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

Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23

May 2021

DOI-BLM-UT-G010-2017-0036-EA

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FEDERAL PIPELINE UNIT WELLS
4-21-4-23 AND 5-21-4-23
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Prepared for

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1 INTRODUCTION

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental consequences of EagleRidge Operating, LLC's (the Applicant's) proposal to construct and operate the Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23, including associated access roads (Project). The EA is a site-specific analysis of potential impacts that could result with the implementation of a proposed action or alternatives to the proposed action. The EA assists the Bureau of Land Management (BLM) with project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and deciding whether any significant impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in 40 Code of Federal Regulations (CFR) 1508.27. An EA provides analysis to support the decision whether to prepare an Environmental Impact Statement (EIS) or a finding of no significant impact (FONSI). If the decision-maker determines that this project has significant impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether it is the proposed action or another alternative. The FONSI documents the reasons why implementation of the selected alternative would not result in significant environmental impacts (effects) beyond those already addressed in the BLM Vernal Field Office Record of Decision and Approved Resource Management Plan (VFO RMP) (BLM 2008).

1.1 Background

On July 15, 2015, the Applicant submitted an application for permit to drill (APD) for a proposed exploratory oil well in an existing lease area (Lease No. UTU-81185). This existing lease area is associated with the Federal Pipeline Unit Agreement designated number UTU90529X, which was approved by the BLM on September 17, 2015. The unitization (unit) agreement provides for the drilling of an obligation well[1] to a depth of 2,500 feet or a depth sufficient to test 800 feet below the base of the Phosphoria Formation, whichever is less. The proposed obligation well is referred to as the Federal Pipeline 4-21-4-23 well (well 4-21) and is in Uintah County, approximately 16.3 miles east of Vernal, Utah (Figure 1-1). The Applicant also submitted an APD for an additional well in the same lease area. This additional well is referred to as the Federal Pipeline 5-21-4-23 well (contingency well[2] 5-21) and is also located in Uintah County (see Figure 1-1). The Applicant also submitted a right-of-way (ROW) request for improvements to the existing Bean Draw Road to access the proposed wells. The improvements would generally include fixing ruts and bringing the 3.6 miles of road back into its original alignment, with a running surface of no greater than 18 feet and a ROW width of 30 feet to account for temporary work areas. The first approximately 0.2-mile (approximately 1,056-foot) portion of the proposed access road heading northeast from Bean Draw Road would be off-lease and would also require a 0.2-mile and 30-foot-wide ROW from the BLM. The rest of the access road would be on-lease.

[1] An obligation well must be drilled within 6 months of the creation of a unit agreement.
[2] A contingency well is a well that is drilled if the obligation well does not produce in paying quantities.

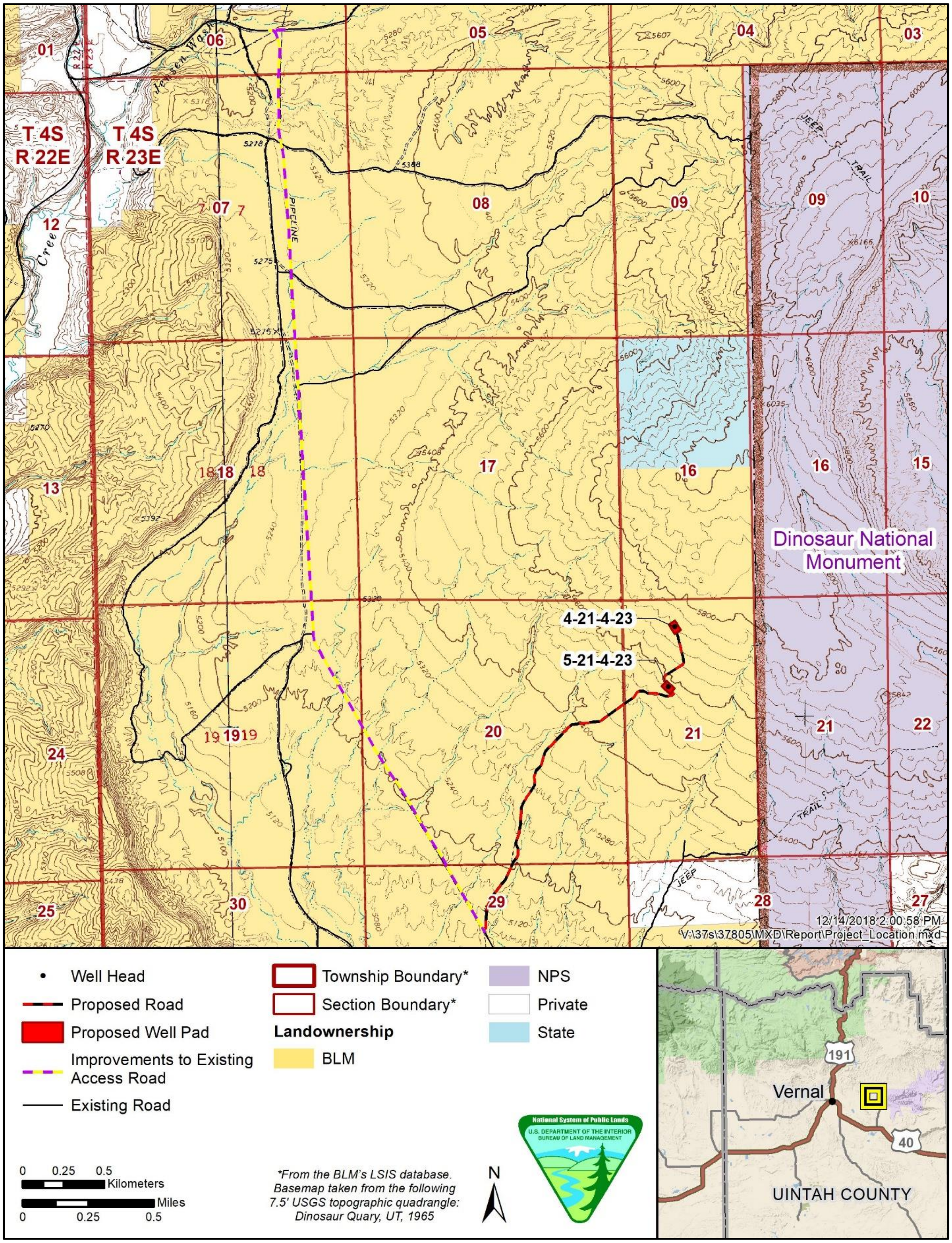

Figure 1-1. General project location.

The Applicant requested a suspension of operations and production for Lease No. UTU-81185 on July 29, 2015, because the NEPA process and the nature of the lease made timely approvals of the APDs unlikely. The Applicant submitted another letter to the BLM on September 21, 2015, again requesting a suspension of operations and production for Lease No. UTU-81185 based on an unavoidable delay for processing and approving the obligation well pursuant to Section 25 of the Unit Agreement. Subsequently, by letter dated October 8, 2015, the BLM approved (effective July 1, 2015) the Applicant's request for the suspension of operations and production for Lease No. UTU-81185 based on the anticipated processing time of the submitted APDs. The decision letter provides that the suspension will terminate the first day of the month following the date the Applicant is notified of a decision that either both APDs have been denied or that one of the APDs has been approved.

If well 4-21 is drilled, the Applicant would evaluate the core samples before deciding whether to complete the well as a producer. This evaluation process may take 60–90 days, during which time the drilling rig could be removed from the well location.

The unit agreement requires the Applicant to commence drilling operations of another well within 6 months from the completion of well 4-21 unless production in paying quantities is achieved. If evaluation of the 4-21 core samples was unfavorable, then the Applicant would begin to reclaim the well site, notify the BLM of its intent to drill contingency well 5-21, and commence such operations within 6 months of completing well 4-21. Therefore, the Proposed Action seeks BLM approval of both APDs. Save for the different resource sensitivities in each location, the general project description information applies to both wells.

Lease UTU-81185 contains a No Surface Occupancy (NSO) lease stipulation for semi-primitive, non-motorized areas for the protection of visual and primitive recreation qualities. This stipulation came from the Diamond Mountain RMP, which was the RMP in place at the time the lease was issued (BLM 1994). On July 15, 2015, the Applicant requested a waiver of the NSO stipulation because the Vernal RMP does not manage the area as a semi-primitive non-motorized recreation area. Therefore, this EA also documents the BLM's consideration of this request.

1.2 Purpose and Need for the Proposed Action

The purpose for the Proposed Action is to respond to the Applicant's proposal to develop its existing federal lease (Lease No. UTU-81185) and validate its proposed unit (Unit No. UTU-90529X) by drilling the proposed unit obligation wells, and if successful, to produce commercial quantities of oil from its federal lease. Additional lease and unit information are attached in Appendix K.

The need for the Proposed Action is established by the BLM's responsibility under the Mineral Leasing Act (MLA) of 1920, 30 United States Code 181 et seq. The MLA recognizes the statutory right of leaseholders to develop federal mineral resources to meet continuing national needs and economic demands, subject to lease stipulations and reasonable measures that the BLM may require to minimize adverse impacts. Additionally, the Federal Land Policy and Management Act of 1976 (Public Law 94-579, 43 United States Code 1701 et seq.) recognizes oil and gas development as one of the principal uses of public lands.

1.3 Decisions to be Made

The BLM must decide

- whether to approve the APDs and associated facilities and activities as proposed on federal lands,
- whether to grant the ROWs across federal lands required for off-lease facilities (access road), and
- whether to grant a waiver to the NSO stipulation.

If a waiver is granted, the BLM must determine what terms and conditions would be applied to ensure that they would not result in unacceptable impacts (43 CFR 3101.1-4).

1.4 Conformance with Bureau of Land Management Land Use Plan(s)

1.4.1 Vernal Field Office Record of Decision and Approved Resource Management Plan

The Proposed Action described in Section 2.2 is in conformance with the VFO RMP, approved October 2008.

The Proposed Action is consistent with the following VFO RMP goals and objectives (BLM 2008:97):

- Meet local and national non-renewable and renewable energy and other public mineral needs.
- Support a viable long-term mineral industry related to energy development while providing reasonable and necessary protections to other resources.
- The following principles will be applied:
  - Encourage and facilitate the private industry development of public land mineral resources in a manner that satisfies national and local needs and provides for economical and environmentally sound exploration, extraction, and reclamation practices.
  - Process applications, permits, operating plans, mineral exchanges, leases, and other use authorizations for public lands in accordance with policy and guidance.

The Proposed Action is consistent with the following VFO RMP management decisions (BLM 2008:97–99):

> MIN-2: Mineral and energy resource exploration and development surface-disturbing activities will be allowed in the Vernal Planning Area (VPA) unless precluded by other program prescriptions. The stipulations identified for surface-disturbing activities in Appendix K of the VFO RMP will generally apply to these activities.
>
> MIN-8: The VFO RMP will provide for a variety of oil and gas operations and geophysical explorations. These activities will be allowed in the VPA unless precluded by other program prescriptions. The stipulations identified for surface-disturbing activities in Appendix K of the VFO RMP will generally apply to these activities.

The energy resource exploration and development described under the Proposed Action is not precluded by any other program prescriptions.

The well sites would be in areas covered by controlled surface use (CSU) stipulation in the VFO RMP. This CSU stipulation includes a light and sound restriction for areas adjacent to Dinosaur National Monument. Operators are required to

> [m]inimize noise and light pollution adjacent to Dinosaur National Monument using best available technology, such as installation of multi-cylinder pumps, hospital sound reducing mufflers, and placement of exhaust systems to direct noise away from the monument. Additionally, there is a requirement to reduce light pollution by using methods such as limiting height of light poles, timing of lighting operations (meaning limiting lighting to times of darkness associated with drilling and work over or maintenance operations), limiting wattage intensity, and constructing light shields. However, this requirement is not applicable if it affects human health or safety. Movement of operations to mitigate sound and light impacts will be required to be at least 200 m [meters] from the Monument boundary for [Visual Resource Management] VRM Classes II, III and IV. (BLM 2008: Appendix K)

The Proposed Action would conform to the VFO RMP because operations would be over 200 m from the boundary of Dinosaur National Monument.

The well sites would be in areas identified as VRM Class II in the VFO RMP.

"Within VRM II areas, surface-disturbing activities will retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen but should not attract attention of the casual observer. Any change to the landscape must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape" (BLM 2008: Appendix K).

The Proposed Action would conform to the VFO RMP by implementing the mitigation measures listed in Section 4.1.5 to minimize potential visual resource impacts.

1.4.2 Greater Sage-Grouse Approved Resource Management Plan Amendment

The Utah Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) was published in September 2015 (BLM 2015; BLM 2008). Under the ARMPA, projects that impact a greater sage-grouse priority habitat management area (PHMA) must comply with ARMPA requirements. A PHMA includes BLM-administered lands identified as having the highest value to maintaining sustainable greater sage-grouse populations. The VFO RMP applies specific protections to a PHMA, including a net conservation gain requirement, a disturbance cap, predation requirements, noise restrictions, tall structure restrictions, seasonal restrictions, a lek buffer, and various required design features. A portion of the project area falls within an area mapped as a PHMA.

1.5 Relationship to Statutes, Regulations, or Other Plans

The APDs and ROW application were submitted and will be processed and evaluated under BLM statutory mandates and authority governing federal oil and gas leasing and other federal authorities listed as follows:

- MLA of 1920
- Multiple-Use Sustained Yield Act of 1960
- NEPA of 1969
- Federal Land Policy and Management Act of 1976
- Energy Policy Act of 2005

The Proposed Action is consistent with the following policies found in the Uintah County General Plan (Uintah County 2012):

- **3n.4**: Encourage and support public land uses consistent with responsible development and efficient use of renewable and non-renewable resources.
- **4i.1**: Continue the County’s progressive, proactive approach to economic growth and development through natural resource exploration and development.
- **4i.9**: Encourage responsible natural resource use and development.

The future land use map in Uintah County’s Land Use Plan identifies the land in the project area as being used for mining and grazing (Uintah County 2011).

The Proposed Action would include development of non-renewable natural resources, which is mandated by federal law and is consistent with Uintah County’s approach to economic growth and development.

1.6 Identification of Issues

Chapter 5 summarizes the issue identification process. The ID Team Checklist (Appendix A) provides the rationale for issues that were considered but not analyzed further.

1.6.1 Cultural: Archaeological Resources

How would the proposed APD approval, ROW approval, and drilling operations affect archaeological resources in the analysis area, including the potential for new discoveries during construction activities?

1.6.2 Lands with Wilderness Characteristics

How would the proposed APD approval, ROW approval, and drilling operations affect Lands with Wilderness Characteristics (LWC) in the Split Mountain Benches LWC inventory unit?

1.6.3 Paleontological Resources

How would the proposed APD approval, ROW approval, and drilling operations affect paleontological resources in the analysis area, including potential fossil interactions along the proposed access route and the potential for new discoveries during construction activities?

1.6.4 Soil Resources

How would the proposed APD approval, ROW approval, and drilling operations affect soil resources in the analysis area, including direct surface disturbance and potential impacts to cryptobiotic soils?

1.6.5 Vegetation

How would the proposed APD approval, ROW approval, and drilling operations affect vegetation in the analysis area, including the potential spread of invasive plants and noxious weeds, such as saltlover (*Halogeton glomeratus*), bull thistle (*Cirsium vulgare*), lesser burdock (*Arctium minus*), tall whitetop (*Lepidium latifolium*), and saltcedar (*Tamarix ramosissima*)?

1.6.6 Visual Resources

How would the proposed APD approval, ROW approval, and drilling operations affect visual resources in the analysis area, including potential impacts at key observation points (KOPs)? Would the proposed APD exceed VRM Class II management objectives?

1.6.7 Wildlife

How would the proposed APD approval, ROW approval, and drilling operations affect fish and wildlife in the analysis area, including potential impacts on migratory birds, raptors, and special status species? This includes potential impacts to greater sage-grouse and potential prairie dog habitat.

1.6.8 Air Resources

How would emissions from earth-moving equipment, vehicle traffic, drilling and completion activities, production operations, daily tailpipe and fugitive dust emissions, and other sources affect air quality and contribute to greenhouse gas (GHG) emissions?

2 DESCRIPTION OF ALTERNATIVES

This chapter describes the alternatives considered by the BLM during preparation of this EA. The Proposed Action (Alternative A) and a No Action Alternative are analyzed in detail. Implementation of design features and/or mitigation associated with the Proposed Action addressed identified resource impacts or conflicts. No other action alternative was identified that would provide a more comprehensive benefit over the Proposed Action in terms of reducing impacts or resource conflicts.

2.1 Introduction

The alternatives considered by the BLM include Alternative A (the Proposed Action) and Alternative B (the No Action Alternative).

2.2 Alternative A – Proposed Action

The Applicant proposes to drill an exploratory oil well (4-21) and contingency well (5-21) in an existing lease area. Access to the well sites would include grading an existing two-track road (1.6 miles) and improvements to 3.6 miles of the existing Bean Draw Road. The proposed exploratory drilling location is in Uintah County, 16.3 miles east of Vernal, Utah. The legal description of the project area is as follows:

The proposed well sites and improvements to the existing two-track road would occur in

Salt Lake Meridian, Utah
Township (T) 4 South (S), Range (R) 23 East (E),
Section 21, Southwest (SW) 1/4 of Northwest (NW) 1/4

The proposed improvements to Bean Draw Road would occur in

Salt Lake Meridian, Utah
T4S, R23E,
Sections 6, 7, 18, 20, 21, and 29

The existing lease (UTU-81185) is approximately 1,598 acres in size, and the proposed drilling depth is 3,000 feet. If well 4-21 does not produce in paying quantities, the Applicant would commence drilling operations of contingency well 5-21 within 6 months from the completion of well 4-21.

The Applicant would drill the well(s) in accordance with the BLM requirements outlined in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, also known as The Gold Book (BLM and USFS 2007) and in BLM Information Bulletin No. 2008-002 (BLM 2007). The BLM would grant a waiver to the NSO stipulation to allow for the proposed well drilling and operations, which would apply to the entire lease area.

The Applicant has visited the well sites with BLM resource specialists on several occasions to review the pad locations, access roads, site topography, cut and fill locations, natural drainage patterns, flora, fauna, habitat, historical and cultural resources, paleontological resources, and other surface issues. The Proposed Action has been developed through consideration of information collected during these visits as well as information provided by specialists in the BLM VFO and in technical reports prepared by professional engineers and resource specialists. As a result, the Applicant has committed to minimize initial ground disturbance to the greatest extent possible and in a manner consistent with the VFO RMP (BLM 2008). Mitigation measures are described in each resource section of Chapter 4.

The Applicant would use a truck-mounted drill such that the proposed access road could be limited to a 14-foot-wide running surface during the exploration phase (except where safety pullouts and corners are needed). No culverts would be installed unless directed by the Authorized Officer. All water crossings would be low. The proposed access route would use an existing county road (Bean Draw Road) except for the last approximately 1.6 miles to the proposed well pads. This 1.6-mile segment would need a ROW from the BLM for the approximately 0.2-mile (approximately 1,056-foot) portion that would be off-lease (see Section 2.2.2). In the event that the exploration and drilling do not result in a producing well, the 1.6 miles of two-track road that would be graded would be reclaimed as near as possible to its current state.

Approximately 3.6 miles of the existing Bean Draw Road would be improved, including up to an 18-foot running surface and a 30-foot-wide temporary work area. A ROW would be needed for the approximately 272 feet of Bean Draw Road where it turns from Island Park Road (T4S, R23E, Section 6, SW1/4 SE1/4). Acres of permanent and temporary surface disturbance under the Proposed Action are listed in Table 2-1.

Table 2-1. Surface Disturbance under the Proposed Action

	Surface Disturbance (acres)
Access road 18-foot-wide	3.4
Access road 30-foot-wide temporary construction area	2.3
Pits/Backfill excess material	1.2
Topsoil stockpiles	0.3
Well pads/Toe of fill slope	2.0
Bean Draw Road improvements 18-foot running surface	0.6
Bean Draw Road improvements 30-foot-wide temporary construction area	5.4
Total	**7.5 (permanent)** **7.7 (temporary)**

The following sections describe the proposed construction activities in more detail.

2.2.1 Surveying and Staking

After receiving approval to drill the proposed well(s), the Applicant would have a professional survey conducted to stake the proposed access road and well site. All staking would conform to the requirements found in Oil and Gas Onshore Order No. 1 (43 CFR 3160). The center stake for the proposed well and two reference markers would be staked, and the proposed access road flagged along the centerline. Staking would also include two 200-foot directional reference stakes, the exterior dimensions of the drill pad, reserve pit, cuts and fills, the outer limits of the area to be disturbed, and any off-location facilities. Staking of the proposed access road would include the centerline as well as the limits of disturbance and areas where road improvements may be required. To minimize the potential for visual resource impacts, existing trees that screen the well pad(s) and road from sensitive viewer locations would be flagged and preserved in place.

2.2.2 Access Road Design and Construction

Access to the site would begin at the intersection of U.S. Route 40 and Utah State Route 44 in Vernal, Utah, proceeding north along Utah State Route 44 for approximately 0.5 mile to the intersection of the Diamond Mountain Road (County B Road 1410, also known as 500 North Street) (Figure 2-1). After traveling east then northeast for approximately 8.1 miles along Diamond Mountain Road, the proposed access route would turn onto Brush Creek Road (Class B Road 1320) and proceed east then south for approximately 1.9 miles to the intersection of Island Park Road (Class B Road 1430). At this point, the proposed access route would proceed east along Island Park Road for approximately 0.9 mile to the intersection of Bean Draw Road (Class D Road) and then turn south for approximately 3.6 miles to a takeoff point for the last segment of the proposed access route. The approximately 3.6 miles of Bean Draw Road used as an access road would require improvements within a 30-foot ROW. The last portion of the access road would head northeast from Bean Draw Road generally along the existing two-track road for approximately 1.6 miles, passing through the proposed contingency well 5-21 well site at approximately 1.4 miles, before arriving at the proposed 4-21 well site. The first approximately 0.2-mile (approximately 1,056-foot) portion of the proposed access road heading northeast from Bean Draw Road is off-lease and would require a ROW from the BLM. The last 1.3 miles of the final segment of the proposed access road would be located on the lease area. The total distance from Vernal, Utah, would be approximately 16.3 miles heading east.

The Applicant expects that the proposed access to the proposed well locations would need to deviate from the existing two-track road in some locations to minimize resource impacts. The proposed access road has been located to avoid identified archaeological sites and steep topography that would require extensive cut and fill.

The proposed access road would be approximately 8,600 feet long and would require new construction suitable to transporting the truck-mounted drilling rig, heavy equipment, and water truck. The construction area width of the proposed access road would be 30 feet, with a maximum running surface width of 18 feet. As described above, the Applicant has committed to minimize initial ground disturbance to the greatest extent possible by using a truck-mounted drill. All construction would remain within the proposed 30-foot-wide ROW. Therefore, to minimize impacts, the initial road would not conform entirely to the minimum running surface construction standards in The Gold Book. If the exploration merited additional development, future roads would be built to The Gold Book standard and therefore an 18-foot running surface, or smaller, would be constructed.

Bulldozers, graders, and other types of heavy equipment would be used to construct and maintain the road. All equipment would be power washed prior to entering the project area to ensure that they are weed free. The proposed access road would be grubbed free of vegetation and graded to eliminate ruts (but avoiding the removal of vegetation useful to screen the road and pads). Where needed, holes would be filled with native materials. Cut and fill would be used to fill holes and flatten the road surface. The proposed access road would be crowned 2 percent to help drain water. To reduce soil impacts and facilitate future reclamation should the well(s) not produce, cut would be minimized to the greatest extent possible and, where practical, fill would be used to build up adjacent topography. Existing trees that screen the well pad(s) and road from sensitive viewer locations would be flagged and preserved. The road would be built and maintained to provide year-round access. All construction materials would consist of native borrow and soil accumulated during road construction. For the most part, the surface material of the proposed access road would be native soil. Soil texture, steepness of the topography, and moisture conditions would dictate whether surfacing the proposed access road would be appropriate. If needed, the Applicant would use gravel or crushed rock per BLM specifications and only after approval by the Authorized Officer. No new culverts would be installed, and low-water crossings would be used. Drainage ditches would be installed on both sides of the proposed access road to prevent the accumulation of silt or debris. Signs would be placed at the beginning of the proposed access road stating that the road is for Authorized Use Only. Periodic monitoring would check for unauthorized uses of the proposed access road.

The approximately 3.6 miles of Bean Draw Road that would be used as an access road would require some upgrading. Upgrading would be contained within a 30-foot ROW and would include bringing the road back into its original alignment, filling ruts, blading as needed, adding minor cuts and fills as needed, adding two culverts, and other improvements as necessary to provide a well-constructed, safe roadway. The running surface would not exceed 18 feet in width. Any improvements that would occur outside the existing road disturbance are quantified in Chapter 4 impacts analyses. Upgrading would not occur during muddy conditions. The Applicant would obtain any necessary approvals from Uintah County prior to Bean Draw Road improvements.

2.2.3 Well Site Layout and Construction

Prior to construction of the well sites, all topsoil would be removed from areas to be disturbed and would be stockpiled in a designated area. The estimated dimension of the well pad(s) would be approximately 100 × 220 feet. The proposed well site layouts are depicted in Figures 2-2 and 2-3.

Construction materials for both the well sites and the proposed access road would be borrow material accumulated during construction of the well sites and proposed access road. Because of the project area's existing topography, cut and fill would be needed to create a level surface for both wells. It is expected that approximately 9,050 cubic yards of cut and 2,040 cubic yards of fill would be needed for well 4-21 and 6,460 cubic yards of cut and 3,980 cubic yards of fill would be needed for contingency well 5-21. For well 4-21, approximately 350 cubic yards would be used as backfill for the reserve pit, which would leave approximately 5,880 cubic yards of excess cut material that would be stockpiled in an area on-site that would allow it to be easily recovered for rehabilitation. The existing cut and fill material would be sufficient for construction and reclamation purposes. For the 5-21 well, approximately 350 cubic yards would be used as backfill for the reserve pit, which would leave approximately 1,370 cubic yards of excess cut material that would be stockpiled in an area on-site that would allow it to be easily recovered for rehabilitation.

An 8-foot-deep, 100-foot-long × 25-foot-wide reserve pit would be constructed in one quadrant of the pad. The reserve pit would be used to store water, drilling fluid, and drill cuttings. It would have an estimated capacity of approximately 1,380 barrels, or 57,960 U.S. gallons. It would have a minimum 2-foot freeboard and side slopes varying between 1:1 and 1.5:1. The pit would be lined with standard pit liner to prevent leakage of pit fluids. The reserve pit would be fenced on three sides during drilling operations and on the fourth side when the rig moves off-site. The fence would be constructed according to BLM requirements, which would include the following minimum standards:

- 39-inch net wire would be used with at least one strand of wire on top of the net wire. Barbed wire would not be necessary if pipe or some type of reinforcement rod is attached to the top of the entire fence.
- The net wire would be no more than 2 inches above the ground. The barbed wire would be 3 inches above the net wire. Total height of the fence would be at least 42 inches.
- Corner posts would be cemented and/or braced in such a manner to keep the fence tight at all times.
- Standard steel, wood, or pipe posts would be used between the corner braces. Maximum distance between any two posts would be no greater than 16 feet.
- All wire would be stretched using a stretching device before the wire is attached to the corner posts.

All production facilities would be contained within the proposed well sites. In addition to a work trailer and portable toilet, the well pad would also contain two mud tanks, one frac tank, and a compressor. Low-profile tanks would be used to minimize visual impacts. All tanks would be surrounded by a dike of sufficient capacity to contain the storage capacity of the largest tank. Regular inspections would be conducted to ensure that the integrity of the dike is maintained. All permanent (on-site for 6 months or longer) structures on the well site would be painted with Covert Green paint to minimize potential impacts to visual resources, unless certain colors are required to conform to Occupational Safety and Health Administration (OSHA) requirements.

Construction equipment may include bulldozers, motor graders, scrapers, and backhoes. Maintenance and upgrading of the well pad, such as for ditching, drainage, or graveling, may be necessary from time to time. Maintenance and upgrading would be avoided during muddy conditions to the extent possible. Personnel would access the site using an average of three light trucks each day during construction of the proposed access road and well pad. Construction of each well pad is estimated to take approximately 21 days and require four to six workers. Up to eight vehicles and/or pieces of heavy equipment would be used per day, with a maximum of one trip each per day.

2.2.4 Drilling and Production Process

Drilling operations would be conducted in compliance with all federal Oil and Gas Onshore Orders, all state rules and regulations, and all applicable local rules and regulations. The Applicant proposes to develop the site(s) by conducting continuous drilling and completion operations throughout the life of the Project; however, under the Proposed Action, only one well would be drilled at a time.

Following construction of the proposed access road and the well pad, a truck-mounted drilling rig would be transported to the well site and erected on the well pad. The rig would be erected at the drill site after the mouse and rat holes (holes used to store drilling equipment) have been dug and the conductor pipe has been set. Both the mouse hole and rat hole would be excavated using standard excavation and soil stockpiling techniques. Drilling operations would consist of drilling a surface hole, running, and cementing the surface casing, drilling a production hole, and running and cementing the production casing. The rig would then be dismantled and demobilized from the location.

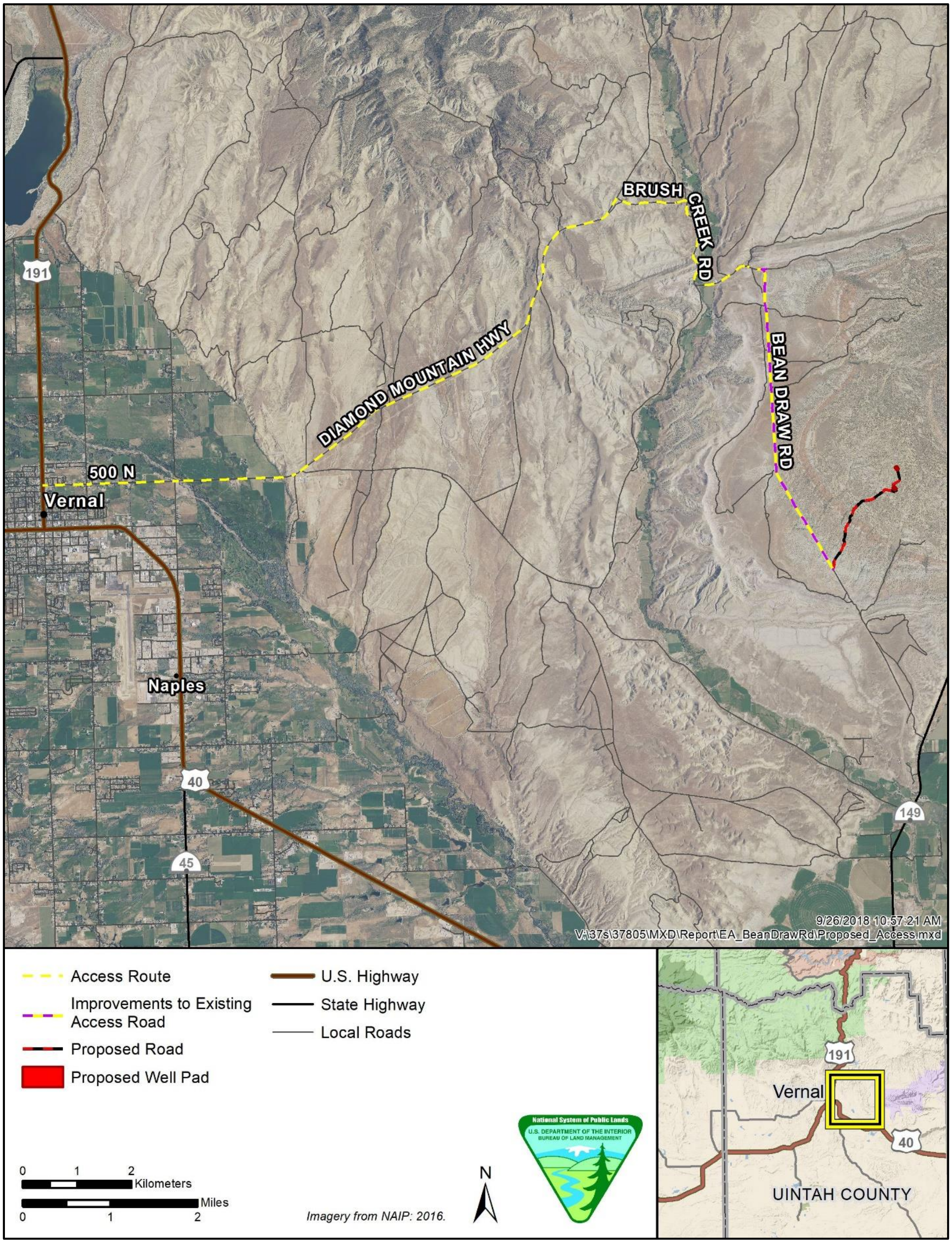

Figure 2-1. Proposed access to well sites.

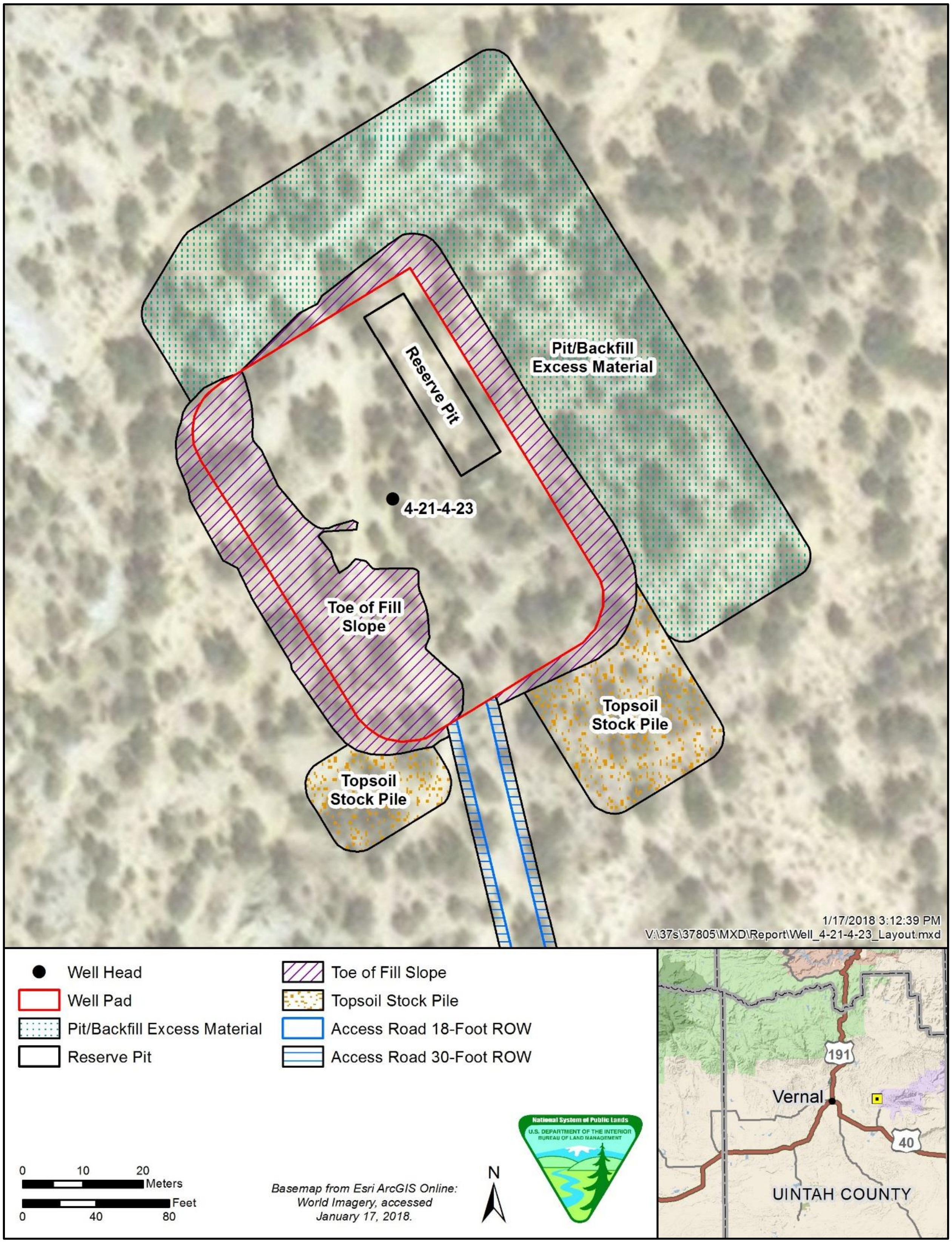

Figure 2-2. Well site layout for well 4-21.

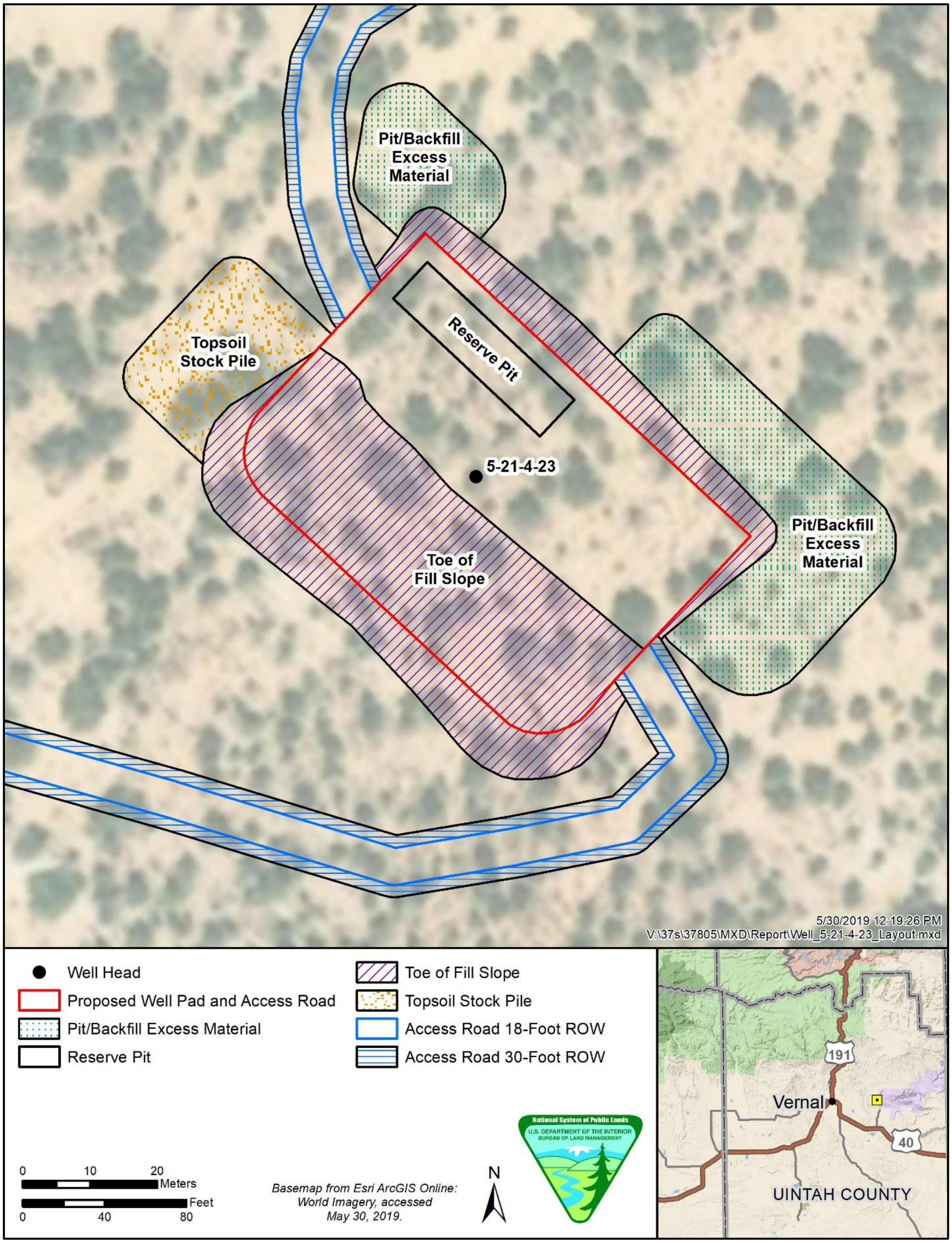

Figure 2-3. Well site layout for contingency well 5-21.

The types of casing used and the depths to which they are set would depend on the physical characteristics of the formations drilled and the pressure requirements anticipated during completion and production operations. All casing would be new or inspected by licensed inspectors before it is sold to the Applicant.

Drilling fluids would consist of an approved commercial mud system with water being the main constituent. All prudent environmental and safety precautions would be adhered to when using drilling fluids. To achieve borehole stability and minimize possible damage to the producing formations, certain formation stabilizing, and hole cleaning materials may be added to the drilling fluid. No hazardous substances would be placed in the reserve pit.

Water for the proposed drilling and cementing would come from a municipal source at Buggsy’s Water Service, Inc. in Vernal, Utah. Approximately 1,440 barrels of water per working day would be used, and approximately 30,240 barrels would be needed to complete the drilling process. Produced water and water used in operations would be recycled for reuse in drilling, completion, work over, and well abandonment where feasible. Approximately 45,360 gallons (0.14-acre foot) of water per working day would be used, and approximately 952,560 gallons (2.9-acre feet) would be needed to complete the drilling process.

During drilling operations, a blow-out preventer would be installed on the surface casing to provide protection against uncontrolled entry of reservoir fluids into the well bore should reservoir pressures exceed the hydrostatic pressure of the well bore fluid. In addition, a flow-control manifold consisting of manually and hydraulically operated valves would be installed below the rig floor.

Prior to setting the casing, open-hole electric logs would be run to evaluate production potential. Cores would be taken during the drilling process in certain intervals to evaluate production potential and determine the most effective completion techniques for the well. Evaluation of cores is a time-consuming process and could delay a decision to complete the well for up to 2 or 3 months. If completion of the well is deemed economically justified, steel production casing would be run and cemented in place in accordance with the well design and as specified in the APD and BLM conditions of approval. In some cases, evaluation logs may be run after setting and cementing the production casing.

Hydraulic fracturing may be used during the drilling operations. Hydraulic fracturing produces fractures in the rock formation that stimulate the flow of natural gas or oil, increasing the volumes that can be recovered. Fractures are created by pumping large quantities of fluids at high pressure down a wellbore and into the target rock formation. Hydraulic fracturing fluid commonly consists of water, proppant, and chemical additives that open and enlarge fractures within the rock formation. Once the injection process is completed, the internal pressure of the rock formation causes fluid to return to the surface through the wellbore. The fluid is known as “produced water” and may contain injected chemicals plus naturally occurring materials such as brines, metals, radionuclides, and hydrocarbons. The produced water is typically stored on-site in tanks or pits before treatment, disposal, or recycling.

If well 4-21 does not produce favorably, then the Applicant would notify the BLM of its intent to drill contingency well 5-21 and commence such operations within 6 months of completing well 4-21. Contingency well 5-21 would be drilled using the same techniques described for well 4-21. Save for the different resource sensitivities in each location, the general project description information applies to both wells.

2.2.5 Waste Handling and Disposal

A semi-closed system would be used to drill the well(s). All fresh water for drilling would come from a frac tank placed on location and from the rig tank. A reserve pit would be used to store water for drilling and hold nonflammable materials such as cuttings, salt, drilling fluids, chemicals, produced water, and other fluids.

Produced water would be confined to the reserve pit or, if deemed necessary, a storage tank for a period not to exceed 90 days after initial production. During the 90-day period, the Applicant would submit an application for approval for permanent disposal methods and location to the Authorized Officer. The proper disposal method and location cannot be determined until the well is complete and the exact contents of the reserve pit are known. On-site evaporation may be used instead of trucking to facilitate closing and reclamation of the reserve pit. A pumping system would be used for evaporation.

A variety of chemicals, including lubricants, corrosion and scale inhibitors, surfactants, solvents, herbicides, paint, and additives, would be used to drill, complete, and produce the well(s). Potentially hazardous substances would be kept in limited quantities on the well site. The transport, use, storage, and handling of hazardous materials would follow the procedures specified by OSHA and by the U.S. Department of Transportation (USDOT) under 49 CFR 171–180. The USDOT regulations pertain to packing, container handling, labeling, vehicle placards, and other safety aspects.

None of the chemicals that would be used meet the criteria for being an acutely hazardous material/substance. On an annual basis, chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act in quantities of 10,000 pounds or more would not be used, produced, stored, transported, or disposed of during the drilling, completion, or operation of the well. In addition, no extremely hazardous substance, as defined in 40 CFR 355, in threshold planning quantities, would be used, produced, stored, transported, or disposed of while producing any well.

Most byproducts that would be generated on-site are exempt from regulation by the Resource Conservation and Recovery Act (40 CFR 239–282) under the oil and gas exploration and production exemption. Exempt wastes include produced water, drilling fluids and solids, well completion/workover fluids, and soils affected by these exempt wastes. Spills and releases can result in soil contamination by produced water, petroleum products, or chemicals. The Applicant would develop and maintain spill prevention control and countermeasures plans for the well(s), which would include a site-specific plan tailored for the well site and its setting.

A trash cage fabricated from expanded metal would be used to hold trash on location and would be removed to an authorized landfill location. A portable chemical toilet would be supplied for human waste. After the rig is moved off-site, the site would be cleaned of all refuse.

2.2.6 Reclamation

2.2.6.1 Reclamation Preparation

Prior to construction at either proposed well site, the top 6 inches of soil material would be stripped off the location and the pit area, as described in Section 2.2.3. The removed and stockpiled topsoil would be approximately 760 cubic yards of material (per well). The topsoil would be stockpiled in distinct piles (at the well site). The topsoil stockpiles would be seeded with a seed mix approved by the Authorized Officer as soon as the soil is stockpiled.

2.2.6.2 Interim Reclamation

Once a well pad goes into production, areas unnecessary to operation would be reshaped to maximize blending with the natural topography. When all drilling and completion activities have been completed and the pit has been backfilled, the topsoil from the pit area would be spread on the pit area. The pit area would be seeded after the soil has been spread. The seeding and recontouring would be completed using a seed mix and techniques approved by the Authorized Officer.

Modifications to the drainage may occur during construction activities, and the drainage would be restored to its original line of flow or as near as possible to the original line of flow when the pit is backfilled. The pit fences would be removed prior to backfilling the pit. The reserve pit would be reclaimed within 90 days of well completion. If the reserve pit has not dried sufficiently to allow backfilling, an extension on the time requirement for backfilling would be requested. Once reclamation activities have begun, they would be completed within 30 days. After the reserve pit has been reclaimed, no depressions in the soil covering the pit would be allowed. The objective is to keep seasonal rainfall and runoff from seeping into the soil used to cover the reserve pit. Diversion ditches and water bars would be used to divert the runoff as needed.

The pit would also be flagged to discourage use by migratory birds.

2.2.6.3 Final Reclamation

If the well is abandoned or becomes a dry hole, reclamation would be final. All equipment, facilities, and trash would be removed from the location. Each borehole would be plugged and capped, and its related surface equipment would be removed. After the well is plugged and abandoned, the site would be reclaimed as soon as possible. Earthwork and seeding would be completed within 1 year from the date of plugging and abandonment, unless otherwise approved by the Authorized Officer. Dry hole markers would be subsurface to prevent raptor predation upon small game, including Greater sage-grouse.

A detailed reclamation plan will provide more specific information regarding final reclamation, but final reclamation will generally include the following activities.

- **Recontouring:** Compacted areas would be recontoured to maximize blending with the natural topography. Following contouring, the contractor would cover the backfilled or ripped surfaced evenly with salvaged topsoil.
- **Seeding:** All disturbed areas would be seeded with a seed mix approved by the Authorized Officer and certified to be weed free. Perennial vegetation would be established, and additional work would be performed in areas of establishment failure. Seeding would be considered successful when the site is protected from erosion and revegetated with a self-sustaining, vigorous, diverse, native (or otherwise approved) plant community that minimizes habitat loss, visual impacts, and forage.
- **Weed Control:** The Applicant would regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Surface Operating Standards and Guidelines for Oil and Gas Development (The Gold Book) (BLM and USFS 2007). A pesticide use proposal would be submitted and approved before herbicides are used.
- **Erosion Control:** Cut and fill slopes would be protected against erosion with the use of pitting or pocking, water bars, lateral furrows, or other measures approved by the Authorized Officer. Hay bale, wattles of weed-free straw, or silt fences would be employed along drainages to protect them from soil erosion.
- **Monitoring:** Reclaimed areas would be monitored annually. An annual report would document whether attainment of reclamation objectives appears likely. If one or more objectives appear unlikely to be achieved, the report would identify appropriate corrective actions. Upon review and approval of the report by the BLM, the Applicant would be responsible for implementing the corrective actions or other measures specified by the Authorized Officer.
- **Notifications:** The Applicant would notify the BLM VFO at least 48 hours before beginning any reclamation work and within 48 hours of completing reclamation work. Within 30 days of seeding, a sundry notice of subsequent report describing the completed work would be submitted to the field manager, including weed-free certification and seed tags. Requests for relinquishment of granted BLM ROWs would be submitted in writing to the BLM VFO.

2.2.7 Applicant Committed Measures

- A truck-mounted drill would be used such that the proposed access road could be limited to a 14-foot-wide running surface during the exploration phase (except where safety pullouts and corners are needed).
- To minimize the potential for visual resource impacts, existing trees that screen the well pad(s) and road from sensitive viewer locations would be flagged and preserved in place.
- Permanent structures would be painted Covert Green.
- Signs would be placed at the beginning of the proposed access road stating that the road is for Authorized Use Only. Periodic monitoring would check for unauthorized uses of the proposed access road.
- Low-profile tanks would be used to minimize visual impacts.

- Spill prevention control and countermeasures plans would be developed and maintained for the well(s), which would include a site-specific plan tailored for the well site and its setting
- An archaeologist will be on-site during construction as deemed necessary by the Authorized Officer.
- During production, lighting will be absent at night to minimize nightscape impacts unless deemed necessary for safety.
- Initial ground disturbance would be minimized to the greatest extent possible and in a manner consistent with the VFO RMP (BLM 2008).
- A licensed paleontologist would be on-site continuously during construction in the Potential Fossil Yield Classification (PFYC) Class 5 area in Section 29, T4S, R3E, NENW.
- During the life of the Project and until the site is released from liability for reclamation, well pads and access roads would be inspected for noxious weeds. If found, the authorized state or federal agent would be notified, and the weeds would be treated following a program approved by the BLM to eliminate further spreading. Treatment would continue until the weeds have been eradicated.
- All equipment used for construction and drilling would be power washed before it arrives to the project area to remove any invasive, nonnative weed seeds.
- Reclamation will follow the Green River District Reclamation Guidelines (BLM N.d.).

2.3 Alternative B – No Action

Under Alternative B, the BLM would not approve the APDs, ROW, or lease waiver, and the proposed wells and access road would not be developed at this time.

3 AFFECTED ENVIRONMENT

This chapter presents the potentially affected existing environment (i.e., the physical, biological, social, and economic values and resources) of the impact area, as identified in the Interdisciplinary Team Checklist found in Appendix A and presented in Chapter 1 of this EA. This chapter provides the baseline for the comparison of impacts described in Chapter 4.

3.1 General Setting

The project area is in an area of dissected tablelands at the base of Split Mountain in the eastern Uinta Basin. The elevation of the project area ranges between 5,080 and 5,740 feet above sea level. Climate data collected at nearby Dinosaur National Monument show an average annual maximum temperature of 64.2°F and an average annual minimum temperature of 31.8°F (Western Regional Climate Center [WRCC] 2016). Average total annual precipitation is 8.47 inches, with an average total annual snowfall of 20.2 inches (WRCC 2016).

3.2 Resources/Issues Brought Forward for Analysis

3.2.1 Cultural: Archaeological Resources

The analysis area for archaeological resources is the project area and includes well pads for both Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23 and associated access roads.

3.2.1.1 Archaeological Sites Identified in the Project Area

Section 106 of the National Historic Preservation Act (NHPA) requires that agencies consider the effects of their actions on historic properties. Historic properties are defined as those localities that are included in or eligible for the National Register of Historic Places (NRHP). To identify possible affected historic properties, an intensive-level (Class III) archaeological survey was conducted on both well pads and a 30-m-wide corridor for the proposed access road. The archaeological survey of well 4-21-4-23 consisted of an area measuring 201 × 201 m (10 acres) and the archaeological survey of well 5-21-4-23 consisted of an area measuring 201 × 240 m (11.97 acres). During the survey, alternate access routes were examined to provide an access corridor that fully avoided identified archaeological sites (Polk and Polk 2017).

Another intensive-level archaeological survey of a 30-m-wide corridor was conducted in 2018 for the proposed improvements to Bean Draw Road. The survey of Bean Draw Road resulted in the identification of seven previously recorded sites; no new sites were identified. Six of the identified sites are prehistoric, while the remaining site is historic. The prehistoric sites are artifact scatters with features and the historic site is an artifact scatter. All these sites have been impacted by extensive disturbances associated with various pipeline projects, and in most cases, each site’s spatial integrity has been compromised. For six of the seven previously recorded sites, it has been recommended that the portions of the sites within the 30-m-wide survey corridor do not contribute to the sites’ NRHP eligibility because these portions either no longer exist or have been heavily disturbed. The remaining previously recorded site has been determined to be not eligible for the NRHP. The results of this survey are reported in SWCA (2018).

Prior to surveys, Utah Division of State History records were examined for the presence of previously documented archaeological sites found within 1 mile of the project area as documented in Polk and Polk (2017). General Land Office (GLO) plat maps were also examined to determine whether any potentially historic features had been mapped within the project area. One previously documented archaeological site (42UN1878) was found within the project area. No potentially historic GLO features were found to intersect the project area.

The archaeological surveys identified eleven archaeological sites within or immediately adjacent to the project area with potential to be affected by the proposed action. These archaeological sites are summarized in Table 3-1.

Table 3-1. Archaeological Sites Identified in the Project Area

Site Number	NRHP Eligibility	Description
42UN1878	Eligible	Prehistoric campsite
42UN8483	Eligible	Prehistoric campsite
42UN8484	Eligible	Prehistoric campsite
42UN8485	Eligible	Prehistoric campsite
42UN8486	Eligible	Prehistoric campsite
42UN8487	Eligible	Prehistoric campsite
42UN8618	Not eligible	Prehistoric lithic scatter
42UN8619	Eligible	Prehistoric campsite
42UN8620	Eligible	Prehistoric campsite
42UN8704	Not eligible	Prehistoric lithic scatter
42UN8705	Not eligible	Prehistoric lithic scatter

Following the archaeological survey, the proposed access road was rerouted to avoid all sites eligible for the NRHP. Accordingly, a determination of no adverse effect for the proposed undertaking was made as provided under the NRHP implementing regulations (36 CFR 800.5(1)(b)). The Utah State Historic Preservation Officer (SHPO) concurred with this determination of no adverse effect on April 21, 2017.

3.2.2 Lands with Wilderness Characteristics

The analysis area for LWC is the Split Mountain Benches LWC inventory unit (approximately 2,164 acres), because the project area overlaps this LWC inventory unit (Figure 3-1).

The BLM completed an LWC inventory of the Split Mountain Benches unit in March 2018 and determined that although the Split Mountain Benches unit is less than 5,000 acres, it meets the 5,000-acre size criterion because it is adjacent to Dinosaur National Monument (201,672 acres). The Split Mountain Benches unit is also contiguous with the Stone Bridge Draw LWC inventory unit, which is 2,638 acres.

The Split Mountain Benches unit is approximately 1 mile wide and 3 miles long. Dinosaur National Monument, State of Utah lands, and private lands form the eastern boundary. To the north, west, and south, the Split Mountain Benches unit is bounded by Bean Draw Road, existing two-track roads, and a buried pipeline corridor. The lower slopes of Split Mountain comprise most of the area. The slopes dip westward at more than 5 degrees. Intervening drainages occur approximately every quarter mile. Near the northwestern boundary, the area is relatively flat. Vegetation consists of dense, 10-foot-tall juniper woodlands (*Juniperus* spp.) on the upper slopes. The lower slopes and flats are occupied by Wyoming big sagebrush (*Artemisia tridentata* Nutt. ssp. *wyomingensis*), rubber rabbitbrush (*Ericameria nauseosa*), and perennials such as Indian ricegrass (*Achnatherum hymenoides*) and needle and thread (*Hesperostipa comata*), and annual grasses such as cheatgrass (*Bromus tectorum*).

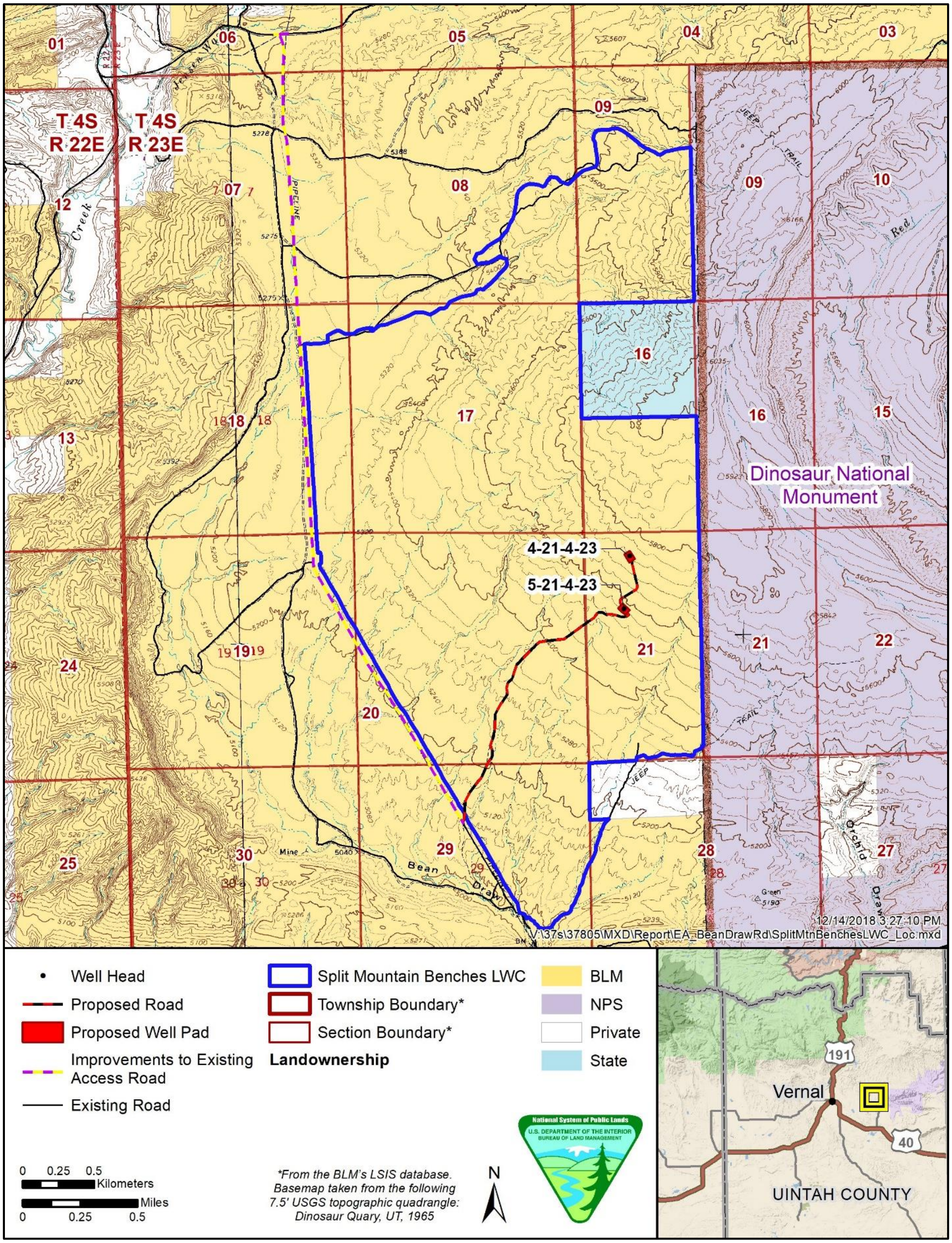

Figure 3-1. Split Mountain Benches Lands with Wilderness Characteristics inventory unit.

