



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

# Lost Creek Uranium *In-Situ* Recovery Project Modifications

Rawlins, Wyoming

**DRAFT AUGUST 2018**

Estimated Lead Agency Total Costs  
Associated with Developing and  
Producing this EIS

\$1,050,000

**ENVIRONMENTAL IMPACT STATEMENT**

## **BLM Mission Statement**

To sustain the health, diversity, and productivity of the public lands  
for the use and enjoyment of present and future generations.

**BLM/WY/PL-18/017+5100**



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT

High Desert District  
Rawlins Field Office  
1300 North Third Street  
Rawlins, WY 82301



In Reply Refer To:  
WYW166318  
3809 (WYD03)

Dear Public Land User:

Enclosed is the Draft Environmental Impact Statement (Draft EIS) for the Lost Creek Uranium *In-Situ* Recovery (ISR) Project Modifications in Sweetwater County, Wyoming. This EIS was prepared to analyze the potential impacts of a modification to the current Plan of Operations for the Lost Creek ISR Project. The Applicant, Lost Creek ISR, LLC, also applied to the U.S. Nuclear Regulatory Commission (NRC) to amend its source and byproduct materials license. The NRC and U.S. Department of the Interior, Bureau of Land Management (BLM) agreed to prepare this EIS with BLM as the lead agency and NRC as a major licensing cooperating agency, in accordance with a memorandum of understanding between the two agencies. The project area covers approximately 10,005 acres of predominantly federal land (94 percent) in the Great Divide Basin.

The Draft EIS analyzes three alternatives: the Proposed Action, the No Action Alternative, and the Exclusion of the KM Horizon Alternative. The Draft EIS discusses other alternatives that were considered but eliminated from detailed analysis.

Under the Proposed Action, the Applicant would expand the areal and vertical extents of uranium recovery using ISR methods at the Lost Creek ISR Project and increase the authorized annual yellowcake production rate. The Applicant proposes to expand the project boundary to include an area east of and contiguous with the existing Lost Creek ISR Project. The Applicant also proposes to vertically expand uranium ISR into the next deeper mineralized sandstone, referred to as the KM Horizon. These changes would increase the number of mine units and extend the operating life of the Lost Creek ISR Project by an estimated 6 to 8 years. The Proposed Action would add up to 1,415 acres of surface disturbance within the project area over the life of the project. When added to the approximately 345 acres of disturbance associated with the currently authorized Lost Creek ISR Project, the total surface disturbance would be up to about 1,760 acres or 18 percent of the project area. The Applicant also proposes to increase the maximum yellowcake production rate from 2 to 2.2 million pounds per year.

Copies of the Draft EIS are available at the BLM Rawlins Field Office at the above address or at the project website: <https://go.usa.gov/xQXYw>

This Draft EIS is not a decision document. The publication of the Notice of Availability (NOA) in the Federal Register for this Draft EIS initiates a 45-day public comment period. Following conclusion of that period, the BLM will review and address comments and then prepare the Final EIS. The NOA for the Final EIS will be published in the Federal Register and the document made available to the public. After the public has reviewed the Final EIS and any appropriate changes have been made, the BLM Authorized Officer will sign the Record of Decision (ROD) to disclose

the BLM's final decision on the modifications to the Applicant's current Plan of Operations for the Lost Creek ISR Project. Availability of the ROD will be announced through local media, the project mailing list, and the project website.

The Draft EIS was prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), the Federal Land Policy and Management Act of 1976 (FLPMA), and other regulations and statutes. The BLM prepared the Draft EIS in consultation with cooperating agencies, taking into account public scoping comments. The Notice of Intent (NOI) to prepare the Draft EIS was published in the Federal Register on September 14, 2015, which began the 45-day public scoping period.

If you wish to submit comments on this Draft EIS, BLM requests that you make them as specific as possible, with references to page numbers and sections of the document. Please refer to "Lost Creek ISR Project Modifications Comments" in your correspondence. Written comments will be accepted by fax, email, or letter for 45 days following the publication of the NOA in the Federal Register by the U.S. Environmental Protection Agency. BLM will review and respond to all substantive comments in the Final EIS. Please provide your comments to:

BLM Wyoming High Desert District, Rawlins Field Office  
Attn: Annette Treat  
P.O. Box 2407  
Rawlins, WY 82301-2407  
Fax: (307) 328-4224  
Email: [blm\\_wy\\_lost\\_crk\\_mine@blm.gov](mailto:blm_wy_lost_crk_mine@blm.gov)

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be publicly available at any time. While you may ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. The BLM will not consider anonymous comments. Comments, including names and street addresses of respondents, will be available for public review at the BLM Rawlins Field Office from 7:45 a.m. to 4:30 p.m., Monday through Friday, excluding federal holidays. Comments may be published as part of the NEPA document and other related documents. All submissions from organizations or businesses will be made available for public inspection in their entirety.

For further information concerning the document, please contact Annette Treat at (307) 328-4314.

Sincerely,

/s/Dennis J. Carpenter

Dennis J. Carpenter  
Field Manager

## **Executive Summary**

Lost Creek ISR, LLC (LCI or the Applicant) submitted a modification application for its current Plan of Operations to the U.S. Department of the Interior Bureau of Land Management (BLM) Rawlins Field Office (RFO) for the Lost Creek Uranium *In-Situ* Recovery (ISR) Project in Sweetwater County, Wyoming. The Applicant also applied to the U.S. Nuclear Regulatory Commission (NRC) to amend its source and byproduct materials license. The Applicant intends to: 1) expand the areal and vertical extents of uranium recovery using ISR methods at the Lost Creek ISR Project and 2) increase the authorized annual yellowcake production rate. The NRC and BLM agreed to prepare this Environmental Impact Statement (EIS) with BLM as the lead agency and NRC as a major licensing cooperating agency, in accordance with a memorandum of understanding between the two agencies.

The Applicant proposes to expand the project boundary to include an area east of and contiguous with the existing Lost Creek ISR Project, referred to as the Lost Creek East (LCE) expansion area. The existing Lost Creek ISR Project area and proposed LCE expansion area (referred to jointly as the project area) are located in the Great Divide Basin in the northeastern corner of Sweetwater County, Wyoming. The project area covers approximately 10,005 acres of predominantly federal land (94 percent). The Lost Creek ISR Project is permitted by the Wyoming Department of Environmental Quality (WDEQ)-Land Quality Division (LQD) under Permit to Mine No. PT788 and licensed by the NRC under Source and Byproduct Materials License SUA-1598.

In February 2015, Wyoming submitted a letter of intent to the NRC to regulate source and byproduct material, including uranium ISR facilities. If the Agreement process is completed, the NRC will transfer the licenses for uranium milling facilities, including the Lost Creek ISR Project, to the State of Wyoming. At that time, WDEQ-LQD would assume NRC's regulatory authority over the Lost Creek ISR Project. Where this EIS refers to NRC review or approval of various aspects of the Lost Creek ISR Project, that authority would be transferred to WDEQ-LQD if Wyoming becomes an Agreement State.

## **Scoping**

The public scoping period for compliance with the National Environmental Policy Act of 1969 (NEPA) commenced when the Notice of Intent to prepare an EIS was published in the Federal Register on September 14, 2015 (80 FR 55149). Notification of the scoping process was also published in local newspapers and posted on the BLM Wyoming online newsroom and the project website. A public scoping meeting was held at the BLM RFO on October 14, 2015. During the 45-day scoping period, BLM received a total of 13 comment submittals (i.e., letter, email, or comment form) containing 61 individual comments. These comments were evaluated to identify key issues and concerns and to develop alternatives. This information assisted BLM and NRC in identifying the potential environmental issues, alternatives, and mitigation measures associated with development of the proposed project. The process provided a mechanism for narrowing the scope of issues so that the EIS could focus the analysis on areas of high interest and concern. Issues and concerns were identified through formal scoping as well as consultation and coordination with federal, state, and local agencies, interested groups, and individuals. Most scoping comments were related to impacts to rangeland, groundwater, wild horses, and sensitive wildlife resources (e.g., Greater sage-grouse, Wyoming pocket gopher, and raptors).

## Proposed Action and Alternatives

Chapter 2 provides a description of the Proposed Action and alternatives. In consultation with other federal, state, and local agencies having jurisdiction or special expertise, the BLM and NRC developed the following alternatives for analysis in this EIS:

- The Proposed Action describes the proposed development, activities, and duration during construction, operation, and reclamation as proposed by the Applicant in the modification application.
- Under the No Action Alternative, approval of the Applicant's modification application would be denied, and construction, operation, and reclamation at the Lost Creek ISR Project would continue as described in the Plan of Operations approved in 2012.
- The Exclusion of the KM Horizon Alternative (Alternative 1) differs from the Proposed Action in that uranium ISR would not occur within the KM Horizon (a deeper horizon than what is currently mined).

**Proposed Action Alternative:** Under the Proposed Action, the Applicant would expand the areal and vertical extents of uranium recovery using ISR methods at the Lost Creek ISR Project and increase the authorized annual yellowcake production rate. The Applicant proposes to expand the project boundary to include an area east of and contiguous with the existing Lost Creek ISR Project. The Applicant also proposes to vertically expand uranium ISR into the next deeper mineralized sandstone, referred to as the KM Horizon. These changes would increase the number of mine units and extend the operating life of the Lost Creek ISR Project by an estimated 6 to 8 years. The Proposed Action would add up to 1,415 acres of surface disturbance within the project area over the life of the project. When added to the approximately 345 acres of disturbance associated with the currently authorized Lost Creek ISR Project, the total surface disturbance would be up to about 1,760 acres or 18 percent of the project area. The Applicant also proposes to increase the maximum yellowcake production rate from 2 to 2.2 million pounds per year.

**No Action:** Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction, operation, and reclamation at the Lost Creek ISR Project would continue as described in the Plan of Operations approved in 2012. The maximum annual yellowcake production rate would not increase.

**Exclusion of the KM Horizon Alternative:** The Exclusion of the KM Horizon Alternative would be the same as the Proposed Action except that no KM Horizon mine units and associated infrastructure would be developed within the project area. This alternative would add up to 1,276 acres of disturbance within the project area over the life of the project (139 acres less than the Proposed Action). Based on current resource estimates, this alternative would extend the operating life of the Lost Creek ISR Project by 3 to 4 years, or about 3 to 4 years less than the Proposed Action.

## Potential Environmental Impacts

Chapter 4 of this EIS describes the environmental effects of implementing the Proposed Action and alternatives on the affected environment. Chapter 4 addresses the specific incremental impacts for each of the resources that could be affected. The impact analysis for each resource area is

evaluated quantitatively and qualitatively, as appropriate, based on available data and the nature of the resource analyzed. The significance of potential environmental impacts was categorized as follows:

**SMALL:** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource considered.

**MODERATE:** The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource considered.

**LARGE:** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource considered.

A comparison of the impacts associated with the Proposed Action and alternatives is provided in Table 2.3-1 of this EIS.

### **Cumulative Impacts**

Cumulative impacts that could result from the Proposed Action and alternatives when added to other past, present, and reasonably foreseeable future actions are presented in Chapter 5. For each resource area, the cumulative impact resource area was identified along with the time frame for assessing cumulative impacts. The cumulative impacts are described using the same significance levels (SMALL, MODERATE, and LARGE) that were used in assessing the direct and indirect impacts in Chapter 4. Other projects considered in the cumulative impact analysis include the following:

- Past, existing, and potential future uranium recovery sites within the Great Divide Basin
- Existing surface coal mines and one potential future coal mine within the Great Divide Basin
- Other coal-related development within the Great Divide Basin
- Oil and gas projects within the Great Divide Basin, including coal bed natural gas
- Wind power generation projects within the Great Divide Basin and south-central Wyoming
- Transmission line projects in the region

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## 1.0 INTRODUCTION

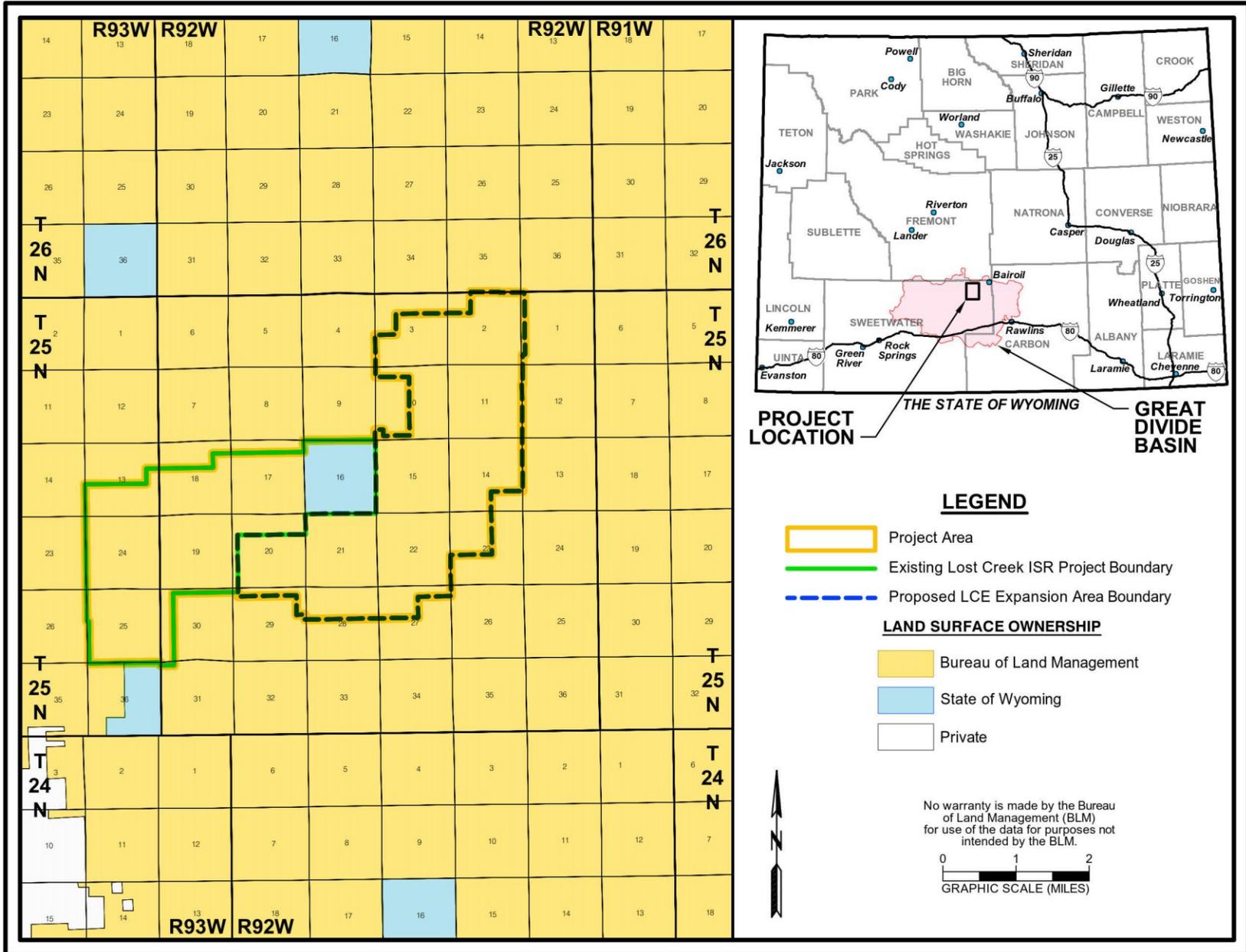
### 1.1 Project Location and Background

The U.S. Department of the Interior (USDO I) Bureau of Land Management (BLM) and the U.S. Nuclear Regulatory Commission (NRC) prepared this Environmental Impact Statement (EIS) in response to an application submitted by Lost Creek ISR, LLC (LCI or the Applicant). The Applicant proposes to modify its current Plan of Operations, as approved by the BLM, for activities at the Lost Creek Uranium *In-Situ* Recovery Project (Lost Creek ISR Project), located in Sweetwater County, Wyoming. The Applicant is also seeking to amend its Source and Byproduct Materials License (SUA-1598) issued by the NRC. The Applicant intends to: 1) expand the areal and vertical extents of uranium recovery using *in-situ* recovery (ISR) methods at the Lost Creek ISR Project and 2) increase the authorized annual yellowcake production rate. The NRC and BLM agreed to prepare this EIS with BLM as the lead agency and NRC as a major licensing cooperating agency, in accordance with the Memorandum of Understanding (MOU) between the two agencies (NRC 2013a).

The Lost Creek ISR Project is authorized by the BLM under the Plan of Operations approved in 2012. It is also permitted by the Wyoming Department of Environmental Quality, Land Quality Division (WDEQ-LQD) under Permit to Mine PT788, and is licensed by the NRC under Source and Byproduct Materials License SUA-1598. Although the Permit to Mine evaluates environmental impacts of the Lost Creek ISR Project, the requirements of the National Environmental Policy Act of 1969 (NEPA) must be fulfilled by a federal agency. Two separate EISs were completed for the Lost Creek ISR Project. In June 2011, the NRC published a Supplemental EIS (SEIS) for the Lost Creek ISR Project (NUREG-1910, Supplement 3; NRC 2011). The SEIS was prepared as a supplement to the Generic EIS for *In-Situ* Leach Uranium Milling Facilities (NRC GEIS; NRC 2009). The BLM published the Final EIS for the Lost Creek ISR Project (herein referred to as the BLM Lost Creek EIS) in July 2012 (BLM 2012a), and the Record of Decision (ROD) was published in October 2012 (BLM 2012b). Following the ROD, the BLM issued a Notice to Proceed authorizing LCI to commence operations.

The Applicant proposes to expand the Lost Creek ISR Project boundary to include an area east of and contiguous with the existing Lost Creek ISR Project, referred to as the Lost Creek East (LCE) expansion area. The existing Lost Creek ISR Project area and proposed LCE expansion area (herein referred to jointly as the project area) are located in the Great Divide Basin in the northeastern corner of Sweetwater County, Wyoming (map 1.1-1). The existing Lost Creek ISR Project area is located in all or portions of Sections 13 and 24-25, Township (T) 25 North (N), Range (R) 93 West (W), and Sections 16-20 and 29-31, T25N, R92W. It covers approximately 4,254 acres, of which 85 percent (3,614 acres) is federal land managed by the BLM and the remaining 15 percent (640 acres) is owned by the State of Wyoming. The proposed LCE expansion area is located in all or portions of Sections 1-3, 9-12, 14-15, 20-23, and 26-29, T25N, R92W and Section 35, T26N, R92W. It includes approximately 5,751 acres of federal land managed by the BLM. Overall, the project area includes approximately 10,005 acres of predominantly federal land (94 percent).

Map 1.1-1. General Location Map



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

## **1.2 Purpose and Need and Agency Decisions**

The Council on Environmental Quality (CEQ) NEPA implementing regulations at Title 40 of the Code of Federal Regulations (CFR) Part 1502 require an EIS to be prepared when significant impacts are anticipated as the result of a federal action. The EIS must describe the purpose and need to which the federal agency is responding (40 CFR § 1502.13). The purpose and need statement serves as the basis for developing a reasonable range of alternatives, including the Proposed Action.

### **1.2.1 Bureau of Land Management**

The purpose of the BLM action is to respond to the Applicant's request to modify its Plan of Operations to extract uranium using ISR methods from mining claims staked under the General Mining Law of 1872, as amended (30 U.S. Code [USC] 22 *et seq.*). LCI submitted its modification request to BLM on September 23, 2014 (LCI 2014a) and revised the modification request on February 27, 2017 (LCI 2017a).

The need for the BLM action is established by the BLM's responsibility under the laws and regulations regarding the availability of all locatable minerals on federal lands, including uranium, as specified under General Mining Law of 1872, as amended (30 USC 22 *et seq.*); 43 CFR Parts 3700 and 3800; and the Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701 *et seq.*). Under these laws, the BLM has the obligation to allow and encourage claim holders to develop their claims, subject to restrictions to ensure this development will not cause unnecessary or undue degradation of public lands. More specifically, the decision to be made by the BLM Authorized Officer based on the NEPA analysis is whether to:

1. approve LCI's Plan of Operations modification relating to uranium ISR on public lands managed by the BLM;
2. approve LCI's Plan of Operations modification with changes or conditions to prevent unnecessary or undue degradation to public lands, or to meet the performance standards of 43 CFR § 3809.420; or
3. deny LCI's Plan of Operations modification.

### **1.2.2 U.S. Nuclear Regulatory Commission**

The NRC regulates uranium milling, including the ISR process, under 10 CFR Part 40, Domestic Licensing of Source Material. Source material is defined in 10 CFR § 40.4 and includes uranium in any chemical or physical form. The Applicant is seeking to amend its NRC source and byproduct materials license to expand the areal and vertical extents of uranium recovery using ISR methods at the Lost Creek ISR Project and increase the authorized annual yellowcake production rate. The Applicant submitted a license amendment application to the NRC on September 23, 2014 (LCI 2014a). The Applicant resubmitted its license amendment application on February 27, 2017, and submitted responses to clarification questions from NRC staff on April 18, 2017 (LCI 2017a, 2017b). The purpose of the NRC action is to respond to LCI's amendment request to expand uranium ISR operations within the project area with respect to public health and safety and the environment. The NRC is conducting a safety evaluation of the proposed license amendment as required by 10 CFR Parts 20 and 40. The NRC will document the results of its safety evaluation in a separate Safety Evaluation Report (SER).

The need for NRC action is established by the NRC's obligation under the Atomic Energy Act of 1954, as amended (AEA), to ensure the safe use of radioactive materials for beneficial civilian purposes. Following issuance of the final EIS and SER, NRC will decide whether to grant or deny the Applicant's license amendment request.

### **1.3 Applicable Statutes, Regulations, and Associated Requirements**

This section summarizes the statutes, regulations, and associated requirements that apply to the Proposed Action.

#### **1.3.1 NEPA Compliance**

Regulations in 43 CFR § 3809.432(a) require BLM to follow the same process to review and approve a modification as required for the initial plan under 43 CFR §§ 3809.401-420. As provided for in 43 CFR § 3809.411(a)(3)(ii), BLM must complete the environmental review required under NEPA before approving the modification. Based on the initial review, BLM determined that an EIS is the appropriate document to meet BLM's NEPA requirements (BLM 2014a).

This EIS also fulfills the NRC's NEPA requirements under 10 CFR Part 51, which require the NRC to assess the potential environmental impacts of licensing and regulatory actions, including amendments to source and byproduct materials licenses. As previously stated, the NRC is acting as a major licensing cooperating agency with BLM as the lead agency in preparing this EIS, in accordance with the MOU between the two agencies (NRC 2013a). The NRC and BLM agreed that a single EIS would be prepared to satisfy the NEPA requirements of both agencies (NRC 2014).

As discussed in Section 1.1, the NRC published its SEIS for the Lost Creek ISR Project in 2011, which supplements the NRC GEIS.

#### **1.3.2 Conformance with Applicable USDOJ BLM Policies and Applicable BLM Land Use Plans**

Policies for development and land use decisions for federal lands and minerals for the Proposed Action are contained in the following federal documents:

**Rawlins Resource Management Plan (RMP) and Final EIS (BLM 2008a and 2008b, respectively).** The BLM Rawlins Field Office (RFO) administrative area includes approximately 11.2 million acres of land in Albany, Carbon, Laramie, and Sweetwater counties. The RMP and ROD for the Rawlins RMP Planning Area are intended to provide land use planning and management direction on a broad scale and to guide future actions. Since management objectives within the Rawlins RMP Planning Area provide for locatable mineral exploration and development within the project area proposed by the Applicant, while protecting or mitigating impacts to other resource values, the Proposed Action and all action alternatives are in conformance with the Rawlins RMP and ROD.

**Lander RMP and Final EIS (BLM 2014b and 2013, respectively).** The BLM Lander Field Office (LFO) planning area includes approximately 6.6 million acres of land in Fremont, Natrona, Carbon, Sweetwater, Hot Springs, and Teton counties. BLM prepared the Lander RMP to provide overall management direction within the LFO Planning Area, which includes approximately 2.4 million acres of public land and 2.8 million acres of mineral estate. The Lander RMP includes

management goals and objectives on mineral resources. Since one of the objectives is to provide opportunities for mining claimants to explore for and develop locatable minerals, while providing protections for resource values, including a portion of the project area, the Proposed Action and all action alternatives are in conformance with the Lander RMP and ROD.

**Approved RMP Amendments for the Rocky Mountain Region, Including the Greater Sage-Grouse Sub-Regions of Lewistown, North Dakota, Northwest Colorado, and Wyoming (BLM 2015a).** The BLM prepared the Approved RMP Amendments (ARMPA) to amend RMPs for field offices/district offices that contain Greater sage-grouse habitat and were not undergoing RMP revisions. The ARMPA is the result of a 2010 U.S. Fish and Wildlife Service (USFWS) determination that concluded that the Greater sage-grouse was “warranted, but precluded” for listing as a threatened or endangered species (BLM 2015a). The ARMPA includes planning criteria to minimize and mitigate adverse environmental surface impacts to BLM-administered lands related to sage-grouse and their habitat. The Proposed Action and all action alternatives are in conformance with the ARMPA.

Greater sage-grouse management is under the jurisdiction of Wyoming Executive Order 2015-4 regarding sage-grouse core area protection on lands that, according to state or federal law, require state agency review or approval. As such, any state agency action related to the project would be subject to the strategies outlined in the Executive Order. The sage-grouse core area protection concept came about “to maintain and enhance a viable and connected set of populations before the opportunity to do so is lost” (Office of the Governor 2015). Using mapping included in the Executive Order, it has been determined that the project area is located within the South Pass Sage-Grouse Core Area. Additional information is presented in Sections 3.8 and 4.9.

### **1.3.3 Compliance with NRC Governing Legislation and Regulations**

The AEA, as amended by the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), authorizes NRC to issue licenses for the possession and use of source and byproduct materials. As described previously, source material is defined in 10 CFR § 40.4 and Section 11e(2) of the AEA and includes uranium in any physical or chemical form. Byproduct material is also defined in 10 CFR § 40.4 and includes the wastes generated by the ISR process. NRC regulatory requirements for ISR facilities are found in 10 CFR Part 20, 10 CFR Part 40, and 10 CFR Part 40, Appendix A. These requirements were developed to protect public health and safety from radiological hazards and to protect common defense and security. LCI must obtain approval from NRC to amend its license to expand uranium ISR operations within the project area. Conformance with NRC regulations is documented in the SER prepared by NRC staff for the proposed amendment. The SER evaluates the Applicant’s proposed facility design, operational procedures, and radiation protection programs and whether the Proposed Action can be accomplished in accordance with applicable regulations. Conformance with NRC NEPA regulations in 10 CFR Part 51 is described in Section 1.3.1.

### **1.3.4 Conformance with Local Land Management Plans and Policies**

The Wyoming Legislature enacted the State Land Use Planning Act (Wyoming Statutes (WS) 9-8-101 through 9-8-302) in 1975. The State Land Use Planning Act mandates the preparation and adoption of local land use plans and defines a comprehensive plan as consisting of maps, policies, goals, and actions, as well as providing a blueprint or vision for how a community or region should grow. WS 18-5-101 through 18-5-315 give counties the authority to conduct land use planning

programs and to establish planning commissions, prepare land use plans, and adopt zoning ordinances. As required by law, all 23 Wyoming counties have adopted a county comprehensive plan or land use plan.

The project area is located in Sweetwater County, which has developed the Sweetwater County Comprehensive Plan (Sweetwater County 2002). A goal and objective of the plan is to “encourage and support environmentally responsible resource exploration/development within the region.” As a cooperating agency, Sweetwater County has been involved in the development of the alternatives described in Chapter 2 of this EIS. The Proposed Action and all action alternatives are in conformance with the Sweetwater County Comprehensive Plan.

Carbon County is also a Cooperating Agency. The Carbon County Development Plan includes discussion of the use and development of public lands with the county (Carbon County 2012). A goal of the Carbon County plan is to achieve a sustainable balance between energy development, agriculture, and the environment by enhancing the county government’s capacity to monitor, comment on, and influence state and federal decisions on energy development projects. Carbon County’s involvement as a cooperating agency is consistent with the Carbon County Development Plan.

Fremont County has developed the Fremont County Wyoming Land Use Plan (Fremont County Natural Resources Planning Committee 2004). This plan is “intended to be a guide for the citizens of Fremont County in identifying and respecting the customs, culture, economic viability, social stability and quality of life found in this unique area, and then applying those values to growth and development as they occur in the county.” The Fremont County plan recognizes the influence the mineral industry has on area values, and includes provisions for encouraging and supporting economically feasible mineral development. Fremont County has been involved in the development of the alternatives (Chapter 2) as a cooperating agency. Fremont County’s involvement as a cooperating agency is consistent with the Fremont County planning objectives.

## **1.4 Authorizing Actions and Project Relationships to Statutes and Regulations**

### **1.4.1 BLM Statutes and Regulations**

The BLM is responsible for administering the laws and regulations regarding the availability of all locatable minerals on federal lands, including uranium, as specified under the General Mining Law of 1872, 43 CFR Parts 3700 and 3800, and the FLPMA. Under these laws and regulations, the BLM is obligated to allow claim holders to develop their claims subject to reasonable restrictions including the restriction that unnecessary or undue degradation may not occur [43 CFR § 3809.411(d)(3)]. BLM is responsible for ensuring that the Applicant complies with the performance standards (43 CFR § 3809.420) and other federal and state regulations [43 CFR § 3809.415(a)]. Chapter 6 of this EIS describes conformance with other legislation applicable to BLM-managed lands potentially affected by the Proposed Action, including the Endangered Species Act of 1973 (ESA; 16 USC 1531 *et seq.*) and the National Historic Preservation Act of 1966, as amended (NHPA; 54 USC 300101 *et seq.*).

The BLM authority for land management is derived from the FLPMA. General BLM regulations are described in 43 CFR Subtitle B – Regulations Relating to Public Lands, Chapter II – BLM, USDO. The BLM regulations for the management of mining are included in 43 CFR Subpart 3809, Surface Management, and derive their mandate from Sections 302 and 303 of the FLPMA. Subpart 3809 established procedures and standards for mining claimants to prevent

public land degradation and requires reclamation of disturbed areas. It also requires coordination with applicable federal and state agencies. For operations on public lands other than casual use, 43 CFR 3809 requires BLM approval of a Plan of Operations, a full environmental review, and reclamation bonding.

The management of use and occupancy of public lands for the development of locatable minerals is described in provisions of 43 CFR 3715. The BLM will make a determination as to whether or not the construction, presence, or maintenance of the proposed structures described in the Plan of Operations meet the requirements of 43 CFR 3715.

The General Mining Law of 1872 declared all valuable mineral deposits in land belonging to the United States “to be free and open to exploration and purchase.” Under FLPMA, these actions require recordation of mining claims with the BLM and authorized regulations for surface protection of the public lands. The Mining and Mineral Policy Act of 1970 (30 USC 21 *et seq.*) mandates that federal agencies ensure completion and reclamation of mine operations in an environmentally responsible manner. The Mining and Mineral Policy Act of 1970 states that the federal government should promote the “development of methods for the disposal, control, and reclamation of mineral waste products, and the reclamation of mined lands, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities.”

An MOU between the BLM and the WDEQ-LQD recognizes the authorities and responsibilities of both agencies when permitting mining operations on BLM-administered lands (BLM 2003). The intent of the MOU is to avoid unnecessary permitting duplication while providing protection for human health and the environment. Under the terms of the MOU, BLM coordinates review of surface management Plans of Operations, bonding, and inspections with the WDEQ-LQD. In accordance with the MOU, the bond amount is established by the WDEQ-LQD, and the BLM reviews the bond for adequacy and responds with concurrence or recommendations for modification. Inspections are conducted jointly when possible. Also, as part of the MOU, the BLM and WDEQ-LQD agree that the operator shall be responsible for providing updated reclamation bond estimates annually. The bond amount would be reviewed by the BLM in accordance with the provisions of 43 CFR § 3809.552.

## **1.4.2 NRC Licensing Process**

By letter dated September 23, 2014, the Applicant submitted an application to the NRC to amend Source and Byproduct Materials License SUA-1598 (LCI 2014a). The Applicant resubmitted its license amendment application on February 27, 2017, and submitted responses to clarification questions from NRC staff on April 18, 2017 (LCI 2017a, 2017b). As discussed in NRC GEIS Section 1.7.1, the NRC initially conducts an acceptance review of a license application to determine whether the application is sufficiently complete to support a detailed technical review. The NRC staff accepted the license amendment application for detailed technical review by letter dated May 2, 2017 (NRC 2017a).

The NRC staff’s detailed technical review of the Applicant’s license amendment application is composed of both a safety review and an environmental review. These two reviews are conducted in parallel (see NRC GEIS, Figure 1.7-1). The focus of the safety review is to assess compliance with the applicable regulatory requirements at 10 CFR Part 20, 10 CFR Part 40, and 10 CFR Part 40, Appendix A. The environmental review has been conducted in accordance with the

regulations at 10 CFR Part 51 During the safety and environmental reviews, the NRC staff asks the Applicant for additional information through the request for additional information (RAI) process.

The NRC's hearing process (10 CFR Part 2) applies to licensing actions and offers stakeholders a separate opportunity to raise concerns associated with proposed licensing actions. Regulations in 10 CFR Part 2 specify that a petition for review and request for hearing must include a showing that the petitioner has standing and that the Atomic Safety and Licensing Board Panel would rule on a petitioner's standing by considering (i) the nature of the petitioner's right under the AEA or NEPA to be made a party to the proceeding; (ii) the nature and extent of the petitioner's property, financial, or other interest in the proceeding; and (iii) the possible effect of any decision or order that may be issued in the proceeding on the petitioner's interest. In accordance with the regulation, the NRC published a "Notice of Opportunity for Hearing" related to the Applicant's license amendment application on July 13, 2017 (82 FR 32382). The NRC did not receive a request for hearing.

Two emerging issues have the potential to affect NRC regulation of the Lost Creek ISR Project. The first is the State of Wyoming's application to NRC to become an Agreement State with respect to regulation of uranium recovery or milling facilities (NRC 2017b). Section 274 of the AEA provides a basis for NRC to relinquish to the States portions of its regulatory authority to license and regulate specific categories of materials or classes of facilities. In February 2015, Wyoming submitted a letter of intent to the NRC to regulate source material involved in uranium or thorium recovery or milling facilities, including uranium ISR facilities, and byproduct material as defined in Section 11e.(2) of the AEA. Under the terms of the limited Agreement, NRC would continue to have regulatory authority over the management and disposal of byproduct materials as defined in Section 11e.(2) of the AEA and a subcategory of source material associated with uranium or thorium milling within the State of Wyoming. The NRC would continue to retain regulatory authority over other AEA radioactive materials in the State of Wyoming. Wyoming submitted a draft Agreement application to NRC in October 2016, and NRC staff provided completeness review comments in April 2017. Wyoming submitted a Formal Request and certified the State of Wyoming has an adequate and compatible program in November 2017. Upon receiving approval from the Commission to proceed, the NRC staff will publish the draft Agreement and the staff's associated regulatory analysis in the Federal Register for a 30-day public comment period. If the Agreement process is completed, the NRC will transfer the licenses for uranium milling facilities, including the Lost Creek ISR Project, to the State of Wyoming. At that time, WDEQ-LQD would assume NRC's regulatory authority over the Lost Creek ISR Project. Where this EIS refers to NRC review or approval of various aspects of the Lost Creek ISR Project, that authority would be transferred to WDEQ-LQD if Wyoming becomes an Agreement State.

The second emerging issue is the U.S. Environmental Protection Agency (EPA) proposed rulemaking for 40 CFR Part 192, which establishes standards for protection of the public health, safety, and environment from radiological and non-radiological hazards associated with uranium and thorium ore processing, and their associated wastes. EPA is proposing revisions to 40 CFR Part 192 that would regulate ISR facilities, with a primary focus on groundwater protection and restoration (EPA 2017a). EPA proposed new health and environmental standards within 40 CFR Part 192 in January 2015 and revised the proposed rules in January 2017 based on public comments and other information received from stakeholders (EPA 2017b). The public comment period for the revised rules ended on October 16, 2017. If the EPA finalizes the 40 CFR Part 192 regulations,

the NRC and Agreement States would need to develop conforming regulations with which the Applicant would need to comply. Since the proposed rules have not been finalized, they are not considered in the impact analysis for this EIS.

Other major federal, state, and local regulations and permits that are relevant to the Proposed Action include those listed in table 1.4-1.

**Table 1.4-1. Major Federal and State Laws, Regulations, and Applicable Permits**

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
<b>Federal Agencies</b>		
BLM	BLM, as lead federal agency, will prepare an EIS to review the environmental impacts associated with the proposed modifications to the Plan of Operations and issue a ROD	NEPA (Public Law [P.L.] 91-190); CEQ – regulations for implementing NEPA (40 CFR Parts 1500-1508); USDOJ Implementation of NEPA, Final Rule (43 CFR Part 46)
	BLM to authorize expansion of ISR mining operations within project area based on submitted Plan of Operations	General Mining Law of 1872, as amended (30 USC 22 <i>et seq.</i> ) and implementing regulations (43 CFR Parts 3700 and 3800); Portions of FLPMA (43 USC §§ 1701-1782), as amended, that affect the General Mining Law
	Evaluate antiquities and cultural resources on public lands	Antiquities Act of 1906, as amended (54 USC §§ 320301-320303); Archaeological Resources Protection Act (ARPA) of 1979, as amended (16 USC 470aa-470mm); NHPA (54 USC § 300101 <i>et seq.</i> ) (36 CFR Part 80)
	Evaluate Environmental Justice	Executive Order (EO) 12898, Environmental Justice, February 11, 1994
	Pesticide Use Permit and Daily Pesticide Application Record	BLM Authorization for Herbicide Applications on Federal Lands
	Federal Noxious Weed Act compliance	Plant Protection Act of 2000 (PPA) (P.L. 106-224, 7 USC 7701); Federal Noxious Weed Act of 1974, as amended (7 USC 2801-2814); EO 13112, February 3, 1999
	Initiation of Section 7 consultation	Section 7 of the ESA (16 USC <i>et seq.</i> )
	Paleontological Resource Use Permit; approval for surveys and potential data collection at well pads and road sites	Paleontological Resources Preservation Act of 2009 (PRPA; 16 USC §§ 470aaa-470aaa-11); FLPMA [§ 302(b)]
	Identify and comply with Native American religious concerns	American Indian Religious Freedom Act of 1978 (AIRFA) (42 USC 1996)
NRC	Amendment to Source and Byproduct Materials License SUA-1598	Requirements under 10 CFR Part 40 (Domestic Licensing of Source Material) and 10 CFR Part 20 (Standards for Protection Against Radiation)
	NRC, as major licensing cooperating agency, to participate in the development of this EIS and issue a ROD	10 CFR Part 51 (Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions), including § 51.102

**Table 1.4-1. Major Federal and State Laws, Regulations, and Applicable Permits  
(Continued)**

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
EPA	Final review and approval of WDEQ-Water Quality Division (WQD) aquifer exemption request	Safe Drinking Water Act, as amended (SDWA); 40 CFR § 146.4
U.S. Department of Transportation (DOT)	Transportation of radioactive material and transportation of byproduct material for off-site disposal	10 CFR Part 71 and 49 CFR Part 173, Subpart I DOT and NRC co-regulate the transportation of radioactive material in accordance with 44 FR 38690
USFWS	Informal or formal consultation under Section 7; Coordination under Section 9	ESA (P.L. 93-205)
	Protection of birds that live, reproduce, or migrate within or across international borders	Migratory Bird Treaty Act of 1918, as amended (MBTA); Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668-668c; 50 CFR 22)
	Protection of bald and golden eagles	Bald and Golden Eagle Protection Act of 1940, as amended
<b>State Agencies</b>		
WDEQ-LQD	Amendment to Permit to Mine PT788, including Class III Underground Injection Control (UIC) authorization for <i>in-situ</i> mining	1973 Wyoming Environmental Quality Act; WDEQ-LQD, Chapter 11 Noncoal Rules and Regulations; WDEQ-LQD, Chapter 7 Noncoal Rules and Regulations
WDEQ-WQD	Amendment to aquifer reclassification; recommendation to EPA to exempt aquifer from SDWA	WDEQ-LQD, Chapter 11 Noncoal Rules and Regulations; WDEQ-LQD Guideline 4
	Amend UIC Permit 13-409 to include three additional Class I disposal wells and potential modification to aquifer exemption	WDEQ-WQD Rules and Regulations Chapters 8 and 27; an aquifer exemption request for an aquifer containing less than 3,000 milligrams per liter (mg/L) of total dissolved solids (TDS) would require the aquifer exemption request to be processed as a program revision pursuant to 40 CFR § 145.32; an aquifer exemption request for an aquifer containing 3,000 or more TDS pursuant to Chapter 27, WDEQ-WQD Rules and Regulations
	General Permit to Discharge Storm Water Associated with Large Construction Activity under Wyoming Pollutant Discharge Elimination System (WYPDES); no changes to existing permit WYR103695 required	WDEQ-WQD Rules and Regulations Chapter 2
	General Authorization to Discharge Storm Water Associated with Industrial Activities under WYPDES; no changes to existing permit WYR001378 required	WDEQ-WQD Rules and Regulations Chapter 2

**Table 1.4-1. Major Federal and State Laws, Regulations, and Applicable Permits  
(Continued)**

<b>Issuing Agency</b>	<b>Name and Nature of Permit/Approval</b>	<b>Regulatory Authority (if appropriate)</b>
WDEQ-Air Quality Division (AQD)	Amendment to Air Quality Permit CT-7896	WDEQ-AQD Rules and Regulations Chapter 6; Wyoming Environmental Quality Act, Article 2, Air Quality, as amended (WS 35-11-201 through 35-11-212)
	Prevention of Significant Deterioration (PSD) Program; National Emission Standards for Hazardous Pollutants (NESHAP) Pre-Construction Approval	Clean Air Act, as amended (CAA) (42 USC 7401 <i>et seq.</i> )
Wyoming Game and Fish Department (WGFD)	Compliance with Greater sage-grouse core area protection	State of Wyoming EO 2015-4, July 29, 2015
Wyoming Office of State Lands and Investments (OSLI)	Compliance with Greater sage-grouse core area protection	State of Wyoming EO 2015-4, July 29, 2015
Wyoming State Historic Preservation Office (SHPO)	Review and compliance activities related to cultural resources	Consultation under Section 106 of the NHPA (36 CFR Part 800)
<b>County Agencies</b>		
Sweetwater County Land Use Department	Construction Use Permit	W.S. 18-5-201 <i>et seq</i>
Sweetwater County Public Works Department	Sweetwater County Road Use and Maintenance Agreement, Sweetwater County Road Crossing and Access Permits	W.S. 24-3-101 <i>et seq</i>

**1.5 Related NEPA Reviews and Other Related Documents**

A number of NEPA documents (Environmental Assessments [EAs] and EISs) were reviewed and used in the development of this EIS. The following describes the related NEPA reviews.

