact (EPA 1974). Potential noise impacts at the various residences depicted on Figure 3-2 can be mitigated by the distance between the residence and the well pads. Analysis indicates that noise emanating from well pads attenuates to baseline (31 dBA) between 1,280 and 2,500 feet, depending on the number of wells per location and the method of pump jack operation. As such, SRC will attempt to locate well pads so that they are more than 2,500 feet from residences. In addition to distance, topography plays a role in mitigating noise. In instances where distance and topography cannot mitigate noise perceived at a residence SRC has a policy of mitigating noise using additional engineering or policy controls, such as the silencers discussed in Section 3.12.

4.10 Visual Resources

According to NEPA, a thorough evaluation of visual resources must be conducted prior to any issuance of a permit where adverse effects on the natural environment of public lands exist. The VRM System under the Bureau of Land Management is responsible for the enforcement of this evaluation. This program was adopted June 22, 2004 and requires all oil and natural gas agencies to partake in the policy.

4.10.1 The Proposed Action

Current VRM classes for the area included in the project area were established during the Platte River Resource Area Oil and Gas Environmental Assessment. The project area is located within the VRM Class IV area. The current natural scenic quality in and near the general Hornbuckle analysis area is fairly low because of the industrial nature of the oil and gas field development. There would be no increase in the maximum amount of disturbance acres when compared to the Original Hornbuckle EA but there is the potential to increase the number of production facilities associated with the added wells per pad. Impacts to visual resources resulting from the Proposed Action would likely be negligible if SRC implements the visual resource related mitigation measures listed below.

4.10.2 The No Action Alternative

The footprint for maximum disturbance would not change compared to the Proposed Action but the amount of long-term disturbance acres would be less. The number of storage tanks present on each individual well pad would be smaller. The visual resources impacts from the No Action Alternative would be slightly less than the Proposed Action.

4.10.3 Mitigation and Monitoring

Approximately 11,455 acres, or 24.86% of the Hornbuckle EA Update Project Area is composed of state and federal lands, which limits the extent of public use of the Project Area. In general the following practices would be used to mitigate visual impacts.

Best Management Practices (BMPs) are general guidelines set forth by the BLM to aid in the identification and mitigation of certain practices and aspects of a project. These guidelines pertaining to the visual resource aspect of a project can decrease visual pollution and aid in the acceptance of the overall permitting process and the effectiveness and cost of reclamation. Some of these guidelines are:

- The use of existing roads.
- Upgrading and maintaining existing roads as necessary.
- Keeping sites clean.
- Mandatory fire extinguishers in all vehicles.
- Painting facilities to blend into the landscape (VRM Standard Environmental Color Chart).
- Reassessing the final reclamation plan to account for an increase in industrial material.
- The use of natural topography or berms to screen facilities.
- Conducting snow removal in a manner to avoid impacts to the surface and subsurface.
- Planning transportation needs to reduce vehicle density.
- Burying of new utility lines, utilizing the plow/pull method.
- Reducing barren areas on the pad.
- Revegetating borrow ditches to reduce erosion.
- To the extent possible, revegetating the well pad disturbance to blend the disturbance with native ground.

Implementation of these techniques can help provide a better experience for the primary viewer, the public. Because the area has been previously developed, it would be most important to review the guidelines that pertain to adding further industrial components to the area and the temporary increase in activity during the initial stages of the operation. The BMPs that are deemed fit for the project will be employed throughout the entire phase of the industrial process and further exemplified when necessary in later stages.

4.11 Waste and Hazardous Materials Management

4.11.1 *The Proposed Action*

Hazardous materials that would be used at the site may include drilling mud and cementing products, fuels, flammable or combustible materials, and corrosive acids and gels. Under the Proposed Action, 192 new wells would be added resulting in additional potential short-term impacts from the hazardous materials utilized during drilling process. Impacts from hazardous or solid wastes resulting from the Proposed Action would likely be negligible if SRC implements the mitigation measures listed below.

4.11.2 *The No Action Alternative*

The footprint for maximum disturbance would not change compared to the Proposed Action but the amount of long-term disturbance acres would be less. The number of wells present on each individual well pad would be smaller. The potential for impacts from hazardous or solid wastes from the No Action Alternative would be less than the Proposed Action as a result of fewer wells being drilled.

4.11.3 *Mitigation Measures*

In the event that hazardous or extremely hazardous materials or substances, as defined in 40 CFR 355, would be used, produced, stored, transported, or left on or in the vicinity of the SRC project area, SRC will comply with all rules and regulations including but not limited to reportable quantities of stored materials and the reporting of accidental release as set forth in 40 CFR 355. SRC will follow all applicable federal, state, County or local laws and regulations if any chemicals or proprietary blends that are subject to SARA are used during the drilling process or are stored on any site. All hazardous substances and commercial preparations would be handled in an appropriate manner to minimize the potential for leaks or spills. SRC would develop and maintain a Spill Prevention, Control and Countermeasure (SPCC) plan for each well site. Storage facilities and tanks would utilize secondary containment structures of sufficient capacity to contain, at a minimum, the entire contents of the largest tank with sufficient freeboard to contain precipitation after the well goes into production.

Portable chemical toilets would be provided for the use of workers. Toilets would be pumped as required and waste disposed of by a commercial operator.

Trash and debris would be picked up daily and deposited in an appropriate container. After removal of the drilling equipment, the container would be removed from the site.

4.12 Public Health and Safety

4.12.1 The Proposed Action

Public health and safety is addressed in operator-specific (SPCC) plans and aboveground storage tanks (ASTs), as mandated by both federal and state regulations through the EPA and the WDEQ. Federal regulations for SPCC are at 40 CFR 112; Wyoming AST program administration is available online at: <http://deq.state.wy.us/shwd/stp/>.

4.12.2 The No Action Alternative

The footprint for maximum disturbance would not change compared to the Proposed Action but the amount of long-term disturbance acres would decrease. The number of wells present on each individual well pad would decrease. The potential for impacts related to public health and safety from the No Action Alternative would be less than the Proposed Action as a result of fewer wells being drilled.