Approximately 1,969 acres of the Split Mountain Benches unit has been leased for oil and gas exploration and production (BLM 2018). This represents approximately 91% of the area. No producing or plugged and abandoned wells are present in the area.

Wilderness characteristics, as defined in the Wilderness Act (16 United States Code 1131–1136), consist of size, naturalness, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and supplemental values. As discussed above, because the Split Mountain Benches unit is adjacent to Dinosaur National Monument, the BLM has determined that it meets the size criterion. The other criteria are discussed below.

3.2.2.1 Naturalness

The only access road to the Split Mountain Benches unit is via Bean Draw Road, which is located along an underground gas pipeline corridor that runs north to south along the length of the western boundary of the unit. Most of the unit's human use consists of livestock grazing and pipeline corridor maintenance along Bean Draw Road. Other uses include recreation, specifically access to hunting areas via non-wilderness roads that originate from Bean Draw Road and typically head into the interior of the unit toward Dinosaur National Monument. The more remote areas of the unit are used for hunting, shed antler gathering, hiking, and all-terrain vehicles. There are minimal signs of dispersed camping in the unit (BLM 2018).

3.2.2.2 Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation

The Split Mountain Benches unit is contiguous with recommended wilderness in Dinosaur National Monument, with no defined separating feature, and the unit is considered to have the same opportunities for solitude identified in the larger, contiguous area containing wilderness characteristics. Because of the topography, vegetation, relative remoteness, low frequency of visitation, and proximity to Dinosaur National Monument, it is relatively easy for recreationists to experience outstanding opportunities for solitude in the Split Mountain Benches unit (BLM 2018). Remote hiking, backpacking, horseback riding, climbing, or backcountry hiking represent some of the recreation opportunities currently found within the unit and contiguous lands identified as recommended wilderness by the National Park Service (BLM 2018).

3.2.2.3 Supplemental Values

The Split Mountain Benches unit has paleontological, geological, and historical supplementary values that are monitored and regulated by the BLM.

3.2.3 Paleontological Resources

The analysis area for paleontological resources is the project area because any potential impacts to paleontological resources would occur within the project footprint.

The BLM PFYC System for Paleontological Resources on Public Lands provides baseline guidance for predicting, assessing, and mitigating paleontological resources. The PFYC classes, as defined in the BLM Instruction Memorandum 2016-124 (BLM 2016a), are described as follows:

> **Class 2 – Low.** Geologic units that are not likely to contain paleontological resources. Except where paleontological resources are known or found to exist, management concerns for paleontological resources are generally low and further assessment is usually unnecessary except in occasional or isolated circumstances.
>
> **Class 3 – Moderate.** Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Management concerns for paleontological resources are moderate because the existence of significant paleontological resources is known to be low. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for casual collecting.
>
> **Class 5 – Very High.** Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources. Management concerns for paleontological resources in Class 5 areas are high to very high.

There are 7.9 acres of PFYC Class 2, 4.1 acres of Class 3, and 1.4 acre of Class 5 in the project area.

A paleontological survey of the project area was completed in 2015 (Sandau 2015). A single unidentifiable bone fragment was found in a hillside ephemeral wash near the proposed site for well 4-21. A large number of fossils was found near the proposed site for well 5-21, including belemnites (*Pachyteuthis densus*), ammonites (*Goliathoceras* and *Cardioceras*), bivalve fossils, and gastropods as well as invertebrate burrows. Two scatters of probable vertebrate bone fragments and one isolated bone fragment were found on the surface. Also found were fish scales in a fragment of gray siltstone and bivalve steinkerns in a fragment of light gray limestone. No significant vertebrate fossils were found; however, when vertebrate fossils are found within the formations in the project area, they are of high scientific importance due to their rarity. A previously discovered vertebrate (Ichthyosaur) fossil locality exists in the Stump Formation west of the proposed access road.

3.2.4 Soil Resources

The analysis area for soil resources is the Lower Brush Creek Hydrologic Unit Code (HUC) 12 watershed (16,881 acres), because it encompasses the project area and provides distinct topographical boundaries against which to measure impacts to related soil types.

Soils in the VFO planning area have developed from bedrock, minerals deposited by rivers and glacial activity, and windblown silt and sand (BLM 2008). The acres of soil types in the analysis area are listed in Table 3-2. There are also occurrences of cryptobiotic soils or biological soil crusts in the analysis area; however, the locations of these soils are not mapped. Cryptobiotic soils are formed by living organisms, a consortium of lichens, mosses, green algae, microfungi, cyanobacteria, and other bacteria that create a crust of soil particles held together by organic materials (U.S. Geological Survey [USGS] Canyonlands Research Station 2006). Biological soil crusts increase soil stability, water infiltration and redistribution, nutrient cycling, and soil fertility, and are highly susceptible to disturbance. (USGS Canyonlands Research Station 2006). Locations of soil types in the analysis area are shown in Figure 3-2.

The most prevalent soil types in the analysis area are as follows:

- Arches-Mespun-Rock outcrop complex, 4 to 40 percent slopes (moderate potential for erosion, 14.8% of the analysis area, found in the project area).
- Hanksville silty clay loam, 25 to 50 percent slopes (moderate to high potential for erosion, 10.0% of the analysis area).
- Cadrina extremely stony loam-Rock outcrop complex, 25 to 50 percent slopes (low potential for erosion, 8.6% of the analysis area).
- Greybull-Utaline-Badland complex, 8 to 50 percent slopes (low potential for erosion, 7.5% of analysis area); and
- Polychrome-Milok complex, 8 to 50 percent slopes (moderate to high potential for erosion, 3.5% of the analysis area, found in the project area).

A more detailed description of these soil types and a list of all soil types in the analysis area is included in Appendix B.

3.2.5 Vegetation

The analysis area for vegetation is the Lower Brush Creek HUC 12 watershed (16,881 acres), because it encompasses the project area and provides distinct topographical boundaries against which to measure impacts to related vegetation types.

Vegetation in the VFO planning area ranges from desert shrub to boreal forest, including vegetation types such as grassland/herbaceous, desert shrub, sagebrush/perennial grass, pinyon-juniper, mountain shrub, and conifer, which includes aspen/forb. The acres of specific land cover types in the vegetation analysis area are listed in Table 3-2. The locations of land cover types in the vegetation analysis area are shown in Figure 3-3. More detailed descriptions of the land cover types in the analysis area and project area are provided in Appendix B.

Invasive species and noxious weeds are a management concern in the VFO planning area. Of particular management concern are the potential and existing populations of invasive species in the oil and gas fields where increased activity is occurring (BLM 2008). Noxious weeds are identified and recognized by the federal government, the state, and local counties. Within the VFO planning area, the BLM controls weeds designated as noxious, as per regulations.

Table 3-2. Acres of Land Cover Types in the Vegetation Analysis Area

Land Cover Types	Acres in Vegetation Analysis Area	Percent of Vegetation Analysis Area
Agriculture	761.0	4.5
Colorado Plateau Mixed Bedrock Canyon and Tableland	1,635.0	9.7
Colorado Plateau Mixed Low Sagebrush Shrubland	783.0	4.6
Colorado Plateau Pinyon-Juniper Shrubland	3,398.0	20.1
Colorado Plateau Pinyon-Juniper Woodland	118.0	0.7
Developed, Medium-High Intensity	64.0	0.4
Developed, Open Space-Low Intensity	2.0	< 0.1
Inter-Mountain Basins Big Sagebrush Shrubland	4,396.0	26.0
Inter-Mountain Basins Greasewood Flat	618.0	3.7
Inter-Mountain Basins Mat Saltbush Shrubland	1,005.0	6.0
Inter-Mountain Basins Mixed Salt Desert Scrub	2,740.0	16.2
Inter-Mountain Basins Semi-Desert Grassland	18.0	0.1
Inter-Mountain Basins Semi-Desert Shrub Steppe	603.0	3.6
Inter-Mountain Basins Shale Badland	339.0	2.0
Invasive Annual Grassland	158.0	0.9
Open Water	8.0	< 0.1
Rocky Mountain Alpine-Montane Wet Meadow	3.0	< 0.1
Rocky Mountain Cliff and Canyon	38.0	0.2
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	3.0	< 0.1
Total	16,881.0	100

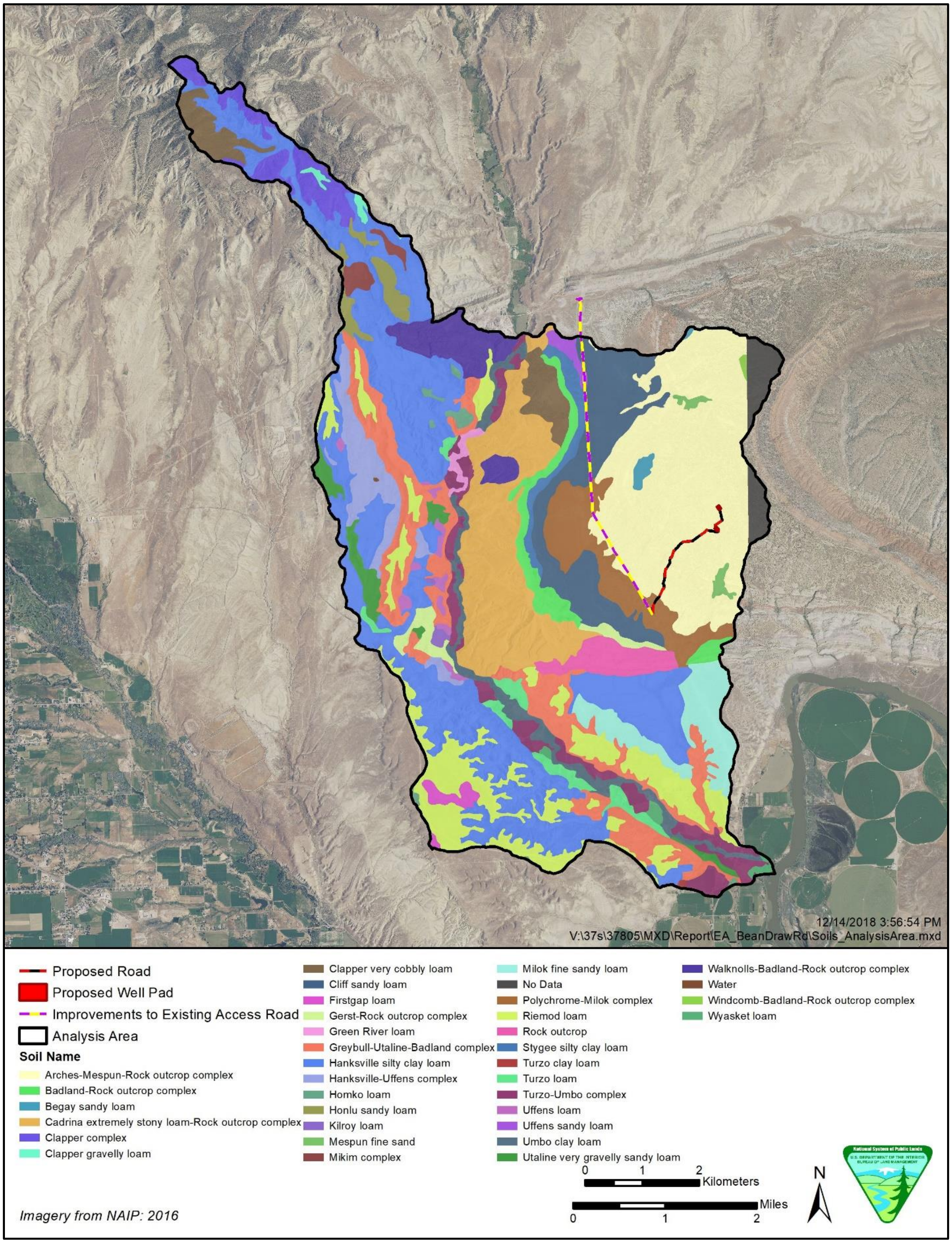

Figure 3-2. Locations of soil types in the soil analysis area.

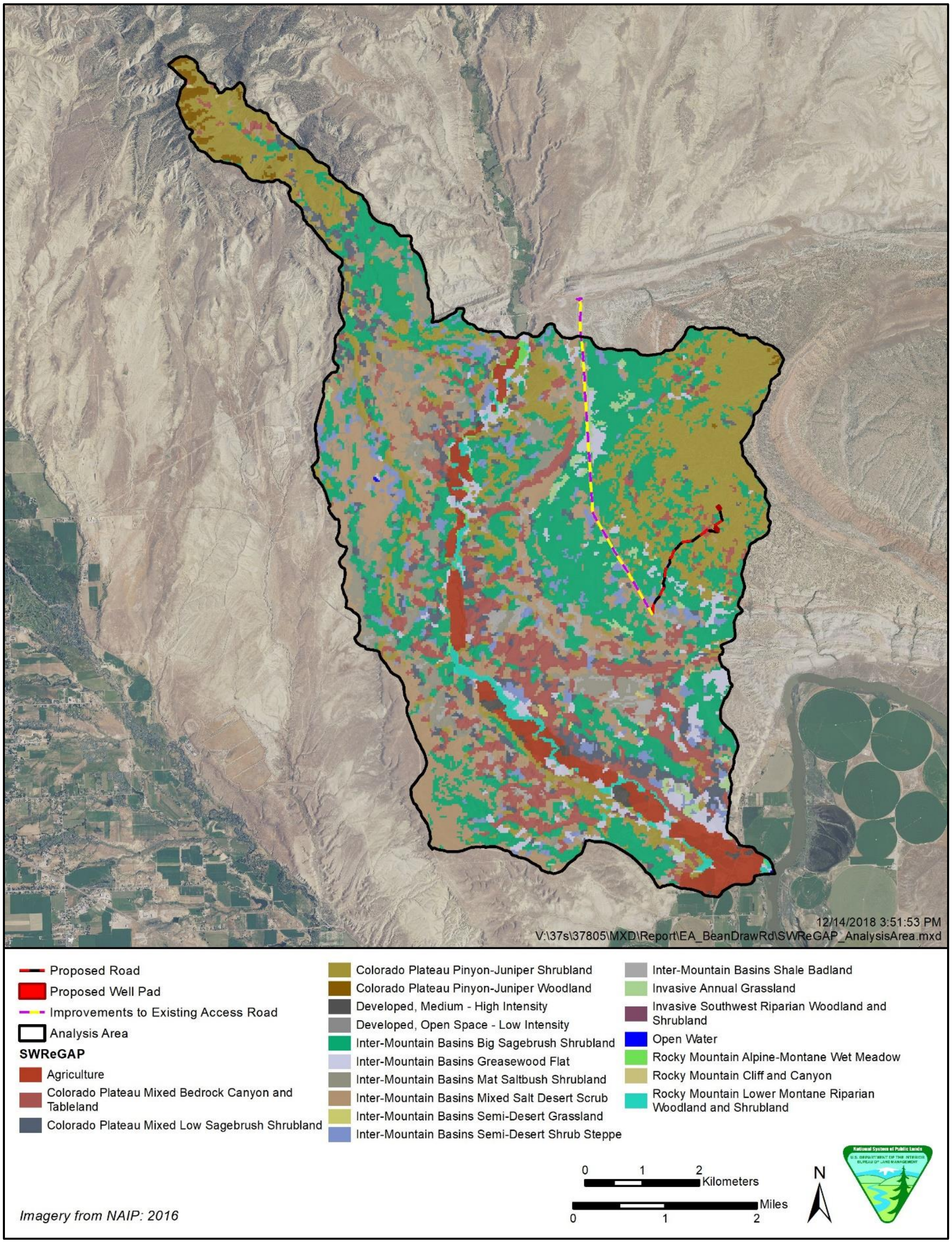

Figure 3-3. Locations of land cover types in the vegetation analysis area.

3.2.6 Visual Resources

The analysis area for visual resources is the viewshed within a 5-mile radius from the project area. A 5-mile buffer was selected based on the likelihood that the proposed structures or surface disturbance would not be noticeable to viewers based on their visual magnitude (apparent size) at that distance (see Section 4.1.5). Haack et al. (2013) noted that modifications that occupy less than 5 degrees of the field of view are considered insignificant and have low visual prominence to an observer, especially if contrast is low.

The BLM manages public lands for visual resources using the VRM system. The VRM system classifies land based on visual appeal, public concern for scenic quality, and visibility from travel routes or other KOPs. A visual resources inventory (VRI) is used to place BLM-administered lands into one of four VRM classes. The Proposed Action would be in VRI Class II. The VRI class is used as a baseline for the inventoried characteristics of the landscape and is not the indicator used for determining land management for a specific tract of land. The VRM is used to guide the management decisions throughout BLM-administered lands as they are designated in the approved RMP.

The Proposed Action would occur in VRM Class II and VRM Class III areas. The objective of VRM Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but they should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. A portion of Bean Draw Road extends into a VRM Class III area. The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Two KOPs were identified for analysis (Figure 3-4). The KOPs were visited on June 15, 2017. Sections A and B of BLM Form 8400-4 (Visual Contrast Rating Worksheet) were completed (Appendix D), and photographs of surrounding views at the two KOPs were taken to record the visual character of the landscape. Representative photographs from the KOPs and associated visual simulations of the Proposed Action are included in Section 4.1.6 below.

3.2.6.1 Key Observation Point 1

KOP 1 is in Uintah County in Section 19 of T4S, R23E, along Bean Draw Road, approximately 1.4 miles west of the proposed well pad sites (see Figure 3-4). Bean Draw Road provides a noticeable, light-colored linear element that contrasts with the surrounding low grasses and sparse shrubs. It also marks a discontinuity in the visual landscape to the east and west of the road. Yellow markers form an implied line adjacent to the dirt road.

The visual landscape rising to the east of Bean Draw Road (VRM Class II) is characterized by rolling topography and drainages. Dark- and medium-green shrubs and low trees contrast strongly with exposed areas of light-colored soils and rock outcrops. Dark red-brown soils are also visible in the background. The dark ridgeline contrasts sharply with the sky. The foreground and middleground consist of clumps of low gray-green vegetation scattered across exposed light-brown sandy soils and low brown grasses.

The landscape to the west of the road (VRM Class III) is more barren and open. The visual matrix of low brown grasses and light-colored soils is punctuated with occasional clumps of light- and medium-green shrubs. The land rises to meet unvegetated steep cliff faces with noticeable gray, brown, and subtle purple-red strata that bound the view. Views to the north and south open to more distant and less distinct landforms.

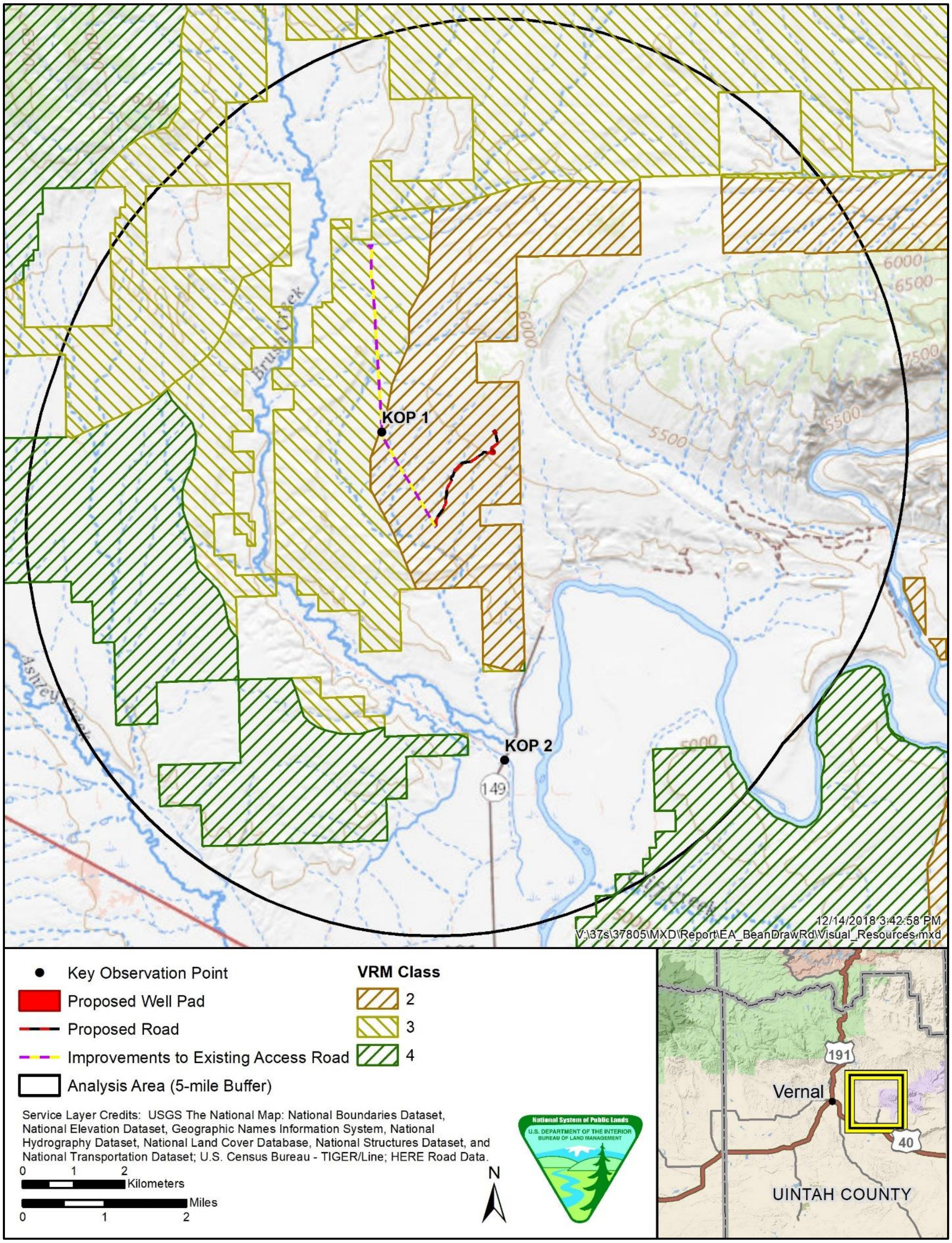

Figure 3-4. Visual Resource Management classes in the project area vicinity.

3.2.6.2 Key Observation Point 2

KOP 2 is in Section 9 of T5S, R23E and located on Utah State Highway 149 just south of the intersection with Brush Creek Road. The highway leads to the west entrance of Dinosaur National Monument and was selected because it is a well-traveled route. The view to the north (toward the proposed well pads) looks across bright green irrigated fields with clumps of darker green trees. The middleground is bounded to the north by a steep, flat-topped bluff with little vegetation on the dun-colored slopes. The top is dotted with dark green trees that visually disrupt the line created by the bluff top. Beyond the bluff are light brown and gray hills mottled with an irregular matrix of dark vegetation.

The highway and Brush Creek Road form strong linear elements in the fore- to middleground. The pavement is medium gray and flanked by clumps of low gray-green grasses and shrubs. Other structures include brown single-pole transmission lines, pivot irrigation sprinklers, low gray structures, and light-colored dirt and graveled access roads and parking areas for vehicles.

3.2.7 Wildlife

The analysis area for wildlife is the Lower Brush Creek HUC 12 watershed (16,881 acres), because it encompasses the project area and represents a defined, continuous area linked by common watercourses on which wildlife depend.

Wildlife species found in the VFO planning area are typical of the Intermountain Region of the United States. These include big game species such as mule deer (*Odocoileus hemionus*), Rocky Mountain elk (*Cervus elaphus nelsoni*), pronghorn (*Antilocapra Americana*), bighorn sheep (*Ovis canadensis nelsoni*), moose (*Alces alces*), black bear (*Ursus americanus*), and mountain lion (*Puma concolor*). Of these species, the Utah Division of Wildlife Resources (UDWR) has specifically identified only mule deer habitat in the wildlife analysis area. Other typical species found in the VFO planning area fall into the categories of upland game species, raptors, waterfowl, and shorebirds, fish, and aquatic species, neotropical migrants, and small mammals and reptiles (BLM 2008).

3.2.7.1 Big Game

The UDWR manages mule deer consistent with the *Utah Mule Deer Statewide Management Plan* (UDWR 2015a). According to the UDWR, statewide adult mule deer survival has been relatively constant, with estimates ranging between 84% and 86% (UDWR 2015a). The project area falls within the UDWR's South Slope mule deer herd unit, which covers Wasatch, Summit, Daggett, Uintah, and Duchesne Counties. The South Slope herd unit includes 950,681 acres of year-long range, 1,140,008 acres of summer range, and 731,950 acres of winter range (UDWR 2016a). The wildlife analysis area (Lower Brush Creek HUC 12 watershed) provides a more site-specific analysis of potential impacts to mule deer than the herd unit. Vegetative communities vary throughout the range of mule deer, but habitat is characterized by areas of thick brush or trees interspersed with small openings. The size and condition of mule deer populations are primarily determined by the quantity and quality of winter, summer, and transitional habitats. Table 3-3 lists the acres of big game habitat in the wildlife analysis area, and Figure 3-5 shows the locations of mule deer habitat in the wildlife analysis area.

The UDWR manages Rocky Mountain elk consistent with the *Utah Statewide Elk Management Plan* (UDWR 2015b). There are six recognized subspecies of elk in North America, with all the elk in Utah belonging to the subspecies known as Rocky Mountain elk (UDWR 2015b). Statewide, the current population objective for elk is 70,965 (UDWR 2015b). The project area falls within UDWR's South Slope elk herd unit, which covers Wasatch, Summit, Daggett, Uintah, and Duchesne Counties. The South Slope herd unit includes 1,081,157 acres of summer range and 677,516 acres of winter range (UDWR 2016b). The wildlife analysis area (Lower Brush Creek HUC 12 watershed) provides a more site-specific analysis of potential impacts to elk than the herd unit. Elk eat a variety of plants, including grasses, forbs, and shrubs, based on availability. They prefer to spend summer months in aspen-conifer forests at high elevations and winter at mid- to low elevations in habitats that contain sagebrush and mountain shrub vegetation communities (UDWR 2015b). Aspen stands provide calving areas in the spring and forage and cover for elk during the summer. Figure 3-6 shows the locations of elk habitat in the wildlife analysis area.

Table 3-3. Acres of Big Game Habitat in the Wildlife Analysis Area

Big Game Habitat Type	Acres in the Analysis Area	Percent of Wildlife Analysis Area
Mule deer crucial winter	7,039.1	41.7%
Mule deer substantial value winter	830.2	4.9%
Mule deer crucial year-long	3,868.4	22.9%
Rocky Mountain elk crucial winter	921.5	5.5%
Rocky Mountain elk substantial value winter	698.3	4.1%

3.2.7.2 Migratory Birds and Raptors

Migratory birds require nesting and brooding habitat, nonbreeding foraging and resting habitat, habitats along migratory routes, and wintering habitat. Neotropical migratory bird populations are in decline due to habitat fragmentation, habitat loss and modification, urban expansion, loss of nonbreeding habitats and habitats along migratory routes, and brood parasitism (Parrish et al. 2002).

Habitat needs for raptors consist of nesting sites, foraging areas, and roosting or resting sites. Roosting generally occurs in riparian areas and on cliff faces. Habitat loss and disturbance to nest sites, reduction of the prey base, electrocution from power lines, and environmental contaminants are the primary threats to raptor species (Parrish et al. 2002). There are three golden eagle (*Aquila chrysaetos*) nests within 0.5 mile of the project area. Golden eagles are typically found in open areas in mountainous regions and nests are constructed on cliffs or in large trees (UDWR 2019a). The bald eagle is protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Potential burrowing owl (*Athene cunicularia*) nesting habitat also occurs within the project area. The burrowing owl is a State of Utah and BLM sensitive species. In Utah, prairie dog burrows are the most important source of burrowing owl nest sites. Migratory bird and raptor species with potential to occur in the wildlife analysis area are listed in Table 3-4.

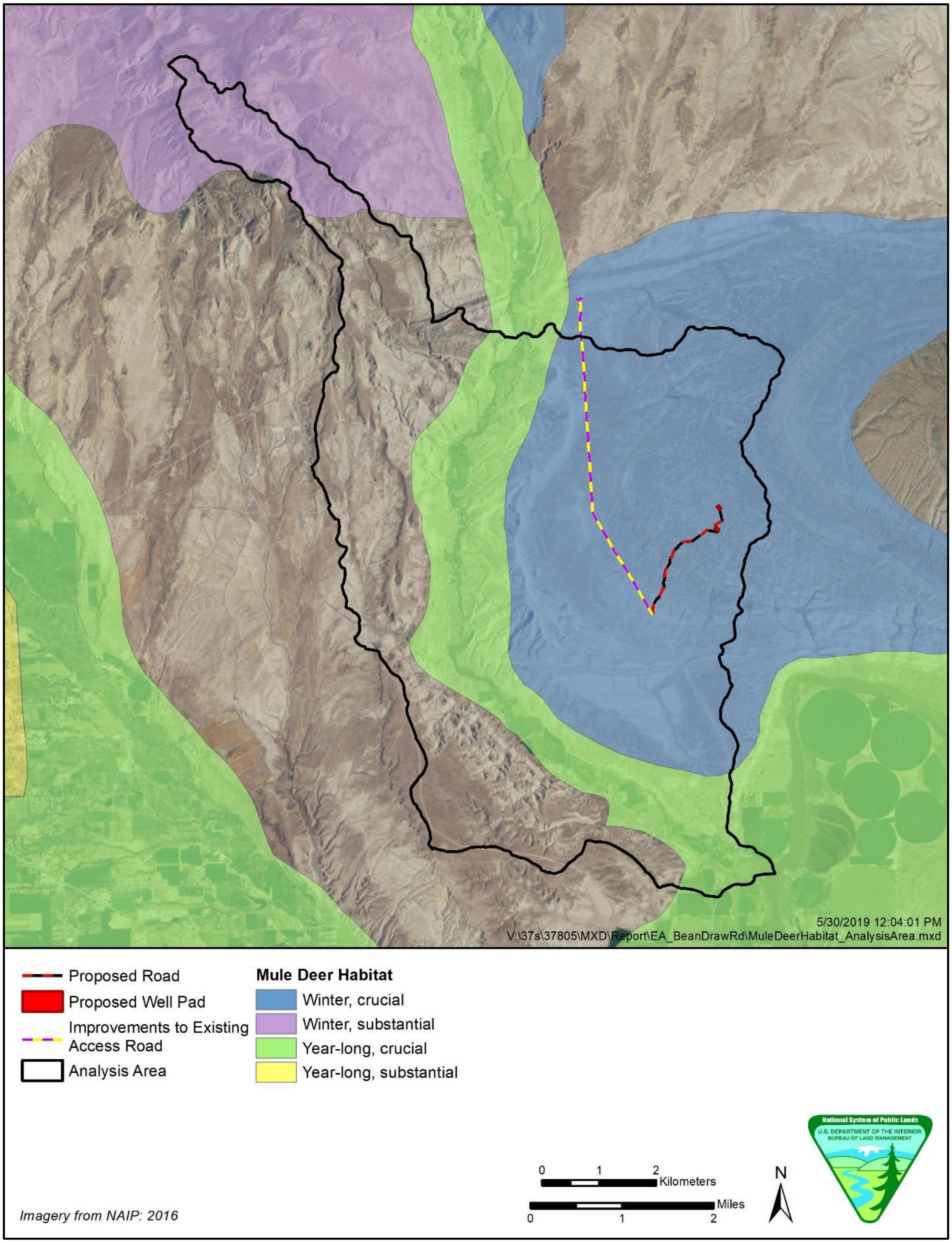

Figure 3-5. Mule deer habitat in the wildlife analysis area.

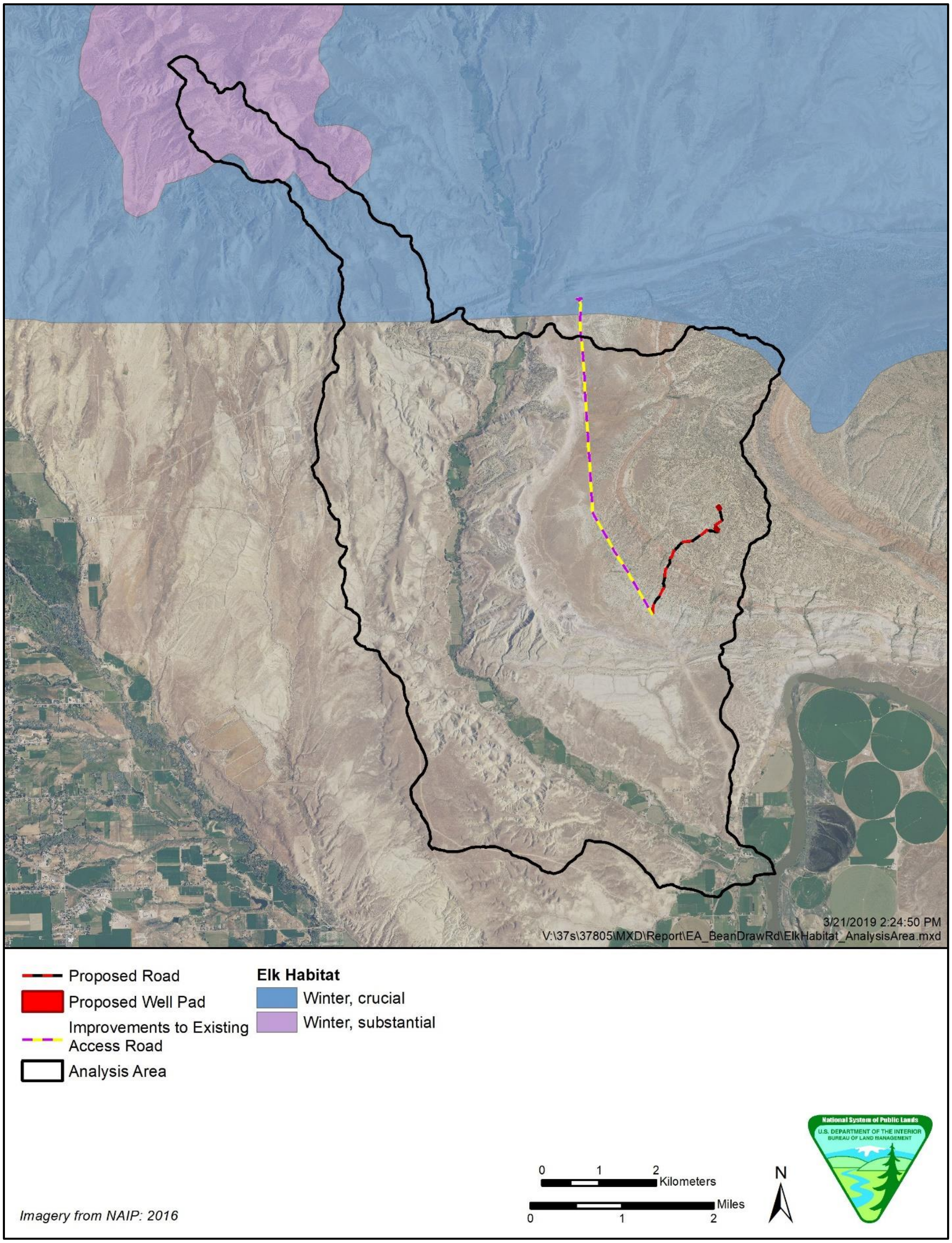

Figure 3-6. Elk habitat in the wildlife analysis area.

Table 3-4. Migratory Bird and Raptor Species with Potential to Occur in the Wildlife Analysis Area

Species Common Name	Species Scientific Name
Turkey vulture	*Cathartes aura*
Mourning dove	*Zenaida macroura*
Northern flicker	*Colaptes auratus*
Western wood-pewee	*Contopus sordidulus*
Say’s phoebe	*Sayornis saya*
Western kingbird	*Tyrannus verticalis*
Black-billed magpie	*Pica hudsonia*
Horned lark	*Eremophila alpestris*
Violet-green swallow	*Tachycineta thalassina*
Barn swallow	*Hirundo rustica*
House wren	*Troglodytes aedon*
Blue-gray gnatcatcher	*Polioptila caerulea*
Mountain bluebird	*Sialia currucoides*
American robin	*Turdus migratorius*
Sage thrasher	*Oreoscoptes montanus*
Common yellowthroat	*Geothlypis trichas*
Yellow-breasted chat	*Icteria virens*
Chipping sparrow	*Spizella passerina*
Brewer’s sparrow	*Spizella breweri*
Lark sparrow	*Chondestes grammacus*
Vesper sparrow	*Pooecetes gramineus*
Song sparrow	*Melospiza melodia*
Spotted towhee	*Pipilo maculatus*
Black-headed grosbeak	*Pheucticus melanocephalus*
Lazuli bunting	*Passerina amoena*
Western meadowlark	*Sturnella neglecta*
Brewer’s blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Bullock’s oriole	*Icterus bullockii*
Burrowing owl	*Athene cunicularia*
Cooper’s hawk	*Accipiter cooperii*
Golden eagle	*Aquila chrysaetos*
Bald eagle	*Haliaeetus leucocephalus*

Species Common Name	Species Scientific Name
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
American kestrel	*Falco sparverius*
Peregrine falcon	*Falco peregrinus*
Prairie falcon	*Falco mexicanus*

3.2.7.3 Greater Sage-Grouse

The analysis area for greater sage-grouse is the Lower Brush Creek HUC 12 watershed (16,881 acres), which is also used as the general wildlife analysis area.

The BLM's land management activities must be consistent with the ARMPA (BLM 2015). There are 5,111.6 acres of PHMAs in the wildlife analysis area. The PHMAs are BLM-administered lands where some special management will apply to sustain greater sage-grouse populations, which includes areas of occupied seasonal or year-round habitat outside of PHMAs (BLM 2015). The UDWR manages greater sage-grouse consistent with the *Utah Conservation Plan for Greater Sage-Grouse* (UDWR 2019b). The UDWR recognizes occupied greater sage-grouse habitat in the wildlife analysis area as well as greater sage-grouse brooding and winter habitat. Table 3-5 lists the acres of greater sage-grouse habitat in the wildlife analysis area. Figure 3-7 shows the locations of greater sage-grouse habitat in the wildlife analysis area.

Table 3-5. Acres of Greater Sage-Grouse Habitat in the Wildlife Analysis Area

Greater Sage-Grouse Habitat	Acres in Analysis Area
Occupied*	5,111.6
Nesting and brood rearing	271.7
Winter	4,938.8
Primary Habitat Management Area	5,111.6

* Occupied habitat acres overlap nesting, brood-rearing, and winter habitat acres, and share the same boundary as PHMA within the analysis area.

The UDWR (2019b) has identified the following threats as being those of concern for greater sage-grouse and its habitat in Utah:

- Invasive species—Habitat loss due to invasive species, such as whitetop, medusahead (*Taeniatherum caput-medusae*), knapweeds (*Centaurea* spp.), saltcedar, cheatgrass, and others is a serious threat to greater sage-grouse habitat.
- Extractive mineral development—Surface disturbance from mineral development causes greater sage-grouse habitat loss and fragmentation.

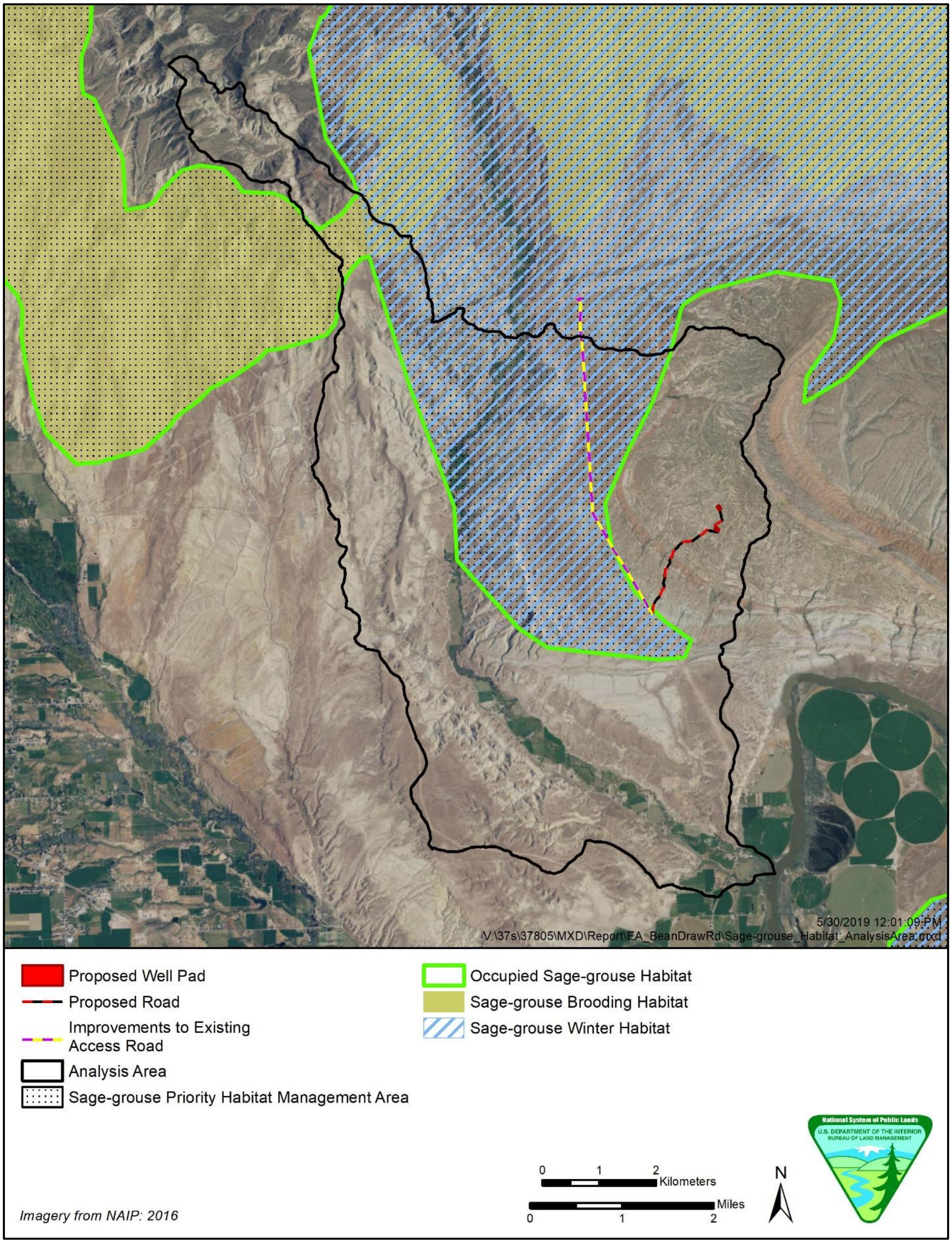

Figure 3-7. Greater sage-grouse habitat in the wildlife analysis area.

3.2.7.4 White-Tailed Prairie Dog

There are approximately 1,814 acres of white-tailed prairie dog (*Cynomys leucurus*) habitat in the analysis area and a white-tailed prairie dog colony that overlaps the project area. White-tailed prairie dogs are typically found in open shrublands, semidesert grasslands, and mountain valleys, where they occur in loosely organized colonies that may occupy hundreds of acres on favorable sites. Similar to other prairie dogs, white-tailed prairie dogs spend much of their time in underground burrows, often hibernating during the winter.

3.2.8 Air Resources

3.2.8.1 Ambient Air Quality

The project area is in the Uinta Basin, a semiarid, mid-continental climate regime typified by dry, windy conditions; limited precipitation; and wide seasonal temperature variations subject to abundant sunshine and rapid nighttime cooling.

The U.S. Environmental Protection Agency (EPA) has established the National Ambient Air Quality Standards (NAAQS) to limit the amount of air pollutant emissions considered harmful to public health and the environment. Primary and secondary standards have been set for six criteria pollutants: carbon monoxide (CO), lead, nitrogen dioxide (NO_2),[3] ozone,[4] sulfur dioxide (SO_2), and particulate matter (PM). Geographic areas that do not comply with primary NAAQS requirements for criteria pollutants are considered nonattainment areas. Compliance with the NAAQS is typically demonstrated by monitoring for ground-level atmospheric air pollutant concentrations. Ozone is formed by chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs), and emissions of these pollutants are of particular concern in the Uinta Basin.

Areas in Duchesne and Uintah Counties below 6,250 feet of elevation, including the project area, are designated as nonattainment areas for the 8-hour ozone NAAQS, effective August 3, 2018 (EPA 2018a). General conformity regulations implement Section 176(c) of the Clean Air Act (CAA), which prohibits federal agencies from taking actions that may contribute to violations of the NAAQS in an area working to attain or maintain the standards; it applies to all federal actions in nonattainment areas. Once a nonattainment area has been designated by the EPA, federal agencies have a 1-year grace period before general conformity applies. Starting in August 2019, the BLM will be required to make a general conformity determination in the Uinta Basin nonattainment area for reasonably foreseeable emissions that result from a federal action on BLM-administered lands (40 CFR 93.153.k).

NAAQS standards for all criteria pollutants can be found at https://www.epa.gov/criteria-air-pollutants/naaqs-table. The EPA's Air Quality Design Values webpage lists the 2017 Design Value Reports used for making NAAQS compliance determinations (EPA 2018b). A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS; it is typically used to designate nonattainment areas and assess progress toward meeting the NAAQS. The 8-hour ozone 2015–2017 design value for the Uinta Basin is 0.088 parts per million, which does not meet the NAAQS standard of 0.070 parts per million (EPA 2018b).

The Utah Division of Air Quality (DAQ) compiles statewide emission inventories at the state and county levels to assess the level of pollutants released into the air from various sources. These emission inventories provide helpful information about ambient air quality in Utah counties. The Utah DAQ's website lists the most recent emissions inventory by point source for each county, including oil and gas sources (UDAQ 2014a). Hazardous air pollutants (HAPs), also known as toxic air pollutants, are known or suspected to cause cancer or other serious health effects, or adverse environmental effects. HAPs emitted by the oil and gas industry include benzene, toluene, ethyl benzene, mixed xylenes,

[3] The EPA uses NO_2 as the indicator for the larger group of nitrogen oxides (oxides of nitrogen), or NO_x; however, emissions are usually reported as NO_x.

[4] Ozone is not directly emitted into the air but is created by chemical reactions between NO_x and VOCs in the presence of sunlight.

formaldehyde, normal-hexane, acetaldehyde, and methanol. The Utah DAQ's website lists the most recent statewide HAP point source emission inventory by county (UDAQ 2014b).

The Prevention of Significant Deterioration (PSD) is a CAA permitting program for new and modified major sources of air pollution that are in attainment areas. It is designed to prevent NAAQS violations, preserve, and protect air quality in sensitive areas, and protect public health and welfare (EPA 2016). Under PSD regulations, the EPA classifies airsheds as Class I, Class II, or Class III. PSD rules require the assessment of impacts to air quality–related values (AQRVs) such as visibility. The Uinta Basin Air Resource Management Strategy modeled impacts to AQRVs for three types of assessment areas: the Uinta Basin study area (Class II), Class I and sensitive Class II areas, and sensitive lakes. The locations of the Class I and sensitive Class II areas that are within 300 kilometers (km) of the Uinta Basin study area, with respect to the modeling domains, are shown in Figure 2-2 of the 2014 *Final Utah Air Resource Management Strategy Modeling Project Impact Assessment Report* (AECOM 2014). The closest sensitive areas to the project area are the High Uintas Wilderness, the Uintah and Ouray Reservation, Dinosaur National Monument, and Flaming Gorge Recreation Area (all Class II). The closest Class I areas are Arches National Park to the south, Flat Tops Wilderness to the east, and Bridger Wilderness to the north. Each of these classes have different applicable thresholds for evaluating air quality and AQRV impacts, which, in turn, require different air quality assessment methods.

3.2.8.2 Greenhouse Gases and Climate Change

Climate is the composite of generally prevailing weather conditions of a particular region, such as temperature and precipitation, throughout the year, averaged over a series of years. Climate change is the long-term (several decades or longer) alteration of atmospheric weather patterns (temperature, precipitation, winds, etc.), but changes could also occur in other parts of the climate system such as the hydrosphere (water), cryosphere (ice), biosphere (living organisms, ecosystems), or lithosphere. While climate is always changing, much of the recent observed changes are linked to rising levels of GHGs in the atmosphere due to human activities. The 2018 BLM Utah Air Monitoring Report (BLM 2019b) discusses the current climate conditions in Utah and is incorporated by reference. The report presents the three-decade average and trends of temperature and precipitation for each of the seven climate divisions and BLM Field Offices in Utah.

As shown in Table 3-6, the Vernal Field Office has average annual temperatures ranging between 45 and 52 ºF and average precipitation of 10 to 13 inches (BLM 2019b). Trends over the most recent climate normal period (1981–2010) show average temperatures increase 0.5 ºF while precipitation decreases between 0.5 and 1.3 inches. It is noted that decreases in precipitation are heavily influenced by the historic rain and snowfall in the early 1980s, and recent precipitation is near the 1895–2017 average.

Average annual temperature and precipitation information for each Utah climate division is presented in Table 3-6, along with trends from the most recent climate normal period (1981–2010). Average annual temperatures range from 40 to 52°F, with the Northern Mountains division being the coolest and the Southeast division the warmest. The 30-year (1981–2010) climate trends of annual averages show increasing temperatures and decreasing precipitation; however, the decreasing precipitation trend is heavily influenced by the record amounts of precipitation that occurred in the early 1980s. Additional details on climate in these areas and the rest of Utah are provided in the 2018 BLM Utah Air Monitoring Report (BLM 2019b).

Table 3-6. Climate Trends

Climate Division	1895–2017 Mean		1981–2010 Trend	
	Temp (°F)	Precip (in.)	Temp (°F)	Precip (in.)
5, Northern Mountains	40.1	23.5	+ 0.5	-1.32
6, Uinta Basin	45.1	10.7	+ 0.5	-0.65
7, Southeast	51.5	9.8	+ 0.5	-0.51

In November 2018, the Fourth National Climate Assessment (NCA4) Volume II was published (U.S. Global Change Research Program [USGCRP] 2018). Compared to previous reports, NCA4 provides greater detail on regional scales as impacts and adaptation tend to be realized at a more local level. The Southwest region (Arizona, California, Colorado, New Mexico, Nevada, and Utah) encompasses diverse ecosystems, cultures, and economies, reflecting a broad range of climate conditions, including the hottest and driest climate in the United States. The average annual temperature of the Southwest increased 1.6°F (0.9ºC) between 1901 and 2016. Moreover, the region recorded more warm nights and fewer cold nights between 1990 and 2016, including an increase of 4.1°F (2.3°C) for the coldest day of the year. Each NCA has consistently identified drought, water shortages, and loss of ecosystem integrity as major challenges that the Southwest confronts under climate change. Since the last assessment, published field research has provided even stronger detection of hydrological drought, tree death, wildfire increases, sea level rise and warming, oxygen loss, and acidification of the ocean that have been statistically different from natural variation, with much of the attribution pointing to human-caused climate change (USGCRP 2018).

Climate change includes both historic and predicted climate shifts that are beyond normal weather variations. Climate change may be due to natural internal processes or external forces. Earth's atmosphere has a natural greenhouse effect wherein naturally occurring gases such as water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) absorb and retain heat (EPA 2018c). Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. Fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are generally unrelated to the activities authorized by the BLM and will not be discussed further in this document. A number of activities contribute to the phenomenon of climate change, including emissions of GHGs (especially CO_2 and methane) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo). To assess the potential for climate change, and the resultant effects of climate change, the standard approach is to measure and predict emissions of GHGs. Since the pre-industrial era (approximately 1750) to 2017, concentrations of GHGs have increased 45% for CO_2, 164% for CH_4, and 22% for N_2O, as shown in Table 3-7. In 2017, the atmospheric concentration of CO_2 was 407 ppm, and it is increasing at a rate of 2.2 ppm/yr.

Table 3-7. Global Atmospheric Concentration and Rate of Change of Greenhouse Gases

	CO_2	**CH_4**	**N_2O**
Pre-Industrial Concentration	280 ppm	0.700 ppm	0.270 ppm
2017 Atmospheric Concentration	407 ppm	1.850 ppm	0.330 ppm
2007-2017 Rate of Change	2.2 ppm/yr.	0.007 ppm/yr.	0.008 ppm/yr.

Source: EPA (2019a)

Each GHG has a global warming potential (GWP) that accounts for the intensity of each GHG's heat trapping effect and its longevity in the atmosphere. GWP values allow for a comparison of the impacts of emissions and reductions of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period, relative to the emissions of 1 ton of CO_2. According to the Intergovernmental Panel on Climate Change (IPCC), GWPs typically have an uncertainty of ±35 percent. GWPs have been developed for several GHGs over different time horizons including 20-year, 100 year, and 500 year. The choice of emission metric and time horizon depends on the type of application and policy context; hence, no single metric is optimal for all policy goals. The 100-year GWP (GWP100) was adopted by the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol and is now used widely as the default metric. In addition, the EPA uses the 100-year time horizon in its *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2017* (EPA 2019a), GHG Reporting Rule requirements under 40 CFR Part 98 Subpart A, and uses the GWPs and time horizon consistent with the IPCC's *Climate Change 2014 Synthesis Report* (2015) in its science communications. The BLM uses GWPs that reflect the current state of science and the 100-year time horizon to allow for direct comparison to state and national emissions.

Because GHGs circulate freely throughout Earth's atmosphere, climate change is a cumulative global issue. For context, BLM-related emissions can be compared with the state, national, and global total GHG emissions presented in Table 3-8. Sources of GHG emissions include the EPA's GHG Reporting Program FLIGHT tool (EPA 2019b) for state emission, the EPA inventory report on GHG emissions and sinks (EPA 2019a) for national emissions, and the European Commission, Joint Research Centre, *Fossil* CO_2 *& GHG Emissions of All World Countries* report (Jassens-Maenhout et al. 2017) for global emissions. State emissions information only includes major stationary industrial sources and does not include minor sources such as vehicles or oil and gas wells.

Table 3-8. Greenhouse Gas Emissions in Million Metric Tons (CO_2e)

Utah	U.S. Energy Sector	United States	Global
35.0	5,424.8	6,456.7	46,423.3

Source: EPA (2019a, 2019b), Jannssens-Maenhout et al. (2017)

GHG reported emissions from major sources in Utah in 2017 totaled 35.0 million metric tons (MMT) of CO_2e. A total of 64 facilities reported GHG emissions in 19 of Utah's 29 counties. Annual emissions in Utah for each year from 2010 to 2017 is shown in Figure 3-8. From 2013 to 2017, emissions in Utah decreased 9.4 MMT CO_2e, or 19.6%.

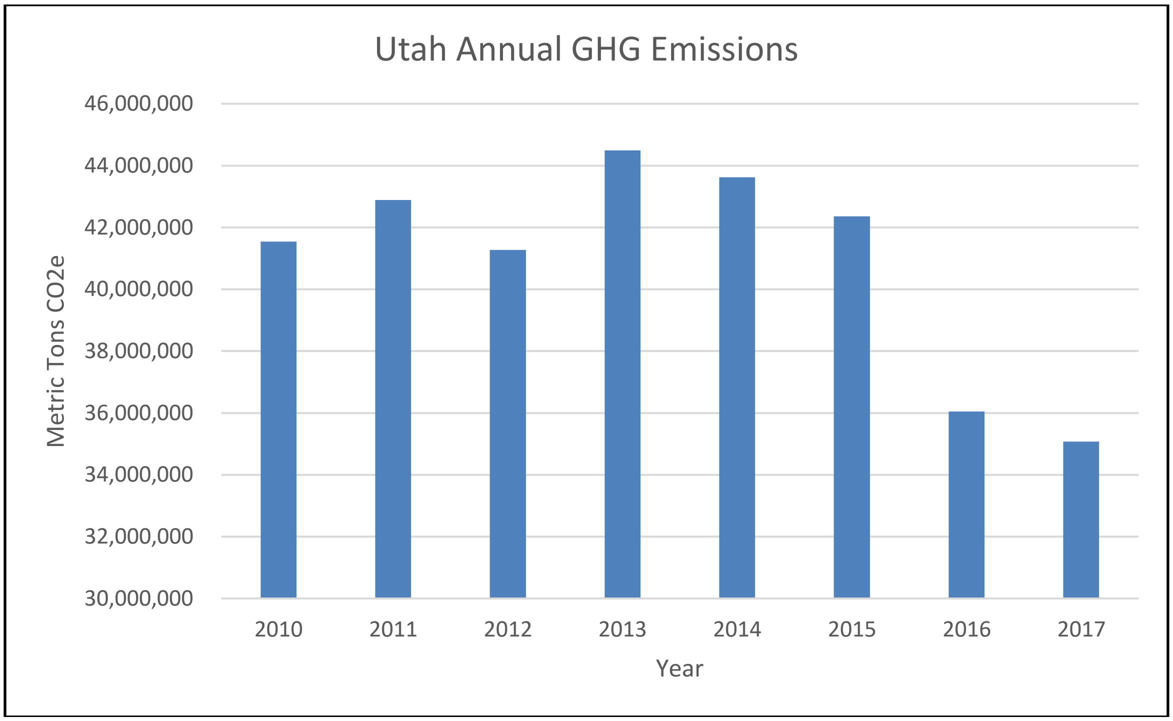

Figure 3-8. Annual GHG emissions in Utah in MMT CO_2e. Source: EPA (2018)

Total U.S. greenhouse gas emissions in 2017 were 6,456.7 MMT of CO_2e, shown in Table 3-9. This represents a 1.3% increase in emissions compared to the 1990 baseline year. Emissions decreased from 2016 to 2017 by 0.5% (35.5 MMT CO_2e), driven in large part by a decrease in CO_2 emissions from fossil fuel combustion (EPA 2019a). The energy sector accounts for 84% (5,424.8 CO_2e) of GHG emissions in the United States.

Table 3-9. Recent Trends in U.S. Greenhouse Gas Emissions (MMT CO_2e)

	1990	2013	2014	2015	2016	2017
Total U.S. emissions	6,371.0	6,710.2	6,760.0	6,623.8	6,492.3	6,456.7

Global emissions information is obtained from the European Commission Emission Database for Global Atmospheric Research (EDGAR) (Janssens-Maenhout et al. 2017). The EDGAR database provides a comprehensive picture of anthropogenic CO_2 emissions through 2016 and includes all IPCC sectoral classifications. Emissions data for all other GHGs is available through 2012. More recent estimates for all GHGs is not possible since there is no recent global agriculture information, a major source sector for CH_4 and N_2O.

Total global emissions in 2012 were 46,423.3 MMT CO_2e. Figure 3-9 shows the annual global emissions from 1990 to 2012. The global GHG emissions trends have increased since the beginning of the twenty-first century, driven mainly by increases in CO_2 emissions from China and other emerging economies. Methane and N_2O emissions were 19% and 6%, respectively, of total emissions in 2012.