**Final Environmental Impact Statement for the Lost Creek Uranium *In-Situ* Recovery Project (BLM 2012a).** BLM prepared this EIS to evaluate the environmental impacts of the then proposed Lost Creek ISR Project. The BLM Lost Creek EIS was prepared “[i]n order to support the BLM’s NEPA requirements and regulatory authorities ... to focus on the issues and mitigation measures not analyzed in sufficient detail in the NRC NEPA documents,” including the NRC GEIS and SEIS.

**Environmental Impact Statement for the Lost Creek ISR Project in Sweetwater County, Wyoming, Supplement to the Generic Environmental Impact Statement for *In-Situ* Leach Uranium Milling Facilities (NUREG-1910, Supplement 3, NRC 2011).** NRC prepared the SEIS as a supplement to the NRC GEIS based on its review of an application from LCI for a source and byproduct materials license for the then proposed Lost Creek ISR Project. The SEIS was prepared “to evaluate the potential environmental impacts from the applicant’s proposal to construct, operate, conduct aquifer restoration, and decommission an ISR uranium milling facility at the [then] proposed Lost Creek ISR Project.”

**Generic Environmental Impact Statement for *In-Situ* Leach Uranium Milling Facilities (NUREG-1910, NRC 2009).** The NRC prepared the NRC GEIS to assess the potential environmental impacts from the construction, operation, aquifer restoration, and decommissioning of an ISR facility located in any of four different geographic regions of the western United States. The environmental analysis in the SEIS for the Lost Creek ISR Project both tiers and incorporates by reference from the NRC GEIS.

**Final Environmental Assessment for the Lost Creek *In-Situ* Uranium Recovery Facility License Amendment for Rotary Vacuum Dryer Installation (NRC 2013b).** NRC prepared the EA in response to an application by LCI to amend NRC License SUA-1598 to include yellowcake rotary vacuum drying as an option within the Central Processing Plant (the Plant) at the Lost Creek ISR Project and subsequent offsite shipment of dried yellowcake up to 2 million pounds per year. The EA included an evaluation of the potential environmental impacts.

**Environmental Assessment for the Lost Creek *In-Situ* Uranium Recovery Facility License Amendment for Class V Underground Injection Control (NRC 2016a).** NRC prepared the EA in response to a license amendment request by LCI to inject treated wastewater into Class V UIC wells at the Lost Creek ISR Project. The EA includes an evaluation of the potential environmental impacts of the action requested by LCI.

## **1.6 Scoping and Consultation**

### **1.6.1 Public Participation and Scoping Summary**

The public scoping period for NEPA commenced when the Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on September 14, 2015 (80 FR 55149). Notification of the scoping process was also published in local newspapers and posted on the BLM Wyoming online newsroom and the project website. A public scoping meeting was held at the BLM Rawlins Field Office on October 14, 2015. The Response to Scoping Comments in Appendix A summarizes all comments received during the 45-day public scoping period and indicates how each comment was considered in this EIS. The full Scoping Report, including all scoping comments, is available at <https://go.usa.gov/xQXYw>. Chapter 6 includes additional details on the public scoping process.

### **1.6.2 Agency Coordination and Consultation**

This section summarizes consultation and coordination with federal, state, and local agencies. Additional details are provided in Chapter 6 of this EIS.

#### **1.6.2.1 Other Cooperating Agencies**

The BLM identified state agencies, local governments, tribal governments, and other federal agencies with jurisdiction or special expertise for potentially impacted environmental resources associated with the EIS. These agencies were extended the opportunity to become cooperating agencies for the development of this EIS and to be involved in the development of alternatives and mitigation measures. In addition to NRC, other agencies requesting cooperating agency status include the USFWS, EPA Region 8, Wyoming Department of Agriculture, Carbon County Commissioners, Sweetwater County Commissioners, Fremont County Commissioners, and Sweetwater County Conservation District.

Cooperating agencies were consulted throughout the development of this EIS to ensure a comprehensive analysis was performed. A cooperating agency meeting and site visit were held at the Lost Creek ISR Project on April 14, 2016. The purpose of the meeting and site visit was to solicit input from cooperating agencies on the EIS, including alternatives.

### ***1.6.2.2 Endangered Species Act of 1973 Consultation***

The ESA was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. ESA Section 7 recommends consultation with the USFWS to ensure that actions it authorizes, permits, or otherwise carries out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats. No consultation under Section 7(a)(2) of the ESA was required, since there is no effect to endangered or threatened species or designated critical habitats within the project area.

### ***1.6.2.3 National Historic Preservation Act of 1966 Consultation***

Section 106 of the NHPA requires that federal agencies take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on such undertakings.

The BLM initiated consultation with the Wyoming SHPO by a letter dated May 4, 2016, which described the undertaking, proposed the area of potential effect (APE), and requested concurrence from SHPO on this effort (BLM 2016a). On May 12, 2016, SHPO provided concurrence with the proposed APE (Wyoming SHPO 2016). The BLM provided notice to SHPO on November 21, 2016, documenting NHPA Section 106 compliance in accordance with the terms of the State Protocol (BLM 2016b). The notification completed the determinations of National Register of Historic Places eligibility and effect for the undertaking and documented BLM's determination that no eligible historic properties would be affected by the proposed expansion of the Lost Creek ISR Project.

The BLM initiated Section 106 consultation with Tribal governments by letters dated October and December 2015 (BLM 2015b, 2015c, 2015d). The Northern Arapaho, Ute, and Eastern Shoshone Tribes were invited to participate as cooperating agencies in development of the EIS. Historically, these Tribes have an affiliation with the general project area and have participated in previous consultations in the general region. None of the Tribes responded to the invitation to be cooperating agencies for this NEPA review.

## **1.7 Issues Identified through Scoping and Consultation**

### **1.7.1 Issues Identified for Analysis**

Issues and concerns were identified through formal scoping as well as consultation and coordination with federal, state, and local agencies, interested groups, and individuals. The majority of the issues and concerns were addressed in the BLM Lost Creek EIS and would not change as a result of the Proposed Action. Key issues not previously addressed that are addressed in this EIS include:

Rangeland management:

- Will there be additional restrictions to grazing allotments and impacts of fencing on livestock and wild horses from the project?

- Will the project limit access to water supply wells (livestock, wild horses, and wildlife)?

Wildlife:

- Will the project impact Greater sage-grouse and core areas as defined in Wyoming Executive Order 2015-4?

Groundwater:

- Will the project degrade groundwater quality as a result of ISR mining?

### **1.7.2 Issues Considered but Not Analyzed**

Issues that were considered, but not analyzed, included out-of-scope comments and procedural-based comments not analyzed, since the EIS conforms to NEPA policy. All comments are summarized in the Response to Scoping Comments provided in Appendix A and included in the Scoping Report available at <https://go.usa.gov/xQXYw>.

## 2.0 PROPOSED ACTION AND ALTERNATIVES

### 2.1 Introduction

This chapter provides a description of the Proposed Action and alternatives. The BLM reviewed the Proposed Action and consulted with other federal, state, and local agencies having jurisdiction or special expertise to develop a range of reasonable alternatives to address the issues identified through consultation and public scoping (refer to Section 1.7 and Chapter 6 of this EIS). The alternatives considered in this EIS include the No Action Alternative and Exclusion of the KM Horizon Alternative (Alternative 1). Alternatives that were considered but eliminated from detailed analysis are also described in this chapter. In developing the alternatives, the agency followed guidance set forth in the BLM NEPA Handbook H-1790-1 (BLM 2008c), which outlines the development of a range of reasonable alternatives. The BLM developed the following alternatives for analysis in this EIS:

- The Proposed Action describes the proposed development, activities, and duration during construction, operation, and reclamation as proposed by the Applicant in the modification application (LCI 2017a). The modification application is available at: <https://go.usa.gov/xQXYw>. The Proposed Action is described in Section 2.2.
- Under the No Action Alternative, approval of the Applicant's modification application would be denied, and construction, operation, and reclamation at the Lost Creek ISR Project would continue as described in the Plan of Operations approved in 2012. This alternative is discussed in Section 2.3.1.
- The Exclusion of the KM Horizon Alternative (Alternative 1) differs from the Proposed Action in that uranium ISR would not occur within the KM Horizon (a deeper horizon than what is currently mined). The alternative is described in Section 2.3.2.1.
- Alternatives that were considered but eliminated from detailed analysis include construction and operation of a satellite ion exchange facility, alternative mining methods, and portable mud pits. These alternatives are described in Section 2.3.3.

Table 2.1-1 provides a summary comparison of key project elements for the Proposed Action and other alternatives considered in this EIS. The No Action Alternative is presented in the table as the base case, representing existing conditions against which the Proposed Action and other alternatives may be compared.

**Table 2.1-1. Summary Comparison of the Proposed Action and Alternatives**

<b>Project Element</b>	<b>No Action Alternative<sup>1</sup> (Existing Mine)</b>	<b>Proposed Action</b>	<b>Exclusion of the KM Horizon Alternative</b>
Project Area	4,254 acres	10,005 acres (5,751 acres added)	10,005 acres (5,751 acres added)
Total Area to Be Disturbed	345 acres	1,760 acres (1,415 acres added)	1,621 acres (1,276 acres added)
Fenced Area	417 acres	1,788 acres (1,371 acres added)	1,661 acres (1,244 acres added)
Remaining Life of Mine	6.5 years	14 years (7.5 years added)	10.5 years (4 years added)
Average No. of Employees	55	55 (no change)	55 (no change)
No. of Class I UIC Wells	5	8 (3 added)	8 (3 added)
No. of Class V UIC Wells	2	2 (no change)	2 (no change)
No. of Mine Units <sup>2</sup>	2	11 (9 added)	6 (4 added)
Mining Horizons	HJ	HJ and KM (KM added)	HJ (no change)
Recovery Flow Rate	6,000 gpm	6,000 gpm (no change)	6,000 gpm (no change)
Maximum Annual Production Rate	2 M lbs. yellowcake	2.2 M lbs. yellowcake (0.2 M lbs. added)	2.2 M lbs. yellowcake (0.2 M lbs. added)

Notes:

<sup>1</sup> The No Action Alternative is based on the 2012 BLM Lost Creek EIS and ROD (BLM 2012a, 2012b) with the following updates: 1) the fenced area and disturbance area have been updated based on the MU1 and MU2 mine unit packages (LCI 2011a, 2016); 2) the Class V UIC wells have been authorized and installed (WDEQ-WQD 2016a; NRC 2016a, 2016b); and 3) NRC has increased the maximum authorized annual yellowcake production rate from 1 to 2 million pounds (M lbs.) per year (NRC 2013b, 2013c).

<sup>2</sup> Although a portion of MU5 is currently authorized, it is not considered part of the No Action Alternative to conservatively estimate potential impacts, since the proposed extents are larger than what was previously evaluated. The Applicant withdrew MU3 and MU12 from its modification application, but they are considered part of the Proposed Action in the EIS to provide a boundary analysis.

## 2.2 The Proposed Action

The Applicant proposes to expand the areal and vertical extents of uranium recovery using ISR methods at the Lost Creek ISR Project and increase the authorized annual yellowcake production rate. The Applicant is currently authorized by BLM, NRC, and the State of Wyoming to conduct uranium ISR within the existing Lost Creek ISR Project area in a mineralized sandstone referred to as the HJ Horizon. Under the Proposed Action, the Applicant would increase the areal extent of mining in the HJ Horizon and vertically expand mining into the next deeper mineralized sandstone, the KM Horizon, within the existing Lost Creek ISR Project area. On March 2, 2018, the Applicant withdrew the KM Horizon mine units (MUs) within the existing Lost Creek ISR Project area from the application (i.e., MU3 and MU12; LCI 2018a). However, since the Applicant may elect to pursue licensing of those mine units in a future action, this EIS provides a bounding analysis that includes MU3 and MU12. In addition, the Applicant proposes to expand uranium ISR into an area east of and contiguous with the existing Lost Creek ISR Project area. This area is referred to as the proposed LCE expansion area. Both the KM and HJ horizons would be mined within the proposed LCE expansion area. As described in Section 1.1, the area of the Proposed Action in this EIS (existing Lost Creek ISR Project area and proposed LCE expansion area) is referred to as the project area.

The Applicant also proposes to increase the authorized annual yellowcake production rate at the Lost Creek ISR Project. Yellowcake is the uranium oxide product of the ISR milling process that is used to produce fuel for commercially operated nuclear power reactors. The Applicant is currently authorized by the NRC to produce up to 2 million pounds of yellowcake per year. Under the Proposed Action, the maximum authorized yellowcake production rate would increase to 2.2 million pounds per year. This would include up to 1.2 million pounds from wellfields within the project area and the remainder from toll milling (processing of uranium-laden resin or slurry from another facility into yellowcake). Uranium processing and the proposed production rate increase are described in Section 2.2.3.2. Section 4.2.2 of this EIS describes toll milling transportation impacts.

Construction, operation, and reclamation of uranium ISR mine units under the Proposed Action would use the same methods evaluated under previous BLM and NRC NEPA analyses. These methods are described in the following documents, which are incorporated by reference:

- BLM Lost Creek EIS – Section 2.1, pp. 2-1 through 2-55 (BLM 2012a)
- NRC GEIS – Section 1.7.2.1, pp. 1-21 through 1-22 and Chapter 2, pp. 2-1 through 2-57 (NRC 2009)
- NRC Lost Creek SEIS – Section 2.1, pp. 2-1 through 2-49 (NRC 2011)
- NRC Dryer Amendment EA – Chapter 2, pp. 4 through 8 (NRC 2013b)

This section supplements the referenced documents with updates specific to the currently Proposed Action. It also provides a brief description of the referenced content where no changes are proposed.

Uranium extraction within the project area would be conducted using the ISR process, which utilizes *in-situ* chemical dissolution to recover uranium using injection and production wells completed in a mineralized sandstone. In order to dissolve uranium, a solution called lixiviant is injected into the mineralized sandstone through the injection wells. The lixiviant is composed of native groundwater, an oxidizing agent (typically oxygen and/or hydrogen peroxide), and a complexing agent (typically sodium bicarbonate, sodium carbonate, and/or carbon dioxide). The lixiviant mobilizes (dissolves) the uranium from the uranium ore body. The uranium-rich lixiviant is then recovered from the production wells and pumped through buried pipelines to central collection facilities called header houses. Header houses contain manifolds that connect groups of injection and production wells. Buried pipelines connect the header houses with the processing facility (the Plant), where a series of chemical processes are used to recover the uranium from the lixiviant and produce yellowcake, which is shipped to a conversion facility. The lixiviant is then refortified with oxidizing and complexing agents and returned to the header houses to continue uranium recovery.

Injection and production wells are grouped into mine units (also referred to as wellfields). Mine units consist of patterns of production and injection wells, which follow the mineralized sandstone. The portion of the mineralized sandstone within the injection and production patterns of each mine unit is referred to as the production zone. The production zone of each mine unit is surrounded by a perimeter monitor well ring. Perimeter monitor wells are completed in the same horizon as the production zone and are used to detect the lateral migration of lixiviant outside of the production zone. Mine units also include monitor wells installed within the horizons overlying and underlying the mineralized sandstone to detect vertical migration of lixiviant outside of the mineralized

sandstone. An illustration of a typical ISR operation is shown on figure 2.1-2 of the BLM Lost Creek EIS. More detailed discussions of the uranium ISR process are included in Section 2.1.1 of the BLM Lost Creek EIS and Chapter 2 of the NRC GEIS.

The geologic water-bearing strata associated with uranium ISR under the Proposed Action are all part of the Battle Spring Formation. The production zones would include mineralized sandstones within the HJ Horizon and the deeper KM Horizon. Above the HJ Horizon is the FG Horizon, which would serve as the overlying monitoring interval for production zones within the HJ Horizon. Below the KM Horizon is the L Horizon, which would serve as the underlying monitoring interval for production zones within the KM Horizon. Due to the type of deposition of the Battle Spring Formation, multiple shale layers are interfingered within and between the water-bearing horizons. Table 2.2-1 presents the relationship between the water-bearing horizons and those horizons to be monitored during mining in either the HJ or KM horizons. Sections 3.3 and 3.6 provide additional discussions of the hydrogeologic conditions within the project area.

**Table 2.2-1. Relationships of Horizons Associated with the Proposed Action**

<b>Designation for Uranium ISR in HJ Horizon Mine Unit</b>	<b>Horizon</b>	<b>Designation for Uranium ISR in KM Horizon Mine Unit</b>
Overlying Monitoring	FG	---
Confining Layer	Lost Creek Shale	---
Production Zone and Perimeter Monitor Wells	HJ	Overlying Monitoring
Confining Layer	Sagebrush Shale	Confining Layer
Underlying Monitoring	KM	Production Zone and Perimeter Monitor Wells
---	K Shale	Confining Layer
---	L	Underlying Monitoring

To inject lixiviant into the mineralized sandstones, the portion of the aquifer where mining will occur typically needs to be exempted from protection as an underground source of drinking water (USDW). During the aquifer exemption process, it must be determined that the aquifer does not currently serve as a source of drinking water and cannot now and would not in the future serve as a source of drinking water. Section 1.7.2.1 of the NRC GEIS and Section 2.1.1.1.2.4.1 of the NRC Lost Creek SEIS describe the aquifer exemption process followed for the Lost Creek ISR Project. This is the same process that would be followed under the Proposed Action since no changes have since been made to the exemption process. The areal and vertical expansion of ISR activities under the Proposed Action would require an expansion of the Lost Creek ISR Project aquifer exemption boundary.

The Proposed Action would increase the number of mine units and extend the operating life of the Lost Creek ISR Project without increasing the lixiviant flow rate or changing the uranium recovery processes in the Plant. Based on current resource estimates, the Proposed Action would extend the operating life of the Lost Creek ISR Project by 6 to 8 years (LCI 2017a). This would result in an approximately two-fold increase in the operation (production) phase evaluated in Section 2.1.6 of the BLM Lost Creek EIS (about 7 years). Since the development of the additional mine units would be progressive (so that one mine unit may be in operation while another is being developed), the Proposed Action would extend the duration of lixiviant recovery and processing at the Plant without increasing the currently approved lixiviant flow rate of 6,000 gallons per minute (gpm). All of the lixiviant generated from the mine units added under the Proposed Action would be processed at the Plant to recover uranium and produce yellowcake.

The ISR process requested under the Proposed Action would require the installation of underground and aboveground facilities. Injection and production wells would be installed within the production zone (either HJ Horizon or KM Horizon) of each mine unit, and perimeter monitor wells would be installed in the same horizon as the production zone. Overlying and underlying monitor wells would be installed within the horizons overlying and underlying the production zone. Buried pipelines would be installed to convey lixiviant between the injection and production wells and the header houses and between the header houses and the Plant. Header houses would contain equipment and piping to monitor and control (using meters, valves, and pumps) the amounts of lixiviant injected and recovered. Waste management facilities associated with the Proposed Action would include the installation of Class I UIC wells and associated well pads, buried pipelines, and power lines. Access roads would be constructed to access mine units and Class I UIC wells. Overhead and buried power lines, staging areas, and fencing around mine unit pattern areas would also be constructed. Section 2.2.1 provides a more detailed discussion of the facilities that would be installed under the Proposed Action.

As presented in table 2.1-1, the Proposed Action would add up to 1,415 acres of surface disturbance within the project area over the life of the project. This includes an estimated 1,371 acres of fenced mine units (conservatively assumed to be entirely disturbed); 11 acres for perimeter monitor wells; 14 acres for additional Class I UIC wells; and 19 acres for secondary access roads (20 feet width), trunk lines (48 feet width), and pipelines to the Class I UIC wells (10 feet width) (LCI 2017a). When added to the approximately 345 acres of disturbance associated with the currently authorized Lost Creek ISR Project, the total surface disturbance would be up to about 1,760 acres.

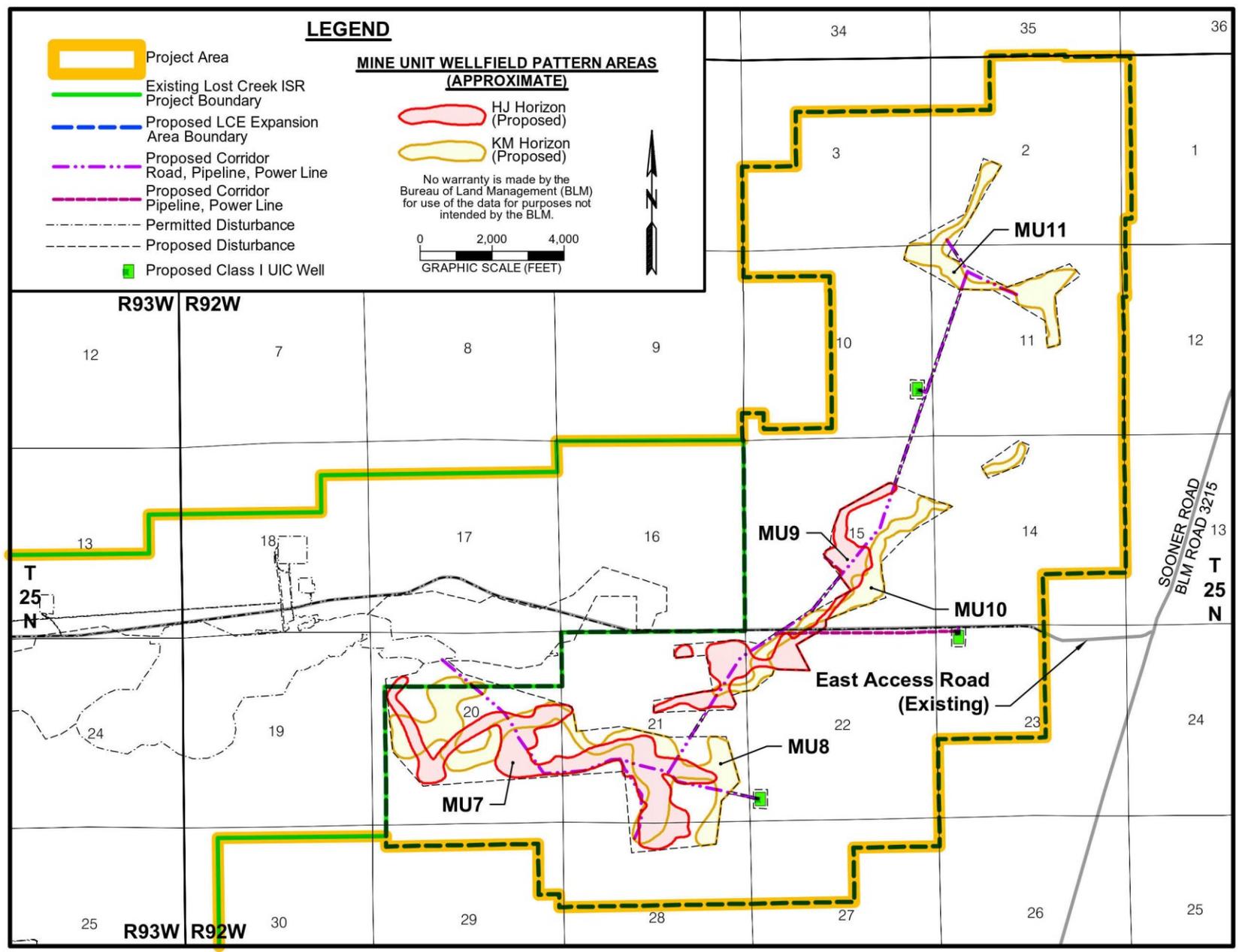
The Proposed Action would be conducted in phases, including construction, operation, and reclamation (including groundwater restoration). Each phase is discussed in more detail in Sections 2.2.2 (Construction), 2.2.3 (Operation), and 2.2.4 (Reclamation) of this EIS. Because of the progressive nature of uranium ISR, phases would be conducted concurrently as mine units are sequentially developed (that is, one mine unit may undergo uranium ISR operations at the same time that other mine units undergo construction, groundwater restoration, or surface reclamation).

### **2.2.1 Site Facilities**

The site facilities associated with the Proposed Action within the existing Lost Creek ISR Project area are depicted on map 2.2-1. This map also shows the approximate layout of the currently authorized facilities. Map 2.2-2 depicts the proposed site facilities within the proposed LCE expansion area. The mine unit outlines on maps 2.2-1 and 2.2-2 show the approximate areas that would be occupied by injection and production wells (wellfield pattern areas). Each mine unit would also include a fenced area and perimeter monitor well ring surrounding the wellfield pattern area. The Proposed Action includes the following activities:



Map 2.2-2. Site Layout within the Proposed LCE Expansion Area



- Existing Lost Creek ISR Project area: as shown on map 2.2-1, MU1 and MU2 are currently authorized mine units in the existing Lost Creek ISR Project area. The approximate extents of these two mine units were obtained from the mine unit packages that were reviewed by WDEQ-LQD and NRC (LCI 2011a, 2016). A portion of MU5 (referred to as MU3 in the BLM Lost Creek EIS and MU6 in the NRC SEIS) also was previously authorized; however, the currently proposed extents of MU5 are larger than what was previously evaluated. Specifically, neither the BLM EIS nor NRC SEIS evaluated planned wellfield disturbance within Section 16, T25N, R92W. To conservatively evaluate potential impacts, this EIS considers all of MU5 as part of the Proposed Action rather than a currently authorized facility. The Proposed Action also includes three new mine units (one targeting the HJ Horizon [MU4] and two targeting the KM Horizon [MU3 and MU12]) within the existing Lost Creek ISR Project area. As noted previously, the Applicant withdrew MU3 and MU12 from its modification application, but they are considered part of the Proposed Action in the EIS to provide a boundary analysis. Map 2.2-1 shows that there would be overlap between HJ and KM mine units. The additional disturbance estimates for the Proposed Action and alternatives listed in table 2.1-1 consider this overlap. They represent the total area that may be disturbed over the life of the project and do not count areas that would be re-disturbed in the totals.
- Proposed LCE expansion area: five new mine units would be installed within the proposed LCE expansion area, as shown on map 2.2-2. Both the HJ Horizon and the KM Horizon would be targeted for uranium ISR. Proposed activities associated with development in the proposed LCE expansion area include construction of infrastructure (i.e., access roads, header houses, power lines, pipelines, and staging areas) and installation of up to three additional Class I UIC wells.

### **2.2.1.1 Mine Units**

The Applicant has delineated uranium resources within the project area into mine units. A mine unit consists of patterns of production and injection wells surrounded by a perimeter monitor well ring and overlying and underlying monitor wells. The physical size of mine units and the number of injection and production wells within mine units vary according to the spatial distribution of the uranium and the feasibility of conducting uranium ISR as a unit within a specific geographic area. The Proposed Action would add four mine units within the existing Lost Creek ISR Project area and five mine units within the proposed LCE expansion area (maps 2.2-1 and 2.2-2).

General details for each mine unit are included in table 2.2-2. The Proposed Action would expand uranium ISR downward into the KM Horizon. The KM Horizon underlies the HJ Horizon, which is the production horizon currently authorized for the Lost Creek ISR Project. As shown on maps 2.2-1 and 2.2-2, mine units may overlap where resources in both the HJ and KM horizons are targeted for production. This overlap is reflected in the fenced acreage shown in table 2.2-2, where one fenced area would encompass multiple, overlapping mine units. The surface disturbance resulting from each mine unit is conservatively assumed to include the entire fenced area.

**Table 2.2-2. Description of Existing and Proposed Mine Units**

Mine Unit	Location <sup>1</sup>	Action <sup>2</sup>	Horizon	Pattern Area <sup>3</sup> (acres)	Fenced Area (acres)
MU1	LC	PAA	HJ	53	--- <sup>4</sup>
MU2	LC	PAA	HJ	73	
MU3	LC	PA	KM	27	--- <sup>5</sup>
MU4	LC	PA	HJ	28	203
MU5	LC	PA	HJ	30	233
MU7	LCE	PA	HJ	66	555
MU8	LCE	PA	KM	22	
MU9	LCE	PA	HJ	22	268
MU10	LCE	PA	KM	20	
MU11	LCE	PA	KM	18	112
MU12	LC	PA	KM	26	--- <sup>6</sup>

Notes:

Values shown are approximate.

<sup>1</sup> LC – existing Lost Creek ISR Project area, LCE – proposed LCE expansion area.

<sup>2</sup> PAA – Previously Authorized Action, PA – Proposed Action; although a portion of MU5 is currently authorized, this EIS considers it part of the Proposed Action in order to conservatively estimate potential impacts, since the extents are larger than what was previously evaluated. In addition, this EIS considers MU3 and MU12 as part of the Proposed Action even though they were withdrawn by the Applicant.

<sup>3</sup> Total pattern area within each mine unit including areas which overlap with other mine units.

<sup>4</sup> Fenced area accounted for in previously authorized action.

<sup>5</sup> Fenced area accounted for in previously authorized action and in MU5 due to overlap.

<sup>6</sup> Fenced area accounted for in previously authorized action and in MU4 due to overlap.

Sources: LCI 2017a, 2017c

### Header Houses

Header houses are central collection buildings within the mine units that house equipment used to monitor and control the flow of barren lixiviant to injection wells and uranium-rich lixiviant from production wells. Section 2.1.2.3 of the BLM Lost Creek EIS and Sections 2.1.1.1.2.4.1 and 2.1.1.1.2.4.5 of the NRC Lost Creek SEIS describe the header houses that would be used under the Proposed Action, and no changes have since been made to the header house design. Each header house would be designed to accommodate well controls and distribution plumbing for approximately 25 production wells and 50 injection wells. Each mine unit would include approximately four to 13 header houses (LCI 2017f). Instrumentation and controls within the header houses would be linked back to the Plant for overall monitoring and control.

Exterior building lighting is proposed at the header houses for safety and security purposes. No other nighttime lighting is proposed.

### Production and Injection Wells

Production and injection wells would be used to recover uranium from the production zone of each mine unit. They would be arranged in patterns consisting of a production well surrounded by injection wells. Section 2.1.2.3 of the BLM Lost Creek EIS and Section 2.1.1.1.2.4.1 of the NRC Lost Creek SEIS describe the production and injection wells that would be used under the Proposed Action, and no changes have since been made to the design of these wells. Figure 2-7 of the NRC Lost Creek SEIS shows a typical wellfield pattern and solution flow direction within a pattern. With four to 13 header houses per mine unit, each mine unit would include approximately 100 to 325 production wells and 200 to 650 injection wells. The actual number and location of header houses, production, and injection well would be determined during mine unit package development (LCI 2017f). Depths of production and injection wells are expected to range from 300 to 700 feet.

## Monitor Wells

Monitor wells would be installed within each mine unit to collect background (pre-operational) water quality and to detect the potential migration of lixiviant outside of the production zone, which could lead to an excursion. An excursion is generally characterized by the NRC GEIS as the “unintended spread, either horizontally or vertically, of recovery solutions beyond the production zone” (NRC 2009). The Applicant would conduct excursion monitoring as discussed in Section 2.2.3.4 of this EIS.

Four types of monitor wells would be installed: perimeter monitor wells, overlying monitor wells, underlying monitor wells, and production zone monitor wells. Two additional types of monitor wells, observation or trend wells, may also be used at specific locations within a mine unit. Section 2.1.2.3 of the BLM Lost Creek EIS and Section 2.1.1.1.2.4.2 of the NRC Lost Creek SEIS describe the monitor wells that would be used under the Proposed Action, and no changes have since been made to the design of these monitor wells. The layout of monitor wells within a typical mine unit is shown on figure 2.1-4 of the BLM Lost Creek EIS.

## Other Mine Unit Facilities

Other facilities associated with the mine units would include access roads, fencing, power lines, and pipelines. These are described in Sections 2.2.1.3 through 2.2.1.5 and 2.2.2.1 of this EIS. The layout of surface facilities in a typical mine unit is shown on figure 2.1-5 of the BLM Lost Creek EIS.

### ***2.2.1.2 Underground Injection Control Wells***

Injection wells used for uranium ISR and disposal wells used for managing liquid wastes would need to be permitted under the UIC programs administered by WDEQ. Three classes of UIC wells would be used for activities conducted under the Proposed Action. Injection wells used for uranium ISR would be Class III UIC wells, and wells used to dispose of liquid wastes would be Class I or Class V UIC wells. Additional descriptions of the general UIC permitting process and UIC well types are provided in Section 1.7.2.1 of the NRC GEIS. In Wyoming, WDEQ-WQD has primacy to regulate Class I and Class V UIC wells, and WDEQ-LQD has primacy to regulate Class III UIC wells. The Applicant intends to dispose of liquid process waste generated under the Proposed Action using a combination of Class I and Class V UIC wells. In general, the purpose of a Class I UIC well is to dispose of hazardous or non-hazardous industrial, commercial, or municipal waste by injecting it below the deepest formation containing a USDW, though Class I UIC wells for ISR facilities are prohibited from disposing hazardous waste. The purpose of a Class V UIC well is to dispose of non-hazardous waste directly into or above a formation containing a USDW. The Applicant plans to dispose of liquid waste, such as that from Plant processes, reverse osmosis brine, and other process wastewaters, in Class I UIC wells. The Applicant would use Class V UIC wells to dispose of process waters that have been treated (WDEQ-WQD 2016b).

## Class I UIC Wells

The Applicant proposes to install up to three Class I UIC wells within the proposed LCE expansion area under the Proposed Action. Class I UIC wells would be used as the primary disposal method for liquid 11e.(2) byproduct material. 11e.(2) byproduct material is discussed in Section 2.2.6.3 of this EIS.

The Applicant has installed three Class I UIC wells within the existing Lost Creek ISR Project area under UIC Permits 09-586 and 13-409. UIC Permit 13-409 is a modification of the original permit and was approved by WDEQ-WQD in December 2013. Permit 13-409 authorizes the Applicant to install five Class I UIC wells within the existing Lost Creek ISR Project area. The Applicant would be required to apply for a modification to Permit 13-409 or apply for a new UIC permit in order to complete and operate three additional Class I UIC wells within the proposed LCE expansion area. At the time of this EIS, the Applicant has submitted a modification application to Permit 13-409 to recomplete the existing Class I UIC wells into the Lower Battle Spring Formation just above the current injection interval in the Fort Union Formation. The modification does not request an increase in the maximum allowable injection rate and is currently under review by WDEQ-WQD.

The locations of the proposed Class I UIC wells within the proposed LCE expansion area are shown on map 2.2-2. The installation and operation of Class I UIC wells within the proposed LCE expansion area would be subject to the same or similar construction, operation, maintenance, integrity testing, plugging and abandonment, and monitoring requirements that are defined in UIC Permit 13-409 (WDEQ-WQD 2013a). The proposed wells would also be completed in the same receiving formation(s) (Fort Union and possibly Lower Battle Spring) and dispose of liquid waste at similar depths due to proximity and similar geologic characteristics. Depending on the TDS level in the receiving formation, the Applicant may be required to obtain an aquifer exemption for each Class I UIC well as described in Permit 13-409. As mentioned above, hazardous waste, as defined in 40 CFR § 261.3, is prohibited from injection into Class I UIC wells.

### Class III UIC Wells

Under the Proposed Action, the Applicant would install additional Class III UIC wells, or ISR injection wells, associated with new mine units within the project area (refer to maps 2.2-1 and 2.2-1 for mine unit locations). As WDEQ-LQD has primacy for Class III UIC wells, these wells would need to be permitted by WDEQ-LQD under an amendment to Permit to Mine PT788. As mentioned above, aquifer exemptions are typically required for the portion of the aquifer where mining will occur. An expansion of the current aquifer exemption boundary would be needed in order to install Class III UIC wells in portions of the project area not previously exempted from protection as a USDW.

### Class V UIC Wells

Under UIC Permit 15-081 issued by WDEQ-WQD, the Applicant has installed and currently operates two Class V UIC wells near the Plant to dispose of treated wastewater. The location of the Class V wells is shown on map 2.2-1. UIC Permit 15-081 authorizes the Applicant to inject up to 200 gpm of treated wastewater into the shallow FG Horizon of the Battle Spring Formation at depths ranging from 190 to 455 feet below the ground surface. The Applicant is required to maintain four monitor wells surrounding the Class V UIC wells to monitor flow direction and groundwater quality and to determine compliance with permit limits established for the monitor wells (WDEQ-WQD 2016b).

The water injected in Class V UIC wells is derived from the same sources as for the Class I UIC wells, but it is treated to meet UIC permit limits established to protect the background water quality in the receiving formation. The Class V UIC wells are being used in conjunction with Class I UIC wells to provide additional disposal capacity, reduce the disposal cost, and reduce water consumption (LCI 2015). The treatment methods used prior to injection as well as an evaluation

of water consumption are described in the Applicant's Class V UIC permit application (LCI 2015). Details on the installation, operation, and monitoring for the Class V UIC wells is described in UIC Permit 15-081 (WDEQ-WQD 2016b). According to semi-annual effluent and environmental monitoring reports, injection into the Class V UIC wells commenced in January 2017 (LCI 2017d, 2017e).

NRC License SUA-1598 and WDEQ-LQD Permit to Mine PT788 have been amended to allow treated wastewater injection into Class V UIC wells. As part of its license amendment review process, NRC prepared an EA that evaluated the potential environmental impacts resulting from installing and operating the Class V UIC wells (NRC 2016a). The EA, which is incorporated by reference, describes how the land disturbance associated with the installation of one Class V UIC disposal well and four Class V UIC monitor wells (one of which is a designated backup injection well) totaled approximately 0.1 acre. The conclusion of the EA was that the installation and operation of Class V UIC wells would not have a significant impact on the human environment.

### ***2.2.1.3 Access Roads***

Mine unit and Class I UIC well installation would require the construction of secondary and two-track access roads. The main access roads and associated culverts that would be used to access the project area (i.e., east and west access roads, as shown on maps 2.2-1 and 2.2-2) were previously approved by BLM and WDEQ-LQD and constructed as part of the currently authorized Lost Creek ISR Project. Proposed secondary access roads within the existing Lost Creek ISR Project area and proposed LCE expansion area are shown on maps 2.2-1 and 2.2-2, respectively. Additional information on access road construction and siting criteria is provided in Section 2.1.2.5 of the BLM Lost Creek EIS and Section 2.1.1.1.2.3 of the NRC Lost Creek SEIS.

Under the Proposed Action, approximately 8.8 miles of secondary access roads would be constructed. In addition, approximately 39.5 miles of two-track access roads would be added. Two-track access roads would not be constructed, but rather would be new roads without gravel surfacing or grading, or unimproved, existing roads. They typically would be used by light vehicles during mine unit construction and during operation to access header houses and monitor wells.

### ***2.2.1.4 Fencing***

Wellfield pattern areas within the mine units would be enclosed in fencing. Figure 2.1-5 of the BLM Lost Creek EIS shows the typical fencing configuration around a mine unit. Fencing would not include the perimeter monitor wells, but any exploration drilling mud pits that are located outside of the pattern area would be fenced temporarily. Section 2.1.2.6 of the BLM Lost Creek EIS describes the standard wildlife friendly fencing that would be used under the Proposed Action to keep cattle and wild horses out of mine units and drilling sites while allowing the passage of pronghorn and other wildlife and to deter collisions with Greater sage-grouse. No changes have since been made to the fencing procedures.

Since mine units would be developed sequentially, not all of the wellfield pattern areas would be fenced at the same time. The estimated total fenced area that would be added under the Proposed Action is presented in table 2.1-1. The total length of fencing that would be added under the Proposed Action would be approximately 20 miles over the life of the project.

### **2.2.1.5 Power Lines and Pipelines**

The Applicant would adhere to the same construction methods, best management practices (BMPs), and operating procedures for power lines under the Proposed Action as those authorized for the Lost Creek ISR Project and described in Section 2.1.2.1 of the BLM Lost Creek EIS. Approximately 7 miles of additional overhead and buried power lines would be constructed under the Proposed Action, not including power lines from header houses to individual wells. This includes constructing approximately 848 feet of overhead power lines, which would be constructed in compliance with regional raptor specifications provided in the Avian Power Line Interaction Committee (APLIC) report on Suggested Practices for Avian Protection on Power Lines (APLIC 2006). Maps 2.2-1 and 2.2-2 depict the approximate locations of power line corridors serving each mine unit that would be added under the Proposed Action. The estimated construction right-of-way width for overhead and buried power lines would be approximately 30 feet. Disturbance associated with power line corridors is accounted for in disturbance estimates for secondary access roads and pipelines.

A pipeline network would be used to transport wellfield fluids to and from the Plant. Individual well lines would connect the injection and production wells to manifolds in the header houses, and main trunklines and laterals would be used to convey fluids between the header houses and the Plant. Pipelines would also be constructed to carry liquid waste from the Plant to the proposed Class I UIC wells within the proposed LCE expansion area. Excluding individual well piping, approximately 14 miles of buried pipelines would be constructed under the Proposed Action. All pipelines would be buried 4 to 6 feet below the ground surface (i.e., below the frost line) to prevent freezing and damage by traffic. The Applicant would monitor instrumentation systems to observe and control the flow and pressures in the pipelines. The instrumentation systems would allow automated monitoring and data output, automatic alarms of unusual conditions, and control and/or shutdown of the system during upset conditions, such as a pipeline break (LCI 2011b).

## **2.2.2 Construction**

Facilities constructed under the Proposed Action would include mine units (including injection wells, production wells, monitor wells, and header houses), pipelines, Class I UIC wells, power lines, and access roads. Construction activities would be phased, as mine units and ancillary facilities would be developed sequentially. Construction of Class I UIC wells under the Proposed Action would be initiated on an as-needed basis. No satellite or central processing plants would be constructed under the Proposed Action. In general, the Applicant's proposed methods for construction of new mine units in the project area are the same as those that were assessed in the BLM Lost Creek EIS and NRC Lost Creek SEIS. The construction of each mine unit could take 2 to 4 years; however, construction and operation would be conducted concurrently, since operation generally would be initiated at individual header houses rather than on a complete mine unit basis (LCI 2011b).