4.12.3 Mitigation Measures

SRC will have an emergency/ contingency plan that addresses public health and safety in the event of an accident or unforeseen circumstance warranting immediate response.

4.13 Cumulative Impacts

Cumulative impacts are impacts which are likely to occur due to the Proposed Action in combination with other existing and ongoing activities including recently constructed projects in the area and/or projects which would likely be implemented in the area in the near future. Pursuant to NEPA, the BLM must consider the cumulative impacts of the Proposed Action in conjunction with other existing and ongoing oil/gas exploration activities within the general area. In addition, unrelated activities within the overall project area which might have an adverse impact upon existing natural resources in the area and, consequently, which would further contribute to the overall degradation of the human environment must be considered in the analysis of cumulative impacts as well. Cumulative impact is defined by Council of Environmental Quality (CEQ) regulations at 40 CFR §1508.7 as:

the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

One other project (Scott Field Development) has been proposed, however, specifics of the project have not been developed so impacts from it cannot be analyzed.

4.13.1 Introduction

As stated in Section 3.4 of this EA, approximately 154 oil or gas wells have been drilled within the project area. Of these 154 wells, 107 were in place prior to the Original Hornbuckle EA. Impacts associated with the 47 wells drilled in the project area since approval of the Original Hornbuckle EA were accounted for in that document. For the purposes of this environmental analysis, it is assumed that any permanently abandoned wells have been successfully reclaimed and no longer represent long-term surface disturbance within the Project Area. The remaining wells within the Project Area have the potential to produce and thus represent a cumulative, long-term impact upon the human environment.

Using these assumptions, the surface disturbance within the overall project area resulting from previous oil/gas exploration and development activities as well as oil/gas activities associated with ongoing activities within the project area not subject to federal jurisdiction is quantified as follows:

- 2.16 acres of short-term disturbance (1.81 acres long-term) associated with the installation of an SRC field office on private surface estate within the Hornbuckle Field (see Section 2.1.8 of the Original Hornbuckle EA).
- 4.61 acres of long-term disturbance associated with the installation of a storage yard on private surface estate within the Hornbuckle Field (see Section 2.1.8 of the Original Hornbuckle EA).
- 144.94 acres of long-term disturbance for the 69 producing wells in place prior to the Original Hornbuckle EA.
- 268.39 acres of long-term surface disturbance associated with 79.08 miles of existing road within the project area. Existing surface disturbance within the overall project area attributable to the existing road network (including all crown and ditch roads) is based on the assumption that the outslope and borrow ditch areas of these roads have already been reseeded resulting in an average disturbed ROW width of 28 feet following interim reclamation.
- 424.24 acres of short-term disturbance associated with the installation of approximately 100 miles of buried pipeline within the project area. Of this total disturbance, approximately 242.42 acres would be attributable to the installation of approximately 211,200 feet of pipeline in a 50 foot ROW cross-country, and the remaining 181.81 acres would be attributable to the installation of approximately 316,800 feet of pipeline parallel to existing roads and installed in a 25 foot ROW.
- 11.48 acres of short-term surface disturbance associated with the eight inch trunk line referenced in Section 2.1.4.1, with 3.09 acres attributed to the installation of the line across federal surface estate and the remaining 8.39 acres attributed to the installation of the line across approximately 7,310

feet of private (fee) surface estate. The disturbance calculations were based on a 50 foot disturbed ROW width for installation of the buried pipeline.

In addition to the previous oil/gas activity within the project area, the area has also undergone surface disturbance related to uranium recovery activities as follows:

- 1,047 acres of long-term disturbance associated with the Bear Creek open pit uranium mine. The Bear Creek facility was operated as a series of open pit mines with associated facilities that originally encompassed 8,000 acres within Township 38 North, Range 73 West. The uranium mine and mill (which includes the Spook site discussed in Sections 1.2 and 3.8.1 of the Original Hornbuckle EA) operated from 1977 until 1986 when falling prices for yellow cake rendered the operation unprofitable. Through a series of acquisitions, Anadarko Petroleum Corporation subsequently acquired the rights to the Bear Creek acreage and is currently in the process of decommissioning the mine. Reclamation of the Bear Creek uranium mill was completed in 1999 (Spook site) and the Nuclear Regulatory Commission (NRC) concurred that the reclamation of the mill facility and tailings impoundment was complete in 2001 (DOE 2011, WMA 2011). The mine permit area has subsequently been reduced from 8,000 acres to 1,047 acres (WMA 2011).
- From the extant data on the Bear Creek uranium mine, it would appear that most long-term surface disturbance associated with the operation had been reclaimed by the turn of the 21st Century and that much of that reclamation has since been approved by the appropriate regulatory authorities. However, for the purposes of this document, it is assumed that the remaining 1,047 acres referenced above does represent a long-term disturbance and will be included in the calculations of cumulative surface disturbance within the project area. While this is probably an inflated disturbance figure, this is the best available information on remaining surface disturbance within the original mine permit area.
- 34.9 acres of short-term surface disturbance (9.04 acres long-term) associated with the Power Resources, Inc./Cameco Resources Reynolds Ranch *in-situ* uranium mining proposal. Cameco has applied to the NRC and the Wyoming Department of Environmental Quality (WDEQ) for approval to expand their Smith Ranch-Highland mining operation in Townships 36 and 37 North, Ranges 73 and 74 West. The overall Reynolds Ranch *In-Situ* Leaching (ISL) project encompasses a mine permit area of approximately 8,280 acres, with approximately 1,200 acres of this permit area included within the project area in Sections 30-32 of Township 37 North, Range 73 West. Of the 1,200 acres included within the project area, 40 surface/mineral acres are in federal ownership, 800 acres are fee surface/federal mineral (split) estate, with the remaining 360 acres of surface/mineral estate in private ownership (BLM 2010). From the information contained in Section 3.8.1 of the Original Hornbuckle EA, it is known that Cameco has drilled 17 groundwater monitoring wells within that

portion of the mine permit area located within the project area, but it is unclear if actual ISL operations have commenced.