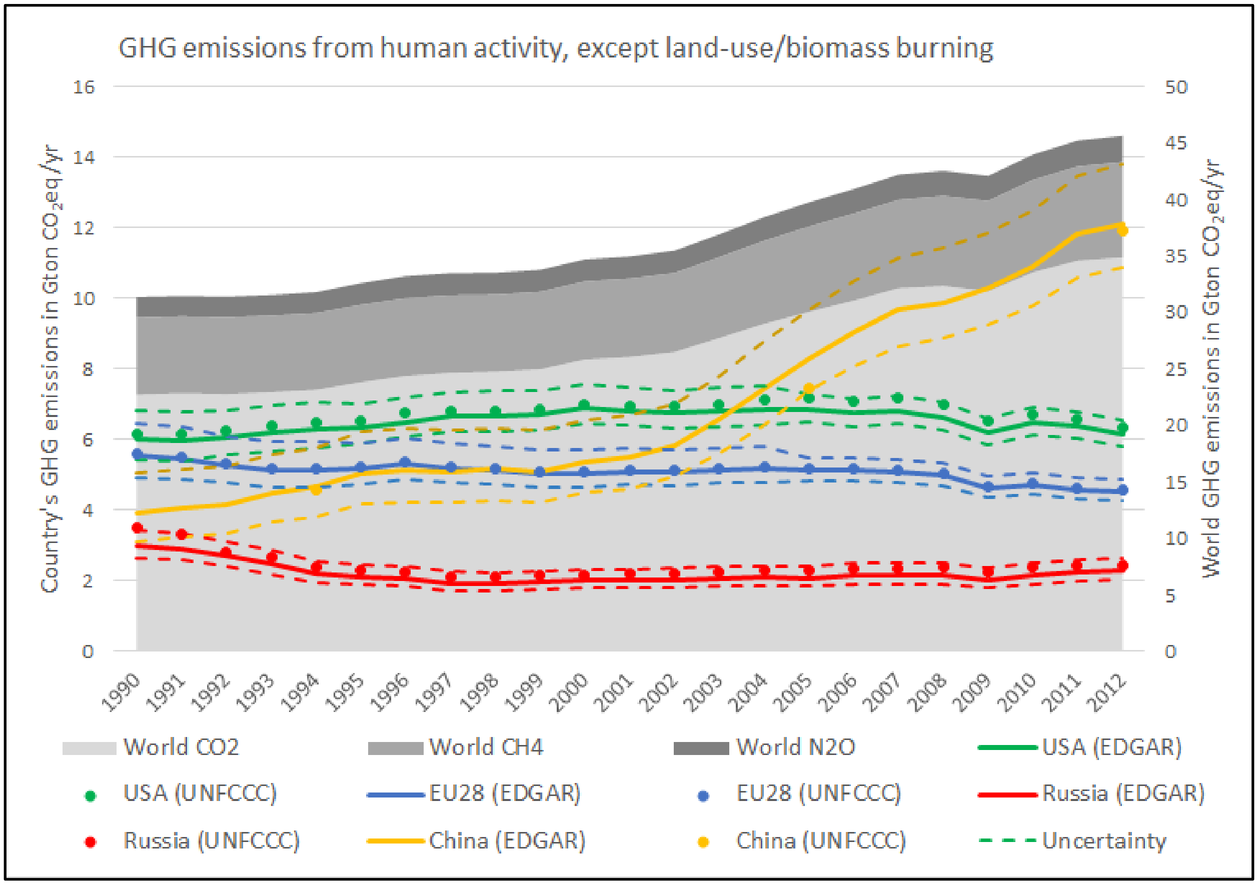

Figure 3-9. Total GHG emissions in gigatons CO_2e/yr. Source: Janssens-Maenhout et al. (2017)

Energy-related GHG emissions are presented in Table 3-10 (EPA 2019a). Fossil fuel combustion is the largest source of energy related GHG emissions in the United States. Energy-related emissions increased 1.5% from 1990 to 2017. These increases were largely from fossil fuel combustion, non-energy use of fuels, and petroleum systems. Emissions decreases were seen in natural gas systems, coal mining, and mobile combustion.

Table 3-10. Recent Trends in U.S. Energy Sector Greenhouse Gas Emissions (MMT CO_2e) Source: EPA (2019a)

	1990	2013	2014	2015	2016	2017
Fossil fuel combustion	4,738.8	5,157.4	5,199.3	5,047.1	4,961.9	4,912.0
Natural gas systems	223.1	190.8	190.6	192.2	191.2	191.9
Non-energy use of fuels	119.6	123.5	119.9	126.9	113.7	123.2
Petroleum systems	51.0	66.8	71.7	71.2	60.4	61.0
Coal mining	96.5	64.6	64.6	61.2	53.8	55.7
Stationary combustion	33.7	41.5	41.9	39.0	38.0	36.4
Mobile combustion	55.0	26.6	24.3	22.4	21.2	20.1
Incineration of waste	8.4	10.6	10.7	11.1	11.1	11.1
Abandoned oil and gas wells	6.6	7.0	7.1	7.1	7.2	6.9
Abandoned underground coal mines	7.2	6.2	6.3	6.4	6.7	6.4
Total	**5,339.8**	**5,695.0**	**5,736.4**	**5,584.7**	**5,465.3**	**5,424.8**

Gas wells tend to have higher methane emissions due to the nature of the fossil fuel being extracted. U.S. natural gas systems include hundreds of thousands of wells, hundreds of processing facilities, and over a million miles of transmission and distribution pipelines. Details on methane emissions from natural gas systems are provided in Table 3-11 and include emissions from well exploration, production, processing, transmission and storage, and distribution. Methane emissions occur from un-combusted exhaust, venting and flaring, pressure relief systems, and equipment or pipeline leaks. In 2017, 1% of non-combustion methane emissions from natural gas systems came from exploration, 65% from production, 7% from processing facilities, 20% from transmission and storage, and 7% from distribution.

Table 3-11. Methane Emissions from Natural Gas Systems (MMT CO_2e)

	1990	2013	2014	2015	2016	2017
Exploration	4.0	3.0	1.0	1.0	0.7	1.2
Production	67.0	108.5	108.5	108.8	107.1	108.4
Processing	21.3	10.8	11.1	11.1	11.4	11.7
Transmission and storage	57.2	31.0	32.4	34.2	34.5	32.4
Distribution	43.5	12.3	12.2	12.0	12.0	11.9
Total	**193.1**	**165.6**	**165.1**	**167.2**	**165.7**	**165.6**

The U.S. Geological Survey (USGS) has produced estimates of the GHG resulting from the extraction and end-use combustion of fossil fuels produced on Federal lands in the United States, as well as estimates of ecosystem carbon emissions and sequestration on those lands (USGS 2018). The study reports GHG emissions from extraction, transport, fugitives, and combustion of fossil fuels over a ten-year period (2005-2014). In 2014, nationwide gross GHG emissions from fossil fuels (coal, oil, and gas) extracted from Federal lands was 1,332.1 MMT CO_2e. Emissions from fossil fuels produced on Federal lands represent, on average, 23.7 percent of national emissions for CO_2, 7.3 percent for CH_4, and 1.5 percent for N_2O over the 10-year evaluation period (USGS, 2018). Uncertainty associated with emissions estimates is 2-5% for combustion, 25-42% for fugitives, and 12-15% for degassed CH_4 emissions from coal mines. Trends and relative magnitude of emissions are roughly parallel to production volumes. Utah Federal fossil-fuel-related gross emissions in 2014 were 46.75 MMT CO_2e, which is 3.5% of the national emissions estimate (1,332.1 MMT CO_2e). GHG emissions in 2014 from fossil fuel (coal, oil, and gas) in the adjacent states of Colorado, New Mexico, and Wyoming were 55.78, 91.63, and 744.2 MMT CO_2e, respectively. For comparison, Utah Federal emissions were 83.8% of Colorado's, 51.0% of New Mexico's, 6.3% of Wyoming's, and 4.98% of the region combined.

Federal lands also uptake carbon in vegetation, soils, and water. Carbon storage on federal lands was 83,600 MMT CO_2e in 2014. Soils stored 63% of carbon, with vegetation and dead organic matter storing 26% and 11%, respectively. The national rate of net carbon uptake (sequestration) varies from 475 MMT CO_2e/yr to a source (emission) of 51 MMT CO_2e due to changes in climate/weather, land use, land cover change, wildfire frequency, and other factors. In 2014 Federal lands sequestered 475 MMT CO_2e, which is over 60% of the 773.5 MMT CO_2e sequestered in 2018 for the entire United States. From 2005 to 2014, terrestrial ecosystems on federal lands sequestered an average of 195 MMT CO_2e/yr, offsetting about 15% of emissions resulting from fossil fuel extraction and combustion nationally. In Utah, the annual average ecosystem stock is 3,581 MMT CO_2e, with soils accounting for about 70%. The annual average sequestration in Utah is 8.6 MMT CO_2e/yr, offsetting about 18% of extraction and combustion emissions from fossil fuels produced on federal lands in Utah (USGS 2018).

Additional information on the affected environment for greenhouse gases and climate change is incorporated by references from the Supplemental Analysis for GHG Emissions Related to Oil and Gas Leasing in Utah (GHG EA) (BLM 2021). The GHG EA (BLM, 2021) includes an accounting of GHG emissions from past, present, and foreseeable leasing actions. Estimated emissions from oil and gas activity, including from development of parcels offered in past lease sales, in Utah from 2015 through 2019, see Table 3-12. These estimates include emissions from the construction and operation of a well, and the end-use combustion emissions of produced oil and gas.

Table 3-12. 2015 TO 2019 GHG EMISSIONS (MT CO2E/YR.) From Oil and Gas Development in Utah

Field Office (Federal and non-federal)	2015	2016	2017	2018	2019
Vernal	35,611,824	30,974,240	30,751,978	31,156,996	29,805,795
Statewide Total	47,260,831	41,295,733	40,210,937	40,188,503	38,447,125
Statewide Federal Only	25,871,451	22,606,046	22,012,209	21,999,928	21,061,908

4 ENVIRONMENTAL IMPACTS

This chapter presents the expected effects to the resources of concern from implementing the alternatives (action). Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and occur later in time or farther removed in distance, but they are still reasonably foreseeable.

4.1 Alternative A – Proposed Action

The following are the impacts expected from the implementation of the Proposed Action to the resources of concern.

4.1.1 Cultural: Archaeological Resources

Under the Proposed Action, the potential for impacts to archaeological resources is primarily from direct surface disturbance during well site construction, new access road construction, and improvements to Bean Draw Road. The BLM would grant a waiver to the NSO stipulation to allow for this proposed surface disturbance, which would apply to the entire lease area. Planned well site construction is located outside the boundary of any known NRHP eligible site. Further, to avoid impacts, the new access road was rerouted to avoid all NRHP-eligible archaeological sites. Although there would also be an increase in noise, visual resources impacts, and human activity during well construction and production activities, these potential indirect impacts would not affect the characteristics of eligible historic properties that make them eligible for the NRHP.

The section of Bean Draw Road that would be improved was surveyed for cultural resources in August 2018. Seven previously recorded sites were identified during the survey and no newly identified sites were found during the survey (SWCA 2018). Six of the identified sites are prehistoric, while the remaining site is historic. All the sites have been impacted by extensive disturbances associated with various pipeline projects, and in most cases, each site’s spatial integrity has been compromised (SWCA 2018). Because the integrity of each of these sites has been comprised by extensive previous disturbances, SWCA recommended that the portion of the sites in the Bean Draw Road corridor do not contribute to each site’s NRHP eligibility under any criteria.

The proposed activities on sandy soils could result in subsurface impacts to cultural resources, including potential unknown archaeological sites; however, because all archaeological sites recommended eligible for the NRHP would be avoided and monitoring for discovery during construction of undocumented archaeological sites is required, there would be no impacts to archaeological resources under the Proposed Action.

The Proposed Action would not affect any designated Traditional Cultural Properties or hinder access to or use of Native American religious sites; however, this area is an area of concern for the Hopi Tribe, Santa Clara Pueblo, Ute Tribe, and Eastern Shoshone Tribe due to the high density of prehistoric sites found within and near the project area. Several Native American tribes associated with the area have concerns due to the number of cultural sites located along the proposed access road. Both the Eastern Shoshone and Ute Tribes have requested tribal monitors during any proposed construction activities.

4.1.1.1 Mitigation Measures

- An archaeological monitor would be present during construction of the access road and two wells and would follow the archaeological monitoring protocols outlined in in Polk and Polk (2017).
- A tribal representative would be invited to monitor construction of the access road and two wells as requested by the Eastern Shoshone and Ute Tribes.

4.1.1.2 Residual Impacts

The residual impacts are previously described in Section 4.1.1.

4.1.2 Lands with Wilderness Characteristics

Under the Proposed Action, there would be approximately 3.0 acres of surface disturbance for development of well 4-21 and approximately 5.4 acres of surface disturbance for the development of contingency well 5-21 in the Split Mountain Benches LWC unit. The BLM would grant a waiver to the NSO stipulation to allow for this proposed surface disturbance, which would apply to the entire lease area.

If both well 4-21 and contingency well 5-21 were developed, there would be a total of 8.4 acres of surface disturbance. This would represent approximately 0.4% of the Split Mountain Benches unit. Because the Proposed Action would impact only 0.4% of the analysis area, it would not affect the Split Mountain Benches unit's LWC size qualification but would create a "cherry-stem" of disturbance within the unit.

Along with the surface disturbance from well development, there would also be an increase in noise impacts, visual resource impacts, and human activity during well construction and production activities. Surface disturbance, increased noise, visual impacts, and increased human activity in the project area would impact wilderness characteristics as described below.

4.1.2.1 Naturalness

The construction of the proposed well pads, new access road, and improvements to Bean Draw Road would create surface disturbances that would affect the appearance of naturalness in the analysis area. Because Bean Draw Road already exists, the proposed improvements to the road would create a minor impact to the appearance of naturalness. Although approximately 91% of the analysis area has been leased for oil and gas exploration and production, there are no producing or plugged and abandoned wells present in the analysis area. Therefore, the construction and operation of well 4-21 and contingency well 5-21, as well as the access road, would affect the naturalness of the analysis area because the construction and operations of the wells and access road would create noticeable visual and noise impacts. As discussed in Section 4.1.5, the landscape has a relatively high visual absorption capacity due to the topography and the density and height of vegetation (10–15 feet). This would effectively screen much of the surface disturbance and structures associated with the Proposed Action.

4.1.2.2 Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation

During construction and production activities for well 4-21 and contingency well 5-21, the access road, and the improvements to Bean Draw Road, opportunities for solitude and primitive and unconfined types of recreation would be impacted within the approximately 8.6 acres of proposed surface disturbance and within a buffer around the surface disturbance footprint where noise and visual impacts would occur. Solitude would be affected by increased noise and visual impacts as well as increased human activity. Primitive recreation would also be affected by increased noise and visual impacts as well as increased human activity. The well pads and other proposed surface disturbance would also reduce the ability to move across the landscape in a primitive setting. The approximately 8.6 acres of total surface disturbance represents approximately 0.4% of the analysis area. As discussed in Section 4.1.5, the landscape has a relatively high visual absorption capacity due to the topography and the density and height of vegetation (10–15 feet). This would effectively screen much of the surface disturbance and structures associated with the Proposed Action. The VRM II classification of the area would help reduce visual impacts and protect primitive recreation by restricting development visible from key observation points. Cherry-stemming the proposed surface disturbances would help preserve primitive recreation opportunities in the rest of the lease area. Impacts to outstanding opportunities for solitude or primitive and unconfined recreation in one part of the analysis area does not disqualify the entire area as an LWC unit.

4.1.2.3 Supplemental Values

Impacts to supplemental values (paleontological, geological, and historical resources) would be avoided through required mitigation measures. Paleontological resources mitigation measures are described in Section 4.1.1.1. No potential impacts to geological resources have been identified. The access road has been routed to avoid any impacts to historical/cultural resources, as described in Section 2.2.2.

4.1.2.4 Mitigation Measures

Multicylinder pumps, hospital sound-reducing mufflers, and directional placement of exhaust system would be used to reduce noise pollution.

Visual resources mitigation measures would also help reduce potential impacts to naturalness (see Section 4.1.6.3).

4.1.2.5 Residual Impacts

The mitigation measures listed above would help reduce potential impacts to solitude and primitive recreation by limiting surface disturbance, visual impacts, and noise, as well as reclaiming the project area once operations are completed.

4.1.3 Paleontological Resources

The location and acres of surface disturbance in each PFYC class under the Proposed Action are listed in Table 4-1. The location of surface disturbance in each PFYC class under the Proposed Action is shown in Figure 4-1. The BLM would grant a waiver to the NSO stipulation to allow for this proposed surface disturbance, which would apply to the entire lease area.

Table 4-1. Acres of Surface Disturbance in Potential Fossil Yield Classification Areas under the Proposed Action

	PFYC 2	PFYC 3	PFYC 5
Access road 18-foot-wide (acres)	1.8	1.5	0.1
Access road 30-foot-wide temporary construction area (acres)	1.1	1.0	0.1
Pits/Backfill excess material (acres)	1.2	0.0	0.0
Topsoil stockpiles (acres)	0.3	0.0	0.0
Well pads/Toe of fill slope (acres)	2.0	0.0	0.0
Bean Draw Road improvements 18-foot running surface (acres)	0.5	0.1	0.0
Bean Draw Road Improvements 30-foot-wide temporary construction area	3.2	1.7	0.5
Total (acres)	**5.8 (permanent) 4.3 (temporary)**	**1.6 (permanent) 2.7 (temporary)**	**0.1 (permanent) 0.6 (temporary)**

The probability of impacting significant paleontological resources in PFYC Class 2 areas is low. Localities containing important paleontological resources may exist, but they are occasional and should be managed on a case-by-case basis. An assignment of Class 2 may not trigger further analysis unless paleontological resources are known or found to exist. The discovery mitigation measure would be sufficient to protect this resource.

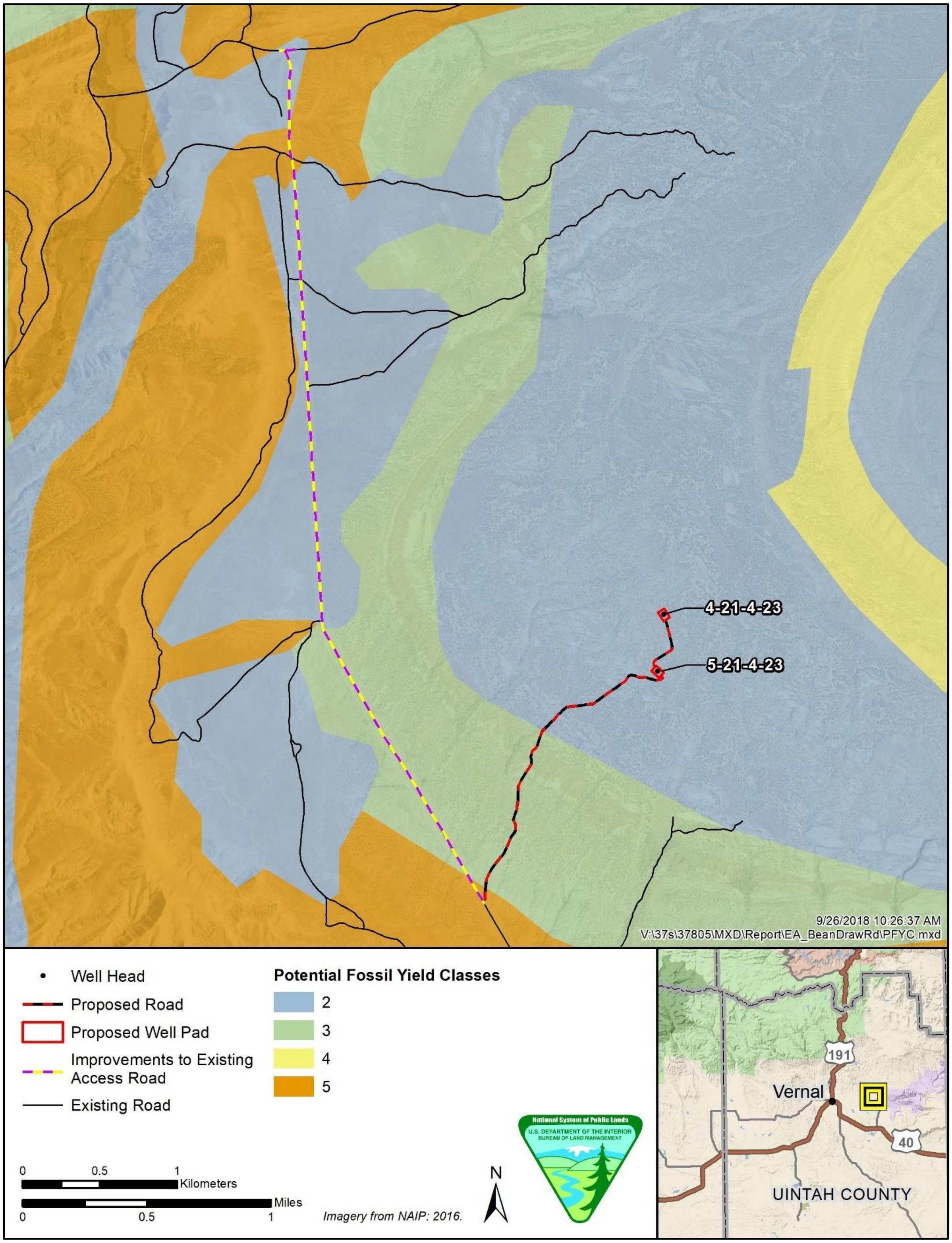

Figure 4-1. Potential Fossil Yield Classification Areas in the project area.

Up to approximately 4.3 acres of surface disturbance would occur in PFYC Class 3 areas (see Table 4-1 and Figure 4-1). Up to approximately 0.7 acre of surface disturbance would occur in PFYC Class 5 areas (see Table 4-1 and Figure 4-1). The 1.4 acres of surface disturbance would occur in areas that have already been disturbed by an existing pipeline and road, thereby making new disturbance to paleontological resources in this area unlikely.

As discussed in Section 3.2.3, many invertebrate fossils have been found in the project area, such as belemnites, ammonites, bivalve fossils, gastropods, and invertebrate burrows. Thus, there is a potential for surface disturbance during construction activities to impact such fossils. No significant vertebrate fossils were found in the project area during the paleontological survey. Construction and operation activities would avoid a previously discovered vertebrate (Ichthyosaur) fossil locality west of the proposed access road.

4.1.3.1 Mitigation Measures

- A licensed paleontologist would be present to monitor the beginning of the construction process and thereafter conduct spot-monitoring as paleontological conditions merit.
- The operator will immediately notify the Authorized Officer of any paleontological resources discovered as a result of operations under this authorization. The permittee will suspend all activities near such discovery until notified to proceed by the Authorized Officer and will protect the discovery from damage or looting.
- The operator would be responsible for informing all persons in the project area who are associated with the project of the requirements for protecting paleontological resources.

4.1.3.2 Residual Impacts

The mitigation measures described above would help reduce and avoid potential impacts to paleontological resources. The presence of a licensed paleontologist and an informed workforce would increase the potential of identifying paleontological resources before those resources are impacted by surface-disturbing activities.

4.1.4 Soil Resources

Direct impacts to soils would include changes in soil functions due to soil exposure from vegetation removal, mixing of soil horizons, potential loss of topsoil productivity, soil compaction, and increased susceptibility to wind and water erosion. Use of equipment for mechanical treatment of vegetation may compact soils, which would reduce soil infiltration rates and lead to increases in overland water flow, erosion, and soil displacement. Overall, the potential for successful reclamation is high in the project area, and there would not be a long-term loss of soil or soil fertility at the disturbed sites.

Each well pad would be stripped of vegetation and topsoil as part of construction, which would lead to localized increases in potential erosion. Most erosion in the project area would occur on steeper cut and fill slopes and in areas where runoff is concentrated, such as within roadway ditches. These impacts would be reduced by rehabilitating and recontouring disturbed lands. Removed topsoil would be stockpiled for reclamation. Additional erosion mitigation measures would include reseeding and stabilizing unstable slopes, cut and fill areas, stockpiles, and other disturbances. When practical, the operator should respread topsoil over the entire location and revegetate to within a few feet of the production facilities, unless an all-weather, surfaced access route or turnaround is needed (BLM and USFS 2007). Once production is established, well pads would be reduced in size, and this interim reclamation would restore part of the disturbed lands to natural conditions, to the extent practicable, with ongoing operations. The portions of the cleared well site not needed for operational and safety purposes would be recontoured to a final or intermediate contour that blends with the surrounding topography as much as possible (BLM and USFS 2007).

The loosening of earthen material and the removal of soil and vegetation would contribute sediment and total dissolved solids to the watershed. Most sediment eroded from the project area would be transported by surface runoff from precipitation, which includes winter snowfalls and summer storms. Threat of erosion from snowfall is low because snowfall is low in energy and does not rapidly create overland flow. Thunderstorms would be more likely to produce high energy (i.e., erosive) runoff, but these storms are infrequent in the project area; however, any increase in sediment load or total dissolved solids is anticipated to be relatively minor and localized due to mitigation measures, interim and final reclamation, and implementation of the stormwater pollution prevention plan. The potential for increased erosion and sedimentation would be greatest in the short term immediately after construction, when the disturbed soils are loose. Potential for increased erosion would decline over time in areas where reclamation, such as reseeding and stabilization of unstable slopes, is implemented, and in other areas as natural stabilization occurs.

Table 4-2 lists the acres of soil disturbance under the Proposed Action. The BLM would grant a waiver to the NSO stipulation to allow for this proposed surface disturbance, which would apply to the entire lease area.

Both Arches and Mespun soils have a moderate potential for erosion. Arches soils have a low potential for reclamation, while Mespun soils have a high potential for reclamation. Cliff, Stygee, and Uffens soils have a low to moderate potential for erosion and a high potential for reclamation. Polychrome soils have a low potential for erosion, while Milok soils have a moderate to high potential for erosion. Polychrome soils have a moderate potential for reclamation, while Milok soils have a high potential for reclamation. The 7.3 acres of soil disturbance within the 30-foot-wide construction area for the proposed access road and Bean Draw Road improvements would be temporary and would be reclaimed when construction activities are completed.

Direct impacts to cryptobiotic soils would include changes in cryptobiotic soil structure and function due to soil exposure from vegetation removal, removal or compaction of cryptobiotic soil crusts, potential destabilization of underlying soils, decreases in soil nutrients, and increased susceptibility to wind and water erosion. Recovery rates are dependent on several factors, including disturbance type, extent, and severity of the disturbance; adjoining substrate condition; vascular plant community structure; and climate conditions during and following disturbance (U.S. Department of the Interior, Bureau of Land Management, and U.S. Geological Survey 2001). Currently there are no cost-effective technologies for restoring biological soil crusts.

The VFO RMP contains stipulations meant to protect soil resources, which would be incorporated into any approval of drilling activities.

Table 4-2. Acres of Soil Disturbance under the Proposed Action

	Arches-Mespun-Rock outcrop complex, 4 to 40 percent slopes	**Cliff sandy loam, 2 to 4 percent slopes**	**Polychrome-Milok complex, 8 to 50 percent slopes**	**Stygee silty clay loam, 0 to 1 percent slopes**	**Uffens sandy loam, 0 to 2 percent slopes**
Access road 18-foot-wide (acres)	3.0	0.0	0.4	0.0	0.0
Access road 30-foot-wide temporary construction area (acres)	2.0	0.0	0.3	0.0	0.0
Pits/Backfill excess material (acres)	1.2	0.0	0.0	0.0	0.0
Topsoil stockpiles (acres)	0.3	0.0	0.0	0.0	0.0
Well pads/Toe of fill slope (acres)	2.0	0.0	0.0	0.0	0.0
Bean Draw Road improvements 18-foot running surface (acres)	0.1	0.3	0.2	0.02	0.0
Bean Draw Road improvements 30-foot-wide temporary construction area (acres)	1.5	2.1	1.1	0.3	0.4
Total (acres) / Percent of soil type in the analysis area	**6.6 / 0.3% (permanent) 3.5 / 0.1% (temporary)**	**0.3 / 0.03% (permanent) 2.1 / 0.2% (temporary)**	**0.6 / 0.1% (permanent) 1.4 / 0.2% (temporary)**	**0.02 / 0.01% (permanent) 0.3 / 0.2% (temporary)**	**0.0 / 0.0% (permanent) 0.4 / 0.7% (temporary)**

CSU stipulation requires that surface operating standards for oil and gas exploration and development (The Gold Book) be used as a guide for surface-disturbing proposals on steep slopes/hillsides.

CSU stipulation requires that if surface-disturbing activities cannot be avoided on slopes from 21 to 40 percent, a plan will be required. The plan will be approved by the BLM prior to construction and maintenance and will include the following:

- An erosion control strategy
- Geographic information systems (GIS) modeling
- Proper survey and design by a certified engineer
- NSO stipulation for slopes greater than 40%.

Under the Proposed Action, there would be approximately 0.1 acre of permanent surface disturbance and approximately 0.1 acre of temporary surface disturbance in areas with slopes between 20 and 40 degrees. There would be no surface disturbance in areas with slopes above 40 degrees.

4.1.4.1 Mitigation Measures

No mitigation measures for impacts to soil resources were identified under the Proposed Action.

4.1.4.2 Residual Impacts

Residual impacts are as previously described in Section 4.1.4 since no mitigation measures were identified.

4.1.5 Vegetation

Surface disturbance from drilling and construction activities associated with the Proposed Action would affect vegetation in the project area through direct removal. The land cover type that would experience the largest acreage of disturbance would be Colorado Plateau Pinyon-Juniper Shrubland (5.8 acres), followed by Inter-Mountain Basins Big Sagebrush Shrubland (1.5 acres). Approximately 2.3 acres of disturbance from the proposed well pads and access road would be temporary disturbance that would occur within the 30-foot-wide construction area for the access road. Disturbance within these 2.3 acres would be reclaimed when construction activities are complete.

The 30-foot-wide ROW in which the proposed improvements to Bean Draw Road would occur includes approximately 5.2 acres of Inter-Mountain Basins Big Sagebrush Shrubland; 4.9 acres of Inter-Mountain Basins Mixed Salt Desert Scrub; 1.3 acres of Invasive Annual Grassland; 1.1 acres of Inter-Mountain Basins Shale Badland; 0.4 acre of Inter-Mountain Basins Greasewood Flat; 0.3 acre of Inter-Mountain Basins Mat Saltbush Shrubland; and 0.1 acre of Colorado Plateau Mixed Low Sagebrush Shrubland. Most of the proposed surface disturbance for the improvements to Bean Draw Road would occur within the existing roadway.

Table 4-3 lists the acres of surface disturbance in each land cover type under the Proposed Action. Figure 4-2 shows the surface disturbance footprint of the Project in relation to land cover types. The BLM would grant a waiver to the NSO stipulation to allow for this proposed surface disturbance, which would apply to the entire lease area.

Indirect effects to vegetation could also occur from dust deposition as a result of vehicles driving on unpaved (i.e., dirt, gravel) roads and surface-disturbing construction activities. Dust deposition on leaves and other plant structures can cause plants to grow at slower rates and result in lower plant density over time. Leaf shaking by wind and leaching by rain can remove dust loads completely from plants at any time (Doley and Rossato 2010). Surface application of water to control fugitive dust would limit effects to vegetation. Expected dust deposition effects to vegetation would be restricted to the project footprint (approximately 8.6 acres), a 300-foot buffer surrounding the project footprint, and areas adjacent to unpaved roads; however, dust deposition can vary widely depending on amounts produced and wind conditions. These effects would be short term and temporary and would be reduced following construction activities.

Construction and drilling activities could spread existing noxious weed populations throughout areas adjacent to the access road by seed transport in fill materials and on vehicles. Vehicles traveling on roads, both paved and unpaved, are conduits for seed dispersal. In addition, noxious weeds often prefer disturbed sites, such as areas cleared for facilities construction (Hobbs and Huenneke 1992). If noxious weeds are introduced or spread, they can invade and outcompete existing vegetation.

During the life of the Project and until the site is released from liability for reclamation, the well pads and access roads would be inspected for noxious weeds. If found, the authorized state or federal agent would be notified, and the weeds would be treated following a program approved by the BLM to eliminate further spreading. Treatment would continue until the weeds have been reduced to preconstruction levels. In addition, all equipment used for construction and drilling would be power washed before it arrives at the project area to remove any invasive, nonnative weed seeds.

If there are invasive plants in the project area, such as cheatgrass, this could lead to a change of ecosystem dynamics and an increase in fire frequency; however, applying the Green River District Reclamation Guidelines should prevent additional hazardous fuels.

4.1.5.1 Mitigation Measures

No mitigation measures for impacts to vegetation were identified under the Proposed Action.

4.1.5.2 Residual Impacts

Residual impacts are as previously described in Section 4.1.5 since no mitigation measures were identified.

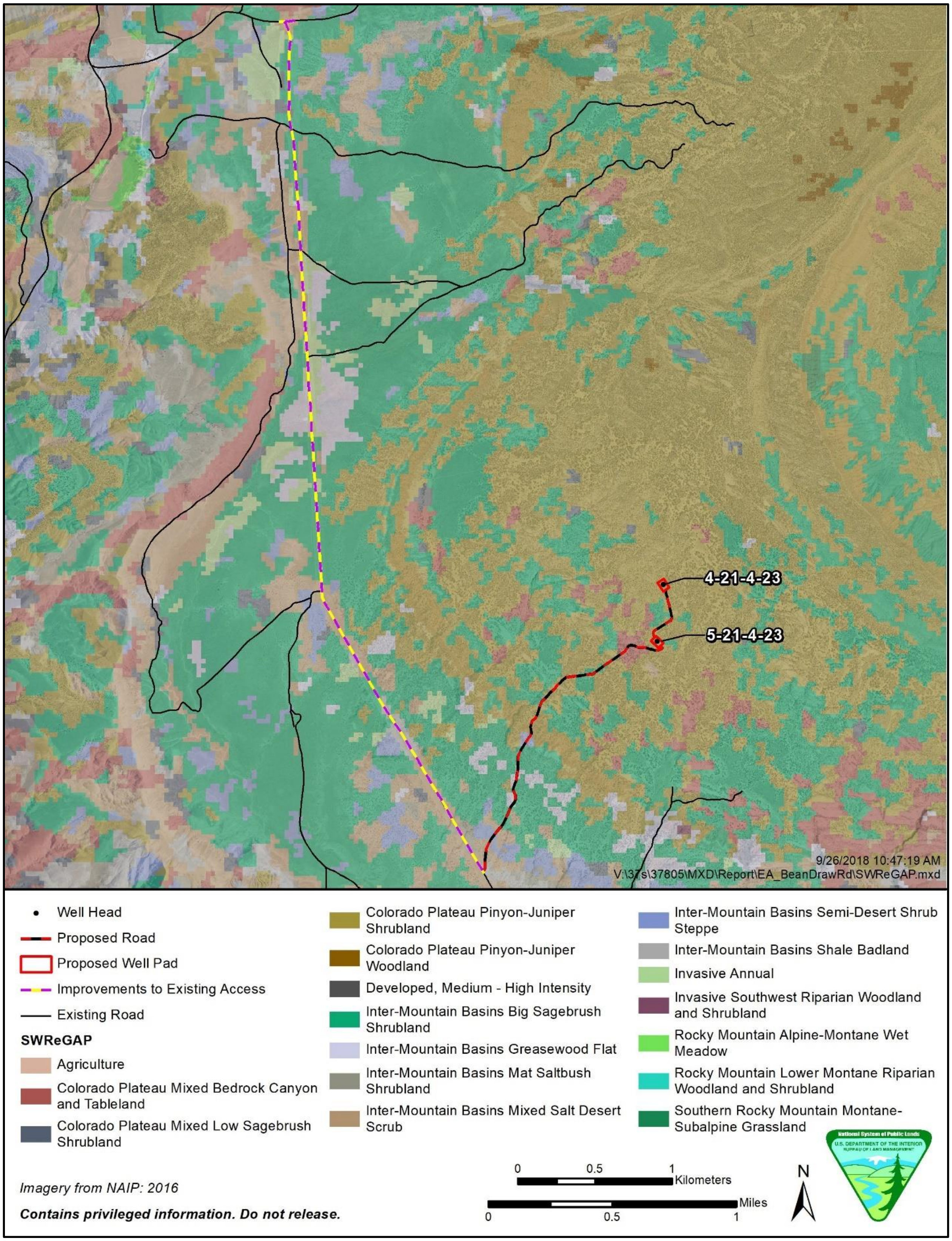

Figure 4-2. Land cover types within the project footprint (proposed road and well pad[s]).

Table 4-3. Acres of Land Cover Type Disturbance under the Proposed Action

	Colorado Plateau Mixed Bedrock Canyon and Tableland	Colorado Mixed Low Sagebrush Shrubland	Colorado Plateau Pinyon-Juniper Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	Inter-Mountain Basins Greasewood Flat	Inter-Mountain Basins Mat Saltbush Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	Inter-Mountain Basins Semi-Desert Shrub Steppe	Inter-Mountain Basins Shale Badland	Invasive Annual Grassland
Access road 18-foot-wide (acres)	0.3	0.0	1.4	0.8	0.3	0.0	0.3	0.2	0.04	0.0
Access road 30-foot-wide temporary construction area (acres)	0.2	0.0	1.0	0.6	0.2	0.0	0.2	0.1	0.03	0.0
Pits/Backfill excess material (acres)	0.0	0.0	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Topsoil stockpiles (acres)	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Well pads/Toe of fill slope (acres)	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bean Draw Road improvements 18-foot running surface (acres)	0.0	0.04	0.0	0.3	0.03	0.0	0.2	0.0	0.0	0.1
Bean Draw Road improvements 30-foot-wide temporary construction area (acres)	0.0	0.1	0.0	2.1	0.2	0.1	1.9	0.0	0.4	0.5
Total (acres) / Percent of soil type in analysis area	**0.3 / 0.02% (permanent) 0.2 / 0.01% (temporary)**	**0.04 / 0.005% (permanent) 0.1 / 0.01% (temporary)**	**4.8 / 0.1% (permanent) 1.0 / 0.03%% (temporary)**	**1.2 / 0.03% (permanent) 2.7 / 0.06%% (temporary)**	**0.3 / 0.05% (permanent) 0.4 / 0.06% (temporary)**	**0.0 / 0.0% (permanent) 0.1 / 0.01% (temporary)**	**0.5 / 0.02% (permanent) 2.1 / 0.08% (temporary)**	**0.2 / 0.03% (permanent) 0.1 / 0.02% (temporary)**	**0.04 / 0.01% (permanent) 0.4 / 0.1% (temporary)**	**0.1 / 0.06% (permanent) 0.5 / 0.3% (temporary)**

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4.1.6 Visual Resources

In a viewshed analysis, line-of-sight visibility was calculated for up to a 5-mile radius from the project area (Figure 4-3). This GIS analysis used a digital terrain model to calculate whether one cell was visible from another cell based on elevations of the two cells and the elevations of any cells between the two. Two things that affect the accuracy of this type of analysis are height of vegetation and visual magnitude.

As noted in Section 3.2.6, this landscape has a relatively high visual absorption capacity due to the topography and the density and height of vegetation (10–15 feet). This would effectively screen much of the surface disturbance and structures associated with the Proposed Action. Because this is not accounted for in the viewshed analysis, the potentially visible areas shown in Figure 4-3 are overestimated.

The other variable that affects potential visibility is visual magnitude or visual angle. This relates to the perceived size of an object based on the distance between the object and an observer: the farther away an observer is, the smaller the object appears. For example, at a distance of 1-mile, a 20-foot object would appear to be about 0.15 inch in size to a human observer. At 2 miles, the object would appear to be 0.06 inch in size. There are other factors that affect this perception, such as visual acuity of the human eye, atmospheric visibility, and visual contrast between the object and surrounding colors and textures. Haack et al. (2013) noted that modifications that occupy less than 5 degrees of the field of view are considered insignificant and have low visual prominence to an observer, especially if contrast is low. The overall impact is that, given the size of potentially visible structures and the minimum distance of likely viewers (1.4 miles from KOP 1 and 3.8 miles from KOP 2), the Proposed Action would appear to be a small and insignificant component of the surrounding visual backdrop. The tallest permanent infrastructure under the Proposed Action would be the tank, which was assumed to be 12 feet tall for the purposes of the visual resource analysis. Potential impacts to night skies would be minimized because no lighting would be used at night during production unless lighting is deemed necessary for safety.

4.1.6.1 Key Observation Point 1

The topography and vegetation would shield most of the proposed surface disturbance of the well pads and access road leading to them from viewpoints along Bean Draw Road and surrounding areas; however, vegetation removal and soil disturbance would create some visual contrast by creating visible, light-colored patches against darker vegetation. These patches would appear similar to the surrounding naturally occurring patches in terms of color, contrast, and pattern (Figures 4-4 and 4-5). Although elements of the proposed well pads (VRM Class II) would be visible from KOP 1, the anticipated level of change to the existing visual character of the landscape would be subtle and would not likely attract the attention of the casual observer. Improvements to Bean Draw Road (VRM Classes II and III) would be obvious from KOP 1 but would be similar in nature to the existing road and would not constitute any significant change in visual contrast from the existing condition.

The well pads would be approximately 1.4 miles away from KOP 1. Because the proposed well pad sites would be approximately 300–400 feet higher in elevation than the potential viewers at Bean Draw Road, intervening vegetation may provide slightly more screening; however, this elevational difference also increases the potential for project elements to be more visible along the perceived ridgeline.

4.1.6.2 Key Observation Point 2

The well pads would be approximately 3.8 miles away from KOP 2. Because potential viewers would be driving, the distance, and the low degree of contrast between the Proposed Action and the color and texture of surrounding landforms and vegetation make it unlikely that the well pads or access roads would be noticeable from KOP 2 (Figures 4-6 and 4-7).

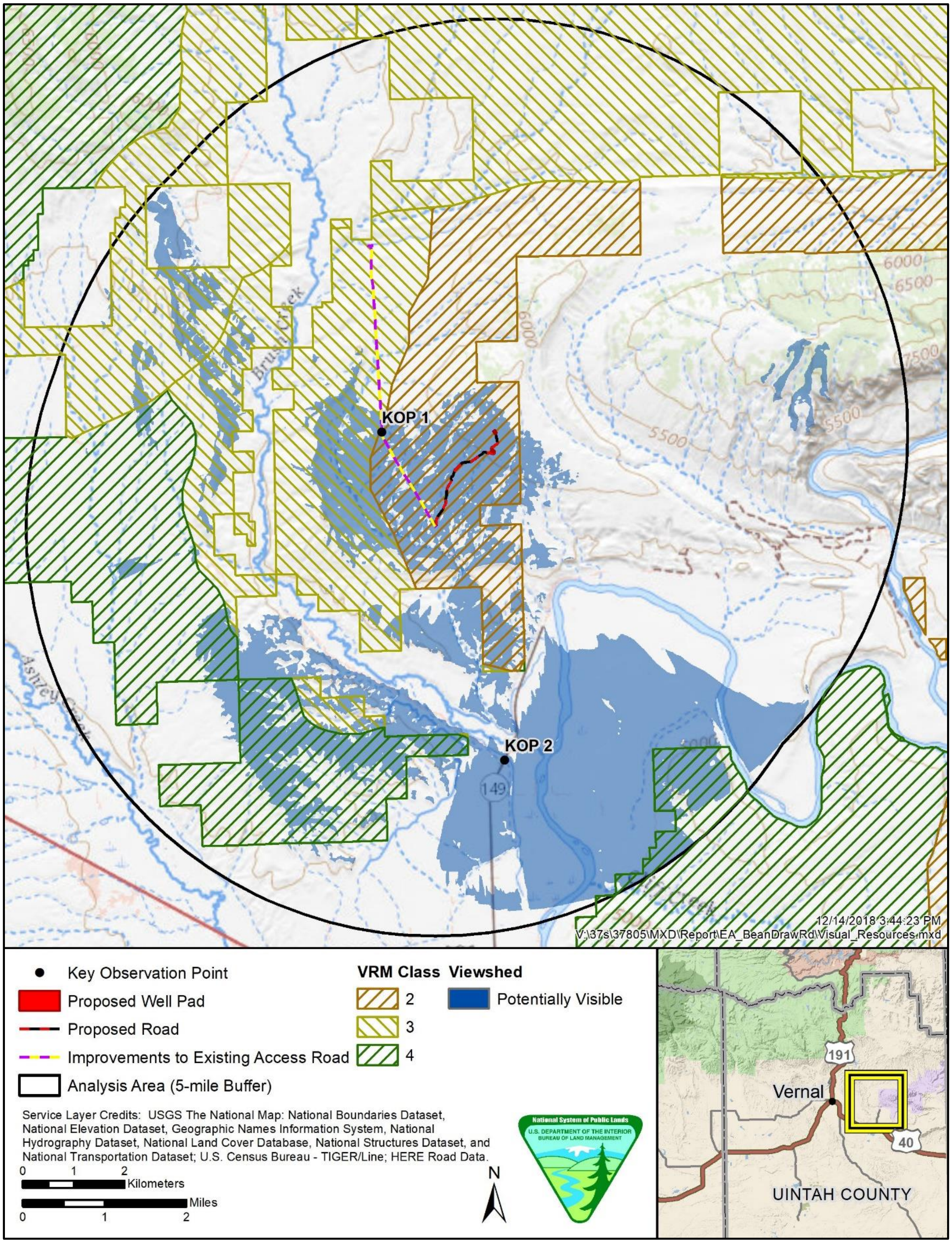

Figure 4-3. Visibility analysis within 5 miles of the project area.

Figure 4-4. Existing view to the east from Key Observation Point 1 along Bean Draw Road.

Figure 4-5. Simulation of wells 4 and 5 from Key Observation Point 1.

Figure 4-6. Existing view to the east from Key Observation Point 2 along Utah State Highway 149.

Figure 4-7. Simulation of wells 4 and 5 from Key Observation Point 2.

4.1.6.3 Mitigation Measures

Applicant would not use road base or other road-building materials that would create a high visual contrast between the native soil and the road.

If it is determined by the BLM that disturbed soil or rock is light enough to attract the attention of the casual observer from KOPs 1 or 2, then a rock stain (e.g., Permeon or Natina) would be applied to lessen the contrast.

If it is determined that lighting will attract the attention of the casual observer from KOPs 1 or 2, light pollution will be mitigated by using methods such as limiting height of light poles, limiting wattage intensity, and constructing light shields unless otherwise required by OSHA or the Federal Aviation Administration.

4.1.6.4 Residual Impacts

Mitigation measures would be effective because they would reduce the potential for visual contrast from construction, reduce the potential for noticeable lighting, and limit drilling lighting to times when casual observers are least likely to be at the KOPs.

4.1.7 Wildlife

Impacts from the Proposed Action on common wildlife species encountered in the project area would generally consist of approximately 9.3 acres of habitat loss (0.06% of the wildlife analysis area). Surface disturbance could result in the direct loss of habitat elements such as groundcover and trees, which could cause a decrease in available forage and cover for certain species (e.g., birds, mule deer). The BLM would grant a waiver to the NSO stipulation to allow for this proposed surface disturbance, which would apply to the entire lease area.

Effects on wildlife from human activity and noise during Proposed Action construction and operations would consist of auditory and visual disturbances to individual wildlife present in or near the project area, which could cause stress to individual animals. Noise from light traffic and heavy diesel trucks used during construction and operations activities would typically be in the range of approximately 50 decibels on the A-weighted scale (dBA) to 90 dBA (EPA 1974). Under the Proposed Action, this noise would be short term and sporadic in nature, and the sound level would be reduced the farther a receptor is from the project area. Because of the inverse-square law in physics, a doubling of the distance from the sound source results in a 6-dBA reduction in the sound level. Therefore, if construction and operations activities produce 90 dBA from 25 feet away, the sound level would be 84 dBA from 50 feet away, 78 dBA from 100 feet away, and so on. Using this calculation, noise levels of 90 dBA would be reduced to approximately 66 dBA from approximately 400 feet away. For context, OSHA notes that conversation from 3 feet away is typically 60 dBA and classroom chatter is typically 70 dBA (OSHA 2019). Other factors, such as meteorological conditions and intervening terrain, can also affect how sound propagates over distances. Some wildlife individuals would likely leave the immediate area, resulting in a temporary spatial redistribution of individuals or habitat use patterns. Construction activity and noise would be direct, short-term impacts that would disappear at the completion of the Project. Some human activity and noise associated with drilling operations would be present consistently and in the long term and sporadic in the project area if either proposed well produces in paying quantities because of well maintenance and production trucking activities.

Vehicle use associated with the Proposed Action (during construction and operations) would result in an increased risk of vehicle-animal collisions on project access roads and could cause stress to individual animals. Vehicle-animal collisions could cause injury or mortality to individual wildlife. This risk would be minimal because of the low level and sporadic nature of anticipated vehicle use. Drilling operations would include the construction of reserve pits at each pad to contain drilling fluids. Reserve pits would present trapping hazards to wildlife. Big game and larger animals would be protected through the fencing of each reserve pit. In accordance with the BLM's Gold Book standards (BLM 2007), three sides of the reserve pit would be fenced during drilling activities. The fourth side would be fenced upon completion of drilling.

Common wildlife species' population viability (e.g., American robin [*Turdus migratorius*], ground squirrel [Sciuridae]) is unlikely to be affected because of the relatively small percentage of surface disturbance in the analysis area (0.06%) and the ability of individuals to move into adjacent habitat as needed to avoid the disturbance.

4.1.7.1 Big Game

Impacts to big game would be the same as those described above along with the more specific impacts discussed below.

Because the Proposed Action would affect such a small portion of mule deer habitat, its impact on mule deer would likely be negligible. All Proposed Action surface disturbance would occur within crucial winter habitat for mule deer. Under the Proposed Action, there would be approximately 7.6 acres of permanent surface disturbance and 7.7 acres of temporary surface disturbance in crucial winter habitat for mule deer in the 16,881-acre wildlife analysis area (Table 4-4), resulting in a loss of approximately 0.1% of the total mule deer crucial winter habitat in the wildlife analysis area. The approximately 3.4 acres of the proposed new access road would be unlikely to result in habitat fragmentation because the road would be unpaved, would cover a relatively small area of habitat, and traffic on the road would be infrequent and light. The well pads and fenced drill rigs could result in some hindrance of movement for mule deer. The project area is in the South Slope deer unit, which is currently considered to be declining slightly (UDWR 2016a). The Proposed Action would create approximately 1.2 acres of permanent disturbance in Inter-Mountain Basins Big Sagebrush Shrubland, which would represent approximately 0.03% of this land cover type in the analysis area. Because the Proposed Action would impact such a small portion of this land cover type, it would likely result in a negligible decline in the condition of mule deer winter range.

Under the Proposed Action, there would be approximately 0.3 acre of temporary disturbance in crucial winter habitat for Rocky Mountain elk (approximately 0.03% of the total crucial winter habitat for Rocky Mountain elk in the analysis area) (see Table 4-4). Because Bean Draw Road is an existing road, the proposed improvements would not result in any new big game habitat fragmentation. The project area is in the South Slope elk unit and Vernal subunit, which is currently considered to be declining slightly (UDWR 2016b). The Proposed Action would create approximately 1.2 acres of permanent disturbance in Inter-Mountain Basins Big Sagebrush Shrubland, which would represent approximately 0.03% of this land cover type in the analysis area. Because the Proposed Action would impact such a small portion of this land cover type, it would likely result in a negligible decline in the condition of elk winter range.

Table 4-4. Acres of Permanent and Temporary Surface Disturbance in Big Game Habitat under the Proposed Action

	Mule Deer Crucial Winter Habitat	**Rocky Mountain Elk Crucial Winter Habitat**
Access road 18-foot-wide (acres)	3.4	0.0
Access road 30-foot-wide temporary construction area (acres)	2.3	0.0
Pits/Backfill excess material (acres)	1.2	0.0
Topsoil stockpiles (acres)	0.4	0.0
Well pads/Toe of fill slope (acres)	2.0	0.0
Bean Draw Road improvements 18-foot running surface (acres)	0.6	0.0
Bean Draw Road improvements 30-foot-wide temporary construction area (acres)	5.4	0.3
Total (acres) / Percent of big game habitat type in the analysis area	**7.6 / 0.1% (permanent) 7.7 / 0.1% (temporary)**	**0.0 / 0.0% (permanent) 0.3 / 0.03% (temporary)**

4.1.7.2 Migratory Birds and Raptors

For migratory birds and raptors, including golden eagles and burrowing owls, impacts could include a loss of habitat in the project area from surface disturbance and vegetation removal. Habitat loss would be limited because of the small amount of disturbance (9.3 acres or 0.06% of the wildlife analysis area). Impacts could also include the displacement of individual birds, the abandonment of nests during breeding seasons because of human activity and noise, a temporary relocation of prey from the project area because of human activity and noise, and the potential mortality from vehicular collisions. Human activity and noise would be short term during construction activities, occurring sporadically, but they would continue to occur after completion of the Proposed Action. Similar habitat for displaced prey or individual birds would be available in adjacent areas.

4.1.7.3 Greater Sage-Grouse

Loss and fragmentation of sagebrush habitat are the primary causes of the decline of greater sage-grouse populations across the West (Connelly et al. 2004). Several factors—fire, expansion of native conifers, energy development activities, invasive weeds, and lack of sufficient regulatory mechanisms—are linked to the loss of the sagebrush-steppe habitat (USFWS 2013). The response of greater sage-grouse to oil and gas infrastructure has been widely studied over the past decade. Studies consistently support that oil and gas development exerts direct and indirect pressure on greater sage-grouse populations.

A recent study by Pratt and Beck (2019) demonstrated that adult greater sage-grouse individuals avoid mining disturbance when selecting for nesting, breeding, and winter habitats. Not only can mining or mineral extraction directly result in habitat loss but activities such as haul trucking, road maintenance, machinery noise, and expansion of invasive plants can directly and indirectly impact greater sage-grouse. A study of greater sage-grouse winter habitat selection in relation to energy development found that greater sage-grouse avoided energy development in otherwise suitable habitats in the winter (Doherty et al. 2008; Holloran et al. 2015). Greater sage-grouse avoidance of energy development in the winter indicates that a comprehensive strategy is needed to maintain suitable habitats in all seasons. Another study by Lyon and Anderson (2003) observed that hens from disturbed leks were nesting farther from the lek due to light road traffic (1–12 vehicles per day) during breeding. Braun (1986) reported that the upgrade of haul roads associated with surface coal mining in North Park, Colorado, resulted in a lek that was 50 m from a road becoming inactive and an 83% reduction in strutting males on another lek that was 500 m from a road within 3 years of the upgrade. When looking at yearling response to gas development, Holloran et al. (2010) found that the annual survival was lower for yearling males and females reared in areas where infrastructure was present. Avoidance of infrastructure may indicate that energy development can affect the spatial distribution and numerical size of regional sage-grouse populations. Overall, there is an abundance of literature supporting that oil and gas development has a negative impact on greater sage-grouse populations over time both directly and indirectly (Green et al. 2017). These impacts of habitat fragmentation on a landscape species that needs large intact tracts of sagebrush are well documented (Naugle and Boyce 2011).

The disturbance at the impact site will incur displacement from and loss of greater sage-grouse wintering habitat (6.8 acres of direct loss) until reclamation has restored the habitat; until activities associated with construction, maintenance, and extraction have ceased; and until the area is usable again for greater sage-grouse. The Applicant will be responsible for reclamation efforts that should, over time, return occupied habitat back into a functioning sagebrush system. However, arid ecosystems are less resilient to frequent disturbances such as energy development, conversion agriculture, increased grazing pressure, and increased fire regimes (Chambers et al. 2016, 2017). Consequently, natural recovery from disturbance is slower than it is in more productive systems and is more susceptible to invasion from non-native plants (e.g., cheatgrass), which influences the frequency of disturbance from fire (Balch et al. 2013; Chambers et al. 2016, 2017). Reclamation practices can be used to limit the long-term effect of anthropogenic disturbance, but they are more difficult to implement and less successful in arid ecosystems.

To address these threats to greater sage-grouse and their habitats, required design features, conservation measures, and potential compensatory mitigation will be used to help reduce impacts to greater sage-grouse and their habitats (see Appendix E). Appendix E is also an example form that shows how the BLM will measure the relative value of the chosen habitat improvement project against the habitat impacts from the proposed project in conformance with the Utah Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) (BLM 2015). The State of Utah was also consulted with the State of Utah, , to determine if the existing mitigation applied is sufficient or if additional mitigation including compensatory mitigation is required or recommended under State regulation, policies, or programs related to the conservation of the greater sage-grouse. In May 2019, a letter and pertinent information were sent to Braden Sheppard at the Public Lands Policy and Coordinating Office (PLPCO) and to Brian Maxfield at the UDWR in the Northeastern Region Office. In the letter, the BLM requested that the State of Utah review the proposed project, Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23 (DOI-BLM-UT-G010-2017-0036-EA), to determine if the existing mitigation applied is appropriate or if additional mitigation including compensatory mitigation is required or recommended under State regulation, policies, or programs related to the conservation of the greater sage-grouse. The State of Utah officially responded in June 2019 with their recommendations. The State of Utah recommended a 4:1 mitigation ratio for the loss of GRSG habitat. White-Tailed Prairie Dog

Under the Proposed Action, the proposed improvements to Bean Draw Road would result in approximately 5.0 acres of permanent surface disturbance and approximately 3.3 acres of temporary surface disturbance in white-tailed prairie dog habitat. For white-tailed prairie dogs, impacts would include a loss of habitat in the project area from surface disturbance, vegetation removal, and habitat fragmentation. Habitat loss would be limited because of the small amount of disturbance (8.3 acres or 0.5% of white-tailed prairie dog habitat in the wildlife analysis area). Impacts could also include the displacement of individual prairie dogs; the abandonment of burrows because of surface disturbance, human activity, and noise; potential mortality from surface disturbance and vehicular collisions, and loss of forage due to vegetation removal and potential invasion of nonnative plant species. Human activity and noise would be short term during construction activities, occurring sporadically, but they would continue to occur after completion of the Proposed Action. Because of the relatively small amount of disturbance to prairie dog habitat, the Project is unlikely to affect the population viability of this species.

4.1.7.4 Mitigation Measures

No construction or drilling activities would be allowed from December 1 through April 30 to protect mule deer and Rocky Mountain elk crucial winter range. This timing could be waived if a BLM-approved biologist determines that the mule deer are not present. Surveys would be performed no more than 7–10 days before ground disturbance is proposed to begin.

No construction or drilling would be allowed within 100 feet of nesting migratory birds from March 1 to August 31 to protect nesting birds. This timing could be waived if a BLM approved biologist determines that migratory bird nests are not present. Surveys would be performed no more than 7–10 days before ground disturbance is proposed to begin.

No construction or drilling would be allowed within 0.5 mile of an active golden eagle nest from January 1 to August 31 to protect nesting eagles. This timing restriction could be waived if a BLM approved biologist determines that the nest is not active. Surveys would be performed no more than 7–10 days before ground disturbance is proposed to begin.

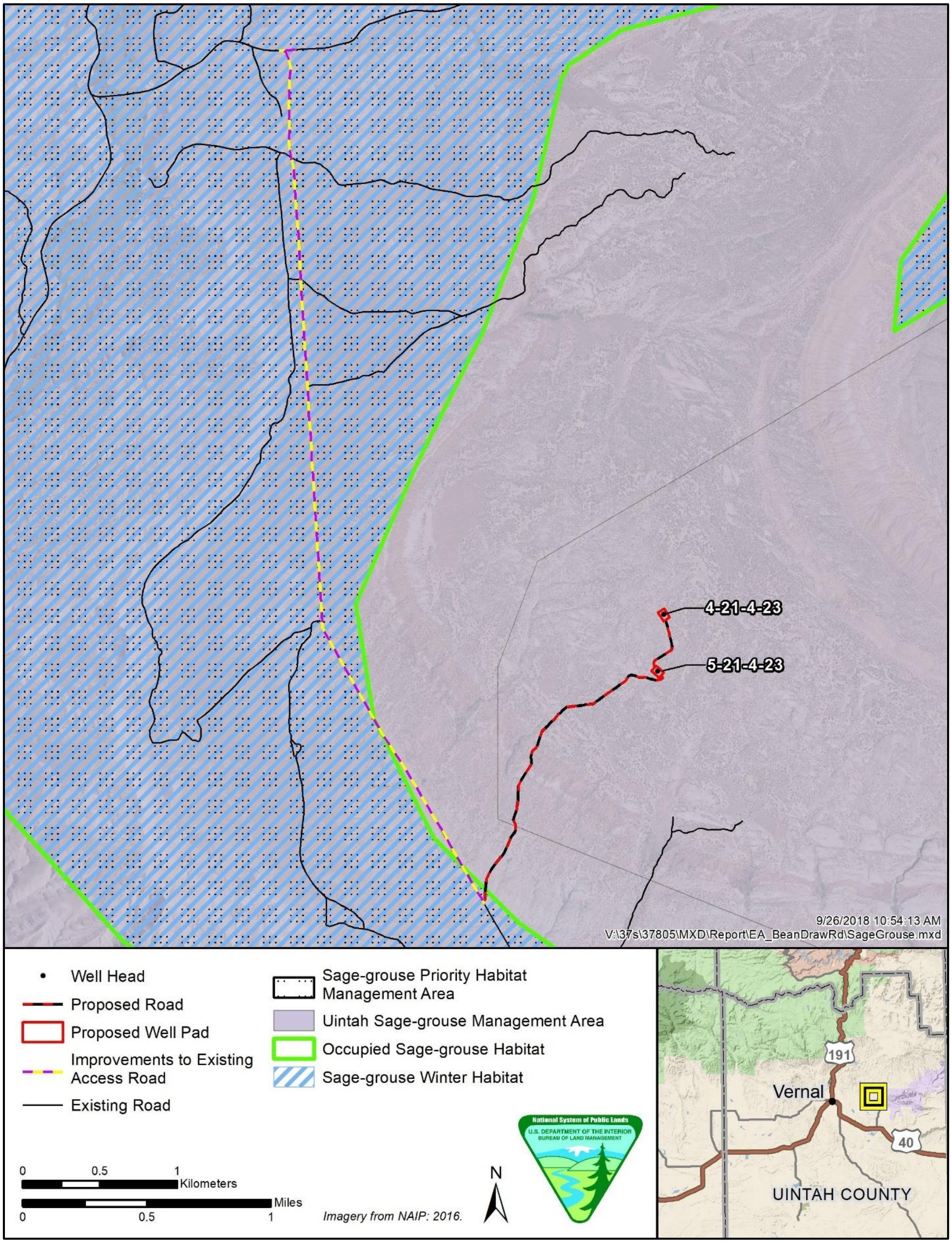

Figure 4-8. Greater sage-grouse habitat in the project area (proposed access road and well pad[s]).