### **2.2.2.1 Mine Unit Development**

Each mine unit would be constructed in two phases. The first phase would include drilling delineation boreholes to refine the extent of the economic mineralization (in other words, to define the lateral and vertical boundaries of the production zone) and installing monitor wells. The proposed mine unit extents depicted on maps 2.2-1 and 2.2-2 are approximate, as is the pattern

area of each mine unit listed in table 2.2-1. The disturbance areas listed in table 2.1-1 are based on the anticipated mine unit fenced areas. Although the actual mine unit boundaries may be refined following delineation drilling, the disturbance estimates are conservatively high and provide a bounding analysis of potential mine unit disturbance under the Proposed Action. The monitor wells would be installed within the proposed pattern area, perimeter monitor well ring, and the overlying and underlying horizons. These wells would be used to establish baseline water quality and excursion limits for the horizons. One or more aquifer pumping tests would be conducted as described below. The results of the baseline water quality testing and aquifer pumping test(s) would be included in a mine unit package, which would be submitted to WDEQ-LQD and NRC. The mine unit package would also include the final details of the wellfield and surface facilities layout for the mine unit.

Following submittal of the mine unit package, the second phase of mine unit construction would commence. This would include installing header houses, pipelines, access roads, and power lines. Injection and production wells and access roads would be installed intermittently throughout both construction phases, in conjunction with monitor well installation and other construction activities. The construction phase would also include installation of Class I UIC wells and associated infrastructure as necessary.

#### Delineation Drilling

Delineation drilling would be performed within each mine unit to define the lateral and vertical boundaries of the production zone. Section 2.1.3.2 of the BLM Lost Creek EIS describes the delineation drilling program including the drilling materials, equipment, construction, and reclamation procedures that would be used under the Proposed Action, and no changes have since been made to the delineation drilling program.

Surface disturbance during delineation drilling would be associated primarily with excavation of mud pits and constructing drill pads. A typical drill pad is shown on figure 2.1-7 of the BLM Lost Creek EIS. Drilling mud pits would be used for multiple well locations when possible. The total estimated surface disturbance associated with delineation drilling for all new mine units under the Proposed Action is 60 acres. Since this disturbance would occur predominantly within the future fenced mine unit areas, it is accounted for in the estimated mine unit disturbance in table 2.1-1. Drilling mud pits would be reclaimed as soon as possible (within several weeks) after drilling. As described in Section 2.2.6.3, drilling mud pits would be reclaimed by allowing the contents to dry, covering the pits with native soil, and revegetating the reclaimed area.

#### Well Construction and Integrity Testing

Production, injection, and monitor wells would be drilled to the target depth using the same equipment and procedures as discussed in Section 2.1.3.2 of the BLM Lost Creek EIS. After drilling, the wells would be completed as described in Section 2.1.1.1.2.4.3 of the NRC Lost Creek SEIS.

Casings for wells completed in the project area would be constructed of polyvinyl chloride (PVC) pipe. Specifically, the Applicant states that standard dimension ratio (SDR) 17 PVC casing would be used for all production, injection, and monitor wells (LCI 2011b). Since SDR 17 PVC well casing is not normally installed at depths greater than 600 feet when standard drilling fluid is used, the Applicant states that weighting material may be used in the drilling fluid to extend drilling depths up to 1,000 feet, which is deeper than any of the planned production, injection, or monitor

wells in the project area (LCI 2011b). A weighting material such as barite would be added to the drilling fluid as necessary to offset the density difference between the cement and drilling fluid. This would reduce the risk of over-pressuring the casing during cementing or collapsing the casing from the weight of cement in the annulus. Well casing material would be required to meet regulations in WDEQ-LQD Noncoal Chapter 11, which states that casing must be of sufficient strength and diameter to prevent casing collapse during installation and convey liquid at a specified injection/recovery rate and pressure (WDEQ-LQD 2013).

Prior to a well (production, injection, or monitor) being used for any purpose (including water level measurement, sampling, or aquifer test), mechanical integrity testing (MIT) of the well casing would be conducted. The purpose of the MIT is to detect breaks or leaks in the casing and to test the competency of the casing when pressurized to the maximum injection pressure expected during ISR. MIT procedures that would be used under the Proposed Action are the same procedures described in Section 2.1.1.1.2.4.3 of the NRC Lost Creek SEIS. Additional details of the Applicant's MIT program are included in Section OP 3.4 of the Permit to Mine PT788 Operations Plan (LCI 2011b) and NRC License SUA-1598 (NRC 2016b).

Well construction methods, materials, and MIT for Class V UIC wells would be nearly identical to those for injection and production wells. One exception is that Class V UIC wells do not require MIT every 5 years. Class V UIC wells require MIT before being put into service and whenever the well is re-entered for maintenance activities (WDEQ-WQD 2016a).

Well construction equipment and procedures for Class I UIC wells are described in Section 2.1.3.1 of the BLM Lost Creek EIS, and no changes have since been made to the equipment or procedures. Class I UIC wells are designed to prevent the movement of injected fluids into USDWs. Class I UIC wells are typically constructed with a surface casing, which extends below the lowermost USDW; a long string casing, which extends from the surface through the injection zone; and injection tubing, which conveys the injection fluid from the surface to the injection zone. Packers (seals) are located at the bottom and top of the casing to isolate the casing from the injection zone. The casing is pressurized and monitored to determine well integrity. MIT for Class I UIC wells consists of two tests: one to demonstrate the internal integrity of the injection tubing, casing, and packers and one to demonstrate the external integrity of the well to help ensure that fluid from the injection zone does not migrate along the outside of the casing. MIT for Class I UIC wells is required at least every 5 years.

#### Aquifer Pumping Tests and Baseline Water Quality

One or more aquifer pumping tests would be conducted within each mine unit prior to injecting lixiviant in that mine unit. The purpose of the test(s) would be to determine whether the perimeter monitor well ring spacing and completion depths are adequate to detect lateral movement of lixiviant from the pattern area and whether there is adequate hydrogeologic confinement between the production zone and overlying and underlying horizons. The procedures for aquifer pumping tests are described in Section 2.1.3.2 of the BLM Lost Creek EIS, and no changes have since been made to the procedures. They involve pumping one or more wells within the proposed pattern area and verifying that perimeter monitor wells respond (i.e., through a measured drawdown in the perimeter monitor wells compared to levels measured prior to the test). In addition, hydrogeologic confinement between the production zone horizon and overlying and underlying horizons is evaluated based on response (or lack thereof) in the overlying and underlying monitor wells. Water recovered during aquifer pumping tests would be discharged to the surface under the provisions of

a temporary WYPDES permit or reused in drilling. The results of aquifer pumping test(s) would be included in a mine unit package

Monitor wells within each mine unit would be used to establish the pre-operational baseline water quality prior to injecting lixiviant into that mine unit, as described in Section 2.1.3.2 of the BLM Lost Creek EIS and Section 2.1.1.1.4 of the NRC Lost Creek SEIS. Baseline groundwater sampling would be conducted to establish groundwater restoration target values for the production zone and upper control limits (UCLs) for excursion monitoring in the perimeter, overlying, and underlying monitor wells. The results of baseline water quality testing would be included in a mine unit package with the proposed groundwater restoration target values and excursion monitoring UCLs.

#### Mine Unit Infrastructure and Surface Facilities

Construction of mine unit infrastructure, including access roads, pipelines, power lines, and header houses, would require earth moving equipment such as scrapers, dozers, excavators, and backhoes, as well as trenchers, pipe fusing equipment, and truck-mounted cranes (LCI 2011b). To minimize erosion potential, weed invasion, and related problems, surface reclamation in a mine unit would begin as soon as conditions allow upon construction completion (in the first appropriate growing season), in accordance with BLM and WDEQ-LQD reclamation requirements.

#### Piping

Mine unit piping would typically be constructed of high density polyethylene (HDPE), PVC, or stainless steel with a pressure rating of at least 150 psi. Where justified by engineering design, piping with a higher-pressure rating would be used. When constructing multiple pipelines, a common trench would be used whenever possible. Pipeline routes would be designed to minimize disturbance, avoid areas with sensitive vegetation, and avoid drainages and steep slopes. The Applicant estimates that pipeline installation typically would take from a few days to a few weeks, depending on the length of the route (LCI 2011b).

#### Header Houses

Header houses may be assembled remotely and transported to the project area or built on site. The typical disturbance area for header house construction would be 0.25 acre per header house.

### **2.2.3 Operation**

The uranium ISR process that would be used under the Proposed Action is described in Section 2.2 of this EIS and would be the same as that authorized for the Lost Creek ISR Project. In this EIS, the term “operation” is used synonymously with “production” to refer to uranium recovery. It does not include groundwater restoration, which is addressed in Section 2.2.4.1.

#### ***2.2.3.1 Mine Unit Operation***

As previously noted, mine units would be developed and operated sequentially. Typically, as operation in a specific wellfield pattern area (header house) nears the end of economic recovery, another header house would be brought into production. Mine units would be operated to maintain a net inward hydraulic gradient. This would be accomplished by recovering more lixiviant than is injected in order to control the unwanted spread of mining fluids (i.e., outside the wellfield pattern area). Mine unit operation is described in Section 2.1.4.1 of the BLM Lost Creek EIS and Section 2.1.1.1.3.1.2 of the NRC Lost Creek SEIS, and no changes have since been made to the operation. Operation is anticipated to last 2 to 4 years in each mine unit.

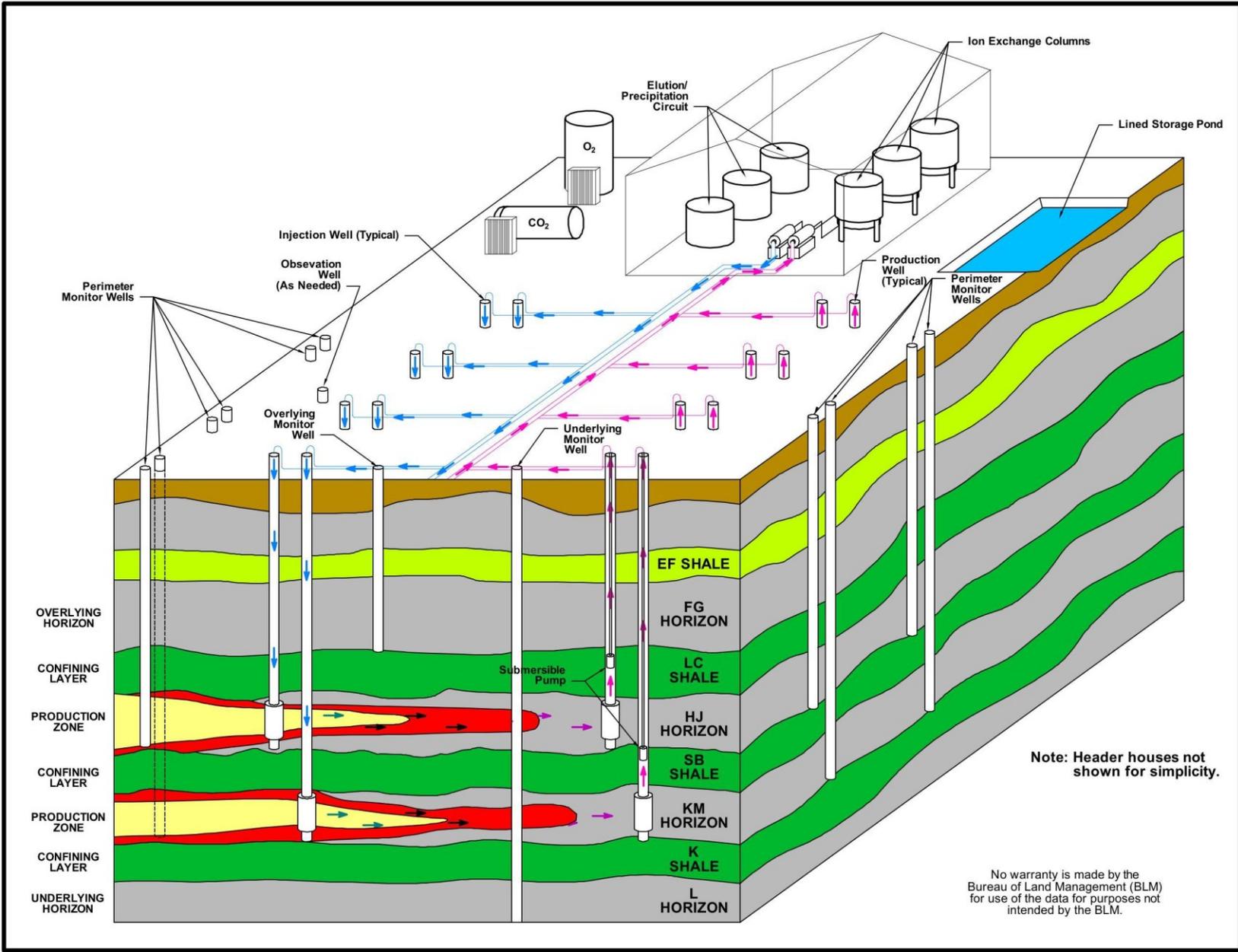
A key difference between the Proposed Action and previously authorized action is that uranium ISR would be conducted in two horizons. Maps 2.2-1 and 2.2-2 show that mining in the HJ and KM horizons would overlap in portions of the project area. Figure 2.2-1 illustrates conceptually how ISR would be conducted in multiple horizons. In such cases, concurrent production in the HJ and KM horizons would not occur. The KM Horizon would be the underlying monitoring interval when mining in the HJ Horizon, and the HJ Horizon would be the overlying monitoring interval when mining in the KM Horizon. If mining were to commence in one horizon prior to the adjacent horizon being restored, then the adjacent horizon would not be an appropriate excursion monitoring interval. The Applicant states that if the KM Horizon is mined prior to the overlying HJ Horizon, restoration of the KM Horizon may not be finalized prior to commencing ISR in the HJ Horizon. In that case, the aquifer underlying the KM Horizon would be monitored for excursions until groundwater restoration is complete in the KM Horizon. At that time, the KM Horizon would be designated as the underlying monitoring interval for the HJ Horizon. If the KM Horizon is restored prior to mining the HJ Horizon, the restored water quality in the KM Horizon would be determined, and the KM Horizon would serve as the underlying monitoring interval (LCI 2017a). In general, if groundwater restoration has not been completed in the KM or HJ Horizon prior to initiating ISR in the adjacent horizon, the next overlying or underlying aquifer would be monitored to detect potential vertical excursions.

### **2.2.3.2 Plant**

Within the Plant, ion exchange is used to recover the uranium from the lixiviant, and additional chemical processes are used to produce yellowcake. These include elution, precipitation, and yellowcake drying and packaging processes. Although the Applicant would not modify any processes or equipment within the Plant as part of the Proposed Action, it proposes to increase the maximum annual yellowcake production rate from the Plant. The proposed annual production rate increase is from 2 million to 2.2 million pounds of yellowcake, which would result from increased production from mine units within the project area and/or toll milling. The maximum annual production rate currently approved by NRC for the Lost Creek ISR Project is 2 million pounds of yellowcake (NRC 2016b). Of the three main agencies that regulate uranium ISR activities in Wyoming (BLM, NRC, and WDEQ), only NRC specifically limits the annual yellowcake production rate. This is because the NRC is responsible through the AEA for regulating the production, storage, and use of source material (e.g., uranium).

Although the Proposed Action would increase the maximum annual production rate within the project area by 0.2 million pounds of yellowcake per year, it would not increase the maximum authorized production flow rate from the mine units. According to the Permit to Mine PT788 Operations Plan (LCI 2011b), the elution and precipitation circuits in the Plant were designed for an output of 2 million pounds of yellowcake per year. The Applicant states that the Plant would be capable of processing the additional 0.2 million pounds of yellowcake per year requested under the Proposed Action due to significant redundancy in the Plant design, which includes two elution circuits, four precipitation cells, two filter presses, and two dryers (LCI 2017b). As described in Section 1.5 of this EIS, the NRC prepared an EA evaluating the potential environmental impacts associated with adding two drying circuits, each consisting of a standard rotary vacuum dryer (NRC 2013b).

Figure 2.2-1. Example of ISR Operations in Multiple Horizons



Note: Header houses not shown for simplicity.

No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

### ***2.2.3.3 Instrumentation and Control***

The instrumentation and control systems that would be used for new and expanded mine units under the Proposed Action would be the same as those currently used at the Lost Creek ISR Project. These systems are described in Section 6.3.2 of the NRC Lost Creek SEIS and Section 3.6 of the Permit to Mine PT788 Operations Plan (LCI 2011b), and no changes have since been made to the instrumentation and control systems.

### ***2.2.3.4 Excursion Monitoring***

Excursions and excursion monitoring at ISR facilities are described in Section 2.4 of the NRC GEIS (NRC 2009), which is incorporated by reference. The excursion monitoring program under the Proposed Action would remain unchanged from what was evaluated in 2012 for the Lost Creek ISR Project, except that a restored aquifer could serve as an overlying or underlying monitoring interval where mine units in the HJ and KM horizons overlap. As discussed in Section 2.2.3.1, where HJ and KM mine units overlap, the overlying or underlying monitoring interval could be either the restored KM or HJ Horizon or the next underlying or overlying horizon if the adjacent horizon (KM or HJ) has been mined but not completely restored. If a restored horizon is used as the overlying or underlying monitoring unit, the excursion monitoring UCLs would be established based on the restored water quality in that horizon. The excursion monitoring program for the Lost Creek ISR Project is described in Section 2.1.1.1.3.1.3 of the NRC Lost Creek SEIS, and no changes have since been made to the program.

## **2.2.4 Reclamation**

Reclamation practices under the Proposed Action would be the same as were assessed in Section 2.1.5 of the BLM Lost Creek EIS and Sections 2.1.1.1.4 and 2.1.1.1.5 of the NRC Lost Creek SEIS. Reclamation includes groundwater restoration, well plugging and abandonment, radiological decontamination and equipment removal, and decommissioning and surface reclamation. The following describes each reclamation activity that would be conducted under the Proposed Action.

### ***2.2.4.1 Groundwater Restoration***

After uranium recovery operations in each mine unit conclude, the Applicant would be required to restore the water quality in the production zone to meet groundwater restoration standards designed to protect groundwater quality and groundwater use in surrounding aquifers. Groundwater restoration is intended to reverse the effects of ISR by removing constituents that the lixiviant mobilized and reestablishing the reducing geochemical environment that was present prior to lixiviant injection. Groundwater restoration would commence once the Applicant determines that uranium recovery is no longer technically, economically, or operationally feasible within each mine unit. Typically, groundwater restoration would not begin in a mine unit until all production flow has ceased; however, since uranium ISR is progressive, restoration at one header house could occur contemporaneously with production from another header house in the same mine unit. Groundwater restoration activities under the Proposed Action would be the same as those authorized for the Lost Creek ISR Project, which are described in Section 2.1.5.1 of the BLM Lost Creek EIS and Section 2.1.1.1.4 of the NRC Lost Creek SEIS.

Groundwater restoration standards that would apply to new and existing mine units under the Proposed Action are found in NRC regulations in 10 CFR Part 40, Appendix A, Criterion 5B(5). These standards require restoration of the production zone groundwater to (i) the NRC-approved baseline levels (pre-operational background level prior to uranium ISR), (ii) the value in Table 5C of 10 CFR Part 40, Appendix A (generally consistent with EPA's maximum contaminant levels for drinking water) if the approved baseline level is less than that value, or (iii) an alternate concentration limit (ACL) approved by the NRC. NRC could only approve an ACL through a license amendment after determining it to be as low as reasonably achievable (ALARA) and that it would not pose a potential hazard to human health or the environment. Wyoming statutes and regulations also require restoring groundwater to the pre-operational class of use, which would be determined by comparing the baseline water quality with use categories defined by WDEQ-WQD (WDEQ-LQD 2013).

Groundwater restoration would be conducted in up to four stages for each mine unit: groundwater transfer, groundwater sweep, groundwater treatment, and groundwater recirculation. Following groundwater restoration, stability monitoring would be conducted for at least 1 year and until the Applicant demonstrates that the production zone groundwater is stable (i.e., there are no statistically increasing trends). A final restoration report would be submitted to NRC and WDEQ-LQD for regulatory approval.

#### ***2.2.4.2 Well Plugging and Abandonment***

All production, injection, and monitor wells would be plugged and abandoned after approval of groundwater restoration by NRC and WDEQ-LQD. BLM would be notified prior to plugging and abandoning wells located on BLM-managed surface, which includes all but one section of the project area (the State of Wyoming owns the surface and subsurface minerals in Section 16, T25N, R92W). Wells would be plugged and abandoned according to State of Wyoming regulations. Applicable regulations include Wyoming Statutes § 35-11-404, WDEQ-LQD Rules and Regulations Noncoal Chapter 11, WDEQ-WQD Rules and Regulations Chapter 26, and Wyoming State Engineer's Office Groundwater Regulations and Instructions Part III, Chapter IV. Well plugging and abandonment procedures under the Proposed Action would be the same as described in Section 2.1.1.1.5.2 of the NRC Lost Creek SEIS. They include plugging the well casing with a grouting gel, cutting the well casing off below the ground level, and placing a concrete plug in the top of the casing. A steel plate would be placed in the concrete plug to identify the WDEQ permit number, well identification number, and date of abandonment. Well site reclamation would follow plugging and abandonment as described in Section 2.2.4.4. After well site reclamation, the Applicant would request a joint BLM and WDEQ-LQD inspection to verify proper plugging, filling of any mud pits, contouring of the site, and seeding (BLM 2016c). Written abandonment reports would be completed and sent to the Wyoming State Engineer's Office, WDEQ-LQD, and WDEQ-WQD.

#### ***2.2.4.3 Decommissioning, Radiological Decontamination, and Equipment Removal***

Decommissioning would include conducting radiological surveys of facilities, equipment, and other materials, and removing such items for reuse, decontamination, or disposal. Areas requiring decommissioning under the Proposed Action would include the mine units (wellheads, wellfield piping, header houses, and associated equipment), pipelines, power lines, UIC well pads, and secondary and two-track access roads. Procedures for decommissioning, decontamination, and

building and equipment removal are described in Section 2.1.1.1.5 of the NRC Lost Creek SEIS, and no changes have since been made to the procedures.

The Class I and Class V UIC wells would either be transferred to another owner or plugged and abandoned. Transfer of the UIC wells could include transfer for injection of wastes by another entity or conversion of the wells for other uses, either of which would require approval by the WDEQ-WQD Director and Administrator. It is more likely that the Class I and Class V UIC wells would be plugged and abandoned, in which case the UIC permits specify that the Applicant must follow the procedures in WDEQ-WQD Rules and Regulations Chapter 26. The general well plugging procedures would involve removing downhole equipment, filling the well with impervious sealing material such as neat cement, sand-cement grout, concrete, or bentonite grout from the bottom of the well up, and installing a cement plug with permanent markings at the surface. Well site reclamation would be conducted following plugging and abandonment and would include removal of surface equipment, surface reclamation and reseeding, closure of on-site storage ponds, and removal of underground piping. UIC well site reclamation would follow requirements contained in the UIC permit as well as those in 43 CFR § 3809.420(b)(3).

#### ***2.2.4.4 Surface Reclamation***

At the completion of decommissioning, all of the disturbed lands would be returned to the pre-operational land use (i.e., livestock grazing and wildlife habitat) (LCI 2010a). The objective of surface reclamation would be to return the land to the condition that existed prior to uranium ISR activities, in accordance with BLM and WDEQ-LQD requirements. Surface reclamation procedures under the Proposed Action would be the same as those authorized for the Lost Creek ISR Project. Surface reclamation procedures are described in Section 2.1.5.2 of the BLM Lost Creek EIS and Section 2.1.1.1.5 of the NRC Lost Creek SEIS, and no changes have since been made to the procedures. Surface reclamation includes surface preparation, regrading, topsoil replacement, and revegetation. In general, surface reclamation would be accomplished by regrading disturbed areas to approximate pre-operational contours and drainage patterns, replacing topsoil in accordance with the depths and acreages salvaged during construction, and seeding with an approved seed mix that supports the post-operational land uses.

Revegetation success would be evaluated for at least five grazing seasons in accordance with standards that are consistent with the Wyoming BLM Reclamation Policy (BLM 2012c) in that they are designed to establish a self-perpetuating, native plant community (based on BLM and WDEQ-LQD approval of the seed mix). Compliance and effectiveness monitoring would be conducted in accordance with the BLM's approved monitoring protocols.

#### **2.2.5 Financial Assurance**

Prior to the initiation of activities under the Proposed Action, the Applicant would be required to establish and maintain appropriate financial assurance (such as a cash bond) to cover the costs of a third party conducting groundwater restoration, radiological decontamination, decommissioning, and surface reclamation. The financial assurance would be used to complete a portion or all reclamation activities if the Applicant were unable to do so.

Financial assurance is required by BLM, WDEQ, and NRC regulations. BLM regulations under 43 CFR § 3809.500 require that the Applicant provide financial assurance (guarantee) for operations conducted under a Plan Of Operations. In addition, WDEQ requires financial assurance

under the authority of Wyoming Statutes § 35-11-417, and NRC requires financial assurance under the authority of 10 CFR Part 40, Appendix A, Criterion 9. Through an MOU between BLM and WDEQ-LQD (BLM 2003), BLM has given WDEQ-LQD primacy for establishing the financial assurance amount for operations covered under 43 CFR § 3809.500. However, BLM reviews financial assurance estimates and retains the authority to require additional financial assurance if it determines that the reclamation cost estimate is inadequate.

The Applicant currently has in place financial assurance to cover costs of reclaiming lands and groundwater currently disturbed at the Lost Creek ISR Project. Reclamation costs for additional disturbance would be added to the financial assurance prior to constructing facilities under the Proposed Action. As required by WDEQ-LQD Permit to Mine PT788 and NRC License SUA-1598, the financial assurance would be reevaluated, and the amount updated annually to reflect any approved expansions or additional disturbance planned for the upcoming year, as well as any reclamation completed during the preceding year. Updates to the financial assurance estimate would be reviewed and approved by NRC and WDEQ-LQD. Under the MOU between BLM and WDEQ-LQD, BLM would also review the annual financial assurance updates and concur with the proposed updates or recommend modifications to WDEQ-LQD (BLM 2003). The financial assurance instrument for the Proposed Action would be redeemable by both the State of Wyoming and the Secretary of the Interior (BLM).

## **2.2.6 Effluents and Waste Management**

Activities conducted under the Proposed Action would produce airborne emissions, liquid wastes, and solid wastes. The effluents and the control systems used to manage and dispose of the effluents are the same as were assessed in the BLM Lost Creek EIS, NRC Lost Creek SEIS, and the NRC Class V UIC Well Amendment EA (NRC 2016a). The effluents and control systems are discussed below.

### ***2.2.6.1 Non-Radioactive Airborne Effluents***

Non-radioactive airborne effluents would be generated from fugitive dust and combustion engine exhaust. Fugitive dust and combustion emission sources and control techniques are described in Section 2.1.4.4 of the BLM Lost Creek EIS and Section 2.1.1.1.6.1 of the NRC Lost Creek SEIS.

The WDEQ-AQD is responsible for managing the State's air resources. Under the WDEQ-AQD permitting program, any entity planning to construct, modify, or use a facility capable of emitting air contaminants must obtain an air quality permit. The Lost Creek ISR Project is covered under WDEQ-AQD Permit CT-7896. This permit would need to be modified to include activities under the Proposed Action. Condition 10 of Permit CT-7896 would require the Applicant to control fugitive dust using chemical dust suppressants (e.g., magnesium chloride) on certain access roads. Dust suppressant would need to be applied on a schedule sufficient to control fugitive dust from vehicular traffic (WDEQ-AQD 2010).

### ***2.2.6.2 Radioactive Airborne Effluents***

The primary potential airborne radioactive effluent would be radon gas and its decay products. Radon gas sources and control techniques under the Proposed Action are the same as were assessed for the Lost Creek ISR Project. Section 2.1.4.4 of the BLM Lost Creek EIS and Section 2.1.1.1.6.1 of the NRC Lost Creek SEIS describe the radon sources and control techniques, and no changes

have since been made to the source or control techniques. Additional information on potential radon emissions and the evaluation of potential impacts are provided in Section 4.15.

### ***2.2.6.3 Liquid and Solid Waste Management***

Liquid and solid waste generated under the Proposed Action would be managed according to whether the waste meets the NRC definition of byproduct material. Byproduct material, as defined in 10 CFR § 40.4 and Section 11e.(2) of the AEA, includes discrete surface wastes generated by the ISR process. Byproduct material is also referred to as 11e.(2) byproduct material or AEA-regulated waste.

Non-AEA-regulated wastes are those that are not closely associated with the ISR process such as native groundwater recovered during well installation, construction debris, and waste petroleum products and chemicals. These wastes are also referred to as non-11e.(2) byproduct material or non-byproduct material.

The Applicant states that few deviations from the liquid and solid waste storage, treatment, and disposal methods authorized for the Lost Creek ISR Project would be implemented under the Proposed Action (LCI 2017a). This section describes proposed changes in the liquid and solid waste management programs. It also describes additional waste generated from the dryers that was not evaluated in the NRC Lost Creek SEIS or BLM Lost Creek EIS. Since the publication of those documents in 2012, NRC issued a license amendment for rotary vacuum dryer installation at the Lost Creek ISR Project, and dryers have been installed. NRC evaluated the waste produced by the addition of the drying circuit in the NRC Dryer Amendment EA (NRC 2013b) and the disposal of treated liquid waste in the NRC Class V UIC Well Amendment EA (NRC 2016a). Both EAs resulted in a Finding of No Significant Impact (FONSI) and are incorporated by reference.

#### Liquid Wastes

The major sources of AEA-regulated liquid waste generated under the Proposed Action would include production and groundwater restoration bleed, groundwater restoration wastewater, wastewater from injection and production well work-over and enhancement operations in the wellfield, wastewater from spills and leaks, and liquid process waste from the Plant. The Applicant states that there would not be any changes in the liquid waste generation rates for new and expanded mine units under the Proposed Action; however, there would be a slight increase in liquid waste from the Plant due to the increase in the maximum annual yellowcake production rate (LCI 2017a). As summarized in Section 2.1.1.1.6.2 (Liquid Wastes) of the NRC Lost Creek SEIS, the estimated AEA-regulated liquid waste during operations would be approximately 60 to 90 gpm, increasing to about 130 gpm during concurrent operations and groundwater restoration. According to the Applicant, approximately 10 gpm of this is Plant process water (LCI 2011b). Considering the maximum annual increase from 2 million to 2.2 million pounds of yellowcake under the Proposed Action, BLM estimates that the liquid waste generation rate would increase by about 1 gpm. In addition, AEA-regulated liquid waste associated with the drying process would include condensate water and sealed yellowcake drum washdown water. According to the NRC Dryer Amendment EA, each batch of yellowcake dried yields about 250 to 500 gallons of condensate, most of which is reused. In addition, about 5 to 10 gallons of water are used to wash down each sealed drum, with most of that water also collected and reused. An estimated five dryer batches would be completed per week, each yielding four to seven drums. Based on the above information, the additional AEA-regulated liquid waste resulting from the increase in the

maximum annual production rate and from dryer operations would minimally affect the overall range of 60 to 90 gpm estimated during operations.

AEA-regulated liquid waste that cannot be treated to meet requirements for Class V UIC well disposal would be disposed of in Class I UIC wells (LCI 2017c). As described in Section 2.2.1.2, five Class I UIC wells are permitted within the existing Lost Creek ISR Project area, of which three have been constructed and are operating. Under the Proposed Action, the Applicant would add up to three Class I UIC wells within the proposed LCE expansion area. In addition to the permitted and proposed Class I UIC wells, the Applicant has received approval from WDEQ-WQD, WDEQ-LQD, and NRC to install and operate two Class V UIC wells, which allow for the on-site disposal of up to 200 gpm of treated wastewater (refer to Section 2.2.1.2). The Applicant currently operates two Class V UIC wells near the Plant. Based on the revised water balances for the Proposed Action (LCI 2017c), the disposal capacity gained from the addition of the Class V UIC wells would reduce the maximum required disposal capacity of the Class I UIC wells from 130 to 70 gpm. According to UIC Permit 13-409, each Class I UIC well has a maximum injection rate of 50 gpm, giving an overall permitted disposal capacity of 400 gpm for all eight potential Class I UIC wells. The actual injection into the three constructed Class I UIC wells is between 3 and 11 gpm per well, which may increase if the proposed modification to Permit 13-409 is approved by WDEQ-WQD to add the Lower Battle Spring Formation as a target for the injected waste.

Non-AEA-regulated liquid waste would include TENORM (technologically enhanced naturally occurring radioactive material), small quantities of liquid hazardous waste (e.g., organic solvents, paints, and chemical waste), waste petroleum products, and stormwater runoff. With the exception of TENORM, non-AEA-regulated liquid waste handling and disposal methods are the same as those assessed for the Lost Creek ISR Project. These methods are described in Section 2.1.4.4 of the BLM Lost Creek EIS and Section 2.1.1.1.6.2 of the NRC Lost Creek SEIS.

TENORM includes drill cuttings and fluids from the drilling of delineation boreholes, construction and development of monitor wells, and construction and development of production and injection wells prior to operation. TENORM would be disposed of in mud pits constructed adjacent to the wells. Upon completion of drilling, the TENORM would be allowed to dry and then covered with native soil and revegetated (LCI 2009). Another type of TENORM is groundwater recovered prior to mining during aquifer tests. As described in Section 2.1.4.4 of the BLM Lost Creek EIS, this native groundwater would not be exposed to any mining process or chemicals and would be discharged to the surface under the provisions of a temporary WYPDES permit, in a manner that mitigates erosion, or reused in drilling.

### Solid Wastes

Similar to the liquid waste, solid waste associated with the Proposed Action would include both AEA-regulated and non-AEA-regulated wastes. AEA-regulated solid waste would include:

- scale and sludge from equipment maintenance;
- contaminated soil, contaminated solids from wells, and contaminated PPE;
- spent resin and other materials resulting from ongoing Plant operations; and
- contaminated materials and equipment from reclamation that cannot be decontaminated to NRC unrestricted release standards.

Non-AEA-regulated solid waste would include construction debris, solid hazardous waste, and decontaminated material and equipment (LCI 2011b).

The Applicant states that there would not be any changes in the solid waste generation rates for new and expanded mine units and ongoing Plant operations conducted under the Proposed Action compared to what was evaluated for the Lost Creek ISR Project (LCI 2017a). Solid waste handling and disposal methods are described in Section 2.1.1.6.3 of the NRC Lost Creek SEIS, and no changes have since been made to the methods. In addition, the drying process would also generate AEA-regulated and non-AEA-regulated solid wastes (NRC 2013b). Bag filters from the bag house operation of the dryer process are considered AEA-regulated solid waste. Other solid waste generated from the drying process includes a minor amount of paint chip-sized particles from the washdown of the filled yellowcake drums, which are considered non-AEA-regulated solid waste.

The Applicant has an agreement with a licensed disposal facility to accept its solid 11e.(2) byproduct material (LCI 2013a). The Applicant has requested that the agreement remain confidential, and the location of the disposal facility has not been released to the public. The only existing facility in Wyoming that is licensed by NRC to dispose of 11e.(2) byproduct material is the Pathfinder-Shirley Basin site, which is located approximately 125 road miles northeast of the Lost Creek ISR Project. Other potential disposal sites include the Rio Algom Ambrosia Lake site near Grants, New Mexico; the Energy Solutions site in Clive, Utah; the White Mesa site near Blanding, Utah; and the Waste Control Specialists site near Andrews, Texas.

### **2.2.7 Schedule**

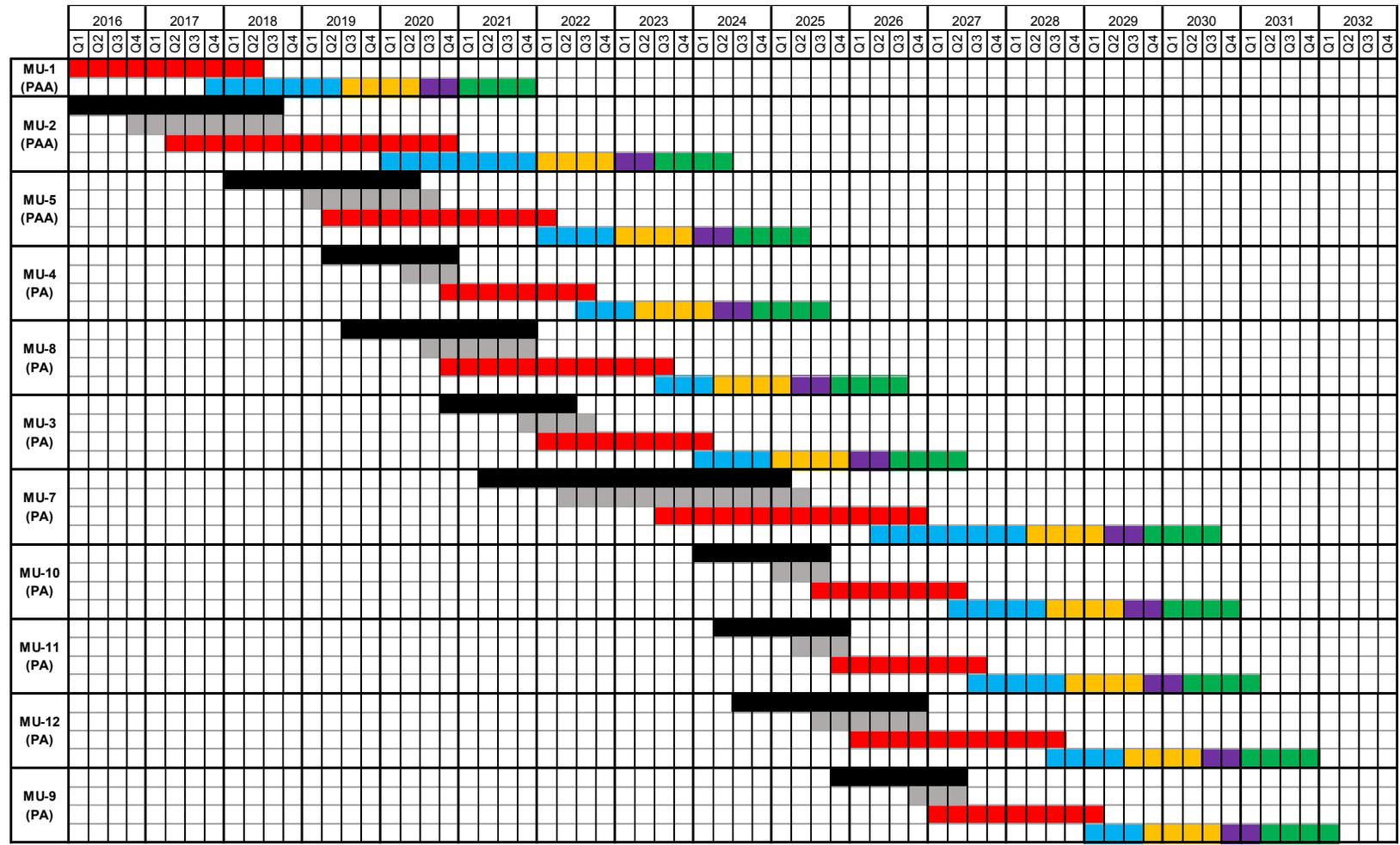
Figure 2.2-2 depicts the estimated construction, operation, and reclamation schedule for the mine units associated with the Lost Creek ISR Project and the Proposed Action. Due to the progressive nature of uranium ISR, significant overlap is anticipated between operation and groundwater restoration at various mine units, since these phases would be conducted concurrently. Decommissioning would be ongoing, as mine units receive regulatory approval of successful groundwater restoration.

The anticipated remaining duration of the Lost Creek ISR Project is approximately 6.5 years. This includes approximately 4 years of uranium recovery operations followed by 2.5 years until groundwater restoration, decommissioning, and reclamation are complete in the last mine unit. Based on current resource estimates, the Proposed Action would extend the operating life of the Lost Creek ISR Project by 6 to 8 years.

### **2.2.8 Existing Monitoring Plans**

Monitoring programs for the existing Lost Creek ISR Project have been developed by the Applicant and approved by BLM, WDEQ, and NRC to protect worker health and safety, members of the public, and the environment. Table 3 of the ROD for the BLM Lost Creek EIS lists the monitoring required by various regulations and permits (BLM 2012b). Required monitoring includes, but is not limited to, air quality, historic and cultural resources, equipment, groundwater, surface water, public and occupational health, transportation, incidents, soil, vegetation, and wildlife. These monitoring programs would be expanded, as applicable, to accommodate uranium ISR activities within the proposed LCE expansion area and additional mine units within the existing Lost Creek ISR Project area.

Figure 2.2-2. Proposed Action Schedule



- Drilling: Delineation, Well Installation, and Pump Test:
- Construction: Infrastructure and Surface Wellfields
- Operation
- Groundwater Restoration
- Groundwater Stability Monitoring
- Regulatory Approval
- Decommissioning and Surface Reclamation

Note:  
 PAA - Previously Approved Action, PA - Proposed Action

Source: LCI 2017a

## **2.3 Alternatives**

As required by NEPA, this section describes alternatives to the Proposed Action, including alternatives evaluated in detail and reasonable alternatives considered but not carried forward for detailed analysis.

### **2.3.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. The No Action Alternative would result in the Applicant not constructing or operating mine units within the project area, other than those currently approved by BLM, NRC, and WDEQ within the existing Lost Creek ISR Project area. No uranium would be recovered from the KM Horizon. The maximum annual production rate would not be increased from 2 to 2.2 million pounds of yellowcake. No buildings, access roads, wellfields, pipelines, or Class I UIC wells would be constructed within the proposed LCE expansion area.

The No Action Alternative is included to provide a basis for comparing and evaluating the potential impacts of other alternatives, including the Proposed Action, with ongoing activities at the Lost Creek ISR Project as currently authorized. Under the No Action Alternative, construction, operation, groundwater restoration, and reclamation of the Lost Creek ISR Project would continue under the currently authorized BLM Plan of Operations, NRC License SUA-1598, and WDEQ-LQD Permit to Mine PT788. Uranium ISR would take place within three mine units targeting the HJ Horizon within the existing Lost Creek ISR Project area. Recovered uranium would be converted to yellowcake at the Plant, which would include dryer operations authorized by NRC in 2013. Up to five Class I UIC wells and two Class V UIC wells would be used to dispose of AEA-regulated liquid waste. The cumulative surface disturbance over the life of the Lost Creek ISR Project would be approximately 345 acres. No additional disturbance would occur within the proposed LCE expansion area under the No Action Alternative.

### **2.3.2 Action Alternatives**

#### ***2.3.2.1 Alternative 1 (Exclusion of KM Horizon)***

As described in Section 1.7 of this EIS, one of the primary issues of concern identified during scoping is potential impact on groundwater quality. With respect to this issue, the primary difference between the Proposed Action and the currently authorized Lost Creek ISR Project is the Applicant's proposal to conduct uranium ISR within a deeper mineralized sandstone, the KM Horizon. Under this alternative, NRC and BLM would authorize new HJ Horizon mine units within the project area but would not authorize uranium ISR within the KM Horizon in order to protect the groundwater quality in the underlying L Horizon.