The surface disturbances discussed above are summarized in Table 4-2. The Scott Field Development has been proposed, but specifics of the project have not been developed so impacts from it cannot be included in cumulative impacts discussion.

Table 4-2. Compilation of Proposed and Existing Surface Disturbance in the Project Area

Source(s) of Disturbance	Disturbance in Acres		
Components of Proposed Action Subject to Analysis	Short-Term	Original EA Long-Term	Long-Term Added by EA Update
New Well Locations	284.64	100.80	37.92
Proposed Access Road	109.18	76.43	0.00
Proposed Pipelines: 25' ROW Width	181.82	0.00	0.00
Proposed Pipelines: 50' ROW Width	242.42	0.00	0.00
Eight Inch Trunk Line Crossing BLM Surface Estate	3.09	0.00	0.00
Sub-Total	821.15	177.23	37.92
Source(s) of Disturbance	Disturbance in Acres		
Cumulative Additions to Proposed Action	Short-Term	Original EA Long-Term	Long-Term Added by EA Update
SRC Office in Hornbuckle Field on Fee Surface Estate	2.16	1.81	0.00
SRC Storage Yard in Hornbuckle Field on Fee Surface Estate	0.00	4.61	0.00
Eight Inch Trunk Line Crossing Fee Surface Estate	8.39	0.00	0.00
Drilling/Producing Wells Existing Prior to project area Analysis	0.00	144.94	0.00
Existing Access Roads within the project area	0.00	268.39	0.00
Bear Creek Uranium Mine Permit Area	0.00	1,047.00	0.00
Reynolds Ranch ISL Uranium Mine Estimated Disturbance	37.06	9.04	0.00
Sub Total	47.61	1,475.79	0.00
Grand Total	868.76	1,653.02	37.92

4.13.2 Air Quality

There are currently 125 oil or gas wells in production or capable of production within the project area. The Proposed Action would add up to 192 wells.

As of 2010, there were approximately 5,000 producing oil and gas wells in the CFO jurisdictional area (BLM 2012a). Converse County, which includes the overall project area, is currently considered to be in attainment with National and State of Wyoming Ambient Air Quality Standards (EPA 2012 and WDEQ/AQD 2010). The Proposed Action would add up to 192 wells to the CFO jurisdictional area, which represents an increase in the number of wells of approximately 3.8 percent. Potential air quality impacts from the additional wells would result from additional oil field related traffic on access and county roads that would create additional dust (PM₁₀ and PM_{2.5}) and the additional wells and associated gas powered production equipment would generate additional air quality related emissions (primarily NO_x, CO, and O₃) but these potential impacts from these emissions are not significantly different than air quality impacts from current oil and gas production. The Proposed Action would have direct, short- and long-term adverse impacts on air quality but, based on the relatively slight increase in the number of wells and if mitigation measures included in Section 4.2.1.2 are implemented, the cumulative air quality impacts from the Proposed Action would not result in violations of air quality standards.

4.13.3 Cultural Resources

Those surface-disturbing activities subject to federal jurisdiction proposed within the overall project area resulting from the Proposed Action or any other activities proposed within the project area would all be inventoried to determine their potential impact upon cultural resources. Any cultural sites identified in conjunction with these inventories would add to our cumulative understanding of past human habitation within the overall project area and any sites identified in conjunction with these surveys that were subsequently deemed to be potentially eligible for nomination to the National Register of Historic Places (NRHP) would either be avoided or the potential impacts thereto mitigated in accordance with BLM/SHPO recommendations.

Considering that any potentially eligible cultural sites identified within the overall project area have been and would continue to be avoided, combined with the fact that no eligible cultural sites have been identified in conjunction with the Proposed Action to date, it is anticipated that no adverse cumulative impacts to cultural resources would occur within the overall project area as a result of surface disturbing activities proposed.

4.13.4 Range Management

As stated in Sections 2.1 and 4.4.1, construction activities associated with the Proposed Action would not increase the maximum surface disturbance. As such, the maximum disturbance total remains at approximately 869 acres within the project area, or 1.89 percent of the overall project area. This short-term disturbance is not representative of total existing surface disturbance within the project area considering that much of the surface disturbance within the project area is pre-existing and

therefore not included in the short-term calculations. Under the disturbance assumptions presented above, the initial loss of approximately 869 acres of vegetation associated with the Original Hornbuckle EA would result in the short-term loss of approximately 263 AUMs for domestic livestock grazing in the project area, based on 3.30 acres per AUM which is the average for grazing allotments in the Project Area (BLM 2011).

Long-term surface disturbance within the overall project area would increase slightly with the Proposed Action due to the additional area (37.92 acres) required for the additional wells/facilities. Based on 3.30 acres per AUM the long-term disturbance from the Proposed Action would result in the loss of 11 AUMs. The cumulative long-term disturbances listed in Table 4-1 would total approximately 1,691 acres or 3.67 percent of the overall project area. This long-term disturbance would result in the cumulative loss of approximately 512 AUMs. This long-term loss of grazing equates to an overall decline of approximately 3.67 percent in available AUMs within the overall project area. The loss of an additional 11 AUMs attributable to the Proposed Action over the long-term would not represent an adverse cumulative impact.

In addition to the loss of grazing and concomitant AUMs, the disturbance of existing, native vegetation would create opportunities for the establishment of invasive, non-native (noxious) species. Invasive species are easily established and commonly found on newly disturbed and reclaimed sites throughout Wyoming. These species are fast growing, can out-compete native species, increase the danger of wildfires, and prevent the establishment of native species including grasses, forbs and shrubs. Considering that invasive, non-native plant species would be controlled by SRC within the overall project area, it is unlikely that the Proposed Action would have any adverse cumulative impacts on native plant communities arising from the invasion of and replacement with non-native species. However, any area(s) within the overall project area subjected to new surface disturbance would represent an opportunity for the establishment of these invasive, non-native species.