No construction or drilling would be allowed from March 1 to August 31 within 0.25 mile of an active burrowing owl nest to protect nesting owls. This timing restriction could be waived if a BLM approved biologist determines that active nests are not present. Surveys would be performed no more than 7–10 days before ground disturbance occurs.

No ground-disturbing activities would be allowed from November 15 through March 15 to protect greater sage-grouse in their PHMA habitat.

Road construction would not be authorized to minimize noise during the winter season (November 15–March 15) when greater sage-grouse are using the area.

Multi-cylinder pumps, hospital sound-reducing mufflers, and directional placement of exhaust system would be used to reduce noise pollution.

Greater Sage-Grouse Mitigation Measures: Also see Appendix E for details.

- Seasonal Restrictions: No ground-disturbing activities will be authorized during the following season: Winter habitat: November 15–March 15.
- Noise Restrictions: Road construction would not be authorized during the winter season (November 15–March 15) when greater sage-grouse are utilizing the area.
- Predation: Individuals constructing the road will remove any trash or debris resulting from construction. No new permanent facilities will be constructed within the PHMA boundary, thus eliminating perching and nesting opportunities for predators.
- Required Design Features: See Appendix E.
- Compensatory Mitigation: The State of Utah recommends a 4:1 compensatory mitigation ratio, based on their greater sage-grouse conservation plan for direct loss of greater sage-grouse habitat (UDWR 2019b).

4.1.7.5 Residual Impacts

The mitigation measures listed above would reduce potential impacts to migratory birds and raptors during breeding and nesting by avoiding project activities during those seasons. The mitigation measures listed above would reduce potential impacts to mule deer and greater sage-grouse by avoiding project activity during crucial times in their wintering habitat. The mitigation measure addressing noise pollution would help reduce impacts to wildlife from human-created noise. Residual impacts to wildlife would be as described above in Section 4.1.7.

Greater Sage-Grouse Residual Impacts

If the above mitigation measures are implemented, residual impacts would consist of the following:

- Loss and fragmentation of habitat, though these impacts would be offset by the compensatory mitigation
- Disturbance from periods of human activity to greater sage-grouse in the winter habitat

4.1.8 Air Resources

4.1.8.1 Ambient Air Quality

The Proposed Action is considered a minor air pollution source under the CAA as present control technology on some emissions sources (e.g., drill rigs) is not required by regulatory agencies. Annual estimated emissions from the Proposed Action are summarized in Appendix G: Emissions Inventory. The conformity determination for this project is contained in Appendix F.

Well development includes NO_X, SO_2, and CO tailpipe emissions from earth-moving equipment, vehicle traffic, drilling, and completion activities. Fugitive dust concentrations would also occur from vehicle traffic on unpaved roads and wind erosion where soils are disturbed. Drill rig and fracturing engine operations would result mainly in NO_X and CO emissions, with lesser amounts of SO_2. These emissions would be short-term during drilling and completion. During well production, continuous NO_X, CO, VOC, and HAP emissions would originate from well pad separators and condensate storage tank vents. Tailpipe and fugitive dust emissions would occur from operations traffic. Fugitive dust (PM_{10} and $PM_{2.5}$) from roads would also be produced by vehicles servicing the wells. The primary sources of HAPs are oil storage tanks and other production equipment. Small amounts of HAPs are emitted by construction equipment; these emissions are estimated to be minor. Emissions would be dispersed or diluted to the extent where any local ozone impacts from the Proposed Action would be indistinguishable from background conditions.

Air quality impacts are incorporated by reference from the Monument Butte Oil and Gas Development Project Final EIS Section 4.2 and Appendix F, which modeled near field and far field impacts from oil and gas development to the Uinta Basin airshed (BLM 2015). The results of this model greatly overestimate the air quality impacts of the Proposed Action because it included 5,750 oil and gas wells (versus two for the Proposed Action), and because it does not include the reductions required by regulations promulgated since 2014 (including State of Utah General Administrative Order DAQE-ANI49250001-14, the tribal New Source Review programs, and the Waste Prevention Rule).

None of the maximum modeled impacts for the Monument Butte proposed action exceed the NAAQS (BLM 2015: Tables 4.2.1.1.2-1 and 4.2.1.1.2-2). The peak project-specific ozone impact (fourth-highest 8-hour daily maximum) for the absolute modeling results is 1.6 parts per billion at the Dinosaur air quality monitoring station. None of the maximum modeled impacts for HAPs are greater than the HAP evaluation criteria or greater than the EPA's acceptable range of cancer risk (BLM 2015: Table 4.2.1.1.3-1). None of the maximum modeled impacts at Class I and sensitive Class II areas are greater than the applicable PSD increments (BLM 2015: Table 4.2.1.1.4-1). For regional haze impacts, modeling showed 1 day at the nearest Class I area (Arches National Park) where the maximum deciview (dV) change was greater than 1.0, but the 98th percentile maximum change was less than 1.0 dV. Regional haze impacts at Class II areas are shown in Table 4.2.1.1.4-2 (BLM 2015). For acid deposition, none of the maximum modeled impacts for the Monument Butte proposed action exceeded the 3 and 5 kilogram per hectare-year impact thresholds. The deposition analysis threshold (DAT), a level below which estimated impacts from a source are considered negligible, was exceeded at the closest Class I and Class II areas for nitrogen deposition, but not for sulfur deposition. None of the maximum modeled impacts for the Monument Butte proposed action would exceed the acid neutralizing capacity evaluation thresholds at the 21 evaluated sensitive lakes. In summary, all of the evaluated potential air quality impacts of the Monument Butte proposed action and alternatives were less than the evaluation criteria, except for regional haze impacts in two sensitive Class II areas and one day in Arches National Park. These results indicate that Proposed Action impacts to air quality would not exceed the NAAQS or other applicable evaluation criteria.

Best management practices have been developed for oil and natural gas drilling and production to help minimize impacts to air quality through reduction of emissions, surface disturbances, and dust from field production and operations. The BLM also encourages oil and natural gas companies to adopt other proven, cost-effective technologies and practices that increase operational efficiency and reduce emissions. The Proposed Action would comply with all applicable state air quality regulations and dust control requirements.

4.1.8.2 Greenhouse Gases and Climate Change

Direct emissions of GHGs occur during both the construction/drilling and operation phases of a well. Construction/drilling emissions occur from heavy equipment and vehicle exhaust; drill rigs; completion equipment, including fracturing engines; and venting. Operation emissions occur from storage tank breathing and flashing, truck loading, pump engines, heaters and dehydrators, pneumatics, flaring, fugitives, and vehicle exhaust. GHG emissions for well construction/drilling and operation are listed in Table 4-5 and are calculated by multiplying the single well emissions from Appendix G with the number of wells developed under the Proposed Action.

Table 4-5. Estimated Emissions for Drilling and Operating Wells from the Proposed Action

	CO2	CH4	N2O	CO2e (100-yr GWP)	CO2e (20-yr GWP)
Construction & Drilling (Development)	874.08	1.98	0.484	1,057.8	1,168.3
Operation	810.44	5.50	0.083	986.5	1,294.4

Indirect Impacts from Combustion of Produced Oil or Gas

Indirect GHG emissions will result from the end use of the fossil fuel. Estimates of downstream emissions are assumed to come from the combustion of all produced oil or gas for domestic heating or energy production; however, the BLM has no authority to direct or regulate the end use of the produced products, and an actual end use may differ from the assumption used for calculating downstream GHG emissions.

Calculations of indirect emissions from downstream combustion can be made by multiplying the produced number of barrels (bbl) of oil and thousand cubic feet (mcf) of gas with GHG emission factors from the EPA Greenhouse Gases Equivalencies Calculator – Calculations and References webpage (EPA 2019c). These emission factors are used because they provide a quick calculation of the equivalent amount of CO_2 produced from a bbl of oil or mcf of gas. The emission factors also follow IPCC guidance by accounting for 100% oxidation of carbon in the fossil fuel to CO_2, regardless if the carbon atom is part of a CO_2, CH_4, or other hydrocarbon molecule.

As it is unknown how much oil would be produced from the Proposed Action, it is assumed that future wells will produce oil in similar amounts as existing nearby wells. The GHG EA (BLM 2021) estimated the average oil and gas production per well in the Vernal Field Office results in end-use GHG emissions of 2,471 MT CO_2e/yr. The Proposed Action wells may produce more or less than the average well in the field office and annual end-use emissions could be higher or lower than the estimate provided. Table 4-6 lists the estimated annual GHG emissions for a single well and for the Proposed Action.

Table 4-6. Estimated Emissions for Downstream Combustion of Produced Oil and Gas from the Proposed Action

	Single Well Annual Emissions Range (MT CO_2e/yr)	Two Wells Annual Emissions Range (MT CO_2e/year)
Vernal	2,471	4,942

Lifetime GHG emissions from the Proposed Action are estimated in Table 4-7. Lifetime emissions can be estimated by multiplying well production life with the operation and combustion emissions and adding the one-time construction emissions. Assuming an average well life of 30 years, the total gross emissions from the Proposed Action would be 0.179 MMT CO_2e.

Table 4-7. Estimated Lifetime Emissions for Downstream Combustion of Produced Oil and Gas from the Proposed Action

Field Office	Two Wells Construction/ Drilling Emissions (MT CO_2e)	Two Wells 30-Year Lifetime Operation Emissions (MT CO_2e)	Two Wells Total 30-Year Lifetime Average Combustion Emissions (MT CO_2e/yr)	30-Year Lifetime Total Emissions
Vernal	1,058	29,595	148,260	178,913

As climate change is a response to global emissions of GHGs, it is not possible to assign an environmental impact based on a single action that is identifiable apart from natural inter-annual variability. Emission estimates themselves are presented for disclosure purposes and as a proxy for the direct and indirect impacts from the Proposed Action. Emissions can be compared to the state and national emissions listed in Table 3-8 to provide a scale of the impact. To express GHG emissions on a scale relatable to everyday life, the EPA GHG equivalency calculator can be used (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator). The construction, operation, and average combustion GHG emissions projected per year from this two-well project is 6,986 MT CO_2e/yr and is equivalent to 1,509 passenger vehicles driven for 1 year, or energy use for 806 homes for 1 year. As climate change is a result of all GHG emissions across the globe, climate change impacts are further discussed in the Cumulative Impacts section of this document.

"Social cost of carbon" estimates is one approach that an agency can take to examine climate consequences from GHG emissions resulting from a proposed action; however, this EA provides no quantitative monetary estimates of any benefits or costs. NEPA does not require an economic cost-benefit analysis (40 CFR 1502.23), although NEPA does require consideration of "effects" that include "economic" and "social" effects (40 CFR 1508.8(b)). Quantifying only the costs of oil and gas development by using the social cost of carbon metrics but not the benefits (as measured by the economic value of the proposed oil and gas development and production generally equaling the price of oil and gas minus the cost of producing, processing, and transporting the minerals) would yield information that is both inaccurate and not useful for the decision-maker, especially given that there are no current criteria or thresholds that determine a level of significance for social cost of carbon monetary values.

Instead, the BLM's approach to GHG and climate change impacts analysis is to include calculations to show estimated direct, indirect, and cumulative GHG emissions from potential future development. The BLM's approach recognizes that there are adverse environmental impacts related to climate change associated with the development and use of fossil fuels, provides potential GHG emission estimates, and discusses potential climate change impacts qualitatively. This effectively informs the decision-maker and the public of the potential for GHG emissions and the potential implications of climate change. This approach presents the data and information in a manner that follows many of the guidelines for effective climate change communication developed by the National Academy of Sciences (National Research Council 2010) by making the information more readily understood and relatable to the decision-maker and the general public.

Uncertainty

The direct and indirect emission estimates above provide an estimate of the full potential for GHGs released into the atmosphere from initial wellsite construction, well drilling and completion, production, and end use. Although this EA presents quantified estimates of direct and indirect GHG emissions associated with the potential for oil development on the leases, GHG emission estimates involve significant uncertainty due to unknown factors, including actual production, how produced minerals are used, the form of regulation of GHG parameters by delegated agencies, and whether any Best Available Control Technologies are utilized at the upstream or downstream emission location(s). Deeper wells require engines with a greater horsepower and take longer to drill but may produce for shorter or longer periods of time. The British thermal unit content of the product can also vary substantially, which will ultimately influence any estimates of GHGs produced or combusted, as can the total volume of liquids produced with the gas stream, which also requires handling. Ultimately, while estimates in this EA are based on the best available data, including information from existing operators regarding future drilling plans and targets, these estimates are subject to many conditions that are largely beyond the BLM's control. Unforeseen changes in factors such as geologic conditions; drilling technology; economics; demand; and federal, state, and local laws and policies could result in different outcomes than those projected in this EA.

The rough estimates of indirect CO_2e emissions presented above are qualified by uncertainty in potential future production and in predicting the end uses for the fuels extracted from a particular leasehold. Future production is uncertain with regard to the actual levels of development over time, levels of development over the life of the lease, new technology, geologic conditions, and the ultimate level of production from any given well (whether reservoir related or for economic reasons). The BLM is using an average production estimate per well for each planning area; this approach may overestimate or underestimate in areas where resource conditions depart from "average," but it allows the BLM to assume for analysis purposes that all lands have equal potential for production. While this may not hold true based on site-specific geology, it is a reasonable forecast that assumes all lands may be produced at some point in the future.

After extraction from federal leases, the end uses of oil may include refining for transportation fuels, fuel oils for heating and electricity generation, or production of asphalt and road oil. Oil may also be used in the chemical industry, for the manufacture of medicines and everyday household items, plastics, military defense, and for the manufacture of synthetic materials. Fossil fuels can be consumed, but not combusted, when they are used directly as construction materials, chemical feedstock, lubricants, solvents, waxes, and other products. Common examples include petroleum products used in plastics, natural gas used in fertilizers, and coal tars used in skin treatment products. The BLM does not control the specific end use of the oil produced from federal leases. As a result, the BLM can only provide an estimate of potential GHG emissions by conservatively assuming that all produced oil would eventually be combusted.

4.1.8.3 Mitigation Measures

All internal combustion equipment would be kept in good working order.

Water or other approved dust suppressants would be used at construction sites and along roads, as determined appropriate by the Authorized Officer.

Open burning of garbage or refuse would not occur at well sites or other facilities.

Drill rigs would be equipped with Tier II or better diesel engines

During completion, no venting would occur, and flaring would be limited as much as possible. Production equipment and gathering lines would be installed as soon as possible.

Hydrocarbon gases will be flared at high temperatures in order to reduce emissions of incomplete combustion through the use of multichamber combustors.

Telemetry will be installed to remotely monitor and control production.

All new and replacement internal combustion gas field engines of less than or equal to 300 design-rated horsepower must not emit more than 2 grams of NO_x per horsepower-hour. This requirement does not apply to gas field engines of less than or equal to 40 design-rated horsepower-hour.

All new and replacement internal combustion gas field engines of greater than 300 design-rated horsepower must not emit more than 1.0 grams of NO_x per horsepower-hour.

Green completions would be used for all well completion activities where technically feasible.

4.1.8.4 Residual Impacts

The above mitigation measures may reduce, but will not eliminate, emissions from the Proposed Action.

4.2 Alternative B – No Action

The following are the impacts expected from the implementation of the No Action Alternative to the resources of concern.

4.2.1 Cultural: Archaeological Resources

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time, and there would be no impacts to archaeological resources from drilling and associated construction activities in the project area.

4.2.2 Lands with Wilderness Characteristics

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to LWCs from drilling and associated construction activities in the project area.

4.2.3 Paleontological Resources

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to paleontological resources from drilling and associated construction activities in the project area.

4.2.4 Soil Resources

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to soil resources from drilling and associated construction activities in the project area.

4.2.5 Vegetation

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to vegetation from drilling and associated construction activities in the project area.

4.2.6 Visual Resources

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to visual resources from drilling and associated construction activities in the project area.

4.2.7 Wildlife

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to wildlife, including big game, migratory birds, and greater sage-grouse, from drilling and associated construction activities in the project area.

4.2.8 Air Resources

Under the No Action Alternative, the proposed wells and ROW would not be approved at this time and there would be no impacts to air resources, including GHGs, and climate change from drilling and associated construction activities in the project area.

4.3 Cumulative Impacts

Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Past and present actions resulting in surface disturbance in the cumulative impacts analysis areas (CIAAs) include oil exploration and development, road construction, pipelines, transmission lines, residential areas, and other surface-disturbing activities, such as agriculture. The two proposed wells are the only reasonably foreseeable future actions in the CIAAs.

4.3.1 Cultural: Archaeological Resources

The CIAA for archaeological resources is the Lower Brush Creek HUC 12 watershed (16,881 acres) because it encompasses the project area and provides distinct topographical boundaries against which to measure cumulative impacts to archaeological resources. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past and present actions in the CIAA that have affected archaeological resources include oil and gas exploration and development, road construction, and pipelines. Cumulative impacts include damage to, or loss of, both surface and subsurface archaeological resources. This typically occurs when surface- or subsurface-disturbing activities damage or destroy archaeological resources but can also result from potential looting because of increased human presence. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J).

The Proposed Action would result in no cumulative impacts to archaeological resources because all archaeological sites eligible for the NRHP would be avoided and monitoring for discovery during construction of undocumented archaeological sites is required. There may be a change in the feel of the archaeological setting because of the infrastructure associated with the Proposed Action. This would not affect the NRHP eligibility criteria of the archaeological sites in the CIAA. Under the No Action Alternative, there would be no cumulative impacts to archaeological resources because the proposed wells and ROW would not be approved.

4.3.2 Lands with Wilderness Characteristics

The CIAA for LWCs is the Split Mountain Benches inventory unit (2,164 acres) and the contiguous National Park Service lands to the east (Dinosaur National Monument) (201,672 acres) because the Split Mountain Benches inventory unit encompasses the project area, is the only LWC unit that would be impacted by the Proposed Action, and the contiguous National Park Service lands help the Split Mountain Benches inventory unit meet the 5,000-acre wilderness characteristic criterion. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past and present actions in the CIAA that have affected wilderness characteristics include road construction, a pipeline, ATV use, and grazing. The surface disturbance, infrastructure, noise, and increased human activity resulting from these past and present actions impact wilderness characteristics, including naturalness, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and supplemental values. These actions have resulted in approximately 11.2 acres of disturbance in the CIAA (approximately 0.01% of the CIAA and approximately 0.5% of the Split Mountain Benches inventory unit). No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J).

The Proposed Action would result in an approximately 75% increase in cumulative surface disturbance in the CIAA, representing disturbance of approximately 0.01% of the CIAA. This increase in surface disturbance would decrease the appearance of naturalness in the project area portion of the CIAA. The increase in human activity during construction and operation activities would affect the opportunities for solitude or a primitive and unconfined type of recreation in the project area portion of the CIAA. The surface disturbance from the Proposed Action would not, by itself or cumulatively with past or present actions, result in segmentation that would cut off any part of the Split Mountain Benches inventory unit from the main body of the unit. Under the No Action Alternative, there would be no cumulative increase in potential impacts to wilderness characteristics from the proposed wells because the proposed wells and ROW would not be approved.

4.3.3 Paleontological Resources

The CIAA for paleontological resources is the Lower Brush Creek HUC 12 watershed (16,881 acres) because it encompasses the project area and provides distinct topographical boundaries against which to measure cumulative impacts to paleontological resources. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past and present actions in the CIAA that have affected paleontological resources include oil and gas exploration and development, road construction, pipelines, and agriculture. Cumulative impacts include damage to, or loss of, both surface and subsurface paleontological resources. This typically occurs when surface- or subsurface-disturbing activities damage or destroy paleontological resources but can also result from potential looting because of increased human presence. Past and present actions have resulted in approximately 700.0 acres of disturbance in PFYC 2 areas, approximately 476.7 acres of disturbance in PFYC 3 areas, and approximately 273.6 acres of disturbance in PFYC 5 areas. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J).

The Proposed Action would add an approximately 1.0% in cumulative surface disturbance to PFYC Class 2 areas, add an approximately 1.1% in cumulative surface disturbance to PFYC Class 3 areas, and add an approximately 0.3% in cumulative surface disturbance to PFYC Class 5 areas in the CIAA. Under the No Action Alternative, there would be no cumulative increase in potential impacts to paleontological resources from the proposed wells because the proposed wells and ROW would not be approved.

4.3.4 Soil Resources

The CIAA for soil resources is the Lower Brush Creek HUC 12 watershed (16,881 acres) because it encompasses the project area and provides distinct topographical boundaries against which to measure cumulative impacts to related soil types. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past and present actions in the CIAA that have affected soil resources include oil and gas exploration and development, road construction, pipelines, transmission lines, residential areas, and other surface-disturbing activities, such as agriculture. These actions affect soil resources through surface disturbance that results in the removal of soil resources, soil compaction, and an increased risk of soil erosion. These actions have resulted in approximately 1,450.4 acres of disturbance to soil resources in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). The acres of existing disturbance to the soil types in the CIAA that would also be disturbed by the Proposed Action are listed in Table 4-8.

Table 4-8. Existing Surface Disturbance in Soil Types in the Cumulative Impacts Analysis Area Affected by the Proposed Action

Soil Type	Acres of Disturbance in the Cumulative Impacts Analysis Area
Arches-Mespun-Rock outcrop complex, 4 to 40 percent slopes	12.7
Cliff sandy loam, 2 to 4 percent slopes	11.9
Polychrome-Milok complex, 8 to 50 percent slopes	8.5
Stygee silty clay loam, 0 to 1 percent slopes	5.5
Total	**38.6**

The cumulative increases to surface disturbance in soil types in the CIAA resulting from the Proposed Action, as well as the percentage of the total acres of each soil type in the CIAA that would be cumulatively impacted, are listed in Table 4-9. Under the No Action Alternative, there would be no cumulative increase in potential impacts to soil resources from the proposed wells because the proposed wells and ROW would not be approved.

Table 4-9. Cumulative Increase in Soil Type Disturbance under the Proposed Action

Soil Type	Cumulative Increase in Disturbance in the Cumulative Impacts Analysis Area (CIAA) / % of Total Available Acres in the CIAA
Arches-Mespun-Rock outcrop complex, 4 to 40 percent slopes	79.5% / 0.9%
Cliff sandy loam, 2 to 4 percent slopes	20.2% / 1.5%
Polychrome-Milok complex, 8 to 50 percent slopes	23.5% / 1.7%
Stygee silty clay, 0 to 1 percent slopes	5.8% / 3.6%

4.3.5 Vegetation

The CIAA for vegetation is the Lower Brush Creek HUC 12 watershed (16,881 acres) because it encompasses the project area and provides distinct topographical boundaries against which to measure cumulative impacts to related vegetation types. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past, present, and reasonably foreseeable future actions in the CIAA that have affected vegetation include oil and gas exploration and development, road construction, pipelines, transmission lines, residential areas, and other surface-disturbing activities, such as agriculture. These actions affect vegetation resources through surface disturbance that results in the temporary or permanent removal of vegetation, decreased vegetation productivity, and an increased risk of the spread of weeds and invasive species. These actions have resulted in approximately 1,450.4 acres of disturbance to vegetation resources in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). The acres of disturbance to each land cover type in the CIAA that is also affected by the Proposed Action are listed in Table 4-10.

Table 4-10. Existing Surface Disturbance in Land Cover Types in the Cumulative Impacts Analysis Area Affected by the Proposed Action

Land Cover Type	Acres of Disturbance in Cumulative Impacts Analysis Area
Colorado Plateau Mixed Bedrock Canyon and Tableland	38.0
Colorado Plateau Mixed Low Sagebrush Shrubland	40.1
Colorado Plateau Pinyon-Juniper Shrubland	83.3
Inter-Mountain Basins Big Sagebrush Shrubland	74.7
Inter-Mountain Basins Greasewood Flat	120.4
Inter-Mountain Basins Mat Saltbush Shrubland	6.9
Inter-Mountain Basins Mixed Salt Desert Scrub	69.8
Inter-Mountain Basins Semi-Desert Shrub Steppe	27.4
Inter-Mountain Basins Shale Badland	5.1
Invasive Annual Grassland	23.2
Total	**488.9**

The cumulative increases to surface disturbance in land cover types in the CIAA resulting from the Proposed Action, as well as the percentage of the total acres of each land cover type in the CIAA that would be cumulatively impacted, are listed in Table 4-11. Under the No Action Alternative, there would be no cumulative increase in potential impacts to vegetation resources from the proposed wells.

Table 4-11. Cumulative Increase in Land Cover Type Disturbance under the Proposed Action

Land Cover Type	Cumulative Increase in Disturbance in Cumulative Impacts Analysis Area (CIAA) / % of Total Available Acres in CIAA
Colorado Plateau Mixed Bedrock Canyon and Tableland	1.3% / 2.3%
Colorado Plateau Mixed Low Sagebrush Shrubland	0.3% / 5.1%
Colorado Plateau Pinyon-Juniper Shrubland	7.0% / 2.6%
Inter-Mountain Basins Big Sagebrush Shrubland	5.2% / 1.8%
Inter-Mountain Basins Greasewood Flat	0.6% / 19.6%
Inter-Mountain Basins Mat Saltbush Shrubland	1.4% / 0.7%
Inter-Mountain Basins Mixed Salt Desert Scrub	3.7% / 2.6%
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.1% / 4.6%
Inter-Mountain Basins Shale Badland	8.6% / 1.6%
Invasive Annual Grassland	2.6% / 15.1%

4.3.6 Visual Resources

The CIAA for visual resources is the viewshed within a 5-mile radius from the project area. This area was chosen because the Proposed Action would not create any cumulative impacts to visual resources beyond the 5-mile viewshed. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past and present actions resulting in visual resource impacts in the CIAA include oil and gas exploration and development, road construction, pipelines, transmission lines, residential areas, and other surface-disturbing activities, such as agriculture. These impacts typically include surface disturbance that creates visual contrast with the color and texture of surrounding landforms and vegetation. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J).

Elements of the Proposed Action would be visible from KOP 1, but they would not likely attract the attention of the casual observer. The Proposed Action would not be noticeable from KOP 2. Because the Proposed Action would result in a subtle change to the visual character of the landscape, and the visual setting of the CIAA includes existing visual contrasts from similar types of development and has a relatively high visual absorption capacity, the cumulative contribution to visual resources impacts in the CIAA would be low. Under the No Action Alternative, there would be no cumulative increase in potential impacts to visual resources because the proposed wells and ROW would not be approved.

4.3.7 Wildlife

The CIAA for wildlife is the Lower Brush Creek HUC 12 watershed (16,881 acres) because it encompasses the project area and represents a defined continuous area linked by common watercourses on which wildlife depend. The temporal boundary for the cumulative impacts analysis is 40 years because it includes the proposed production life and reclamation period. Past and present actions in the CIAA that have affected wildlife include oil and gas exploration and development, road construction, pipelines, transmission lines, residential areas, and other surface-disturbing activities, such as agriculture. These actions affect wildlife through surface disturbance that results in loss or fragmentation of wildlife habitat, direct mortality of wildlife through collisions with vehicles or construction equipment, and altered wildlife behavior because of increased human presence and activities, including the associated noise and artificial lighting.

Past and present actions have resulted in approximately 1,370.3 acres of disturbance in mule deer habitat in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). Approximately 58.2 acres of crucial winter mule deer habitat have been affected by past and present actions in the CIAA. The Proposed Action would affect up to 15.3 acres of crucial winter mule deer habitat. Although the Proposed Action would result in an approximately 26.3% increase in cumulative surface disturbance in crucial winter mule deer habitat, the total cumulative disturbance would represent only 1.0% of the total available acres of this habitat type in the CIAA (7,039.1 acres).

Past and present actions have resulted in approximately 20.1 acres of disturbance in Rocky Mountain elk habitat in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). Approximately 14.2 acres of crucial winter Rocky Mountain elk habitat have been affected by past and present actions in the CIAA. The Proposed Action would affect up to approximately 0.3 acre of crucial winter Rocky Mountain elk habitat. Although the Proposed Action would result in an approximately 2.1% increase in cumulative surface disturbance in crucial winter Rocky Mountain elk habitat, the total cumulative disturbance would represent only 1.6% of the total available acres of this habitat type in the CIAA (921.5 acres). The nature of the impacts would be the same as those described in Section 4.1.7.1.

Past and present actions have resulted in approximately 349.9 acres of disturbance in greater sage-grouse PHMA in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). The Proposed Action would affect up to 6.8 acres of greater sage-grouse habitat. The Proposed Action would result in an approximately 1.9% increase in cumulative surface disturbance in greater sage-grouse habitat, representing a total cumulative disturbance of approximately 7.0% of the total available acres of PHMA in the CIAA (5,111.6 acres). The nature of the impacts would be the same as those described in Section 4.1.7.3.

Past and present actions have resulted in approximately 42.5 acres of disturbance in white-tailed prairie dog habitat in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). The Proposed Action would affect up to 8.3 acres of white-tailed prairie dog habitat. Although the Proposed Action would result in an approximately 19.5% increase in cumulative surface disturbance in white-tailed prairie dog habitat, the total cumulative disturbance would represent only 2.8% of the total available acres of white-tailed prairie dog habitat in the CIAA (1,814 acres). The nature of the impacts would be the same as those described in Section 4.1.7.4.

Past and present actions have resulted in approximately 1,450.4 acres of disturbance in migratory bird and raptor including golden eagle and burrowing owl habitat in the CIAA. No reasonably foreseeable future actions beyond the two proposed wells have been identified in the CIAA (See appendix J). The Proposed Action would affect up to 15.2 acres of migratory bird and raptor including golden eagle and burrowing owl habitat. The Proposed Action would result in an approximately 1.0% increase in cumulative surface disturbance in migratory bird and raptor including golden eagle and burrowing owl habitat, representing a total cumulative disturbance of approximately 8.0% of the total available acres of habitat in the CIAA (16,881 acres). The Proposed Action would represent a cumulative increase in surface disturbance in the CIAA that would result in cumulative impacts to migratory birds and raptors, including golden eagles and burrowing owls. The nature of these impacts would be the same as those described in Section 4.1.7.2.

Under the No Action Alternative, there would be no cumulative increase in potential impacts to wildlife because the proposed wells and ROW would not be approved.

4.3.8 Air Resources

4.3.8.1 Ambient Air Quality

The cumulative impact area for air quality is the Uinta Basin, plus all regional Class I areas and other environmentally sensitive areas (e.g., national parks and monuments, wilderness areas, etc.) near the Uinta Basin through 2021, which is the area and timeframe encompassed by the Air Resource Management Strategy (ARMS) Modeling Project (AECOM 2014). The ARMS project is a cumulative assessment of potential future air quality impacts associated with predicted oil and gas activity in the Uinta Basin. The ARMS is incorporated by reference and predicts the following impacts to air quality and air quality related values. All scenarios predict exceedances of the ozone NAAQS in the Uinta Basin. In the Uinta Basin, the ozone concentrations are highest during the winter period. In Class I and Class II areas outside the Uinta Basin study area, ozone concentrations are highest during the summer period. All modeled NO_2, CO, SO_2, $PM_{2.5}$, and PM_{10} values are well below the NAAQS. The ARMS model determined that in the 2021 future year, all assessment areas are within the applicable PSD increments for annual NO_2, 3-hour SO_2, annual SO_2, and annual PM_{10}, while most assessment areas exceed the 24-hour $PM_{2.5}$ PSD increment (ARMS Report Executive Summary). However, this does not represent a formal regulatory PSD increment consumption analysis since the modeling effort used projected instead of actual development emissions and emissions sources were not separated into PSD increment-consuming and non-PSD increment-consuming sources. Therefore, this PSD analysis is for informational purposes and does not count towards the BLM's determination of significance. Visibility conditions in Class I and sensitive Class II areas generally show improvement in the 2021 Scenarios relative to the 2010 Typical Year. Results generally show a decrease in deposition for the 2021 Scenarios relative to the 2010 Typical Year. Acid Neutralizing Capacity change at all seven sensitive lakes exceeds the 10 percent limit of acceptable change for all model scenarios. It is anticipated that the impact to ambient air quality and air quality related values associated with the Proposed Action would be indistinguishable from and dwarfed by the model and emission inventory scope and margin of error. The No Action Alternative would not contribute to air quality impacts.

4.3.8.2 Greenhouse Gases

The cumulative impact area for GHG is the world and is discussed at various scales (State, National, Federal) to provide context. Climate impacts occur throughout the globe and may include increases in atmospheric and ocean temperatures, sea level rise, impacts to ecosystems and ecosystem biodiversity, changes to weather phenomena (increase in frequency, intensity, and duration), and other impacts that are too numerous to list. This section discusses GHG emissions from foreseeable Federal oil and gas development and the projected climate change that may occur from all GHG sources. Short-term foreseeable emissions from the development of approved APD’s and long-term emissions from oil and gas development in the state, region, and nation are incorporated by reference from the GHG EA (BLM 2021).

Short-term foreseeable GHG emissions from oil and gas wells in Utah are estimated from approved APDs that have not been drilled to completion. These short-term emissions were quantified in the GHG EA (BLM 2021) and are emissions that are expected from the development of previously issued leases. The GHG EA identified that of the approved APDs in Utah that have not been drilled, approximately 116 will be drilled and 107 will produce oil and gas. For the same 5-year period an average of 183 wells per year were plugged. Assuming the rate of well plugging continues, there will be a net decrease of 60 operating wells. Development of these APDs is estimated to result in 88,997 MT CO_2e of construction emissions. Statewide operation and end-use combustion emissions are estimated to decrease by 42,154 MT CO_2e/yr and 195,631 MT CO_2e/yr, respectively, as emissions from 107 new wells that are anticipated to go into production will be offset by production decline in existing wells and the end of emissions from the 183 wells that are estimated to be plugged.

Long-term foreseeable GHG emission estimates from oil and gas wells in Utah are estimated by applying U.S. Energy Information Administrations (EIA) projected growth rates for oil and gas production to the 2019 base year emission estimates provided in Table 3-12**Error! Reference source not found.** These long-term emissions were quantified in the GHG EA (BLM, 2021) and are estimates of emissions that may occur from the existing wells, the development of leases previously issued (including the Proposed Action), and from the development of leases that may be issued in the future. The high and low oil price scenarios for the Rocky Mountain region are used from the EIA's 2020 Annual Energy Outlook (AEO) to provide a range of future oil and gas production growth in Utah. Since GHG emissions are roughly parallel to production volumes (USGS 2018), the EIA growth projections are applied to the base year construction, operation, and combustion emissions to estimate total annual GHG emissions each year through the year 2050. From 2020 to 2050, the annual average oil and gas related emissions in Utah (Federal and non-federal wells) are estimated to range from 35.04 to 42.74 MMT CO_2e/yr, with aggregate emissions over the 30-year period ranging from 1,086.27 to 1,325.05 MMT CO_2e/yr. The foreseeable annual and aggregate emissions estimate for each BLM Utah field office are provided in the GHG EA (BLM, 2021). Assuming the distribution of wells remains the same for each mineral lease type (Federal, State, Tribal, Private), approximately 55% of the emissions would result from Federal leases, annually 19.27 to 23.51 MMT CO_2e/yr. or an aggregate of 597.45 to 728.78 MMT CO_2e from 2020 to 2050.

The GHG EA also looked at potential long-term GHG emissions based on the full development of the reasonably foreseeable development scenario (RFDS) in field office resource management plans. However, this method of estimating long-term emissions was determined to not be useful as it would take over 100 years to fully develop the (RFDS) which is outside the cumulative timeframe (well production life, approximately 30-year) and it is plausible the emissions regulations and control technologies would change such that actual emissions would differ from those estimated. Even though a portion of the long-term emissions from RFDS development would occur outside the cumulative timeframe the GHG EA evaluated the portion that could occur over a 30-year period. Emissions over a 30-year period are estimated to be 324.28 MMT CO_2e, which is 55% of the low and 45% of the high aggregate Federal emissions estimates based on EIA production growth projections in Utah. The BLM finds that the long-term GHG emissions based on EIA oil and gas production growth provides a better estimate of emissions that may occur in the cumulative analysis timeframe.

The GHG EA (BLM 2021) also evaluates existing and potential future Federal fossil fuel emissions that may result from lease parcels across the region and nation. Regional emissions include those that occur in Utah and neighboring fossil fuel producing states (Wyoming, Colorado, and New Mexico). Future emissions from 2020 to 2050 are estimated by applying the EIA 2020 AEO reference scenario production growth projections to the base year emissions estimates. Over the 2020 to 2050 timeframe the aggregate GHG emissions from Utah Federal fossil fuel leasing (coal, oil, and gas; 1,206 MMT CO_2e) is 4.9% of regional Federal emissions (24,769 MMT CO_2e) and 4.4% of U.S. Federal emissions (27,281 MMT CO_2e). Excluding emissions from coal, Federal oil and gas leasing in Utah (598.43 MMT CO_2e) is

6.1% of the regional Federal emissions (9,808 MMT CO_2e) and 5.3% of U.S. Federal emissions (11,218 MMT CO_2e).

Table 4-14 shows the Proposed Action's contribution to aggregate emissions from other oil and gas development in the state, region, and nationally.

Table 4-14. Proposed Action Annual Emissions Compared to the Field Office Cumulative, State, and U.S. Emissions

Proposed Action (MMT CO_2e)	Percent of Utah Federal & NonFederal (1,086 to 1,325 MMT CO_2e)	Percent of Utah Federal (597 to 729 MMT CO_2e)	Percent of Regional Federal (9,808 MMT CO_2e)	Percent of U.S. Federal (11,218 MMT CO_2e)
0.179	0.02% to 0.01%	0.03% to 0.02%	0.002%	0.002%

In the United States, energy related GHG emissions are projected to decrease over the short-term as the power sector transitions away from coal, but energy demands from the transportation and industrial sectors will cause emissions increases in later years through 2050 (EIA 2020). Economic growth is the biggest factor in national GHG emissions projections. For a high economic growth scenario, emissions are 13% higher than the reference scenario in 2050 and the emissions in the low growth scenario is 11% lower than the reference by 2050. The EIA also reports global emissions projections in the International Energy Outlook report (EIA 2019). Worldwide energy related GHG emissions are projected to increase by 0.6% per year from 2018 to 2050. Over the same time period annual energy sector emissions increases from about 35 billion metric tons CO_2e to about 43 billion metric tons CO_2e.

The IPCC developed various emissions scenarios, called Representative Concentration Pathways (RCP) to provide a consistent foundation for climate change modeling and impact assessment. The RCPs are a set of GHG emissions and concentrations trajectories based on potential future energy use, population, and changes to air pollution and land use. There are four scenarios named after the amount of radiative forcing in watts per square meter (RCP2.6, RCP4.5, RCP6, and RCP8.5) that is projected to occur by the year 2100 if actual atmospheric concentrations of GHGs follow one of these paths. There are several other pathways that lead to each level of radiative forcing, but these four RCPs provide plausible emissions paths for assessing the range of possible changes to the climate. Figure -9 shows the different RCP emissions scenarios (bold lines) though the year 2100. Global energy related GHG emissions projections tack closest to RCP6.0 and RCP4.5 though mid-century.

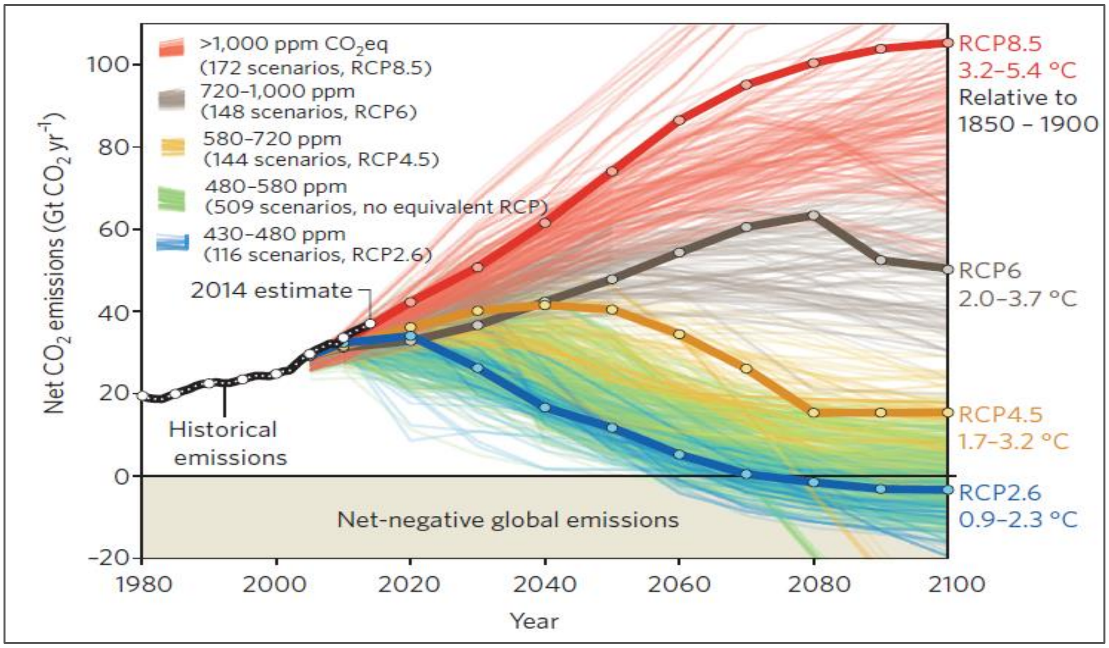

Figure 4-9. GHG Emissions Pathways for Lead to Radiative Forcing Of 8.5 W/M^2 (Red), 6.0 W/M^2 (Gray), 4.5 W/M^2 (Yellow), And 2.6 W/M^2 (Blue) by the Year 2100. Source Of Figure: (FUSS, ET AL., 2014)

The U.S. Geological Survey National Climate Change Viewer (USGS, 2019) can be used to evaluate potential climate change at the state and county level. Data presented in the climate viewer is intended to assist the scientific community in conducting studies on climate changes and to enhance public understanding of possible future climate impacts to their local communities. The viewer provides historical (1950-2005) and future (2006-2099) climate projections under a moderate (RCP4.5) and aggressive (RCP8.5) emissions scenario. The climate viewer compiles projections from 30 different global climate models.

For both the RCP8.5 and RCP4.5 GHG emissions scenarios temperatures increase above historical levels by mid-century and 2100. Projections for RCP8.5 begin to deviate from the RCP4.5 projections after mid-century and depending on the season are approximately 5ºF or warmer by 2100. For the RCP4.5 scenario, both maximum and minimum temperatures level off approximately 5ºF warmer than historical temperatures, while the RCP8.5 scenario shows a continued increasing trend at year 2100. Projected changes to monthly precipitation for both emission scenarios are minimal (not statistically significant) with respect to historic precipitation but show a slight increase in precipitation for RCP8.5 during the winter. Historical precipitation totals fall within the upper and lower ranges for all projected estimates of precipitation change. However, both the RCP8.5 and RCP4.5 projections show a statistically significant decrease in snow water equivalent and runoff for all future time periods. In other words, less snowpack in the winter, more runoff during the winter, and less during the spring and summer. Further, climate change in Utah may result in an increased frequency of drought and wildfires, increasing the demand for water while reducing the water supply, with increased impacts to human health.

The BLM prepared several Rapid Ecoregional Assessments (REAs) to predict future conditions, including climate change, in various regions. Vernal lies within the Colorado Plateau REA (Bryce 2012), which covers areas east of the Wasatch Mountains and south of the Uinta Mountains.

The Colorado Plateau REA analysis covered the years 1968 to 2060. Past, present, and reasonably foreseeable activities in the analysis include energy development, agricultural development, urban and road development, and recreational development. The assumption details and modeling methodology are incorporated by reference. The Colorado Plateau REA depicts the data sources for potential oil and gas leasing, development and production, and oil shale and tar sand extraction. Modeled average annual future temperatures in the Colorado Plateau REA are generally predicted to increase. Average annual precipitation predicted by the model in general is predicted to decrease (drier) through 2030 and increase (wetter) through 2060. Figure 4-10 shows the potential for climate-related change and is a composite of predicted changes to temperature, precipitation, runoff, and vegetation. Potential for climate-related change in the Colorado Plateau area is generally predicted to be mostly moderate or lower (about 70%); areas with high or very high (approximately 30%) potential for change are generally seen in higher elevations. Due to inherent uncertainties described in the Colorado Plateau REA, caution should be used for interpreting climate change potential at site-specific scales (Bryce et al. 2012).

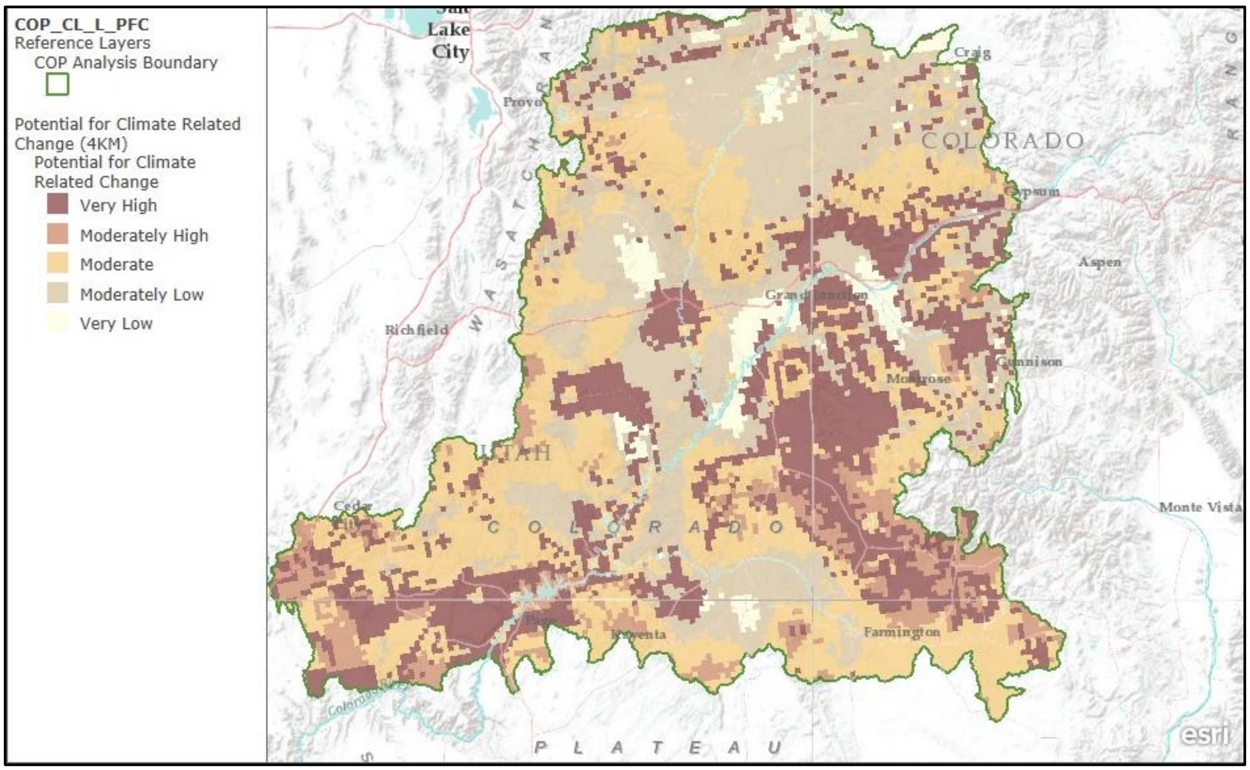

Figure 4-10. Potential for Climate Change Impacts for the Colorado Plateau.

In general, the world has come to the consensus that limiting global warming can avoid some of the more dire consequences associated with projected climate change. To limit warming the world must achieve carbon neutrality or net zero emissions, which is a balance between CO_2 emissions and sinks. Carbon budgets provide estimates of the remaining cumulative CO_2 emissions until the time of net zero global emissions should be achieved in order to limit global warming to a specified amount, usually 1.5°C or 2.0°C. The estimates suggest a range of approximately 420 gigatons (Gt)CO_2 for a two-thirds chance of limiting warming to 1.5°C and about 580 $GtCO_2$ for an even chance (50/50). Limiting warming to 2.0°C would place the budget at 1170 $GtCO_2$ for a two-thirds chance and 1500 $GtCO_2$ for an even chance (50/50). However, the estimates contain uncertainties that are characteristic of scientists' current understanding of the Earth's climate influencing systems, such as feedbacks and the forcing and response associated with the non-CO_2 GHG species. The uncertainty range associated with the current budget estimate is ±400 $GtCO_2$. The large uncertainty range, relative to the target budget, illustrates just how difficult climate analysis is. These uncertainties are more important to the probability of success for a given budget estimate as warming approaches the target limit. As such, it is likely that the absolute budget targets, or at the very least the estimated remaining time until emissions are required to reach carbon neutrality, is likely to change over time as emissions trajectories fluctuate and climate science continues to evolve.

Annually the United Nations (UN) publishes an emissions gap report which provides an assessment of how actions and pledges of countries affect global GHG emissions trends and how these trends compare to emissions trajectories that are consistent with long-term goals for limiting global warming (UNEP 2019). Specifically, the emissions gap is the difference between GHG emissions levels consistent with limiting global warming to 1.5°C or 2.0°C and the emissions levels consistent with current reduction commitments by member nations. By 2030, the UN estimates that to limit warming to 2.0°C or 1.5°C global annual emissions should be approximately 41 $GtCO_2e$ and 25 $GtCO_2e$, respectively. Based on current emissions pledges, the global emissions gap in 2030 would be 15 $GtCO_2e$ above the 2.0°C warming goal and 32 $GtCO_2e$ above the 1.5°C warming goal. To bridge the gap, nations must implement policies to strengthen emissions reductions commitments threefold to achieve the 2.0°C goal and fivefold to achieve the 1.5°C goal. Delaying the implementation of stronger policies would require even more stringent emissions reduction policies to achieve warming goals. Presently the United States has not adopted emissions policies or pledges related to Federal oil and gas development.

All GHGs, regardless of the source, contribute incrementally to the climate change phenomenon.

The Proposed Action, in concert with other past, present, and reasonably foreseeable actions may contribute incrementally to climate change. While GHG emissions resulting from individual decisions can certainly be modified or potentially prevented by analyzing and selecting reasonable alternatives that appropriately respond to the action's purpose and need, the BLM has limited decision authority to meaningfully or measurably prevent the cumulative climate change impacts that would result from global emissions. When determining NEPA significance for an action, the BLM is constrained to the extent that cumulative effects (such as climate change) are only considered in the determination of significance when such effects can be prevented or modified by decision-making (refer to BLM NEPA Handbook, pg.72). While GHG emissions resulting from individual decisions can certainly be modified or potentially prevented by analyzing and selecting reasonable alternatives that appropriately respond to the action's purpose and need, the BLM has limited decision-making authority to meaningfully or measurably prevent the cumulative climate change impacts that would result from global emissions. The No Action Alternative would not contribute to the cumulative emissions or climate change because the leases would not be issued, and no development would occur.

5 CONSULTATION AND COORDINATION

5.1 Introduction

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. The issues were identified through the public and agency involvement process described below.

5.2 Persons, Groups, and Agencies Consulted

Table 5-1 lists the persons, groups, and agencies that coordinated with or were consulted during the preparation of this EA. The table also summarizes the conclusions of those processes.

Table 5-1. Coordination and Consultation

Name	Purpose and Authorities for Consultation or Coordination	Results of Consultation or Coordination
Utah State Historic Preservation Office	National Historic Preservation Act Section 106	A no adverse effect (36 CFR 800.5(1)(b)) determination was made for the Project. The SHPO concurred with the determination on April 21, 2017. SHPO consultation for the proposed Bean Draw Road improvements was conducted on December 20, 2018. SHPO concurred with a determination of no adverse effect on January 23, 2019.
Tribes	Government-to-Government Consultation Policy	In a letter sent in April 2018, the Eastern Shoshone Tribe requested that a site monitor be present during construction and improvement of access roads and well pad. A cultural representative from the Ute Tribe accompanied BLM Archaeologist Tom Milter on an on-site visit and an October 2018 meeting with Betsy Chapoose, cultural director for the Ute Tribe. Mrs. Chapoose also requested that a Ute monitor be present during construction and improvement of access roads and well pad development. Additional tribal consultation regarding the Bean Draw Road improvements was sent to the tribes on November 29, 2018. No additional concerns were presented by the tribes. Due to the high concern for this area, tribal consultation will be an ongoing process until the Project is finished.
Dinosaur National Monument	Attended on-site visit on September 2, 2015	Dinosaur National Monument expressed concerns about the soundscape, the viewshed, and night skies, and suggested a paleontological monitor be used during construction activities.
Utah Public Lands Policy and Coordinating Office	Utah Greater Sage-Grouse Land Use Plan Amendment	Per the BLM Utah's 2019 Greater Sage-Grouse Land Use Plan Amendment management action MA-SSS-3A, on May 22, 2019 a letter and pertinent information was send to Braden Sheppard at PLPCO and to Brian Maxfield at the UDWR in the Northeastern Office. In the letter BLM requested the State of Utah review the proposed project, Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23 (DOI-BLM-UT-G010-2017-0036-EA), to determine if the existing mitigation applied is appropriate or if additional mitigation including compensatory mitigation is required or recommended under State Regulation, Policies or programs related to the conservation of the greater sage-grouse. An official response from PLPCO was received on June 10, 2019.

5.3 Summary of Public Participation

The public was notified of the Project through a posting on the BLM's National NEPA Register on March 7, 2017. No comments or public inquiries were received. Issues were identified by the BLM Interdisciplinary Team as documented in the Interdisciplinary Team Checklist, which is attached to this document as Appendix A. Issues to be analyzed in detail are summarized in Chapter 1 and carried forward for detailed description and analysis in Chapters 3 and 4. A 30-day public comment period was held for this EA from July 23, 2019, to August 23, 2019. The public comments received, and the BLM's responses are included in Appendix I.

5.4 List of Preparers

The specialists listed in Tables 5-2 and 5-3 assisted in the preparation of this EA.

Table 5-2. Bureau of Land Management Environmental Assessment Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Kevin Sadlier	Project Lead	
Kelly Buckner	NEPA Coordinator	Quality assurance
Rene Arce	Recreation Planner	Lands with Wilderness Characteristics, Visual Resources
Stephanie Howard	NEPA Coordinator	Air Resources
David Christensen	Archaeologist	Cultural: Archaeological Resources
Jessica Farmer	Recreation Planner	Lands with Wilderness Characteristics, Visual Resources
Joe Islas	Geologist	Paleontological Resources
Stacey Leichliter	Geologist	Paleontological Resources
Christine Cimiluca	Botanist	Vegetation
Natasha Hedden	Wildlife Biologist	Wildlife

Table 5-3. Other Environmental Assessment Preparers

Name	Title	Responsible for the Following Section(s) of this Document
David Brown	Project Manager	Project management, Quality assurance/Quality control (QA/QC)
Tom Hale	NEPA Coordinator	QA/QC, Visual Resources
Jeremy Eyre	NEPA Writer	Lands with Wilderness Characteristics, Paleontological Resources, Soil Resources, Vegetation, and Wildlife
Audrey McCulley	NEPA Writer	Soil Resources and Wildlife
Gretchen Semerad	NEPA Writer	QA/QC, Air Resources
R. Kelly Beck	Archaeologist	Cultural: Archaeological Resources

6 REFERENCES

AECOM. 2014. Final Utah Air Resource Management Strategy Modeling Project Impact Assessment Report. September 20. Available at: https://www.blm.gov/sites/blm.gov/files/program_natural%20resources_soil%20air%20water_airut_quick%20links_ImpactsRpt.pdf. Accessed May 24, 2019.

Balch, J.K., B.A. Bradley, C.M. D'Antonio, and J. Gomez-Dans. 2013. Introduced annual grass increases regional fire activity across the arid western USA (1980–2009). *Global Change Biology* 19:173–183.

Braun, C.E. 1986. Changes in sage grouse lek counts with advent of surface coal mining. In *Issues and Technology in the Management of Impacted Western Wildlife*. Proceedings of a national symposium, edited by R.D. Comer, T.G. Baumann, P. Davis, J.W. Monarch, J. Todd, S. VanGytenbeek, D. Wills and J. Woodling, 227–231. Glenwood Springs: Thorne Ecological Institute.

Bryce, S.A., J.R. Strittholt, B.C. Ward, and D.M. Bachelet. 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Denver, Colorado.

Bureau of Land Management (BLM). n.d. Green River District Reclamation Guidelines. Available at: https://www.blm.gov/sites/blm.gov/files/Utah_Green_River_District_Reclamation_Guidelines.pdf. Accessed May 15, 2019.

———. 1994. *Diamond Mountain Resource Area Resource Management Plan and Record of Decision*. Available at: https://eplanning.blm.gov/epl-front-office/projects/lup/74954/99901/121019/DIAMRMP&ROD.pdf. Accessed May 19, 2017.

———. 2007. Travel and Transportation Management, Planning and Conducting Route Inventories, Technical Reference 9113-1. Information Bulletin 2008-002. Available at: https://www.blm.gov/policy/ib-2008-002. Accessed March 29, 2018.

———. 2008. *Vernal Field Office Record of Decision and Approved Resource Management Plan*. Available at: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=98982. Accessed May 18, 2017.

———. 2015. *Final Environmental Impact Statement for Newfield Exploration Corporation Monument Butte Oil and Gas Development Project in Uintah and Duchesne Counties, Utah*. Available at: https://eplanning.blm.gov/epl-front-office/eplanning/docset_view.do?projectId=62904&currentPageId=88062&documentId=75396. Accessed May 24, 2019.

———. 2016a. Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands. Instruction Memorandum 2016-124. Available at: https://www.blm.gov/policy/im-2016-124. Accessed July 19, 2017.

———. 2016b. Final Environmental Impact Statement for Newfield Exploration Corporation Monument Butte Oil and Gas Development Project in Uintah and Duchesne Counties, Utah UT-G010-2009-0127. Available at: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=88062. Accessed June 27, 2019.

———. 2018. Summary of Analysis for UT-080-201 (Split Mountain Benches). On file, BLM Vernal Field Office, Vernal, Utah.

———. 2015. Record of Decision and Approved Utah Greater Sage-Grouse Resource Management Plan Amendment. Available at: https://eplanning.blm.gov/eplanning-ui/admin/project/68351/510Accessed June 27, 2019.

———. 2019 Utah Bureau of Land Management Air Resource Management Strategy 2018 Air Monitoring Report. Available at: https://eplanning.blm.gov/epl-front-office/projects/lup/101390/170567/207199/2018_BLM_Utah_Air_Monitoring_Report_-_Final.pdf. Accessed June 25, 2019.

———. 2021. Supplemental Analysis fo Greenhouse Gas Emissions Related to Oil and Gas Leasing in Utah., Environmental Assessment DOI-BLM-UT-0000-2021-0001-EA. Available at: https://eplanning.blm.gov/eplanning-ui/project/2002778/510. Accessed March 8, 2021.