Alternative 1 (Exclusion of the KM Horizon) would be the same as the Proposed Action except that no KM Horizon mine units and associated access roads, pipelines, and power lines would be developed within the project area. This includes two mine units within the existing Lost Creek ISR Project area (MU3 and MU12) and three mine units within the proposed LCE expansion area (MU8, MU9, and MU11). Under this alternative, the new HJ Horizon mine units depicted on maps 2.2-1 and 2.2-2 would be developed along with associated access roads, pipelines, and power lines. Additional Class I UIC wells and associated infrastructure would also be constructed within

the proposed LCE expansion area, the maximum annual production rate would be increased from 2 to 2.2 million pounds of yellowcake, and the maximum authorized toll milling amount would increase to 2.2 million pounds per year. As presented in table 2.1-1, this alternative would add up to 1,276 acres of disturbance within the project area over the life of the project. Based on current resource estimates, this alternative would extend the operating life of the Lost Creek ISR Project by 3 to 4 years, or about 3 to 4 years less than the Proposed Action.

### **2.3.3 Alternatives Considered but Eliminated from Detailed Analysis**

Section 2.3.3 of the BLM Lost Creek EIS and Section 2.2 of the NRC Lost Creek SEIS considered alternatives that were eliminated from detailed analysis as either unreasonable or impractical because of technical, legal, or policy considerations. These previous evaluations are incorporated by reference. Alternatives that were previously considered but eliminated and that are applicable to this EIS include:

- Portable drill pits and closed loop drilling systems
- Alternative mining methods
- Alternative lixivants

Since these alternatives have been previously considered and eliminated from detailed analysis, they are not repeated in this EIS.

The BLM also considered an Additional Mitigation Measures Alternative that consisted of the Proposed Action with additional mitigation measures that would not be considered requirements imposed on the Applicant but that could potentially reduce environmental impacts. This alternative was eliminated from detailed analysis, since BLM's authority to impose additional mitigation measures is limited to those required to ensure that the Applicant complies with the performance standards in 43 CFR § 3809.420 and other federal and state regulations.

No additional alternatives were identified by cooperating agencies or through scoping.

### **2.3.4 Comparative Summary of Impacts**

This EIS uses a standard of significance for assessing environmental impacts, as described in the NRC guidance NUREG-1748 (NRC 2003), and consistent with that used in the NRC Lost Creek SEIS. Impacts significance levels are summarized as follows:

**SMALL:** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource considered.

**MODERATE:** The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource considered.

**LARGE:** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource considered.

Table 2.3-1 presents a comparative summary of the potential environmental impacts of the Proposed Action and each alternative by resource and includes a reference to the appropriate sections. Chapter 4 includes detailed descriptions of the potential environmental impacts.

**Table 2.3-1. Comparison of Overall Potential Environmental Impacts**

<b>Resource</b>	<b>No Action Alternative</b>	<b>Proposed Action</b>	<b>Exclusion of KM Horizon (Alternative 1)</b>
Land Use	SMALL 4.1.1	SMALL 4.1.2	SMALL 4.1.3
Transportation	SMALL 4.2.1	SMALL 4.2.2	SMALL 4.2.3
Geology	SMALL 4.3.1	SMALL 4.3.2	SMALL 4.3.3
Soils	SMALL 4.4.1	SMALL 4.4.2	SMALL 4.4.3
Surface Water	SMALL 4.5.1	SMALL 4.5.2	SMALL 4.5.3
Groundwater	SMALL 4.6.1	SMALL 4.6.2	SMALL 4.6.3
Vegetation	SMALL 4.7.1	SMALL 4.7.2	SMALL 4.7.3
Wildlife	SMALL to MODERATE 4.8.1	SMALL to MODERATE 4.8.2	SMALL to MODERATE 4.8.3
Wild Horses	SMALL 4.9.1	SMALL 4.9.2	SMALL 4.9.3
Air Quality	SMALL 4.10.1	SMALL 4.10.2	SMALL 4.10.3
Noise	SMALL 4.11.1	SMALL 4.11.2	SMALL 4.11.3
Historic, Cultural, and Paleontological Resources	SMALL 4.12.1	SMALL 4.12.2	SMALL 4.12.3
Visual and Scenic Resources	SMALL 4.13.1	SMALL 4.13.2	SMALL 4.13.3
Socioeconomics	SMALL 4.14.1	SMALL 4.14.2	SMALL 4.14.3
Public and Occupational Health	SMALL 4.15.1	SMALL 4.15.2	SMALL 4.15.3
Waste Management	SMALL 4.16.1	SMALL 4.16.2	SMALL 4.16.3
Environmental Justice	No Impacts 4.17.1	No Impacts 4.17.2	No Impacts 4.17.3

### 3.0 AFFECTED ENVIRONMENT

This chapter describes the affected environment for each of the resource areas potentially impacted by the Proposed Action and alternatives. These resources are present within and surrounding the project area and provide the basis to address substantive issues of concern brought forward during internal and public scoping. The information presented in this chapter provide quantitative data and spatial information, where appropriate, to serve as a baseline for comparison of the direct, indirect, and cumulative impacts of the Proposed Action and alternatives.

#### 3.1 Land Use

The primary land uses within the project area include livestock grazing, wildlife habitat, dispersed recreation, mineral development, and infrastructure. There are no farms, residences, or population centers present. Agricultural production within the project area and vicinity is limited to livestock grazing, which is managed in accordance with BLM grazing regulations (43 CFR Part 4100). Map 3.1-1 depicts the land use within and surrounding the project area.

The following documents describe land use in the existing Lost Creek ISR Project area and vicinity, and these sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.1, pp. 3.1-1 through 3.1-20 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.2, pp. 3-1 through 3-5 (NRC 2011)

The following sections supplement the referenced documents with updated land use discussions and a summary of land use within the project area.

##### 3.1.1 Livestock Grazing

The project area includes portions of three BLM grazing allotments: Stewart Creek, Cyclone Rim, and Arapahoe Creek (formerly known as Green Mountain), as depicted on map 3.1-1. Table 3.1-1 summarizes the grazing allotment area and animal unit months (AUMs) associated with each allotment. Livestock grazing relies primarily on water wells for water, as natural water sources do not occur in or near the project area and there are a limited number of reservoirs within the project area.

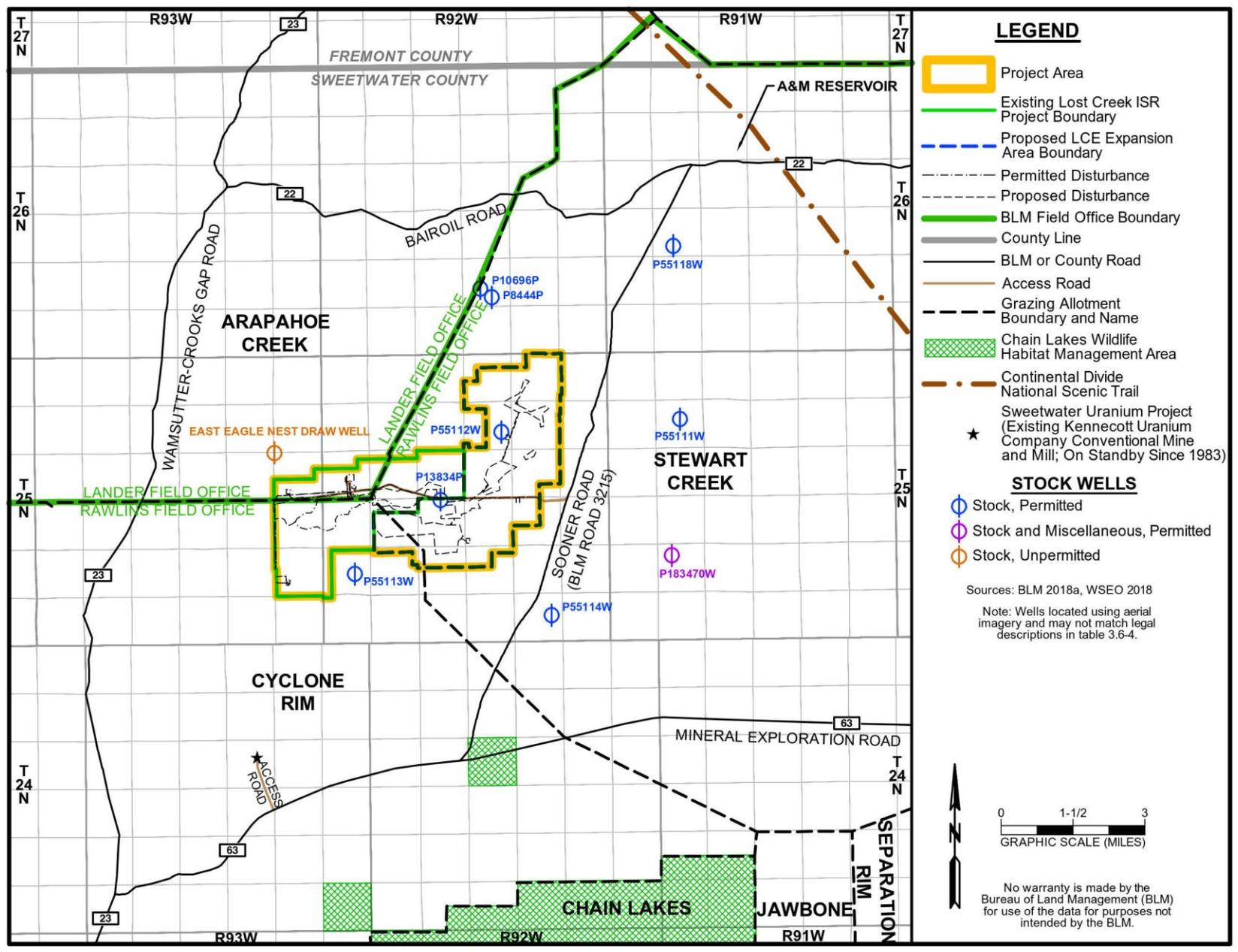
**Table 3.1-1. Grazing Allotments**

BLM Grazing Allotment	Total Area (acres)	Area within Project Area (acres)	Available AUMs <sup>1</sup> within Allotment
Stewart Creek	177,616	6,612	9,753
Cyclone Rim	308,608	2,523	42,975
Arapahoe Creek	258,721	870	28,507

<sup>1</sup> An AUM is a common unit of measure defined as the amount of forage needed to sustain one mature cow and calf or five sheep for one month. Source: BLM 2017a

Since the portion of the Arapahoe Creek grazing allotment occupied by the project area is much less than 1 percent, this allotment is not considered further in this EIS analysis.

Map 3.1-1. Land Use



### **3.1.2 Land Management Areas**

Section 3.1.1.2 of the BLM Lost Creek EIS describes the following five land management areas (referred to as Wildlife Habitats in the BLM Lost Creek EIS) based on proximity to the project area and regulatory requirements:

- Wild Horse Management Areas or Herd Management Areas (HMAs)
- Wilderness Areas
- Wilderness Study Areas (WSAs)
- Wildlife Habitat Management Areas (WHMAs)
- Greater Sage-Grouse Core Areas

Wild horses and HMAs are discussed in detail in Section 3.9 of this EIS. Greater sage-grouse core areas and WHMAs are discussed in more detail in Sections 3.8 of this EIS. The Chain Lakes WHMA is the only WHMA in Sweetwater County. The closest portion of this WHMA is approximately 3.5 miles south of the project area (map 3.1-1) and is designated as pronghorn habitat. There are no other WHMAs within 5 miles of the project area. Two WSAs are within 20 miles of the project area; the Red lakes WSA is approximately 18 miles west of the and the Ferris Mountains WSA is approximately 18 miles northeast of the project area. There are no wilderness areas within 50 miles of the project area.

### **3.1.3 Dispersed Recreation**

As described in Section 3.1.1.3 of the BLM Lost Creek EIS, regional dispersed recreation includes sightseeing, wild horse viewing, hunting, hiking, picnicking, rock hounding, horseback riding, mountain biking, camping, and off-highway vehicle use.

Section 3.1.1.3 of the BLM Lost Creek EIS describes the Recreation Opportunity Spectrum used by BLM to identify and characterize recreational opportunities on public lands. The existing Lost Creek ISR Project area is considered Roaded Natural to Rural. Due to the lack of differences of distinguishing physical, social, and managerial conditions between the existing Lost Creek ISR Project area and the project area evaluated in this EIS, the project area is considered Roaded Natural to Rural.

### **3.1.4 Mineral Development**

Mineral development near the project area includes uranium, oil, natural gas, coal bed natural gas (CBNG), and coal. The BLM Lost Creek EIS and NRC Lost Creek SEIS provide detailed information on mineral development in the area. The following discussion summarizes information in the referenced documents and provides updated information.

#### ***3.1.4.1 Uranium***

Other than the Lost Creek ISR Project, the closest uranium project is Kennecott Uranium Company's Sweetwater Project, approximately 3 miles south-southwest of the project area. The Sweetwater Project is a conventional uranium recovery mine and mill that was operated from 1981 to 1983 and has been on standby since 1983 (NRC 2015a). The only other licensed or proposed

uranium recovery facilities within 50 miles of the project area are the Cameco Resources Gas Hills Project and the Energy Fuels Inc. Sheep Mountain Uranium Project. The Gas Hills Project is approximately 40 miles north of the project area. It is a licensed satellite ISR facility to the Smith Ranch-Highland facility, which is also owned by Cameco Resources (NRC 2015b). As of August 2017, the Gas Hills Project remains non-operational (Cameco 2017). The Sheep Mountain Uranium Project is approximately 15 miles north of the project area. It is a proposed conventional mine with an option for on-site ore processing, which would require an NRC license, or off-site ore processing at the Sweetwater Project (BLM 2016d). The BLM LFO published the Sheep Mountain Project FEIS in 2016 and the Record of Decision in January 2017 (BLM 2016d, 2017b).

Other historical and proposed uranium projects are north of the project area in the Gas Hills Uranium District. As of the date of this EIS, all of these projects are either potential conventional or ISR projects, decommissioned projects, or projects undergoing decommissioning.

#### ***3.1.4.2 Oil, Conventional Gas, and CBNG***

All portions of the project area are currently available for oil and gas leasing, and all of the parcels within the project area were nominated and reviewed for inclusion in the June 22, 2017, competitive lease sale (BLM 2017c). Since the entire project area is located within a Priority Habitat Management Area (PHMA) for Greater sage-grouse habitat, as identified in the ARMPA (BLM 2015a), BLM exercised its discretion and determined that it was appropriate to defer these parcels from the set of the preliminary parcels analyzed in detail in the EA for the June 2017 oil and gas lease sale, and the parcels were not included in the lease sale. These parcels could be leased in the future.

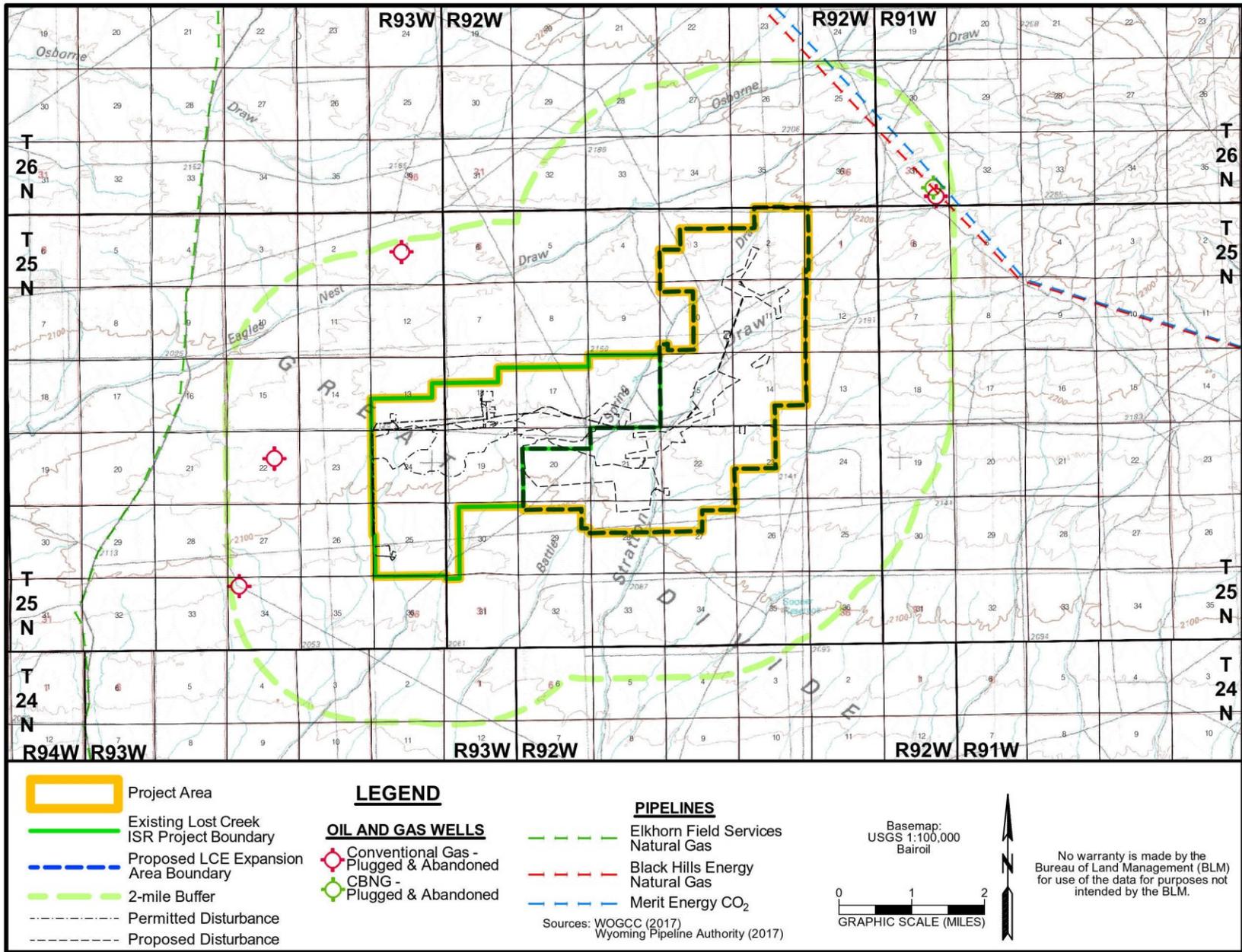
There are no active oil and gas leases within the project area (BLM 2017d), and there are no producing oil wells within 2 miles of the project area. As depicted on map 3.1-2, there are four conventional gas wells and one CBNG well within 2 miles of the project area, but all of these wells have been plugged and abandoned (WOGCC 2017). The nearest producing oil fields are the Lost Soldier-Wertz fields located near Bairoil, approximately 11 miles east-northeast of the project area. These fields produce from the Pennsylvanian Tensleep Sandstone and deeper formations at depths of approximately 5,000 to 8,000 feet. In 2016, approximately 1.0 million barrels of oil and 32 million cubic feet of natural gas were produced from Lost Soldier field, and the Wertz field produced approximately 0.5 million barrels of oil and 22 million cubic feet of natural gas (WOGCC 2017). Hydrogen sulfide (H<sub>2</sub>S) is present in the water, oil, and gas mixture at the Lost Soldier and Wertz oil fields, but risk to the general public is low (BLM 1985).

A considerable amount of conventional oil and gas exploration is taking place approximately 2 miles southwest of the project area. It is targeting the Almond Formation in the Mesaverde Group at depths between 8,000 and 12,000 feet (BLM 2016g).

#### ***3.1.4.3 Coal***

The Jim Bridger Mine is located about 46 miles southwest of the project area. It is a surface and underground coal mine operated by Bridger Coal Company. In 2016, it produced 2.4 million tons of coal using surface mining techniques and 1.5 million tons of coal through underground mining. Directly south of the Jim Bridger Mine is the Black Butte Mine, owned by Black Butte Coal Company. In 2016, it produced 2.2 million tons of coal using surface mining techniques (Wyoming Department of Workforce Services ([WDWS] 2016).

Map 3.1-2. Oil and Gas Wells



### **3.1.5 Infrastructure**

Transportation routes within 50 miles of the project area include an Interstate highway (I-80), a non-interstate U.S. highway (U.S. 287), state highways, county roads, BLM roads, and the Union Pacific railroad. Section 3.2 of this EIS describes additional transportation infrastructure, including BLM roads and the local access roads. The nearest railroad is the Union Pacific railroad, approximately 25 miles south of the project area. The nearest pipelines are depicted on map 3.1-2 and include two natural gas pipelines and one carbon dioxide pipeline, none of which crosses the project area.

### **3.1.6 Wilderness Characteristics**

Section 201 of the FLPMA requires BLM to continually maintain an inventory of public lands and the resources contained within these public lands, including the wilderness characteristics. The project area is located within the Seven Lakes Area (Inventory Unit No. WY-030-409), which was evaluated for wilderness characteristics in 1979 and again in 2012 as part of the BLM Lost Creek EIS. Both evaluations concluded that due to anthropogenic influences, the land did not exhibit wilderness characteristics. Section 3.1.1.6 and Appendix B of the BLM Lost Creek EIS provide detailed information on wilderness characteristics of the area. BLM Manual 6310 (BLM 2012d) was used to update the wilderness characteristics inventory. The October 2015 inventory confirmed that the land still does not exhibit wilderness characteristics.

## **3.2 Transportation**

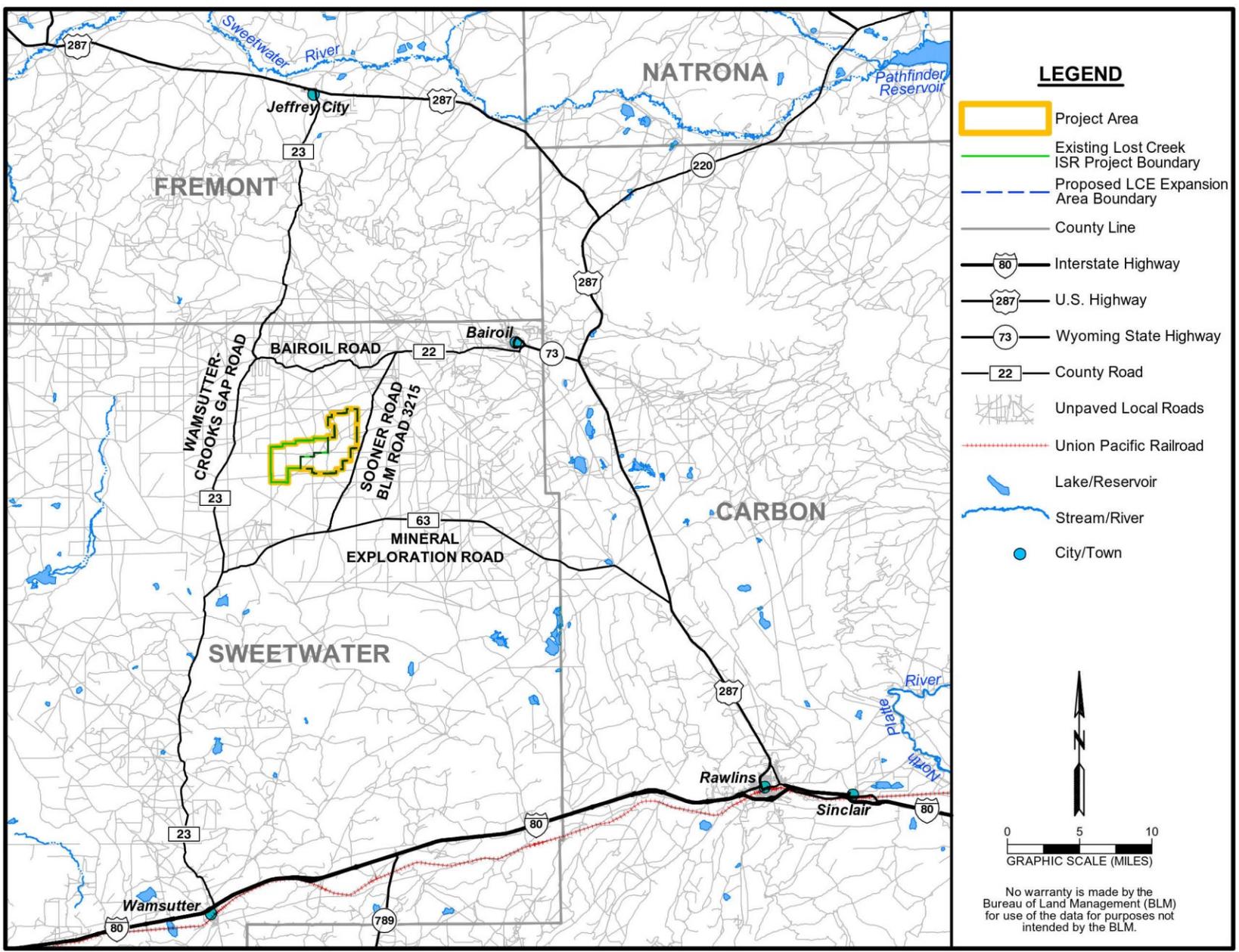
### **3.2.1 Regional and Local Transportation Corridors**

Transportation routes within 50 miles of the project area include an Interstate highway (I-80), a non-interstate U.S. highway (U.S. 287), state highways (WY 220, 73, and 135), county roads (CR 22, 23, and 63), BLM roads, and the Union Pacific railroad. The major transportation corridors used to access the project area include I-80 and U.S. 287 from the south and Wyoming 220 and U.S. 287 from the northeast. Regional and local transportation routes are shown on map 3.2-1.

The Lost Creek ISR Project is accessed via the west access road from Wamsutter-Crooks Gap Road (CR 23) and via the east access road from Sooner Road (BLM 3215). Primary access is from I-80 at Wamsutter. Alternate access from the south is from I-80 at Rawlins. Alternate access from the northeast is from Casper along Wyoming 220, U.S. 287, and Wyoming 73.

Sweetwater County and the Applicant have an agreement regarding maintenance and snow removal operations for county roads near the Lost Creek ISR Project (Sweetwater County and LCI 2012). Sweetwater County has agreed to use reasonable efforts to keep the entire length of the Sweetwater County-portion of the Wamsutter-Crooks Gap Road (CR 23) open to the public and clear of snow and ice. This includes a 15-mile segment of CR 23 that the county maintained prior to the agreement and the previously unmaintained segment of the road. The agreement authorizes the Applicant to maintain and remove snow from CR 23 if it becomes necessary (i.e., if the county is temporarily unable to keep the road open) and to maintain and remove snow from Bairoil Road (CR 22) and Mineral Exploration Road (CR 63) as needed for safe access to the project area.

Map 3.2-1. Regional Transportation Network



### 3.2.2 Traffic on Regional and Local Transportation Corridors

Table 3.2-1 presents the average annual daily traffic (AADT) on the major traffic corridors. Traffic counts are not available for the county or BLM roads. On an average annual basis, traffic on I-80 is about five times higher than that on U.S. 287.

Traffic safety data are presented in table 3.2-2, for the roads with truck data. Wyoming Department of Transportation (WYDOT) requires a traffic accident report if any party is injured or if there is property damage of \$1,000 or more. Accident rate data were calculated by dividing the mean number of truck accidents per year (2008-2016) by the product of the road segment length, the average number of trucks per day, and the number of days per year (365).

**Table 3.2-1. Local and Regional Road Description and Traffic Counts**

Road	Road Surface	Lanes	Speed Limit (mph)	2015 AADT <sup>1</sup> All Vehicles	2015 AADT <sup>1</sup> Trucks
I-80 (Junction U.S. 287/U.S. 30)	Paved	4	75 <sup>2</sup>	14,886	6,532
U.S. 287 (at Lamont/Junction WY 73)	Paved	2	65	2,556	541
WY 220 (Muddy Gap)	Paved	2	65	1,982	787
WY 73	Paved	2	65	239	31
CR 22 (Bairoil Rd)	Gravel	2	Not posted	ND	ND
CR 23 (Wamsutter-Crooks Gap Rd)	Paved/gravel	2	Not posted	ND	ND
CR 63 (Mineral Exploration Rd)	Paved/gravel	2	Not posted	ND	ND
BLM 3215 (Sooner Rd)	Gravel	2	Not posted	ND	ND

<sup>1</sup> Source: WYDOT 2017a; both directions.

<sup>2</sup> Variable speed limits; 75 mph unless otherwise posted.

ND = No Data

**Table 3.2-2. Traffic Safety Data**

Road	Length (miles)	2015 AADT Trucks <sup>1</sup>	Annual Truck Accidents <sup>2</sup>	Accident Period of Record	Truck Accident Rate (Accidents/mile)
I-80 Milepost 57.0 to 280.9	223.9	6,532	398	2008-2016	7.0E-07
U.S. 287 Milepost 0 to 81.0	81.0	541	11	2008-2016	6.6E-07
WY 220 Milepost 57 to 110.9	53.9	787	9	2008-2016	5.8E-07

<sup>1</sup> Source: WYDOT 2017a; both directions.

<sup>2</sup> Source: WYDOT 2017b; annual average accident both directions.

### 3.2.3 Traffic Associated with the Lost Creek ISR Project

Current traffic traveling to and from the Lost Creek ISR Project averages 22 light vehicles (SUVs, vans, or pickups) per day and 0.6 tractor trailer per day (LCI 2017f). The light vehicle traffic is less than the BLM Lost Creek EIS, which estimated a maximum of 33 light vehicles traveling to and from the Lost Creek ISR Project. The current daily tractor trailer traffic is less than the two to three tractors trailers evaluated in the BLM Lost Creek EIS.

### **3.3 Geology and Seismology**

This section describes the geology and seismology of the project area. Except to the extent that new information provided herein updates the previous discussions, the following documents are incorporated by reference:

- BLM Lost Creek EIS – Section 3.3, pp. 3.3-1 through 3.3-5 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.4.1, pp. 3-8 through 3-14 (NRC 2011)

#### **3.3.1 Regional Geology**

As described in Section 3.3.1 of the BLM Lost Creek EIS, the project area is located in the Great Divide Basin, an oval-shaped structural depression in south-central Wyoming encompassing some 3,500 square miles. The Great Divide Basin is bounded on the north by the Wind River Range and Granite Mountains, on the east by the Rawlins Uplift, on the south by the Wamsutter Arch, and on the west by the Rock Springs Uplift.

#### **3.3.2 Stratigraphy**

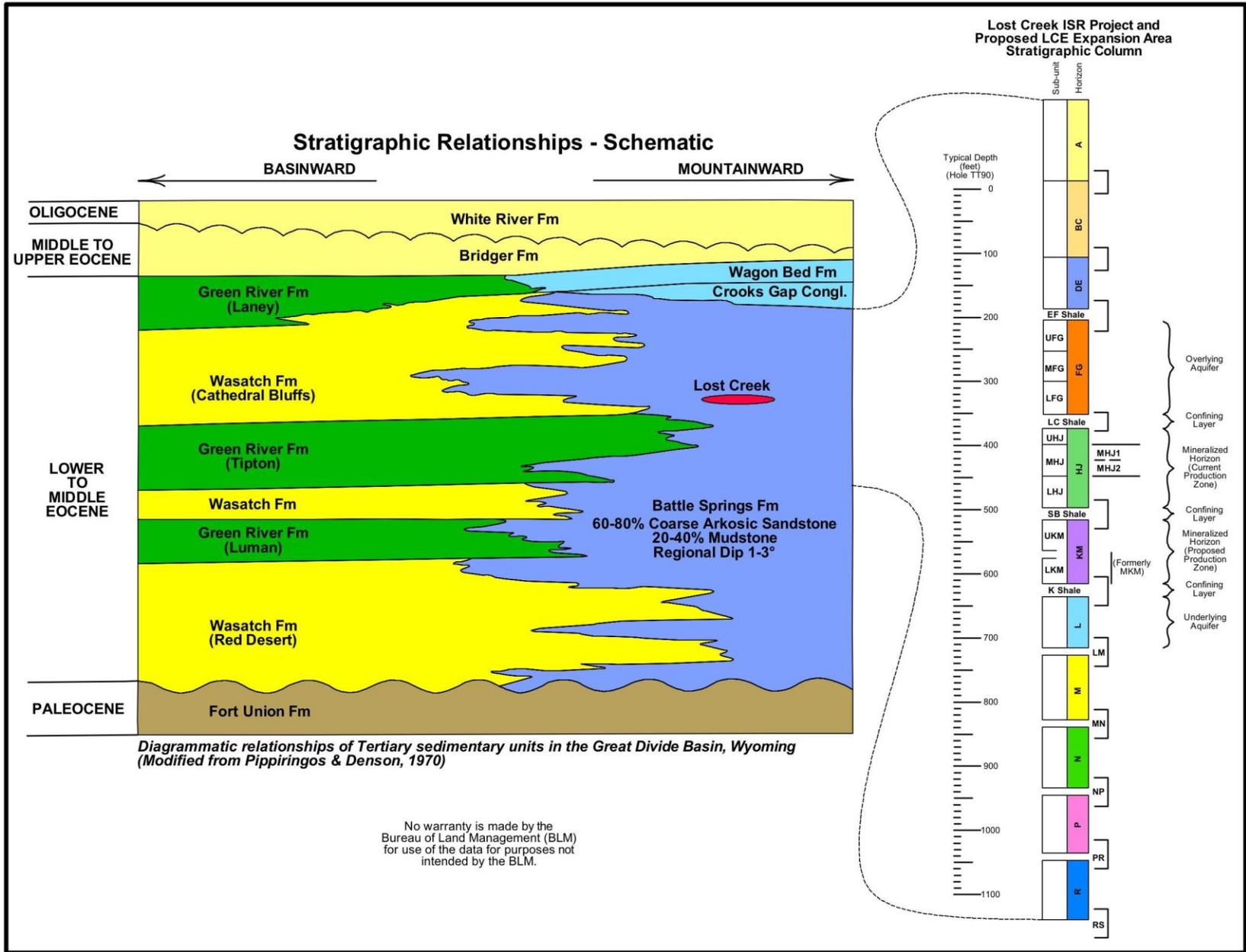
Geologic units of interest within the project area include, in descending order by depth, recent (Quaternary age) alluvial deposits and the Early Eocene age Battle Spring Formation, which contains the uranium mineralization and the upper and lower confining layers. Figure 3.3-1 shows the typical stratigraphic relationship of the geologic units of the Great Divide Basin. It should be noted that the project area is not overlain by the White River, Bridger, or Wagon Bed formations or the Crooks Gap conglomerate. The term “horizon” refers to named stratigraphic intervals identified by the Applicant to facilitate stratigraphic classification. Horizons are generally correlatable across the project area.

The surficial deposits that exist within the project area are recent alluvial and Pliocene pediment deposits derived from the Tertiary-age sediments. The Battle Spring Formation is the only formation directly underlying the veneer of quaternary deposits, as the overlying deposits have been eroded.

Within the project area, the Battle Spring Formation is approximately 6,200 feet thick and is the targeted formation for uranium development. The Battle Spring Formation dips to the southwest at an angle of approximately 3 degrees from horizontal. The uranium mineralization in the project area occurs in classic roll front deposits. The uranium deposits of interest are located in the upper 1,200 feet of the Battle Spring Formation and have been subdivided by the Applicant into named stratigraphic horizons, which consist predominantly of sands. Stratigraphic boundaries between horizons are represented by named layers of shale, although numerous interbedded, unnamed shale layers are also present within the horizons. The uranium production horizons associated with the project area are the HJ and KM horizons. Table 3.3-1 summarizes the stratigraphy of the Battle Spring Formation, including depths and thicknesses.

Due to the dip of the Battle Spring Formation to the southwest, the HJ Horizon subcrops in the northeastern-most portion of the project area. In this area, the LC Shale and other overlying units have been removed by erosion, leaving the HJ Horizon covered by only a veneer of Quaternary age sediments at the surface. The FG Horizon, LC Shale, and HJ Horizon all subcrop in the northeast portion of the project area (as indicated by the 0 ft general depth in table 3.3-1).

Figure 3.3-1. Stratigraphic Relationship of the Great Divide Basin



**Table 3.3-1. Battle Spring Formation Stratigraphy in the Project Area**

Horizon	Thickness (ft) <sup>1</sup>	General Depth (ft)
FG	140-180	0-320
Lost Creek (LC) Shale	2-45	0-500
HJ	110-160	0-510
Sagebrush (SB) Shale	1-75	90-680
KM	80-130	100-690
K Shale	1-40	200-750
L	100	210-760

<sup>1</sup> Thickness where present  
Source: LCI (2018)

Thickness of the named shale horizons (LC, SB, and K) varies across the project area. Where the shales are present, the thickness ranges from 1 to 75 feet. The LC Shale and SB Shale are characterized as continuous and laterally extensive in the project area (LCI 2018b). The K Shale, which is the lower boundary of the KM Horizon, is characterized by the Applicant as generally continuous, though locally discontinuous or represented by multiple overlapping shales (LCI 2018b). In areas proposed for uranium ISR in the KM Horizon (MU3, MU8, MU10, MU11, and MU12), the K Shale is typically less than 10 feet thick based on thickness (isopach) maps presented in Plates 2.6-3b and D5-3e of the application (LCI 2017g).

The shallowest horizon present in the project area is the DE Horizon. Other deeper, named and unnamed horizons are present in the project area and include the LM Shale, M Horizon, MN Shale, N Horizon, and NP Shale (depicted on figure 3.3-1). The M and N horizons occur within a 300 to 350 feet interval below the K Shale. Each horizon is approximately 100 feet thick. The LM, MN, and NP shales represent the lower boundaries of the L, M, and N horizons, respectively. Thickness of the shales varies across the project area, and the continuity within the project area is unconfirmed (LCI 2018b).

The Paleocene-age Fort Union Formation is immediately beneath the Battle Spring Formation at depths approaching 6,000 feet within the project area. Underlying the Fort Union Formation are numerous Mesozoic and Paleozoic formations, which overlie the Precambrian crystalline basement. These units are at sufficient depth that they are not considered relevant to existing or proposed uranium ISR within the project area. The existing and proposed Class I UIC wells in the project area target the Fort Union Formation. However, the Applicant has submitted a modification application to the Class I UIC Permit (13-409) to inject AEA-regulated liquid waste into the Lower Battle Spring Formation just above the approved Fort Union Formation injection interval. At the time of this EIS, the modification is under review by WDEQ-WQD.

The project area contains a series of subparallel normal faults trending east to west, with almost vertical fault planes. The major fault system in the area is known collectively as the Lost Creek Fault, which consists of a pair of parallel faults lying in an en-echelon or staggered configuration. The faults in the area are not considered to be currently active and usually have displacements of less than 100 feet, with most having displacements of less than 50 feet.

### **3.3.3 Seismology**

Since 2007, 19 earthquakes have been recorded in south-central Wyoming (LCI 2017a). The largest earthquake was a magnitude 4.8 with an intensity of IV, which signifies no damage and only slight perceived shaking. On the U.S. Geological Survey (USGS) 500-year probabilistic acceleration map, the estimated peak horizontal acceleration for the project area is approximately

6.5 percent of gravitational acceleration, which is comparable to the acceleration expected in Seismic Zone 1 of the Uniform Building Code. The relatively low intensity of gravitational acceleration corresponds to a 10 percent chance during the next 50 years, and a 100 percent chance during the next 500 years, that an earthquake in the project area would have sufficient ground-shaking intensity to result in minor damage, at most, to a dwelling (NRC 2011).

As described in Section 3.4.1 of the NRC Lost Creek SEIS, there are two active fault systems in the vicinity of the project area that are capable of producing seismic activity: the Chicken Springs Fault System, which is located approximately 6 miles east and the South Granite Mountain Fault System, which is located approximately 14 miles northeast. Both faults could generate earthquakes, which could result in moderate damage to buildings in Bairoil. In the past 100 years, five non-damaging earthquakes have been recorded in the vicinity of Bairoil (Case and Kirkwood 2002).

### **3.4 Soils**

Baseline soils evaluations determine if soils in the project area have suitable characteristics for use during reclamation and if suitable soils are present in sufficient quantities to attain reclamation.

#### **3.4.1 Soil Survey Results**

The soil surveys for the project area are summarized below. Except to the extent that new information provided herein updates the previous discussions, these specific sections in the following documents are incorporated by reference:

- BLM Lost Creek EIS – Section 3.4, pp. 3.4-1 through 3.4-30 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.4.2, pp. 3-14 through 3-15 (NRC 2011)

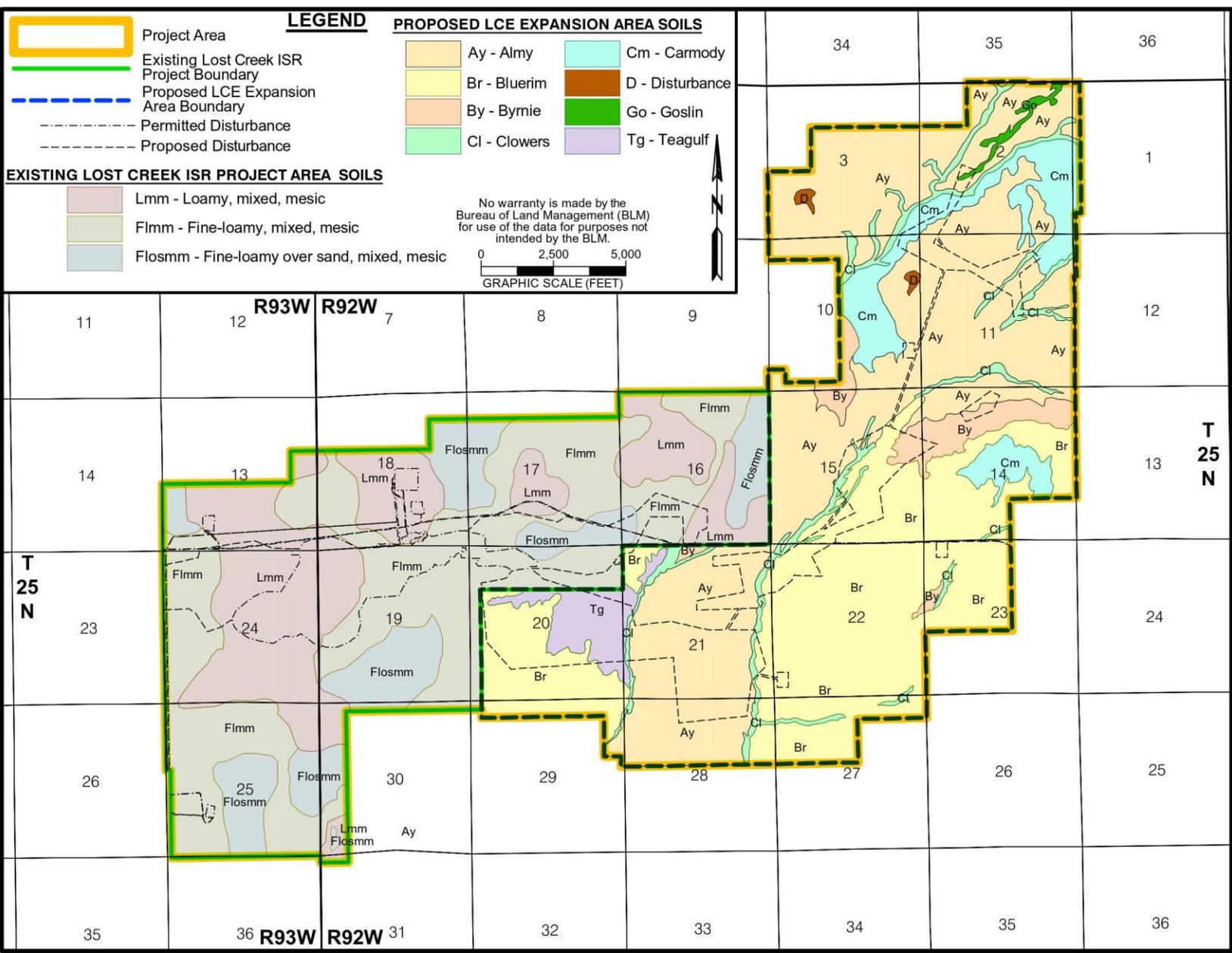
Soils in the existing Lost Creek ISR Project area were mapped in 2006, 2008, and 2009. As described in Section 3.4.1 of the BLM Lost Creek EIS, soils within the existing Lost Creek ISR Project area are classified as Typic Torriorthent with three different textures. A soil survey was conducted in the proposed LCE expansion area in 2012. Seven soil series and one non-soil unit (disturbance) were identified in this survey. The soil series identified for the project area are included in table 3.4-1 and shown on map 3.4-1. The soils for the existing Lost Creek ISR Project area and proposed LCE expansion are presented on map 3.4-1 at different specificity because differing survey levels were conducted.