4.13.5 Soils

As indicated above, there would be no new short-term surface disturbance associated with the Proposed Action construction activities. As such, the cumulative short-term disturbance total would remain at approximately 869 acres within the project area or 1.89 percent of the overall project area.

Implementation of BMPs for reclamation and erosion control would result in a commensurate reduction in overall erosion rates. The successful reclamation of surface disturbance resulting from the Proposed Action would only add a cumulative total of 37.92 acres to the 1,653 acres of existing long-term surface disturbance within the overall project area, which does not represent major increase in long-term disturbance within the project area.

Ultimately, some minor amount of soil would be expected to move off of disturbed areas within the project area due to wind and water erosion; however, such movement would likely cease once the soils reach undisturbed areas. Cumulative impacts to soils would be negligible based on the use of BMPs within the overall project area combined with routine monitoring of reclamation success and implementation of remedial measures as necessary to correct any identified deficiencies would reduce the cumulative impacts to the soil resource to negligible levels.

4.13.6 Water Resources

As indicated in Section 3.8.1 of the Original Hornbuckle EA, there are 53 existing water wells within the project area including 4 wells permitted solely as domestic water wells, 41 permitted solely as stock water wells, 2 wells permitted for both domestic and livestock watering purposes, 4 wells permitted for miscellaneous purposes, and 2 wells permitted for both stock and miscellaneous purposes.

Groundwater could be affected during construction of wells or by other subsurface project-development activities. The most likely pathway for groundwater contamination would be undetected spills and leachate from leaking produced-water facilities or mud pits. Additionally, undetected defects in either casing installation or cementing would be the most likely scenario for groundwater contamination to occur from oil well drilling and completion activities. Leakage from freshwater storage pits (used in fracturing operations) or other storage pits needed for well completion has the potential to leach salts from soils and impact shallow groundwater. Chemicals used for production drilling could cause local contamination of groundwater if not managed properly.

The greatest potential for degradation of the shallow Wasatch and Fort Union aquifers that supply local water wells would be contamination resulting from activities within the project area including the Proposed Action and the proposed uranium mining activities proposed by Cameco Resources. Considering the precautions described in Chapter 2 designed to protect the shallow fresh water aquifers (surface to 1,000 feet) during drilling operations, it is highly unlikely that contamination of these aquifers would contribute to a cumulative degradation of the overall near-surface water quality within the project area. Likewise, mining companies engaged in ISL uranium mining operations are subject to strict regulations regarding the degradation of groundwater quality and are required to ensure that water quality within the mine permit area is returned to pre-mining conditions prior to decommissioning of the mine. Additional information on these requirements and the impacts of uranium ISL activities may be found in the Environmental Assessment of the Cameco Resources/Power Resources Incorporated Reynolds Ranch In-Situ Uranium Recovery Project (BLM 2010).

Additional oil/gas exploration and development activity within the project area would result in negligible impacts to surface waters and the Cheyenne River watershed. Implementation of the Proposed Action would increase the cumulative short-term surface disturbance in the Cheyenne River watershed by approximately 822 acres.

Long-term surface disturbance in the overall project area would increase by approximately 207 acres.

As stated elsewhere in this document, surface disturbing activities associated with the Proposed Action would increase the cumulative long-term surface disturbance in the 46,080 acre project area by approximately 0.47 percent, from 3.20 percent to 3.67 percent. An increase of less than 1 percent in overall surface disturbance within the project area would be considered a negligible impact upon the affected watershed. Moreover, there are no perennial sources of surface water within the project area. As such, cumulative impacts to surface waters or the surface hydrology of the project area resulting from surface disturbing activities associated with the Proposed Action are not anticipated.

4.13.7 Wildlife

There would be no new short-term surface disturbance associated with the Proposed Action construction activities. As such, the cumulative short-term disturbance total would remain at approximately 869 acres within the project area or 1.89 percent of the overall project area. Overall, the generally small amounts of cumulative habitat loss would have minimal impacts on wildlife populations. Once the initial construction and drilling phases of the proposed project have been completed, the project area should return to a pre-project level of human disturbance. Moreover, once the wells in the project area have been depleted, the subsequent abandonment and successful reclamation of existing facilities within the field would return the area to a predisturbance state.

Some small mammals could be killed during construction or by collisions with vehicles during production, and a small amount of wildlife habitat would be removed for the life of the project.

4.13.8 Transportation

Under the Proposed Action, cumulative traffic impacts would likely continue at current or increasing levels for the next 5-10 years. The amount of traffic is dependent on a number of factors, including the success of future drilling, energy prices, rig availability, etc. When development is complete, light duty vehicle (crew trucks, consultant vehicles, etc.) use would likely decline, but truck traffic associated with oil and water transport would continue into the foreseeable future or until an oil pipeline is brought into the project area.

During June 2012, daily traffic on the Ross Road averaged 967 vehicles per day, of which 27 percent, or 261 vehicles, were trucks. Assuming that the 96 wells approved in the Original Hornbuckle EA and the 192 wells under the Proposed Action are successful and produce an average 150 bbl/day of oil and 30 bbl/day of water, daily production in the field would be 43,200 bbl/day for oil and 8,640 bbl/day for water. Based on an average of 30 completions per year, the average truck traffic would

increase by 27 trips per day for each subsequent year until field-wide production becomes economically feasible to support installation of a pipeline gathering system.

At the peak of activity under the Proposed Action, impacts to transportation resources would increase above existing levels, then would gradually decline.

4.13.9 Noise

The EPA has listed that exposure to noise levels of less than 70 dBA for a continuous 24 hours prevents auditory damage and 55 dBA does not pose a risk for impact (BLM 2009). A noise level of 65 dBA is considered unacceptable at a place of residence and noise levels should not exceed this value (HUD 1996). A predetermined acceptable decibel value should range from 30 to 55 dBA and may need to be modified during nighttime hours accordingly. Also, any resonating sound that is 10 dBA over the background noise level is considered a major hindrance (EPA 1974).