Bureau of Land Management (BLM) and U.S. Forest Service (USFS). 2007. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, The Gold Book. Available at: https://eplanning.blm.gov/epl-front-office/projects/nepa/75541/102290/125058/Gold_Book_2007_Revised.pdf. Accessed December 18, 2017.

Boden, T.A., G. Marland, and R.J. Andres. 2013. Global, Regional, and National Fossil-Fuel CO_2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy. Oak Ridge, Tennessee. doi:10.3334/CDIAC/00001_V2013.

Chambers, J.C., J.L. Beck, S. Campbell, J. Carlson, T.J. Christiansen, K J. Clause, J.B. Dinkins, K.E. Doherty, K A. Griffin, D.W. Havlina, K.F.Henke, J D. Hennig, L.L. Kurth, J.D. Maestas, M. Manning, K.E. Mayer, B.A. Mealor, C. McCarthy, M A. Perea, and D.A. Pyke. 2016. Using Resilience and Resistance Concepts to Manage Threats to Sagebrush Ecosystems, Gunnison Sage-Grouse, and Greater Sage-Grouse in Their Eastern Range: A Strategic Multi-Scale Approach. USDA General Technical Report RMRS-GTR-356. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.

Chambers, J.C., J.L. Beck, J.B. Bradford, J. Bybee, S. Campbell, J. Carlson, T.J. Christiansen, K.J. Clause, G. Collins, M.R. Crist, J.B. Dinkins, K.E. Doherty, F. Edwards, S. Espinosa, K.A. Griffin, P. Griffin, J.R. Haas, S.E. Hanser, D.W. Havlina, K.F. Henke, J.D. Hennig, L.A. Joyce, F.F. Kilkenny, S.M. Kulpa, L.L. Kurth, J.D. Maestas, M. Manning, K.E. Mayer, B.A. Mealor, C. McCarthy, M. Pellant, M.A. Perea, K.L. Prentice, D.A. Pyke, L.A. Wiechman, and A. Wuenschel. 2017. Science Framework for Conservation and Restoration of the Sagebrush Biome: Linking the Department of the Interior's Integrated Rangeland Fire Management Strategy to Long-Term Strategic Conservation Actions. Part 1.Science Basis and Applications. General Technical Report RMRS-GTR-360. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats. Cheyenne, Wyoming: Western Association of Fish and Wildlife Agencies.

Doherty, K.E., D.E. Naugle, B.L. Walker, and J.M Graham. 2008. Greater sage-grouse winter habitat selection and energy development. *Journal of Wildlife Management* 72:187–195.

Doley, D., and L. Rossato. 2010. Mineral particulates and vegetation: Modeled effects of dust on photosynthesis in plant canopies. *Air Quality and Climate Change* 44(2):22–27.

DrillingEdge. 2018. Oil & Gas Production in Utah. Available at: http://www.drillingedge.com/utah. Accessed August 21, 2018.

Energy Information Administration (EIA). 2019. International Energy Outlook. Available at: https://www.eia.gov/outlooks/ieo/pdf/ieo2019.pdf Accessed on March 9, 2021

———. 2020. Annual Energy Outlook. Available at: https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf Accessed March 9, 2021

Green, A.W., C.L. Aldridge, and M.S. O'Donnell. 2017. Investigating impacts of oil and gas development on greater sage-grouse. *Journal of Wildlife Management* 81:46–57.

Haack, P., A. Towers, A. Poon, and N. Jeffrey. 2013. *Mt. Arthur Coal Open Cut Modification: Landscape and Visual Impact Assessment*. Melbourne, Australia: Urbis. Available at: https://www.bhp.com/

-/media/bhp/regulatory-information-media/coal/new-south-wales-energy-coal/mt-arthur-coal/mt-arthur-coal-open-cut-mine-modification-project-exhibition-documents/appendix-h--landscape-and-visual-assessment.pdf. Accessed March 29, 2018.

Hansen, J., M. Sato, R. Ruedy, K. Lo, D.W. Lea, and M. Medina-Elizade. 2006. Global Temperature Change. *Proceedings of the National Academy of Sciences* 103:14288–14293.

Herring, D. 2007. Earth's Temperature Tracker. Available at: https://www.giss.nasa.gov/research/features/200711_temptracker/. Accessed August 24, 2018.

Hobbs, R.J., and L.F. Huenneke. 1992. Disturbance, diversity, and invasion: Implications for conservation. *Conservation Biology* 6(3):324–337.

Holloran, M.J., R.C. Kaiser, and W.A. Hubert. 2010. Yearling greater sage-grouse response to energy development in Wyoming. *Journal of Wildlife Management* 74:65–72.

Holloran, M.J., B.C. Fedy, and J. Dahlke. 2015. Winter habitat selection of greater sage-grouse relative to activity levels at natural gas well pads. *Journal of Wildlife Management* 79:630–640.

Intergovernmental Panel on Climate Change (IPCC). 2015. *Climate Change 2014 Synthesis Report*, edited by Core Writing Team, R.K. Pachauri, and L.A. Meyer. Geneva, Switzerland: IPCC.

Janssens-Maenhout, G., M. Crippa, D. Guizzardi, M. Muntean, E. Schaaf, J.G.J. Olivier, J.A.H.W. Peters, and K.M. Schure. 2017. *Fossil CO_2 & GHG Emissions of All World Countries*. Available at: https://edgar.jrc.ec.europa.eu/booklet2017/CO2_and_GHG_emissions_of_all_world_countries_booklet_online.pdf. Accessed June 25, 2019.

Lyon A.G., and S.H. Anderson. 2003. Potential gas development impacts on sage grouse nest initiation and movement. *Wildlife Society Bulletin* 31:486–491.

National Research Council. 2010. Informing an Effective Response to Climate Change. Washington DC. The National Academies Press. Available at: https://www.nap.edu/resource/12784/Informing_Report_Brief_final.pdf . Accessed June 25, 2019.

Naugle, D.E., and M.S. Boyce. 2011. *Energy Development and Wildlife Conservation in Western North America*. Island Press.

Occupational Safety and Health Administration (OSHA). 2019. How loud is too loud? Available at: https://www.osha.gov/SLTC/noisehearingconservation/loud.html. Accessed February 26, 2019.

Parrish, J.R., F P. Howe, and R E. Norvell. 2002. Utah Partners in Flight Avian Conservation Strategy Version 2.0. UDWR Publication No. 02-27. Salt Lake City, Utah: Utah Division of Wildlife Resources.

Polk, M.R., and A.S. Polk. 2017. *Second Revised: A Class III Cultural Resource Inventory of the Proposed Wells, Federal Pipeline 4-21-4-23 and 5-21-4-23, and a Proposed Access Road, Uintah County, Utah*. Utah State Antiquities Project Number U-14-SJ-1060b. Prepared by Commonwealth Heritage Group, Inc. Cultural Resource Report Number 2060. Ogden, Utah.

Pratt, A.C., and J.L. Beck. 2019. Greater sage-grouse response to bentonite mining. *Journal of Wildlife Management* 83:866–878.

Sandau, Stephen D. 2015. *Paleontological Reconnaissance Survey Report, Survey of Paradigm Consulting's Proposed Well Pads & Access Road for EagleRidge Operating, LLC Federal Pipeline "#4-21-4-23 & #5-21-4-23" (Sec. 20, 21 & 29, T 4 S, R 23 E)*. Vernal, Utah, Intermountain Paleo-Consulting.

SWCA Environmental Consultants (SWCA). 2018. *Class III Archaeological Inventory for the Federal Pipeline Unit Project Access Road, Uintah County, Utah*. Salt Lake City, Utah.

Uintah County. 2011. Uintah County Land Use Plan 2010. Amended November 28, 2011. Available at: http://co.uintah.ut.us/document_center/CommunityDevelopment/Land_Use_Plan_2010_Uintah_CountyLand_Use_Plan2010.pdf. Accessed May 19, 2017.

———. 2012. Uintah County General Plan 2005. Amended February 27, 2012. Available at: http://co.uintah.ut.us/document_center/CommunityDevelopment/General_Plan_for_Uintah_County_2012.pdf. Accessed May 19, 2017.

United Nations Environment Programme (UNEP). 2019. Emissions Gap Report Accessed at: https://www.unep.org/resources/emissions-gap-report-2019

U.S. Department of the Interior, Bureau of Land Management, and U.S. Geological Survey. 2001. Biological Soil Crusts: Ecology and Management, Technical Reference 1730-2. Available at: http://www.soilcrust.org/advanced.htm. Accessed March 21, 2019.

U.S. Environmental Protection Agency (EPA). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Available at: https://nepis.epa.gov/Exe/ZyPDF.cgi/2000L3LN.PDF?Dockey=2000L3LN.PDF. Accessed February 6, 2018.

———. 2016. Prevention of Significant Deterioration Basic Information. Available at: https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information. Accessed August 21, 2018.

———. 2017a. Sources of Greenhouse Gas Emissions. Available at: https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions. Accessed October 27, 2017.

———. 2017b. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015—Executive Summary. Available at: https://www.epa.gov/sites/production/files/2017-02/documents/2017_executive_summary.pdf. Accessed December 11, 2018.

———. 2018a. Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards. *Federal Register* (83)107:25776–25848.

———. 2018b. Air Quality Design Values. Available at: https://www.epa.gov/air-trends/air-quality-design-values. Accessed August 21, 2018.

———. 2018c. Emission Factors for Greenhouse Gas Inventories. Available at: https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed June 25, 2019.

———. 2019a. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2017. Available at: https://www.epa.gov/sites/production/files/2019-04/documents/us-ghg-inventory-2019-main-text.pdf. Accessed June 25, 2019.

———. 2019b. Facility Level Information on Greenhouse Gases Tool. Available at: https://ghgdata.epa.gov/ghgp/main.do. Accessed June 25, 2019.

———. 2019c. Greenhouse Gases Equivalencies Calculator – Calculations and References. Available at: https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references. Accessed June 25, 2019.

U.S. Fish and Wildlife Service (USFWS). 2013. *Greater Sage-Grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report*. Denver, Colorado: U.S. Fish and Wildlife Service.

U.S. Geological Survey (USGS). 2018. Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005-14. Scientific Investigations Report 2018-5131. U.S. Department of the Interior U.S. Geological Survey. Available at: https://pubs.usgs.gov/sir/2018/5131/sir20185131.pdf. Accessed June 25, 2019.

———. 2019. National Climate Change Viewer. Accessed at: https://www2.usgs.gov/landresources/lcs/nccv/viewer.asp

U.S. Geological Survey Canyonlands Research Station. 2006. An Introduction to Biological Soil Crusts. Available at: http://www.soilcrust.org/crust101.htm. Accessed March 20, 2019.

U.S. Global Change Research Program (USGCRP). 2018. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, edited by D.R. Reidmiller, C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart. Washington, D.C.: U.S. Global Change Research Program. Available at: https://www.globalchange.gov/nca4. Accessed June 25, 2019.

Utah Division of Air Quality (UDAQ). 2014a. State Summary of Emissions by Source Report. Available at: https://deq.utah.gov/legacy/programs/air-quality/emissions-inventories/inventories/2014-state-list.htm. Accessed May 28, 2019.

———. 2014b. Statewide Hazardous Air Pollutants – Point Sources Summary by County. Available at: https://deq.utah.gov/legacy/programs/air-quality/emissions-inventories/docs/2016/2014-HAPs-by-County.pdf. Accessed August 16, 2018.

Utah Division of Oil, Gas & Mining (UDOGM). 2019. Utah Oil Production by County (past 5 years). Available at: https://oilgas.ogm.utah.gov/oilgasweb/statistics/oil-prod-by-cnty.xhtml. Accessed June 25, 2019.

Utah Division of Wildlife Resources (UDWR). 2015a. Utah Mule Deer Statewide Management Plan. Available at: https://wildlife.utah.gov/pdf/bg/mule_deer_plan.pdf. Accessed May 29, 2019.

———. 2015b. Utah Statewide Elk Management Plan. Available at: https://wildlife.utah.gov/pdf/bg/elk_plan.pdf. Accessed May 29, 2019.

———. 2016a. Deer Herd Unit Management Plan Deer Herd Unit #9 South Slope. On file at SWCA office.

———. 2016b. Elk Herd Unit Management Plan Elk Herd Unit #9 South Slope. Available at: https://wildlife.utah.gov/public_meetings/rac/2016-11_elk_plans.pdf. Accessed May 29, 2019.

———. 2019a. Utah Conservation Data Center. Available at: https://dwrcdc.nr.utah.gov/ucdc/. Accessed March 20, 2019.

———. 2019b. Utah Conservation Plan for Greater Sage-Grouse. Available at: https://wildlife.utah.gov/learn-more/greater-sage-grouse.html. Accessed February 25, 2019.

Western Regional Climate Center (WRCC). 2016. Dinosaur Quarry Area, Utah (422173) Period of Record Monthly Climate Summary, Period of Record: 12/01/1915 to 06/09/2016. Available at: http://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ut2173. Accessed June 1, 2017.

APPENDIX A: INTERDISCIPLINARY TEAM CHECKLIST

INTERDISCIPLINARY TEAM CHECKLIST

RESOURCES AND ISSUES CONSIDERED (INCLUDES SUPPLEMENTAL AUTHORITIES APPENDIX 1 H-1790-1)

Project Title: **Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23**

NEPA Log Number: DOI-BLM-UT-G010-2017-0036

File/Serial Number:

Project Leader: **Kevin Sadlier**

DETERMINATION OF STAFF: *(Choose one of the following abbreviated options for the left column)*

NP = not present in the area impacted by the proposed or alternative actions

NI = present, but not affected to a degree that detailed analysis is required

PI = present with potential for relevant impact that need to be analyzed in detail in the EA

NC = (DNAs only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section D of the DNA form. The Rationale column may include NI and NP discussions.

Determination	Resource/Issue	Rationale for Determination	Signature	Date
PI	Air Quality/Greenhouse Gas Emissions	Emissions from construction, drilling, and production equipment could adversely affect air quality.	Kevin Sadlier	4/20/2021
NP	BLM natural areas	None present per 2008 Vernal RMP and ROD/GIS layer review.	Jessica Farmer	03/30/2021
PI	Cultural: Archaeological Resources	This project potential for relevant impacts to archaeological resources because a Class III intensive cultural resource inventory was conducted identifying the following archaeological sites: 42UN1878 Prehistoric Campsite 42UN8483 Prehistoric Campsite 42UN8484 Prehistoric Campsite 42UN8485 Prehistoric Campsite 42UN8486 Prehistoric Campsite 42UN8487 Prehistoric Campsite 42UN8618 Prehistoric Lithic Scatter 42UN8619 Prehistoric Campsite 42UN8620 Prehistoric Campsite 42UN8704 Prehistoric Lithic Scatter 42UN8705 Prehistoric Lithic Scatter The proposed access road was re-routed to avoid all sites eligible to the National Register of Historic Places (NRHP). A "No	Jaymee Hasty	3/29/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		adverse effect" 36 CFR 800.5(1)(b) determination was made for the proposed undertaking. The SHPO concurred with the determination on 04/21/2017. In accordance with the determinations made in the second addendum to report U-14-SJ-1060b and Sagebrush cultural report number 2060, it is required that a cultural monitor of construction be present during implementation of the Eagle Ridge oil wells, Federal Pipeline 4-21-4-23 and 5-21-4-23, and access road. The monitoring requirement is due to high site density, the aeolian environment (sand) within the project area, and the potential to encounter additional sites. Monitoring of the 11 sites will follow the Archaeological Monitoring Protocols outlined in the reports second addendum. In October 2018 the proponent added an upgrade to the Bean Draw Road for access to the development area. A cultural report for that corridor was completed and 7 previously recorded sites were updated for determination of effect and eligibility. Six sites, prehistoric campsites, are eligible for the National Register, but the areas of the sites within the Area of Potential Effect have been destroyed by previous development and/or those portions of the sites do no retain integrity that would affect their National Register status. SHPO consultation for the Bean Draw Road was conducted on 12/20/2018. SHPO concurred with a determination of "No Adverse Effect" on 01/23/2019.		
PI	Cultural: Native American Religious Concerns	This undertaking will not affect designated Traditional Cultural Properties (TCPs) or hinder access to or use of Native American religious sites. However, this area is an area of concern for the Hopi, Santa Clara Pueblo, Ute Tribe and Eastern Shoshone due to the high density of prehistoric sites found within and near the APE. In a letter sent in April of 2018 the Eastern Shoshone requested that a site monitor be present during the development of the access road and well pad construction. A cultural representative from the Ute Tribe accompanied BLM Archaeologist, Tom Milter, on a project onsite and in an October 2018 meeting with Betsy Chapoose, Cultural Director for the Ute Tribe. Mrs. Chapoose also requested that a Ute Monitor be present during	Jaymee Hasty	3/29/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		construction of access roads and well pad development. Additional tribal consultation with these tribes was sent for the Bean Draw Road upgrade on 11/29/2018. No additional concerns were presented by the tribes. Due to the high concern for this area tribal consultation will be an ongoing process until the project is finished.		
NP	Designated Areas: Areas of Critical Environmental Concern	None present as per GIS/RMP review	Jessica Farmer	03/30/2021
NP	Designated Areas: Wild and Scenic Rivers	None present as per GIS/RMP review	Jessica Farmer	03/30/2021
NP	Designated Areas: Wilderness Study Areas	None present as per GIS/RMP review	Jessica Farmer	03/30/2021
NI	Environmental Justice	Due to the location of the project area and the nature of the proposed action, it is anticipated that no minority, low income, or American Indian populations would be disproportionately high and adversely affected by the Proposed Action or alternatives.	Kevin Sadlier	4/21/2021
NP	Farmlands (prime/unique)	None present per 2008 Vernal RMP/ROD and GIS layer review.	Kevin Sadlier	4/20/2021
NI	Fuels/Fire Management	Disturbance in this area and vegetation type could increase the amount of invasive plants, specifically *Bromus tectorum*. The increase of *Bromus tectorum* could lead to a change of ecosystem dynamics and an increase in fire frequency. Applying the Green River District Reclamation Guidelines should prevent additional hazardous fuels.	Dixie Sadlier	4/12/2021
NI	Geology / Minerals / Energy Production	Spatial analysis of the proposed Federal Pipeline wells within T4S R23E Section 21, NWNW, and road expansion starting in section 29, NENW, traversing through section 20 and terminating in section 21, NWNW, indicates potential conflicts with the listed commodities. The plan is to drill 2500 feet down from surface or to test the area 800 feet below the Phosphoria formation. This formation contains a phosphate resource that will be protected according to onshore order #2 (drilling operations) during drilling, completion, and plugging. Any other potentially valuable resource/mineral formation will also need to be protected. Well logs will need to be supplied to the BLM to show the valuable resource.	Garrett Manion	4/1/2021
PI	Invasive Plants / Noxious Weeds / Vegetation	IP/NW: No invasive plants or noxious weeds have been previously identified in the Project Area, per BLM GIS data and	Sandra Robins	04/16/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		NISIMS data review. However, invasive species such as halogeton (*Halogeton glomeratus*), bull thistle (*Cirsium vulgare*) and common burdock (*Arctium minus*) are likely to be present, as these species have been identified near the Project Area. In addition, the following UT noxious weed species have been identified within 1.5 miles of the Project Area: tall whitetop (*Lepidium latifolium*), and saltcedar (*Tamarix ramosissima*). Development and implementation of a Weed Control Plan by the applicant would reduce potential noxious weed and invasive plant species infestations in the Project Area. Vegetation: The proposed project would require the removal of native vegetation. The following ecological systems are the most represented in the Project Area, per GAP data: Inter-Mountain Basins Big Sagebrush Shrubland, Colorado Plateau Pinyon-Juniper Shrubland, and Colorado Plateau Mixed Bedrock Canyon and Tableland.		
NI	Lands/Access	The proposed area is located within the Vernal Field Office Resource Management Plan area, which allows for oil and gas development with associated road and pipeline right-of-ways. Current land uses, within the area identified in the proposed action and adjacent lands, consist of existing oil and gas development, wildlife habitat, recreational use, and sheep and cattle ranching. No existing land uses would be changed or modified by the implementation of the proposed action. Master Title Plats have been reviewed for conflicts with Public Water Reserves. There are no Public Water Reserves identified in the project area. The proposed project for access is on the Uintah County Class D road known as the Bean Draw Road, as identified on the 2016 Uintah County Transportation Map. Uintah County filed an Title V application for Bean Draw road on 11/26/2019; application is still pending.	Cherei Miller	4/5/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		All required permits would be obtained from Uintah County. A Right-of-Way would be required for the portion of road in T4S., R. 23E., Section 6 & 29. Portions would be part of the Uintah County Class D “Bean Draw” road. There are six existing Right-of-Way holders in the area that would be notified of the proposed project, also Uintah County Commission would be notified of the proposed action when the Road Right-of-Way is processed. Notice letters were sent out on May 4, 2018.		
PI	Lands with Wilderness Characteristics	The proposed project area occurs within the Split Mountain Benches inventory unit which was found to contain wilderness characteristics by BLM staff through an on-the-ground inventory of the unit in 2018. In addition, according to BLM manual 6310 when considering size criteria for an area roadless areas of less than 5,000 acres of contiguous BLM lands that are contiguous with lands that have been formally determined to have wilderness or potential wilderness values, or any Federal lands managed for the protection of wilderness characteristics are to be considered as contiguous lands. BLM *manual 6310(c)(2)(a).* The Split Mountain Benches inventory unit is adjacent to the Stone Bridge Draw inventory unit which was found to contain wilderness characteristics as well as the Dinosaur National Monument managed lands adjacent to the Split Mountain Benches inventory unit are being managed as potential wilderness, therefore, the Split Mountain Benched unit is contiguous with the Stone Bridge Draw inventory unit and the Dinosaur National Monument managed lands.	Jessica Farmer	03/30/2021
NI	Livestock Grazing & Rangeland Health Standards	The proposed action is located on the McFarley Flat grazing allotment. There will be no effects to Livestock Grazing as the project will not alter grazing systems. There will be no effects to Rangeland Health as the project is minimal in size and there will be minimal forage loss. With reclamation, any AUMs lost will be given back.	Travis Decker	3/24/2021
NI	Paleontology	Spatial analysis of the proposed Federal Pipeline wells within T4S R23E Section 21,		

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		NWNW, indicates no direct fossil interactions. The road expansion starting in section 29, NENW, indicates a potential fossil interaction. As the road traverses through section 20 and terminates in section 21, no direct interaction with known fossil localities is indicated, but the potential for new discoveries remains high, as per BLM Potential Fossil Yield Classification (PFYC) data. A survey of the area by Intermountain Paleo-Consulting numbered "IPC #14-56" was conducted, and no significant vertebrate fossil material was found. The operator has committed to paleontological monitoring by a qualified and permitted paleontologist accompany excavation activities along road construction. New fossil discoveries should facilitate the cessation of all construction activities, followed by immediate notification of the VFO authorized officer for mitigation procedures.	Garrett Manion	4/1/2021
NI	Plants: BLM Sensitive	Suitable or occupied habitat for UT BLM Sensitive plant species is not present in the Project Area, per BLM GIS data review. Per GIS data review, potential habitat models based on soils data overlay the project area, for the following BLM Sensitive pant species; park rockcress (*Arabis vivariensis*), Hamilton's milkvetch (*Astrabalus hamilitonii*), horseshoe milkvetch (*Astragalus equisolensis*), Goodrich's stickweed (*Cleomella hillmanii* var. *goodrichii*), Ackerman's green gentian (*Frasera ackermaniae*), and Goodrich's beardtongue (*Penstemon goodrichii*). An onsite visit was conducted and suitable habitat is not present in the project area for the above plant species. The following species are not UT BLM Sensitive or Federally listed, and are listed for information purposes only because they have protected status in Dinosaur National Monument, which is located adjacent to the Project Area: Vernal broadbeard beardtongue (*Penstemon angustifolius* var. *vernalensis*) (Monument: G5T3), grass milkvetch (*Astragalus chloodes*) (Monument: G3), leafy fiddleleaf (*Nama densum* var. *parviflorum*) (Monument: G5T5), and Uinta Basin springparsley (*Cymopterus duchesnensis*)	Sandra Robins	04/16/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		(Monument: G3) These species have documented locations within or near the Project Area, per BLM GIS review, but are not currently protected on BLM managed surface.		
NI	Plants: Threatened, Endangered, Proposed, or Candidate	Ute ladies'-tresses (*Spiranthes diluvialis*) currently listed as Threatened, has been documented near the Project Area, per BLM GIS data review. A review of the Project Area on the ground and in Google Earth shows that suitable habitat for this species is not present in the Project Area. Since suitable habitat is not present, the species is unlikely to be present in the Project Area, and therefore unlikely to be impacted by the Proposed Action. Suitable or occupied habitat for additional threatened, endangered, candidate, or proposed plant species is not present in the Project Area, per BLM GIS data review.	Sandra Robins	04/16/2021
NI	Recreation	The proposed project area occurs within the General Recreation Management Area (GRMA). The main recreational activities that are presumed to take place within and adjacent to the proposed project area include but are not limited to hunting, hiking, 4x4/ATV use, and antler shed gathering. During the proposed drilling phase some recreationists may be negatively impacted by the sights and sounds related to development of the well pads and access road. Long term negative impacts to recreation and access due to oil and gas production once the drilling phase would not be anticipated.	Jessica Farmer	03/30/2021
NI	Socio-Economics	Minimal or no impact to the social and/or economic variables in the county or nearby communities would be expected to occur from this project due to its small size in relation to ongoing development throughout the basin. Cumulative effects on socio-economic conditions resulting from past, present, and future development (including the Proposed Action) are described in the GDBR Final EIS (BLM 2008a).	Kevin Sadlier	4/21/2021
PI	Soils: Physical / Biological	Under the Proposed Action, development of well padsandaccessroads would result in an estimated 17.41 acres of surface disturbance The surface disturbance would result in impacts to soils. For all surface disturbance, Eagle Ridge would recontour and reseed the soil after abandonment and during reclamation.	Kevin Sadlier	4/21/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		Cryptobiotic soils are present at the proposed locations and access road.		
PI	Visual Resources	The proposed project area occurs within Visual Resource Management Class III/II. Management class objective for VRM III are is to partially retain the existing character of the landscape. The level of change to the landscape should be moderate. Management activities may attract the attention of the casual observer, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. Management objectives for VRM II class are to retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes to the landscape must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. The project components found in the proposed action would need to address the level of change to the landscape and implement project design features that would adhere to the management class. The highest level of visual mitigations within the visually sensitive project area would be required in order to reduce the potential for adverse long-term impacts to the visual resource. Examples of these mitigations include but are not limited to appropriate painting of all long-term facility structures in order to match the texture and color of the area as well as to break up the outline of equipment, selective vegetative screening as well as feathering straight edges of vegetation in order to not attract the attention of the casual observer. Key observation points will be selected, and visual simulations will be produced in order to better analyze the potential effects of the proposed project. In 2011 the VFO conducted a Visual Resource Inventory post the 2008 RMP. Findings of that visual resource inventory classify the project area as having a high sensitivity level. (see VRI	Jessica Farmer	03/30/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		2011). Additionally, any lighting used should be dark sky friendly unless otherwise needed for safety.		
Ni	Wastes (hazardous/solid)	No chemicals subject to reporting under SARA Title Ill (hazardous materials) in an amount greater than 10,000 pounds would be used, produced, stored, transported, or disposed of annually in association with the drilling, testing, or completing of wells. Furthermore, extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities, would not be used, produced, stored, transported, or disposed of in association with the drilling, testing, or completing of the proposed wells. Hazardous Waste: The operator would develop drilling and operational plans that cover potential emergencies including fire, employee injuries, chemical releases, and spill prevention. The operator and its contractors would comply with all applicable Federal laws and regulations governing the location, handling and storage of hazardous substances. Solid Waste: Trash would be confined in a trash cage and hauled to a land fill. Burning of waste or oil would not be done. Human waste would be contained and be disposed of at an approved sewage treatment facility. Produced Water: Where necessary produced water would be confined to an approved pit or storage tank for a period not to exceed 90 days as per Onshore Order No. 7 (OSO 7). After the 90 day period, the produced water would be contained in tanks on location and then hauled by truck to a pre-approved disposal site. Implementation of the measures described above, and consistency with all applicable laws, ordinances, regulations, and standards for hazardous materials and wastes would reduce the potential for impacts to a negligible level.	Kevin Sadlier	4/21/2021
NI	Water: Groundwater Quality	Spatial analysis of the proposed Federal Pipeline wells within T4S R23E Section 21, NWNW, and road expansion starting in section 29, NENW, traversing through section 20 and terminating in section 21,	Garrett Manion	4/1/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		NWNW, indicates no interaction with subsurface horizons containing usable water.		
NI	Water: Hydrologic Conditions (stormwater)	The proposed construction and leveling of well pads and roads would alter the topography and divert surface water around well pads until the area is reclaimed. Culverts would be used to maintain surface water flows where access roads cross drainages. Impacts to hydrologic conditions from stormwater management activities would be negligible.	Kevin Sadlier	4/21/2021
NP	Water: Municipal Watershed / Drinking Water Source Protection	Spatial analysis of the proposed Federal Pipeline wells within T4S R23E Section 21, NWNW, and road expansion starting in section 29, NENW, traversing through section 20 and terminating in section 21, NWNW, indicates no interaction with subsurface horizons containing usable water or drinking water source areas or beneficial uses of watersheds from UDEQ-DWQ. Therefore, detailed analysis is not required.	Jerrad Goodell	4/6/2021
NI	Water: Steams, Riparian, Wetlands, Floodplains	Several intermittent streams and associated floodplains are near the project area including several stream crossings. National Wetland Inventory maps show a small emergant wetland near the Bean Draw road that is to be improved. Onsite visits indicate this is a mapping error as no wetland is present. Due to the limited surface disturbance and following best management practices outlined in the Goldbook the proposed action is not expected to significantly impact these resources, therefore detailed analysis is not required.	Jerrad Goodell	4/6/2021
NI	Water: Surface Water Quality	The Proposed Action would result in approximately 17.41 acres of surface disturbance until interim reclamation is successful. COAs and applicant-committed measures pertaining to erosion control, stormwater management, reclamation, materials management, and spill control would reduce the potential for surface water impacts to a negligible level.	Kevin Sadlier	4/21/2021
NI	Water: Water Rights	Spatial analysis of the proposed Federal Pipeline wells within T4S R23E Section 21, NWNW, and road expansion starting in section 29, NENW, traversing through section 20 and terminating in section 21, NWNW, indicates no conflicts with Utah	Jerrad Goodell	4/6/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		Water Rights or the ability to use any water rights. Therefore, detailed analysis is not required.		
NP	Water: Waters of the U.S.	Proposed development would not overlap or cross any identified waters of the U.S. Development and production at the well sites would not significantly impact waters of the U.S.	Kevin Sadlier	4/21/2021
NI	Wild Horses	The Project Area is not located in a wild horse Herd Area/Herd Management Area. Therefore, impacts to wild horses are not anticipated as a result of the Proposed Action.	Kevin Sadlier	4/21/2021
PI	Wildlife: Migratory Birds (including raptors)	**Migratory Birds:** Numerous species may migrate through, or nest within the project area. The project actions should be planned to occur after August 31 to mitigate for any impending impacts or disturbance during the nesting season (March 1 – August 31). The project area can be surveyed by a BLM approved biologist for nesting birds so that the proposed actions can be implemented earlier than the August 31 timing restriction. **Raptors:** **Golden Eagles:** Several golden eagle (3) nests were located within 0.5 mile of the proposed project. A nesting timing and spatial buffer stipulation will apply. If a BLM biologist or BLM approved biologist agrees to monitor whether the nests are active and if active, to observe when the young have fledged the nest and are no longer utilizing the area, the proposed project may be implemented earlier than the August 31 seasonal timing restriction. Authorization and restrictions of the proposed actions will be reevaluated as new data are gathered. <u>Stipulations *(RMP)* Timing restriction for Golden Eagle:</u> 1/1-8/31, 0.5 mile buffer **Burrowing Owl:** Potential burrowing owl nesting habitat also occurs within several areas of the proposed project. The burrowing owl is a State of Utah and BLM sensitive species. In Utah, prairie dog burrows are the most	Natasha Hadden	4/12/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		important source of burrowing owl nest sites. Stipulations *(RMP)* Timing restriction for Burrowing Owl: 3/1-8/31, 0.25 mile buffer The location requires surveys for existing and/or potential burrowing owl nests and burrowing owl sign, within 0.25 miles of the proposed project if the project commences before August 31.		
NI	Wildlife: Fish (designated or non-designated)	**Designated:** It is estimated that 2.9 acre feet of water would be needed for the proposed project. Any water depletion from the Upper Colorado River Basin is likely to adversely affect critical habitat for the endangered fish of the Colorado River System. The Vernal Field Office has a programmatic agreement with the USFWS that states small water depletions (100 acre-feet or less) in the Upper Colorado River Basin for oil and gas development projects is likely to adversely affect the four endangered fish, however the USFWS service believes the recovery program for these species will adequately address the effects through the Recovery Implementation Program Recovery Action Plan (RIPRAP). No effects beyond what was previously analyzed in the programmatic agreement are expected, therefore detailed analysis is not required. **Non-Designated:** No fish are within or near the project area. Due to the limited surface disturbance, and following best management practices outlined in the Goldbook the project is not expected to significantly impact downstream populations, therefore detailed analysis is not required.	Jerrad Goodell	4/6/2021
PI	Wildlife: Non-USFWS Designated	**Big Game:** Per GIS data review the proposed project is located within crucial mule deer and elk wintering habitat. There is no BLM designated crucial habitat for pronghorn. Stipulations *(RMP)* Timing restriction for Crucial Winter Elk and Deer Habitat: 12/1-4/30 **White-tailed Prairie Dog:** Per review of the VFO GIS data there is a white-tailed prairie dog colony within and	Natasha Hadden	4/12/2021

Determination	Resource/Issue	Rationale for Determination	Signature	Date
		around the proposed project area. Thus, there are potential impacts to WTPD and burrowing owl. **Greater Sage-grouse:** Per review of the VFO GIS data, the road portion of the project is within a greater sage-grouse Priority Habitat Management Area (PHMA) and UDWR designated wintering habitat. Consultation has been sent to PLPCO and UDWR and the State of Utah recommends a 4:1 mitigation ratio. Per MA-SSS-3 in the UT GRSG ARMPA (2015) Plan, mitigation, required design features and other management actions will be required to be in compliance with the plan.		
NP	Wildlife: Threatened, Endangered, Proposed or Candidate	Per review of the VFO GIS data there are no threatened, endangered, proposed or candidate species or their habitats identified within the proposed project area nor within given buffers for these species.	Natasha Hadden	4/12/2021
NI	Woodlands/Forestry	No impact to Forest and woodland resources beyond those described for general vegetation.	David Palmer	4/13/2021

FINAL REVIEW:

Reviewer Title	Signature	Date	Comments
Environmental Coordinator			
Authorized Officer			

APPENDIX B: SOIL TYPES IN THE FEDERAL PIPELINE UNIT WELLS 4-21-4-23 AND 5-21-4-23 VEGETATION ANALYSIS AREA

The most prevalent soil types in the analysis area, as well as every soil type present in the project area, are described below:

Arches-Mespun-Rock outcrop complex, 4 to 40 percent slopes. This soil type covers approximately 14.8% of analysis area and is found in the project area. Arches soils' parent material is eolian deposits over sandstone. These soils are excessively drained, with rapid permeability and a very high runoff class. Mespun soils' parent material is eolian deposits derived from sandstone. These soils are excessively drained, with rapid permeability and a very low runoff class. Rock outcrop consists of moderately sloping to steep exposures of bedrock associated with shale, siltstone, sandstone, and limestone of the Duchesne River, Green River, Park City, and Uinta formations. Potential runoff is very high (NRCS 2003). Arches and Mespun soils have a moderate potential for erosion.

Hanksville silty clay loam, 25 to 50 percent slopes. This soil type covers approximately 10.0% of analysis area. Hanksville soils' parent material is slope alluvium and colluvium over residuum from shale. These soils are well drained, with very slow permeability and a very high runoff class (NRCS 2003). Hanksville soils have a moderate-to-high potential for erosion.

Cadrina extremely stony loam-Rock outcrop complex, 25 to 50 percent slopes. This soil type covers approximately 8.6% of analysis area. Cadrina soils' parent material is slope alluvium and colluvium over residuum derived from shale and sandstone. These soils are well drained, with moderate permeability and a very high runoff class (NRCS 2003). Cadrina soils have a low potential for erosion.

Greybull-Utaline-Badland complex, 8 to 50 percent slopes. This soil type covers approximately 7.5% of analysis area. Greybull soils' parent material is slope alluvium and colluvium over residuum derived from shale. These soils are well drained, with moderately slow permeability and a high runoff class. Utaline soils' parent material is slope alluvium derived from sandstone, limestone, shale, and quartzite. These soils are well drained, with moderate permeability and a medium runoff class. Badland consists of nearly level to very steep barren land that is dissected by many intermittent drainage channels. Badlands are associated with soft geologic materials of the Duchesne River, Green River, Mancos, and Uinta formations. The potential for runoff is very high and erosion is active (NRCS 2003). Greybull soils have a low-to-moderate potential for erosion. Utaline and Badlands soils have a low potential for erosion.

Polychrome-Milok complex, 8 to 50 percent slopes. This soil type covers approximately 3.5% of analysis area and is found in the project area. Polychrome soils' parent material is slope alluvium and colluvium over residuum derived from sandstone and shale. These soils are well drained, with moderate permeability and a high runoff class. Milok soils' parent material is eolian deposits over alluvium derived from sandstone. These soils are well drained, with moderately rapid permeability and a low runoff class (NRCS 2003). Polychrome soils have a low potential for erosion, while Milok soils have a moderate-to-high potential for erosion.

Table 3-2. Soil Types in the Soil Analysis Area

Soil Type	Acres in Soil Analysis Area	Percent of Soil Analysis Area
Arches-Mespun-Rock outcrop complex, 4 to 40 percent slopes	2,499.7	14.8
Badland-Rock outcrop complex, 1 to 100 percent slopes	304.5	1.8
Begay sandy loam, 2 to 15 percent slopes	40.9	0.2
Cadrina extremely stony loam-Rock outcrop complex, 25 to 50 percent slopes	1,446.7	8.6
Clapper complex, 25 to 50 percent slopes	366.6	2.2
Clapper gravelly loam, 2 to 25 percent slopes	38.0	0.2
Clapper very cobbly loam, 25 to 50 percent slopes	192.9	1.1
Clapper very cobbly loam, 4 to 25 percent slopes	202.9	1.2
Cliff sandy loam, 2 to 4 percent slopes	942.0	5.6
Firstgap loam, 2 to 20 percent slopes	76.4	0.5
Gerst-Rock outcrop complex, 4 to 40 percent slopes	143.0	0.8
Green River loam, 0 to 2 percent slopes, rarely flooded	50.6	0.3
Greybull-Utaline-Badland complex, 8 to 50 percent slopes	1,261.1	7.5
Hanksville silty clay loam, 2 to 25 percent slopes	1,058.0	6.3
Hanksville silty clay loam, 25 to 50 percent slopes	1,680.9	10.0
Hanksville silty clay loam, moist, 25 to 50 percent slopes	743.8	4.4
Hanksville-Uffens complex, 2 to 25 percent slopes	409.0	2.4
Homko loam, 0 to 4 percent slopes	56.8	0.3
Honlu sandy loam, 1 to 8 percent slopes	171.3	1.0
Kilroy loam, 1 to 4 percent slopes	22.7	0.1
Mespun fine sand, 4 to 25 percent slopes	50.1	0.3
Mikim complex, 1 to 4 percent slopes	84.2	0.5
Milok fine sandy loam, 3 to 8 percent slopes	516.0	3.1
No data available	241.5	1.4
Polychrome-Milok complex, 8 to 50 percent slopes	595.2	3.5
Riemod loam, 0 to 2 percent slopes	602.9	3.6
Riemod loam, 2 to 4 percent slopes	726.0	4.3
Rock outcrop	256.8	1.5
Stygee silty clay loam, 0 to 1 percent slopes	168.4	1.0
Turzo clay loam, 4 to 8 percent slopes	4.9	<0.1
Turzo loam, 0 to 4 percent slopes	201.4	1.2
Turzo-Umbo complex, 0 to 2 percent slopes	482.3	2.9
Turzo-Umbo complex, 2 to 4 percent slopes	42.1	0.2
Uffens loam, 0 to 3 percent slopes	0.4	<0.1
Uffens loam, 3 to 8 percent slopes	91.5	0.5
Uffens sandy loam, 0 to 2 percent slopes	56.5	0.3
Umbo clay loam, 0 to 2 percent slopes	373.7	2.2
Utaline very gravelly sandy loam, 0 to 2 percent slopes	6.4	<0.1

Soil Type	Acres in Soil Analysis Area	Percent of Soil Analysis Area
Utaline very gravelly sandy loam, 2 to 8 percent slopes	83.3	0.5
Utaline very gravelly sandy loam, 8 to 25 percent slopes	124.9	0.7
Walknolls-Badland-Rock outcrop complex, 25 to 50 percent slopes	405.9	2.4
Water	2.2	<0.1
Windcomb-Badland-Rock outcrop complex, 8 to 25 percent slopes, extremely flaggy	9.9	<0.1
Wyasket loam, 0 to 2 percent slopes	46.8	0.3
Grand Total	**16,881.0**	**100**

Source: National Resource Conservation Service (NRCS). 2003. Soil Survey of Uintah Area, Utah—Parts of Daggett, Grand, and Uintah Counties. Available at: https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/utah/UT047/0/UT047.pdf. Accessed July 25, 2017.

APPENDIX C: LAND COVER TYPES IN THE FEDERAL PIPELINE UNIT WELLS 4-21-4-23 AND 5-21-4-23 VEGETATION ANALYSIS AREA

The most prevalent land cover types in the analysis area, as well as every land cover type present in the project area, are described below:

Inter-Mountain Basins Big Sagebrush Shrubland covers approximately 26.0% of the analysis area and is found in the project area. This land cover type typically occurs in broad basins between mountain ranges, plains, and foothills between 4,900 and 7,500 feet elevation. These shrublands are dominated by big sagebrush (*Artemisia tridentate* ssp.) and/or Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Scattered juniper (*Juniperus* spp.), greasewood (*Sarcobatus vermiculatus*), and saltbush (*Atriplex* spp.) may also be present in some stands. Other species often found within this land cover type include rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), bitterbrush (*Purshia tridentata*), mountain snowberry (*Symphoricarpos oreophilus*), Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), wheatgrass (*Elymus lanceolatus*), Idaho fescue (*Festuca idahoensis*), needle-and-thread grass (*Hesperostipa comata*), wild rye (*Leymus cinereus*), James' galleta (*Pleuraphis jamesii*), western wheatgrass (*Pascopyrum smithii*), Sandberg bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Pseudoroegneria spicata*) (USGS 2005)[1].

Colorado Plateau Pinyon-Juniper Shrubland covers approximately 20.1% of the analysis area and is found in the project area. This land cover type is characteristic of the rocky mesa tops and slopes on the Colorado Plateau. The vegetation is dominated by dwarfed pinyon pine (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include black sagebrush (*Artemisia nova*), Wyoming big sagebrush, yellow rabbitbrush, or blackbrush (*Coleogyne ramosissima*). Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids. (USGS 2005)

Inter-Mountain Basins Mixed Salt Desert Scrub covers approximately 16.2% of the analysis area and is found in the project area. This land cover type includes open-canopied shrublands of typically saline basins, alluvial slopes, and plains across the intermountain western U.S. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more Atriplex species such as shadscale saltbush (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), cattle saltbush (*Atriplex polycarpa*), or spinescale saltbush (*Atriplex spinifera*). Other shrubs present may include Wyoming big sagebrush, yellow rabbitbrush, rubber rabbitbrush, Mormon tea (*Ephedra nevadensis*), spiny hopsage (*Grayia spinosa*), winterfat (*Krascheninnikovia lanata*), goji (*Lycium* spp.), bud sagebrush (*Picrothamnus desertorum*), or horsebrush (*Tetradymia* spp.) The herbaceous layer varies from sparse to moderately dense and

[1] U.S. Geological Survey (USGS). 2005. Southwest Regional GAP Analysis Project. USGS National GAP Analysis Program. RS/GIS Laboratory, College of Natural Resources. Utah State University. Available at: https://rsgis-swregap.s3-us-west-2.amazonaws.com/public/docs/swgap_legend_desc.pdf. Accessed July 28, 2017.

is dominated by perennial graminoids such as Indian ricegrass, blue grama, thickspike wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*), western wheatgrass, James' galleta, big galleta (*Pleuraphis rigida*), Sandberg bluegrass, or alkali sacaton (*Sporobolus airoides*). Various forbs are also present. (USGS 2005)

Colorado Plateau Mixed Bedrock Canyon and Tableland covers approximately 9.7% of the analysis area and is found in the project area. This land cover type is comprised of barren and sparsely vegetated landscapes of steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species include pinyon pine, ponderosa pine (*Pinus ponderosa*), juniper, littleleaf mountain mahogany (*Cercocarpus intricatus*), and other short-shrub and herbaceous species. (USGS 2005)

Inter-Mountain Basins Greasewood Flat covers approximately 3.7% of the analysis area and is found in the project area. This land cover type typically occurs near drainages on stream terraces or flats or may form rings around more sparely vegetated playas. The vegetation usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by greasewood. Fourwing saltbush, shadscale saltbush, or winterfat may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by graminoids. Alkali sacaton, saltgrass (*Distichlis spicata*), or common spikerush (*Eleocharis palustris*) may also occur. (USGS 2005)

Inter-Mountain Basins Semi-Desert Shrub Steppe covers approximately 3.6% of the analysis area and is found in the project area. This land cover type is typically found on alluvial fans and flats with moderate to deep soils. The vegetation is typically dominated by graminoids with an open shrub layer. Characteristic grasses include Indian ricegrass, blue grama, saltgrass, needle-and-thread grass, James' galleta, Sandberg bluegrass, and alkali sacaton. The woody layer is often a mixture of shrubs and dwarf-shrubs, such as fourwing saltbush, big sagebrush, Greene's rabbitbrush (*Chrysothamnus greenei*), yellow rabbitbrush, *Ephedra* ssp., rubber rabbitbrush, broom snakeweed (*Gutierrezia sarothrae*), and winterfat. (USGS 2005)

Inter-Mountain Basins Shale Badland covers approximately 2.0% of the analysis area and is found in the project area. This land cover type is composed of barren and sparsely vegetated substrates typically derived from marine shales, but also includes substrates derived from siltstones and mudstones. The vegetation is typically sparse dwarf-shrubs such as mat saltbush (*Atriplex corrugata*), Gardner's saltbush (*Atriplex gardneri*), birdfoot sagebrush (*Artemisia pedatifida*), and herbaceous vegetation. (USGS 2005)

APPENDIX D: VISUAL CONTRAST RATING WORKSHEET: KEY OBSERVATION POINTS 1 & 2

Form 8400-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: June 15, 2017

District/ Field Office: Vernal

Resource Area:

Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name Federal Pipeline EA	4. Location Township T. 4 S.	5. Location Sketch
2. Key Observation Point KOP 1	Range R. 23 E.	
3. VRM Class VRM II	Section 19	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Hills in BG, rolling in FG and MG.	BG vegetation draped across hills, no discernable form. Vegetation in MG and FG is lumpy with individual shrubs and trees distinguishable.	Short vertical structures (markers) along pipeline ROW.
LINE	Dirt road across landscape at KOP location.	Patterns of vegetation on landscape forms short, interconnected lines of contrast: dark vegetation against light rock and soil.	Dirt road along pipeline ROW. Implied line from markers/signage along ROW.
COLOR	Light colored soils and rock outcrops in BG with dark red strata visible.	Dark green (high contrast), medium green, light gray-green shrubs and trees. Light to medium browns and tans for ground plane.	Road is light brown and contrasts with surrounding colors. Markers/signs are yellow.
TEX-TURE	Overall texture moderate to coarse.	Fine to moderate textures depending on distance from KOP.	Road texture is finer than surrounding textures.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM			
LINE			
COLOR			
TEX-TURE			

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

<table>
<tr><td colspan="2" rowspan="3">1.
DEGREE
OF
CONTRAST</td><td colspan="12">FEATURES</td><td rowspan="3">2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)
3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)
Evaluator's Names Date</td></tr>
<tr><td colspan="4">LAND/WATER BODY
(1)</td><td colspan="4">VEGETATION
(2)</td><td colspan="4">STRUCTURES
(3)</td></tr>
<tr><td>STRONG</td><td>MODERATE</td><td>WEAK</td><td>NONE</td><td>STRONG</td><td>MODERATE</td><td>WEAK</td><td>NONE</td><td>STRONG</td><td>MODERATE</td><td>WEAK</td><td>NONE</td></tr>
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</table>

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

Form 8400-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: June 15, 2017	
District/ Field Office: Vernal	
Resource Area:	
Activity (program):	

SECTION A. PROJECT INFORMATION

1. Project Name Federal Pipeline EA	4. Location Township T. 5 S.	5. Location Sketch
2. Key Observation Point KOP 2	Range R. 23 E.	
3. VRM Class None	Section 9	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat fields in FG, bluff in MG, hills in BG.	BG vegetation draped across hills, no discernable form. Vegetation in MG and FG has trees and grasses along highway. Irrigated fields beyond that. Sparse vegetation in MG and BG.	Flat road. Blocky structures in MG. Poles and signage visible.
LINE	Ridgeline forms implied line with sky.	Patterns of vegetation on landscape forms short, interconnected lines of contrast: dark vegetation against light rock and soil. Dark vegetation on ridgeline accentuates implied line.	Highway forms strong linear element in FG. Implied line from poles and signage along highway.
COLOR	Bright green ground plane in FG. Light, dun-colored slopes in MG/BG.	Bright green vegetation in irrigated fields. Dark green shrubs and trees on slopes and along highway.	Highway is medium gray flanked by brown poles. Structures in MG are gray with light-colored parking areas evident.
TEX-TURE	Overall texture moderate to coarse.	Fine to moderate textures depending on distance from KOP.	Texture for highway and structures is coarse.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM			
LINE			
COLOR			
TEX-TURE			

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

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</table>

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

APPENDIX E: GREATER SAGE-GROUSE REQUIRED DESIGN FEATURES AND APPLICABLE MANAGEMENT ACTIONS

Greater Sage Grouse Analysis
Project Name: Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23
NEPA#: DOI-BLM-UT-G010-2017-0036

This appendix documents the conformance of the proposed action with the Greater Sage Grouse Record of Decision and Approved Resource Management Plan Amendments (ARMPA) and associated management actions for Utah, approved in September 2015.

The proposed Eagleridge Operating, LLC project affecting greater sage-grouse (GRSG) habitat directly, includes upgrading a two-track road that leads to a proposed drilling site of an exploratory oil well. There is a direct loss of 6.8 acres of new disturbance on a BLM managed GRSG Priority Habitat Management Area (PHMA). The proposed project site is also located within the State of Utah's Uintah Sage-Grouse Management Area (SGMA) and Utah Division of Wildlife Resources (UDWR) designated wintering habitats. GRSG from Diamond Mountain have been found wintering in the project area. There are no known leks within over a 3.1-mile radius of the project.

A. Avoidance and Minimization

Avoidance and minimization are documented using the required design features (RDF) determined by BLM in the Utah Greater Sage-Grouse Approved RMP Amendment (2015) to ensure regulatory certainty by using these recommended best management practices. For this project, the applicable RDFs for fluid minerals and lands and reality that are required for Priority Habitat Management Areas (PHMA) were addressed below. Also, pertinent stipulations as identified in the ARMPA 2015 will apply to minimize impacts.

a) *Pertinent Restrictions:*

Seasonal Restrictions:
No ground disturbing activities will be authorized during the following season:
Winter habitat: November 15 – March 15.

Noise Restrictions:
Road construction would not be authorized during the winter season (November 15 – March 15) when GRSG are utilizing the area. No new facilities are being constructed within the PHMA boundary.

Tall Structure Restrictions:
No new tall structures are being proposed within BLM designated GRSG habitat management areas.

Buffers:
No lek buffers apply to this project as there are no GRSG leks within the 3.1 mile buffer area.

Predation:
Individuals constructing the road will remove any trash or debris resulting from construction. No

new permanent facilities will be constructed within the PHMA boundary thus eliminating perching and nesting opportunities for predators.

b) *Required Design Features:*

Appendix Table A-1. Required Design Features for Priority Habitat Management Areas

UTAH GREATER SAGE-GROUSE APPROVED RESOURCE MANAGEMENT PLAN AMENDMENT (ARMPA) REQUIRED DESIGN FEATURES FOR PRIORITY HABITAT MANAGEMENT AREAS		
FLUID MINERALS		
Sub Category	**Attachment A – RDF**	**Commitment/ What are you doing to address the RDF?**
Roads	Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.	Roads will be designed to gold book standards. Exploration Phase road will be 14’ running surface. Production Phase will be 18’ running surface.
	Do not issue rights-of-way or special use authorizations to counties on newly constructed energy development roads, unless for a temporary use consistent with all other terms and conditions included in this document.	Upon plugging and abandonment of the wells, EagleRidge Operating will relinquish the ROW.
	Establish speed limits on BLM system roads to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds	Roads will be designed to be driven at slower speeds.
	Coordinate road construction and use among right-of-way or special use authorization holders.	The operator will coordinate road construction with other right-of-way holders.
	Construct road crossings at right angles to ephemeral drainages and stream crossings.	Roads will be constructed at right angles to ephemeral drainages and stream crossings.
	Use dust abatement practices on roads and pads.	The operator will employ water trucks to wet the road and keep dust to a minimum as necessary.
	Close and rehabilitate duplicate roads.	When possible the operator will close and rehabilitate duplicate roads.
	Locate Roads to avoid important areas and habitats (important habitats include seasonal habitats (i.e., winter, nesting, breeding, and brooding habitats) within PHMA).	The road is already existing. Habitats will be avoided to the extent possible.
	Restrict vehicle traffic to only authorized users on newly constructed routes using signage gates, etc.	Signage for newly constructed routes will be posted as authorized use only.
Reclamation	Include objectives for ensuring habitat restoration meets GRSG habitat needs in reclamation practices/sites (Pyke 2011). Address post reclamation management in	Any disturbed area not needed for ongoing operations will be reclaimed as soon as practical to reduce surface disturbance and initiate reclamation of GRSG habitat. Seed mixes designed for GRSG will be used to the extent they are available. Operator will gain BLM approval prior to starting any interim or final

	reclamation plan such that goals and objectives are to improve or restore GRSG habitat needs.	reclamation. Final reclamation will utilize the same practices as interim to allow for maximum reclamation of GRSF habitat.
	Maximize the area of interim reclamation on long-term access roads and well pads including reshaping, topsoiling and revegetating cut and fill slopes.	Unused areas will be reshaped, contoured, and revegetated during interim reclamation.
	Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community.	The operator will restore disturbed areas at final reclamation to pre-disturbance standards to the extent possible.
	Irrigate interim reclamation if necessary for establishing seedlings more quickly.	Water trucks will be used during interim reclamation to establish seedlings more quickly as applicable.
	Utilize mulching techniques to expedite reclamation and to protect soils.	Any available native mulch will be used to expedite reclamation and protect soils.

REQUIRED DESIGN FEATURES FOR LANDS AND REALTY

Attachment A - RDF	**Commitment**
Where technically and financially feasible, bury distribution power lines and communication lines within existing disturbance.	No distribution power or communication lines are proposed as part of this project/Does not apply.
Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose.	Roads will be designed to an appropriate standard to accommodate local oil and gas traffic.
Place infrastructure in already disturbed locations where the habitat has not been fully restored.	No infrastructures are proposed at this time within habitat areas.
Cluster disturbances, operations, and facilities.	All disturbances for operations and facilities will be clustered together when possible.
Micro-site linear facilities to reduce impacts to GRSG habitats	No facilities are proposed within the GRSG habitat.
Locate staging areas outside GRSG habitat to the extent possible.	Staging areas will be located outside of GRSG to the extent possible.
Coordinate road construction and use among ROW holders.	The operator will coordinate road construction and use among all current ROW holders. Encroachment permits will be filed to the appropriate agencies and ROW holders.
Restrict vehicle traffic to only authorized users on newly constructed routes using signage, gates, etc.	Signage will be posted for authorized use only.
Construct road crossings at right angles to ephemeral drainages and stream crossings.	The operator will construct road crossings at right angles to ephemeral drainages and stream crossings.
Consider placing pipelines under or immediately adjacent to a road or adjacent to other pipelines first, before considering co-locating with other ROW.	No pipelines proposed as part of this project/Does not apply.
Control the spread and effects of non-native plant species.	An authorized weed management specialist will be employed to control the spread of not native plant species. A plan will be submitted to the Authorized officer prior to the use of herbicides or pesticides.

New ROW structures will be constructed with perch deterrents or other anti-perching devices, where needed.	No new above ground structures in this portion of the project (road upgrade) that is in PHMA would require perch deterrents.

B. <u>Mitigation</u>

Baseline, Debits, and Credits:

Compensatory mitigation is used to implement net conservation gain to recompense for the remaining impacts after avoidance and minimizations measures have been applied. An activity that impacts GRSG habitat must be mitigated sufficiently to provide actual benefits or gain above the baseline conditions (BLM 2016). The changes in baseline conditions are used to determine the debits and the credits (BLM 2016).

The Sage-grouse Compensatory Mitigation Program, which is administered by Utah's Department of Natural Resources (DNR), was established to offset the impacts of permanent disturbance to GRSG habitat in Utah. Where avoidance or minimization is not possible, the program provides mitigation (called credits) that result in an increase to or protection of GRSG habitat to offset the impacts from permanent disturbance (called debits). Credit and debits are measured in acres. One credit equals one acre of habitat. The mitigation program provides for three actions to generate credits: 1) create functional habitat for GRSG adjacent to existing occupied habitat, 2) create corridors linking two areas of occupied habitat to facilitate safe movement, particularly by broods, and 3) protect existing occupied habitat from development through a conservation easement and ensure the habitat quality is maintained. Projects to generate credits using any of these actions must be completed within a State designated Sage Grouse Management Area (SGMA) in Utah, which are mostly encompassed within BLM designated Priority Management Areas (PHMA).

Timeliness:

The compensatory mitigation must be started either before the disturbance activity begins or within one year after the disturbance activity commences.

Durability:

Projects conducted to create or protect GRSG habitat must be verified before they can be sold as a mitigation credit. Verification that the project meets the credit criteria are substantiated by certified biologists through the Utah Department of Natural Resources (DNR). In addition, the credits generated by projects are be monitored to guarantee their persistence over time. Credits must have a life of at least 20 years but also need to match the longevity of the permanent disturbance. A monitoring procedure has been developed by the Great Basin Research Center, to help determine whether the outcomes of the mitigation are being achieved. To manage uncertainty and to offset any potential loss of credits due to unforeseen circumstances, the State of Utah manages a reserve pool of credits to offset any catastrophic loss of generated credits from unforeseen circumstances.

***Resources (Required outcomes are being achieved) and Additionality*:**

Each mitigation credit should be managed as functional habitat or corridor for the duration prescribed in Utah Administrative Rule R634-3. Those terms are intended to ensure that credits are managed or protected as functional habitat or corridor for the lifetime of the debit it is intended to offset. Functional habitat is described as GRSG habitat created through a credit generation project. It must meet several key requirements, including it is adjacent to habitat that grouse are currently using, has a live sagebrush canopy of at least 10%, and no more than 1% canopy cover of conifer trees (e.g., junipers) over 0.5 meters (20 inches) in height. Corridors (areas of land that facilitate GRSG movement between two or more areas of occupied habitat) can also be improved. These also must meet thresholds, including limits on tree cover, and minimum amounts of other plants that sage grouse need. Corridors must be at least 100 acres in size with a width of at least 2,000 feet. Biologists certified through the Utah Department of Natural Resources (DNR) are consulted to determine whether these parameters are met.