#### **3.4.2 Evaluation of Soil Suitability as a Plant Growth Medium**

Within the project area, the soils are generally suitable as a plant growth medium. When compared to suitability parameters established in WDEQ-LQD Guideline 1 (WDEQ-LQD 1994), marginal materials were found in 30 of the 48 sampled profiles. A frequently occurring marginal parameter in samples was low saturation percentage (below the 25-50 percent range for suitable soils in Guideline 1; low saturation percentage indicates a sandy soil). However, marginal values were generally only slightly less than the 25 percent suitability threshold. When combined with other suitable soils, these marginal quality soils would likely become suitable as a plant growth medium.

Approximate salvage depths of each soil type/series ranged from 0.0 to 26.4 inches. Material unsuitable for topsoil, in the form of coarse fragments, was found in one of the 48 sampled profiles.

Map 3.4-1. Baseline Soils



**Table 3.4-1. Project Area Soil Survey Topsoil Suitability and Salvage Depths**

Baseline Survey Soil Series	Area (acres) <sup>1</sup>	% of Area	Soil Suitability	Avg. Salvage Depth (inches)
<b>2006 Survey</b>				
Lmm - loamy, mixed, mesic	1,417.5	13.7%	Suitable/marginally suitable	10.0
Flmm – fine-loamy, mixed, mesic	2,149.0	20.7%	Suitable/marginally suitable	18.0
Flosmm – fine-loamy over sand, mixed, mesic	800.0	7.7%	Suitable/marginally suitable	12.5
<b>2012 Survey</b>				
Ay - Almy sandy loam	2,615.0	25.2%	Suitable/marginally suitable	21.5
Br - Bluerim sandy loam	1,975.6	19.1%	Suitable/marginally suitable	16.5
Cl - Clowers sandy loam	424.1	4.1%	Suitable/marginally suitable	26.4
Cm - Carmody sandy loam	261.6	2.5%	Suitable/marginally suitable	9.0
By - Byrnie sandy loam	223.9	2.2%	Suitable	7.6
Tg - Teagulf sandy loam	184.3	1.8%	Suitable	18.7
Go - Goslin loamy sand	26.1	0.3%	Marginally suitable/unsuitable	0.0
D - Disturbed land	13.9	0.1%	--	0.0
<b>Total<sup>1, 3</sup></b>	<b>10,090.8</b>	<b>100.0%</b>	<b>--</b>	<b>16.5<sup>2</sup></b>

<sup>1</sup> Area based on soil survey acreage calculations, which do not exactly match the total acres in the project area.

<sup>2</sup> Calculated as the sum of the weighted average salvage depths.

<sup>3</sup> Totals may not sum due to rounding.

### 3.4.3 Topsoil Salvage Depth

Topsoil salvage depths were calculated for the 2006 and 2012 soil surveys (table 3.4-1). Based on the known baseline soil depths for soil series present within the project area, the weighted average depth of salvageable topsoil was estimated to be 16.5 inches.

### 3.4.4 Prime or Unique Farmlands Assessment

Prime and unique farmland determinations are made by evaluating soil quality, growing season, and moisture supply (GPO 2012). In many instances, the Natural Resources Conservation Service (NRCS) has determined the presence of prime or unique farmlands based on soil or ecological site mapping. However, since no NRCS soil or ecological site mapping has been completed for the portion of Sweetwater County that includes the project area (Perkins 2015), the potential for encountering these special agricultural lands was evaluated by examining the soil and ecological aspects of the project area. It is very unlikely that the project area has the growing season or moisture required for prime or unique farmlands.

### 3.4.5 Areas of Limited Reclamation Potential

As described in BLM’s Reclamation Policy (BLM 2012c), areas posing the most extreme reclamation challenges must be identified when developing reclamation proposals for all surface disturbing activities. Areas having limited reclamation potential (LRP) are often characterized by highly sensitive and/or erosive soils, extremely sensitive vegetation types, soils with severe physical or chemical limitations, or extremely steep slopes.

Areas of LRP have not been classified by BLM in Sweetwater County. Slopes associated with the project area are gentle, and no cliffs or rock outcrops are present. The geological substrates do not change abruptly across the project area, and topsoil and subsoil depths are generally sufficient to support vegetation. Soil characteristics, as determined from soil surveys conducted throughout the

project area, do not indicate a significant amount of unsuitable topsoil. The weather conditions, with the potential for wind scour and freezing and thawing cycles, require careful soil protection and reclamation practices. Given the generally sandy loam texture of the surface horizons, the soils are slightly more susceptible to erosion from wind than water.

As described in Section 3.4.2 of the NRC Lost Creek SEIS, wind erosion is a concern at the project area. Most of the soils in the project area have a significant percentage of silt, which has been shown to be directly related to dust emissions from unpaved roads. Water erosion is not a large concern at the project area due to very low surface slopes, limited amount of precipitation, and the lack of perennial and intermittent streams.

### 3.4.6 Historical Surface Disturbances

Construction and operations are ongoing within the existing Lost Creek ISR Project area. There is also a limited amount of surface disturbance within the proposed LCE expansion area. Most of this is related to historical exploration activities for oil, gas, and uranium. There is also a limited amount of surface disturbance within the project area from access roads and other infrastructure and from facilities supporting livestock grazing, such as stock wells.

### 3.5 Surface Water, Wetlands, and Aquatic Ecology

The project area is located in the Great Divide Basin, a topographically closed system that drains internally due to a divergence in the Continental Divide. Surface water and aquatic resources within and in the vicinity of the existing Lost Creek ISR Project area are described in detail in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.5, pp. 3.5-1 through 3.5-22 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.5.1, pp. 3-16 through 3-21 (NRC 2011)

#### 3.5.1 Drainage Basins

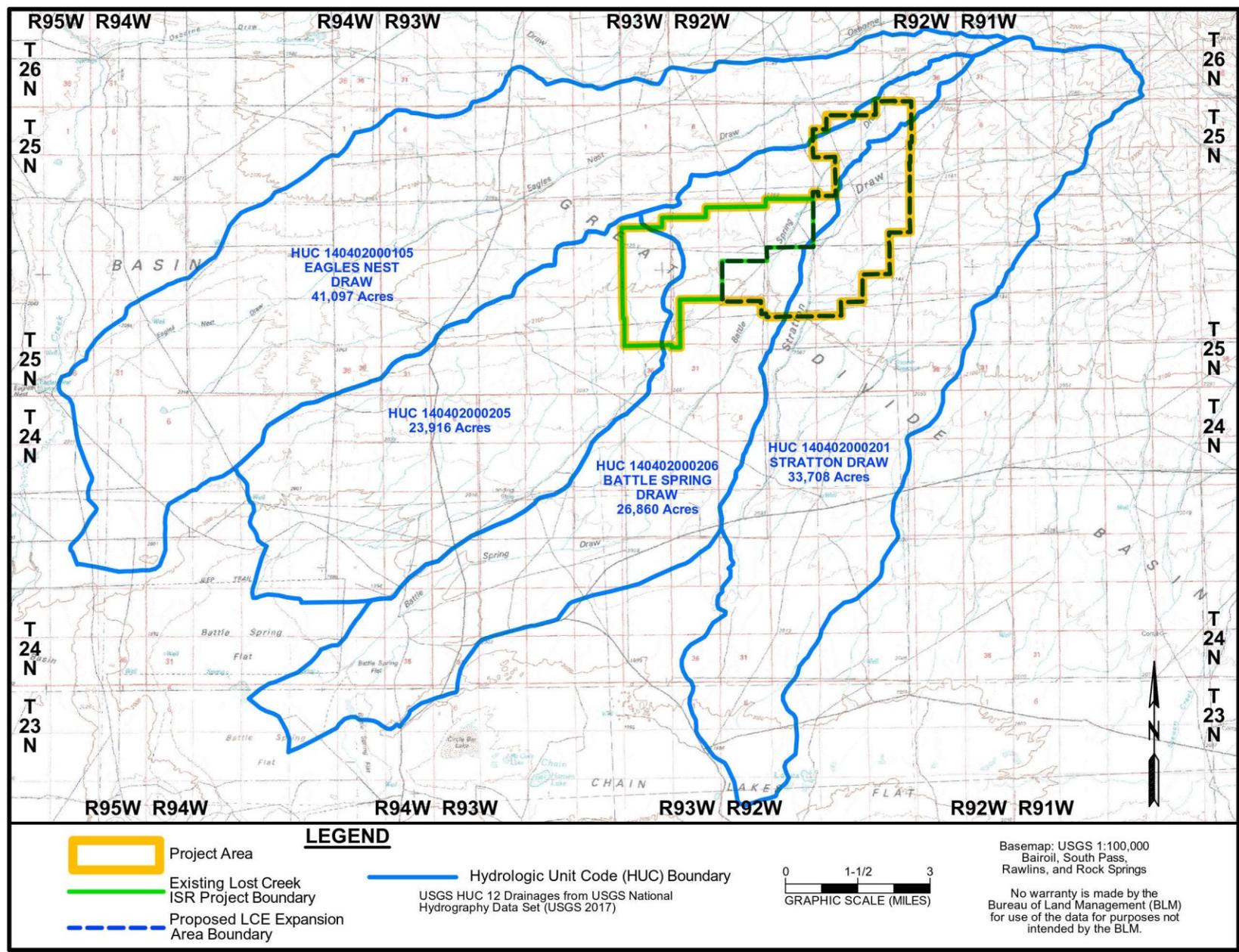
The project area is located within four different 12-digit hydrologic unit code (HUC) areas (map 3.5-1). Three of the four HUC areas have been named by the USGS (USGS 2017). Table 3.5-1 summarizes the drainage area of each HUC and the percentage of the project area within each HUC area. All of the HUC areas associated with the project area drain into Battle Spring Flat or Chain Lakes Flat, which are located approximately 9 to 15 miles southwest and south of the project area, respectively. Much of the water conveyed through the ephemeral channels (flowing water as a result of recent precipitation events or snowmelt) does not reach the flats. Instead, it infiltrates or is lost to evapotranspiration (NRC 2011).

**Table 3.5-1. USGS HUC 12 Areas Encompassing the Project Area**

HUC Area Number	Name	HUC Area (Acres)	HUC Area within Project Area (Acres)	Portion of Project Area in HUC Area (%)
140402000105	Eagles Nest Draw	41,097	105	1.0
140402000205	HUC not named	23,916	1,560	15.6
140402000206	Battle Spring Draw	26,860	4,904	49.0
140402000201	Stratton Draw	33,708	3,436	34.3

Source: USGS 2017

Map 3.5-1. USGS HUC 12 Drainages Associated with the Project Area



The 12-digit HUC areas were further subdivided into the following sub-drainages: Western Draw, West Battle Spring Draw, East Battle Spring Draw, and Upper Stratton Draw, as shown on map 3.5-2. A small portion of the project area drains to Eagles Nest Draw. This portion of Eagles Nest Draw primarily includes upland areas with one small defined drainage. The project area does not extend to the main channel of Eagles Nest Draw.

### 3.5.2 Surface Water Features

Surface water associated with the project area is primarily runoff from precipitation (rainfall and/or snowmelt), most of which quickly infiltrates and recharges shallow groundwater aquifers, evaporates, or is consumed by plants through evapotranspiration. All of the channels within the project area are ephemeral. There are no perennial (continuously flowing) or intermittent (flowing over a portion of the drainage) streams within or adjacent to the project area. Since all of the channels are ephemeral and the project area lies within a closed basin, no surface water features within the project area connect to a tributary of a navigable waterbody.

### 3.5.3 Surface Water Flow

Runoff data are limited for streams in the Great Divide Basin. Only two USGS historical streamflow gaging stations were identified within 40 miles of the project area; both are on perennial streams and not representative of drainages in the project area.

Since no on-site streamflow measurements are available, peak flows were estimated using a statistical regression model developed for Wyoming by Miller (2003). Table 3.5-2 shows the estimated peak flow for the 2-year, 10-year, and 100-year events at the most downstream point in each sub-drainage. Actual peak runoff rates may be lower because of the high infiltration capacity of the soils.

**Table 3.5-2. Estimated Peak Runoff for Sub-drainages**

Sub-drainage	Total Drainage Area (Acres)	2-Year Runoff Event (cfs)	10-Year Runoff Event (cfs)	100-Year Runoff Event (cfs)
Upper Stratton Draw	13,700	57	219	595
East Battle Spring Draw	4,220	28	114	332
West Battle Spring Draw	4,540	29	120	346
Western Draw	1,920	17	75	227

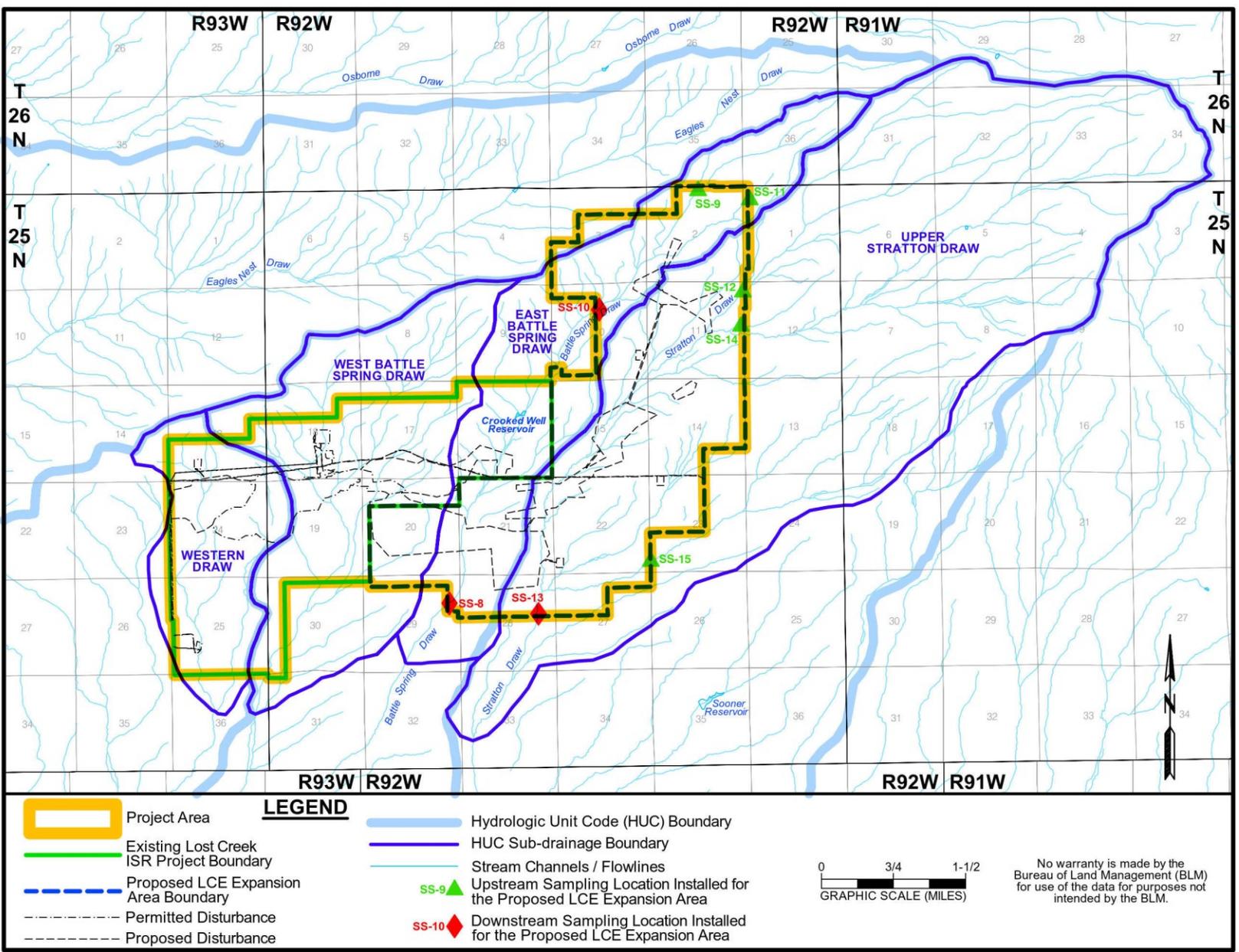
cfs = cubic feet per second  
Source: WWC 2017

As stated in Section 3.5.1.3 of the NRC Lost Creek SEIS, the moderate stream channel gradients, rolling terrain, and steeply incised channels result in the containment and retention of peak surface flows within existing streambanks.

### 3.5.4 Surface Water Quality

Because the ephemeral channels within the project area rarely contain water, water quality data are limited. Available historical water quality information includes data collected about 7 miles downstream of the project area in 1974 and 1975, as well as data collected in 2007 and 2013. Water quality discussions for surface water sampled between 1974 and 2007 are included in Section 3.5.1.4 of the NRC Lost Creek SEIS. The results of 2013 surface water quality sampling are summarized in table 3.5-3.

Map 3.5-2. HUC Sub-drainages and Surface Water Features Associated with the Project Area



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

**Table 3.5-3. Summary of 2013 Surface Water Quality Sampling Results from Runoff Events**

Parameter	Units	SS-9	SS-12	SS-12	SS-14	SS-8	SS-8	SS-10	SS-13
Date		10/28/13	3/27/13	10/29/13	10/29/13	3/27/13	3/27/13	10/23/13	10/23/13
Upstream/Downstream		Up	Up	Up	Up	Down	Down	Down	Down
<b>Metals - Dissolved</b>									
Uranium	mg/L	ND	ND	ND	ND	ND	ND	0.0005	ND
<b>Metals - Suspended</b>									
Uranium	mg/L	0.0447	ND	0.106	0.100	ND	ND	0.0368	0.0233
<b>Radionuclides - Dissolved</b>									
Radium-226	pCi/L	1.6	0.50	5.1	0.11	0.60	0.60	4.9	1.4
Precision (+/-)	pCi/L	0.39	0.16	0.65	0.68	0.17	0.17	0.58	0.34
MDC	pCi/L	0.31	0.20	0.31	1.2	0.19	0.19	0.25	0.26
Thorium-230	pCi/L	0.2	0.3	0.2	0.4	0.2	0.2	0.4	0.08
Precision (+/-)	pCi/L	0.2	0.2	0.2	0.6	0.2	0.2	0.4	0.1
MDC	pCi/L	0.3	0.2	0.3	1.3	0.2	0.2	0.6	0.3
<b>Radionuclides - Suspended</b>									
Radium-226	pCi/L	39	0.001	105	103	0.001	0.001	38	24
Precision (+/-)	pCi/L	4.3	0.0007	6.8	13	0.0006	0.0006	4.9	3.4
MDC	pCi/L	1.9	0.0009	1.9	6.1	0.0008	0.0008	2.6	1.9
Thorium-230	pCi/L	12.3	0.0008	47.8	41.8	0.0006	0.0006	14.9	8.8
Precision (+/-)	pCi/L	3.3	0.0003	8.5	10.9	0.0002	0.0002	3.1	2.1
MDC	pCi/L	1.7	0.0003	1.5	4.9	0.0003	0.0003	1.3	1

Notes:

Map 3.5-2 depicts sampler locations.

ND = Not-detected at or less than reporting limit (0.0003 mg/L).

MDC = Minimum detectable concentration.

Source: LCI 2017a

As described in Section 3.5.1.4 of the NRC Lost Creek SEIS, the quality of surface water sampled in 1974 and 1975 met the criteria for a Class 4C stream, whereas the quality of surface water sampled in 2007 met the quality for a Class 3 stream. Class 4C waters are isolated waters that have been determined to lack the potential to normally support and sustain aquatic life (WDEQ-WQD 2013b). Class 3 waters do not support fisheries but may support other aquatic life.

Five storm water sampler locations (SS-9, SS-11, SS-12, SS-14, and SS-15) were installed upstream of the project area, and three sampler locations (SS-8, SS-10, and SS-13) were installed at the downstream boundary of the proposed LCE expansion area (map 3.5-2). Eight samples were collected from six locations in 2013 (table 3.5-3). Due to the low volume of water available for analysis in 2013, the analyses of these data focused on dissolved and suspended uranium, radium-226, and thorium-230. Dissolved uranium was present in only one sample, whereas suspended uranium was detected in six of the eight samples. Dissolved radium-226 concentrations ranged from 0.11 to 5.1 picocuries per liter (pCi/L), and suspended radium-226 concentrations ranged up to 105 pCi/L. Dissolved thorium-230 concentrations ranged from 0.08 to 0.4 pCi/L, and suspended thorium-230 ranged up to 47.8 pCi/L. For Class 3 and 4 surface waters, including the ephemeral channels within the project area, the only numerical limit for uranium or radionuclides is 60 pCi/L total radium-226 (WDEQ-WQD 2018). The total (dissolved plus suspended) radium-226 concentration exceeded this numerical limit at two upstream surface water sampler locations in October 2013 (SS-12 and SS-14). None of the 2013 samples collected at the downstream locations exceeded the limit.

### **3.5.5 Surface Water Use**

Surface water rights with legal descriptions within 3 miles of the project area were queried using the Wyoming State Engineer's Office (WSEO) water rights database (WSEO 2018). Excluding expired and abandoned permits, five appropriated surface water permits for stock, industrial, and/or wildlife use were identified (table 3.5-4). Map 3.5-3 shows the locations of the permitted surface water rights within 3 miles of the project area.

In addition to the permitted surface water rights, 10 unpermitted reservoirs were identified within 3 miles of the project area either during field investigations or by reviewing aerial photography. The unpermitted reservoirs are generally very small (less than 1 acre-foot in capacity) and are located near wells and used to store water for livestock and wildlife. Three of the unpermitted reservoirs are located within the project area. The reservoirs are filled from spring snow melt or from discharges from adjacent wells. Map 3.5-3 shows the locations of the unpermitted reservoirs within 3 miles of the project area.

### **3.5.6 Wetlands**

Evaluation of potential wetlands within the existing Lost Creek ISR Project area are described in Section 3.5.2 of the BLM Lost Creek EIS and Section 3.5.1.5 of the NRC Lost Creek SEIS. Potential wetland areas within the proposed LCE expansion area were visited in June 2013, and aquatic resources inventories were conducted in accordance with U.S. Army Corps of Engineers (USACE) guidance. Overall, 5.1 acres of drainage features were identified within the project area. These features included ephemeral drainages with coarse, sandy bottoms, reservoirs devoid of vegetation due to livestock use, or collection sites from overflow of stock tanks. No wetlands were identified, and USACE determined that the 2013 site assessment provided an accurate depiction of potential wetlands and other waters within the project area. The USACE Cheyenne Office verified that an application for a jurisdictional determination was not necessary, as no waters of the U.S. have been identified in the Great Divide Basin (USACE 2010, LCI 2013b). Surface waters within the project area are considered "waters of the state" under W.S. § 35-11-103(c)(vi) and are afforded protection under state and BLM regulations (BLM 2008a).

### **3.5.7 Aquatic Ecology**

Research and field investigation confirmed that aquatic life was determined not to exist within the project area. Surface water may be present occasionally, but it does not sustain aquatic life.

**Table 3.5-4 Surface Water Rights within 3 Miles of the Project Area**

Permit Number	Priority Date	Status	Applicant	Facility Name	Use	TwN	Rng	Sec	Qtr-Qtr	Capacity (ac-ft)
P10088R*	7/27/1994	Complete	Kennecott Uranium Company	Sweetwater Pit Reservoir	IND	24N	93W	9	SWSE	3,809
P10542S	12/29/1988	Complete	BLM	Road Crossing Stock Reservoir	STO	25N	91W	5	SEnw	1.2
P10671R**	1/21/1998	Incomplete	Kennecott Uranium Company	Blue Nos. 7 through 12 Reservoir	IND	24N	93W	14	NWNw	2,040
P7871R	7/28/1977	Complete	Kennecott Uranium Company	Blue No. 5 Reservoir	STO; WL	24N	93W	10	NWNw	3,684
P13595R	2/17/2010	Complete	Lost Creek ISR, LLC	Ponds 1 and 2	IND	25N	92W	18	NWSE	4.6

\* WSEO reference location for P10088R is more than 3 miles from the project area; however, facility has points of use in the NESE of Section 9, T24N, R93W and NWSW and SWSW of Section 10, T24N, R93W, which are within the 3-mile buffer.

\*\*WSEO reference location for P10671R is more than 3 miles from the project area; however, facility has points of use in the SESW and SWSW of Section 11, T24N, R93W, which are within the 3-mile buffer.

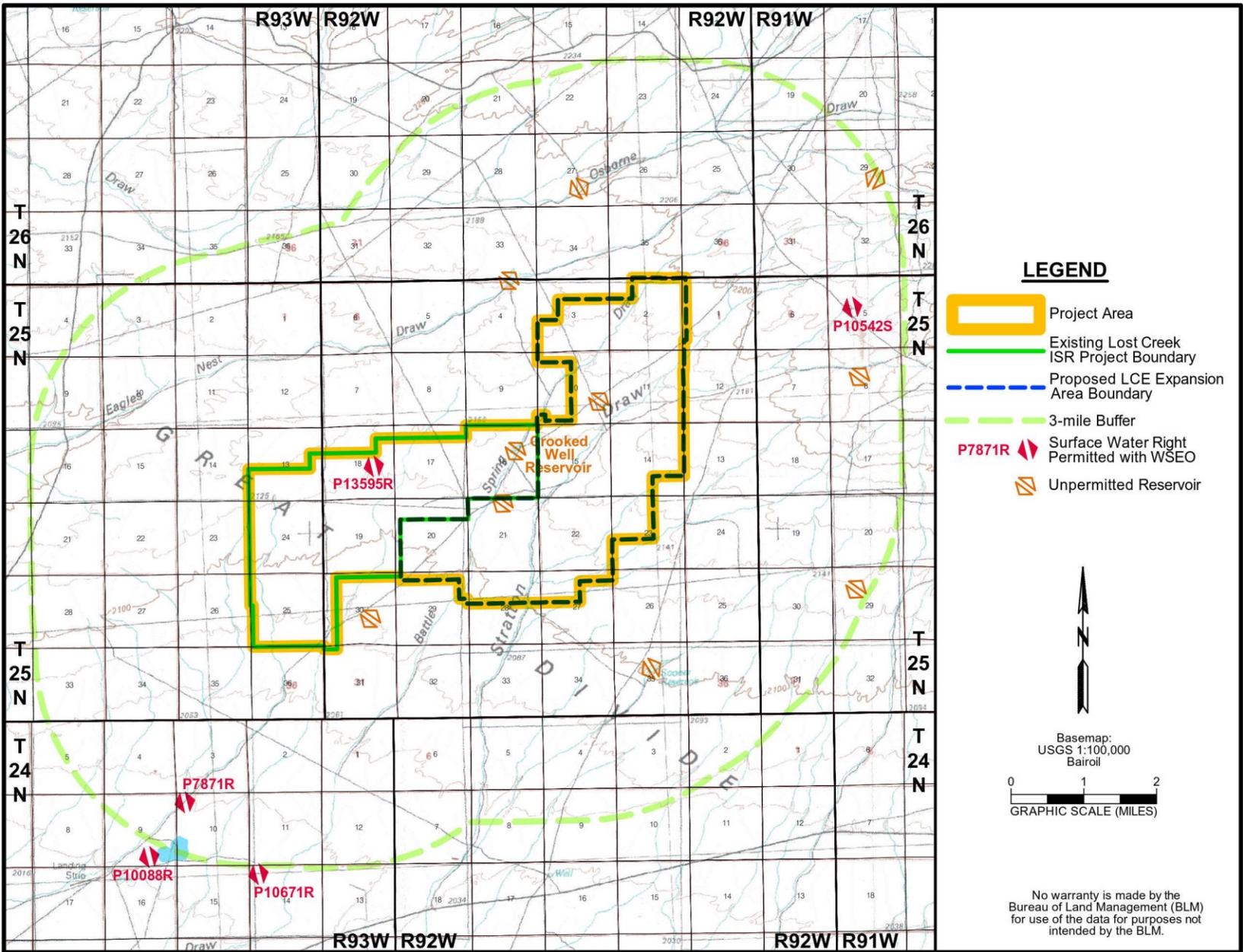
IND = Industrial

STO = Stock

WL = Wildlife

Source: WSEO 2018

**Map 3.5-3. Surface Water Rights and Unpermitted Reservoirs Associated with the Project Area**



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

## **3.6 Groundwater**

The following describes the groundwater resources in and around the project area. Except to the extent that new information provided herein updates the previous discussions, the following documents are incorporated by reference:

- BLM Lost Creek EIS – Section 3.6, pp. 3.6-1 through 3.6-79 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.5.2, pp. 3-21 through 3-34 (NRC 2011)

### **3.6.1 Regional Groundwater**

The regional aquifer system is described in Section 3.6.1 of the BLM Lost Creek EIS and Section 3.5.2.1 of the NRC Lost Creek SEIS. The Great Divide Basin, in which the project area is located, is part of the regional Upper Colorado River Basin aquifer system. This regional aquifer system was subdivided by Whitehead (1996) into five principal aquifers: the Laney aquifer (Tertiary), the Wasatch/Battle Spring-Fort Union aquifer (Lower Tertiary), the Mesa Verde aquifer (Cretaceous-Mesozoic), and the Upper and Lower Paleozoic aquifers.

### **3.6.2 Local Groundwater**

The project area is underlain by the Battle Spring Formation. Within the project area, the Battle Spring Formation has been subdivided into horizons and shale layers by the Applicant. The geologic water-bearing strata of concern include, in descending order, the DE Horizon, FG Horizon, HJ Horizon (containing mineralization), KM Horizon (containing mineralization), and L Horizon. There are multiple named and unnamed shale layers interfingered within and between the horizons due to the alluvial fan deposition of the Battle Spring Formation. The shale layers that represent the borders of the horizons include, in descending order, the LC Shale, SB Shale, and K Shale. Figure 3.3-1 depicts the stratigraphic relationship of these units, and table 3.3-1 provides the thickness and depth for each unit. Following is a brief description of each hydrostratigraphic unit, from stratigraphically highest to lowest.

- The DE Horizon, where present, is the stratigraphically highest water-bearing horizon of the Battle Spring Formation within the project area. The DE Horizon is unconfined and not a fully saturated aquifer that is either dry or nonexistent at some locations within the project area.
- The FG Horizon is the first aquifer overlying the HJ Horizon. The top of the FG Horizon subcrops over the northeast portion of the project area and deepens as it dips to the southwest. As such, the FG Horizon transitions from unconfined to confined conditions moving northeast to southwest within the project area.
- The LC Shale separates the overlying FG Horizon from the mineralized HJ Horizon. The LC Shale is a continuous confining interval beneath the FG Horizon throughout the existing Lost Creek ISR Project area. Within the eastern portion of the proposed LCE expansion area, the LC Shale subcrops and is absent east of the outcrop. Aquifer pumping tests have demonstrated the confining characteristics of the LC Shale (LCI 2017h).

- The mineralized HJ Horizon subcrops within the northeastern portion of the project area and deepens as it dips to the southwest. The HJ Horizon transitions from unconfined to confined conditions moving northeast to southwest within the project area. No wellfields are planned in the HJ Horizon within the northeastern portion of the project area where it is not a confined aquifer.
- The SB Shale is the confining interval between the HJ and KM horizons. It is a pervasive shale layer, with confining characteristics confirmed by aquifer pumping tests (LCI 2017h).
- The mineralized KM Horizon is a thick sequence of sand layers. It contains several locally discontinuous shale and silt layers that are not regionally extensive confining units. The KM Horizon is continuous and confined throughout the project area (LCI 2017h).
- The K Shale has been shown through aquifer testing to have varying levels of confinement throughout the project area. Within the project area, the K Shale has been observed and interpreted as containing some thickness of shale, although potentially not as one laterally continuous bed (LCI 2018b). Since the K Shale is not one laterally continuous bed, it is not considered a regional confining shale. However, through aquifer testing, the K Shale has been shown to be a confining unit on a local scale as described in Section 3.6.4.4 of this EIS.
- The L Horizon is continuous throughout the project area. It is described by the Applicant as the first underlying aquifer to the KM Horizon. Compared to the KM Horizon, it commonly exhibits a much more shaley character with more shale interbeds and thinner sands (LCI 2017h).

The Fort Union Formation is the receiver for wastewater disposal from the Class I UIC wells within the project area. The Fort Union Formation is located over 5,000 feet below the horizons targeted for uranium ISR in the Battle Spring Formation and is not in hydraulic communication with any of the horizons in the project area.

### **3.6.3 Faulting**

As described in Section 3.3.2 of this EIS, several faults have been identified within the project area (map 3.6-1). The major fault system in the area, known as the Lost Creek Fault, has been studied in detail. The Lost Creek Fault has been shown through aquifer testing to be largely a hydraulic barrier to groundwater flow within the HJ Horizon within MU1. However, the Lost Creek Fault is not completely impermeable, as localized connections across the fault may exist (NRC 2011). The effects of other faults on groundwater flow have not been studied in detail. Should the modification to Permit 13-409 be approved by WDEQ-WQD, the Applicant would be allowed to inject into the Lower Battle Spring Formation, which is also not in hydraulic communication with the overlying horizons targeted for uranium ISR.

### **3.6.4 Project Area Potentiometry, Gradients, and Aquifer Properties**

#### ***3.6.4.1 Potentiometry and Hydraulic Gradients***

Potentiometric surfaces for the FG, HJ, and KM horizons indicate that groundwater flow across the project area is to the west-southwest, generally consistent with the regional flow system. The hydraulic gradients in all of these horizons are similar, as shown in table 3.6-1.



**Table 3.6-1. Hydraulic Gradients within the Project Area**

<b>Horizon</b>	<b>Calculated Hydraulic Gradient</b>
FG	0.008-0.019 ft/ft (42-100 ft/mile)
HJ	0.005-0.015 ft/ft (26-79 ft/mile)
KM	0.009-0.018 ft/ft (48-95 ft/mile)

Source: LCI 2017h

Within the L Horizon, the water level has only been measured at three locations spread out across 3 miles and bisected by numerous faults. Given the data limitations, the L Horizon potentiometric surface is poorly defined at this time. Attempts to construct a potentiometric surface indicate that the hydraulic gradient is steeper and is more to the south-southwest, which does not conform to the regional conceptual model. As additional L Horizon monitor wells are installed during construction of additional mine units, the groundwater flow direction and hydraulic gradient in the L Horizon will be defined in more detail. The Applicant anticipates that with more data, the hydraulic gradient and flow gradient in the L Horizon will align with the regional regime (LCI 2017h). Whether or not the hydraulic gradient and groundwater flow direction in the L Horizon conform with the regional regime is less important than the difference in potentiometric head between the KM and L horizons within mine units targeting the KM Horizon, since such differences indicate the potential for groundwater flow between horizons (see next section).

#### **3.6.4.2 Differences in Potentiometric Heads**

Differences in potentiometric heads were determined by measuring water levels in closely grouped wells completed in different hydrostatic units. Table 3.6-2 summarizes the differences in potentiometric heads observed between horizons. Map 3.6-1 depicts the locations of the well clusters used to determine the differences in potentiometric heads. The observed differences indicate that the potential for groundwater flow is downward in all horizons.

**Table 3.6-2. Observed Differences in Potentiometric Heads between Horizons**

<b>Horizon</b>	<b>Observed Differences</b>	<b>No. of Observations</b>
FG to HJ	Water level is 9 to 32 feet higher in the overlying FG Horizon	7
HJ to KM	Water level is 5 to 33 feet higher in the overlying HJ Horizon	12
KM to N	Water level is 6 to 135 feet higher in the overlying KM Horizon	5
KM to L	Water level is 10 to 20 feet higher in the overlying KM Horizon	6

Sources: LCI 2010a and LCI 2017h

#### **3.6.4.3 Aquifer Properties**

A number of aquifer tests have been conducted within the project area to characterize the aquifers and the confining intervals. The results of the aquifer tests were used to determine aquifer characteristics including transmissivity, storativity, and hydraulic conductivity. Many of the aquifer tests also were designed to test the confining intervals and the potential for communication between aquifers. Aquifer tests in the Battle Spring Formation aquifers were first conducted for Conoco in the early 1980s. More recent tests were conducted between 2006 and 2008 within the existing Lost Creek ISR Project area. Additional aquifer testing was conducted between 2009 and 2012 within the existing Lost Creek ISR Project area with a specific focus on expanding ISR into the KM Horizon. Additional testing was conducted in 2013 and 2016 within the proposed LCE expansion area. Table 3.6-3 summarizes the aquifer parameters measured in each horizon based results of on aquifer testing conducted to date.

**Table 3.6-3. Summary of Aquifer and Confining Shale Characteristics**

Hydrostratigraphic Unit	Porosity	Transmissivity (ft <sup>2</sup> /d)	Storativity	Kv (ft/d)
FG Horizon	0.28	4-40	--	--
LC Shale	--	--	--	0.016 - 0.15
HJ Horizon	0.28	30-402	$3.5 \times 10^{-5}$ - $9.1 \times 10^{-4}$	--
SB Shale	--	--	--	0.0009 - 0.004
KM Horizon	0.28	26-384	$1.3 \times 10^{-6}$ - $5.6 \times 10^{-4}$	--
K Shale	--	--	--	--
L Horizon	--	11-34	$3.3 \times 10^{-5}$ - $2.2 \times 10^{-4}$	--

Notes:

Kv = vertical hydraulic conductivity

ft<sup>2</sup>/d = square feet per day; ft/d = feet per day

-- = No data available

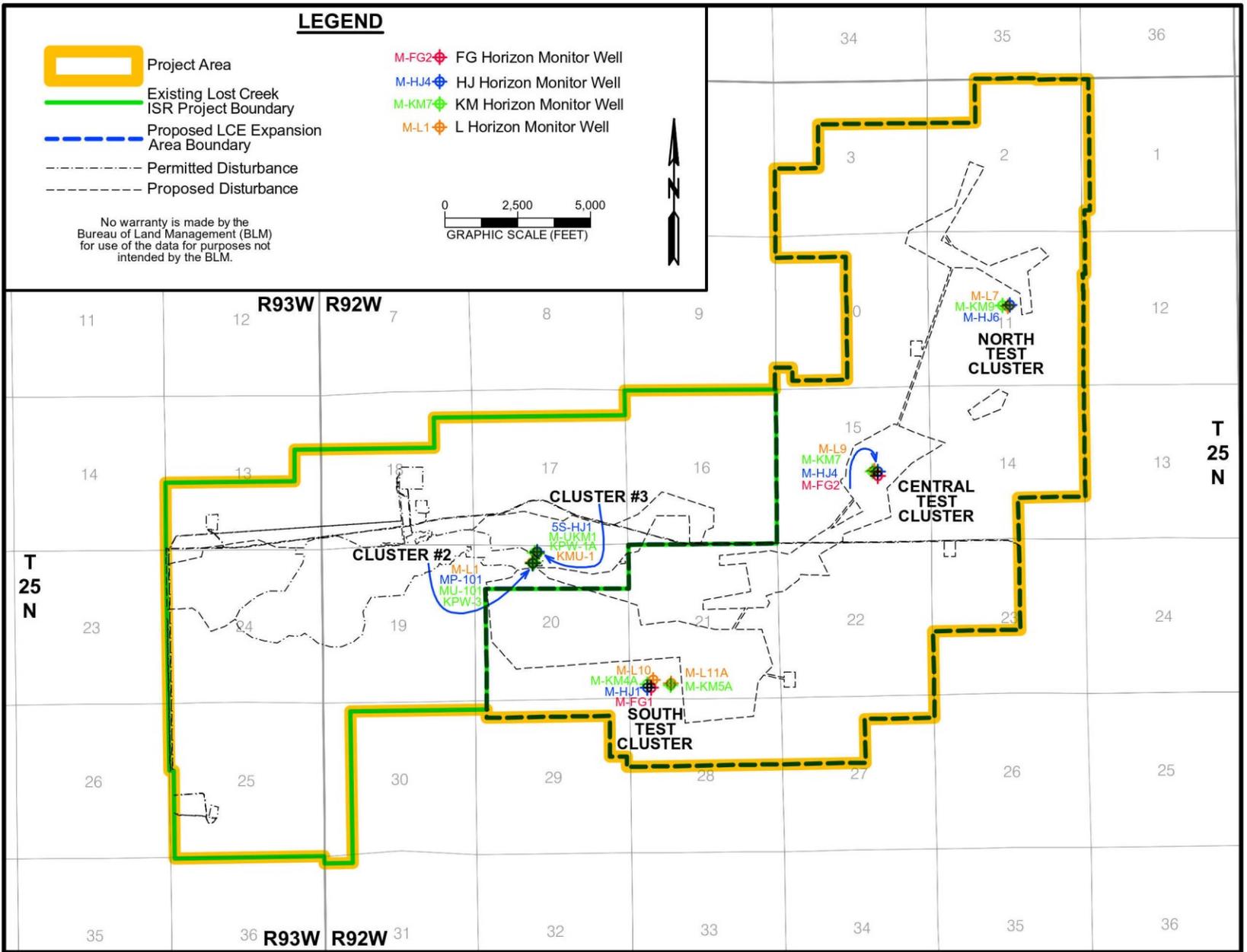
Sources: Hydro-Engineering, LLC 2007; Petrotek 2007a, 2007b, 2010, 2013a, 2013b, and 2013c; LCI 2010a, 2014b, and 2017c

#### 3.6.4.4 Level of Confinement

Although aquifer testing conducted in the HJ Horizon generally has confirmed that the LC and SB shales are confining intervals, minor responses have been observed across the LC Shale or SB Shale during some aquifer tests. To evaluate the confining capabilities of the LC and SB shales in the proposed LCE expansion area, the Applicant conducted aquifer tests at three well clusters termed the south, central, and north test clusters (map 3.6-2). The north test cluster is located near the subcrop of the HJ Horizon; therefore, only the SB Shale was tested. At all three test clusters, aquifer testing demonstrated that the SB Shale was a confining interval, since no responses were observed in three HJ Horizon monitor wells when the KM Horizon was pumped and two KM horizon monitor wells when the HG Horizon was pumped. Numerous aquifer tests conducted within the existing Lost Creek ISR Project area demonstrated minor communication across the SB Shale. The lack of response observed across the SB Shale in the proposed LCE expansion area indicates that it may have better confining properties than within the existing Lost Creek ISR Project area. Within the south and central test clusters, minor responses were observed across the LC Shale. The observed responses were small (less than 1 foot), which was similar to those observed during numerous aquifer tests conducted within the existing Lost Creek ISR Project area. As such, the confining capability of the LC Shale is anticipated to be similar across the project area.