Upon completion of drilling and construction, the short-term noise levels would diminish. Long-term noise would remain. Based on results from the baseline measurements, a series of three muffled gas motors and pumping equipment emits 64.5 dBA at a distance of 40 feet. At 1,280 feet, noise had dissipated to 31 dBA, which is the natural day time baseline.

Using noise compounding formulas, six Ajax® units with silencers would produce an average of 66 dBA compared to 65 dBA from a three well installation. Implementing up to six motors per pad could extend the drop in noise levels to baseline levels from 1,280 feet to a theoretical maximum of 2,500 feet, which does not account for mitigation by terrain or atmospheric variables.

4.13.10 Visual Resources

The current natural scenic quality in and near the general Hornbuckle analysis area is fairly low because of the industrial nature of the oil and gas field development. As such, cumulative impacts to visual resources of the project area resulting from surface disturbing activities associated with the Proposed Action are not anticipated.

4.13.11 Waste and Hazardous Materials Management

Wastes will continue to be generated and hazardous materials will continue to be used in the project area operations for approximately 40 years, the anticipated life of the field.

Cumulative impacts of the Proposed Action include: the addition of wastes generated from drilling and completion of 192 additional wells, and the associated produced water.

4.13.12 Public Health and Safety

Since public health and safety is addressed in operator-specific (SPCC) plans and aboveground storage tanks (ASTs), as mandated by both federal and state regulations through the EPA and the WDEQ, and the installation of casing for the protection of groundwater, cumulative impacts to public health and safety of the project area resulting from the Proposed Action are not anticipated.

4.14 Irreversible and Irretrievable Commitment of Resources

No changes to analysis as a result of the update. This section was included in Original Hornbuckle EA as Section 4.9.

4.15 Short-Term Use of the Environment versus Long-Term Productivity

No changes to analysis as a result of the update. This section was included in Original Hornbuckle EA as Section 4.10.

5.0 CONSULTATION AND COORDINATION

5.1 Background

The Hornbuckle Field Development Program EA Update was prepared by WWC Engineering (WWC), a third party contractor, under the direction of the BLM. A list of the personnel responsible for document preparation and their individual responsibilities are provided below.

5.2 Contributors, Reviewers, and Preparers

Table 5-1. Federal Interdisciplinary Team

Name	Office	Responsibility
Bureau of Land Management		
Art Terry	Casper Field Office	Environmental Protection Specialist
Jude Carino	Casper Field Office	Archaeologist
Shane Evans	Casper Field Office	Hydrologist
Shane Gray	Casper Field Office	Wildlife Biologist, Natural Resource Specialist
Kathleen Lacko	Casper Field Office	Planning & Environmental Coordinator
Patrick Moore	Casper Field Office	Asst. Field Manager - Lands & Minerals

Table 5-2 List of EA Preparers

Name	Agency/Firm	Responsibility
Mike Evers	WWC Engineering	Project Manager, EA Preparation
John Berry	WWC Engineering	EA Preparation
Heidi Robinson	WWC Engineering	Document Production
Leanne Danner	WWC Engineering	Document Production
Mal McGill	WWC Engineering	CADD

6.0 REFERENCES

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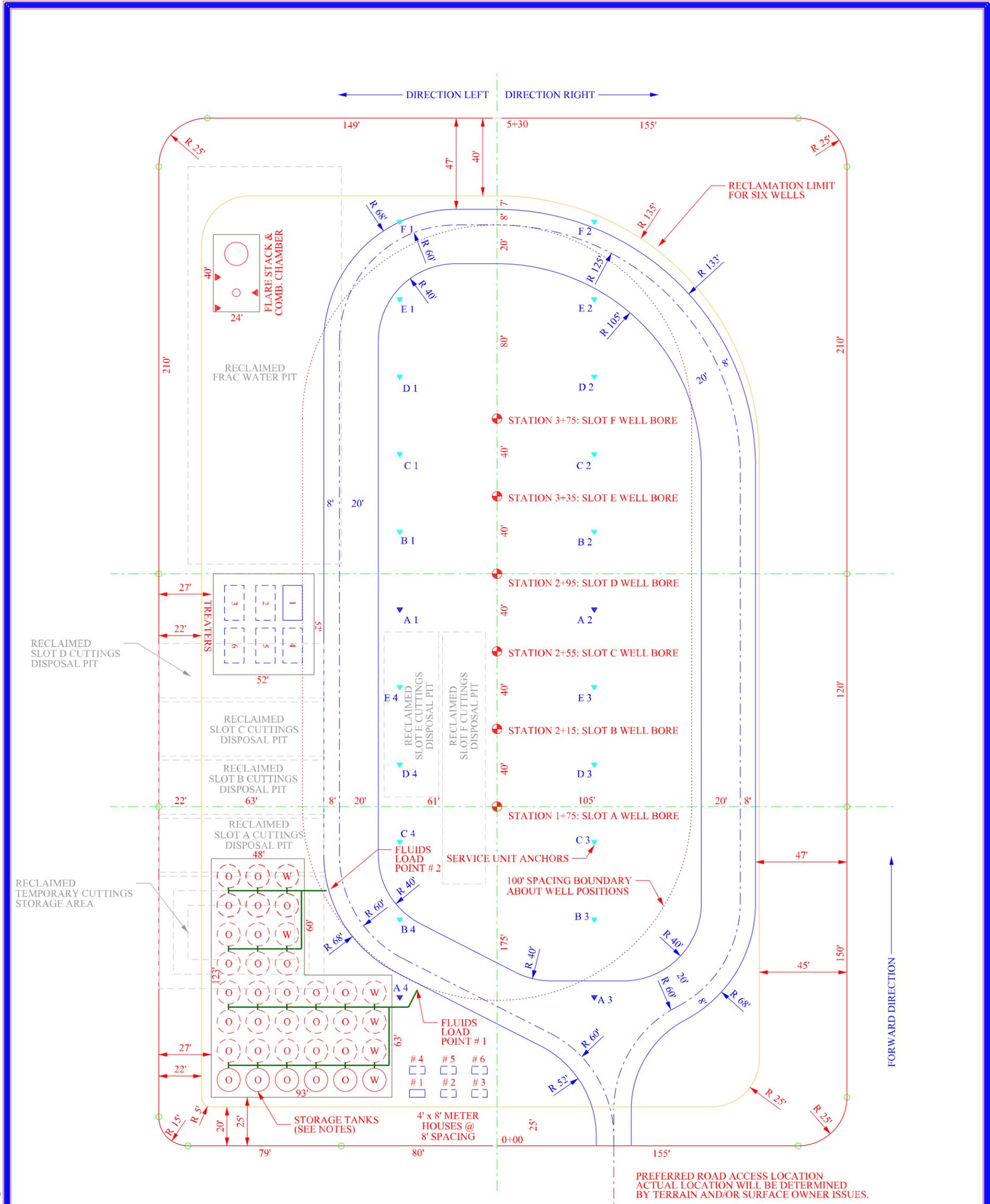
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APPENDIX A