***Administrative (Incompatible uses are being excluded)*:**

Eagleridge Operating, LLC will not implement other activities that are not encompassed in this EA. If modifications are needed an analysis will be conducted to ensure that the new modification is not incompatible with the current and future objectives and uses of the area.

***Financial (Finances are sufficient to maintain, monitor, and adapt mitigation project)*:**

The BLM does not distinguish between priority and general habitat in the plan amendment for mitigation. Currently, neither the plan amendment nor the Greater Sage-Grouse Land Use Plan Implementation Guide provides thorough guidance for net conservation gain. Pending further guidance on mitigation from the BLM Washington, D.C. Office, the Green River District (GRD) is considering a 4:1 habitat (acres) mitigation ratio in PHMA in order to move forward with projects in the interim. The 4:1 mitigation ratio is derived from and is consistent with the State of Utah's Conservation Plan for Greater Sage-grouse in Utah (2013 and 2019). The 4:1 ratio accounts for both direct and indirect impacts that may come from permanent disturbance, differences in habitat quality, and uncertainty of mitigation success. The fiscal monetary mitigation associated with the mitigation ratio, will exceed the cost of most mitigation vegetation treatments that may occur on the landscape because the monetary derivation will include administrative costs, pre and post monitoring, maintenance and retreatments, and adaptation (if there is risk of failure) of the compensatory mitigation project.

The proposed Eagleridge Operating, LLC project will create a direct loss of 6.8 acres of new disturbance on a BLM managed GRSG Priority Habitat Management Area (PHMA). The proposed project site is also located within the State of Utah's Uintah Sage-Grouse Management Area (SGMA) and Utah Division of Wildlife Resources (UDWR) designated wintering habitats. Per the BLM Utah's 2015 and 2019 Greater Sage-Grouse Land Use Plan Amendment management action MA-SSS-3, in May 2019 a letter and pertinent information was sent to Braden Sheppard at the Public Lands Policy and Coordinating Office (PLPCO) and to Brian Maxfield at the Utah Division of Wildlife Resources in the Northeastern Region Office. In the letter, BLM requested the State of Utah review the proposed project, Federal Pipeline Unit Wells 4-21-4-23 and 5-21-4-23 (DOI-BLM-UT-G010-2017-0036-EA), to determine if the existing mitigation applied is appropriate or if additional mitigation including compensatory mitigation is required or recommended under State Regulation, Policies or programs related to the conservation of the GRSG. The State of Utah officially responded on June 10, 2019 to recommend a 4:1 mitigation ratio, based on their GRSG conservation plan for direct loss of GRSG habitat (UDWR 2019). Thus, the BLM also recommends a 4:1 mitigation ratio to compensate for GRSG habitat loss. Using this ratio, the recommended acreage for compensatory mitigation is 27.2 acres (6.8 acres x 4 = 27.2 acres).

If the proponent voluntarily agrees to implement compensatory mitigation, they will work with the State of Utah to purchase compensatory mitigation credits for 27.2 acres through the State's Sage-Grouse Compensatory Mitigation Program.

C. Disturbance Cap

The US Fish and Wildlife Service (USFWS) identified 18 threats that are contributing to the impacts of GRSG habitat and range (75 Federal Register 13910 2010). These 18 threats were aggregated into three measures: sagebrush availability, habitat degradation, and density of energy and mining (BLM 2015). Habitat degradation and density of energy and mining are being evaluated under the disturbance cap and density cap, respectively (BLM 2015). The disturbance cap will be evaluated at the Biologically Significant Unit (BSU) scale and the project scale.

The BSU for the project site (impacted site) is the Uintah-Diamond Mountain Population Area encompassed within the designated PHMA. Total disturbance acreage at the project scale and the Biologically Significant Unit (BSU) scale within the PHMA may not exceed three percent. Geospatial analysis conducted using individual data layers indicates that presently, all individual sub-unit populations within the Uintah population area are under 3 percent disturbance.

At the project level scale, total disturbance is determined by identifying PHMA that is nearby or affected by the proposed project (BLM 2015). Disturbance estimates at the project scale may not exceed three percent. Geospatial analysis was conducted using the FEIS preliminary disturbance inventory. Given the requirements in the current land use plan, we have sufficient information to demonstrate that planned disturbance in the project area is less than 3%, which is in conformance with the ARMPA (MA-SSS-3b).

D. <u>Density of Energy/Mining Facilities Cap</u>

The density cap only applies to energy and mining facilities in PHMA; hence there is no density cap calculation for this particular part of the project (BLM 2015).

E. <u>Conformance With Land and Realty Management Actions (BLM 2015):</u>

Objective MR-2: Where a proposed fluid mineral development project on the existing lease could adversely affects GRSG populations or habitat, the BLM will work with the lessees, operators, or other project proponents to avoid, minimize and compensate for adverse impacts on the extent compatible with lessees' rights to drill and produce fluid mineral resources. The BLM will work with the lessee, operator, or project proponent in developing an application for permit to drill for the lease to avoid, minimize, and compensate for impacts on GRSG or its habitat and will ensure that the best information about the GRSG and its habitat informs and helps to guide development of such federal leases.

MA-LR-2: This project will be collocated with existing disturbances. Avoidance, minimization, mitigation, disturbance cap, tall structure restrictions, seasonal restrictions and applicable RDFs will be implemented to address disturbance impacts to GRSG habitat.

MA-LR-5: Green River District Reclamation Guidelines along with a reclamation plan and BLM approved seed mix will be reviewed and followed. If the lease is relinquished or terminated the company will be required to restore the site by removing any infrastructure and eliminate any raven nesting opportunities. This project will also be collocated with existing disturbances.

MA-LR-6: If the existing leases or ROW are no longer in use, the company will remove the features (if it does not create severe disturbance) and will restore the habitat. The Green River District Reclamation Guidelines along with a reclamation plan and BLM approved seed mix will be followed.

<u>References:</u>

BLM (Bureau of Land Management). 2015. Utah Greater Sage-Grouse Approved Resource Management Plan Amendment. U.S. Department of the Interior, Bureau of Land Management, Utah State Office, Salt Lake City, Utah, USA.

BLM (Bureau of Land Management). 2016. Greater Sage-Grouse Land Use Plan Implementation Guide. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C., USA.

UDWR (Utah Department of Natural Resources, Division of Wildlife Resources). 2019. Utah Conservation Plan for Greater Sage-grouse. Utah Department of Natural Resources, Division of Wildlife Resources, Salt Lake City, Utah, USA.

UDWR (Utah Department of Natural Resources, Division of Wildlife Resources). 2013. Conservation Plan for Greater Sage-grouse in Utah. Utah Department of Natural Resources, Division of Wildlife Resources, Salt Lake City, Utah, USA.

APPENDIX F– CONFORMITY DETERMINATION

MEMORANDUM FOR RECORD June 24, 2019

SUBJECT: General Conformity Analysis for the Eagleridge 2 Wells

LOCATION: Uintah County, Township 4 South, Range 23 East, Section 21

FIELD OFFICE: Vernal Field Office,

BACKGROUND: Eagleridge proposes to drill up to two shallow oil wells.

PREPARED By: Stephanie Howard, Branch Chief, NEPA and GIS

1. The BLM, as the federal agency with jurisdiction for the subject activity, is bound by the requirements of the General Conformity Rule under Section 176(c) of the Clean Air Act and Utah Administrative Code R307-115 for authorizing activities within the designated Uinta Basin Ozone Nonattainment Area.

2. The subject activities will be located within the Uinta Basin Ozone Nonattainment Area (Marginal) and thus a General Conformity demonstration or non-applicability analysis is required before the BLM can authorize the activity.

3. The BLM has developed an emissions inventory of direct and indirect emissions should the wells be approved. This emissions inventory is contained within Appendix F of DOI-BLM-UT-G010-2017-0036-EA. The inventory includes specific information about emission-emitting equipment that will be used (quantity, horsepower, emission rate, etc.), or what emission controls or offsets may be utilized, such that a reasonably precise emission inventory could be estimated and compared to de minimus thresholds in 40 CFR 93.153. Some project components may be permitted under Utah Administrative Code R307 504-511 and are not subject to General Conformity analysis provisions.

REFERENCES:

1. 40 CFR 93.153 defines the *de minimis* thresholds for NO_X and VOC in a marginal ozone nonattainment area as 100 tons per year (tpy).

2. Utah Administrative Code R307 504-511 permits by rule tank truck loading, storage vessels, dehydrators, VOC control devices, well site natural gas–fired engines, and gas flaring. These emissions sources as described in the code are not subject to General Conformity review.

CONCLUSION: This Eagleridge project, has been evaluated in accordance with the requirements of 40 CFR 93.153 subpart B and Utah Administrative Code R307-115 and has been determined to conform with all applicable local, state, and federal air quality laws, regulations, and statutes for the following reason(s):

[ ] Action is covered within the approved SIP

[ ] Action is excluded by the Regulatory Authority per:

[ ] Action is categorically excluded per (citation):

[**X**] Potential maximum total direct and indirect emissions are below *de minimis* threshold levels: Leasing does not authorize emission-generating activities.

Ozone (NO_X emissions): **10.34 tpy**

Ozone (VOC emissions): **12.18 tpy**

[ ] Potential total emissions are fully offset by:

[ ] Other (specify):

____

Authorized Officer

APPENDIX G: EMISSIONS INVENTORY

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Location Selection:

Geography:	**Well Type:**
Uinta Basin Oil	Oil Well

- Choose geography/basin, and well type will automatically fill
  < Choose Uinta/Piceance Basin for deep gas wells with little condensate
  < Choose Upper Green River Basin for deep gas wells with dehydrators and higher condensate
  < Choose San Juan Basin for shallow gas wells with little to no condensate
  < Choose Williston Basin for deep oil wells with high gas
  < Choose Denver Basin for shallow oil wells with low gas

If the user wants to change any specifications, do so within the "Constants and References" tab, as all other tabs connect to it.

	Total Emissions (Tons per Year)								
Pollutant:	**NO_X**	**CO**	**VOC**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**
Construction Phase:	0.46	0.27	0.04	0.0001	2.62	0.05	31.60	0.001	0.0003
Development Phase:	3.22	0.95	0.41	0.0005	8.91	0.12	405.44	0.99	0.2418
Operation Phase:	1.49	2.13	5.64	0.0009	0.14	0.67	405.22	2.75	0.0416
Total:	5.17	3.34	6.09	0.0016	11.67	0.85	842.26	3.74	0.2836

	Total Emissions (Tons per Year)					
Pollutant:	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**	**n-Hexane**	**HAPs**
Construction Phase:	0.00	0.00	0.00	0.00	0.00	0.00
Development Phase:	0.00	0.00	0.0000	0.00	0.01	0.01
Operation Phase:	0.06	0.01	0.00032	0.001	0.21	0.35
Total:	0.06	0.01	0.00032	0.00	0.22	0.36

CO_2 equivalent (Global Warming Potential)

Total TPY: 1022.24

CO_2 equivalent conversions:
CO_2 1.00
CH_4 28.00
N_2O 265.00

H_2S Emissions

Total TPY: 0.25

* If H_2S in gas, input value in "Gas Stream Molar Ratios" tab, and potential emissions will calculate here. Current assumption is no H_2S in gas stream.

Williston	North Dakota, E Montana, NW South Dakota
San Juan	SW Colorado, NW New Mexico (4 corners)
Upper Green River	Jonah-Pinedale fields, W Wyoming
Denver Basin	N-Central Colorado
Uintah	NE Utah, NW Colorado

Well Configuration Table:

Base Location	Type
(None Selected)	(None Selected)
Uinta/Piceance Basin	Natural Gas
Upper Green River Basin	Natural Gas
San Juan Basin	Natural Gas
Williston Basin	Oil Well
Uinta Basin Oil	Oil Well

Well Type
(None Selected)
Natural Gas
Oil Well

BaseLine Well Equipment:

Well Configuration	Well Type
(None Selected)	(None Selected)
Uinta/Piceance Basin	Natural Gas
Upper Green River Basin	Natural Gas
San Juan Basin	Natural Gas
Williston Basin	Oil Well
Uinta Basin Oil	Oil Well

Device Type
Low Bleed
Intermittent Bleed
High Bleed

Annual Run Time:	365	Days/Year
Annual Run Time:	8760	Hours/Year

Road Construction Emissions:

Dozer/Track Hoe:

Construction Schedule:

Assumption	Value	Units	Reference/Description
Project Schedule	4	Days/Location	
Project Working Hours	12	Hours/Day	
Dozer Hours	48	Hours/Location	
Backhoe Hours	48	Hours/Location	

Hauling/Trips:

Heavy Haul Trucks	5	Round Trips

Calculation Parameters:

Parameter	Value	Units	Reference/Description
Watering Control Eff. (CE)	50	Percent (%)	
Soil Moisture Content (M)	7.9	Percent (%)	AP-42 Table 11.9-3, 7/98
Soil Silt Content (S)	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

Grader:

Construction Schedule:

Assumption	Value	Units	Reference/Description
Road Length	5.5	Miles/Location	
Grader Passes	3	Swaths	
Grading Length	16.5	Miles/Location	
Project Schedule	4	Days/Location	
Project Working Hours	12	Hours/Day	
Grader Working Hours	48	Hours/Location	

Hauling/Trips:

Heavy Haul Trucks	2	Round Trips

Calculation Parameters:

Parameter	Value	Units	Reference/Description
Watering Control Eff. (CE)	50	Percent (%)	
Average Grader Speed (S)	7.1	Miles/Hour	AP-42 Table 11.9-3, 7/98
Soil Silt Content (S)	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

Well Pad Construction Emissions:

Dozer/Track Hoe:

Construction Schedule:

Assumption	Value	Units	Reference/Description
Project Schedule	7	Days/Location	
Project Working Hours	12	Hours/Day	
Dozer Hours	84	Hours/Location	
Backhoe Hours	84	Hours/Location	

Hauling/Trips:

Heavy Haul Trucks	5	Round Trips

Calculation Parameters:

Parameter	Value	Units	Reference/Description
Watering Control Eff. (CE)	50	Percent (%)	
Soil Moisture Content (M)	7.9	Percent (%)	AP-42 Table 11.9-3, 7/98
Soil Silt Content (S)	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

Grader:

Construction Schedule:

Assumption	Value	Units	Reference/Description
Project Schedule	4	Days/Location	
Project Working Hours	12	Hours/Day	
Grader Working Hours	48	Hours/Location	
Pad Length	220	Feet	
Pad Width	150	Feet	
Grader Swath Width	10	Feet	
Grading Passes	3		
Distance Graded (D)	1.88	Miles/Location	
Project Schedule	2	Days/Location	
Project Working Hours	12	Hours/Day	
Grader Working Hours	24	Hours/Location	

Hauling/Trips:

Heavy Haul Trucks	2	Round Trips

Calculation Parameters:

Parameter	Value	Units	Reference/Description
Watering Control Eff. (CE)	50	Percent (%)	
Average Grader Speed (S)	7.1	Miles/Hour	AP-42 Table 11.9-3, 7/98
Soil Silt Content (S)	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

Operations Tailpipe:

Pipeline Construction Emissions:

Dozer/Track Hoe:

Construction Schedule:

Assumption	Value	Units	Reference/Description
Project Schedule	0	Days/Location	No pipeline will be used. Product is planned to be hauled out by truck.
Project Working Hours	12	Hours/Day	
Dozer Hours	0	Hours/Location	
Backhoe Hours	0	Hours/Location	

Calculation Parameters:

Parameter	Value	Units	Reference/Description
Watering Control Eff. (CE)	50	Percent (%)	
Soil Moisture Content (M)	7.9	Percent (%)	AP-42 Table 11.9-3, 7/98
Soil Silt Content (S)	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

Hauling/Trips:

Heavy Haul Trucks	4	Round Trips

Grader:

Construction Schedule:

Assumption	Value	Units	Reference/Description
ROW Length	0.0	Miles/Location	No Pipeline will be installed.
ROW Width	50.0	Feet	
Grader Swath Width	10	Feet	
Grader Swaths	5		
Grading Length	0.0	Miles/Location	
Project Schedule	7	Days/Location	
Project Working Hours	12	Hours/Day	
Grader Working Hours	84	Hours/Location	

Hauling/Trips:

Heavy Haul Trucks	2	Round Trips

Calculation Parameters:

Parameter	Value	Units	Reference/Description
Watering Control Eff. (CE)	50	Percent (%)	
Average Grader Speed (S)	7.1	Miles/Hour	AP-42 Table 11.9-3, 7/98
Soil Silt Content (S)	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

Wind Erosion:

Disturbance Area:

Parameter	Value	Units	
Road	871200	Square Feet	Calculated Using road Length, assuming 30 feet wide disturbance
Well Pad	33000	Square Feet	Calculated using pad dimensions
Pipeline ROW	0	Square Feet	Calculated using ROW Length and Width

Construction Equipment Total Hours:

Equipment	Working Hours	Horsepower Rating	Load Factor	
Dozer	132	100	0.59	Nonroad Diesel Other Construction Eq.
Trackhoe	132	140	0.59	Nonroad Diesel Excavators
Grader	156	250	0.59	Nonroad Diesel Graders

Construction Tailpipe:

Light Duty Pickup Trucks:

Parameter	Value	Units	Reference/Description
Trips/Day (Drilling)	4	Trips/Day	AP-42 Table 11.9-3, 7/98
Trips/Day (Completions)	4	Trips/Day	AP-42 Table 11.9-3, 7/98
Trips/Day (Workovers)	8	Trips/Day	
Trips/Day (Conductor Set)			
Total Trips (Road Const.)	16	Trips/Location	
Total Trips (Well Pad Const.)	28	Trips/Location	
Total Trips (Pipeline Const.)	0	Trips/Location	

Heavy Duty Haul Trucks:

Parameter	Value	Units	Reference/Description
Avg. Round Trip Distance	80	Miles	
Trips (Road Const.)	7	Trips/Location	
Trips (Well Pad Const.)	8	Trips/Location	
Trips (Pipeline Const.)	6	Trips/Location	

Development Tailpipe:

Conductor Set:

Parameter	Value	Units
Light Duty Pickup Trucks	4	Trips/Location
Light Duty Haul Trucks	1	Trips/Location
Heavy Duty Haul Trucks	1	Trips/Location
Water Trucks	0	Trips/Location

Drilling:

Parameter	Value	Units
Light Duty Pickup Trucks	48	Trips/Location
Light Duty Haul Trucks	4	Trips/Location
Heavy Duty Haul Trucks	24	Trips/Location
Water Trucks	0	Trips/Location

Completions:

Parameter	Value	Units
Light Duty Pickup Trucks	28	Trips/Location
Light Duty Haul Trucks	4	Trips/Location
Heavy Duty Haul Trucks	36	Trips/Location
Water Trucks	24	Trips/Location

Workovers Cementing:

Parameter	Value	Units
Light Duty Pickup Trucks	4	Trips/Location
Light Duty Haul Trucks	2	Trips/Location
Heavy Duty Haul Trucks	6	Trips/Location
Water Trucks	0	Trips/Location

Total:

Parameter	Value	Units
Light Duty Pickup Trucks:	**84**	**Trips/Location**
Light Duty Haul Trucks	**11**	**Trips/Location**
Heavy Duty Haul Trucks	**67**	**Trips/Location**
Water Trucks	**24**	**Trips/Location**

Operations Tailpipe:

Parameter	Value	Units	
Light Duty Pickup Trucks:	50	**Trips/Location**	Pumper Trips
Light Duty Haul Trucks	0	**Trips/Location**	
Heavy Duty Haul Trucks	2	**Trips/Location**	Equipment for Road Maintanance
Water Trucks	65	**Trips/Location**	Hauling Produced Water

TailPipe/Hauling:	80	**Miles/Trip Average**	
Round Trip (Paved)	32	**Miles**	Estimated to be 40% of Total
Round Trip (Unpaved)	48	**Miles**	Estimated to be 60% of Total

Development Traffic Dust:

	Silt Content (%)	Precipitation Days	Silt Loading	(Reserve)
(None Selected)	0	0	0	0
Uinta/Piceance Basin	8.5	45	0.6	0
Upper Green River Basin	8.5	55	0.6	0
San Juan Basin	8.5	35	0.6	0
Williston Basin	8.5	45	0.6	0
Uinta Basin Oil	8.5	45	0.6	0

WellSite Major Equipment Count:

		Wellsite Template					
		(None Selected)	Uinta/Piceance Basin	Upper Green River Basin	San Juan Basin	Williston Basin	Uinta Basin Oil
		(None Selected)	Natural Gas	Natural Gas	Natural Gas	Oil Well	Oil Well
Gas Service	Wellheads:	0	1	1	1	0	0
	Separators:	0	1	1	1	0	0
	Meters/Piping:	0	1	1	1	0	0
	Line Heaters:	0	0	1	0	0	0
	Dehydrators:	0	0	1	0	0	0
Oil Service	Wellheads:	0	0	0	0	1	1
	Separators:	0	0	0	0	1	1
	Heater/Treaters:	0	0	0	0	1	1
	Headers:	0	0	0	0	1	1

Process Heaters: (MBtu/hr)

	Heater 1	Description	Heater 2	Description	Heater 3	Description	Heater 4	Description	Heater 5	Description	
(None Selected)											
Uinta/Piceance Basin	750	Separator Heater									Dehy's in Uintah usually associated with central locations, but no single well
Upper Green River Basin	750	Separator Heater	500	Dehydrator Heater	80	Glycol Reboiler	500	Line Heater			Well known for having dehy's at each site (ex. caerus)
San Juan Basin	100	Separator Heater									Lower rating cause none/very little oil in wells = very small unit
Williston Basin	750	Heater Treater									
Uinta Basin Oil	750	Heater Treater									

Pneumatics:

Devices:

	Type 1	Description	Quantity	Type 2	Description	Quantity	Type 3	Description	Quantity
(None Selected)									
Uinta/Piceance Basin	Intermittent Bleed	Dump Valve	2	Low Bleed	Pneumatic Controller	1			
Upper Green River Basin	Intermittent Bleed	Dump Valve	4	Low Bleed	Pneumatic Controller	1			
San Juan Basin	Intermittent Bleed	Dump Valve	1	Low Bleed	Pneumatic Controller	1			
Williston Basin									
Uinta Basin Oil			1						

Pumps:

	Type 1	Quantity	Type 2	Quantity	Type 3	Quantity
(None Selected)						
Uinta/Piceance Basin	Chemical Pump	1	Sandpiper	1		
Upper Green River Basin	Chemical Pump	1	Sandpiper	1	Gycol Pump	1
San Juan Basin						
Williston Basin						
Uinta Basin Oil	Pump	1				

Oil Storage Tanks:

	Oil/Condensate Production (bbl/day)	Oil Tanks	Control Efficiency (%)	Water Tanks	
(None Selected)	0	0	0	0	
Uinta/Piceance Basin	10	2	95	1	Estimated production (regularly < 10 bbld)
Upper Green River Basin	30	2	95	1	Estimated production
San Juan Basin	5	0	0	1	Estimated production
Williston Basin	150	5	95	1	Estimated production (Control due to high production - OOOO required 95%)
Uinta Basin Oil	150	3	95	1	Estimated production

Truck Loading:

	Petroleum Liquid	True Vapor Pressure (psia)	True Vapor Pressure Avg Temp (Deg. F)	Vapor Molecular Wt. (60 Deg F.) (lb/lb-mol)	Saturation Factor
(None Selected)	(None)	0	0	0	0
Uinta/Piceance Basin	Gasoline RVP 10	4.2	50	66	0.6
Upper Green River Basin	Gasoline RVP 10	3.4	40	66	0.6
San Juan Basin	Gasoline RVP 10	4.2	50	66	0.6
Williston Basin	Crude Oil RVP 5	1.8	40	50	0.6
Uinta Basin Oil	Crude Oil RVP 5	2.3	50	50	0.6
	AP-42 Table 7.1-2	AP-42 Table 7.1-2	AP-42 Table 7.1-2	AP-42 Table 7.1-2	AP-42 Table 5.2-1

Water Storage Tanks:

	Water Tanks (Count)	Water Tanks (Count)	Water Production bbl/year	VOC EF lb/bbl	Benzene EF lb/bbl	n-Hexane EF lb/bbl	
(None Selected)	0	0	0	0	0	0	Emission factors from Reg 7, CDPHE
Uinta/Piceance Basin	1	1	5,435	0.262	0.007	0.022	5435 bbl/yr based on U produced water tanks…all use the higher
Upper Green River Basin	1	1	3000	0.262	0.007	0.022	of CDPHE's 2 emission factors
San Juan Basin	0	1	800	0.262	0.007	0.022	
Williston Basin	1	1	36000	0.262	0.007	0.022	
Uinta Basin Oil	1	1	12385	0.262	0.007	0.022	12,385 bbl/yr based on UDOGM year end production data and number of operating wells fo Duchesne County from Dec 2018 report

Wellsite Production Equipment:

Well Site Configuration		Gas Service Equipment Count/Location					Oil Service Equipment Count/Location			
Base Location	**Type**	Wellheads	Separators	Meters/Piping	Line Heaters	Dehydrators	Wellheads	Separators	Heater/Treaters	Headers
(None Selected)	(None Selected)	0	0	0	0	0	0	0	0	0
Uinta/Piceance Basin	Natural Gas	1	1	1	0	0	0	0	0	0
Upper Green River Basin	Natural Gas	1	1	1	1	1	0	0	0	0
San Juan Basin	Natural Gas	1	1	1	0	0	0	0	0	0
Williston Basin	Oil Well	0	0	0	0	0	1	1	1	1
Uinta Basin Oil	Oil Well	0	0	0	0	0	1	1	1	1

	Total Fugitive Componets								
Base Location	Gas Service Componets				Oil Service Componets				
	Valve	Connector	Open-Ended Line	Pressure Relief Valve	Valve	Flanges	Connectors	OE Lines	Other
(None Selected)	0	0	0	0	0	0	0	0	0
Uinta/Piceance Basin	59	193	8	3	0	0	0	0	0
Upper Green River Basin	97	348	12	6	0	0	0	0	0
San Juan Basin	59	193	8	3	0	0	0	0	0
Williston Basin	0	0	0	0	24	44	38	0	1
Uinta Basin Oil	0	0	0	0	24	44	38	0	1

Wellsite Pumping Units:

	Present?	Horsepower	BSFC (btu/hp-hr)			
(None Selected)	No	0	0	0	0	
Uinta/Piceance Basin	No	0	0	66	0.60	
Upper Green River Basin	No	0	0	66	0.60	
San Juan Basin	Yes	65	8000	66	0.60	
Williston Basin	Yes	65	7750	50	0.60	Williston Basin HP based on a different well depth (more powerful engine)
Uinta Basin Oil	Yes	65	8000	50	0.60	

Load Factor: 0.54 (4-Stroke, Other General Industrial Equipment)

Wellsite Dehy Emissions TPY (controlled at 95% which is assumed in Pinedale EIS)

	Present?	VOC	HAP	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane
(None Selected)	No	0	0	0	0	0	0	0
Uinta/Piceance Basin	No	0	0	0	0	0	0	0
Upper Green River Basin	Yes	0.63	12.6	0.07	0.19	0.01	0.15	0.01
San Juan Basin	No	0	0	0	0	0	0	0
Williston Basin	No	0	0	0	0	0	0	0
Uinta Basin Oil	No	0	0	0	0	0	0	0

	Avg Natural Gas Flow Rate (Scf/hr)	Duration (Hours)	Combustion Efficiency (%)	Reference 1	Reference 2	Reference 3
(None Selected)	0	0	0			
Uinta/Piceance Basin	0	0	0	* It is assumed that all produced natural gas is sent to a sales line after the well is completed.		
Upper Green River Basin	0	0	0	* It is assumed that all produced natural gas is sent to a sales line after the well is completed.		
San Juan Basin	0	0	0	* It is assumed that all produced natural gas is sent to a sales line after the well is completed.		
Williston Basin	6875	2190	95	* Gas flow rate based on estimated	- GOR of 1100 scf/bbl and 1!	* Combustion control percent based on industry knowledge of standard Williston Basin pit flares
Uinta Basin Oil	77.5	2190	95	* Gas flow rate based on estimated	- GOR of 12.4 scf/bbl and 150 bbl/day production: 12.4 scf/bbl *150 bbl-d / 24 = 77.5 scf/hr)	

Gas Service Equipment:

Componet	Emissions Factor	Units	
Valve	0.121	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S.
Connector	0.017	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S.
Open-Ended Line	0.031	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S.
Pressure Relief Valve	0.193	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S.

Major Equipment	Valves	Connectors	Open Ended Lines	PR Valves	
Wellheads	11	36	1	0	40 CFR Part 98 Subpart W - Table W-1B, Western U.S.
Separators	34	106	6	2	40 CFR Part 98 Subpart W - Table W-1B, Western U.S.
Meters/Piping	14	51	1	1	40 CFR Part 98 Subpart W - Table W-1B, Western U.S.
Line Heaters	14	65	2	1	40 CFR Part 98 Subpart W - Table W-1B, Western U.S.
Dehydrators	24	90	2	2	40 CFR Part 98 Subpart W - Table W-1B, Western U.S.

Oil Service Equipment:

Componet	Emissions Factor	Units	
Valve	0.050	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S., Light Crude Service
Flange	0.003	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S., Light Crude Service
Connector	0.007	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S., Light Crude Service
Open-Ended Line	0.050	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S., Light Crude Service
Other	0.300	Scf/hr/Componet	40 CFR Part 98 Subpart W - Table W-1A, Western U.S., Light Crude Service

Major Equipment	Valves	Flanges	Connectors	OE Lines	Other	
Wellheads	5	10	4	0	1	40 CFR Part 98 Subpart W - Table W-1C, Western U.S.
Separators	6	12	10	0	0	40 CFR Part 98 Subpart W - Table W-1C, Western U.S.
Heater Treaters	8	12	20	0	0	40 CFR Part 98 Subpart W - Table W-1C, Western U.S.
Headers	5	10	4	0	0	40 CFR Part 98 Subpart W - Table W-1C, Western U.S.

Drilling/Completions/Workovers:

Well Site Configuration		Conductor Set Timeframe (Days)	Drilling Timeframe (Days)	Completions Timeframe (Days)	Workovers/Cementing Timeframe (Days)
(None Selected)	(None Selected)	0	0	0	0
Uinta/Piceance Basin	Natural Gas	2	18	7	2
Upper Green River Basin	Natural Gas	2	18	7	2
San Juan Basin	Natural Gas	2	12	3	2
Williston Basin	Oil Well	2	18	7	2
Uinta Basin Oil	Oil Well	2	12	3	2

Conductor Set Equipment:

Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu	Toulene (lb/mmBtu	Xylenes (lb/mmBtu	
Rig Engine	350	0.42	24	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
Rig Generator	50	0.42	24	5.0000	6.9000	0.8000	0.7760	1.8000	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0

Well Drilling Equipment:

Load Factors Nonroad data

HPs estimated (Marcellus gas coalition)

(None Selected)

Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	(No References)
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

Uinta/Piceance Basin

Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)			
Vertical Drill Rig Engine	475	0.42	144	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Horizontal Drill Rig Engine 1	2,950	0.59	288	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Horizontal Drill Rig Engine 2	2,950	0.59	432	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Drill Rig Generator	350	0.42	432	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Trailers Generator	150	0.42	432	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor Booster	650	0.42	144	1.3272	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Forklift	120	0.42	144	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Aerial Lift	50	0.42	16	5.0000	6.9000	0.8000	0.7760	1.8000	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Frontend loader	150	0.42	16	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Dozer	175	0.42	9	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42

Upper Green River Basin

Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)			
Vertical Drill Rig Engine	850	0.42	144	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Horizontal Drill Rig Engine 1	2,100	0.59	288	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Horizontal Drill Rig Engine 2	2,100	0.59	432	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Drill Rig Generator	350	0.42	432	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Trailers Generator	150	0.42	432	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Air Compressor Booster	650	0.42	144	1.3272	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Forklift	120	0.42	144	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Aerial Lift	50	0.42	16	5.0000	6.9000	0.8000	0.7760	1.8000	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
Frontend loader	150	0.42	16	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42

	Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)			
	Dozer	175	0.6	9	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42

	Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)		
San Juan Basin	Vertical Drill Rig Engine	550	0.42	96	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Horizontal Drill Rig Engine	2,100	0.60	192	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Drill Rig Generator	350	0.42	288	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Trailers Generator	150	0.42	288	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Air Compressor	550	0.42	96	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Air Compressor	550	0.42	96	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Air Compressor Booster	650	0.42	96	1.3272	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Forklift	120	0.42	96	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Aerial Lift	50	0.42	12	3.4900	8.3800	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Frontend loader	150	0.42	12	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	Dozer	175	0.42	6	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00		

	Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)			
Williston Basin	Vertical Drill Rig Engine	850	0.42	144	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Horizontal Drill Rig Engine 1	2,100	0.59	288	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Horizontal Drill Rig Engine 2	2,100	0.59	432	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Drill Rig Generator	350	0.42	432	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Trailers Generator	150	0.42	432	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Air Compressor	550	0.42	144	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Air Compressor Booster	650	0.42	144	1.3272	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Forklift	120	0.42	144	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Aerial Lift	50	0.42	16	5.0000	6.9000	0.8000	0.7760	1.8000	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Frontend loader	150	0.42	16	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42
	Dozer	175	0.6	9	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Haps Derived from AP-42

	Engine	HP	Load Factor	Run time (hrs)	CO(g/hp-hr)	NOx(g/hp-hr)	PM10(g/hp-hr)	PM2.5(g/hp-hr)	VOC(g/hp-hr)	Benzene(lb/mmBtu)	Formaldehyde(lb/mmBtu)	Toulene(lb/mmBtu)	Xylenes(lb/mmBtu)			
Uinta Basin Oil	Vertical Drill Rig Engine	550	0.42	96	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Horizontal Drill Rig Engine	0	0.59	192	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	Development plan does not include horizontal drilling.
	Drill Rig Generator	350	0.42	288	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Trailers Generator	150	0.42	288	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Air Compressor	550	0.42	96	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Air Compressor	550	0.42	96	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Air Compressor Booster	650	0.42	96	1.3272	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Forklift	120	0.42	96	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Aerial Lift	50	0.42	12	3.4900	8.3800	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Frontend loader	150	0.42	12	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	Dozer	175	0.42	6	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0	Steady State Emissions Factors "Exhaust and Crankcase Emissions Factors from nonroad Engine Modeling"	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00			

<u>Completions Equipment:</u>

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)
(None Selected)	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)	
Uinta/Piceance Basin	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Blenders	500	0.42	4	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Auxilary Pump	200	0.42	4	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Auxilary Pump	200	0.42	8	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Generator	150	0.42	168	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)	
Upper Green River Basin	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Blenders	500	0.42	4	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Auxilary Pump	200	0.42	4	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Auxilary Pump	200	0.42	8	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Generator	150	0.42	168	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)	
San Juan Basin	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2

	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Blenders	500	0.42	4	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Auxilary Pump	200	0.42	4	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Generator	150	0.42	72	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)	
Williston Basin	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	168	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Blenders	500	0.42	4	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Auxilary Pump	200	0.42	4	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Auxilary Pump	200	0.42	8	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Generator	150	0.42	168	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0

Less frac pump engines due to less intensive operations

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)	
Uinta Basin Oil	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Frac Pump	1,500	0.59	72	0.7642	4.1000	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Blenders	500	0.42	4	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Auxilary Pump	200	0.42	4	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Sand King	100	0.42	8	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	Generator	150	0.42	72	3.4900	8.3000	0.7220	0.7003	0.9900	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 0
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	-	0	0.00	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

Workovers/Cementing Equipment:

	Engine	HP	Load Factor	Run time (hrs)	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu	Toulene (lb/mmBtu	Xylenes (lb/mmBtu	
Workover Activities	Coil Tubing Unit	550	0.42	48	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Circulation Pump	450	0.42	48	0.8425	4.3351	0.1316	0.1277	0.1636	7.76E-04	7.89E-05	2.81E-04	1.93E-04	Tier 2
	Cement Pump Trucks	500	0.42	8	2.7000	8.3800	0.4020	0.3899	0.6800	7.76E-04	7.89E-05	2.81E-04	1.93E-04	

Frac Flowback Rate:

12-12 Very rough estimate

	Estimated Frac Flowback Scf/hr	Combustion Eff. (%)	Event Duration Hours
(None Selected)	0	0	0
Uinta/Piceance Basin	10000	95	100
Upper Green River Basin	10000	95	100
San Juan Basin	10000	95	100
Williston Basin	10000	95	100
Uinta Basin Oil	10000	95	100

Tailpipe Emissions Factors:

Vehicle Properties:

Heavy Duty Pickup Fuel Efficiency:	20	Miles/Gallon	(Typical Value)
Heavy Haul Diesel Fuel Efficiency:	12	Miles/Gallon	(Typical Value)

Construction Vehicles	Heavy Haul Trucks E. Factor (lb/mile)	Light Duty Pickups E. Factor (lb/mile)	
NOx	7.44E-02	7.39E-03	
CO	1.98E-02	7.26E-02	
VOC	3.16E-03	3.54E-03	
SO_2	4.57E-05	2.83E-05	
PM_{10}	4.22E-03	1.94E-04	
$PM_{2.5}$	4.09E-03	1.79E-04	
CO_2	1.88	1.13	40 CFR Part 98 Subpart C HHV and Emissions Factors
CH_4	7.61E-05	4.56E-05	40 CFR Part 98 Subpart C HHV and Emissions Factors
N_2O	1.52E-05	9.13E-06	40 CFR Part 98 Subpart C HHV and Emissions Factors

Pneumatic Emissions Factors:

Low Bleed	1.39	Scf/hour/Componet
Intermittent Bleed	13.5	Scf/hour/Componet
High Bleed	37.3	Scf/hour/Componet
Pneumatic Pump:	13.3	Scf/hour/Componet

Fuel Properties:

Diesel (No.2):

Sulfur Content:	0.0015	Percent (%)	(Typical Value)
Fuel Density:	7.08	lbs/Gallon	(Typical Value)

High Heat Value:	0.138	mmBtu/Gallon	40 CFR Part 98 Subpart C - Table C-1
CO2 Emissions Factor:	73.96	Kg CO2/mmBtu	40 CFR Part 98 Subpart C - Table C-1
CH4 Emissions Factor:	0.003	Kg CH4/mmBtu	40 CFR Part 98 Subpart C - Table C-2
N2O Emissions Factor:	0.0006	Kg N2O/mmBtu	40 CFR Part 98 Subpart C - Table C-2

Motor Gasoline:

High Heat Value:	0.125	mmBtu/Gallon	40 CFR Part 98 Subpart C - Table C-1
CO2 Emissions Factor:	70.22	Kg CO2/mmBtu	40 CFR Part 98 Subpart C - Table C-1
CH4 Emissions Factor:	0.003	Kg CH4/mmBtu	40 CFR Part 98 Subpart C - Table C-2
N2O Emissions Factor:	0.0006	Kg N2O/mmBtu	40 CFR Part 98 Subpart C - Table C-2

Weighted U.S. Average (Natural Gas):

High Heat Value:	0.001028	mmBtu/Scf	40 CFR Part 98 Subpart C - Table C-1
CO2 Emissions Factor:	53.02	kg CO2/mmbtu	40 CFR Part 98 Subpart C - Table C-1
CH4 Emissions Factor:	0.001	Kg CH4/mmBtu	40 CFR Part 98 Subpart C - Table C-2
N2O Emissions Factor:	0.0001	Kg N2O/mmBtu	40 CFR Part 98 Subpart C - Table C-2

Other Constants:

Convert Kg to lbs	2.20462	lbs/kg
Square Feet to Square Meters	0.092903	Sq. Meters/Sq. Feet
	379.49	Scf/lb-mol
Convert grams to lbs	0.00220462	lbs/grams
Feet to Meters	0.3048	meters/feet

Sheet Header Configuration:

Kleinfelder, Inc.
Wellsite Emissions

Emissions Type:
Construction Phase
Development Phase
Production Phase

Production:

**Uintah/Piceance analysis from River Valley RMP (near/in Piceance)

Component	(None Selected) (None Selected) Molar Ratio	Uinta/Piceance Basin Natural Gas Molar Ratio	Upper Green River Basin Natural Gas Molar Ratio	San Juan Basin Natural Gas Molar Ratio	Williston Basin Oil Well Molar Ratio	Uinta Basin Oil Oil Well Molar Ratio	Component Mole Weight (lb/lb-mol)	GMBU Oil Well
Methane	0.0000	83.8580	88.9720	88.9720	88.9720	83.8580	16.043	83.858
Ethane	0.0000	7.9440	5.7920	5.7920	5.7920	7.9440	30.07	7.944
Propane	0.0000	4.3130	1.3650	1.3650	1.3650	4.3130	44.097	4.313
i-Butane	0.0000	0.6870	0.3700	0.3700	0.3700	0.6870	58.123	0.687
n-Butane	0.0000	1.2840	0.2610	0.2610	0.2610	1.2840	58.123	1.284
i-Pentane	0.0000	0.3320	0.1550	0.1550	0.1550	0.3320	72.15	0.332
n-Pentane	0.0000	0.3750	0.1020	0.1020	0.1020	0.3750	72.15	0.375
Other Pentanes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	70.1	0
Hexanes	0.0000	0.1340	0.1460	0.1460	0.1460	0.1340	86.177	0.134
Heptanes	0.0000	0.0550	0.0930	0.0930	0.0930	0.0550	100.204	0.055
Octanes	0.0000	0.0085	0.0440	0.0440	0.0440	0.0085	114.231	0.0085
Nonanes	0.0000	0.0008	0.0160	0.0160	0.0160	0.0008	128.258	0.0008
Decanes +	0.0000	0.0001	0.0050	0.0050	0.0050	0.0001	142.285	0.0001
Benzene	0.0000	0.0520	0.0270	0.0270	0.0270	0.0520	78.12	0.052
Toluene	0.0000	0.0023	0.0190	0.0190	0.0190	0.0023	92.13	0.0023
Ethylbenzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	106.16	0
2,2,4 Trimethylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	78.12	0
Xylenes	0.0000	0.0002	0.0110	0.0110	0.0110	0.0002	106.16	0.0002
n-Hexane	0.0000	0.0820	0.1460	0.1460	0.1460	0.0820	86.177	0.082
Nitrogen	0.0000	0.6470	0.0940	0.0940	0.0940	0.6470	28.013	0.647
Carbon Dioxide	0.0000	0.2680	2.5280	2.5280	2.5280	0.2680	44.01	0.268
Hydrogen Sulfide	0.0000	0.0050	0.0000	0.0000	0.0000	0.0050	34.08	0.005
VOC SUBTOTAL		**7.326**	**2.760**	**2.760**	**2.760**	**7.326**		**7.326**
HAP SUBTOTAL		**0.137**	**0.203**	**0.203**	**0.203**	**0.137**		**0.137**
TOTAL		**100.048**	**100.146**	**100.146**	**100.146**	**100.048**		**100.048**

Flashing Gas:

Component	(None Selected) (None Selected)	Uinta/Piceance Basin Natural Gas	Upper Green River Basin Natural Gas	San Juan Basin Natural Gas	Williston Basin Oil Well	Uinta Basin Oil Oil Well	Component	
Flashing Gas GOR (Scf/bbl):	**0**	**114**	**98**	**75**	**98**	**12.4**		GOR's estimates
Component	**Molar Ratio**	**Molar Ratio**	**Molar Ratio**	**Molar Ratio**	**Molar Ratio**	**Molar Ratio**	**Mole Weight (lb/lb-mol)**	GMBU oil well
Methane	0.0000	38.8940	48.6355	23.6778	17.8400	38.8940	16.043	38.894
Ethane	0.0000	16.5160	21.3989	31.6716	32.2588	16.5160	30.07	16.516
Propane	0.0000	16.9090	14.9031	27.0752	30.9557	16.9090	44.097	16.909
i-Butane	0.0000	3.6940	4.0847	2.3870	3.2347	3.6940	58.123	3.694
n-Butane	0.0000	9.0440	3.6800	6.1325	10.4515	9.0440	58.123	9.044
i-Pentane	0.0000	3.2640	1.7781	0.9352	1.3981	3.2640	72.15	3.264
n-Pentane	0.0000	4.2970	0.8467	1.5003	1.7904	4.2970	72.15	4.297
Other Pentanes	0.0000	0.3610	0.0000	0.6754	0.0000	0.3610	70.1	0.361
Hexanes	0.0000	2.2850	1.3611	2.2516	0.2392	2.2850	86.177	2.285
Heptanes	0.0000	1.4230	1.1842	0.7869	0.3268	1.4230	100.204	1.423
Octanes	0.0000	0.4030	0.2217	0.1469	0.0810	0.4030	114.231	0.403
Nonanes	0.0000	0.0760	0.0693	0.0463	0.0103	0.0760	128.258	0.076
Decanes +	0.0000	0.0260	0.0067	0.0105	0.0000	0.0260	142.285	0.026
Benzene	0.0000	0.1060	0.1161	0.1540	0.0204	0.1060	78.12	0.106
Toluene	0.0000	0.0830	0.1927	0.0709	0.0163	0.0830	92.13	0.083
Ethylbenzene	0.0000	0.0040	0.0039	0.0034	0.0017	0.0040	106.16	0.004
2,2,4 Trimethylpentane	0.0000	0.0000	0.0351	0.0253	0.0030	0.0000	78.12	0
Xylenes	0.0000	0.0230	0.1152	0.0219	0.0062	0.0230	106.16	0.023
n-Hexane	0.0000	1.5130	0.4064	0.9119	0.1870	1.5130	86.177	1.513
Nitrogen	0.0000	0.6120	0.0000	0.0000	0.8693	0.6120	28.013	0.612
Carbon Dioxide	0.0000	0.4600	0.9608	2.1907	0.3095	0.4600	44.01	0.46
Hydrogen Sulfide	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	34.08	0
VOC SUBTOTAL		**43.511**	**29.005**	**43.135**	**48.722**	**43.511**		**43.511**
HAP SUBTOTAL		**1.729**	**0.869**	**1.187**	**0.235**	**1.729**		**1.729**
TOTAL		**99.993**	**100.000**	**100.675**	**100.000**	**99.993**		**99.993**

*** Uintah composition from ongoing projects in Uintah Basin**

* UGR composition from Pinedale Field Tri-Annual default condensate compositions, input in E&P Tanks, ans flash gas comp. pulled from output.

* San Juan composition estimated from ongoing projects in Denver Basin

* Williston composition from submitted application in Baaken field

* Denver composition from ongoing projects in Denver Basin

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Road Dozer and Backhoe Particulate Matter

Assumptions:

Construction Schedule:	4	Days/Location	(Typical Value)
	48.0	Dozer Hours/Location	(Typical Value)
	48.0	Backhoe Hours/Location	(Typical Value)
Watering Control Efficiency:	50	Percent (%)	(Typical Value)
Soil Moisture Content:	7.9	Percent (%)	AP-42 Table 11.9-3, 7/98
Soil Silt Content:	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98

PM_{10} Multiplier: 0.75 * PM_{15} (AP-42 Table 11.9-1, 7/98)

$PM_{2.5}$ Multiplier: 0.105 * TSP (AP-42 Table 11.9-1, 7/98)

Equations: From AP-42 tables 11.9-1 and 11.9-3 for
Bulldozing Overburden Emissions, Western Surface Coal Mining, 10/98 & 7/98

Emissions (TSP lbs/hr) = 5.7 * (soil silt content %)$^{1.2}$ * (soil moisture content %)$^{-1.3}$* Control Efficiency

Emissions (PM_{15} lbs/hr) = 1.0 * (soil silt content %)$^{1.5}$ * (soil moisture content %)$^{-1.4}$ * Control Efficiency

Emissions = 1.97 lbs TSP/hour/piece of equipment

Emissions = 0.50 lbs PM_{15}/hour/piece of equipment

	Dozer Emissions [a]		**Backhoe Emissions [a]**		**Total**
	lbs/hr	**Tons/Location**	**lbs/hr**	**Tons/Location**	**Tons/Location**
TSP	1.97	0.0473	1.97	0.0473	0.0946
PM_{15}	0.50	0.0120	0.50	0.0120	0.0241
PM_{10}	0.38	0.0090	0.38	0.0090	0.0181
$PM_{2.5}$	0.21	0.0050	0.05	0.0013	0.0062

a Assumes one dozer and one backhoe. Backhoe emissions factors are conservatively estimated as equivalent to Dozer emissions.

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Road Grader Particulate Matter

Assumptions:

Grading Length:	16.50	miles	(Typical Value)
Construction Schedule:	4	Days/Location	(Typical Value)
	12	Hours/Day	(Typical Value)
	48	Hours/Location	(Typical Value)
Watering Control Efficiency:	50	Percent (%)	
Average Grader Speed:	7.1	Miles/Hour	AP-42 Table 11.9-3, 7/98
PM_{10} Multiplier:	0.6 * PM_{15}	(AP-42 Table 11.9-1, 7/98)	
$PM_{2.5}$ Multiplier:	0.031 * TSP	(AP-42 Table 11.9-1, 7/98)	

Equations: From AP-42 tables 11.9-1 and 11.9-3 for
Bulldozing Overburden Emissions, Western Surface Coal Mining, 10/98

Emissions (TSP lbs) = 0.040 * (Mean Vehicle Speed)$^{2.5}$ * Distance Graded * Control Efficiency

Emissions (PM_{15} lbs) = 0.051 * (Mean Vehicle Speed)$^{2.0}$ * Distance Graded * Control Efficiency

Emissions = 44.33 lbs TSP/Location

Emissions = 21.21 lbs PM_{15}/Location

	Grader Construction Emissions		
	lbs/Location	**lbs/hr/Location**	**Tons/Location**
TSP	44.33	0.92	2.22E-02
PM_{15}	21.21	0.44	1.06E-02
PM_{10}	12.73	0.27	6.36E-03
$PM_{2.5}$	1.37	0.03	6.87E-04

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Well Pad Dozer and Backhoe Particulate Matter

Assumptions:

Construction Schedule:	7	Days/Location		(Typical Value)
	12	Hours/Day		(Typical Value)
	84	Hours/Location	(Dozer)	(Typical Value)
	84	Hours/Location	(Back Hoe)	(Typical Value)
Watering Control Efficiency:	50	Percent (%)		(Typical Value)
Soil Moisture Content:	7.9	Percent (%)		AP-42 Table 11.9-3, 7/98
Soil Silt Content:	6.9	Percent (%)		AP-42 Table 11.9-3, 7/98

PM_{10} Multiplier: 0.75 * PM_{15} (AP-42 Table 11.9-1, 7/98)

$PM_{2.5}$ Multiplier: 0.105 * TSP (AP-42 Table 11.9-1, 7/98)

Equations: From AP-42 tables 11.9-1 and 11.9-3 for
Bulldozing Overburden Emissions, Western Surface Coal Mining, 10/98

Emissions (TSP lbs/hr) = 5.7 * (soil silt content %)$^{1.2}$ * (soil moisture content %)$^{-1.3}$* Control Efficiency

Emissions (PM_{15} lbs/hr) = 1.0 * (soil silt content %)$^{1.5}$ * (soil moisture content %)$^{-1.4}$ * Control Efficiency

Emissions = 1.97 lbs TSP/hour/piece of equipment

Emissions = 0.50 lbs PM_{15}/hour/piece of equipment

	Dozer Emissions [a]		**Backhoe Emissions [a]**		**Total**
	lbs/hr	**Tons/Location**	**lbs/hr**	**Tons/Location**	**Tons/Location**
TSP	1.97	0.0828	1.97	0.0828	0.17
PM_{15}	0.50	0.0211	0.50	0.0211	0.04
PM_{10}	0.38	0.0158	0.38	0.0158	0.03
$PM_{2.5}$	0.21	0.0087	0.21	0.0087	0.02

a Assumes one dozer and one backhoe. Backhoe emissions factors are conservatively estimated as equivalent to Dozer emissions.

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Well Pad Grader Particulate Matter

Assumptions:

Construction Schedule:	4.0	Days/Location	(Typical Value)
	12	Hours/Day	(Typical Value)
	48	Hours/Location	(Typical Value)
Watering Control Efficiency	50	Percent (%)	(Typical Value)
Average Grader Speed	7.1	Miles/Hour	AP-42 Table 11.9-3, 7/98
Distance Graded	1.88	Miles/Location	(Typical Value)
PM_{10} Multiplier	0.6 * PM_{15}	(AP-42 Table 11.9-1, 7/98)	
$PM_{2.5}$ Multiplier	0.031 * TSP	(AP-42 Table 11.9-1, 7/98)	

Equations: From AP-42 tables 11.9-1 and 11.9-3 for
Bulldozing Overburden Emissions, Western Surface Coal Mining, 10/98

Emissions (TSP lbs) = 0.040 * (Mean Vehicle Speed)$^{2.5}$ * Distance Graded * Control Efficiency

Emissions (PM_{15} lbs) = 0.051 * (Mean Vehicle Speed)$^{2.0}$ * Distance Graded * Control Efficiency

Emissions = 5.04 lbs TSP/well pad

Emissions = 2.41 lbs PM_{15}/well pad

	Grader Construction Emissions		
	lbs/Location	**lbs/hr/Location**	**Tons/Location**
TSP	5.04	0.10	0.0025
PM_{15}	2.41	0.05	0.0012
PM_{10}	1.45	0.03	0.0007
$PM_{2.5}$	0.16	0.00	0.0001

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Pipeline Dozer and Backhoe Particulate Matter

Assumptions:

Construction Schedule:	0.0	Days/Location	(Typical Value)
	12	Hours/Day	(Typical Value)
	0	Hours/Location	(Typical Value)
	0	Hours/Location	(Typical Value)
Watering Control Efficiency:	50	Percent (%)	(Typical Value)
Soil Moisture Content:	7.9	Percent (%)	AP-42 Table 11.9-3, 7/98
Soil Silt Content:	6.9	Percent (%)	AP-42 Table 11.9-3, 7/98
PM_{10} Multiplier:	0.75 * PM_{15}	(AP-42 Table 11.9-1, 7/98)	
$PM_{2.5}$ Multiplier:	0.105 * TSP	(AP-42 Table 11.9-1, 7/98)	

Equations: From AP-42 tables 11.9-1 and 11.9-3 for
Bulldozing Overburden Emissions, Western Surface Coal Mining, 7/98

Emissions (TSP lbs/hr) = 5.7 * (soil silt content %)$^{1.2}$ * (soil moisture content %)$^{-1.3}$* Control Efficiency

Emissions (PM_{15} lbs/hr) = 1.0 * (soil silt content %)$^{1.5}$ * (soil moisture content %)$^{-1.4}$ * Control Efficiency

Emissions = 1.97 lbs TSP/hour/piece of equipment

Emissions = 0.50 lbs PM_{15}/hour/piece of equipment

	Dozer Emissions [a]		**Backhoe Emissions [a]**		**Total**
	lbs/hr	**Tons/Location**	**lbs/hr**	**Tons/Location**	**Tons/Location**
TSP	1.97	0.0000	1.97	0.0000	0.00
PM_{15}	0.50	0.0000	0.50	0.0000	0.00
PM_{10}	0.38	0.0000	0.38	0.0000	0.00
$PM_{2.5}$	0.21	0.0000	0.21	0.0000	0.00

a Assumes one dozer and one backhoe. Backhoe emissions factors are conservatively estimated as equivalent to Dozer emissions.

Kleinfelder, Inc.

Wellsite Emissions

Base Location: Uinta Basin Oil

Well Type: Oil Well

Construction Phase

Pipeline Grader Particulate Matter

Assumptions:

Distance Graded:	0.00	Miles/Location	(Typical Value)
Construction Schedule:	7	Days/Location	(Typical Value)
	12	Hours/Day	(Typical Value)
	84	Hours/Location	(Typical Value)
Watering Control Efficiency:	50	Percent (%)	(Typical Value)
Mean Vehicle Speed:	7.1	Miles/Hour	AP-42 Table 11.9-3, 7/98
PM_{10} Multiplier:	0.6 * PM_{15}	(AP-42 Table 11.9-1, 7/98)	
$PM_{2.5}$ Multiplier:	0.031 * TSP	(AP-42 Table 11.9-1, 7/98)	

Equations: From AP-42 tables 11.9-1 and 11.9-3 for Bulldozing Overburden Emissions, Western Surface Coal Mining, 7/98

Emissions (TSP lbs) = 0.040 * (Mean Vehicle Speed)$^{2.5}$ * Distance Graded * Control Efficiency

Emissions (PM_{15} lbs) = 0.051 * (Mean Vehicle Speed)$^{2.0}$ * Distance Graded * Control Efficiency

Emissions = 0.00 lbs TSP/well

Emissions = 0.00 lbs PM_{15}/well

	Grader Construction Emissions		
	lbs/Location	**lbs/hr/Location**	**Tons/Location**
TSP	0.00	0.00	0.0000
PM_{15}	0.00	0.00	0.0000
PM_{10}	0.00	0.00	0.0000
$PM_{2.5}$	0.00	0.00	0.0000

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Roadway Construction Traffic Tailpipe Emissions

Assumptions:

Average Round Trip Distance:	80.0	Miles/Trip Average			
Heavy Diesel Truck Trips:					
Road Construction:	7	Trips			
Well Pad Construction:	8	Trips	Total Trips:	21	Trips
Pipeline Construction:	6	Trips			
Light Duty Pickup Truck Trips:					
Road Construction:	16	Trips			
Well Pad Construction:	28	Trips	Total Trips:	44	Trips
Pipeline Construction:	0	Trips			

* All assumptions above are based on typical industry values

Equations:

$$\text{Emissions (tons/year)} = \frac{\text{Emission Factor (lb/mile)} * \text{\# Trips} * \text{Trip Distance (miles)}}{\text{2000 (lb/tons)}}$$

Construction Vehicles	Heavy Haul Trucks		Light Duty Pickups		Total
	E. Factor [a] (lb/mile)	Emissions (Tons/Location)	E. Factor [b] (lb/mile)	Emissions (Tons/Location)	Emissions (Tons/Location)
NOx	7.44E-02	6.25E-02	7.39E-03	1.30E-02	7.55E-02
CO	1.98E-02	1.66E-02	7.26E-02	1.28E-01	1.44E-01
VOC	3.16E-03	2.65E-03	3.54E-03	6.23E-03	8.88E-03
SO2	4.57E-05	3.84E-05	2.83E-05	4.98E-05	8.82E-05
PM10	4.22E-03	3.54E-03	1.94E-04	3.41E-04	3.89E-03
PM2.5	4.09E-03	3.44E-03	1.79E-04	3.15E-04	3.75E-03
CO2	1.88	1.58	1.13	1.98	3.56
CH4	7.61E-05	6.39E-05	4.56E-05	8.03E-05	1.44E-04
N2O	1.52E-05	1.28E-05	9.13E-06	1.61E-05	2.88E-05

a Emission factors developed using EPA MOVES model, assuming Heavy-Heavy Duty Diesel Trucks, traveling 15 mph onsite in typical oil and gas development area, for calendar year 2012.

b Emission factors developed using EPA MOVES model, assuming Light Heavy Duty Gasoline Trucks, traveling 15 mph onsite in typical oil and gas development area, for calendar year 2012.