Due to the fact that the K Shale is not a continuous shale but represents multiple overlapping shale units, its confining capacity varies throughout the project area. To evaluate the confining properties of the K Shale, the Applicant conducted aquifer testing at the three test clusters within the proposed LCE expansion area and two well clusters within the existing Lost Creek ISR Project area (Clusters #2 and #3 on map 3.6-2). At Clusters #2 and #3, the drawdowns observed in the L Horizon were roughly half of those observed in the pumped KM Horizon, indicating that the K Shale has limited confining capacity in this area. Within the proposed LCE expansion area, the aquifer tests demonstrated that the K Shale is a much better confining interval. At the central test cluster, no water level responses were observed across the K Shale, and only minor responses (an order of magnitude less than the drawdowns measured in the pumping wells) were observed in the south and north test clusters. These results were similar in magnitude to the responses observed across the LC and SB shales during aquifer tests within the existing Lost Creek ISR Project area.

Map 3.6-2. Aquifer Testing Well Clusters



### **3.6.5 Current Groundwater Uses**

Groundwater-use permits with legal descriptions within 3 miles of the project area were queried using the WSEO water rights database (WSEO 2018). The WSEO water rights search revealed 250 groundwater rights within 3 miles of the project area, including:

- 168 permitted as monitor wells,
- 12 permitted for miscellaneous use,
- 1 permitted for monitoring and miscellaneous use,
- 49 permitted for industrial and miscellaneous use,
- 11 permitted as test wells,
- 7 permitted for stock (livestock) use, and
- 2 permitted for stock and miscellaneous use.

All of the miscellaneous, industrial, test, and monitor well permits are associated with the Lost Creek ISR Project or Kennecott Uranium Company's Sweetwater Project. In addition to the groundwater permits identified in the WSEO search, one additional unpermitted well has been identified that supplies water to a stock pond (LCI 2010d). Map 3.6-3 shows the locations and table 3.6-4 provides details of the permitted and unpermitted stock wells within 3 miles of the project area. Section 3.6.3.1 of the BLM Lost Creek EIS describes the BLM wells located within 1 mile of the project area. In 2013, the Applicant reentered P13834P with a camera and determined that it is completed at a depth equivalent to the FG Horizon (LCI 2017c).

### **3.6.6 Groundwater Quality**

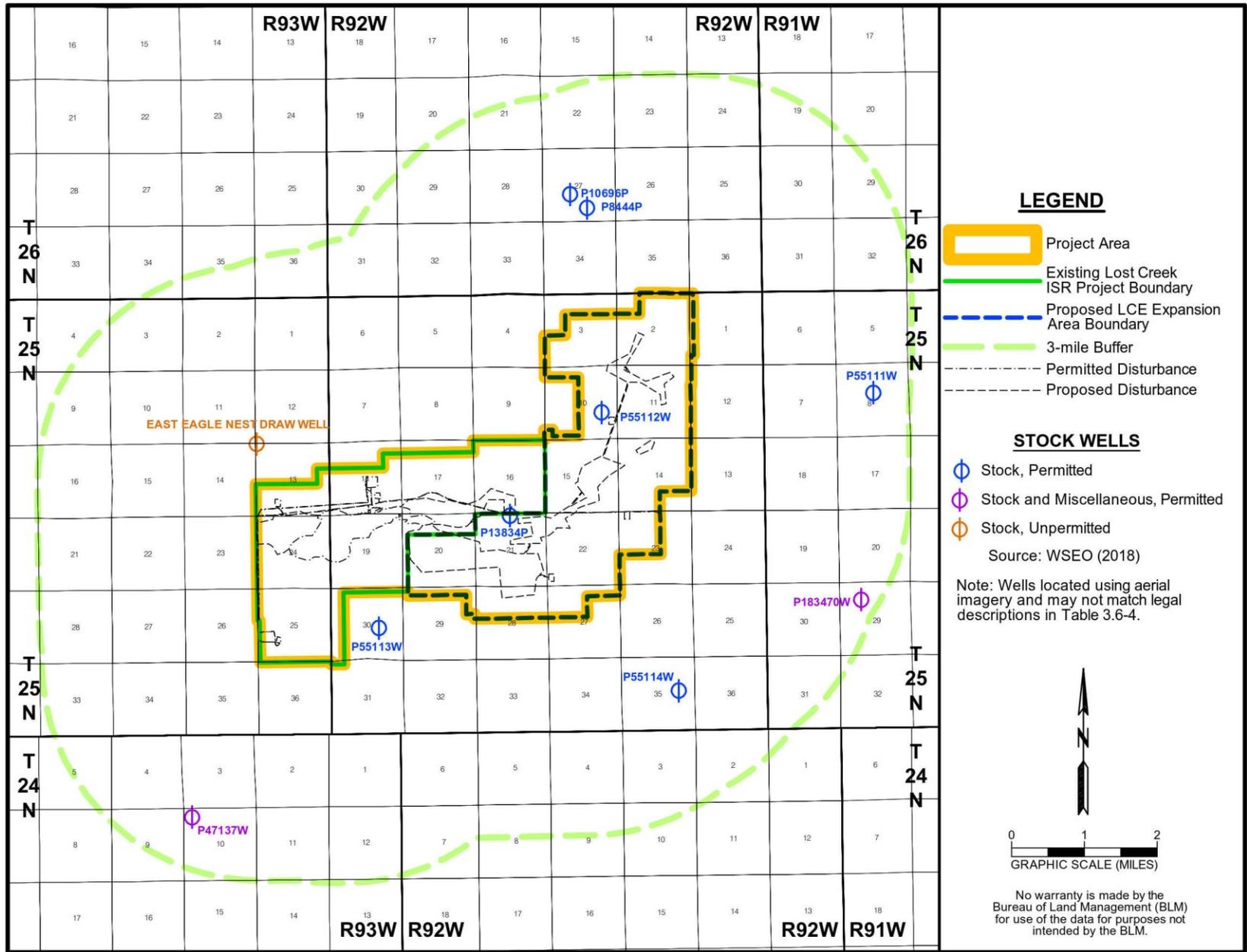
Regional groundwater quality within the Great Divide Basin is described in Section 3.6.4.1 of the BLM Lost Creek EIS. The following provides updates to the project area groundwater quality. It incorporates by reference the following documents:

- BLM Lost Creek EIS – Section 3.6.4.2, pp. 3.6-50 through 3.6-78 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.5.2.3.3, pp. 3-27 through 3-33 (NRC 2011)

Baseline groundwater quality in the FG, HJ, and KM horizons within the existing Lost Creek ISR Project area is described in the referenced sections of the BLM Lost Creek EIS and NRC Lost Creek SEIS. The following describes the water quality of the L, M, and N horizons within the existing Lost Creek ISR Project area and the baseline groundwater quality for all horizons within the proposed LCE expansion area.

Baseline groundwater quality of the L, M, and N horizons within the existing Lost Creek ISR Project area was sampled beginning in 2009 (map 3.6-4). Overall, the major ion chemistry of the L, M, and N horizons was very similar, and TDS concentrations were consistently below 500 mg/L. Water quality results are summarized in table 3.6-5. Complete groundwater quality results are provided in table 3.5-16 of the KM amendment application (LCI 2017i). The following summarizes the groundwater quality of each horizon.

Map 3.6-3. Stock Wells within 3 Miles of the Project Area



**LEGEND**

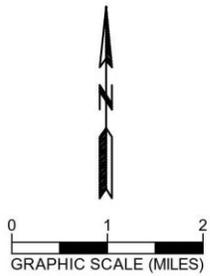
- Project Area
- Existing Lost Creek ISR Project Boundary
- Proposed LCE Expansion Area Boundary
- 3-mile Buffer
- Permitted Disturbance
- Proposed Disturbance

**STOCK WELLS**

- Stock, Permitted
- Stock and Miscellaneous, Permitted
- Stock, Unpermitted

Source: WSEO (2018)

Note: Wells located using aerial imagery and may not match legal descriptions in Table 3.6-4.



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

**Table 3.6-4. Stock Wells within 3 Miles of the Project Area**

Permit Number	Priority Date	Status	Applicant	Facility Name	Use <sup>1</sup>	Twn	Rng	Sec	Qtr-Qtr	Permit Yield (gpm)	Total Depth (ft)	Completion Interval (ft)
P47137W*	12/07/1977	Incomplete	Kennecott Uranium Co.	Blue #5	STO, MIS	24N	93W	10	NWNW	100	--*	--
P55111W	12/24/1980	Complete	BLM	Road Crossing	STO	25N	91W	8	NWNW	5	300	238-280
P183470W	8/27/2007	Complete	BLM, Rawlins Field Office	Driller's Well	STO, MIS	25N	91W	29	NWNW	25	540	400-500
P55112W	12/24/1980	Complete	BLM	Boundary Well #4775	STO	25N	92W	10	SESE	5	280	210-260
P13834P	9/21/1968	Complete	BLM	Battle Spring Draw Well #4451	STO	25N	92W	21	NENW	19	900	180-230**
P55113W	12/24/1980	Complete	BLM	Battle Springs Well #4777	STO	25N	92W	30	NWSE	5	220	185-215
P55114W	12/24/1980	Complete	BLM	Sooner	STO	25N	92W	35	SENE	5	320	180-320
P10696P	1/10/1942	Complete	BLM	Osbourne Draw Well #123	STO	26N	92W	27	NESW	5	237	--
P8444P	12/31/1946	Complete	Sun Land and Cattle	Osborne #1	STO	26N	92W	27	SWSE	10	280	250-280
None	None	Not permitted	None	East Eagle Nest Draw Well	STO	25N	93W	13	NWNW	5 <sup>†</sup>	370	--

<sup>1</sup> STO = stock, MIS = miscellaneous

\* According to WSEO (2018), this well has never been constructed.

\*\* Well completion interval based on investigations by LCI (2017c).

<sup>†</sup> Estimated yield from BLM (2012a).

-- no data

Sources: WSEO 2018 and BLM 2012a

- Nine wells completed in the L Horizon were included in the baseline monitoring program. A comparison of L Horizon groundwater quality to WDEQ-WQD criteria and EPA maximum contaminant levels (MCLs) show that only uranium and radionuclides exceeded the WDEQ-WQD and EPA water quality criteria. Such exceedances are described in Section 3.15 of this EIS.
- Five wells completed in the M Horizon were included in the baseline monitoring program. Radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.
- One well completed in the N Horizon was included in the baseline monitoring program. Radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.

The Applicant constructed a baseline monitoring network within the proposed LCE expansion area in 2012-2013 and 2016 to generally characterize groundwater quality. The monitoring network originally comprised 20 monitor wells completed in 2012 in the FG, HJ, KM, and N horizons. Four monitor wells (one in each of the FG, HJ, KM, and N horizons) were installed in 2013 at the request of WDEQ-LQD, and three L Horizon monitor wells were installed in 2016. The baseline monitoring network is depicted on map 3.6-4. Sampling of the 20 initial monitor wells commenced in the fourth quarter of 2012 and continued quarterly for one year. Sampling of the four monitor wells added in 2013 commenced in December 2013 and continued quarterly for one year. Sampling of the L Horizon monitor wells commenced in October 2016, with one quarter of data provided in the LCE amendment application (LCI 2017j). The samples were spaced sufficiently to assess seasonal variability.

In general, the groundwater quality results for the proposed LCE expansion area indicate little variation in major ion chemistry between horizons and no seasonal variability. The water contained varying concentrations of calcium, sodium, bicarbonate, and sulfate. Uranium and radionuclide concentrations exceeded WDEQ-WQD and EPA water quality criteria for all horizons. Table 3.6-6 summarizes the groundwater quality results. Complete groundwater quality results for the proposed LCE expansion area are provided in tables 3.5-9 and 3.5-11 of the LCE amendment application (LCI 2017j). The following summarizes the groundwater quality of each horizon:

- Three wells completed in the FG Horizon were included in the baseline monitoring program. One or more samples from one well exceeded the selenium MCL. Uranium and radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.
- Seven wells completed in the HJ Horizon were included in the baseline monitoring program. One or more samples from five wells exceeded the selenium MCL. Uranium and radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.
- Eight wells completed in the KM Horizon were included in the baseline monitoring program. Uranium and radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.

- Three wells completed in the L Horizon were included in the baseline monitoring program. Radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.
- Three wells completed in the N Horizon were included in the baseline monitoring program. Radionuclide exceedances of WDEQ-WQD and EPA water quality criteria are described in Section 3.15 of this EIS.



**Table 3.6-5. Summary of the Existing Lost Creek ISR Project Area Groundwater Sampling Results**

Constituent	Units	Water Quality Standard(s) <sup>1</sup>	L Horizon		M Horizon	
			Range	Average	Range	Average
Alkalinity as CaCO <sub>3</sub>	mg/L		69-119	94	<5-111	*
Carbonate as CO <sub>3</sub>	mg/L		<5-29	*	<1-<5	*
Bicarbonate as HCO <sub>3</sub>	mg/L		<5-157	*	98-134	115
Calcium	mg/L		17-60	39	10-49	39
Chloride	mg/L	250	4-9	6	3-8	6
Fluoride	mg/L	2.0-4.0	<0.1-0.2	*	0.1-0.2	0.16
Magnesium	mg/L		<1-2	*	<1-2	*
Ammonia as N	mg/L	0.5	<0.05-0.36	*	<0.05-0.07	*
Nitrate+Nitrite as N	mg/L	10	<0.01	*	<0.05-<0.1	*
Potassium	mg/L		2-7	4	<1-7	*
Silica	mg/L		<0.01-19	*	11.7-18.2	15
Sodium	mg/L		21-45	32	28-60	38
Sulfate	mg/L	250	62-123	88	63-123	84
Conductivity	µmhos/cm		268-796	374	269-443	372
pH	s.u.	6.5-8.5	7.5- <b>11.0</b>	<b>8.6</b>	7.83- <b>9.02</b>	8.3
TDS	mg/L	500	183-443	255	191-322	254
SAR	unitless		0.78-2.23	1.4	1.12-4.83	1.8
Aluminum	mg/L	0.05-0.2	<0.1- <b>0.3</b>	*	<0.1	*
Arsenic	mg/L	0.01	<0.001-0.008	*	<0.001-0.004	*
Barium	mg/L	2.0	<0.1	*	<0.1-0.1	*
Boron	mg/L		<0.1	*	<0.1	*
Cadmium	mg/L	0.005	<0.005	*	<0.005	*
Chromium	mg/L	0.1	<0.05	*	<0.05	*
Copper	mg/L	1.0	<0.01	*	<0.01	*
Iron	mg/L	0.3	<0.03-0.2	*	<0.03	*
Lead	mg/L	0.015	<0.001-0.002	*	<0.03-0.28	*
Manganese	mg/L	0.05	<0.01-0.01	*	<0.01-0.02<	*
Mercury	mg/L	0.002	<0.001	*	<0.001	*
Molybdenum	mg/L		<0.1	*	<0.1	*
Nickel	mg/L	0.1	<0.05	*	<0.05	*
Selenium	mg/L	0.05	<0.001	*	<0.001-0.001	*
Uranium	mg/L	0.03	0.0005- <b>0.0508</b>	0.0069	0.0006-0.0186	0.0087
Vanadium	mg/L		<0.1	*	<0.1	*
Zinc	mg/L	5.0	<0.01	*	<0.01	*
Gross Alpha	pCi/L	15 <sup>2</sup>	8.0- <b>79.5</b>	<b>27</b>	5.1- <b>108</b>	<b>35</b>
Gross Beta	pCi/L		5.2-31.2	14	3.3-47	15
Radium-226	pCi/L		0.94- <b>6.3</b>	3.0	0.72- <b>39</b>	<b>8.6</b>
Radium-228	pCi/L		1.4- <b>8.6</b>	3.9	0.8- <b>5.6</b>	3.5
Radium-226+Radium-228	pCi/L	5.0	2.7- <b>12.2</b>	<b>5.9</b>	1.5- <b>44.4</b>	<b>12.2</b>

<sup>1</sup> EPA Drinking Water Standards – 40 CFR Part 142 and 40 CFR Part 143; WDEQ-WQD Rules and Regulations, Chapter 8, Class I, Domestic Groundwater.

<sup>2</sup> MCL is for adjusted gross alpha which removes uranium activity; therefore, a direct comparison is not accurate.

**BOLD** indicates a value greater than WDEQ/WQD Class I and/or EPA water quality criteria.

\* Indicates that average was not calculated since one or more values are less than the detection limit.

< Less than, where the value following the “<” is the detection limit.

Source: LCI 2017i

**Table 3.6-5. Summary of the Existing Lost Creek ISR Project Area Groundwater Sampling Results (Continued)**

Constituent	Units	Water Quality Standard(s) <sup>1</sup>	N Horizon	
			Range	Average
Alkalinity as CaCO <sub>3</sub>	mg/L		103-113	108
Carbonate as CO <sub>3</sub>	mg/L		<5	*
Bicarbonate as HCO <sub>3</sub>	mg/L		126	*
Calcium	mg/L		55	*
Chloride	mg/L	250	5-7	6
Fluoride	mg/L	2.0-4.0	0.2	*
Magnesium	mg/L		2	*
Ammonia as N	mg/L	0.5	<0.05	*
Nitrate+Nitrite as N	mg/L	10	<0.1	*
Potassium	mg/L		2	*
Silica	mg/L		16.3	*
Sodium	mg/L		28	*
Sulfate	mg/L	250	94	*
Conductivity	µmhos/cm		418	*
pH	s.u.	6.5-8.5	7.97	*
TDS	mg/L	500	258	*
SAR	unitless		1.01	*
Aluminum	mg/L	0.05-0.2	<0.1	*
Arsenic	mg/L	0.01	0.001	*
Barium	mg/L	2.0	<0.1	*
Boron	mg/L		<0.1	*
Cadmium	mg/L	0.005	<0.005	*
Chromium	mg/L	0.1	<0.05	*
Copper	mg/L	1.0	<0.01	*
Iron	mg/L	0.3	<0.03	*
Lead	mg/L	0.015	<0.001	*
Manganese	mg/L	0.05	0.02	*
Mercury	mg/L	0.002	<0.001	*
Molybdenum	mg/L		<0.1	*
Nickel	mg/L	0.1	<0.05	*
Selenium	mg/L	0.05	<0.001	*
Uranium	mg/L	0.03	0.0014	*
Vanadium	mg/L		<0.1	*
Zinc	mg/L	5.0	0.25	*
Gross Alpha	pCi/L	15 <sup>2</sup>	10.5	*
Gross Beta	pCi/L		9.8	*
Radium-226	pCi/L		4.0	*
Radium-228	pCi/L		5.0	*
Radium-226+Radium-228	pCi/L	5.0	<b>9.0</b>	*

<sup>1</sup> EPA Drinking Water Standards – 40 CFR Part 142 and 40 CFR Part 143; WDEQ-WQD Rules and Regulations, Chapter 8, Class I, Domestic Groundwater.

<sup>2</sup> MCL is for adjusted gross alpha which removes uranium activity; therefore, a direct comparison is not accurate.

**BOLD** indicates a value greater than WDEQ/WQD Class I and/or EPA water quality criteria.

\* Indicates that average was not calculated since one or more values are less than the detection limit.

< Less than, where the value following the “<” is the detection limit.

Source: LCI 2017i

**Table 3.6-6. Summary of the Proposed LCE Expansion Area Groundwater Sampling Results**

Constituent	Units	Water Quality Standard(s) <sup>1</sup>	FG Horizon		HJ Horizon	
			Range	Average	Range	Average
Alkalinity as CaCO <sub>3</sub>	mg/L		106-160	132	104-130	117
Carbonate as CO <sub>3</sub>	mg/L		<5	*	<5-10	*
Bicarbonate as HCO <sub>3</sub>	mg/L		122-196	162	91-159	138
Calcium	mg/L		39-157	93	43-96	59
Chloride	mg/L	250	5-7	6	5-7	6
Fluoride	mg/L	2.0-4.0	<0.1-0.2	*	0.1-0.2	0.2
Magnesium	mg/L		3-6	5	2-5	3
Ammonia as N	mg/L	0.5	<0.05-0.09	*	<0.05-0.1	*
Nitrate+Nitrite as N	mg/L	10	<0.1-0.5	*	<0.1-0.8	*
Potassium	mg/L		2-21	6	2-5	3
Silica	mg/L		11.8-19.4	16	13.5-20.2	16
Sodium	mg/L		17-32	24	16-29	21
Sulfate	mg/L	250	40- <b>307</b>	173	39-188	87
Conductivity	µmhos/cm		301-879	601	313-623	411
pH	s.u.	6.5-8.5	7.73- <b>8.53</b>	8.1	7.81- <b>8.90</b>	8.1
TDS	mg/L	500	189- <b>654</b>	427	191-436	269
SAR	unitless		0.63-0.75	0.7	0.52-1.00	0.7
Aluminum	mg/L	0.05-0.2	<0.1	*	<0.1-0.04	*
Arsenic	mg/L	0.01	<0.001-0.005	*	<0.001- <b>0.025</b>	*
Barium	mg/L	2.0	<0.1-0.1	*	<0.1	*
Boron	mg/L		<0.1	*	<0.1	*
Cadmium	mg/L	0.005	<0.005	*	<0.005	*
Chromium	mg/L	0.1	<0.05	*	<0.05	*
Copper	mg/L	1.0	<0.01	*	<0.01	*
Iron	mg/L	0.3	<0.03-0.16	*	<0.03	*
Lead	mg/L	0.015	<0.001-0.004	*	<0.001-0.002	*
Manganese	mg/L	0.05	<0.01-0.03	*	<0.01-0.04	*
Mercury	mg/L	0.002	<0.001	*	<0.001	*
Molybdenum	mg/L		<0.1-0.001	*	<0.1	*
Nickel	mg/L	0.1	<0.05	*	<0.05	*
Selenium	mg/L	0.05	<0.001- <b>0.063</b>	*	<0.001-0.059	*
Silver	mg/L		<0.001	*	<0.001	*
Uranium	mg/L	0.03	0.0098- <b>0.933</b>	<b>0.475</b>	0.0178- <b>0.415</b>	<b>0.101</b>
Vanadium	mg/L		<0.1	*	<0.1	*
Zinc	mg/L	5.0	<0.01-0.09	*	<0.01-0.04	*
Gross Alpha	pCi/L	15 <sup>2</sup>	<b>36.1-649</b>	<b>348</b>	<b>20.4-386</b>	<b>91</b>
Gross Beta	pCi/L		16.8-229	69	5.6-100	24
Radium-226	pCi/L		1.9- <b>14</b>	<b>7.2</b>	2.7- <b>11</b>	<b>6.2</b>
Radium-228	pCi/L		0.8- <b>9.0</b>	4.3	2.0-8.7	3.6
Radium-226+Radium-228	pCi/L	5.0	4.2- <b>20.2</b>	<b>12</b>	<b>5.5-18.7</b>	<b>9.8</b>
Lead-210, dissolved	pCi/L		-0.3-1.3	0.4	-0.3-3.6	1.4
Lead-210, suspended	pCi/L		-0.2-3.2	0.8	-0.20-1.7	0.4
Polonium-210, dissolved	pCi/L		-0.02-0.8	0.5	-0.05-1.3	0.4
Polonium-210, suspended	pCi/L		-0.1-1.4	0.5	0.08-1	0.4
Thorium-230, dissolved	pCi/L		0.0006-0.1	0.04	-0.01-7.5	0.6
Thorium-230, suspended	pCi/L		0.02-0.3	0.09	-0.03-0.2	0.08

<sup>1</sup> EPA Drinking Water Standards – 40 CFR Part 142 and 40 CFR Part 143; WDEQ-WQD Rules and Regulations, Chapter 8, Class I, Domestic Groundwater.

<sup>2</sup> MCL is for adjusted gross alpha which removes uranium activity; therefore, a direct comparison is not accurate.

**BOLD** indicates a value greater than WDEQ/WQD Class I and/or EPA water quality criteria.

\* Indicates that average was not calculated since one or more values are less than the detection limit.

< Less than, where the value following the “<” is the detection limit.

Source: LCI 2017j

**Table 3.6-6. Summary of the Proposed LCE Expansion Area Groundwater Sampling Results (Continued)**

Constituent	Units	Water Quality Standard(s) <sup>1</sup>	KM Horizon		L Horizon	
			Range	Average	Range	Average
Alkalinity as CaCO <sub>3</sub>	mg/L		81-126	105	93-108	100
Carbonate as CO <sub>3</sub>	mg/L		<5-10	*	<5	*
Bicarbonate as HCO <sub>3</sub>	mg/L		86-153	127	113-132	121
Calcium	mg/L		22-101	46	30-43	38
Chloride	mg/L	250	2-7	5	4-7	5
Fluoride	mg/L	2.0-4.0	0.1-0.2	0.2	0.1-0.2	0.2
Magnesium	mg/L		<1-4	*	<1-2	*
Ammonia as N	mg/L	0.5	<0.05-0.11	*	<0.05	*
Nitrate+Nitrite as N	mg/L	10	<0.1-1	*	<0.1	*
Potassium	mg/L		1-6	3	2	2
Silica	mg/L		12.2-18.1	15	15.1-16.6	16
Sodium	mg/L		13-28	21	23-26	25
Sulfate	mg/L	250	8-200	61	18-49	35
Conductivity	µmhos/cm		208-668	339	231-315	272
pH	s.u.	6.5-8.5	7.76- <b>9.04</b>	8.2	8.1-8.3	8.2
TDS	mg/L	500	119-461	221	141-206	174
SAR	unitless		0.53-1.25	0.9		
Aluminum	mg/L	0.05-0.2	<0.1-0.04	*	<0.03	*
Arsenic	mg/L	0.01	<0.001-0.004	*	<0.001-0.002	*
Barium	mg/L	2.0	<0.1	*	<0.05	*
Boron	mg/L		<0.1	*	<0.05	*
Cadmium	mg/L	0.005	<0.005	*	<0.001	*
Chromium	mg/L	0.1	<0.05	*	<0.005	*
Copper	mg/L	1.0	<0.01	*	<0.005	*
Iron	mg/L	0.3	<0.03-0.05	*	<0.03	*
Lead	mg/L	0.015	<0.001-0.002	*	<0.001	*
Manganese	mg/L	0.05	<0.01-0.02	*	0.003-0.01	0.007
Mercury	mg/L	0.002	<0.001	*	<0.0001	*
Molybdenum	mg/L		<0.1-0.003	*	<0.001-0.001	*
Nickel	mg/L	0.1	<0.05	*	<0.005	*
Selenium	mg/L	0.05	<0.001-0.023	*	<0.001	*
Silver	mg/L		<0.001	*	NM	NM
Uranium	mg/L	0.03	0.0053- <b>0.314</b>	<b>0.078</b>	0.0019-0.0246	0.0152
Vanadium	mg/L		<0.1	*	<0.01	*
Zinc	mg/L	5.0	<0.01-0.06	*	<0.01	*
Gross Alpha	pCi/L	15 <sup>2</sup>	9.2- <b>269</b>	<b>69</b>	9- <b>23.9</b>	<b>16</b>
Gross Beta	pCi/L		3.3-85.2	19	4.2-8.5	6
Radium-226	pCi/L		0.68- <b>14</b>	3.7	1.8-3.0	2.4
Radium-228	pCi/L		<b>0.8-6.1</b>	3.2	0.8-3.8	2.6
Radium-226+Radium-228	pCi/L	5.0	2.4- <b>19.1</b>	<b>6.9</b>	3.8- <b>6.3</b>	5.0
Lead-210, dissolved	pCi/L		0.05-2.0	0.8		
Lead-210, suspended	pCi/L		-0.10-6.2	0.8		
Polonium-210, dissolved	pCi/L		-0.03-1.6	0.3		
Polonium-210, suspended	pCi/L		-0.07-1.8	0.4		
Thorium-230, dissolved	pCi/L		-0.008-0.2	0.05		
Thorium-230, suspended	pCi/L		0.03-0.5	0.2		

<sup>1</sup> EPA Drinking Water Standards – 40 CFR Part 142 and 40 CFR Part 143; WDEQ-WQD Rules and Regulations, Chapter 8, Class I, Domestic Groundwater.

<sup>2</sup> MCL is for adjusted gross alpha which removes uranium activity; therefore, a direct comparison is not accurate.

**BOLD** indicates a value greater than WDEQ/WQD Class I and/or EPA water quality criteria.

\* Indicates that average was not calculated since one or more values are less than the detection limit.

< Less than, where the value following the “<” is the detection limit.

Source: LCI 2017j

**Table 3.6-6. Summary of the Proposed LCE Expansion Area Groundwater Sampling Results (Continued)**

Constituent	Units	Water Quality		
		Standard(s) <sup>1</sup>	Range	Average
Alkalinity as CaCO <sub>3</sub>	mg/L		85-105	92
Carbonate as CO <sub>3</sub>	mg/L		<5-10	*
Bicarbonate as HCO <sub>3</sub>	mg/L		83-123	106
Calcium	mg/L		23-48	34
Chloride	mg/L	250	4-5	4
Fluoride	mg/L	2.0-4.0	0.1-0.2	0.2
Magnesium	mg/L		<1-2	*
Ammonia as N	mg/L	0.5	<0.05-0.12	*
Nitrate+Nitrite as N	mg/L	10	<0.1	*
Potassium	mg/L		1-6	3
Silica	mg/L		14.1-20.5	16
Sodium	mg/L		23-37	29
Sulfate	mg/L	250	24-106	59
Conductivity	µmhos/cm		232-416	312
pH	s.u.	6.5-8.5	8.13- <b>9.15</b>	8.4
TDS	mg/L	500	139-280	203
SAR	unitless		1.08-1.52	1.4
Aluminum	mg/L	0.05-0.2	<0.1	*
Arsenic	mg/L	0.01	<0.001-0.004	*
Barium	mg/L	2.0	<0.1	*
Boron	mg/L		<0.1	*
Cadmium	mg/L	0.005	<0.005	*
Chromium	mg/L	0.1	<0.05	*
Copper	mg/L	1.0	<0.01	*
Iron	mg/L	0.3	<0.03	*
Lead	mg/L	0.015	<0.001	*
Manganese	mg/L	0.05	<0.01	*
Mercury	mg/L	0.002	<0.001	*
Molybdenum	mg/L		<0.1	*
Nickel	mg/L	0.1	<0.05	*
Selenium	mg/L	0.05	<0.001	*
Silver	mg/L		<0.001	*
Uranium	mg/L	0.03	0.0005-0.0136	0.002
Vanadium	mg/L		<0.1	*
Zinc	mg/L	5.0	<0.01-0.01	*
Gross Alpha	pCi/L	15 <sup>2</sup>	2.1-11.3	6.4
Gross Beta	pCi/L		2.5-10	6.8
Radium-226	pCi/L		1.1-2.4	1.9
Radium-228	pCi/L		0.8- <b>9.5</b>	4.0
Radium-226+Radium-228	pCi/L	5.0	3.0- <b>10.7</b>	<b>5.9</b>
Lead-210, dissolved	pCi/L		0.2-1.0	0.5
Lead-210, suspended	pCi/L		-0.08-0.5	0.2
Polonium-210, dissolved	pCi/L		0.02-0.6	0.2
Polonium-210, suspended	pCi/L		-0.05-0.8	0.3
Thorium-230, dissolved	pCi/L		0.001-0.1	0.1
Thorium-230, suspended	pCi/L		0.001-0.2	0.1

<sup>1</sup> EPA Drinking Water Standards – 40 CFR Part 142 and 40 CFR Part 143; WDEQ-WQD Rules and Regulations, Chapter 8, Class I, Domestic Groundwater.

<sup>2</sup> MCL is for adjusted gross alpha which removes uranium activity; therefore, a direct comparison is not accurate.

**BOLD** indicates a value greater than WDEQ/WQD Class I and/or EPA water quality criteria.

\* Indicates that average was not calculated since one or more values are less than the detection limit.

< Less than, where the value following the “<” is the detection limit.

Source: LCI 2017j

### 3.7 Vegetation

The project area consists of flat, upland areas and gentle, south-facing slopes dissected by southerly-flowing ephemeral washes. There are no perennial streams in the project area. The region has limited precipitation and high potential evaporation, which results in little soil moisture available for the growth of most plants. The Eagles Nest rain gauge, maintained by BLM 5 miles west of the project area, has a 30-year average of about 6 inches of annual moisture, with a range from 2 to 10 inches (Warren 2018). Limited soil moisture, when coupled with cold temperatures that persist for much of the year, results in what is called a northern cold desert plant community dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), along with other shrubs, cushion plants, and grasses. The terrain of the project area slopes gently to the south. The bedrock is interbedded shales and sandstones, which serve as the parent material for the soils. The resulting soils are typical of semi-arid areas in Wyoming.

#### 3.7.1 Vegetation Survey Results

The following vegetation discussion describes the vegetation communities within the project area as well as noxious weeds, invasive species, and special status species. Vegetation surveys were conducted in the existing Lost Creek ISR Project area in 2006, 2007, and 2009. Surveys were conducted in the proposed LCE expansion area in 2012 and 2013. Except to the extent that new information provided herein updates the previous discussions, the following specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.7, pp. 3.7-1 through 3.7-22 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.6.1.1, pp. 3-35 through 3-38 (NRC 2011)

#### 3.7.2 Vegetation Communities

The vegetation in the project area is dominated by Wyoming big sagebrush and includes three vegetation community types (map 3.7-1). The majority of the project area is classified as an Upland Big Sagebrush Shrubland (UBSS) vegetation community, with the remaining area covered by Lowland Big Sagebrush Shrubland (LBSS), Mixed Grass/Mat Cushion Grassland (MG/MC), disturbed areas, and water (table 3.7-1).

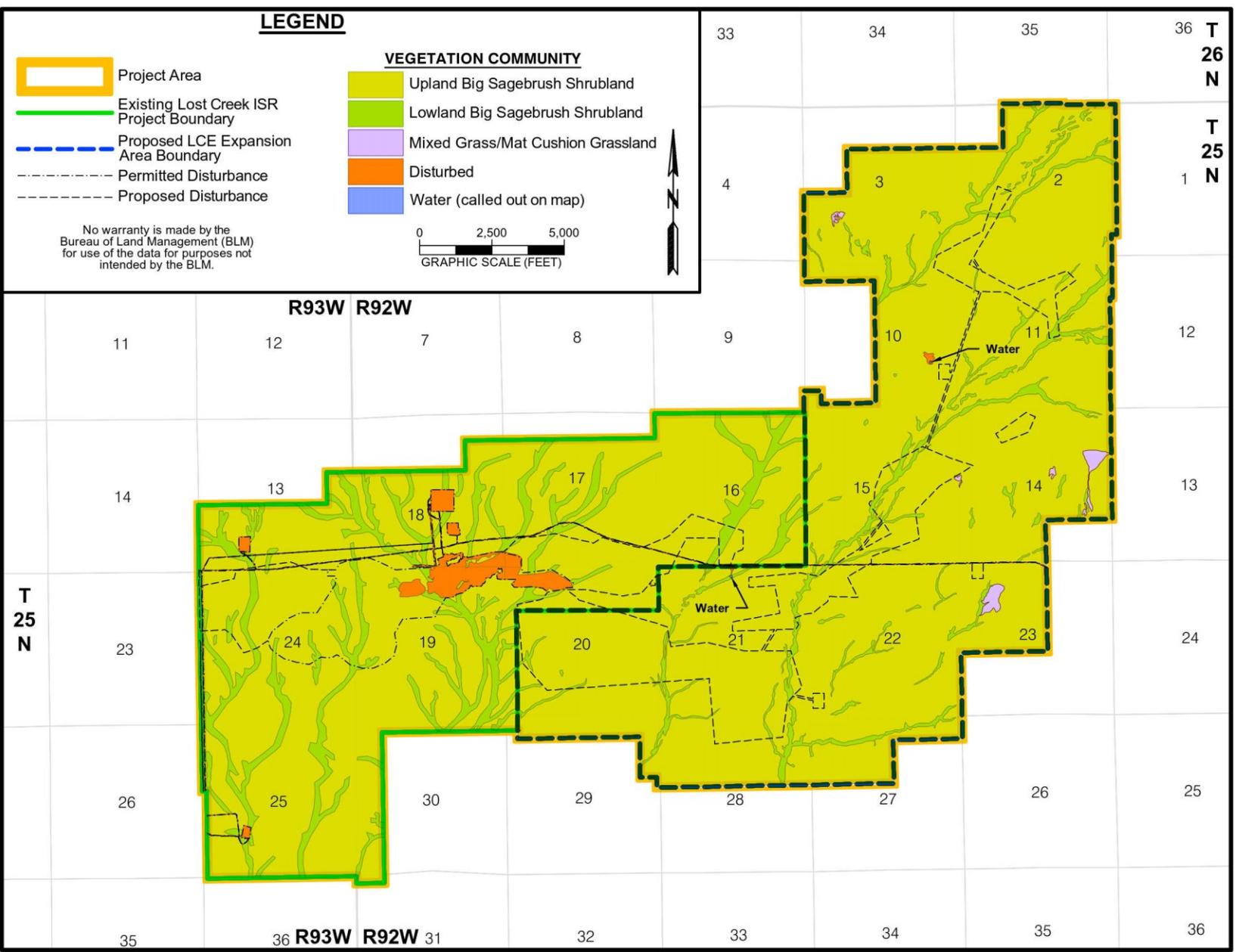
**Table 3.7-1. Vegetation Communities**

Vegetation Type	Acres <sup>1</sup>	Percent of Total Area
Upland Big Sagebrush Shrubland (UBSS)	8,431	84.7%
Lowland Big Sagebrush Shrubland (LBSS)	845	8.5%
Mixed Grass/Mat Cushion Grassland (MG/MC)	27	0.3%
Disturbed Area	641	6.5%
Water (W)	<1	0.0%
<b>Total<sup>2</sup></b>	<b>9,944</b>	<b>100%</b>

<sup>1</sup> Area based on vegetation surveys, which do not exactly match the total acres in the project area.

<sup>2</sup> Total may not sum due to rounding.

Map 3.7-1. Vegetation Community Types



The UBSS vegetation community covers approximately 85 percent of the project area (table 3.7-1). As described in the BLM Lost Creek EIS, UBSS is commonly found in shallow, coarse-textured soils in flat areas and south-facing slopes. The most common shrub within the UBSS vegetation community is Wyoming big sagebrush. Grasses and forbs were observed in this vegetation community but in smaller quantities than shrubs.

The LBSS is found on 8.5 percent of the project area along ephemeral drainages, where soils are deeper than in the uplands. The BLM Lost Creek EIS describes how the deeper soil and increased potential for soil moisture cause the big sagebrush of the lowlands to grow bigger than the shrubs in the UBSS. The LBSS is dominated by Wyoming big sagebrush and sticky-leaved rabbitbrush (*Chrysothamnus viscidiflorus*), with lower densities of perennial grasses and forbs.

The MG/MC Grassland vegetation community, which covers approximately 0.3 percent of the project area, is generally found in coarse-textured soils on sandy hilltops and eroded areas on hillsides. The dominant vegetation types in this community are native perennial forbs with scattered shrub species. Native cool season perennial grasses were the second most common lifeform with seven plant species observed.

Disturbed areas make up about 6.5 percent of the project area. The disturbed areas are primarily associated with the existing Lost Creek ISR Project area. Water (reservoirs) makes up less than 0.1 percent of the project area.

### **3.7.3 Noxious Weeds, Declared Weeds, and Selenium Indicator Species**

The State of Wyoming defines noxious weeds as any plant species having seeds or other parts determined to be detrimental to the general health or welfare of the state based on its ability to aggressively invade native plant communities or agricultural crops, cause injurious effects on livestock, carry disease or parasites, or negatively impact management of agricultural or natural ecosystems (W.S. § 11-5-102(a)(xi)). The State of Wyoming currently designates 26 noxious weed species (Wyoming Weed and Pest Council 2017). In addition, Sweetwater County has declared weeds of concern under the authority of the Wyoming Weed and Pest Control Act. No noxious weeds, as determined from the State of Wyoming and Sweetwater County 2017 weed lists, were observed within the project area during baseline vegetation surveys. In addition, the BLM maintains an invasive species list, which includes not only noxious weeds but also other non-native plants (BLM 2018b). No BLM invasive species were observed within the project area during baseline vegetation surveys.

The WDEQ-LQD defines selenium indicator plants as “plant species which may selectively concentrate selenium in their tissue and/or be tolerant of high selenium concentrations in the soil” (WDEQ-LQD 2014). During the baseline vegetation surveys, no selenium indicator species were observed within the project area.