Typical Well Pad Layout



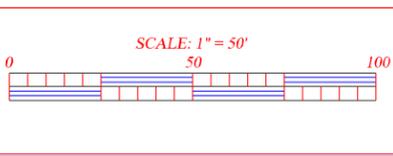
NOTES:

1. The drawing shows the proposed location of production equipment and the proposed fluids haul loop route.
2. The storage tanks are 12' diameter by 20' height with a capacity of 400 bbls. The estimated storage volume required per well is 2000 bbl of oil and 400 bbl of water. The spacing between tanks is 3 feet.
3. The storage tanks and treaters will usually be placed near the positions shown. An earthen berm or steel spill barrier will be erected on the perimeter of the tanks, flare stack and treaters. Dependent upon the access road location, it may be necessary to locate the flare stack and meter house in different positions. In any case, the minimum safety spacing will be observed. The minimum spacing utilized is 100 feet between wells and tanks and treaters. The minimum spacing of 125 feet between a flare and wells and tanks and treaters.
4. The position of the well service anchors is the four points at 100 feet forward and 100 feet back of the well bore and 50 feet left and 50 feet right of the well bore.
5. The interim reclamation limit is estimated to lie outside the anchors and production equipment as shown.
6. The area of the pad within the pad perimeter is 4.30 acres prior to interim reclamation. The area of the pad within the proposed interim reclamation boundary for the six wells 3.00 acres. Thus approximately 70.0 % of the area of original pad will be used for production operations.

PRODUCED FLUIDS HAUL LOOP ROUTE NOTE:

1. The haul route center line is proposed as shown. The shoulders of the route are shown to illustrate the validity of this route. The nominal width is 16', with 8' on each side of center line. Curve widening on the inside of curves is shown where the widening is 12' for a radius of 60'. Although a curve widening of 4' for a radius of 125' is sufficient, a value of 12' is used to simplify construction. This configuration will support a tractor-trailer-pup combination hauling unit. The entry point to the haul loop would be determined by the actual entry point of the road. The radius of the approach to the haul loop should be a minimum of 50 feet as shown in this example.

PRJ. #:	68H10	SUR:	
REC:		DES:	SAG 8/14/12
DWG: ea_HB-6w-40s-400b-prod		DWN:	SAG 8/15/12
PREPARED BY: P.E. GROSCHE CONSTRUCTION, INC. SURVEYORS - ENGINEERS - CONSTRUCTORS P. O. BOX 36 WORLAND, WY 82401 (307)347-3332			



OWNER
SAMSON RESOURCES COMPANY
DENVER, COLORADO

PROJECT
TYPICAL WELL SITE FOR PRODUCTION ACTIVITIES
6 WELLS - 40' SPACING - 400 BBL TANKS
HORNBUCKLE FIELD
CONVERSE COUNTY, WYOMING

DRAWING TITLE
EX. HB-6-40-400-081512
DRAWING DESCRIPTION
TYPICAL PRODUCTION FACILITY LAYOUT

APPENDIX B

Hornbuckle Field Federal Oil and Gas Lessees of Record

Appendix B – Hornbuckle Field Federal Oil & Gas Lessees of Record

Location	Parcel/Lot	Lease Number	Lessees of Record
T37N R72W			
Section 06	SENE, Lot 1	WYW 049848	Abraxas Operating LLC Citations 2002 Investment LP Flehmer Properties LLC Gunlikson Petro Inc. Niwort Resources LLC Prima Exploration Inc. Samson Resources Company Whiting Oil and Gas Corp.
Section 06	Lots 4,6	WYW 059237	Abraxas Operating LLC
Section 18	SWNE		EQT Production Company
Section 19	NE, E2NW; Lots 1,2		Greenbriar Energy LP IV
Section 31	N2NE, NENW; Lot 1		Samson Resources Company
Section 31	E2SW; Lots 3,4	WYW 172443	Samson Resources Company
Section 18	E2SW, N2SE; Lots 2-4	WYW 173989	Samson Resources Company
Section 19	W2NE,E2NW,NESW Lots 1-4		
Section 30	SENE, E2SW; Lots 1-4		
Section 31	E2NW,SE; Lots 1,2		
Section 32	W2		
Section 07	SE	WYW 180616	Samson Resources Company
T37N R73W			
Section 02	S2NE; Lots 1,2	WYW 039967	AGS Oil & Gas Holdings #2 Inc.
Section 17	SE		Conoco Phillips Company
Section 20	NE		Cordell James C
Section 24	SW		G.F. Collins Jr. Trust
Section 26	N2SW		Muirfield Production Company
Section 27	W2NE,SENE,NW,W2SW,SESW		Petrogulf Corporation
Section 33	NE		R.B.C. Exploration Co. Ryder Stilwell Oil Samson Resources Company WM WY Energy resources LLC Wold Oil Properties Inc.
Section 01	SWNE,SWSW; Lot 2	WYW 042587	Samson Resources Company
Section 04	S2NW, SWSE; Lot 4		WM WY Energy Resources LLC
Section 09	SWNE, W2, SWSE		
Section 11	W2NW, NWSW		
Section 35	SE		
Section 02	Lots 3,4	WYW 045718	Eland Energy Inc.
Section 03	Lots 3,4		I C Gas Amcana Inc.
Section 04	S2NE, N2SE		Journey Properties LLC
Section 05	S2N2; Lots 1-4		Louisiana Land & Exploration Company
Section 09	NWNE, NWSE		
Section 10	S2NW		Merit Energy Company
Section 11	SWSW		Merit MGMT Partners I LP
Section 12	E2NW,NWNW,N2SW,SWSW		Pedco Res Co
Section 24	W2NE,SENE		Ram Energy Inc.
Section 31	S2NE		Samson Resources Company
Section 03	N2S2	WYW 047304	Citation 2002 Investment LP EQT Production Company Nortex Corporation Samson Resources Company SM Energy Company