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Construction Phase

Construction Heavy Equipment Tailpipe Emissions

Assumptions:

Fuel and Engine:

Brake Specific Fuel Consumption, Avg. (BSFC)	8250	btu/hp-hr	(Typical Value)
Diesel Higher Heating Value (HHV)	0.138	mmBtu/Gallon	(Typical Value)

Trackhoe:

Working Hours	132	Total Hours (Typical Value)
Rated Horsepower	100	(Estimate)
Load Factor	0.59	(Default LF from NONROAD model for Tractors/Loaders/Backhoes)

Dozer:

Working Hours	132	Total Hours (Typical Value)
Rated Horsepower	140	(Estimate)
Load Factor	0.59	(Default LF from NONROAD model for Crawler Tractor/Dozers)

Grader:

Working Hours	156	Total Hours (Typical Value)
Rated Horsepower	250	(Estimate)
Load Factor	0.59	(Default LF from NONROAD model for Graders)

Total Horsepower Hours:	41701.2	Hp-hrs (Sum of all horsepower above)
Total Fuel Usage:	2493.01	Gallons Diesel Fuel

Equations:

Total Fuel Usage: ((btu-hp-hr * hp-hrs) / Mmbtu-gal) / 1,000,000

$$\text{Emissions (tons/year/pad)} = \frac{\text{Emission Factor (g/mile) * Trip Distance (miles) * Load Factor}}{\text{453.6 (g/lb) * 2000 (lb/tons)}}$$

Heavy Const. Vehicles	Backhoe			Dozer			Grader		
	E. Factor [a] (g/hp-hr)	Emissions (lb/hr)	Emissions (Tons/Year)	E. Factor [a] (g/hp-hr)	Emissions (lb/hr)	Emissions (Tons/Year)	E. Factor [a] (g/hp-hr)	Emissions (lb/hr)	Emissions (Tons/Year)
NOx	8.38	1.09E+00	7.19E-02	8.38	1.53E+00	1.01E-01	8.38	2.72E+00	2.13E-01
CO	2.7	3.51E-01	2.32E-02	2.7	4.92E-01	3.25E-02	2.7	8.78E-01	6.85E-02
VOC [b]	0.68	8.84E-02	5.84E-03	0.68	1.24E-01	8.17E-03	0.68	2.21E-01	1.72E-02
PM_{10}	0.39	5.07E-02	3.35E-03	0.39	7.10E-02	4.69E-03	0.39	1.27E-01	9.89E-03
$PM_{2.5}$	0.39	5.07E-02	3.35E-03	0.39	7.10E-02	4.69E-03	0.39	1.27E-01	9.89E-03

Heavy Const. Vehicles	Total Emissions [c] (tons/yr)
NOx	0.39
CO	0.12
VOC	0.03
PM_{10}	0.02
$PM_{2.5}$	0.02

Greenhouse Gas Emissions:

	Diesel EF kg/mmbtu	Emissions lbs	Emissions Tons
CO_2	73.96	56096.16	28.05
CH_4	0.003	2.28	0.0011
N_2O	0.0006	0.46	0.0002

a From Table A-4 of Exhaust and Crankcase Emission Factors for NONROAD Engine Modeling - Compression Ignition, EPA-420-R-10-018, July 2010.
b Emission Factor represents total Hydrocarbon Emissions
c Converted from emission factor for Distillate Fuel Oil #2 (diesel) as listed in Table C-1 to Subpart C of Part 98 - Default Emission Factors and High Heat Values for Various Types of Fuel.

Listed Factor:

73.96 kg CO_2/mmBtu
393 hp-hr = mmBtu
188.2 g CO_2/hp-hr

Kleinfelder, Inc. Wellsite Emissions	Base Location: Uinta Basin Oil Well Type: Oil Well

Construction Phase

Wind Erosion Fugitive Dust

Assumptions:

Threshold Friction Velocity (U_t) 1.02 m/s (2.28 mph) for well pads (AP-42 Table 13.2.5-2 Overburden - Western Surface Coal Mine)
1.33 m/s (2.97 mph) for roads (AP-42 Table 13.2.5-2 Roadbed material)

Initial Disturbance Area

Total Access Road/ROW Area Per Location:	871,200	Square Meters	(Typical Value)
Total Well Pad Area Disturbed Per Location:	33,000	Square Meters	(Typical Value)
Total Area Disturbed Per Location:	904,200	Square Meters	(Typical Value)
Exposed Surface Type	Flat		
Meteorological Data	2002 Grand Junction (obtained from NCDC website)		
Fastest Mile Wind Speed:	45	miles/hour	(Typical Value)
Fastest Mile Wind Speed (U_{10}^{+})	20.12	meters/sec (45 mph) reported as fastest 2-minute wind speed for Grand Junction (2002)	
Number soil of disturbances	1.00	for well pads (Assumption, disturbance at construction and reclamation) constant for dirt roads	

Equations (AP-42 13.2.5.2 Industrial Wind Erosion)

Friction Velocity $U^* = 0.053\ U_{10}^{+}$

Erosion Potential P (g/m^2/period) = $58*(U^*-U_t^*)^2 + 25*(U^*-U_t^*)$ for $U^*>U_t^*$, P = 0 for $U^*< U_t^*$

Emissions (tons/year) = Erosion Potential(g/m^2/period)*Disturbed Area(m^2)*Disturbances/year*(k)/(453.6 g/lb)/2000 lbs/ton/Develop Period

Particle Size Multiplier (k)		
30 µm	<10 µm	<2.5 µm
1.0	0.5	0.075

Maxium U_{10}^{+} Wind Speed (m/s)	Maximum U* Friction Velocity m/s	Well U_t* Threshold Velocity[a] m/s	Well Pad Erosion Potential g/m^2	Road U_t* Threshold Velocity[a] m/s	Road Erosion Potential g/m^2
20.12	1.07	1.02	1.28	1.33	0.00

Wind Erosion Emissions

Particulate Species	Well Pad (tons/year)	Roads/Pipelines (tons/year)
TSP	4.65E-02	0.00E+00
PM_{10}	2.33E-02	0.00E+00
$PM_{2.5}$	3.49E-03	0.00E+00

Kleinfelder, Inc.

Wellsite Emissions

Base Location: Uinta Basin Oil

Well Type: Oil Well

Construction, Development, and Production Phase

Construction, Development, and Operations Traffic Fugitive Dust Emissions

Assumptions:

Round Trip Miles	80
Round Trip (Paved) Miles	32
Round Trip (Un-Paved) Miles	48
Precipitation Days (P)	45

Unpaved Calculation AP-42, Chapter 13.2.2
November 2006

E (PM_{10}) / VMT = 1.5 * $(S/12)^{0.9}$ * $(W/3)^{0.45}$ * (365-p)/365
E ($PM_{2.5}$) / VMT = 0.15 * $(S/12)^{0.9}$ + $(W/3)^{0.45}$ * (365-p)/365

Silt Content (S) 8.5 AP 42 13.2.2-1 Mean Silt Content Construction Sites

Paved Calculation AP-42, Chapter 13.2.1
January 2011

E (PM_{10}) / VMT = 0.0022 * $(sL)^{0.91}$ * $(W)^{1.02}$ * (1-(P/(365*4))
E ($PM_{2.5}$) / VMT = 0.00054 * $(sL)^{0.91}$ * $(W)^{1.02}$ * (1-(P/(365*4))

Silt Loading (sL) 0.6 AP-42 Table 13.2.1-2 baseline low volume roads

Construction Phase

Unpaved Calculations:

Vehicle Type	Average Weight (lbs)	Vehicle Round Trips	PM_{10} (lb/VMT)	PM_{10} (lbs)	PM_{10} (Tons)	$PM_{2.5}$ (lb/VMT)	$PM_{2.5}$ (lbs)	$PM_{2.5}$ (Tons)
Heavy Duty Haul Trucks	80,000	21	3.09	3117.8	1.6	0.3	311.8	0.2
Light Duty Pickup Trucks	5,000	44	0.89	1876.0	0.9	0.1	187.6	0.1
Total:				**4993.74**	**2.50**		**499.37**	**0.25**

Paved Calculations:

Vehicle Type	Average Weight (lbs)	Vehicle Round Trips	PM10 (lb/VMT)	PM10 (lbs)	PM10 (Tons)	PM2.5 (lb/VMT)	PM2.5 (lbs)	PM2.5 (Tons)
Heavy Duty Haul Trucks	80,000	21	0.0576	38.7	0.0194	0.014	9.5	0.0048
Light Duty Pickup Trucks	5,000	44	0.0034	4.8	0.0024	0.001	1.2	0.0006
Total:				**43.5**	**0.0**		**10.7**	**0.0**

Development Phase

Unpaved Calculations:

Vehicle Type	Average Weight (lbs)	Vehicle Round Trips	PM_{10} (lb/VMT)	PM_{10} (lbs)	PM_{10} (Tons)	$PM_{2.5}$ (lb/VMT)	$PM_{2.5}$ (lbs)	$PM_{2.5}$ (Tons)
Light Duty Pickup Trucks:	5,000	84	0.89	3581.4	1.8	0.1	358.1	0.2
Light Duty Haul Trucks	7,500	11	1.07	562.9	0.3	0.1	56.3	0.0
Heavy Duty Haul Trucks	80,000	67	3.09	9947.2	5.0	0.3	994.7	0.5
Water Trucks	70,000	24	2.91	3355.4	1.7	0.3	335.5	0.2
Total:				**17446.82**	**8.72**		**1744.68**	**0.87**

Paved Calculations:

Vehicle Type	Average Weight (lbs)	Vehicle Round Trips						
Light Duty Pickup Trucks:	5000	84	0.00	9.2	0.0	0.0	2.2	0.0011
Light Duty Haul Trucks	7500	11	0.01	1.8	0.0	0.0	0.4	0.0002
Heavy Duty Haul Trucks	80000	67	0.06	123.5	0.1	0.0	30.3	0.0152
Water Trucks	70,000	24	0.05	38.6	0.0	0.0	9.5	0.0047
Total:				**173.1**	**0.1**		**42.5**	**0.0**

Production Phase

Unpaved Calculations:

Vehicle Type	Average Weight (lbs)	Vehicle Round Trips	PM10 (lb/VMT)	PM10 (lbs)	PM10 (Tons)	PM2.5 (lb/VMT)	PM2.5 (lbs)	PM2.5 (Tons)
Light Duty Pickup Trucks:	5,000	50	0.89	2131.78	1.07	0.0888	213.18	0.1066
Light Duty Haul Trucks	7,500	0	1.07	0.00	0.00	0.1066	0.00	0.0000
Heavy Duty Haul Trucks	80,000	2	3.09	296.93	0.15	0.3093	29.69	0.0148
Water Trucks	70,000	65	2.91	9087.47	4.54	0.2913	908.75	0.4544
Total:				**11516.18**	**5.76**		**1151.62**	**0.58**

Paved Calculations:

Vehicle Type	Average Weight (lbs)	Vehicle Round Trips	PM10 (lb/VMT)	PM10 (lbs)	PM10 (Tons)	PM2.5 (lb/VMT)	PM2.5 (lbs)	PM2.5 (Tons)
Light Duty Pickup Trucks:	5,000	50	0.00	5.45	0.0027	0.0008	1.34	0.0007
Light Duty Haul Trucks	7,500	0	0.01	0.00	0.0000	0.0013	0.00	0.0000
Heavy Duty Haul Trucks	80,000	2	0.06	3.69	0.0018	0.0141	0.91	0.0005
Water Trucks	70,000	65	0.05	104.60	0.0523	0.0123	25.67	0.0128
Total:				**113.74**	**0.06**		**27.92**	**0.01**

Annual Total

	Unpaved Roads PM_{10} (tons)	**Unpaved Roads $PM_{2.5}$ (tons)**
	16.98	**1.7**
	Paved Roads PM_{10}	**Paved Roads $PM_{2.5}$**
	0.2	**0.0**
Total:	**17.1**	**1.7**

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Development Phase
Drill Rig Emissions

Assumptions:

Parameter	Value	
Days of Operation	12	(Typical Value)
Hours of Operation	288	(Typical Value)
Diesel Fuel Sulfur Content	0.000015	(Typical Value)

Parameter	Value	Units	
BSFC (Avg.)	8250	btu/hp-hr	(Typical Value)
Diesel HHV	0.138	mmbtu/gal	(Typical Value)

Engine	HP [a]	Load Factor	Run time (hrs)	Total Hp-hrs
Vertical Drill Rig Engine	550	0.42	96	22176
Horizontal Drill Rig Engine	0	0.59	192	0
Drill Rig Generator	350	0.42	288	42336
Trailers Generator	150	0.42	288	18144
Air Compressor	550	0.42	96	22176
Air Compressor	550	0.42	96	22176
Air Compressor Booster	650	0.42	96	26208
Forklift	120	0.42	96	4838.4
Aerial Lift	50	0.42	12	252
Frontend loader	150	0.42	12	756
Dozer	175	0.42	6	441
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0
Total HP	3,295			

Total: 159,503 Hp-hrs

Fuel Usage: 9,536 Gallons of Diesel Total Fuel Usage: (btu/hp-hr * hp-hrs) * gal/btu

Greenhouse Gasses:

	Diesel EF	Emissions	Emissions
	Kg/mmBtu	lbs/Location	Tons/Location
CO2	73.96	214562.85	107.28
CH4	0.003	8.70	0.00
N2O	0.0006	1.74	0.00

Greenhouse gas emission factors from Subpart C, Table C-1 and C-2

Engine	Total Hp-hrs	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	SO_2 (lb/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)
Vertical Drill Rig Engine	22176	0.8425	4.3351	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Horizontal Drill Rig Engine	0	0.7642	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Drill Rig Generator	42336	2.7000	8.3800	0.4020	0.3899	1.27E-05	0.6800	7.76E-04	2.81E-04	1.93E-04
Trailers Generator	18144	2.7000	8.3800	0.4020	0.3899	1.27E-05	0.6800	7.76E-04	2.81E-04	1.93E-04
Air Compressor	22176	0.8425	4.3351	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Air Compressor	22176	0.8425	4.3351	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Air Compressor Booster	26208	1.3272	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Forklift	4838.4	2.7000	8.3800	0.4020	0.3899	1.27E-05	0.6800	7.76E-04	2.81E-04	1.93E-04
Aerial Lift	252	3.4900	8.3800	0.7220	0.7003	1.27E-05	0.9900	7.76E-04	2.81E-04	1.93E-04
Frontend loader	756	2.7000	8.3800	0.4020	0.3899	1.27E-05	0.6800	7.76E-04	2.81E-04	1.93E-04
Dozer	441	2.7000	8.3800	0.4020	0.3899	1.27E-05	0.6800	7.76E-04	2.81E-04	1.93E-04
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00

Engine		CO (Tons/yr)	NO_x (Tons/yr)	PM_{10} (Tons/yr)	$PM_{2.5}$ (Tons/yr)	SO_2 (Tons/yr)	VOC (Tons/yr)	Benzene (Tons/yr)	Toulene (Tons/yr)	Xylenes (Tons/yr)
Vertical Drill Rig Engine		0.02059	0.10597	0.00322	0.00312	3.10E-07	0.00400	0.00007	0.00003	0.00002
Horizontal Drill Rig Engine		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
Drill Rig Generator		0.12600	0.39107	0.01876	0.01820	5.93E-07	0.03173	0.00014	0.00005	0.00003
Trailers Generator		0.05400	0.16760	0.00804	0.00780	2.54E-07	0.01360	0.00006	0.00002	0.00001
Air Compressor		0.02059	0.10597	0.00322	0.00312	3.10E-07	0.00400	0.00007	0.00003	0.00002
Air Compressor		0.02059	0.10597	0.00322	0.00312	3.10E-07	0.00400	0.00007	0.00003	0.00002
Air Compressor Booster		0.03834	0.11845	0.00380	0.00369	3.67E-07	0.00473	0.00008	0.00003	0.00002
Forklift		0.01440	0.04469	0.00214	0.00208	6.77E-08	0.00363	0.00002	0.00001	0.00000
Aerial Lift		0.00097	0.00233	0.00020	0.00019	3.53E-09	0.00028	0.00000	0.00000	0.00000
Frontend loader		0.00225	0.00698	0.00034	0.00032	1.06E-08	0.00057	0.00000	0.00000	0.00000
Dozer		0.00131	0.00407	0.00020	0.00019	6.17E-09	0.00033	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
	Total:	**0.29906**	**1.05311**	**0.04313**	**0.04184**	**0.00000**	**0.06686**	**0.00051**	**0.00018**	**0.00013**

Emission Factors

- Drill rig emission factors based on Tier II engines
- All other engine emission factors based on Tier 0 engines (typical values)
- HAP emission factors from AP-42 Volume I, Large Stationary Diesel Engines Table 3.4-3

Calculations:

ton/year: (Total hp-hr * g/hp-hr) * lb-gram / lb-ton

*** Drill rig horsepower developed based on:**

1 Williston Basin: 2,100 from Jonah, Wyoming RMP
2 San Juan Basin: 2,100 from River Valley RMP
3 Upper Green River Basin: 2,100 from Jonah, Wyoming RMP
4 Denver Basin: 2,950 from River Valley RMP
5 Uintah Basin: 2,952 from River Valley RMP

Note, runtime for each drilling event is based on research and industry experience dependent upon each basin.

Kleinfelder, Inc. Wellsite Emissions	Base Location: Uinta Basin Oil Well Type: Oil Well

Development Phase

Conductor Pipe Set Emissions

Assumptions:

Parameter	Value
Days of Operation	2
Hours of Operation	24
Diesel Fuel Sulfur Content	0.000015

Parameter	Value	Units	
BSFC (Avg.)	8250	btu/hp-hr	(Typical Value)
Diesel HHV	0.138	mmbtu/gal	(Typical Value)

Workovers:

Engine	HP	Load Factor	Run time (hrs)	Total Hp-hrs
Rig Engine	350	0.42	24	3528
Rig Generator	50	0.42	24	504

Total Horsepower: 400

Total: 4,032 Hp-hrs

Fuel Usage: 241 Gallons of Diesel Total Fuel Usage: ((btu/hp-hr * hp-hrs) * gal/btu

Greenhouse Gases:

	Diesel EF	Emissions	Emissions
	Kg/mmBtu	lbs/Location	Tons/Location
CO2	73.96	5423.82	2.71
CH4	0.003	0.22	0.00
N2O	0.0006	0.04	0.00

Greenhouse gas emission factors from Subpart C, Table C-1 and C-2

Engine	Total Hp-hrs	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	SO_2 (lb/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Toulene (lb/mmBtu	Xylenes (lb/mmBtu
Rig Engine	3528	0.8425	4.3351	0.1316	0.1277	1.27E-05	0.1636	0.0008	0.0003	0.0002
Rig Generator	504	5.0000	6.9000	0.8000	0.7760	1.27E-05	1.8000	0.0008	0.0003	0.0002

Engine		CO (Tons/yr)	NO_x (Tons/yr)	PM_{10} (Tons/yr)	$PM_{2.5}$ (Tons/yr)	SO_2 (Tons/yr)	VOC (Tons/yr)	Benzene (Tons/yr)	Toulene (Tons/yr)	Xylenes (Tons/yr)
Rig Engine		0.00328	0.01686	0.00051	0.00050	0.00000	0.00064	0.00001	0.00000	0.00000
Rig Generator		0.00278	0.00383	0.00044	0.00043	0.00000	0.00100	0.00000	0.00000	0.00000
	Total:	**0.00605**	**0.02069**	**0.00096**	**0.00093**	**0.00000**	**0.00164**	**0.00001**	**0.00000**	**0.00000**

Calculations:

ton/year: (Total hp-hr * g-hp-hr) * lb-gram / lb-ton

* Rig engine emission rates are based on a Tier II engine and rig generator emission rates are based on a Tier 0 engine.
* All days, hours, and HP values above are based on typical industry values

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Development Phase
Well Fracturing Engine Emissions

Assumptions:

Parameter	Value	
Days of Operation	3	(Typical Value)
Hours of Operation	72	(Typical Value)
Diesel Fuel Sulfur Content	0.000015	(Typical Value)

Parameter	Value	Units	
BSFC (Avg.)	8250	btu/hp-hr	(Typical Value)
Diesel HHV	0.138	mmbtu/gal	(Typical Value)

Engine	HP	Load Factor	Run time (hrs)	Total Hp-hrs
Frac Pump	1,500	0.59	72	63720
Frac Pump	1,500	0.59	72	63720
Frac Pump	1,500	0.59	72	63720
Frac Pump	1,500	0.59	72	63720
Frac Pump	1,500	0.59	72	63720
Blenders	500	0.42	4	840
Auxilary Pump	200	0.42	4	336
Sand King	100	0.42	8	336
Sand King	100	0.42	8	336
Generator	150	0.42	72	4536
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0
-	0	0.00	0	0

Greenhouse Gasses:

	Diesel EF	Emissions	Emissions
	Kg/mmBtu	lbs/Location	Tons/Location
CO_2	73.96	437166.20	218.58
CH_4	0.003	17.73	0.01
N_2O	0.0006	3.55	0.00

Greenhouse gas emission factors from Subpart C, Table C-1 and C-2

Total: 324,984 Hp-hrs

Fuel Usage: 19,428 Gallons of Diesel Total Fuel Usage: ((btu/hp-hr * hp-hrs) * gal/btu

Engine	Total Hp-hrs	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	SO_2 (lb/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Toulene (lb/mmBtu)	Xylenes (lb/mmBtu)
Frac Pump	63720	0.7642	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Frac Pump	63720	0.7642	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Frac Pump	63720	0.7642	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Frac Pump	63720	0.7642	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Frac Pump	63720	0.7642	4.1000	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Blenders	840	0.8425	4.3351	0.1316	0.1277	1.27E-05	0.1636	7.76E-04	2.81E-04	1.93E-04
Auxilary Pump	336	2.7000	8.3800	0.4020	0.3899	1.27E-05	0.6800	7.76E-04	2.81E-04	1.93E-04
Sand King	336	3.4900	8.3000	0.7220	0.7003	1.27E-05	0.9900	7.76E-04	2.81E-04	1.93E-04
Sand King	336	3.4900	8.3000	0.7220	0.7003	1.27E-05	0.9900	7.76E-04	2.81E-04	1.93E-04
Generator	4536	3.4900	8.3000	0.7220	0.7003	1.27E-05	0.9900	7.76E-04	2.81E-04	1.93E-04
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00
-	0	0.0000	0.0000	0.0000	0.0000	1.27E-05	0.0000	0.00E+00	0.00E+00	0.00E+00

Engine		CO (Tons/yr)	NO_x (Tons/yr)	PM_{10} (Tons/yr)	$PM_{2.5}$ (Tons/yr)	SO_2 (Tons/yr)	VOC (Tons/yr)	Benzene (Tons/yr)	Toulene (Tons/yr)	Xylenes (Tons/yr)
Frac Pump		0.05368	0.28798	0.00924	0.00897	8.92E-07	0.01149	0.00020	0.00007	0.00005
Frac Pump		0.05368	0.28798	0.00924	0.00897	8.92E-07	0.01149	0.00020	0.00007	0.00005
Frac Pump		0.05368	0.28798	0.00924	0.00897	8.92E-07	0.01149	0.00020	0.00007	0.00005
Frac Pump		0.05368	0.28798	0.00924	0.00897	8.92E-07	0.01149	0.00020	0.00007	0.00005
Frac Pump		0.05368	0.28798	0.00924	0.00897	8.92E-07	0.01149	0.00020	0.00007	0.00005
Blenders		0.00078	0.00401	0.00012	0.00012	1.18E-08	0.00015	0.00000	0.00000	0.00000
Auxilary Pump		0.00100	0.00310	0.00015	0.00014	4.70E-09	0.00025	0.00000	0.00000	0.00000
Sand King		0.00129	0.00307	0.00027	0.00026	4.70E-09	0.00037	0.00000	0.00000	0.00000
Sand King		0.00129	0.00307	0.00027	0.00026	4.70E-09	0.00037	0.00000	0.00000	0.00000
Generator		0.01745	0.04150	0.00361	0.00350	6.35E-08	0.00495	0.00001	0.00001	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
-		0.00000	0.00000	0.00000	0.00000	0.00E+00	0.00000	0.00000	0.00000	0.00000
	Total:	**0.29020**	**1.49467**	**0.05063**	**0.04911**	**0.00000**	**0.06354**	**0.00104**	**0.00038**	**0.00026**

Emission Factors

- Frac pump emission factors based on Tier II engines (typical values)
- All other engine emission factors based on Tier 0 engines (typical values)

Calculations:

ton/year: (Total hp-hr * g-hp-hr) * lb-gram / lb-ton

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Development Phase

Hydraulic Fracturing Flowback Emissions

Assumptions:

Estimated Frac flowback Rate:	10,000	Scf/hr	
Combustion Efficiency:	95.00	Percent (%)	
Event Duration:	100.00	Hours	
	379.49	Scf/lb-mol	- Typical/Constant Conversion Value

* Venting duration based on research and industry knowledge; please see report for additional information.
* Venting control based on Subpart OOOO requirements of 95% minimum control.
Control efficiency can be deleted if applicable.

Equations:

Emissions (Tons/Year) = ((Scf/hr * Mole% / 100) * Mole Wt.) / (2000 * scf/lb-mol)) * hrs/yr
** Multiply above equation by 0.02 if including 98% control efficiency

Un-combusted Componet Emissions:

Component	Mole % [a]	Mole Weight lb/lb-mole	Emissions Scf/hr	Emissions lbs/hour	Emissions Tons/Year
Methane	83.8580	16.0	419.29	17.73	0.89
Ethane	7.9440	30.1	39.72	3.15	0.16
Propane	4.3130	44.1	21.57	2.51	0.13
i-Butane	0.6870	58.1	3.44	0.53	0.03
n-Butane	1.2840	58.1	6.42	0.98	0.05
i-Pentane	0.3320	72.2	1.66	0.32	0.02
n-Pentane	0.3750	72.2	1.88	0.36	0.02
Other Pentanes	0.0000	70.1	0.00	0.00	0.00
Hexanes	0.1340	86.2	0.67	0.15	0.01
Heptanes	0.0550	100.2	0.28	0.07	0.00
Octanes	0.0085	114.2	0.04	0.01	0.00
Nonanes	0.0008	128.3	0.00	0.00	0.00
Decanes +	0.0001	142.3	0.00	0.00	0.00
Benzene	0.0520	78.1	0.26	0.05	0.00
Toluene	0.0023	92.1	0.01	0.00	0.00
Ethylbenzene	0.0000	106.2	0.00	0.00	0.00
2,2,4 Trimethylpentane	0.0000	78.1	0.00	0.00	0.00
Xylenes	0.0002	106.2	0.00	0.00	0.00
n-Hexane	0.0820	86.2	0.41	0.09	0.00
Nitrogen	0.6470	28.0	64.70	4.78	0.24
Carbon Dioxide	0.2680	44.0	26.80	3.11	0.16
Hydrogen Sulfide	0.0050	34.1	0.03	0.00	0.00
VOC Subtotal	7.3259	1492.8	36.63	5.08	0.25
HAPS Subtotal	0.1365	546.9	0.68	0.15	0.01
Total	100.0479	1645.0	587.16	33.84	1.69

[a] Gas analyses for gas wells are based on research done on different RMP's and private industry analyses. Research showed that the representative average gas analyses used by the River Valley RMP was a good representative analyses of general gas wells.

Flare Combustion GHG emissions:

	Component Molar Ratio (%)	Emissions Scf/hr	Emissions lbs/hr	Emissions Tons/Year
C1	83.86	7966.51	923.89	46.19
C2	7.94	754.68	87.52	4.38
C3	4.31	409.74	47.52	2.38
C4	1.97	187.25	21.72	1.09
C5+	1.04	98.98	11.48	0.57

CO_2 Total Emissions:	**54.61**	**Tons/Event**
N_2O Emissions:	**1.13E-04**	**Tons/Event**

Flare Combustion Emissions: Fuel Heating Value: 1028.00 btu/scf

	lbs/mmBTU	lbs/hour	Tons/event	
CO	0.37	3.80	0.19	AP-42 CH13.5-1
NOx	0.068	0.70	0.03	AP-42 CH13.5-1
SO_2	-	0.00	0.00	*Based on $H2_S$ 34 mol weight and SO_2 64 mol weight

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Development Phase
Workover Cementing Emissions

Assumptions:

Parameter	Value	
Days of Operation	2	(Typical Value)
Hours of Operation	24	(Typical Value)
Diesel Fuel Sulfur Content	0.000015	(Typical Value)

Parameter	Value	Units	
BSFC (Avg.)	8500	btu/hp-hr	(Typical Value)
Diesel HHV	0.138	mmbtu/gal	(Typical Value)

Workovers/Cementing:

Engine	HP	Load Factor	Run time (hrs)	Total Hp-hrs
Coil Tubing Unit	550	0.42	24	5544
Circulation Pump	450	0.42	24	4536
Cement Pump Trucks	500	0.42	8	1680

Greenhouse Gasses:

	Diesel EF	Emissions	Emissions
	Kg/mmBtu	lbs/Location	Tons/Location
CO2	73.96	16298.85	8.15
CH4	0.003	0.66	0.00
N2O	0.0006	0.13	0.00

Total Horsepower: 1,500 (Typical Value)

Total: 11,760 Hp-hrs

Fuel Usage: 724 Gallons of Diesel Total Fuel Usage: ((btu/hp-hr * hp-hrs) * gal/btu

Engine	Total Hp-hrs	CO (g/hp-hr)	NO_x (g/hp-hr)	PM_{10} (g/hp-hr)	$PM_{2.5}$ (g/hp-hr)	VOC (g/hp-hr)	Benzene (lb/mmBtu)	Formaldehyde (lb/mmBtu)	Toulene (lb/mmBtu	Xylenes (lb/mmBtu
Coil Tubing Unit	5544	0.8425	4.3351	0.1316	0.1277	0.1636	0.0008	0.0001	0.0003	0.0002
Circulation Pump	4536	0.8425	4.3351	0.1316	0.1277	0.1636	0.0008	0.0001	0.0003	0.0002
Cement Pump Trucks	1680	2.7000	8.3800	0.4020	0.3899	0.6800	0.0008	0.0001	0.0003	0.0002

Engine		CO (Tons/yr)	NO_x (Tons/yr)	PM_{10} (Tons/yr)	$PM_{2.5}$ (Tons/yr)	VOC (Tons/yr)	Benzene (Tons/yr)	Formaldehyde (Tons/yr)	Toulene (Tons/yr)	Xylenes (Tons/yr)
Coil Tubing Unit		0.00515	0.02649	0.00080	0.00078	0.00100	0.00002	0.00000	0.00001	0.00000
Circulation Pump		0.00421	0.02168	0.00066	0.00064	0.00082	0.00001	0.00000	0.00001	0.00000
Cement Pump Trucks		0.00500	0.01552	0.00074	0.00072	0.00126	0.00001	0.00000	0.00000	0.00000
Total:		**0.01436**	**0.06369**	**0.00221**	**0.00214**	**0.00308**	**0.00004**	**0.00000**	**0.00001**	**0.00001**

Emission Factors

- Engine emission factors based on Tier II engines (typical values)

Calculations:

ton/year: (Total hp-hr * g-hp-hr) * lb-gram / lb-ton

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Development Phase

Well Venting During Workover Events

Assumptions:

Significant gas venting only occurs on natural gas wells.

Estimated Venting Rate:	5,000	Scf/Event	(Typical Value)
Combustion Efficiency:	0.00	Percent (%)	
Event Quantity:	1.00	Event	- Assumed one event
	379.49	Scf/lb-mol	- Typical/Constant Conversion Value

* Vented quantity based on research and industry knowledge; please see report for additional information.

Equations:

Emissions (Tons/Year) = ((Scf/hr * Mole% / 100) * Mole Wt.) / (2000 * scf-lb-mol))

** Multiply above equation by 0.02 if including 98% control efficiency

Component	Mole %	Mole Weight lb/lb-mole	Emissions Scf/hr	Emissions lbs/hour	Emissions Tons/Event
Methane	83.8580	16.0	4192.90	177.26	0.0886
Ethane	7.9440	30.1	397.20	31.47	0.0157
Propane	4.3130	44.1	215.65	25.06	0.0125
i-Butane	0.6870	58.1	34.35	5.26	0.0026
n-Butane	1.2840	58.1	64.20	9.83	0.0049
i-Pentane	0.3320	72.2	16.60	3.16	0.0016
n-Pentane	0.3750	72.2	18.75	3.56	0.0018
Other Pentanes	0.0000	70.1	0.00	0.00	0.0000
Hexanes	0.1340	86.2	6.70	1.52	0.0008
Heptanes	0.0550	100.2	2.75	0.73	0.0004
Octanes	0.0085	114.2	0.43	0.13	0.0001
Nonanes	0.0008	128.3	0.04	0.01	0.0000
Decanes +	0.0001	142.3	0.01	0.00	0.0000
Benzene	0.0520	78.1	2.60	0.54	0.0003
Toluene	0.0023	92.1	0.12	0.03	0.0000
Ethylbenzene	0.0000	106.2	0.00	0.00	0.0000
2,2,4 Trimethylpentane	0.0000	78.1	0.00	0.00	0.0000
Xylenes	0.0002	106.2	0.01	0.00	0.0000
n-Hexane	0.0820	86.2	4.10	0.93	0.0005
Nitrogen	0.6470	28.0	32.35	2.39	0.0012
Carbon Dioxide	0.2680	44.0	13.40	1.55	0.0008
Hydrogen Sulfide	0.0050	34.1	0.25	0.02	0.0000

VOC Subtotal	7.3259	1492.8	366.30	50.76	0.0254
HAPS Subtotal	0.1365	546.9	6.83	1.50	0.0007
Total	100.0479	1645.0	5002.40	263.45	0.1317

[a] Gas analyses for gas wells are based on research done on different RMP's and private industry analyses. Research showed thatthe representative average gas analyses used by the River Valley RMP. was a good representative analyses of general gas wells.

Flare Combustion GHG emissions:

	Component Molar Ratio (%)	Emissions Scf/hr	Emissions lbs/hr	Emissions Tons/Year
C1	83.86	0.00	0.00	0.00
C2	7.94	0.00	0.00	0.00
C3	4.31	0.00	0.00	0.00
C4	1.97	0.00	0.00	0.00
C5+	1.04	0.00	0.00	0.00

CO_2 Total Emissions:	**0.00**	**Tons/Event**
N_2O Emissions:	**5.67E-07**	**Tons/Event**

Flare Combustion Emissions: Fuel Heating Value: 1028.00 btu/scf

	lbs/mmBTU	lbs/hour	Tons/event	
CO	0.00	0.00	0.00	AP-42 CH13.5-1
NOx	0.000	0.00	0.00	AP-42 CH13.5-1
SO_2	-	0.00	0.000	*Based on $H2_S$ 34 mol weight and SO_2 64 mol weight

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Development Phase

Wellsite Development Traffic Tailpipe Emissions

Assumptions:

Average Round Trip Distance:	80.0	Miles/Trip Average			
Light Duty Pickup Trucks:	84	Trips/Location			
Light Duty Haul Trucks	11	Trips/Location	Total Trips:	95	Trips
Heavy Duty Haul Trucks	67	Trips/Location			
Water Trucks	24	Trips/Location	Total Trips:	91	Trips

* Miles and number of trips based on research and industry knowledge; please see report for additional information.

Equations:

$$\text{Emissions (tons/year)} = \frac{\text{Emission Factor (lb/mile)} * \text{\# Trips} * \text{Trip Distance (miles)}}{2000 \text{ (lb/tons)}}$$

Construction Vehicles	**Heavy Haul Trucks**		**Light Duty Pickups**		**Total**
	E. Factor [a] (lb/mile)	Emissions (Tons/Location)	E. Factor [b] (lb/mile)	Emissions (Tons/Location)	Emissions (Tons/Location)
NOx	7.44E-02	2.71E-01	1.98E-02	2.83E-01	5.54E-01
CO	1.98E-02	7.21E-02	3.16E-03	7.52E-02	1.47E-01
VOC	3.16E-03	1.15E-02	4.57E-05	1.20E-02	2.35E-02
SO2	4.57E-05	1.66E-04	4.22E-03	1.74E-04	3.40E-04
PM10	4.22E-03	1.54E-02	4.09E-03	1.60E-02	3.14E-02
PM2.5	4.09E-03	1.49E-02	1.88E+00	1.55E-02	3.04E-02
CO2	1.88E+00	6.83E+00	7.61E-05	7.13E+00	1.40E+01
CH4	7.61E-05	2.77E-04	1.52E-05	2.89E-04	5.66E-04
N2O	1.52E-05	5.54E-05	0.00E+00	5.78E-05	1.13E-04

a Emission factors developed using EPA MOVES model, assuming Heavy-Heavy Duty Diesel Trucks, traveling 15 mph onsite for calendar year 2012.

b Emission factors developed using EPA MOVES model, assuming Light Heavy Duty Gasoline Trucks, traveling 15 mph onsite for calendar year 2012.

c Assumes maximum development scenario

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Development Phase

Wellhead Gas Combustion

**Wellhead gas combustion only for Williston Basin wells, due to the regularity of of pit flares combusting all gas coming from the wellhead. If gas being captured, change scf/hr value or hours of event value.

Assumptions:

Estimated Gas Flow Rate:	78	Scf/hr	
Combustion Efficiency:	95.00	Percent (%)	
Event Duration:	2190.00	Hours	- Estimated 3 months before sales line
	379.49	Scf/lb-mol	- Typical/Constant Conversion Value

* Gas flow rate based on estimated gas to oil ratio and estimated liquid production
- GOR of 12.4 scf/bbl and 150 bbl/day production: 12.4 scf/bbl *150 bbl-d / 24 = 77.5 scf/hr)

Emissions (Tons/Year) = ((Scf/hr * Mole% / 100) * Mole Wt.) / (2000 * scf/lb-mol)) * hrs/yr
** Multiply above equation by 0.05 if including 95% control efficiency

Combusted Componet Emissions:

Component	Mole % [a]	Mole Weight lb/lb-mole	Emissions Scf/hr	Emissions lbs/hour	Emissions Tons/Year
Methane	83.8580	16.0	3.25	0.14	0.15
Ethane	7.9440	30.1	0.31	0.02	0.03
Propane	4.3130	44.1	0.17	0.02	0.02
i-Butane	0.6870	58.1	0.03	0.00	0.00
n-Butane	1.2840	58.1	0.05	0.01	0.01
i-Pentane	0.3320	72.2	0.01	0.00	0.00
n-Pentane	0.3750	72.2	0.01	0.00	0.00
Other Pentanes	0.0000	70.1	0.00	0.00	0.00
Hexanes	0.1340	86.2	0.01	0.00	0.00
Heptanes	0.0550	100.2	0.00	0.00	0.00
Octanes	0.0085	114.2	0.00	0.00	0.00
Nonanes	0.0008	128.3	0.00	0.00	0.00
Decanes +	0.0001	142.3	0.00	0.00	0.00
Benzene	0.0520	78.1	0.00	0.00	0.00
Toluene	0.0023	92.1	0.00	0.00	0.00
Ethylbenzene	0.0000	106.2	0.00	0.00	0.00
2,2,4 Trimethylpentane	0.0000	78.1	0.00	0.00	0.00
Xylenes	0.0002	106.2	0.00	0.00	0.00
n-Hexane	0.0820	86.2	0.00	0.00	0.00
Nitrogen	0.6470	28.0	0.50	0.04	0.04
Carbon Dioxide	0.2680	44.0	0.21	0.02	0.03
Hydrogen Sulfide	0.0050	34.1	0.00	0.00	0.00

VOC Subtotal	7.3259	1492.8	0.28	0.04	0.04
HAPS Subtotal	0.1365	546.9	0.01	0.00	0.00
Total	100.0479	1645.0	4.55	0.26	0.29

Flare Combustion GHG emissions:

	Component Molar Ratio (%)	Emissions Scf/hr	Emissions lbs/hr	Emissions Tons/Year
C1	83.86	61.74	7.16	7.84
C2	7.94	5.85	0.68	0.74
C3	4.31	3.18	0.37	0.40
C4	1.97	1.45	0.17	0.18
C5+	1.04	0.77	0.09	0.10

CO_2 Total Emissions: **9.27** **Tons/Year**

N_2O Emissions: **1.92E-05** **Tons/Year**

Flare Combustion Emissions: Fuel Heating Value: 1028.00 btu/scf

	lbs/mmBTU	lbs/hour	Tons/event	
CO	0.37	0.03	0.03	AP-42 CH13.5-1
NOx	0.068	0.01	0.01	AP-42 CH13.5-1
SO_2	-	0.00	0.00	*Based on H_2S 34 mol weight and SO_2 64 mol weight

Kleinfelder, Inc.

Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Production Phase

Production Equipment Fugitive Component Emissions

Assumptions:

Components Counts:

	Fugitive Components				
Component *	Valves	Flanges	Connectors	OE Lines	Other
Count	24	44	38	0	0
Emissions Factor (scf/hr) [b]	0.050	0.003	0.007	0.050	0.300

* Fugitive component counts for natural gas wells from Subpart W, Table W-1B
* Fugitive component counts for oil wells from Subpart W, Table W-1C

Annual Equipment Run Time: 8760 Hours/Year 379.49 Scf/lb-mol

Component	Mole % [a]	Mole Weight lb/lb-mol	Emissions Scf/Year [b]	Emissions lbs/Year	Emissions Tons/Year
Methane	83.8580	16.0	11,738.8	496.3	0.25
Ethane	7.9440	30.1	1,112.0	88.1	0.04
Propane	4.3130	44.1	603.8	70.2	0.04
i-Butane	0.6870	58.1	96.2	14.7	0.01
n-Butane	1.2840	58.1	179.7	27.5	0.01
i-Pentane	0.3320	72.2	46.5	8.8	0.00
n-Pentane	0.3750	72.2	52.5	10.0	0.00
Other Pentanes	0.0000	70.1	0.00	0.00	0.00
Hexanes	0.1340	86.2	18.8	4.3	0.00
Heptanes	0.0550	100.2	7.7	2.0	0.00
Octanes	0.0085	114.2	1.2	0.4	0.00
Nonanes	0.0008	128.3	0.1	0.0	0.00
Decanes +	0.0001	142.3	0.0	0.0	0.00
Benzene	0.0520	78.1	7.3	1.5	0.00
Toluene	0.0023	92.1	0.3	0.1	0.00
Ethylbenzene	0.0000	106.2	0.00	0.00	0.00
2,2,4 Trimethylpentane	0.0000	78.1	0.00	0.00	0.00
Xylenes	0.0002	106.2	0.0	0.0	0.00
n-Hexane	0.0820	86.2	11.5	2.6	0.00
Nitrogen	0.6470	28.0	90.6	6.7	0.00
Carbon Dioxide	0.2680	44.0	37.5	4.4	0.00
Hydrogen Sulfide	0.0050	34.1	0.70	0.06	0.00

VOC Subtotal	7.3259			142.12	0.07
HAPS Subtotal	0.1365			4.19	0.00
Total	100.0479			737.59	0.37

Calculation

lb/hr = (Mol % * SumSCF/yr) / scf/lb-mol

[a] Gas analyses for gas wells are based on research done on different RMP's and private industry analyses. Research showed that the representative average gas analyses used by the River Valley RMP was a good representative analyses of general gas wells.

[b] Fugitive emission factors from Subpart W, Table W-1A

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Production Phase
Process Heater Emissions

Wellsite Heater Inventory:

	Heating Value (Mbtu/hr)	Fuel Consumption (MMScf/yr)	
Heater Treater	**750**	**6.44**	* Heater treater size based on industry standard

Annual Run Time: **8760** **Hours/Year**
Fuel Gas Heat Value: **1,020** **Btu/scf (Standard heating value from AP-42)**

Equations:

Fuel Consumption (MMscf/yr) = $\frac{\text{Heater Size (MBtu/hr) * 1,000 (Btu/MBtu) * Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf) * 1,000,000 (scf/MMscf)}}$

NOx/CO/TOC Emissions (tons/yr) = $\frac{\text{AP-42 E.Factor (lbs/MMscf) * Fuel Consumption (MMscf/yr) * Fuel heating Value (Btu/scf)}}{\text{2,000 (lbs/ton) * 1,020 (Btu/scf - Standard Fuel Heating Value)}}$

	Emission Factor (lb/MMscf)	Heater Treater Total Emissions (Tons/Year)	Total Emissions (Tons/Year)	Total Emissions (Tons/Year)	Total Emissions (Tons/Year)	Total Emissions (Tons/Year) [e]
Criteria Pollutants & VOC						
NOx [a]	100	0.3221	0.0000	0.0000	0.0000	0.3221
CO [a]	84.0	0.2705	0.0000	0.0000	0.0000	0.2705
VOC	5.5	0.0177	0.0000	0.0000	0.0000	0.0177
SO_2 [b]	0.00	0.0000	0.0000	0.0000	0.0000	0.0000
TSP [c]	7.60	0.0245	0.0000	0.0000	0.0000	0.0245
PM_{10} [c]	7.60	0.0245	0.0000	0.0000	0.0000	0.0245
$PM_{2.5}$ [c]	7.60	0.0245	0.0000	0.0000	0.0000	0.0245
Hazardous Air Pollutants						
Benzene [d]	2.10E-03	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene [d]	3.40E-03	0.0000	0.0000	0.0000	0.0000	0.0000
Hexane [d]	1.80	0.0058	0.0000	0.0000	0.0000	0.0058
Formaldehyde [d]	7.50E-02	0.0002	0.0000	0.0000	0.0000	0.0002
Greenhouse Gases						
CO_2 [f]	120,162	386.9918	0.0000	0.0000	0.0000	386.9918
CH_4 [f]	2.27	0.0073	0.0000	0.0000	0.0000	0.0073
N_2O [f]	0.23	0.0007	0.0000	0.0000	0.0000	0.0007

a AP-42 Table 1.4-1, Emission Factors for Natural Gas Combustion, 7/98
b Assumes produced gas contains no sulfur
c AP-42 Table 1.4-2, Emission Factors for Natural Gas Combustion, 7/98 (All Particulates are $PM_{1.0}$)
d AP-42 Table 1.4-3, Emission Factors for Organic Compounds from Natural Gas Combustion, 7/98
e Assumes maximum development scenario
f Subpart W - Part 98.233(z)(1) indicates the use of Table C-1 and Table C-2 for fuel combustion of stationary and portable equipment. Table C-1 provides an EF for natural gas combustion of 53.02 kg CO_2/mmBtu. Table C-2 provides an EF for natural gas combustion for CH_4 as 1.0E-03 kg/MMBtu and for N_2O as 1.0E-04 kg/MMBtu.

Kleinfelder, Inc. Wellsite Emissions	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Production Phase

Atmospheric Oil Tank Flashing Emissions

Assumptions:

Production Estimate:	150	barrels/day		
Production Days:	365	Days/Year		
Flasing Gas-to-Oil Ratio:	12.4	Scf/bbl	379.49	Scf/lb-mol
Control Efficiency:	95	Percent (%)		

Flashing Gas Composition:

Component	Mole %	Mole Weight (lb/lb-mol)	Emissions (Uncontrolled) Scf/Year	Emissions (Uncontrolled) lbs/Year	Emissions (Uncontrolled) Tons/Year	Emissions (Controlled) Tons/Year
Methane	38.8940	16.043	264051.366	11162.8134	5.5814	0.2791
Ethane	16.5160	30.07	112127.124	8884.7206	4.4424	0.2221
Propane	16.9090	44.097	114795.201	13339.2816	6.6696	0.3335
i-Butane	3.6940	58.123	25078.566	3841.0538	1.9205	0.0960
n-Butane	9.0440	58.123	61399.716	9404.0309	4.7020	0.2351
i-Pentane	3.2640	72.150	22159.296	4213.0048	2.1065	0.1053
n-Pentane	4.2970	72.150	29172.333	5546.3486	2.7732	0.1387
Other Pentanes	0.3610	70.100	2450.829	452.7211	0.2264	0.0113
Hexanes	2.2850	86.177	15512.865	3522.7599	1.7614	0.0881
Heptanes	1.4230	100.204	9660.747	2550.9117	1.2755	0.0638
Octanes	0.4030	114.231	2735.967	823.5586	0.4118	0.0206
Nonanes	0.0760	128.258	515.964	174.3828	0.0872	0.0044
Decanes +	0.0260	142.285	176.514	66.1817	0.0331	0.0017
Benzene	0.1060	78.120	719.634	148.1404	0.0741	0.0037
Toluene	0.0830	92.130	563.487	136.7995	0.0684	0.0034
Ethylbenzene	0.0040	106.160	27.156	7.5967	0.0038	0.0002
2,2,4 Trimethylpentane	0.0000	78.120	0	0.0000	0.0000	0.0000
Xylenes	0.0230	106.160	156.147	43.6812	0.0218	0.0011
n-Hexane	1.5130	86.177	10271.757	2332.5758	1.1663	0.0583
Nitrogen	0.6120	28.013	4154.868	306.7019	0.1534	0.0077
Carbon Dioxide	0.4600	44.010	3122.94	362.1718	0.1811	0.0091
Hydrogen Sulfide	0.0000	34.080	0	0.0000	0.0000	0.0000

VOC Subtotal	43.51				23.30	1.17
HAPS Subtotal	1.73				1.33	0.07
Total	**99.9930**				**33.6597**	**1.6830**

Calculation:

Scf/yr = (Mol% * scf/bbl * bbl/day * days/yr) / 100

lb/yr = (scf/yr * mol wt.) / scf/lb-mol

*** Production and gas to oil ratio based on basin specific differences. Please see "Gas Stream Molar Ratios" tab and report for additional information.**

Kleinfelder, Inc. Wellsite Emissions	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Production Phase

Wellsite Produced Water Tanks Venting

Assumptions:

Average Estimated Water Production:	12385	Barrels Per Year
Number of Water Tanks:	1	Tanks
VOC Emissions Factor:	0.2620	lbs/bbl
n-Hexane Emission Factor:	0.0220	lbs/bbl
Benzene Emission Factor:	0.0070	lbs/bbl

Calculations:

VOC Emissions:	1.622435	Tons/Year
Hexane Emissions:	0.136235	Tons/Year
Benzene Emissions:	0.0433475	Tons/Year

* Production conservatively based on estimated industry single well average
* Emission factors based on only known lb/bbl factor, which was developed by the Colorado Department of Health and Environment (PS Memo 09-02).

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Production Phase

Truck Loading Emissions

AP - 42, Chapter 5.2 $\mathbf{L_L = 12.46 \times S \times P \times M / T}$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (ºR)

VOC Emissions (tpy) =

$$\frac{L_L \text{ (lbs VOC/1000 gal)} * 42 \text{ gal/bbl} * 365 \text{ days/year} * \text{production (bbl/day)}}{1000 \text{ gal} * 2000 \text{ lbs/ton}}$$

S[1]	P (psia)[2]	M (lb/lbmol)[3]	T (ºF)[4]	T (ºR)	L_L (lb/1000 gal)	Production (bbl/day)	VOC (tpy)
0.6	2.30	50.00	50.00	509.67	1.69	150.0	**1.94**

Notes:

1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading: dedicated normal service)
2. True vapor pressure is estimated from AP-42, Table 7.1-2 assuming an average daily temperature of either 40 or 50 deg F and an RVP of 10.0.
3. Molecular weight liquid vapor is estimated from AP-42, Table 7.1-2 assuming an RVP of 10.0.
4. Temperature based on the annual average temperature for basin location (either 40 or 50 degrees F based on options provided in AP-42 Table 7.1-2

Kleinfelder, Inc. **Wellsite Emissions**	**Base Location:** Uinta Basin Oil **Well Type:** Oil Well

Production Phase

Pumpjack Unit Emissions

Assumptions:

Pumpjack engines only included at oil wells

Pumpjack Horsepower Rating:	65.0	Horsepower
Load Factor:	0.54	
Brake Specific Fuel Consumption:	8,000	Btu/hp-hr
Annual Operation:	8,760	Hours/Year

Equations:

$$\text{Emissions (lbs/hr)} = \frac{\text{Emission Factor (g/hp-hr)} * \text{Power (hp)}}{453.6 \text{ g/lb}}$$

Pollutant	**Emission Factor [a] (lb/MMBtu)**	**Emission Factor [a] (g/hp-hr)**	**Emissions (lb/hr)**	**Emissions (Tons/Year)**
Criteria Pollutants & VOC				
NOx		2.80	0.22	0.9490
CO		4.80	0.37	1.6269
VOC	0.12	-	0.0337	0.1476
PM_{10} [b]	4.83E-02	-	1.36E-02	5.94E-02
$PM_{2.5}$ [b]	4.83E-02	-	1.36E-02	5.94E-02
SO_2	5.88E-04	-	0.0002	0.0007
Hazardous Air Pollutants				
Benzene	1.94E-03	-	5.45E-04	2.39E-03
Toluene	9.63E-04	-	2.70E-04	1.18E-03
Ethylbenzene	1.08E-04	-	3.03E-05	1.33E-04
Xylenes	2.68E-04	-	7.53E-05	3.30E-04
Formaldehyde	5.52E-02	-	0.0155	0.0679
n-Hexane	4.45E-04	-	1.25E-04	5.47E-04
Greenhouse Gases				
CO_2 [c]	117	-	32.82	144
CH_4	0.002	-	0.0006	0.0027
N_2O	0.0002	-	0.0001	0.0003

a AP-42 Table 3.2-3 Uncontrolled Emission Factors for 4-Stroke Rich-Burn Engines, 7/00; and Subpart JJJJ for NOX and CO emission rates.

b PM = sum of PM filterable and PM condensable

c Subpart W - Part 98.233(z)(1) indicates the use of Table C-1 and Table C-2 for fuel combustion of stationary and portable equipment. Table C-1 provides an EF for natural gas combustion of 53.02 kg CO_2/mmBtu. Table C-2 provides an EF for natural gas combustion for CH_4 as 1.0E-03 kg/MMBtu and for N_2O as 1.0E-04 kg/MMBtu.

- Network website for the 1999 National-Scale Air Toxics Assessment at http://www.epa.gov/ttn/atw/nata1999/nsata99.html

Kleinfelder, Inc. Wellsite Emissions	Base Location: Uinta Basin Oil Well Type: Oil Well

Production Phase

Wellsite Dehydrator Emissions

Assumptions:

Number of Dehy Units: 0 Units

Calculations:

Calculations and specifications derived from Pinedale Anticline Final SEIS
GRI-GLYCalc 4.0 operated with: 4 MMSCFD, 0.32 gpm glycol flow, average representative gas analysis, and 95% control efficiency

Emissions:

Species	Total Project Emissions (tons/year)
Total VOC	0.000
Hazardous Air Pollutants	
Benzene	0.000
Toluene	0.000
Ethylbenzene	0.000
Xylenes	0.000
n-Hexane	0.000
Greenhouse Gases	
CO_2	0.000
CH_4 [a]	0.000
N_2O	0.000

Note, no greenhouse gas emissions included for dehydrator in Pinedale EIS

Kleinfelder, Inc.

Wellsite Emissions

Base Location: Uinta Basin Oil

Well Type: Oil Well

Construction Phase

Roadway Construction Traffic Tailpipe Emissions

Assumptions:

Average Round Trip Distance:	80.0	Miles/Trip Average			
Light Duty Pickup Trucks:	50	Trips/Location			
Light Duty Haul Trucks	0	Trips/Location	Total Trips:	50	Trips
Heavy Duty Haul Trucks	2	Trips/Location			
Water Trucks	65	Trips/Location	Total Trips:	67	Trips

* Miles and number of trips based on research and industry knowledge; please see report for additional information.

Equations:

$$\text{Emissions (tons/year)} = \frac{\text{Emission Factor (g/mile) * \# Trips * Trip Distance (miles)}}{\text{2000 (lb/tons)}}$$

Construction Vehicles	Heavy Haul Trucks		Light Duty Pickups		Total
	E. Factor [a] (lb/mile)	Emissions (Tons/Location)	E. Factor [b] (lb/mile)	Emissions (Tons/Location)	Emissions (Tons/Location)
NOx	7.44E-02	1.99E-01	7.39E-03	1.48E-02	2.14E-01
CO	1.98E-02	5.31E-02	7.26E-02	1.45E-01	1.98E-01
VOC	3.16E-03	8.47E-03	3.54E-03	7.08E-03	1.55E-02
SO2	4.57E-05	1.22E-04	2.83E-05	5.66E-05	1.79E-04
PM10	4.22E-03	1.13E-02	1.94E-04	3.88E-04	1.17E-02
PM2.5	4.09E-03	1.10E-02	1.79E-04	3.58E-04	1.13E-02
CO2	1.88E+00	5.03E+00	1.13E+00	2.25E+00	7.28E+00
CH4	7.61E-05	2.04E-04	4.56E-05	9.13E-05	2.95E-04
N2O	1.52E-05	4.08E-05	9.13E-06	1.83E-05	5.90E-05

a Emission factors developed using EPA MOVES model, assuming Heavy-Heavy Duty Diesel Trucks, traveling 15 mph onsite in typical oil and gas development area, for calendar year 2012.

b Emission factors developed using EPA MOVES model, assuming Light Heavy Duty Gasoline Trucks, traveling 15 mph onsite in typical oil and gas development area, for calendar year 2012.

c Assumes maximum development scenario

Kleinfelder, Inc.
Wellsite Emissions

Base Location: Uinta Basin Oil
Well Type: Oil Well

Production Phase
Pneumatic Device Emissions

Wellsite Pneumatic Inventory:

		Classification	Quantity	Emission Factor (Scf/hr/unit)
Devices:			1	0.00
			0	0.00
			0	0.00
Pumps:	Pump	Pneumatic Pump	1	13.30

Annual Equipment Run Time: 8760 Hours/Year   379.49 Scf/lb-mol
Pneumatic Device Control: [b] 0 Percent

* Low bleed and intermittent bleed emission factors (scf/hr) based on Subpart W, Table W-1A
* Quantity of devices based on typical industry values

Component	Mole %	Mole Weight lb/lb-mol	(None) Tons/Year	(None) Tons/Year	(None) Tons/Year	Pneumatic Pumps Tons/Year	Total Tons/Year
Methane	83.8580	16.0	0.000	0.000	0.000	2.065	2.065
Ethane	7.9440	30.1	0.000	0.000	0.000	0.367	0.367
Propane	4.3130	44.1	0.000	0.000	0.000	0.292	0.292
i-Butane	0.6870	58.1	0.000	0.000	0.000	0.061	0.061
n-Butane	1.2840	58.1	0.000	0.000	0.000	0.115	0.115
i-Pentane	0.3320	72.2	0.000	0.000	0.000	0.037	0.037
n-Pentane	0.3750	72.2	0.000	0.000	0.000	0.042	0.042
Other Pentanes	0.0000	70.1	0.000	0.000	0.000	0.000	0.000
Hexanes	0.1340	86.2	0.000	0.000	0.000	0.018	0.018
Heptanes	0.0550	100.2	0.000	0.000	0.000	0.008	0.008
Octanes	0.0085	114.2	0.000	0.000	0.000	0.001	0.001
Nonanes	0.0008	128.3	0.000	0.000	0.000	0.000	0.000
Decanes +	0.0001	142.3	0.000	0.000	0.000	0.000	0.000
Benzene	0.0520	78.1	0.000	0.000	0.000	0.006	0.006
Toluene	0.0023	92.1	0.000	0.000	0.000	0.000	0.000
Ethylbenzene	0.0000	106.2	0.000	0.000	0.000	0.000	0.000
2,2,4 Trimethylpentane	0.0000	78.1	0.000	0.000	0.000	0.000	0.000
Xylenes	0.0002	106.2	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.0820	86.2	0.000	0.000	0.000	0.011	0.011
Nitrogen	0.6470	28.0	0.000	0.000	0.000	0.028	0.028
Carbon Dioxide	0.2680	44.0	0.000	0.000	0.000	0.018	0.018
Hydrogen Sulfide	0.0050	34.1	0.000	0.000	0.000	0.000	0.000
VOC Subtotal	7.3	1492.8	0.00	0.00	0.00	0.59	0.59
HAPS Subtotal	0.1	546.9	0.00	0.00	0.00	0.02	0.02
Total	100.0	1645.0	0.00	0.00	0.00	3.07	3.07

[a] Gas analyses for gas wells are based on research done on different RMP's and private industry analyses. Research showed that the representative average gas analyses used by the River Valley RMP was a good representative analyses of general gas wells.

[b] 98% control input is a result of the Wyoming Department of Environment Quality requirement, and only pertains to the Upper Green River Basin.

APPENDIX H – GHG CALCULATIONS

Direct GHG Emissions from Constructing and Operating an Oil or Gas Well

Direct GHG emissions from oil and gas activities occur during construction and operation of a well. Construction-related emissions occur from the use of heavy machinery during pad construction, drilling, testing and completion, venting and flaring, interim reclamation, and vehicles. Construction emissions are typically a onetime occurrence. Operation-related emissions occur from well workovers, pump engines, heaters, tanks, truck loading, fugitive leaks, pneumatics, dehydrators, compressor engines, reclamation, and vehicle traffic. Emissions from operation activities occur throughout the life of a well. Several factors may influence actual emissions, including location, geological formation, well depth, equipment used, supporting infrastructure, and other factors. For these reasons, this document presents GHG emissions by BLM District Office from the typical oil and gas well activity occurring in each area.