### **3.7.4 Threatened, Endangered, and Special Concern Plant Species**

According to the USFWS, threatened and endangered (T&E) species known to occur within Sweetwater County include Ute Ladies'-tresses (*Spiranthes diluvialis*) and the western prairie fringed orchid (*Platanthera praeclara*) (USFWS 2015b). A more refined search area that included just the immediate vicinity of the project area identified only the potential for Ute Ladies'-tresses (USFWS 2017). Habitat suitability for Ute ladies'-tresses within the project area was evaluated based on the presence of a late season perennial water source, associated vegetation species, sandy

or loamy textured soils, gradual transitions between uplands and water bodies or drainages, vegetation density between 75 and 90 percent, vegetation height less than 18 inches, and non-alkaline soils. The field evaluations conducted during the appropriate time frame indicated that late season perennial water sources were not present within the project area. No individuals or populations of Ute ladies'-tresses were found during field surveys and, based on the lack of suitable habitat characteristics, local habitat was confirmed unsuitable for Ute ladies'-tresses.

No BLM sensitive plant species were observed in the project area during the field surveys. In addition, no BLM sensitive or special status plant species have been reported within the project area on the Wyoming Natural Diversity Database (WYNDD 2015).

### **3.7.5 Vegetation Communities with Limited Reclamation Potential**

No vegetation communities with LRP or plant species indicative of soils with LRP were identified within the project area. Areas having LRP are often characterized by highly sensitive and/or erosive soils, extremely sensitive vegetation types, soils with severe physical or chemical limitations, extremely steep slopes, etc. While halophytes and salt-tolerant herbaceous species (e.g., narrowleaf goosefoot [*Chenopodium leptophyllum*] and western wheatgrass [*Agropyron smithii*]) were observed, the vegetation communities within the project area are dominated by Wyoming big sagebrush rather than salt-tolerant vegetation species.

### **3.8 Wildlife**

The wildlife resources and ecology within and in the vicinity of the existing Lost Creek ISR Project area are described in detail in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.8, pp. 3.8-1 through 3.8-61 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.6, pp. 3-34 through 3-53 (NRC 2011)

These documents evaluated site-specific and regional species occurrence for big game (elk [*Cervus canadensis*], mule deer [*Odocoileus hemionus*], pronghorn [*Antilocapra americana*], and moose [*Alces alces*]), upland game birds, waterfowl and shorebirds, passerine and breeding birds, other mammals, T&E species, reptiles and amphibians, other species of special interest (SOSI), and fish and aquatic life. No significant changes to the status or use areas for big game, upland game birds (excluding Greater sage-grouse [*Centrocercus urophasianus*]), other mammals (excluding pygmy rabbits [*Brachylagus idahoensis*] and Wyoming pocket gophers [*Thomomys clusius*]), waterfowl and shorebirds, reptiles and amphibians, and fish and aquatic life have been noted since the publication of the BLM Lost Creek EIS and the NRC Lost Creek SEIS. Because no significant changes to the status or use areas for these species have been observed, specific data from the BLM Lost Creek EIS and the NRC Lost Creek SEIS are incorporated by reference into this EIS.

There have been changes in discussions related to Greater sage-grouse, selected other mammal species, raptor nest locations, T&E species, and SOSI. Therefore, discussions of these species are included in the following sections. The following updated wildlife information is from annual wildlife monitoring, which has been conducted in accordance with the Applicant's Wildlife Protection Plan and Wildlife Monitoring Plan (LCI 2010b).

### 3.8.1 Greater Sage-grouse

On September 22, 2015, USFWS determined that listing the Greater sage-grouse as a T&E species under the ESA was not warranted (USFWS 2015a). However, Greater sage-grouse are a species of concern in the area because the project area is located within a BLM PHMA, as delineated in the ARMPA (BLM 2015a). The project area is also within the Greater South Pass Greater sage-grouse core population area, as delineated in the Wyoming Greater Sage-Grouse Core Area Protection strategy (Office of the Governor 2015).

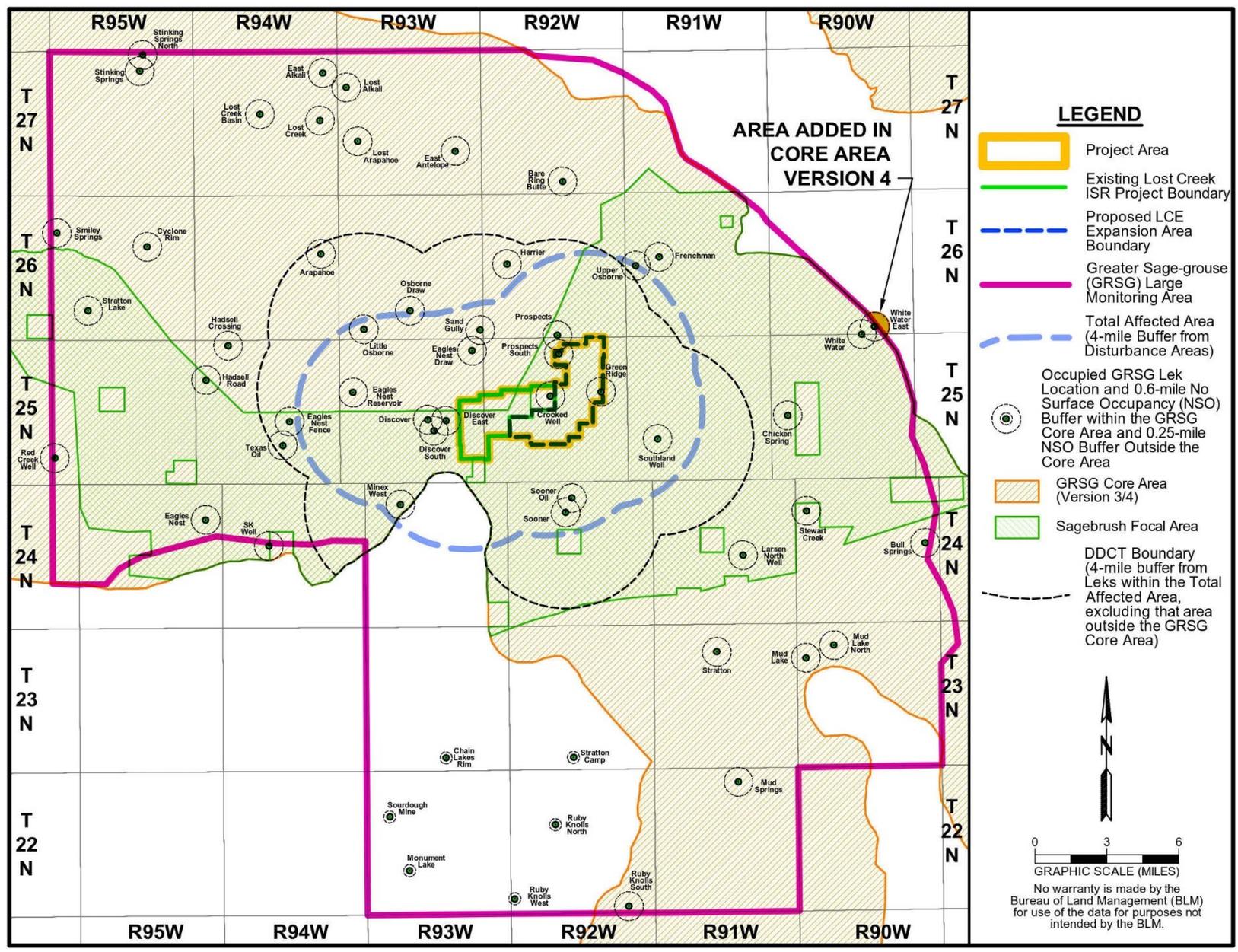
The ARMPA is consistent with the BLM's National Sage-Grouse Conservation Strategy and addresses threats to Greater sage-grouse and its habitat identified by the Greater sage-grouse National Technical Team. The ARMPA includes management procedures to consolidate Greater sage-grouse protection within the State of Wyoming in light of the federal government's recent decision not to list the species under the ESA.

The Wyoming Greater Sage-Grouse Core Area Protection strategy has been updated since publication of the BLM Lost Creek EIS. Wyoming Executive Order 2015-4 updated the 2011 Wyoming Executive Order by redefining core population areas and providing clarifications and corrections (Office of the Governor 2015). The updated core areas, Greater sage-grouse monitoring boundaries, and lek locations are shown on map 3.8-1.

Leks within the Total Affected Area (shown on map 3.8-1) are considered Affected Leks, and leks outside of the Total Affected Area but within the Large Greater Sage-grouse Monitoring Area (defined on map 3.8-1) are considered Reference Leks. The Applicant is currently monitoring the 11 Affected Leks/lek complexes within the Total Affected Area. There are three Affected Leks/lek complexes (Crooked Well, Prospects/Prospects South, and Green Ridge) located within the project area. In addition, the Applicant is currently monitoring or has obtained lek-count data from other reliable sources on 40 Reference Leks/lek complexes. The Applicant provides the result of annual wildlife monitoring in annual reports submitted to BLM, NRC, and WGFD. Results for 2012-2017 are provided in table 3.8-1. The results of monitoring show that differences in annual change and in slopes are diverging or negative starting in 2012 to 2013 (LWR 2018). This suggests that trends in the number of males counted on the Affected Leks are responding negatively to activities at the Lost Creek ISR Project. The majority of leks, however, experienced an increase in 3-year running average counts in 2016, including Affected Leks. Monitoring conducted in 2017 indicates that, while lek count numbers declined in both monitoring areas, the rates of decline were similar (BLM 2017e).

Brood-transect surveys were also conducted in the project area to assess Greater sage-grouse productivity. Table 3.8-2 summarizes the results of the Greater sage-grouse brood-transect surveys for 2012 through 2017, as depicted as young of the year per female. The information provided by WGFD in table 3.8-2 regarding the South-Central Sage-Grouse Local Conservation Area was determined from wing-barrel data and is included for comparison purposes. Wing-barrel data were gathered from hunters who voluntarily deposit wings in barrels scattered across central and southwest Wyoming. WGFD uses the wings to determine age and gender of harvested sage-grouse, ultimately gaining information about a year's chick survival and anticipated population trends.

Map 3.8-1. Greater Sage-grouse Monitoring Boundaries and Lek Locations



**Table 3.8-1. Maximum Number of Male Greater Sage-grouse Counted on Affected Leaks and on Reference Leaks, 2012-2017**

	2012	2013	2014	2015	2016	2017
<b>Affected Lek (Total Affected Area)</b>						
Discover/Discover East/Discover South Complex	29	10	3	7	25	26
Crooked Well	0	0	0	0	0	0
Eagles Nest Draw	64	29	13	19	44	31
Eagles Nest Reservoir	0	0	0	0	0	0
Green Ridge	55	32	26	27	42	43
Little Osborne	0	0	0	0	0	--
Minex West	5	1	0	0	0	0
Prospects/Prospects South Complex	39	29	14	19	38	34
Sand Gully	1	1	0	0	2	4
Sooner/Sooner Oil Complex	19	4	2	0	0	0
Southland Well	32	20	11	7	21	23
<b>Total</b>	<b>244</b>	<b>126</b>	<b>69</b>	<b>79</b>	<b>172</b>	<b>161</b>
<b>Annual Percent Change</b>	<b>--</b>	<b>-48.4</b>	<b>-45.2</b>	<b>14.5</b>	<b>117.7</b>	<b>-7.0</b>
<b>Reference Leaks (Large Greater Sage-grouse Monitoring Area)</b>						
Arapahoe	28	17	8	13	33	28
Bare Ring Butte	46	60	56	118	135	100
Bull Springs	25	20	17	23	19	18
Chain Lakes Rim	20	19	13	30	54	47
Chicken Spring	90	70	54	97	110	111
Cyclone Rim	48	29	22	36	47	26
Eagles Nest	1	0	0	0	0	0
Eagles Nest Fence	39	17	7	21	43	47
East Alkali	16	14	17	17	31	35
East Antelope	33	20	26	26	27	20
Frenchman	10	10	10	64	86	65
Hadsell Crossing	25	10	0	1	3	2
Hadsell Road	1	0	0	0	0	0
Harrier	60	25	38	25	32	26
Larsen North Well	18	12	6	13	20	15
Lost Alkali	0	0	0	0	0	0
Lost Arapahoe	22	17	19	37	38	49
Lost Creek	0	0	0	0	0	0
Lost Creek Basin	50	25	31	42	82	75
Monument Lake	4	1	0	0	0	0
Mud Lake	0	16	0	0	0	41
Mud Lake North	21	18	11	19	31	28
Mud Springs	--	--	--	--	135	78
Osborne Draw	0	0	0	0	0	0
Red Creek Well	29	16	11	11	24	18
Ruby Knolls South	45	17	21	48	50	53
Ruby Knolls West	23	11	3	9	19	18
Ruby Knolls North	0	0	0	--	--	--
SK Well	0	0	0	0	0	0
Smiley Springs	44	32	22	39	49	41
Sourdough Mine	10	9	7	16	32	43
Stewart Creek	43	30	22	34	44	38
Stinking Springs/Stinking Springs North	33	19	21	27	30	33
Stratton	21	19	10	22	22	22
Stratton Lake	0	0	0	0	0	0
Stratton Camp	9	13	8	10	9	19
Texas Oil	0	0	0	0	0	1
Upper Osborne	49	43	25	21	25	12
White Water	0	0	0	0	0	0
White Water East	7	12	9	9	10	4
<b>Total</b>	<b>870</b>	<b>621</b>	<b>494</b>	<b>828</b>	<b>1,240</b>	<b>1,113</b>
<b>Annual Percent Change</b>		<b>-</b>	<b>-20.5%</b>	<b>67.6%</b>	<b>49.8%</b>	<b>-10.2%</b>

Source: LWR 2018

**Table 3.8-2. Greater Sage-grouse Brood-Rearing Transect Survey Results, 2012-2017**

Year	Males	Females	Young of Year	Young of Year per Female	WGFD Young per Female <sup>1</sup>
2012	1	32	35	1.09	0.80
2013	9	17	8	0.47	1.10
2014	34	53	24	0.45	2.10
2015	22	39	48	1.23	1.40
2016	88	79	93	1.18	1.30
2017	39	30	18	0.60	Not Available

<sup>1</sup> Information from the South-Central Sage-Grouse Job Completion Report Information (WGFD 2016).  
Source: LWR 2018

While a direct comparison between young of the year per female determined from brood surveys and from wing-barrel analysis is not appropriate due to the differences in data collection methods, a comparison of trends may be valid. Data collected between 2012-2016 indicated that there was a slightly higher increasing trend in the number of young of year per female calculated by WGFD from wing-barrel analysis compared to the increasing trend observed by the Applicant from brood survey data. A longer period of time may be required to establish useable long-term trends.

### 3.8.2 Selected Mammal Species

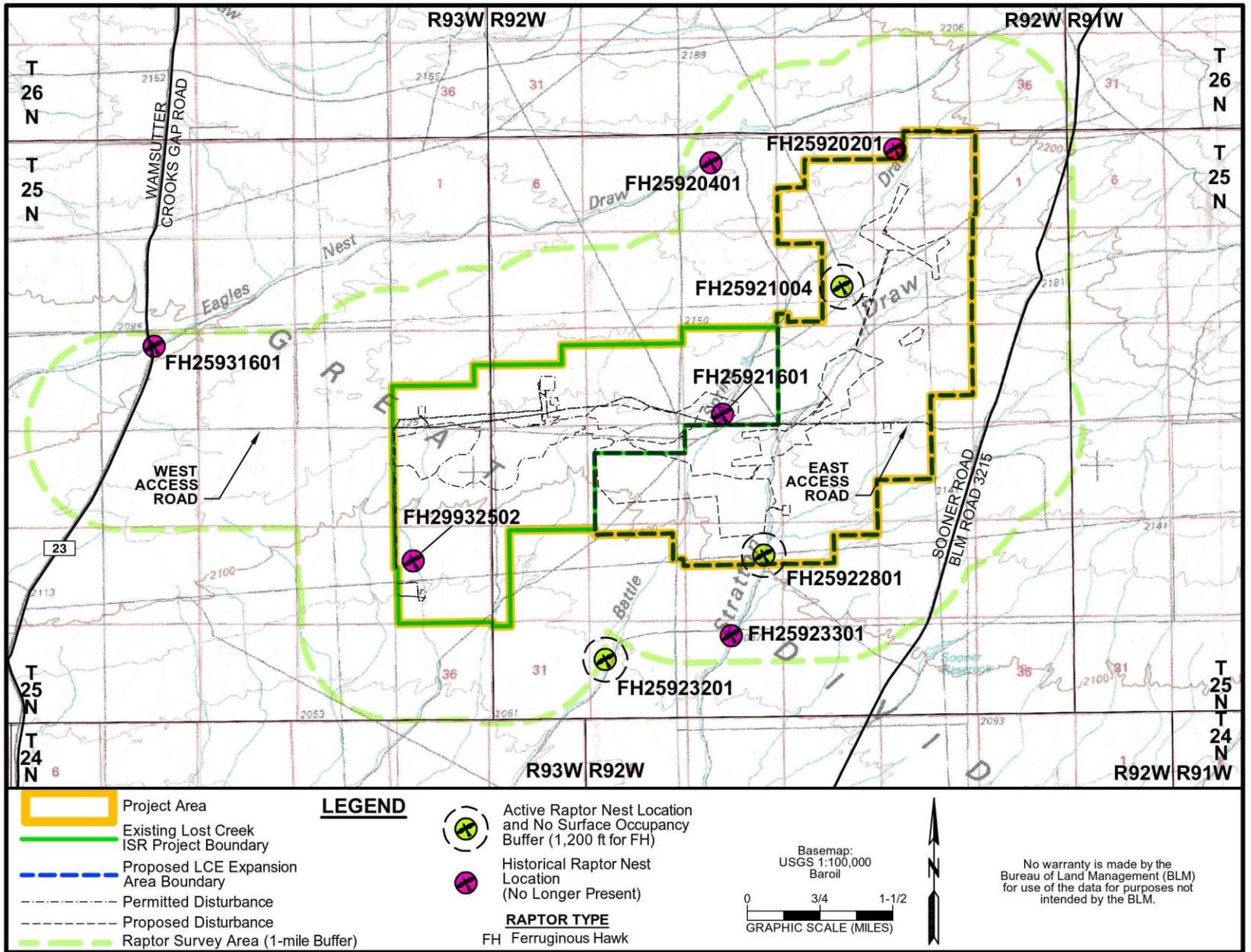
The pygmy rabbit was petitioned for listing under the ESA in 2008. In 2010, USFWS determined that listing was not warranted because information does not indicate pygmy rabbits are significantly impacted by sagebrush loss or modification from various actions, hunting, research activities, predation, disease, or inadequacies of existing regulatory mechanisms across its range (USFWS 2010b). Surveys for pygmy rabbits were completed in the area between 2010 and 2017 utilizing eight survey transects. Although evidence of pygmy rabbit use was documented each year, the numbers of rabbits observed were low, with two or fewer pygmy rabbits observed during each annual survey. Survey results indicated that pygmy rabbits occupied Lowland Big Sagebrush habitats within the project area.

The Wyoming pocket gopher was petitioned for listing under the ESA in 2007. In 2010, USFWS determined that listing was not warranted because the species was not likely in danger of extinction throughout all or significant portions of its range (USFWS 2010a). The species was again petitioned for listing in 2016, and USFWS again determined that listing was not warranted (via a “not substantial” 90-day decision) in September 2016 (81 FR 63165, September 14, 2016). Trapping within the project area specifically for Wyoming pocket gophers was conducted in 2010 and 2013. Based on the trapping results and from more current incidental sightings of burrows, Wyoming pocket gophers are found on a limited basis in suitable habitat within the project area.

### 3.8.3 Raptors

Map 3.8-2 shows the locations of historical and active raptor nests within 1 mile of the project area as of 2017. The nearest known human activity to the active nests observed during the 2017 breeding season (March 1 to July 31) is also shown on map 3.8-2. Table 3.8-3 lists the status of the raptor nests identified within 1 mile of the project area and summarizes the results of the 2017 raptor nesting survey. The 2017 surveys documented two active ferruginous hawk (*Buteo regalis*) nests.

Map 3.8-2. Raptor Nest Locations



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

**Table 3.8-3. Raptor Nest Status within the 1-Mile Raptor Monitoring Buffer, 2015-2017**

Species	Nest Number	2015			2016			2017		
		Substrate	Status	# Fledged	Substrate	Status	# Fledged	Substrate	Status	# Fledged
Ferruginous Hawk	FH25920201	--	Nest gone	--	--	Nest gone	--	--	Nest gone	--
Ferruginous Hawk	FH25920401	--	Nest gone	--	--	Nest gone	--	--	Nest gone	--
Ferruginous Hawk	FH25921601	--	Inactive, Dilapidated	--	--	Inactive, Dilapidated	--	--	Nest gone	--
Ferruginous Hawk	FH25921004	ANP <sup>1</sup>	Active/Successful	2	ANP	Active/Successful	2	ANP	Active/Successful	2
Ferruginous Hawk	FH25922801	ANP	Ravens used in 2015	--	ANP	Ravens used in 2016	--	ANP	Ravens used in 2017	--
Ferruginous Hawk	FH25931601	--	Nest gone	--	--	Nest gone	--	--	Nest gone	--
Ferruginous Hawk	FH25923201	ANP	Active/Successful	2	ANP	Active/Successful	3	ANP	Active/Successful	2
Ferruginous Hawk	FH25923301	--	Nest gone	--	--	Nest gone	--	--	Nest gone	--
Ferruginous Hawk	FH25932502	--	Nest gone	--	--	Nest gone	--	--	Nest gone	--

<sup>1</sup> ANP = Artificial Nest Platform  
Nest locations are depicted on map 3.8-2.

The ferruginous hawk is a BLM sensitive species and WGFD Species of Greatest Conservation Need (SGCN) Tier 1 species. The two ferruginous hawk nests within the monitoring area that were active in 2017 were located on nesting platforms. No golden eagle or great-horned owl nests or breeding activity were observed during the February and March 2017 surveys. Raptor nest success in 2017 was slightly below 2016 nest success.

### 3.8.4 T&E Vertebrate Species

No USFWS designated T&E vertebrate species (including candidate species) are known to occur in the project area (USFWS 2017). USFWS has not designated critical habitat for any T&E species in the vicinity of the project area at this time. Following the completion of an environmental evaluation, BLM has determined that the Proposed Action will have no effect on T&E vertebrate species.

### 3.8.5 Species of Special Interest

For the purposes of this discussion, SOSI include USFWS Birds of Conservation Concern (BCC), BLM Sensitive Species, and WGFD SGCN.

The USFWS list of BCC includes nongame birds, game birds without hunting seasons, candidate and proposed T&E species, and recently delisted species that “without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act” (USFWS 2008). The species on this list represent the USFWS’ highest conservation priorities beyond those species already designated as T&E species.

The Wyoming BLM has prepared a list of sensitive species to focus management efforts towards maintaining habitats under a multiple use mandate. Management requirements that apply to the

species on the BLM Wyoming sensitive species list are to avoid or minimize adverse impacts and maximize potential benefits to species whose viability has been identified as a concern by reviewing programs and activities to determine their potential effect on sensitive species (BLM 2010).

Through Wyoming’s State Wildlife Action Plan, the WGFD identified SGCN that are used to develop conservation strategies and are designated by evaluating trends in population numbers and potential threats (WGFD 2017a).

As compiled from the USFWS list of BCC, the list of BLM sensitive species for the RFO and the LFO, and from the WGFD list of SGCN, 185 vertebrate SOSI have the potential of occurring in the region (appendix B). Of this number, 61 are included in the WYNDD database as occurring in area, with 15 SOSI indicated in the WYNDD database as overlapping with the T25N, R92-93W evaluation area (table 3.8-4). Other than the sagebrush sparrow (*Artemisiospiza nevadensis*), all SOSI species observed in the project area are discussed in Section 3.6 of the NRC Lost Creek SEIS, which is incorporated by reference.

**Table 3.8-4. SOSI Observed during Field Surveys within and Surrounding the Project Area**

Common Name	Scientific Name	USFWS BCC	BLM Sensitive	WGFD SGCN
Golden eagle	<i>Aquila chrysaetos</i>	Yes		
Sagebrush sparrow	<i>Artemisiospiza nevadensis</i>	Yes		Yes
Burrowing owl	<i>Athene cunicularia</i>	Yes		Yes
Ferruginous hawk	<i>Buteo regalis</i>	Yes		Yes
Swainson's hawk	<i>Buteo swainsoni</i>	Yes		
Greater sage-grouse	<i>Centrocercus urophasianus</i>			Yes
Mountain plover	<i>Charadrius montanus</i>	Yes		Yes
Prairie falcon	<i>Falco mexicanus</i>	Yes		
Peregrine falcon	<i>Falco peregrinus</i>	Yes	Yes	Yes
Loggerhead shrike	<i>Lanius ludovicianus</i>	Yes	Yes	Yes
Sage thrasher	<i>Oreoscoptes montanus</i>	Yes	Yes	Yes
Brewer's sparrow	<i>Spizella breweri</i>	Yes		Yes
Pygmy rabbit	<i>Brachylagus idahoensis</i>			Yes
Wyoming pocket gopher	<i>Thomomys clusius</i>		Yes	Yes
Wyoming ground squirrel	<i>Urocitellus elegans</i>		Yes	Yes

The sagebrush sparrow is considered a sagebrush obligate in Wyoming. It is generally found in relatively open, medium to tall big sagebrush habitat, although it can sometimes occur in other open shrublands. Suitable habitat exists for this sparrow within the project area, and it is a fairly commonly observed species (LWR 2018).

### 3.9 Wild Horses

The occurrence and management of wild horses in the vicinity of the project area are described in detail in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.9, pp. 3.9-1 through 3.9-2 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.6.1.2.7, pp. 3-46 through 3-47 (NRC 2011)

The project area is within the Lost Creek and Stewart Creek wild horse HMAs. The Green Mountain HMA is located approximately 8 miles northeast of the project area (map 3.9-1).

Appropriate management levels (AMLs) have been established by BLM for these three HMAs. AMLs are designed to ensure the ecological balance among all the users and resources of the HMA, such as wildlife, livestock, vegetation, water and soil and the wild horse population (BLM 2012a). Table 3.9-1 compares the AMLs with estimated 2016 populations for each HMA. As the table indicates, the numbers of wild horses within each HMA are at least three times the AMLs established by BLM for the effective management of the land and resources.

**Table 3.9-1. 2016 Estimates of Wild Horse Populations and AMLs for Potentially Affected HMAs**

HMA	Total Area (acres)	2016 Population Estimate	BLM AML	Percent of AML
Stewart Creek	168,000	610	125-175	349-488 percent
Lost Creek	251,000	280	60-82	341-467 percent
Green Mountain	117,000	1,178	170-300	392-693 percent

Source: BLM 2016e

While the Green Mountain HMA is located a considerable distance north of the project area, there appears to be interchange between the Green Mountain and Stewart Creek herds. Wild horse movement has been documented between the Stewart Creek and Green Mountain HMAs along a fence line that starts at the existing Lost Creek ISR Project area and extends about 10 miles to the northeast (Warren 2017).

### 3.10 Meteorology, Climatology, and Air Quality

The following describes meteorology, climatology, and air quality (including climate change and greenhouse gases [GHGs]) of the project area and region. The meteorology, climatology, and air quality in the vicinity of the project area are described in detail in the following documents, and these specific sections are incorporated by reference:

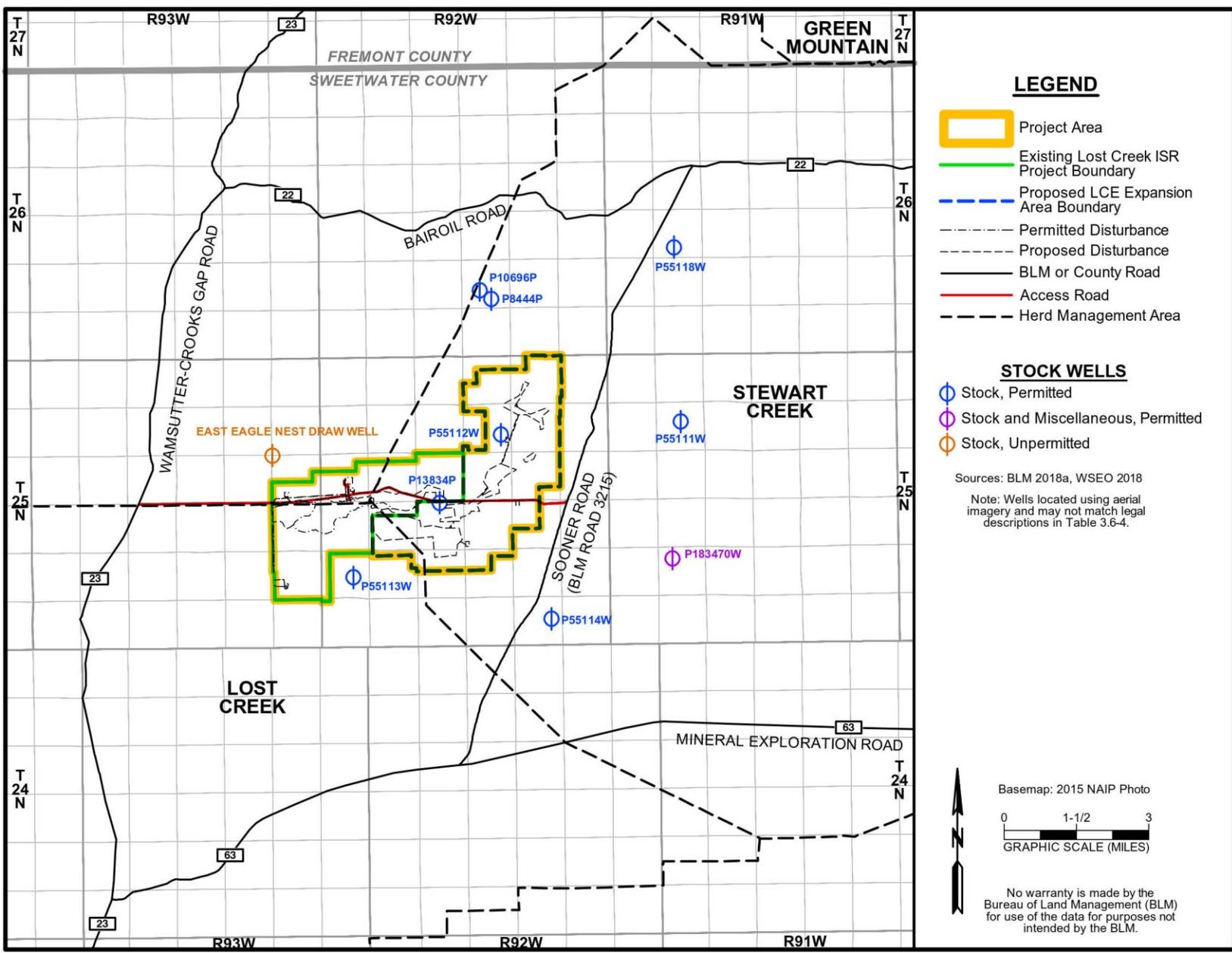
- BLM Lost Creek EIS – Section 3.10, pp. 3.10-1 through 3.10-19 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.7, pp. 3-53 through 3-61 (NRC 2011)

#### 3.10.1 Meteorology and Climatology

Discussions of the regional and site-specific meteorology and climatology are provided in Section 3.10.1 of the BLM Lost Creek EIS and Section 3.7.1 of the NRC Lost Creek SEIS. Updated meteorology and climatology information (temperature, precipitation, humidity, wind, evaporation, severe weather, and local air flow patterns and characteristics) is included in Section 3.7 of the LCE Environmental Report (LCI 2017j). The updated regional and site-specific meteorology and climatology data are consistent with the information provided in Section 3.10.1 of the BLM Lost Creek EIS and the Section 3.7.1 of NRC Lost Creek SEIS. Therefore, the previous discussions are not reiterated or updated herein.

A revised meteorological data evaluation report was prepared by the Applicant, using methods approved by NRC, that corrected errors found in the original data evaluation report and compared meteorological data from year to year as well as to the initial baseline evaluation for the Lost Creek ISR Project permit application (LCI 2017k). The report states that the consistency in 5 years of meteorological data (precipitation, temperature, and wind speed and direction) provides evidence that the data collected are representative of long-term conditions at the project area and supports the stability of data and the suitability of siting the meteorological station.

Map 3.9-1. Wild Horse HMA's Associated with the Project Area



**LEGEND**

- Project Area
- Existing Lost Creek ISR Project Boundary
- Proposed LCE Expansion Area Boundary
- Permitted Disturbance
- Proposed Disturbance
- BLM or County Road
- Access Road
- Herd Management Area

**STOCK WELLS**

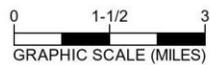
- ⊕ Stock, Permitted
- ⊕ Stock and Miscellaneous, Permitted
- ⊕ Stock, Unpermitted

Sources: BLM 2018a, WSEO 2018

Note: Wells located using aerial imagery and may not match legal descriptions in Table 3.6-4.



Basemap: 2015 NAIP Photo



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM.

### 3.10.2 Air Quality

Nonradiological and radiological airborne effluents are released as part of currently authorized activities at the Lost Creek ISR Project. Nonradiological airborne effluents include gaseous emissions and fugitive dust, as described below. Radiological airborne effluents include radon gas releases from well system relief valves, resin transfer, and elution. Background radiological conditions related to air particulates are discussed in Section 3.15 of the BLM Lost Creek EIS, Section 3.12 of the NRC Lost Creek SEIS, and Section 3.15 of this EIS.

As described in Section 3.10.2 of the BLM Lost Creek EIS, overall air quality in the project area is good. The principal nonradiological emissions from activities at the Lost Creek ISR Project include fugitive road dust (particulate matter) and diesel engine combustion emissions. EPA and WDEQ-AQD have established air quality standards to promote and sustain healthy living conditions. These standards, known as the National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS), address carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), ozone (O<sub>3</sub>), and sulfur dioxide (SO<sub>2</sub>) (EPA 2018a and WDEQ-AQD 2015). The Applicant's air quality permit for the Lost Creek ISR Project (Permit CT-7896) does not require the Applicant to monitor criteria pollutants (WDEQ-AQD 2010); therefore, this evaluation of current conditions is based on data from regional air quality monitor sites.

Due to widespread mineral resource development, the air quality within the Great Divide Basin has been monitored extensively by WDEQ-AQD. Table 3.10-1 summarizes concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, O<sub>3</sub>, and SO<sub>2</sub> at selected regional monitor sites, from 2011 through 2016. Pb is not monitored in Wyoming. Map 3.10-1 shows the locations of these air quality monitor sites relative to the project area.

Six PM<sub>10</sub> monitors recorded concentrations less than the NAAQS/WAAQS of 150 µg/m<sup>3</sup>. Among these sites, South Pass comes closest to reflecting true background PM<sub>10</sub> concentrations, as this site is far from urban and industrial sources (IML 2017). The second-high 24-hour value of 11 µg/m<sup>3</sup> at South Pass in 2014 resembles baseline monitoring results at the Lost Creek ISR Project, which averaged 8.5 µg/m<sup>3</sup> from six samplers measured in June 2006 (BLM 2012a). The Lander PM<sub>10</sub> readings were impacted by urban sources, including dirt and sand applied to snowy roads during the winter months when temperature inversions trap air particulates near the ground. The Wamsutter, Encana, and Casper monitors were impacted by nearby industrial sources of particulate matter.

Five PM<sub>2.5</sub> monitors recorded concentrations less than the NAAQS/WAAQS of 35 µg/m<sup>3</sup>. The relatively high PM<sub>2.5</sub> concentrations for Lander are attributable to a combination of wintertime temperature inversions and smoke from wood burning stoves. This is a localized phenomenon not observed at other monitors in the region and not expected to occur at the Lost Creek ISR Project (IML 2017).

Six NO<sub>2</sub> monitors recorded concentrations less than the NAAQS/WAAQS of 100 µg/m<sup>3</sup>. The recorded NO<sub>2</sub> concentrations illustrate the influence of industrial sources. The relatively high 1-hour NO<sub>2</sub> concentrations at Wamsutter, Casper Sinclair, and Moxa reflect localized industrial impacts rather than regional conditions, but the concentrations are still well below the NAAQS/WAAQS. Short-term concentrations of NO<sub>2</sub> at South Pass are more representative of the region, since this station is distant from significant industrial development (although close to the

Upper Green River Basin ozone non-attainment boundary). The Encana site is only slightly influenced by industry, whereas the Wamsutter site experiences more extensive oil and gas activity (IML 2017).

The O<sub>3</sub> concentrations measured at five monitors in the region were within the NAAQS/WAAQS of 70 ppb (0.070 ppm). The 1-hour SO<sub>2</sub> concentrations at two monitors were less than the NAAQS/WAAQS of 0.075 ppm.

As discussed in Section 3.7.2 of the NRC Lost Creek SEIS, PSD requirements identify maximum allowable increases in concentrations for particulate matter, SO<sub>2</sub>, and NO<sub>2</sub> for areas designated as in attainment. However, according to EPA, PSD evaluations apply only to new major sources or major modifications at existing sources for pollutants, where the source area is in attainment or unclassifiable with the NAAQS/WAAQS.

### ***3.10.2.1 Climate Change and Greenhouse Gases***

According to EPA, GHGs include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and several fluorinated species of gas (EPA 2016). CO<sub>2</sub> and other GHGs are naturally occurring gases in the atmosphere. Their status as a pollutant is not related to their toxicity but instead to the added long-term impacts they have on climate because of their increased incremental levels in the earth's atmosphere. Because they are non-toxic and non-hazardous at normal ambient concentrations, naturally occurring GHGs do not have applicable ambient standards or emission limits under the major environmental regulatory programs (NAAQS and WAAQS).

The U.S. Global Change Research Program released the third National Climate Assessment (NCA) in May 2014 (NCA 2014). The assessment summarizes the current state of knowledge on climate change and its impacts throughout the U.S. It also provides analysis of projected climate change by region. The Lost Creek ISR Project is part of the Great Plains Region. The key messages for this region are as follows:

- Rising temperatures are leading to increased demand for water and energy. In parts of the region, this will constrain development, stress natural resources, and increase competition for water among communities, agriculture, energy production, and ecological needs.
- Changes to crop growth cycles due to warming winters and alterations in the timing and magnitude of rainfall events have already been observed; as these trends continue, they will require new agriculture and livestock management practices.
- Landscape fragmentation is increasing in the context of energy development activities in the northern Great Plains. A highly fragmented landscape will hinder adaptation of species when climate change alters habitat composition and timing of plant development cycles.
- Communities that are already the most vulnerable to weather and climate extremes will be stressed even further by more frequent extreme events occurring within an already highly variable climate system.
- The magnitude of expected changes will exceed those experienced in the last century. Existing adaptation and planning efforts are inadequate to respond to these projected impacts.