Appendix B – Hornbuckle Field Federal Oil & Gas Lessees of Record

Location	Parcel/Lot	Lease Number	Lessees of Record
Section 09 Section 10 Section 35	SENE,NESE S2NE,N2SW,SESW NWSW	WYW 051178	Durango Prod Corporation Flehmer Properties LLC Gunlikson Petro Inc. Niwot Resources LLC Pride Energy Company Prima Exploration Inc. Samson Resources Company SM Energy Company
Section 01	S2NW; Lots 3,4	WYW 059237	Abraxas Operating LLC EQT Production Company Greenbriar Energy LP IV Samson Resources Company
Section 04 Section 08 Section 11 Section 13 Section 26	SW NE NE NESW,S2SW SENE	WYW 063529	Merit Energy Company Merit MGMT Partners I LP Orion Energy Corporation Samson Resources Company Sedco Energy Corporation WM WY Energy Resources LLC
Section 11 Section 13 Section 24	E2NW,N2SE S2NE N2SE	WYW 070359	Samson Resources Company WM WY Energy Resources LLC
Section 02 Section 11 Section 25 Section 26	S2NW,N2SW,S2SE E2SW,S2SE NW N2NE	WYW 073473	Eland Energy Inc. Merit Energy Company Merit MGMT Partners I LP Swift Energy Operating LLC
Section 03 Section 27 Section 29 Section 30 Section 33	S2N2; Lots 1,2 SE NE E2NW; Lots 1,2 W2,SE	WYW 078824	I C Gas Amcana Inc. Journey Properties LLC Louisiana Land & Exploration Merit Energy Company Merit MGMT Partners I LP Ram Energy Inc. Samson Resources Company
Section 24	NW	WYW 102949	Samson Resources Company WM WY Energy Resources LLC
Section 25 Section 26	SWNE NW	WYW 102950	Samson Resources Company WM WY Energy Resources LLC
Section 10	SE	WYW 112575	Samson Resources Company WM WY Energy Resources LLC
Section 18 Section 19	E2,E2W2 E2E2	WYW 138424	Samson Resources Company
Section 01 Section 04 Section 12	SESW Lot 3 SWNW, SESW	WYW 149212	ABO Petro Corporation Myco Industries Inc. OXY-1 Company Sharbro Energy LLC Yates Industries LLC Yates Petroleum Corporation
Section 13	E2SE	WYW 151706	Nearburg Exploration Co. LLC
Section 13	NWNW,W2SE	WYW 161770	Samson Resources Company WM WY Energy Resources LLC
Section 17	SWNW	WYW 162615	Samson Resources Company
Section 24 Section 27 Section 34	NENE NESW N2N2	WYW 172447	Samson Resources Company WM WY Energy Resources LLC
Section 34 Section 12	SWSW W2NE,NWSE	WYW 176204 WYW 176528	Samson Resources Company Samson Resources Company

Appendix B – Hornbuckle Field Federal Oil & Gas Lessees of Record

Location	Parcel/Lot	Lease Number	Lessees of Record
Section 05	S2	WYW 177704	Samson Resources Company
Section 06	Lots 1-4		
Section 07	S2NE,SE,SE,SE; Lots 2-		
Section 08	4		
Section 17	NW,S2SW,SE		
Section 18	NE,N2NW,SE,SW		
	Lots 1-4		
Section 08	N2SW	WYW 177705	Samson Resources Company
Section 19	W2E2		
Section 20	SE		
Section 29	W2,SE; MS702 within	WYW 177706	Samson Resources Company
	SE,SE,S2SE		
Section 30	NESW; MS747 in N2SW; Lot 3		
Section 31	S2NE,SE,SE,SE; MS748		
	in E2SE; Lots 2-4		
Section 32	NE,S2NW,S2; MS702 & MS748		
	in NE,S2NW,S2		
T38N R73W			
Section 34	S2SE	WYW 031775	Riverbend Expl. & Production LLC Riverbend Production LP
Section 20	S2NW,N2SW	WYW 040793	Anadarko Petroleum Corporation Bird 2000 LP GB Acquisition Corporation Jetta Operating Co. Inc. Jetta Operating Co. Inc. Nominee Radler 2000 LP Tug Hill Energy LLC
Section 31	S2NE	WYW 045718	Eland Energy Inc. I C Gas Amcana Inc. Journey Properties LLC Louisiana Land & Exploration Merit Energy Company Merit MGMT Partners I LP Pedco Res Co. Ram Energy Inc. Samson Resources Company
Section 24	N2S2	WYW 048567	Bill Barrett CBM Corporation BP America Production Company Cox John L. Daven Corporation DNR O&G Inc. Don O. Chapel Inc. Hog Partnership LP Lee Wiley Moncrief 1988 Trust Merit Energy Partners III Merit MGMT Partners I LP Michael J. Moncrief GRNTRS Trust Mindyanne E. Moncrief Trust Moncrief C.B. Moncrief Oil & Gas Master LLC Monty Brenna Moncrief Trust Richard Jason Moncrief Trust RWM 1988 Trust Wedad O&G Corporation W. A. Moncrief III Trust