Green River District Direct Emissions

GHG emission estimates for the Green River District are incorporated from the Monument Butte FEIS (BLM 2016b), Alternative B No Action Alternative. All methods and assumptions used to develop the emissions in the Monument Butte FEIS apply and are incorporated by reference. The No Action alternative emission inventory is used because it does not include applicant-committed emission reduction measures and would be representative of potential wells that may result from leasing in the Green River District. The emissions estimate for construction and operation of a single well are presented in Table C-1. Emissions are listed by well type, with gas wells having higher construction emissions, mainly due to deeper drilling depths, and oil wells having higher operation emissions, mainly from heaters and pump engines. Well types are not easily identifiable when calculating the total emissions from existing and reasonably foreseeable wells, so calculations for the Green River District are based on gas well construction emissions (678.5 CO_2e/yr per well) combined with oil well operation emissions (427.7 CO_2e/yr per well). This provides a conservative estimate when the well type is unknown. These emissions are only used for other foreseeable wells included in the cumulative impacts analysis.

Table C-1. Single Well GHG Emissions Based on the Monument Butte FEIS Alternative B Inventory

Single Oil Well Emissions (metric tons per year)				
Development Phase	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Construction	89.3	0.08	0.0007	91.8
Operations	388.6	1.40	0.0007	427.7
Total	477.9	1.48	0.001	519.5
Single Gas Well Emissions (metric tons per year)				
Development Phase	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Construction	676.3	0.03	0.005	678.5
Operations	1.3	3.00	0.000004	85.3
Total	677.6	3.03	0.005	763.8

Downstream GHG Emissions for a Single Well

Downstream combustion emissions from foreseeable development is difficult to quantify since the amount of produced oil and gas is unknown until after a well is drilled. For the purpose of this EA, it is assumed that future wells will produce oil and gas in similar amounts as other existing nearby wells. Annual data from 2008 to 2018 is used to determine the average production per well; however, some wells may produce more or less than the average. To better inform decision-makers and the public, low and high production estimates are also used for calculating downstream combustion emissions.

Estimates of production and combustion GHG emissions for a single well are presented in Table C-2. The average annual production and standard deviation of annual production between the years 2008 and 2018 was first calculated for each field office using data from the Utah Division of Oil, Gas & Mining (UDOGM 2019). A standard deviation is a statistical measure used to quantify the amount of variation in a set of data. Low and high production estimates are two standard deviations from below and above the average annual production. Two standard deviations are chosen for the range as it accounts for 95% of the variation, assuming the dataset of annual production is a Gaussian distribution or equally varies above and below the average. Since two standard deviations only cover 95% of the variation, it is possible that an individual well could produce more or less oil and gas than the estimated production range. A well is most likely to produce higher amounts of oil and gas immediately after it is drilled and produce less at the end of its lifespan due to production decline. At the field office level, it is assumed that active wells produce both oil and gas since the Utah Division of Oil, Gas & Mining reports only identify well type at the state level. For comparison, the low, average, and high emissions for an oil well in Utah is 1,857 mt CO_2e/yr, 3,156 mt CO_2e/yr, and 4,455 mt CO_2e/yr, respectively. Gas well emissions are 2,410 mt CO_2e/yr (low), 3,483 mt CO_2e/yr (average), and 4,556 mt CO_2e/yr (high).

TABLE C-2. PRODUCTION OF OIL AND GAS FOR A SINGLE WELL AND ASSOCIATED GHG COMBUSTION EMISSIONS

	2008-2018 Range of Oil Production (bbl/well)			2008-2018 Range of Gas Production (mcf/well)			Range of Emissions per Well (metric tons CO_2e/yr)		
Field Office	**Low**	**Avg**	**High**	**Low**	**Avg**	**High**	**Low**	**Avg**	**High**
Vernal	797	2,254	3,711	14,344	29,171	43,997	1,133	2,577	4,020

EPA emission factors: 0.43 metric tons CO2e/bbl and 0.0551 metric tons CO2e/mcf (EPA 2019c).
Production data obtained from the Utah Division of Oil, Gas & Mining (UDOGM 2019).

Estimated GHG Emissions from Oil and Gas Development

The cumulative analysis considers GHG emissions from existing and reasonably foreseeable oil and gas projects. Existing emissions come from the operation of active producing wells and the downstream combustion of produced oil and gas. Foreseeable emissions are based on the number of existing APDs and estimated emissions from drilling, production, and downstream combustion for these wells. Emissions from recent lease sales (December 2018, March 2019, June 2019, and September 2019) are also included in the foreseeable estimates. The reasonable foreseeable development from the Proposed Action and recent lease sales is shown in Table C-3.

TABLE C-3. REASONABLY FORESEEABLE DEVELOPMENT FROM RECENT BLM LEASE SALES

Number of Reasonably Foreseeable Wells						
Field Office	**May 15 and Feb 16 Remand**	**Dec 18**	**Mar 19**	**Jun 19**	**Sep 19**	**Total**
Vernal	49	690	400	0	48	1,187

Estimating foreseeable development from future lease sales would be speculative at this time. It is unknown if parcels will be nominated, how many parcels will be nominated, or if parcels will be in areas with high or low development potential. Identifying the foreseeable number of wells and emissions from future lease sales is difficult to do without this information; however, it is foreseeable that future lease sales will occur due to requirements in the Mineral Leasing Act and Federal Onshore Oil and Gas Leasing Reform Act. Even though development from future lease sales may be speculative, the BLM is preparing a best estimate of foreseeable development in order to disclose potential future GHG emissions to the public.

Direct Emissions from Well Construction and Operation

Calculations of total annual direct emissions can be made by multiplying the number of existing and foreseeable wells with per well construction and operation emissions from Direct GHG Emissions from Constructing and Operating an Oil or Gas Well of this appendix. Existing wells include all (federal and non-federal) active producing oil and gas wells as reported by the Utah Division of Oil, Gas & Mining (2019) at the end of 2018. Foreseeable wells include federal APDs, where wells are not yet completed, as reported in the BLM Automated Fluid Minerals Support System on April 18, 2019. Construction emissions include pad construction and well drilling, testing, and completion. Also, construction emissions are only applied to foreseeable wells, as existing wells have already completed all construction activities that produce GHG emissions. Operational emissions account for the maintenance and operation of each well. This provides a conservative estimate since some well pads will have multiple wells and foreseeable new wells will not be operating for an entire year.

Existing Oil and Gas Wells

Existing GHG emissions from the operations of all (federal and non-federal) producing oil and gas wells are presented in Table C-4.

TABLE C-4. DIRECT EMISSIONS FROM EXISTING FEDERAL AND NON-FEDERAL OIL AND GAS WELLS

Field Office	**CO_2e/yr per Well**	**Number of Active Wells**	**Total (metric tons CO_2e/yr)**
Vernal	428	11,112	4,752,716

Foreseeable Oil and Gas Wells

GHG emissions from drilling, operation, maintenance, and reclamation of foreseeable federal oil and gas wells are presented in Table C-5. As shown in Table C-5, over a five year period (between 2014 and 2018) on average only 58% of APDs across Utah were developed [UDOGM 2018]). For calculating annual emissions in Table C-6, it is assumed that existing APDs will yield a similar completion rate as reported by the Utah Division of Oil, Gas & Mining.

TABLE C-5. APDS SUBMITTED TO UTAH DIVISION OF OIL, GAS & MINING AND THE DEVELOPMENT STATUS OF APDS, FROM 2014 TO 2018

	Year					
	2018	**2017**	**2016**	**2015**	**2014**	**Average**
APD	290	374	212	570	1389	567
Spuds	204	199	84	155	899	308
Drilling Results by Well Status and Type						
Producing Oil	130	148	68	157	695	240
Producing Gas	2	2	19	139	167	66
Shut-in Oil	0	0	1	3	6	2
Shut-in Gas	1	0	0	0	3	1
Service	0	0	0	0	0	0
Temp Abandoned	2	0	0	2	2	1
Plugged	10	5	17	9	57	20
APDs Developed	145	155	105	310	930	329
% APDs Developed	50%	41%	50%	54%	67%	**58%**

TABLE C-6. DIRECT GHG EMISSIONS FROM FORESEEABLE FEDERAL WELLS

Field Office	**Drilling CO_2e/yr per Well**	**Operation CO_2e/yr per Well**	**Existing APDs**	**Developed APDs/yr**	**UT BLM Lease Sales**	**Drilling Total (metric tons CO_2e/yr)**	**Operations Total (metric tons CO_2e/yr)**
Vernal	678	428	1,517	880	1,187	1,402,387	884,077

Indirect Emissions from Combustion of Produced Oil and Gas

Emissions from existing wells are calculated by multiplying 2018 annual production data (UDOGM 2018) with emission factors from the EPA Greenhouse Gases Equivalencies Calculator – Calculations and References webpage (EPA 2019c). Calculations of GHG combustion emissions from foreseeable development follows the same methodology described in Downstream GHG Emissions for a Single Well of this appendix. These estimates are conservative since some APDs may not be drilled and some wells may be dry.

Existing Oil and Gas Combustion Emissions

Emissions of GHGs from downstream combustion for all oil and gas produced within Utah are presented in Table C-7. Production data reported by the Utah Division of Oil, Gas & Mining database (UDOGM 2018) for each county was obtained for all (federal and non-federal) producing wells in 2018. As previously mentioned, emissions are calculated by multiplying the production amounts by EPA equivalency emission factors (EPA 2019).

TABLE C-7. EXISTING GHG EMISSIONS FROM DOWNSTREAM COMBUSTION OF PRODUCED OIL AND GAS

	2018 Total Production		Metric Tons CO_2e/yr		
Field Office	**Oil (bbl)**	**Gas (mcf)**	**Oil**	**Gas**	**Total**
Vernal	30,929,312	230,867,520	13,299,604	12,720,800	26,020,405

EPA Emission factors: 0.43 metric tons CO_2e/bbl and 0.0551 metric tons CO_2e/mcf (EPA 2019c).
Production data obtained from the Utah Division of Oil, Gas & Mining (2019).

Estimate of Foreseeable Oil and Gas Combustion Emissions

It is difficult to predict future oil and gas production due to uncertainties described previously in the EA. Additionally oil and gas production can vary from one well to another. For these reasons, and to disclose emission possibilities, a range of emissions from downstream combustion are presented in Table C-8. These emissions are calculated by multiplying the estimated per well emissions with the reasonably foreseeable number of new wells. Table C-5 identifies that approximately 42% of APDs are not drilled per year, so only the estimated number of APDs that are drilled to completion are included in the foreseeable calculations. This provides a conservative estimate since 94% of the APDs developed over the 5-year period are capable of producing oil or gas. While a range of combustion emissions are presented in Table C-8, the average is used for simplicity when discussing the cumulative emissions and for comparison with the state and national emissions in Table 3-8 in the EA.

TABLE C-8. COMBUSTION GHG EMISSIONS FROM FORESEEABLE FEDERAL OIL AND GAS WELLS

	Range per well (metric tons CO2e/yr)					Total Range of Emissions (metric tons CO2e/yr)		
Field Office	**Low**	**Ave.**	**High**	**Completed APDs/yr**	**UT BLM Lease Sales**	**Low**	**Ave.**	**High**
Vernal	1,133	2,577	4,020	880	1,187	2,341,816	5,325,752	8,309,688

USGS Compiled Federal Land Fossil Fuel GHG Emissions

Data from the USGS report on federal land fossil fuel emissions is presented in Table C-9 (gross emissions) and Table C-10 (net emissions) (USGS 2018). Data is presented for Utah and adjacent states. Figure C-1 shows the gross emissions for Utah and the linear trend over the 10-year period.

TABLE C-9. GROSS FOSSIL FUEL EMISSIONS FROM FEDERAL LANDS (MMT CO_2E)

State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Colorado	63.43	63.62	63.32	64.22	60.49	63.19	66.2	65.71	51.77	55.78
New Mexico	91.4	89.48	84.36	78.94	78.65	73.74	72.44	78.18	80.68	91.63
Utah	51.52	52.92	45.36	49.77	42.74	37.71	42.12	51.57	49.06	46.75
Wyoming	775.1	798.9	836.4	908.9	858.6	875	855.4	779.4	730.6	744.2
National	1422	1438.8	1458.5	1490.2	1482.6	1489.3	1424.3	1338.2	1264.7	1332.1

TABLE C-10. NET (GROSS EMISSIONS - CARBON STORAGE) FOSSIL FUEL EMISSIONS FROM FEDERAL LANDS (MMT CO_2E)

State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Colorado	29.3	34.4	32.8	52.8	37.1	52.1	43.2	68.7	30.7	12.1
New Mexico	68	66.6	67.6	63.3	71	58.7	72.5	79.7	63.5	68.6
Utah	4.8	37.1	50.7	55	31.6	28.5	14.4	55.3	38.8	25.2
Wyoming	736	789.6	818.2	871	814.9	836.3	824.2	783.3	708.2	701.5
National	668.9	1130.6	1239.9	1151.4	912	821	918.6	1098.8	808.7	759

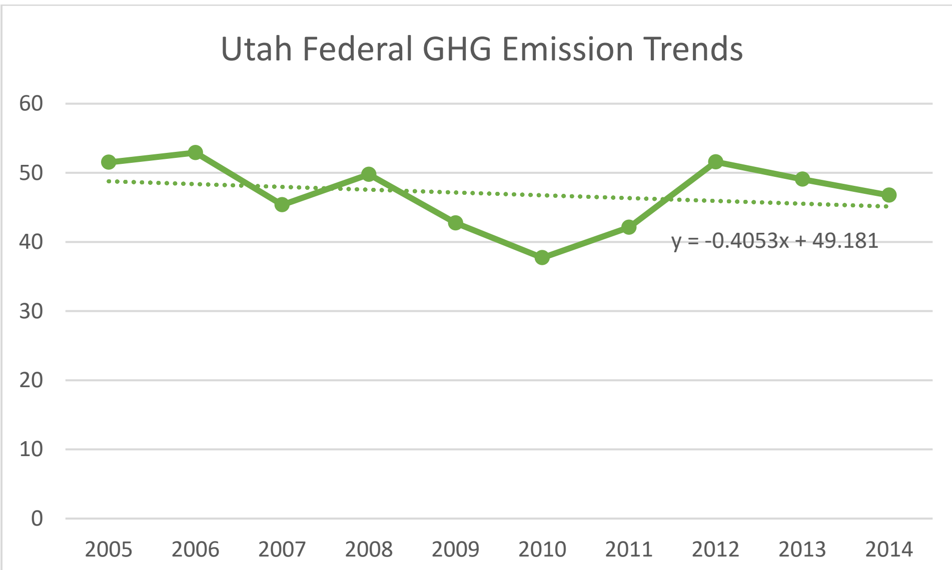

FIGURE C-1. UTAH FEDERAL FOSSIL FUEL GHG EMISSIONS (MMT CO_2E) AND TREND FOR THE PERIOD OF 2005-2014.

APPENDIX I – PUBLIC COMMENTS AND RESPONSES

Comment 1: The Federal Pipeline EA failed to analyze the cumulative impacts of the Vernal RMP's reasonably foreseeable wells, and the Greater Uinta Basin Technical Support Document's foreseeable wells.

Response 1a: Cultural, Paleontological, Soil, Vegetation, and Wildlife Resources

The cumulative impact area for cultural, paleontological, soil, vegetation, and wildlife resources is the Lower Brush Creek HUC 12 watershed. This watershed is entirely within the Tabiona-Ashley Valley Exploration and Development Area of the Vernal RMP's mineral potential report. For this area, the Vernal RMP Mineral Potential Report projected that 30 wells would be developed within the entire 2,125,613-acre area. This equals one well per 70,853 acres. The Lower Brush Creek watershed encompasses 16,886 acres, so it may not even contain one well from the Vernal RMP RFD. Therefore, the two wells contained in this proposed action are all that is reasonably foreseeable in that cumulative impact area.

Lands with Wilderness Characteristics

The cumulative impact area for lands with wilderness characteristics is the Split Mountain Benches Inventory Unit. This unit is entirely within the Tabiona-Ashley Valley Exploration and Development Area of the Vernal RMP's mineral potential report. For Tabiona-Ashley, the Vernal RMP Mineral Potential Report projected that 30 wells would be developed within the entire 2,125,613-acre area. This equals one well per 70,853 acres. The Split Mountain Benches encompasses 2,164 acres, so it may not even contain one well from the Vernal RMP RFD. Therefore, the two wells contained in this proposed action are all that is reasonably foreseeable in that cumulative impact area.

Visual

The cumulative impact area for visual resources is a 5-mile radius from the project area. This area is entirely within the Tabiona-Ashley Valley Exploration and Development Area of the Vernal RMP's mineral potential report. For Tabiona-Ashley, the Vernal RMP Mineral Potential Report projected that 30 wells would be developed within the entire 2,125,613-acre area. This equals one well per 70,853 acres. The 5-mile radius encompasses 59,763 acres, so it may contain up to one well from the Vernal RMP RFD. Therefore, the two wells contained in this proposed action are all that is reasonably foreseeable in that cumulative impact area per the Vernal RMP's RFD.

Air

To develop the foreseeable scenario for air quality, the BLM elected to use publicly available emissions data compiled by regulatory agencies and their partners and project those data into the future using air-modeling-contractor-recommended and subject-matter-expert-reviewed protocols. A comprehensive emissions inventory includes point sources, area sources, and on-road and non-road mobile sources as well as fugitive dust, ammonia, biogenic sources, fire, and emissions from outside the United States, such as from Mexico, Canada, and offshore sources. Given the predominance of oil and gas activities in the Uinta Basin, special care was taken to develop a comprehensive oil and gas emissions inventory (AECOM 2014, Section 1.2). For example, the ARMS project incorporated several data sources including WRAP emissions inventory products and Preliminary Reasonable Progress cases, Utah Division of Air Quality emission inventories, and other State and Federal emission inventory products (AECOM 2014, Section 2.0). Both the

Gasco model and the Greater Natural Buttes model relied on five different WRAP inventories (Alpine Geophysics LLC and Buys and Associates Environmental Consultants 2010, Section 3.1; BLM 2012, Section ES-1). WRAP's stated purpose is to understand current and evolving regional air quality issues in the West. WRAP's stated mission is to develop, maintain, and share databases, support technical analyses, and provide access to data and results from various information sources to produce consistent, comparable, and complete air quality results for use by individual WRAP member jurisdictions and agencies (Western Regional Air Partnership 2015). These data sources are appropriate for use in an air model emission inventory because they were developed specifically for future use in air quality modeling efforts.

To account for future development, the emission inventory is "grown" or projected into the future according to protocols that the BLM's air Resource Technical Advisory Group reviewed and approved. In the Greater Natural Buttes model, for example, four scenarios were modeled, three of which were future year scenarios (BLM 2012, Section 1.3). In both the Gasco and ARMS models, five scenarios were modeled, four of which were future year scenarios (Alpine Geophysics LLC and Buys and Associates Environmental Consultants 2010, Section 2.0; AECOM 2014, Section 1.3). In the Monument Butte model, only one future year scenario was modeled because it was re-using the ARMS model (Alpine Geophysics LLC 2015, Section 2.1.1 [on file at the BLM Vernal Field Office]). As a specific example of how the inventory is "grown," for the Greater Natural Buttes model the BLM first developed the 2006 baseline scenario from the WRAP III emissions inventory. The baseline scenario accounted for 6,663 existing wells in five counties (UDOGM 2019, Table 3-11). The BLM then developed the 2018 projected baseline scenario by "growing" the WRAP inventories to 2018, supplemented by oil and gas development in the Uinta Basin (UDOGM 2019, Section 3.1). This growth accounted for 17,227 wells in five counties[1] (Table 3-11). The BLM then developed the 2017 proposed action scenario by adding the proposed action's 3,675 wells to the 2018 projected baseline (UDOGM 2019, Section 1.3). Finally, the BLM developed the 2026 optimal recovery alternative by adding the maximum recovery alternative's 13,446 wells to the 2018 projected baseline (BLM 2012, Section 1.3). It is noted that these projects, totaling 21,236 wells, were included in the 2014 ARMS emission inventory for the 2021 future year scenarios (AECOM 2014).

Greenhouse Gases

For greenhouse gases, please refer to Table 4-15, which identifies the Vernal RMP RFD as being a part of the reasonably foreseeable development scenario.

Response 1b: BLM should have considered the Greater Uinta Basin Oil and Gas Cumulative Impacts TSD's RFD of 28,417 wells in the cumulative impact sections including greenhouse gases.

Response 1c: The TSD was an August 2011 best estimate of reasonably foreseeable future wells that projected the drilling of 25,721 wells over an indefinite future during a "boom" cycle. In 2014, the cycle "busted," and as of September 2017, the BLM's best estimate of reasonably foreseeable future wells has decreased from that estimate by more than 11,000 wells.

Detailed Explanation: The TSD was an August 2011 snapshot of the reasonably foreseeable future number of wells (BLM 2012, Page 1 Header). If this document were revised today, its projected number of wells would be much lower due to the drop in gas and oil prices that resulted in an economic "bust"

[1] Regarding the Greater Natural Buttes 2018 projected baseline, the prediction of 17,227 wells in five counties is conservative. As of September 25, 2019, UDOGM reports that the entire state of Utah contains 13,944 total wells that are capable of production (UDOGM 2019) .

in late 2014. For example, BLM 2012, Table 4-1 states that the foreseeable BLM wells totaled 25,721. However, the operator or proponent has since dropped several of the pending NEPA projects listed on BLM 2012, page 11 that were included in that number. These dropped projects include the following:

- Enduring Resource’s Big Pack EA (664 wells) (BLM 2008 [on file at the BLM Vernal Field Office])
- XTO’s Little Canyon EA (510 wells) (BLM Vernal Field Office 2008a [on file at the BLM Vernal Field Office])
- Enduring Resource’s Southam Canyon EA (249 wells) (BLM Vernal Field Office 2008c [on file at the BLM Vernal Field Office])
- XTO’s Hill Creek Unit EA (137 wells) (BLM Vernal Field Office 2009 unpublished data [on file at the BLM Vernal Field Office])
- Uintah and Ouray Tribal Oil and Gas EIS (4,899 wells) (Bureau of Indian Affairs 2010 [on file at the BLM Vernal Field Office])
- Greater Chapita Wells EIS Proposed Action (7,000 wells) (BLM 2017 [on file at the BLM Vernal Field Office])

In addition, the number of wells in the following projects have been reduced since that time:

- XTO River Bend EA 2013 Decision Record permitted 200 wells instead of the 484 Proposed Action wells included in the TSD (BLM Vernal Field Office 2013 [on file at the BLM Vernal Field Office]). *Also note that as of August 2019, no wells have been drilled under this EA.*
- Gasco Final EIS Record of Decision permitted 1,298 wells instead of the 1,491 Proposed Action wells included in the TSD (BLM Vernal Field Office 2012c [on file at the BLM Vernal Field Office]). *Also note that as of August 2019, only four wells have been drilled and 16 wells have been permitted under this EIS.*

One project has increased its numbers over those accounted for in the model:

- EOG’s 22 well North Alger EA was acquired by Koch, and the new NEPA decision contains 124 natural gas wells (BLM 2013 [on file at the BLM Vernal Field Office]). *Also note that as of August 2019, no wells have been drilled under this EA.*

Only two new large development proposals have been reviewed or received by the BLM VFO since 2011.

- In 2015, the BLM completed the Koch Wild Horse Bench EA 135 wells (BLM 2015a [on file at the BLM Vernal Field Office]). *Also note that as of August 2019, no wells have been drilled under this EA.*
- In 2016, the BLM published a Notice of Intent for the Crescent Point Federal-Tribal EIS, a project that proposed up to 3,925 new wells (BLM Vernal Field Office 2016a [on file at the BLM Vernal Field Office]). This project has since been cancelled by the proponent, so no new wells will occur.

In all, of the 25,721 wells “foreseen” by the TSD, 13,213 have been dropped by the proponent (Big Pack, Little Canyon, Hill Creek, Tribal EIS, and Chapita), 477 have been rejected by the BLM (River Bend 282 of the total proposed action and Gasco 193 of the total proposed action), and 7,232 were approved by the BLM but not implemented by the proponent to the level expected. For example:

- Newfield Monument Butte: of 5,750 wells, none have been drilled.
- XTO Riverbend: of 200 wells, none have been drilled.
- Gasco EIS: of 1,298 wells, four have been drilled and 12 others have been approved.

As a result of these overall reductions in foreseeable wells, the TSD now grossly overestimates the future numbers of wells in the greater Uinta Basin area. The remaining projects (Blacktail Ridge, Randlette EDA, Rocky Point EDA, ANF South Project, and Greater Natural Buttes) are being implemented at a much lower rate than originally foreseen. Therefore, foreseeable development in the Vernal Field Office more closely matches what was originally projected in the Vernal RMP RFD scenario than what was anticipated in the 2012 TSD.

Reason 2: The TSD was prepared by the BLM to estimate oil and gas cumulative surface disturbance.

Detailed Explanation: As stated on page 2 of the Greater Uinta Basin TSD:

> *"Data presented in this document account for the use of pad drilling to more accurately estimate levels of surface disturbance… Its scope is limited to those projects within the [cumulative impact area], which are determined to be reasonably foreseeable in the context of the BLM NEPA Handbook… This document deals exclusively with cumulative surface disturbance resulting from past, present, and reasonably foreseeable oil and gas development projects and oil and gas related infrastructure…."* (BLM Vernal Field Office, 2012b, Section 1.2 [on file at the BLM Vernal Field Office])

The TSD did not estimate when those wells would be drilled, and it did not estimate what emissions sources are associated with those wells. In contrast, emission inventories account for emissions in one or more particular years, usually including the baseline year (typically a year in the past for which both monitoring and emission inventory data is available) and a future emission year (to determine the ozone trend response to predicted growth and regulation). To get a reasonable emissions accounting, the number of emitting sources operating in those particular years must be known or estimated. The BLM notes that these projects were included in the 2013 ARMS emission inventory for the 2021 future year scenarios, but to do so the BLM had to make gross assumptions regarding project drilling timing and associated emissions (AECOM 2014).

Comment 2: BLM did not analyze foreseeable development on the other leases in the Split Mountain Bench unit.

Response 2: There are three leases within the Split Mountain Bench unit: UTU-081183, UTU-081184, and UTU-081185. All three are committed to the Federal Pipeline Unit. Therefore, if either of the two Eagle Ridge wells are capable of production, then all three leases will be held without needing additional wells. The nearest producing wells are 7 miles away, and all wells closer than that have been plugged and abandoned. Based on the drilling, plugging, and economic trends of plugged wells in the area[2], the lack of existing APDs, and the RMP's minimal foreseeable wells for this area as explained in Response 1 for Lands with Wilderness Characteristics, it is not reasonably foreseeable that any additional wells beyond the two EagleRidge Wells would be drilled in this area.

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[2] The plugged wells within the 5-mile radius cumulative impact area were drilled and plugged in the early 1950s, the early to mid-1960s, early to mid-1970s, and 2009. A barrel of oil in the 1950s was priced at about $25 per barrel, equal to $242.05 per barrel in 2019 dollars. Similarly, the 1960s oil was priced at about $25 per barrel, equal to $212.39 in 2019 dollars. The 1970s oil was priced at about $55 per barrel, equal to $337.59 in 2019 dollars. The 2009 oil was priced at about $85 per barrel, equal to $105 in 2019 dollars. All wells were plugged in the same year as they were drilled. The 2019 price of oil is $55 per barrel, which is unlikely to make an economic return based on the above data from when other wells were drilled in the area. Price per barrel came from https://www.macrotrends.net/1369/crude-oil-price-history-chart. Dollar equivalents came from http://www.in2013dollars.com/us/inflation/1952.

Comment 3: BLM did not analyze other past and present actions on existing leases in the 5-mile visual resources cumulative impact area.

Response 3: There are 11 leases within the 5-mile buffer: UTU081180, UTU081181, UTU081182, UTU081183, UTU081184, UTU081185, UTU092693, UTU092694, UTU092699, UTU080628, and UTU080627. The nearest producing wells are 7 miles away, and all wells closer than that have been plugged and abandoned. Based on the drilling, plugging, and economic trends of plugged wells in the area[3], the lack of existing APDs, and the RMP's minimal foreseeable wells for this area as explained in Response 1 for Visual Resources, it is not reasonably foreseeable that any additional wells beyond the two EagleRidge Wells would be drilled in this area.

Comment 4: The cumulative impact area for greenhouse gases should not be limited to the Vernal Field Office.

Response 4: The cumulative impact area was limited to the Vernal Field Office because it contains the majority of the present oil and gas production emissions for the state, as demonstrated by the UDOGM statistics duplicated below. However, comparisons to state and U.S. emissions were included in Tables 4-13 and 4-14 of the EA for context.

Utah Oil Production by County (past 5 years)

Report is Complete* Through: May 2019

From Production Reports Submitted and Processed as of Sep 4, 2019

Counties	2019	2018	2017	2016	2015	Cumulative Lifetime Production
DUCHESNE	8,307,224	18,981,854	16,987,028	13,895,726	17,113,980	478,324,965
UINTAH	4,541,483	12,095,427	11,278,096	10,117,371	12,777,507	357,178,240
SAN JUAN	1,599,286	3,916,716	4,113,225	4,243,892	4,374,969	599,550,181
SEVIER	581,724	1,269,427	1,196,170	1,257,711	1,432,936	26,911,351
GRAND	113,581	349,571	407,603	517,633	913,982	13,749,518
SUMMIT	66,823	173,320	169,161	187,225	191,312	182,720,449
GARFIELD	50,229	133,801	139,199	133,117	146,922	29,274,613
SANPETE	30,473	76,510	88,428	95,073	95,997	469,597
CARBON	21,137	47,386	57,792	79,247	87,968	942,972
DAGGETT	471	581	803	746	601	370,883
EMERY	70	347	571	608	184	728,351
BEAVER	0	0	0	0	0	0
BOX ELDER	0	0	0	0	0	2,665

Utah Natural Gas Production by County (past 5 years)

Report is Complete* Through: May 2019

From Production Reports Submitted and Processed as of Sep 4, 2019

Counties	2019	2018	2017	2016	2015	Cumulative Lifetime Production
UINTAH	70,636,999	187,860,540	205,419,493	246,050,467	275,631,755	5,502,599,687
DUCHESNE	17,572,950	42,455,505	38,972,077	35,952,110	41,754,816	1,068,275,530
CARBON	16,274,028	42,229,697	46,883,601	55,684,110	69,382,875	1,709,703,011
SAN JUAN	3,863,486	9,647,168	8,877,016	10,157,132	11,511,312	1,483,535,779
EMERY	2,667,928	6,952,008	7,466,663	8,143,306	8,630,719	302,782,455
GRAND	1,067,179	3,062,669	3,596,442	4,104,622	4,496,603	414,622,541
SUMMIT	688,371	1,980,016	2,082,449	2,964,585	3,706,767	3,241,055,727
DAGGETT	420,436	781,050	1,078,305	1,336,934	1,103,337	189,997,065
SANPETE	280,668	708,139	812,196	878,826	796,449	7,211,814
GARFIELD	3,775	9,125	9,125	9,150	8,350	178,048

[3] The plugged wells within the 5-mile radius cumulative impact area were drilled and plugged in the early 1950s, the early to mid-1960s, the early to mid-1970s, and 2009. A barrel of oil in the 1950s was priced at about $25 per barrel, equal to $242.05 per barrel in 2019 dollars. Similarly, the 1960s oil was priced at about $25 per barrel, equal to $212.39 in 2019 dollars. The 1970s oil was priced at about $55 per barrel, equal to $337.59 in 2019 dollars. The 2009 oil was priced at about $85 per barrel, equal to $105 in 2019 dollars. All wells were plugged in the same year as they were drilled. The 2019 price of oil is $55 per barrel, which is unlikely to make an economic return based on the above data from when other wells were drilled in the area. Price per barrel came from https://www.macrotrends.net/1369/crude-oil-price-history-chart. Dollar equivalents came from http://www.in2013dollars.com/us/inflation/1952.

Comment 5: The BLM did not include the 2012 RFD of 28,417 wells in its greenhouse gas and climate change cumulative impact analysis.

Response 5: See Response 1b.

Comment 6: It is arbitrary for BLM to consider the cumulatve emissions of only four recent oil and gas leasing proposals.

Response 6: The comment did not identify what lease sales were missing from the list. The BLM included the four most recent lease sales in their ennumeration of emissions in Appendix H because those sales are the latest data available to the BLM. The lease sales are just for reference to put in perspective how many emissions could come from leasing on an annual basis. Foreseeable cumulative emissions are expressed in the RMP RFD emissions enumeration. Current development is on pace with the RMP.

Comment 7: BLM's EA allows for increased development and incompatible uses adjacent to Dinosaur National Monument, which can lead to impairment of monument resources including dark night skies, natural quiet, viewsheds, adjacent NPS lands, native plants, wildlife, and water resources. The Secretary has an absolute duty to preserve the National Park System.

Response 7: Dinosaur National Monument was expanded to its current acreage in 1938 by President Frankin D. Roosevelt[4]. No buffers were established by the Proclamation, and the project is entirely outside the Monument boundaries; therefore, the Secretary is not impacting the Monument. Impacts to plants, wildlife, water, visual resources, night skies, and noise in the project area were included in the EA.

Comment 8: BLM never explained how the APDs will comply with air quality standards.

Response 8: The BLM has followed the Clean Air Act conformity regulations, which determine what activities are allowable within a non-attainment area. The conformity process documents that emissions from this project are de minimis.

Comment 9: There is no scenario in which the proposed action will not result in continued exceedances of the NAAQS for ozone.

Response 9: The commenter is correct that the proposed action will result in emissions in a non-attainment area. The 40 CFR 93B.150 regulations specify actions that must be taken for projects that result in emissions in nonattainment areas. The BLM has followed those regulations. The continued exceedences are predicted by a cumulative air quality model. Although this project would contribute VOC and NOx emissions, the amount of emissions from these two wells is too small to be measured by a model because it would be less than the margin of error of the model. For example, a 5,750-well project resulted in a peak modeled impact of 1.6 ppb at the Dinosaur Air Quality Station (BLM 2016, Appendix K page 3-2).

Comment 10: The Waste Prevention Rule has been rescinded and cannot be relied on by BLM.

Response 10: On September 28, 2018, the BLM published the "Waste Prevention, Production Subject to Royalties, and Resource Conservation; Rescission or Revision of Certain Requirements" (2018 final rule).

[4] https://home.nps.gov/dino/learn/management/upload/Dinosaur-1938-President-Roosevelt-Proclamation.pdf

The following requirements of the 2016 rule were removed in their entirety:

- Waste minimization plans
- Well drilling and completion requirements
- Pneumatic controller and diaphragm pump requirements
- Storage vessels requirements
- Leak detection and repair requirements

The following requirements of the 2016 rule were modified and/or replaced:

- Gas-capture requirement (The BLM will now defer to state or tribal regulations in determining when the flaring of associated gas from oil wells will be royalty-free.)
- Downhole well maintenance and liquids unloading requirements
- Measuring and reporting volumes of gas vented and flared

The BLM is relying on the portions of the rule that have been modified or are still in effect.

Comment 11: The Vernal RMP requires the BLM to ensure that its decision complies with the NAAQS for ozone.

Response 11: The RMP requires that the BLM "ensure that authorizations granted…comply with and support applicable local, state, and federal laws, regulations, and implementation plans pertaining to air quality." The BLM has complied the the Clean Air Act conformity regulations for this project as demonstrated by the conformity memorandum. There are currently no implementation plans that apply to the project area because it is outside the external boundary of the Uintah and Ouray Indian Reservation.

Comment 12: A decision to waive a lease stipulation is governed by the Mineral Leasing Act, which states a waiver can be granted if the authorized officer determines that 1) the factors leading to its inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified or 2) if the proposed operations would not cause unacceptable impacts.

Response 12: Regarding changed factors: The stipulation was issued under the Diamond Mountain RMP, which in 1995 found that no surface occupancy would protect visual and primitive recreational qualities. The Vernal RMP (BLM 2008), signed in 2008, found that the timing and controlled surface use stipulation and a VRM II stipulation would protect viewsheds surrounding Dinosaur National Monument. Min-5 specifies the following:

> *The BLM will seek to minimize light and sound pollution within the VPA using the best available technology such as installation of multi-cylinder pumps, hospital sound-reducing mufflers, and placement of exhaust systems to direct noise away from noise sensitive areas (e.g., sensitive habitat, campgrounds, river corridors, and Dinosaur National Monument). Light pollution will be mitigated by using methods such as limiting height of light poles, timing of lighting operations (meaning limiting lighting to times of darkness associated with drilling and work over or maintenance operations), limiting wattage intensity, and constructing light shields. If a determination is made that natural barriers or view sheds will meet these mitigation objectives, the above requirements may not apply.*

The Vernal RMP did not find visual and primitive recreational qualities in the project area beyond the viewsheds from KOPs in the Dinosaur National Monument and did find that controlled surface use is sufficient to protect those resources.

Regarding unacceptable impacts, the proposal has followed the RMP's light and sound pollution recommendations. Therefore, no unacceptable impacts are anticipated. The EA has been updated to explain how the pumps, mufflers, and exhaust systems were considered. The EA already contains information about how the light poles, timing, wattage, and light shields were considered.

Comment 13: The Vernal RMP sets out three specific considerations for lease waiver requests. See Vernal RMP App. K and K-1 to K-2.

Response 13: The Vernal RMP does not affect valid existing rights (BLM 2008, page 21). The lease in question was issued in 2005, so it is a valid existing right.

Comment 14: The EA failed to analyze whether the NSO stipulation is no longer required. There is no record evidence that the BLM considered whether the proposed action would cause unacceptable impacts.

Response 14: The completed NEPA document will help inform the Authorized Officer, so he/she can determine whether the stipulation may be waived. The BLM has added to the EA in the visual and primitive recreation (wilderness character) sections information about whether the waiver would cause unacceptable impacts, per the MLA requirement.

Comment 15: The Vernal RMP established non-waivable stipulations to protect resources values at Dinosaur National Monument.

Response 15: The Vernal RMP does not affect valid existing rights (BLM 2008, page 21). The lease in question was issued in 2005, so it is a valid existing right.

Comment 16: The BLM did not analyze whether relaxing restrictions on development would protect visual and primitive recreation qualities.

Response 16: The BLM has added to the EA in the visual and primitive recreation (wilderness character) sections information about whether the waiver would cause unacceptable impacts, per the MLA requirement.

Comment 17: The BLM did not show how visual resources will continue to be protected if the NSO stipulation is waived. BLM did not analyze the potential recreational impacts.

Response 17: The visual resource throughout the lease area will continue to be protected by the visual resource management Class Two designation, which allows only for low levels of change. Additionally, the applicant has committed to multipule measures for the two proposed wells to help protect the visual resources including preserving the existing trees that would act as a screen to the primary routes of travel by visitors and only having lighting at night where required for safety. The EA demonstrates the expected disturbance to the viewshed from KOPs 1 and 2.

The primary areas of use by visitors are over a mile to the north off of Island Park Road. The disturbance to those persons using the area would be temporary and limited to the time frame of drilling, during which there would a drill rig in place and noise from operations. Once pumping operations begin, most of the equipment on-site would be blocked from visitors due to the size of surrounding vegetation and any noise would be muffled from that same vegetation.

Comment 18: UDWR requests voluntary compliance with the 4:1 compensatory mitigation measure in Utah’s Conservation Plan for greater sage-grouse.

Response 18: BLM referred your request to the operator for consideration. The operator has decided not to contribute to the compensatory mitigation at this time. Per policy, the BLM compensatory mitigation must be voluntary.

Comment 19: UDWR requests no construction from December 1 to April 15 to minimize disturbance to wintering mule deer.

Response 19: The BLM has identified a timing restriction from December 1 to April 30.

Comment 20: UDWR could identify opportunities for conifer removal projects that would provide valuable greater sage-grouse mitigation.

Response 20: Thank you. The information has been relayed to the operator.

REFERENCES

AECOM. 2014. *Final Utah Air Resource Management Strategy Modeling Project Impact Assessment Report.* September 20. Available at: https://www.blm.gov/sites/blm.gov/files/program_natural%20resources_soil%20air%20water_airut_quick%20links_ImpactsRpt.pdf. Accessed May 24, 2019.

Alpine Geophysics LLC and Buys and Associates Environmental Consultants. 2010. *Ozone Impact Assessment for GASCO Energy Inc. Uinta Basin Natural Gas Development Project Environmental Impact Statement.* Available at: https://eplanning.blm.gov/epl-front-office/projects/nepa/72548/96793/116898/23_Gasco_Appendix_J._Ozone_Impact_Assessment.pdf.

Bureau of Land Management. 1994. Diam*ond Mountain Resource Area Resource Management Plan and Record of Decision.* Available at: https://eplanning.blm.gov/epl-front-office/projects/lup/74954/99901/121019/DIAMRMP&ROD.pdf. Accessed May 19, 2017.

———. 2008. *Vernal Field Office Record of Decision and Approved Resource Management Plan.* Available at: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do? methodName=dispatchToPatternPage&currentPageId=98982. Accessed May 18, 2017.

———. 2012. *Greater Natural Buttes Final Environmental Impact Statement FES 12-8*. Available at: https://eplanning.blm.gov/epl-front-office/eplanning/legacyProjectSite.do? methodName=renderLegacyProjectSite&projectId=74257. Accessed September 25, 2019.

———. 2016. *Final Environmental Impact Statement for Newfield Exploration Corporation Monument Butte Oil and Gas Exploration Project in Uintah and Duchesne Counties, Utah UT-G010-2009-0217.* Available at: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do? methodName=dispatchToPatternPage&currentPageId=88062. Accessed September 25, 2019.

Utah Division of Oil, Gas & Mining (UDOGM). 2019. Well Counts. Available at: https://oilgas.ogm.utah.gov/oilgasweb/statistics/well-counts.xhtml. Accessed September 25, 2019.

Western Regional Air Partnership. 2015. *Western Regional Air Partnership Strategic Plan.* Available at: https://www.wrapair2.org/pdf/WRAP%20Strategic%20Plan%20final%20March_2015.pdf. Accessed September 25, 2019.

APPENDIX J: REASONABLY FORESEEABLE DEVELOPMENT ASSUMPTIONS

For the purposes of cumulative impacts analysis in this EA, the BLM reviewed several sources. First, the 2008 Resource Management Plan (RMP's) Mineral Potential Report (MPR). Second the 2012 Greater Sage Grouse Reasonably Foreseeable Development (RFD) Scenario. The finding of the review is included in the following sub sections and then summarized in the cumulative impact section.

Public comment also requested that we review the 2012 Greater Uinta Basin Technical Support Document (TSD). The BLM elected to not include this document for the following reasons. First, the TSD is not an RFDS. This document was not prepared in accordance with Manual 3031, Handbook 1624 Planning for Fluid Mineral Resources, or WO Instruction Memorandum 2004-0089 Policy for Reasonably Foreseeable Development Scenario for Oil and Gas. The Vernal RMP's five-year review incorrectly describes this document as an updated reasonably foreseeable development scenario on pages 5, 10, 19, 36, and 37. To the contrary, the TSD itself specifies that "*Data presented in this document account for the use of pad drilling to more accurately estimate levels of surface disturbance. This document is not a new RFD[S] for the Vernal RMP because it does not project future oil and gas development potential, and because it includes information adjacent to but outside of the Vernal Planning Area*" (page 2).

Second, according to the Utah Division of Oil, Gas and Mining, since 2012 for every new oil and gas well drilled and placed into production in the Uinta Basin, an existing well is taken out of production and plugged and abandoned.

Third, the 28,417 wells projection is more than double all the producing oil and gas wells currently in the State of Utah.

Public comment also requested that we review the December 2017 oil and gas lease sale anticipated wells. The BLM elected to not include this document for the following reasons. First, the TSD is not an RFDS.

Public comment implies that existing leases and proposed lease sales foreseeable development scenarios are independent of and additive to the Vernal RMP's RFDS and the GSG RFDS. However, the lease foreseeable development scenario is a portion of those RFDS. Handbook H-1624 states "*The State Director determines where and under what conditions oil and gas or geothermal exploration, development, and utilization activities will be permitted…These determinations are the basis for the timing, surface use, and no surface occupancy stipulations that are attached to a Federal oil and gas or geothermal lease…The BLM has a statutory responsibility under NEPA to analyze and document the direct, indirect and cumulative impacts of past, present and reasonably foreseeable future actions resulting from Federally authorized fluid minerals activities. By law, these impacts must be analyzed before the agency makes an irreversible commitment. In the fluid minerals program, this commitment occurs at the point of lease issuance. Therefore, the EIS prepared with the RMP is intended to satisfy NEPA requirements for issuing fluid mineral leases"* (section I.B.2). Therefore, adding the lease sale development scenario to the RMP RFDS would result in a double counting of impacts from foreseeable development. In addition, the Government Accountability Office has determined that only 6% of onshore leases actually experience development[1].

HUC 12 Watershed Lower Brush Creek

The 16,881 acres HUC 12 Watershed Lower Brush Creek cumulative impact area falls inside the 2002 2,125,613 acres Tabiona-Ashley Valley Vernal RMP RFDS area called Tabiona-Ashley Valley. The MPR predicted up to 30 wells would be drilled over 15 years in the Tabiona-Ashley Valley area. The MPR identified the cumulative impact area as having areas of ND potential with A certainty (Lack of useful data and direct or indirect evidence of mineral resources), M potential with B certainty (Moderate potential with indirect evidence of mineral resources) and H potential with D certainty (High potential with direct and indirect evidence of mineral resources). Given the cumulative impact area comprises less than one percent of the Tabiona-Ashley Valley (RFDs) area which only anticipated 30 wells over two million acres, the two wells of the proposed action are all that is reasonably foreseeable in the cumulative impact area at this time.

The 16,881 acres HUC 12 Watershed Lower Brush Creek cumulative impact area falls inside the 2,355,390 acres 2012 Uintah Northern Lobe Greater Sage Grouse Population Area. The MPR predicted up to 570 well pads would be constructed over 15 years in the Uintah population area. The RFDS identified the Lower Brush Creek cumulative impact area as having low potential for oil and gas resources. Given the cumulative impact area comprises less than one percent of the Uintah Population area which anticipated 570 well pads over two million acres and that areas south and west of the cumulative impact area were identified as having moderate to high mineral potential with oil and gas field development projects already approved, the two wells of the proposed action are all that is reasonably foreseeable in the cumulative impact area at this time.

Five Mile Radius from the Project Area

The approximately 50,000 acres cumulative impact area within a five-mile radius from the project area falls inside the 2,125,613 acres Tabiona-Ashley Valley Vernal RMP RFDS area. The MPR predicted up to 30 wells would be drilled over 15 years in the Tabiona-Ashley Valley area. The MPR identified the cumulative impact area as having areas of ND potential with A certainty (Lack of useful data and direct or indirect evidence of mineral resources), M potential with B certainty (Moderate potential with indirect evidence of mineral resources) and H potential with D certainty (High potential with direct and indirect evidence of mineral resources). Given the cumulative impact area comprises less than one percent of the Tabiona-Ashley Valley RFDS area which only anticipated 30 wells over two million acres, the two wells of the proposed action are all that is reasonably foreseeable in the cumulative impact area at this time.

The approximately 50,000 acres cumulative impact area within a five-mile radius from the project area falls inside the 2,355,390 acres 2012 Uintah Northern Lobe Greater Sage Grouse Population Area. The MPR predicted up to 570 well pads would be constructed over 15-years in the Uintah population area. The RFDS identified the cumulative impact area as having low potential for oil and gas resources. Given the cumulative impact area comprises less than one percent of the Uintah Population area which anticipated 570 well pads over two million acres and that areas south and west of the cumulative impact

[1] **GAO-09-74**

area were identified as having moderate to high mineral potential with oil and gas field development projects already approved, the two wells of the proposed action are all that is reasonably foreseeable in the cumulative impact area at this time.

Split Mountain Benches Cumulative Impact Area

The 2,164 acres Split Mountain Benches cumulative impact area falls inside the 2,125,613 acres Tabiona-Ashley Valley Vernal RMP RFDS area. The MPR predicted up to 30 wells would be drilled over 15 years in the Tabiona-Ashley Valley area. The MPR identified the cumulative impact area as having areas of ND potential with A certainty (Lack of useful data and direct or indirect evidence of mineral resources), M potential with B certainty (Moderate potential with indirect evidence of mineral resources) and H potential with D certainty (High potential with direct and indirect evidence of mineral resources). Given the cumulative impact area comprises less than one percent of the Tabiona-Ashley Valley RFDS area which only anticipated 30 wells over two million acres, the two wells of the proposed action are all that is reasonably foreseeable in the cumulative impact area at this time.

The 2,164 acres Split Mountain Benches cumulative impact area falls inside the 2,355,390 acres 2012 Uintah Northern Lobe Greater Sage Grouse Population Area. The MPR predicted up to 570 well pads would be constructed over 15 years in the Uintah population area. The RFDS identified the cumulative impact area as having low potential for oil and gas resources. Given the cumulative impact area comprises less than one percent of the Uintah Population area which anticipated 570 well pads over two million acres and that areas south and west of the cumulative impact area were identified as having moderate to high mineral potential with oil and gas field development projects already approved, the two wells of the proposed action are all that is reasonably foreseeable in the cumulative impact area at this time.

Uinta Basin Plus All Regional Class I Areas

To develop the foreseeable scenario for air quality, the BLM elected to use publicly available emission data compiled by regulatory agencies and their partners, and project that data into the future using air-modeling contractor recommended, and subject-matter-expert-reviewed protocols. A comprehensive emission inventory includes point sources, area sources, and on-road and non-road mobile sources as well as fugitive dust, ammonia, biogenic, fire, and emissions outside the U.S, such as Mexico, Canada, and offshore sources. Given the predominance of oil and gas activities in the Basin, special care was taken to develop a comprehensive oil and gas emissions inventory (AECOM 2013) (Section 1.2). For example, the ARMS project incorporated several data sources including WRAP emissions inventory products and Preliminary Reasonable Progress cases, Utah Division of Air Quality emission inventories, and other State and Federal emission inventory products (AECOM 2013) (Section 2.0). Both the Gasco model and the Greater Natural Buttes model relied on five different WRAP inventories (Alpine Geophysics LLC and Buys and Associates Environmental Consultants, 2010) (Section 3.1) (Bureau of Land Management Utah State Office, 2012) (Section ES-1). WRAP's stated purpose is to understand current and evolving regional air quality issues in the West. WRAP's stated mission is to develop, maintain, and share databases, support technical analyses, and provide access to data and results from various information sources to produce consistent, comparable, and complete air quality results for use by individual WRAP member jurisdictions and agencies (Western Regional Air Partnership, 2015). These data sources are appropriate for use in an air model emission inventory because they were developed specifically for future use in air quality modeling efforts.

To account for future development, the emission inventory is “grown” or projected into the future according to protocols that the BLM’s air Resource Technical Advisory Group (RTAG) reviewed and approved. In the Greater Natural Buttes model for example, four scenarios were modeled, three of which were future year scenarios (Bureau of Land Management Utah State Office, 2012) (Section 1.3). In both the Gasco and ARMS models, five scenarios were modeled, four of which were future year scenarios (Alpine Geophysics LLC and Buys and Associates Environmental Consultants, 2010) (Section 2.0) (AECOM 2014) (Section 1.3). In the Monument Butte model, only one future year scenario was modeled because it was re-using the ARMS model (Alpine Geophysics LLC, 2015) (Section 2.1.1). As a specific example of how the inventory is “grown”, for the Greater Natural Buttes model the BLM first developed the 2006 baseline scenario from the WRAP III emissions inventory. The baseline scenario accounted for 6,663 existing wells in five counties (Table 3-11). The BLM then developed the 2018 projected baseline scenario by “growing” the WRAP inventories to 2018, supplemented by oil and gas development in the Uinta Basin (Section 3.1). This growth accounted for 17,227 wells in five counties[2] (Table 3-11). The BLM then developed the 2017 proposed action scenario by adding the proposed action’s 3,675 wells to the 2018 projected baseline (Section 1.3). Finally, the BLM developed the 2026 optimal recovery alternative by adding the maximum recovery alternative’s 13,446 wells to the 2018 projected baseline (Section 1.3) (Bureau of Land Management Utah State Office, 2012). It is noted that these projects, totaling 21,236 wells, were included in the 2013 ARMS emission inventory for the 2021 future year scenarios (AECOM 2013).

For greenhouse gases, please refer to Table 4-15 which identifies the Vernal RMP RFD as being a part of the reasonably foreseeable development scenario.

References:

AECOM. 2014. Final Utah Air Resource Management Strategy Modeling Project Impact Assessment Report. September 20. Available at: https://www.blm.gov/sites/blm.gov/files/program_natural%20 resources_soil%20air%20water_airut_quick%20links_ImpactsRpt.pdf. Accessed May 24, 2019.

BLM. 2012. Greater Uinta Basin Oil and Gas Cumulative Impacts Technical Support Document. Available at http://www.blm.gov/ut/st/en/fo/vernal.html. Accessed on April 30, 2012.

BLM. 2002. "Mineral Potential Report for the Vernal Planning Area Encompassing Approximately 5.1 million Acres, Duchesne, Dagget, Uintah, and Grand Counties", Utah, Bureau of Land Management, U.S. Department of Interior.

Utah Division of Oil, Gas & Mining (UDOGM). 2019. Utah Oil Production by County (past 5 years). Available at: https://oilgas.ogm.utah.gov/oilgasweb/statistics/oil-prod-by-cnty.xhtml. Accessed June 25, 2019.

[2] Regarding the Greater Natural Buttes 2018 projected baseline, the prediction of 17,227 wells in five counties is conservative. As of September 8, 2017, UDOGM reports that the entire state of Utah contains 13,872 total wells that are capable of production (Utah Division of Oil, Gas, and Mining, Accessed September 8, 2017).

APPENDIX K: FEDERAL LEASE INFORMATION

The Applications for Permit to Drill (APD) associated with the environmental assessment (EA) are the Federal Pipeline 4-21-4-23 and Federal Pipeline 5-21-4-23, both located in Federal Lease UTU81185 located in Sec 21 T4S R23E in Uintah County, Utah. Both APDs are within the Federal Pipeline Unit (UTU90529X) which was approved effective September 17, 2015 by the Utah State Office. The Federal Pipeline Unit (unit map provided at end of appendix) also has leases UTU81180, UTU81181, UTU81182, UTU81183, and UTU81184 committed to it. The approval for the unit required one (1) unit obligation well to be drilled to a depth of 2500' or a depth sufficient to test 800' below the Phosphoria formation, whichever is less, and located within the W2 of Section 21, Township 4 South, Range 23 East.

The original NEPA for the APDs for the referenced wells was approved September 27, 2019 and the APDs were approved on September 30, 2019. A State Director Review was filed challenging the NEPA, which was remanded back to the Vernal FO. The APD approvals have been suspended pending the outcome of this NEPA analysis and decision. Each of these leases and the Unit are currently under suspension due to wildlife constraints which restrict drilling and construction operations to a window from September 1 through November 15 of the calendar year.

The following table is a list of the leases in the unit with their effective date, suspension date, and resultant remaining primary term upon lifting of the suspension:

Lease #	Effective date	Primary term	Date Suspended	Time left in lease term upon lifting of suspension
UTU81180	10/1/2005	10 years	9/1/2015	1 month
UTU81181	10/1/2005	10 years	9/1/2015	1 month
UTU81182	10/1/2005	10 years	9/1/2015	1 month
UTU81183	10/1/2005	10 years	9/1/2015	1 month
UTU81184	10/1/2005	10 years	9/1/2015	1 month
UTU81185	10/1/2005	10 years	7/1/2015	3 months

The following describes some potential effects to the leases if this NEPA analysis supports reaffirming the approval of the APDs. The following information below is based upon an assumption that the suspension could then lift September 1st in consideration of options available to the operator:

• Operator decides not to drill or commence operations prior to September 30th:
Should the operator decide not to drill either APD or not commence operations to drill a well prior to September 30th, the lease suspension would lift effective September 1st. Leases UTU81180, UTU81181, UTU81182, UTU81183, and UTU81184 could expire effective September 30th. Lease UTU81185 could expire effective November 30th.

• Drilling operations are being conducted over September 30th:
If drilling operations are being conducted over September 30th, all the unit leases would receive a 2-year extension, according to 43 CFR 3107.1 (CFR language provided below). If production is established, all of the leases in the unit would be held by production (HBP) according to 43 CFR 3107.2-3 (CFR language provided below).

Per the Unit agreement, the operator is allowed sufficient time (6 months or more) for the obligation well to produce and stabilize. After stabilization, a determination would be made by the Utah State Office as to whether the well is capable of production in Unit paying quantities or not. If the well is capable of production in unit paying quantities, the unit will stay in effect and the operator would work with the Utah State Office to establish a Participating Area (PA) and continue developing the unit area. Per the unit agreement, the "Operator shall submit for the approval of the AO an acceptable plan of development and operation for the unitized land which, when approved by the AO, shall constitute the further drilling and development obligations of the Unit Operator under this agreement for the period specified therein." Additional NEPA would be required to address any future proposed development. Should a PA be established and additional development not occur, the unit would contract to the PA boundary.

• Well drilled and completed as a producing well, but not in paying unit quantities:
If the well is determined to not be capable of production in unit paying quantities (non-paying well), the well would become a lease well. The operator would have to decide whether or not to continue to drill other wells within the unit in order to discover unitized substances. If drilling is not continued, the unit would invalidate by its own terms unless the operator voluntarily terminates the unit. If the operator elects to voluntarily terminate the unit, each lease would receive a 2-year extension according to 43 CFR 3107.4 (CFR language provided below). If the operator chooses to let the unit invalidate, all the leases would expire according to however much time was left in the lease term, except for lease UT81185 which would be HBP.

• Well drilled, but plugged and abandoned as a dry hole:
If well is drilled (drilling not being conducted over September 30th) and the well is a dry hole, the well would be plugged. Leases UTU81180, UTU81181, UTU81182, UTU81183, and UTU81184 could expire effective September 30th; Lease UTU81185 could expire effective November 30th.

§ 3107.1 Extension by drilling.

Any lease on which actual drilling operations were commenced prior to the end of its primary term and are being diligently prosecuted at the end of the primary term or any lease which is part of an approved communitization agreement or cooperative or unit plan of development or operation upon which such drilling takes place, shall be extended for 2 years subject to the rental being timely paid as required by § 3103.2 of this title, and subject to the provisions of § 3105.2–3 and § 3186.1 of this title, if applicable. Actual drilling operations shall be conducted in a manner that anyone seriously looking for oil or gas could be expected to make in that particular area, given the existing knowledge of geologic and other pertinent facts. In drilling a new well on a lease or for the benefit of a lease under the terms of an approved agreement or plan, it shall be taken to a depth sufficient to penetrate at least 1 formation recognized in the area as potentially productive of oil or gas, or where an existing well is reentered, it shall be taken to a depth sufficient to penetrate at least 1 new and deeper formation recognized in the area as potentially productive of oil or gas. The authorized officer may determine that further drilling is unwarranted or impracticable.

§ 3107.2–3 Leases capable of production.

No lease for lands on which there is a well capable of producing oil or gas in paying quantities shall expire because the lessee fails to produce the same, unless the lessee fails to place the lease in production within a period of not less than 60 days as specified by the authorized officer after receipt of notice by certified mail from the authorized officer to do so. Such production shall be continued unless and until suspension of production is granted by the authorized officer.

§ 3107.4 Extension by elimination.

Any lease eliminated from any approved or prescribed cooperative or unit plan or from any communitization or drilling agreement authorized by the Act and any lease in effect at the termination of such plan or agreement, unless relinquished, shall continue in effect for the original term of the lease or for 2 years after its elimination from the plan or agreement or after the termination of the plan or agreement, whichever is longer, and for so long thereafter as oil or gas is produced in paying quantities. No lease shall be extended if the public interest requirement for an approved cooperative or unit plan or a communitization agreement has not been satisfied as determined by the authorized officer.

FEDERAL PIPELINE

UINTAH County of Utah

Effective Date: 9/17/2015