Appendix B – Hornbuckle Field Federal Oil & Gas Lessees of Record

Location	Parcel/Lot	Lease Number	Lessees of Record
Section 04 Section 05 Section 06 Section 07 Section 09	SWNE, SENW, N2S2, SWSW N2SW SESE NENE, S2NE, NWSE NWNW	WYW 048568	Hilcorp Energy X LP
Section 01 Section 12	S2NW, SE NE	WYW 049861	Devon Energy Production Co. LP Kerr McGee Corporation L.W. Moncrief Trust Michael J. Moncrief GRNTRS Trust Mindyanne E. Moncrief Trust Moncrief C.B. Moncrief Oil & Gas Master LLC Monty Brennan Moncrief Trust Richard Jason Moncrief Trust RWM 1988 Trust T.O. Moncrief Trust W.A. Moncrief III Trust
Section 08 Section 26 Section 34	N2SW NESE N2SE	WYW 055076	Citation 2002 Investment LP
Section 09 Section 24	S2 NW	WYW 057343	Lee Wiley Moncrief 1988 Trust Michael J. Moncrief GRNTRS Trust Moncrief C.B. Moncrief Oil & Gas Master LLC Moon Royalty LLC RWM 1988 Trust Sonorin III LLC T.O. Moncrief Trust W.A. Moncrief III Trust Woods Research & Development
Section 28	E2SE	WYW 076347	Samson resources Company WM WY Energy Resources LLC
Section 08 Section 21 Section 25 Section 28 Section 29 Section 30	N2NE, SWNE NE, NESE N2SW W2E2, S2NW All E2, E2SW; Lots 3,4	WYW 100394 WYW 118536	Hilcorp Energy X LP Samson Resources Company WM WY Energy Resources LLC
Section 18 Section 25 Section 31 Section 32	Lots 3,4 SWNW S2SE; Lots 1,2 S2SW	WYW 119601	Ruthea Inc. Sierra Pacific Production
Section 27 Section 19 Section 33 Section 27	W2NE, E2W2, E2SWNW; E2W2SWNW S2SE N2NE W2SW	WYW 124838 WYW 126303 WYW 126782	Samson Resources Company WM WY Energy Resources LLC Samson Resources Company WM WY Energy Resources LLC Samson Resources Company WM WY Energy Resources LLC
Section 28 Section 31 Section 32	N2NW N2NE, E2NW NE, N2NW	WYW 135589	Samson Resources Company WM WY Energy Resources LLC
Section 18 Section 20	NENE, SESW NWNE	WYW 139645	El Paso E&P Company LP Kab Acquisition LLLP-V Wilbanks Acquisitions I LLC

Appendix B – Hornbuckle Field Federal Oil & Gas Lessees of Record

Location	Parcel/Lot	Lease Number	Lessees of Record
Section 22	SESW	WYW 140227	EPE Nominee Corporation Kab Acquisition LLLP-VIII Wilbanks Acquisitions I LLC
Section 23	NWSW		
Section 25	W2SE,SESE		
Section 26	SENE		
Section 35	E2,E2NW		
Section 23	NESW,S2SW,N2SE,SWSE	WYW 140783	Noble Energy Inc.
Section 25	NESE		
Section 26	NWNE,NW,W2SW,SWSE		
Section 27	E2NE,SE		
Section 34	N2NE		
Section 35	SW		
Section 25	S3SW	WYW 142787	Abo Petro Corporation Oxy Y-1 Company Sharbro Oil Ltd. Company Yates Petroleum Corporation
Section 17	S2N2,N2SW		
Section 20	N2NW		
Section 21	SW	WYW 142795	Samson Resources Company WM WY Energy Resources LLC
Section 22	S2SE		
Section 18	NESW	WYW 143535	Bill Barrett Corporation
Section 19	N2SE		
Section 20	NENE,S2NE		
Section 15	N2SW,NWSE; MS693 in N2SW,NWSE	WYW 149213	ABO Petro Corporation Myco Industries Inc. Oxy Y-1 Company Sharbro Energy LLC Yates Industries LLC Yates Petroleum Corporation
Section 22	W2NW; MS693 in NWNW		
Section 06	SENE,N2SE,SWSE; Lots 1-4	WYW 155731	Chesapeake Exploration LLC Khody Land & Minerals Company OOGC America Inc.
Section 07	NWNE,SENE,NESW; Lots 1,2		
Section 15	S2SW	WYW 162616	Samson Resources Company
Section 27	W2W2SWNW	WYW 164687	Samson Resources Company WM WY Energy Resources LLC
Section 28	SENE		
Section 07	NESE	WYW 172448	Samson Resources Company WM WY Energy Resources LLC
Section 31	S2SE; Lots 1-2		
Section 32	SWSW; SESW		
Section 17	N2SE	WYW 172718	Samson Resources Company WM WY Energy Resources LLC
Section 20	S2SW		
Section 32	S2NW		
Section 09	NE	WYW 172974	Samson Resources Company
Section 21	NW	WYW 172975	Samson Resources Company WM WY Energy Resources LLC
Section 26	SESE		
Section 08	NWNW	WYW 175924	Chesapeake Exploration LLC Khody Land & Minerals Company OOGC America Inc.
Section 10	SE		
Section 10	SE	WYW 175925	Chesapeake Exploration LLC Khody Land & Minerals Company OOGC America Inc.

Appendix B – Hornbuckle Field Federal Oil & Gas Lessees of Record

Location	Parcel/Lot	Lease Number	Lessees of Record
Section 14	NW	WYW 175926	Samson Resources Company
Section 15	NE		
Section 20	NWNE,SE	WYW 175927	Samson Resources Company
Section 21	W2SE		WM WY Energy Resources LLC
Section 10	N2	WYW 176205	Samson Resources Company
Section 18	Lot 3		
Section 24	SESE		
Section 07	Lots 3,4	WYW 179142	Samson Resources Company
Section 18	Lot 4	Not Posted	Not Posted

Note: From BLM OG Plats (08/23/2010, 01/26/2012, and 07/09/2012) (BLM 2012c). The oil and gas rights for the above locations are owned by the federal government. For the remainder of the Project Area, the oil and gas rights are state or privately owned.