**Table 3.10-1. Regional Criteria Pollutant Concentrations**

Pollutant	Year/ Standard	Site Name/ Number								
		Wamsutter 560370200	South Pass 560130099	Encana 560130232	Riverton 560136001	Lander 560131003	Casper 560250100	Casper Sinclair 560252601	Moxa 560370300	Rock Springs 560370007
PM <sub>10</sub> <sup>a</sup> (µg/m <sup>3</sup> )	2011	62	31	74	--	39	--	--	34	46
	2012	60	45	79	--	54	--	--	149	64
	2013	50	30	29	--	39	--	--	75	35
	2014	38	11	28	--	51	--	--	54	35
	2015	44	--	46	--	35	--	--	42	48
	2016	31	--	30	--	38	--	--	39	34
	<b>NAAQS/WAAQS</b>	<b>150</b>	<b>150</b>	<b>150</b>		<b>150</b>			<b>150</b>	<b>150</b>
PM <sub>2.5</sub> <sup>b</sup> (µg/m <sup>3</sup> )	2011	--	--	--	--	30	13	--	--	12
	2012	--	--	--	--	25	17	--	--	27
	2013	--	--	11	--	29	13	--	--	12
	2014	--	9	7	--	26	14	--	--	8
	2015	--	12	11	--	20	31	--	--	12
	2016	--	8	10	--	22	13	--	--	17
	<b>NAAQS/WAAQS</b>		<b>35</b>	<b>35</b>		<b>35</b>	<b>35</b>			<b>35</b>
NO <sub>2</sub> <sup>c</sup> (µg/m <sup>3</sup> )	2011	38.7	4.7	6.7	--	--	--	14.0	--	--
	2012	38.0	5.0	7.7	--	--	--	23.0	19.7	--
	2013	37.3	4.7	7.7	--	--	+	35.0	22.0	+
	2014	35.3	4.7	6.7	+	--	+	32.3	20.3	+
	2015	35.0	4.7	5.0	+	--	38.0	34.3	19.7	--
	2016	32.3	4.7	4.3	--	--	39.7	33.0	20.0	--
	<b>NAAQS/WAAQS</b>	<b>100</b>	<b>100</b>	<b>100</b>			<b>100</b>	<b>100</b>	<b>100</b>	
O <sub>3</sub> <sup>d</sup> (ppm)	2011	0.064	0.070	0.062	--	--	--	--	--	--
	2012	0.065	0.067	0.065	--	--	+	--	--	--
	2013	0.064	0.065	0.066	+	--	+	--	--	--
	2014	0.063	0.064	0.063	+	--	0.059	--	--	+
	2015	0.061	0.063	0.062	0.060	--	0.058	--	--	+
	2016	0.055	0.063	0.061	--	--	0.057	--	--	--
	<b>NAAQS/WAAQS</b>	<b>0.070</b>	<b>0.070</b>	<b>0.070</b>	<b>0.070</b>		<b>0.070</b>			
SO <sub>2</sub> <sup>e</sup> (ppm)	2011	--	--	--	--	--	--	+	+	--
	2012	--	--	--	--	--	--	+	0.018	--
	2013	--	--	--	--	--	--	0.066	0.018	--
	2014	--	--	--	--	--	--	0.067	0.017	--
	2015	--	--	--	--	--	--	0.031	0.018	--
	2016	--	--	--	--	--	--	0.025	0.021	--
	<b>NAAQS/WAAQS</b>							<b>0.075</b>	<b>0.075</b>	

<sup>a</sup> 2<sup>nd</sup> high 24-hour average

<sup>b</sup> 98<sup>th</sup> percentile of the daily 24-hour averages

<sup>c</sup> 98<sup>th</sup> percentile of the highest daily 1-hour averages during each year, averaged over 3 years

<sup>d</sup> 4<sup>th</sup> high, 8-hour concentration, averaged over 3 years

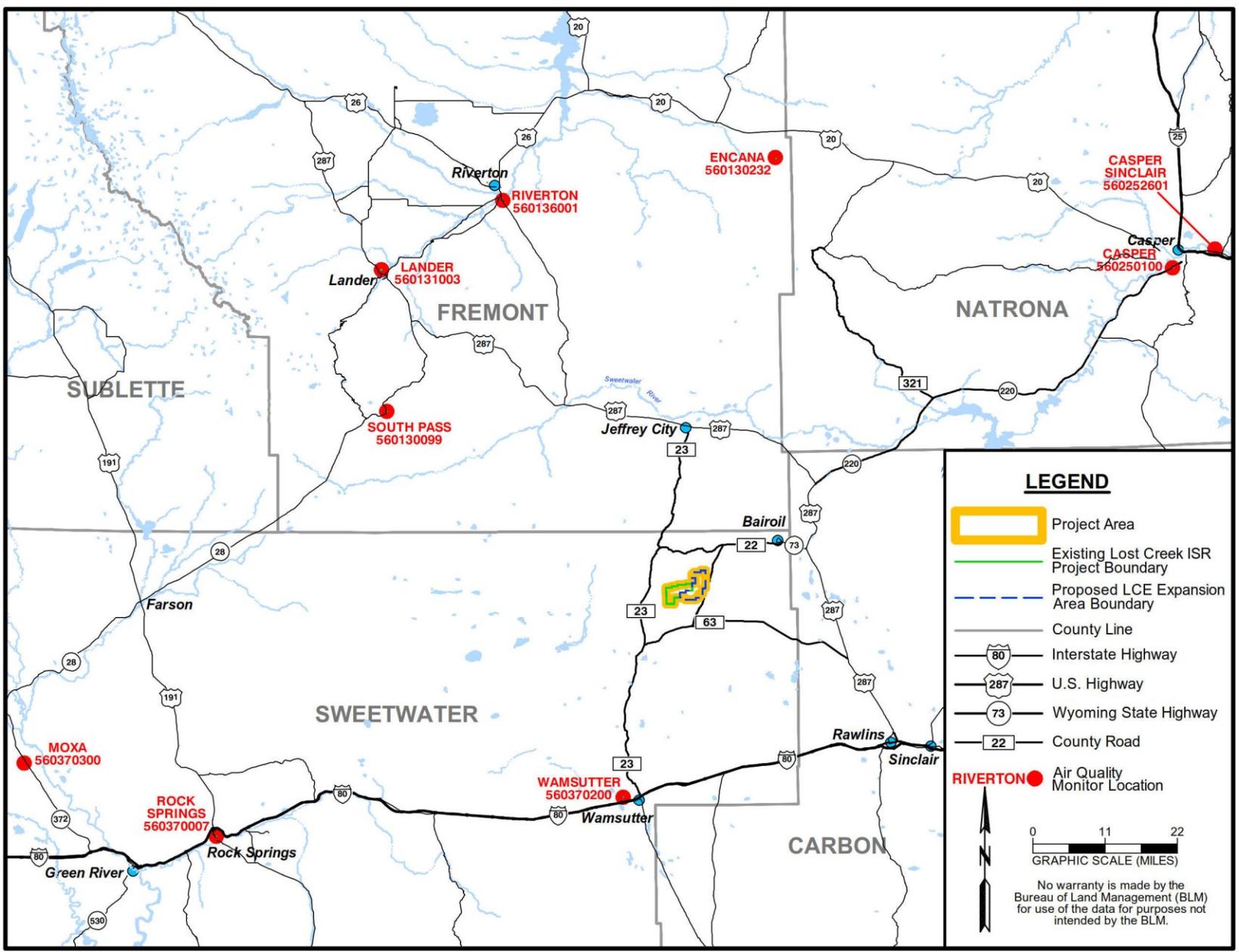
<sup>e</sup> 99<sup>th</sup> percentile of the highest daily 1-hour averages during each year, averaged over 3 years

-- No data for site

+ Data are available but insufficient for 3-year average

Source: EPA 2018b

Map 3.10-1. Air Quality Monitor Locations



### **3.11 Noise**

Due to the remoteness of the project area, low population density of the surrounding area, and lack of noise generated from the primary land uses of livestock grazing, wildlife habitat, dispersed recreation, and uranium ISR operations, existing noise levels are generally low, notwithstanding prolonged periods of moderate to high noise levels caused by wind. The nearest residences are located in the town of Bairoil, approximately 13 miles northeast of the project area. The majority of the existing ambient noise is generated from wind, traffic on mine access roads, well drilling and construction activities, aircraft flyovers, thunderstorms, and wildlife.

#### **3.11.1 Noise Studies**

Noise standards and sound measurement equipment have been designed to account for the sensitivity of human hearing to different frequencies. The unit of measure used to represent sound pressure levels (decibels) using the A-weighted scale is a dBA (A-weighted decibel). It is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies.

Noise within the existing Lost Creek ISR Project area is described in detail in the following documents, and these specific sections are incorporated by reference.

- BLM Lost Creek EIS – Section 3.11, pp. 3.11-1 through 3.11-2 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.8, pp. 3-61 through 3-62 (NRC 2011)

As discussed in Section 3.11.2 of the BLM Lost Creek EIS, noise studies were conducted in 2007 and 2009 to establish baseline or ambient noise levels in the existing Lost Creek ISR Project area. An additional study was conducted in 2016, on the east access road within the proposed LCE expansion area, with no traffic present. This noise survey site was approximately 2 miles from ISR activities within the existing Lost Creek ISR Project area. Table 3.11-1 summarizes the noise survey results. Noise levels were also assessed by measuring noise associated with on-site exploration and pre-operational activities, which are as loud as the projected noise levels during construction and operations.

Current noise levels within the project area vary according to the wind speed and proximity to operating vehicles or other equipment. According to Section 4.7.1.2 of the LCE amendment application, background noise levels range between 30 and 35 dBA (LCI 2017j). Table 3.11-1 shows that wind speed plays a major role in ambient noise levels, which range from less than 40 dBA in calm to relatively calm conditions to 60-90 dBA in windy or gusty conditions. Most of the noise related to ISR operations is generated from passenger vehicle and heavy truck traffic along the east and west access roads and, to a lesser extent, wellfield access roads. Other sources of noise include construction equipment associated with ongoing wellfield development and operating pumps and other equipment within the Plant and header houses.

Drill rigs, heavy trucks, and equipment currently generate audible on-site noise that is above the 30 to 35 dBA background noise levels. The maximum noise measured during exploration activities was 102 dBA, measured 4 feet from a cement mixer/generator (LCI 2017j).

**Table 3.11-1. Ambient Noise Survey Summary**

<b>Date</b>	<b>Location</b>	<b>Wind Speed</b>	<b>Measured Noise Level</b>
June 2007	Plant site	Average: 10.7 mph	<40 dBA
February 2009	HV-5 Air Sampler <sup>1</sup>	Average: 8.5 mph Gust: 21 mph	60-70 dBA
April 2009	Plant site <sup>2</sup>	Average: 25 mph Gust: 34 mph	68-89 dBA
December 2016	East access road within proposed LCE expansion area	Calm	<40 dBA

<sup>1</sup> Located in the northwest portion of the existing Lost Creek ISR Project area.

<sup>2</sup> Noise levels were recorded when no workers were on-site and no equipment was operational.  
Source: BLM 2012a, LCI 2017j

### **3.12 Historic, Cultural, and Paleontological Resources**

Cultural resources consist of specific, spatially defined locations of human activity, occupation, and usage. They include prehistoric and historic archaeological resources; historic and architectural sites; and properties of traditional, religious, and cultural significance to local and past populations, such as Traditional Cultural Properties (TCPs).

#### **3.12.1 Regulatory Framework**

Legislation at the federal level requires that governmental agencies assess the impacts of projects on cultural resources prior to approving the undertaking. This legislation provides a regulatory framework for the identification, evaluation, protection, and management of cultural resources. The primary pieces of legislation applicable to cultural resources are Section 106 of the NHPA and its implementing regulations (36 CFR Part 800); the Archaeological Resources Protection Act of 1979, as amended (ARPA), and its implementing regulations (43 CFR Part 7); and the Native American Graves Protection and Repatriation Act (NAGPRA) and its implementing regulations (43 CFR Part 10). It should be noted that NEPA requires consideration of a broad range of factors related to the environment, including cultural and historic resources. Therefore, Section 106 compliance is one of the many required aspects of consideration in the NEPA process. In consideration of overlapping factors, the implementing regulations allow for parallel, coordinated Section 106 and NEPA processes. As indicated in Section 1.6.2.3 of this EIS, BLM is the lead federal agency for cultural resource compliance. The Wyoming BLM and the SHPO, an agency and position established in each state by the NHPA, have established a State Protocol (BLM and SHPO 2014) that guides the application of the NHPA on BLM-administered public lands in the State of Wyoming.

#### **3.12.2 Area of Potential Effect**

The APE for an undertaking is defined as the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties should any such properties exist. For this undertaking, the BLM in consultation with SHPO determined that the APE includes the project disturbance area plus a 100-foot buffer, which includes areas that may be directly affected by physical ground disturbance and construction of wellfields and appurtenant facilities.

The APE includes areas that were surveyed in 2006 and 2007 as part of the Lost Creek ISR Project and surveys in 2010, 2012, and 2016 within the proposed LCE expansion area. The results of the

2006 and 2007 surveys, which were evaluated in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, are included in this EIS since they occur within the APE.

### 3.12.3 Cultural Resource Surveys

The cultural resource surveys for the existing Lost Creek ISR Project area are summarized below. Detailed discussions are provided in the documents listed below, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.12, pp. 3.12-1 through 3.12-4 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.9, pp. 3-62 through 3-67 and Appendix E (NRC 2011)

In 2006, a Class I site file search was conducted, and in 2006 and 2007, a Class III archaeological inventory of the existing Lost Creek ISR Project area was conducted. Based on the results, three prehistoric sites were determined as eligible for the National Register of Historic Places (NRHP). One of the eligible sites was within the APE for the Lost Creek ISR Project. The BLM determined the site to have the potential to be adversely affected. A Memorandum of Agreement (MOA) between the SHPO, BLM, Northern Arapaho Tribe, Eastern Shoshone Tribe, and the Applicant was implemented to mitigate the adverse effects caused by the proposed mine (Appendix E, NRC Lost Creek SEIS). The terms of the MOA have been fulfilled and it has expired.

In 2012, a Class I file search and Class III cultural resource inventory were conducted within the proposed LCE expansion area. In June 2016, subsurface archaeological testing was conducted on four sites in the APE that were prehistoric or that contained prehistoric components. This was done to facilitate a determination of NRHP eligibility. Through the testing plan, it was determined that one eligible site was located within the APE. It is being avoided by project design so no eligible sites will be affected.

### 3.12.4 Cultural Sites within the APE

Twelve archaeological sites are situated within the APE. These consist of prehistoric lithic scatters, historic trash scatters, and multicomponent sites that include both prehistoric and historic elements. None of the sites contains architectural elements such as buildings or stone alignments. Tables 3.12-1 and 3.12-2 present general information about the sites in the APE. The sites listed in table 3.12-2 were surveyed in 2006 and 2007 as part of the Lost Creek ISR Project.

**Table 3.12-1. Archaeological Sites in the APE within the Proposed LCE Expansion Area**

Site Number	NRHP Assessment	Site Type
48SW16594	Not eligible	Multicomponent - prehistoric lithic scatter and historic trash scatter
48SW17875	Not eligible	Historic trash scatter
48SW17877	Not eligible	Prehistoric lithic scatter
48SW18359	Not eligible	Historic trash scatter
48SW18367	Not eligible	Multicomponent - prehistoric lithic scatter and historic trash scatter
48SW18370	Eligible	Prehistoric lithic scatter
48SW18372	Not eligible	Multicomponent - prehistoric lithic scatter and historic trash scatter

**Table 3.12-2. Previously Recorded Archaeological Sites in the APE within the Existing Lost Creek ISR Project Area**

Site Number	NRHP Assessment	Site Type
48SW7633	Not eligible	Historic trash scatter
48SW16601	Not eligible	Historic trash scatter
48SW16604	Eligible - mitigated	Prehistoric open camp (lithic scatter and hearths)
48SW16605	Not eligible	Prehistoric lithic scatter
48SW16764	Not eligible	Multicomponent - prehistoric lithic scatter and historic trash scatter

### 3.12.5 Tribal Consultation

No Native American reservation land is located within or near the project area. The only tribal reservation in Wyoming is the Wind River Indian Reservation, located about 105 miles northwest of the project area. Additionally, no properties having religious and/or cultural significance are known to exist within or near the project area.

BLM invited the Northern Arapaho Tribe, the Eastern Shoshone Tribe, and the Ute Tribe of the Uintah and Ouray Reservation in October and December 2015 to participate in the Section 106 consultation process, as required by 36 CFR § 800.2(c)(B)(ii)(A). Historically, these Tribes have an affiliation with the general project area and have participated in previous consultations in the general region. No response by the Tribes has been received for the consultation letters or follow-up telephone calls.

### 3.12.6 Paleontological Resources

BLM Instruction Memorandum No. 2016-124 evaluates the potential for geologic units to contain fossils (BLM 2016f). The following documents describe the potential for paleontological resources to be present in the existing Lost Creek ISR Project area, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.12.4, p. 3.12-5
- NRC Lost Creek SEIS – Section 3.9.6, pp. 3-67 through 3-68

As described in Section 3.12.4 of the BLM Lost Creek EIS, the geologic units within existing Lost Creek ISR Project area with a potential for paleontological resources include Quaternary deposits and the Battle Spring Formation. Under the BLM’s Potential Fossil Yield Classification (PFYC) system, the Quaternary deposits are a Class 2 and the Battle Spring Formation is a Class 3. Based on these rankings, the Quaternary deposits are not likely to yield vertebrate or significant invertebrate fossils, whereas the Battle Spring Formation has a moderate potential to yield paleontological resources. These two deposits are also present at the surface within the proposed LCE expansion area. To date, no known significant paleontological resources are known to occur within the project area.

### 3.13 Visual and Scenic Resources

The visual resource inventory process is the basic tool used by BLM to inventory visual resources on public lands. In accordance with BLM Handbook H-8410-1, a visual resource inventory can be created using three categories: scenic quality, visual sensitivity, and distance zones (BLM 1986). Visual resource inventories are combined with BLM management goals established in BLM’s RMP for the area. Within the RMP, BLM assigns one of the four visual resource management

(VRM) classes to the area based on the level of necessity to preserve the landscape and the acceptable level of change. The objectives of the four classes are defined in BLM Handbook H-8410-1.

Visual and scenic quality of the existing Lost Creek ISR Project area is described in detail in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.13, pp. 3.13-1 through 3.13-6 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.10, pp. 3-68 through 3-71 (NRC 2011)

As discussed in Section 3.13.2 of the BLM Lost Creek EIS, the RFO has jurisdiction over most of the BLM-administered lands within the existing Lost Creek ISR Project area, while the LFO has jurisdiction over the northwestern portion of the existing Lost Creek ISR Project area. The RFO portion previously had been classified as VRM Class III (level of change to the characteristic landscape should be moderate), whereas the LFO portion has been assigned VRM Class IV. As described in Section 3.13 of the BLM Lost Creek EIS, the level of change to the characteristic landscape in a Class IV area can be high, but every effort should be made to minimize the impact of modifications to the landscape.

Section 3.13 of the BLM Lost Creek EIS included the results of a scenic quality field inventory conducted in 2011 in the center of the existing Lost Creek ISR Project area. The scenic quality field inventory score, according to BLM methodology, was 7 out of 32, which resulted in a scenic quality classification of C, the lowest possible. Previous alterations to the area prior to the development of the Lost Creek ISR Project included fencing, power lines, and roads. Additional modifications have since been constructed within this area, including the Plant, mine units, improved and newly constructed access roads, pipelines, monitoring equipment, and water disposal facilities.

In 2011, a visual resource inventory was completed as part of a proposed amendment to the RFO RMP (BLM 2011a). The updated inventory reclassified the RFO portion of the project area as VRM Class IV, which is consistent with the LFO portion of the project area. Based on the updated inventory, the project area and surrounding area are VRM Class IV.

In 2015, a site-specific scenic quality evaluation was conducted within the proposed LCE expansion area at three inventory observation points using the methodology in BLM Manual H-8410-1. The results indicate that the scenic quality evaluation rating for the proposed LCE expansion area averages 9.25 out of a possible 32, which results in a classification rating of C. This is consistent with the 2011 RFO visual resource inventory and the 2011 scenic quality evaluation conducted for the existing Lost Creek ISR Project area.

### **3.14 Socioeconomics**

This section describes current socioeconomic factors that have the potential to be directly or indirectly affected by the Proposed Action. The following documents describe the socioeconomic factors in the project area and vicinity as of 2011-2012. Except to the extent that new information provided herein updates the previous discussions, these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.14, pp. 3.14-1 through 3.14-32 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.11, pp. 3-71 through 3-75 (NRC 2011)

The project area is situated in a remote area of Sweetwater County, near its borders with Carbon and Fremont counties. Though the project area is located near the border of Fremont County, no communities within the county are in proximity to the project area (see map 1.1-1). The socioeconomic discussion focuses primarily on Sweetwater County, which would receive *ad valorem* and property tax revenues, and Carbon County and its county seat, Rawlins, which is the nearest city and source of mining services, retail, and business and consumer service establishments in the area. The State of Wyoming would also receive severance and sales and use tax revenues associated with uranium mining.

### 3.14.1 Demographics

According to the U.S. Census Bureau (USCB) 2012-2016 American Community Survey 5-year estimates, the 2016 population of Wyoming was estimated to be 583,029. Wyoming ranked as the least populous state in the U.S. Sweetwater County’s estimated 2016 population (44,165) ranked the county as Wyoming’s 4<sup>th</sup> most populous among the state’s 23 counties. Carbon County was the 12<sup>th</sup> most populous county in 2016 (15,618) (USCB 2017a). According to the Wyoming Department of Administration and Information, Economic Analysis Division (WDAI/EAD), the estimated 2016 population of Rawlins (9,075) ranks it as Wyoming’s 12<sup>th</sup> largest city (WDAI/EAD 2017).

### 3.14.2 Income

Estimated income for Sweetwater and Carbon counties and for Wyoming are presented in table 3.14-1. According to the USCB, the 2016 median household and income in Sweetwater County was above the Wyoming median, while it was below statewide median for Carbon County. The percent of the population living below the official poverty level was about the same for Sweetwater County as the statewide percentage, but higher than the statewide percentage for Carbon County (USCB 2017c).

**Table 3.14-1. 2016 Income Estimates, Sweetwater and Carbon Counties and Wyoming**

	Sweetwater County	Carbon County	Wyoming
Median household income (dollars)	68,233	56,972	59,143
Per capita income (dollars)	30,945	27,399	30,139
Percentage of families below the poverty level	8.4	13.3	7.6
Percentage of persons below the poverty level	11.0	14.3	11.6

Source: USCB 2017c

### 3.14.3 Temporary Housing

Table 3.14-2 lists the temporary housing units (hotel and motel rooms and recreational vehicle sites) in Sweetwater and Carbon counties.

**Table 3.14-2. Temporary Housing Characteristics in Sweetwater and Carbon Counties**

	Sweetwater County <sup>1</sup>	Carbon County <sup>2</sup>
Hotel and motel rooms	2,365	1,486
Recreational vehicle sites	273	385

Source: Carbon County Visitors Council 2018, Sweetwater County Travel and Tourism 2018

<sup>1</sup> Results from 2018 surveys

<sup>2</sup> Results from 2015 surveys

### 3.14.4 Employment Structure

The 2010 and 2017 annual average labor force and unemployment for Sweetwater and Carbon counties and Wyoming are listed in table 3.14-3. Between 2010 and 2017, the workforce in Sweetwater County decreased by 6.7 percent and decreased in Carbon County by 3.6 percent. The 2017 unemployment rate for Sweetwater County was above the statewide rate, while the Carbon County rate was below the statewide rate. According to the WDWS, the mining industry was the largest employer in Sweetwater County in 2016, followed by local, state, and federal governments (WDWS 2017). In Carbon County, the largest employer in 2016 was the local, state, and federal governments sector, followed by the accommodation and food services sector. The Lost Creek ISR Project currently employs approximately 55 workers.

**Table 3.14-3. Labor Force and Unemployment Rates for Sweetwater and Carbon Counties and for Wyoming**

	Sweetwater County	Carbon County	Wyoming
	<b>2010</b>		
Labor force	23,134	8,254	303,297
Employed	21,608	7,698	283,744
Unemployed	1,526	556	19,553
Unemployment rate	6.6	6.7	6.4
	<b>2017</b>		
Labor force	21,581	7,957	293,347
Employed	20,599	7,641	281,017
Unemployed	982	316	12,330
Unemployment rate	4.6	4.0	4.2

Source: United States Department of Labor, Bureau of Labor Statistics 2018

### 3.14.5 Local Finance

Revenue from natural resource extraction is a primary source of income for local governments across the state. In general, counties collect revenue from extraction through *ad valorem* and property taxes, and the State of Wyoming collects revenue from extraction in the form of severance, sales, and use taxes. Mineral production on state lands is also subject to state rental or royalty fees.

Counties receive 3.9 percent (up to \$6 million) of the state’s severance tax distribution, while cities and towns receive 9.3 percent (up to \$14.3 million). Distributions of these funds are allocated to individual local governments based on their population relative to the state incorporated population. In fiscal year 2017 (FY2017), \$20.4 million in mineral severance tax revenue was distributed to cities, towns, and counties across Wyoming (Wyoming Department of Revenue 2017). Of this amount, approximately \$975,500 was distributed to Sweetwater County (Sweetwater County 2017). At the local level, county tax collectors collect *ad valorem* taxes and distribute them within their own jurisdictions. In 2017, the average tax levy on mineral production in Sweetwater County was 67.7 mills, or 6.8% of its market value (Wyoming Department of Revenue 2017). The estimated 2017 *ad valorem* tax revenue collected in Wyoming from uranium was \$2.27 million, based on 2016 statewide production of 1.85 million pounds of taxable uranium units (pounds U<sub>3</sub>O<sub>8</sub>) and an average tax per unit of \$1.23. In addition to taxes on mineral production, the county assesses an average mill levy of 73.1 (7.3%) on the fair market value of property used for mineral production. In FY17, the Lost Creek ISR Project produced

300,967 pounds of U<sub>3</sub>O<sub>8</sub> and payed \$834,000 in *ad valorem* and severance taxes (LCI 2016 and 2017n).

In FY2017, the State of Wyoming collected \$1.43 million in severance taxes from the uranium sector, based on a taxable valuation per unit of \$19.28 and a severance tax rate of 4 percent (Wyoming Department of Revenue 2017). Wyoming Department of Revenue collects these severance tax revenues, aggregates them with revenues from other minerals, and distributes them according to statute. Approximately 1.5 percent of total severance tax revenues are designated for the Wyoming Permanent Mineral Fund. Depending on revenues, a maximum of \$155 million in severance taxes are distributed by varying percentages to the State General Fund, water development accounts, the highway fund, capital construction funds, counties and county road construction funds, and cities.

### **3.15 Public and Occupational Health**

Nonradiological and radiological airborne effluents are released as part of currently authorized activities at the Lost Creek ISR Project. Nonradiological airborne effluents include gaseous emissions and fugitive dust, as described in Section 3.10.2 of this EIS. Radiological airborne effluents include radon gas releases from well system relief valves, resin transfer, and elution. Regional air quality is discussed in Section 3.10.1 of the BLM Lost Creek EIS, Section 3.7.1 of the NRC Lost Creek SEIS, and Section 3.10.2 of this EIS.

This section summarizes the natural background radiation levels in and around the project area. It also describes the applicable safety criteria and radiation dose limits that have been established for protection of public and occupational health and safety.

#### **3.15.1 Background Radiological Conditions**

Baseline radiological surveys were conducted between 2006 and 2010 in the existing Lost Creek ISR Project area to establish background radionuclide concentrations in various environmental media. Sampling methods and results are provided in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 3.15, pp. 3.15-1 through 3.15-22 (BLM 2012a)
- NRC Lost Creek SEIS – Section 3.12.1, pp. 3-76 through 3-80 (NRC 2011)

Preoperational monitoring was performed between 2012 and 2016 to establish baseline environmental conditions within the proposed LCE expansion area (LCI 2017f). Sampling methods and results are summarized as follows:

- An overland gamma scan survey was conducted throughout the proposed LCE expansion area to detect areas of anomalously high radiological activities on the surface, such as from a geologic outcrop or previous site activities, and to map ambient gamma radiation levels. It was performed using gamma-sensitive sodium iodide (NaI) detectors coupled with a global positioning system (GPS). A total of 126,299 gamma exposure-rate measurements were collected within the proposed LCE expansion area. The gamma exposure rates ranged from 17.4 to 35.5 microrentgen/hour ( $\mu\text{R/hr}$ ) and averaged 22.0  $\mu\text{R/hr}$ . Based on these gamma measurements, the estimated soil radium-226 concentrations range from 2.38 to 14.2 picocurie/gram (pCi/g) and averaged 5.42 pCi/g.

- Passive air samples were collected to measure gamma radiation and radon-222 gas at one location at the eastern boundary of the proposed LCE expansion area, along with additional environmental monitoring stations located along the site boundary. Radon-222 concentrations in air along the eastern boundary ranged from 0.3 to 2.0 pCi/L. These values are similar to those reported in Section 3.12.1 of the NRC Lost Creek SEIS, which indicated that the values are consistent with background levels reported for that region of the country.
- Air particulates were monitored using a high velocity air sampler at one site located on the eastern boundary of the proposed LCE expansion area, along with additional environmental monitoring stations located along the site boundary. Composite samples were collected quarterly and analyzed for natural uranium, thorium-230, radium-226, and lead-210. Reported results along the eastern boundary were consistent with those provided in Section 3.12.1 of the NRC Lost Creek SEIS and are summarized as follows:
  - o Uranium: Five of six uranium concentrations were at or below the detection limit of  $1.0\text{E-}16$  microcurie/milliliter ( $\mu\text{Ci/mL}$ ). The maximum was  $1.57\text{E-}16$   $\mu\text{Ci/mL}$ , which is less than 1 percent of the effluent concentration ( $9.0\text{E-}14$   $\mu\text{Ci/mL}$ ) specified in 10 CFR Part 20, Appendix B.
  - o Thorium-230: Four of six thorium-230 concentrations were above the detection limit of  $1.0\text{E-}16$   $\mu\text{Ci/mL}$ . The maximum was  $2.5\text{E-}16$   $\mu\text{Ci/mL}$ , which is less than 1 percent of the effluent concentration ( $3.0\text{E-}14$   $\mu\text{Ci/mL}$ ) specified in 10 CFR Part 20, Appendix B.
  - o Radium-226: Two of six radium-226 concentrations were above the detection limit of  $1.0\text{E-}16$   $\mu\text{Ci/mL}$ . The maximum was  $1.98\text{E-}16$   $\mu\text{Ci/mL}$ , which is less than 1 percent of the effluent concentration ( $9.0\text{E-}13$   $\mu\text{Ci/mL}$ ) specified in 10 CFR Part 20, Appendix B.
  - o Lead-210: All six lead-210 concentrations were above the detection limit of  $2.0\text{E-}15$   $\mu\text{Ci/mL}$ , with concentrations ranging from  $6.10\text{E-}15$  to  $2.39\text{E-}14$   $\mu\text{Ci/mL}$ . The maximum value was 4 percent of the effluent concentration ( $6.0\text{E-}13$   $\mu\text{Ci/mL}$ ) specified in 10 CFR Part 20, Appendix B.
- Groundwater samples were collected for radiological background characterization from wells completed in the FG, HJ, KM, L, and N horizons within the proposed LCE expansion area. They were also collected in the L, M, and N horizons within the existing Lost Creek ISR Project area, as groundwater in shallower FG, HJ, and KM horizons of that area was characterized previously in the BLM Lost Creek EIS and NRC Lost Creek SEIS. Except for wells completed in the L Horizon in the proposed LCE expansion area, the groundwater samples were collected on a quarterly basis and analyzed for radium-226, radium-228, natural uranium, gross alpha, and gross beta. Thorium-230, polonium-210, and lead-210 were analyzed for only two quarters from most wells, but for all four quarters for one well in each horizon. For wells completed in the L Horizon in the proposed LCE expansion area, only one sampling result was reported for all three wells, and the analytical parameters did not include thorium-230, polonium-210, or lead-210. Groundwater analyses for uranium and radionuclides are summarized as follows:
  - o In general, and as expected, the uranium and radiological parameters uranium, gross alpha, and radium-226 are elevated in groundwater at horizons bearing the reported ore bodies (i.e., the HJ and KM horizons). The uranium concentration at 9 of 15 wells

screened in those horizons exceeded the MCL of 0.030 mg/L for one or more sampling events. The Applicant reported gross alpha concentrations at all wells above the MCL of 15 pCi/L; however, the Applicant used an analytical method that did not remove the contribution to gross alpha from uranium, which is necessary for comparison to the gross alpha MCL. The combined radium (radium-226 and radium-228) concentration at all wells exceeded the MCL of 5 pCi/L. This was largely attributed to radium-226, since a significant number of the reported radium-228 results were below the minimum detectable concentration (MDC).

- o For wells in the L or N horizons in the proposed LCE expansion area, the uranium and radiological parameters except radium were detected at low concentrations near the MDC. The combined radium concentrations exceeded the MCL of 5 pCi/L in groundwater at six of eight wells. Of the two L or N Horizon wells with combined radium concentrations below the MCL, one of the wells (well M-N3) had general chemistry concentrations outside the range of the other wells (e.g., pH and TDS) and may not be representative of L or N Horizon water quality within the project area. The Applicant reported that the gross alpha measured in one sample from well M-N5A exceeded the MCL; however, if the level is corrected for uranium it would be below the standard.
- o The groundwater quality in the FG, HJ, and KM horizons within the proposed LCE expansion area is consistent with that reported previously within the existing Lost Creek ISR Project area.
- o The uranium and radionuclide concentrations in the L, M, and N horizons within the existing Lost Creek ISR Project area are similar to those discussed above for the L and N horizons within the proposed LCE expansion area. In table 2.7-15 of the KM amendment application (LCI 2017i), the Applicant reported BLM well BLM-4451 as completed in the N Horizon; however, in response to a question from NRC staff (LCI 2017b), the Applicant reported that the well is blocked at a shallower depth, and thus the water quality is not representative of the N Horizon.
- o In summary, elevated uranium, gross alpha, and radium levels are observed in the shallower ore-bearing HJ and KM horizons. The concentrations generally exceed MCLs, although, if the gross alpha concentrations are corrected for uranium, they may not exceed the MCLs as extensively as reported by the Applicant. The uranium and radionuclide concentrations in the deeper horizons (L, M, and N) are generally lower than the shallower horizons, although the combined radium concentrations generally exceed the MCL. The reported distributions in groundwater may be attributed to the radiological content of the aquifer matrix and/or oxidation state.
- Five storm water samplers were installed upstream and three downstream of the proposed LCE expansion area. Samples were analyzed for uranium, radium-226, and thorium-230. Over the course of a year, eight samples were collected from six of the storm water samplers. Dissolved uranium was present in only one sample at a concentration of 0.0005 mg/L. Suspended uranium was detected in six of the eight samples at concentrations ranging from 0.023 to 0.106 mg/L. Dissolved radium-226 was detected in all samples at concentrations ranging from 0.11 to 5.1 pCi/L. Suspended radium-226 was present in all samples at levels ranging from 0.001 to 105 pCi/L. Dissolved thorium-230 was detected in

all samples at levels ranging from 0.08 to 0.4 pCi/L. Suspended thorium-230 was present in all samples at levels ranging from 0.0006 to 47.8 pCi/L.

- One soil sample was collected from site HV6 and analyzed for uranium, lead-210, radium-226, and thorium-230. Results were similar to those reported in Section 3.12.1 of the NRC Lost Creek SEIS.

### **3.15.2 Public Health and Safety**

As described in Section 3.12.2 of the NRC Lost Creek SEIS, NRC has the statutory responsibility under the AEA to protect public health and safety. NRC regulations in 10 CFR Part 20 specify annual dose limits to members of the public of 100 millirems (mrem) total effective dose equivalent (TEDE) and 2 mrem per hour from any external radiation source. The NRC Lost Creek SEIS indicated that none of the inactive and decommissioned uranium mills within 50 miles of the project area are considered to represent a source of radiation exposure in and around the project area. Therefore, the NRC Lost Creek SEIS concluded that the natural background represents the only radiation exposure to individuals in the area surrounding the project area. Although operations have commenced at the Lost Creek ISR Project, access to areas of potential radiation exposure is restricted to the public.

### **3.15.3 Occupational Health and Safety**

As described in Section 3.12.3 of the NRC Lost Creek SEIS, NRC regulates occupational health and safety risks to workers as a result of exposure to radiation mainly through the Radiation Protection Standards contained in 10 CFR Part 20. The Applicant's license (license condition 9.7 of SUA-1598) requires radiation safety measures for protecting workers and ensuring radiation exposures and resulting doses are less than the occupational limits and ALARA.

## **3.16 Waste Management**

As described in Section 3.1 of this EIS, the primary land uses within the project area include livestock grazing, wildlife habitat, dispersed recreation, mineral development, and infrastructure. There are no farms, residences, or population centers present. Of these existing land uses, only mineral development produces a significant quantity of waste. There are no landfills within the vicinity of the project area.

Within the existing Lost Creek ISR Project area, liquid and solid wastes are currently generated as part of uranium ISR operations. The types of wastes generated and waste management practices are summarized in Section 2.2.6 of this EIS and described in detail in Section 3.13 of the NRC Lost Creek SEIS (NRC 2011; pp. 3-81 through 3-83), which is incorporated by reference. There are no liquid or solid wastes present within the project area other than those associated with uranium development. The Applicant is currently classified under the Resource Conservation and Recovery Act as a conditionally exempt small quantity generator of hazardous wastes (generating no more than 100 kg of hazardous waste per month).

The following summarizes the liquid wastes and disposal methods currently used by the Applicant:

- Groundwater that has not been exposed to any mining process or chemicals ("native" groundwater) generated during well development, sample collection, or aquifer pumping

tests is discharged to the ground surface under a temporary or general WYPDES permit or reused in the drilling process.

- Storm water runoff is regulated under the Applicant's large construction general WYPDES permit (WYR103695), industrial general WYPDES permit (WYR001378), and associated Storm Water Pollution Prevention Plan (SWPPP).
- Waste petroleum products and chemicals not associated with laboratory operations or uranium processing are recycled or disposed of in an appropriately permitted disposal facility. Waste chemicals associated with the laboratory and its operations are captured in drains and/or sumps within the laboratory and disposed of with AEA-regulated liquid waste.
- Domestic sewage is disposed of in a permitted on-site septic tank and leach field system.
- AEA-regulated liquid waste is disposed of using Class I UIC wells or treated and disposed in Class V UIC wells (NRC 2016a).

Solid wastes at the Lost Creek ISR Project are separated into non-AEA-regulated and AEA-regulated wastes. Non-AEA-regulated solid waste is recycled or disposed of in an appropriately permitted disposal facility. AEA-regulated solid waste is accumulated in covered containers and stored temporarily in restricted areas until final disposal at a licensed disposal facility.

TENORM includes drill cuttings and fluids from the drilling of delineation boreholes, construction and development of monitor wells, and construction and development of production and injection wells prior to operation. TENORM would be disposed of in mud pits constructed adjacent to the wells. Upon completion of drilling, the TENORM would be allowed to dry and then covered with native soil and revegetated (LCI 2009). Another type of TENORM is groundwater recovered prior to mining during aquifer tests. As described in Section 2.1.4.4 of the BLM Lost Creek EIS, this native groundwater would not be exposed to any mining process or chemicals and would be discharged to the surface under the provisions of a temporary WYPDES permit, in a manner that mitigates erosion, or reused in drilling.

### **3.17 Environmental Justice**

Environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income. As described in Section 4.16 of the BLM Lost Creek EIS and Section 4.12 of the NRC Lost Creek SEIS, environmental justice analyses assess the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations. As shown in table 3.17-1, the percentage of the population in Sweetwater County living in poverty declined from 2009 to 2016 and remained below the national level but slightly higher than the Wyoming poverty rate. The NRC Lost Creek SEIS noted these same trends between 2000 and 2009 (NRC 2011).

The percentage of the population in Sweetwater County identified as a minority increased from 2009 to 2016 (table 3.17-1). While there was an increase in all minority populations, most of the increase was due to an influx into the county of more than 2,500 Hispanics or Latinos from 2009 to 2016, which resulted in a 55.5 percent increase in this population segment (USCB 2017b). Increases in minority populations were also recorded at the state and national levels during the same time period. The NRC Lost Creek SEIS noted these same trends between 2000 and 2009 (NRC 2011).

**Table 3.17-1. Percentage of Population Living in Poverty and the Percentage of Minority Population in 2000, 2009, and 2016**

Geographic Unit	Percent Living in Poverty			Percent Minority		
	2000	2009	2016	2000	2009	2016
U.S.	13.0	12.4	11.0	30.9	27.8	38.0
Wyoming	11.4	8.3	7.6	11.2	13.1	15.6
Sweetwater County	7.8	9.2	8.4	13.1	16.3	20.2

Sources: NRC 2011, USCB 2017b, USCB 2017c

## 4.0 POTENTIAL ENVIRONMENTAL IMPACTS

This chapter describes the probable consequences of each alternative on the human and natural environmental resources that could be affected and presents comparative analyses of the direct and indirect effects on the environment. Environmental impact analysis is based upon available data and literature from state and federal agencies, peer-reviewed scientific literature, and resource studies conducted in the project area.

Within each resource, evaluation of impacts is intended to provide an impartial assessment to help inform the decision-maker and the public. Actions resulting in adverse impacts to one resource may impart a beneficial impact to other resources. In general, adverse impacts described in this section are considered important if they result from, or are related to, the implementation of any of the alternatives. These impacts are defined as follows:

- Direct impacts – Impacts that are caused by the action and that occur at the same time and in the same general location as the action.
- Indirect impacts – Impacts that occur at a different time or in a different location than the action to which the impacts are related.
- Short-term or long-term impacts – When applicable, the short-term or long-term aspects of impacts are described. For the purposes of this EIS, short-term impacts occur during or after the activity or action and may continue for up to 5 years. Long-term impacts are those lasting longer than 5 years.

The impact analysis is organized by resource area. Each resource area evaluation includes assumptions and Applicant-committed design features used in the analysis of impacts. Assumptions applicable to all resource areas include:

- Fencing would be installed around each mine unit at the start of construction and would remain through operation and reclamation. Due to the overlap in the HJ and KM horizons, two or more mine units would share a fence in some areas. The Proposed Action would result in up to 1,371 acres of additional fencing within the project area. The fenced area around each mine unit would not include the perimeter monitor well ring. All mud pits outside of fenced areas would be fenced temporarily until the pits are backfilled. Up to 11 acres would be disturbed and temporarily fenced for the perimeter monitor wells.
- Surface disturbance associated with the additional Class I UIC wells would be 14 acres (LCI 2017j). Outside of the fenced mine units, the surface disturbance for secondary access roads (20 feet width), trunk lines (48 feet width), and pipelines to the Class I UIC wells (10 feet width) would be 19 acres.
- Mine unit development would be progressive, with the construction, operation, and restoration phases overlapping.
- No new main access roads would be constructed.
- No additional employees would be added to the current workforce.
- The operating life of the project would be extended by 6 to 8 years.

- The maximum annual production rate would be increased from 2 million to 2.2 million pounds of dried yellowcake equivalent. This would include 1.2 million pounds from mine units within the project area plus toll milling of ion exchange resin or yellowcake slurry to or from another uranium recovery facility. If there were no mine unit production within the project area, toll milling could be employed to produce up to the maximum 2.2 million pounds per year (LCI 2017).
- Up to three additional Class I UIC wells would be completed in the Fort Union Formation and possibly the Lower Battle Spring Formation within the proposed LCE expansion area and operated for AEA-regulated liquid waste disposal.

This EIS uses a standard of significance for assessing environmental impacts, as described in the NRC guidance NUREG–1748 (NRC 2003), and consistent with that used in the NRC Lost Creek SEIS. Impacts significance levels are summarized as follows:

**SMALL:** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource considered.

**MODERATE:** The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource considered.

**LARGE:** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource considered.

#### **4.1 Land Use**

This section describes potential impacts to land use and land management as a result of activities associated with the Proposed Action and alternatives. As described in Section 1.1, 94 percent of the project area is federal land managed by the BLM, with 6 percent state-owned land. Other than ongoing uranium recovery, the primary land uses within the project area include livestock grazing, wildlife habitat, dispersed recreation, and infrastructure. These are the only land uses potentially affected by the Proposed Action and alternatives. Although there are other mineral development projects in the general vicinity (see Section 3.1.4), they would not be directly or indirectly (e.g., limiting access) impacted. Nearby mineral and energy development projects are discussed in the cumulative impacts analysis in Chapter 5.

##### **4.1.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant’s proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation currently approved by BLM, NRC, and WDEQ would continue within the existing Lost Creek ISR Project area. Exploratory drilling would continue within the project area under an NOI at a rate of approximately 5 acres of surface disturbance per year. Reclamation of exploration holes generally would occur within the same calendar year as the disturbance. Mining-related activities on BLM-managed lands would limit unreclaimed surface disturbance to 5 acres at any time during the life of the NOI filed for each action (43 CFR § 3809.21). The impacts to land use for the No Action Alternative are consistent with the impacts stated in Section 4.2 of the BLM Lost Creek EIS and Section 4.2 of the NRC Lost Creek SEIS.

## 4.1.2 Proposed Action

### Livestock Grazing

Potential impacts to livestock grazing from the Proposed Action were identified based on the locations of the grazing allotments in relation to the proposed facility disturbance and fenced mine units. The following additional assumptions were used in the analysis of impacts to livestock grazing resources:

- Fencing in the proposed LCE expansion area could restrict up to an additional 500 acres of grazing access around well P13834P in Section 21, T25N, R92W and well P55112W in Section 10, T25N, R92W (see map 3.1-1). These areas are not enclosed by mine unit fencing but could restrict livestock grazing due to the fencing configurations.

The same type of direct and indirect effects to livestock grazing would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.2.4.1, pp. 4.2-3 through 4.2-5 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.2, pp. 4-4 through 4-8 (NRC 2011)

Direct effects to livestock grazing resources would include a loss of available grazing area and restriction or alteration in livestock movement. The primary impact to livestock grazing would be loss of available grazing area as a result of fencing around the mine units. Table 4.1-1 summarizes the maximum number and percentage of AUMs that would be lost within each allotment.

**Table 4.1-1. Impacts to Grazing Allotment Carrying Capacity under the Proposed Action**

Grazing Allotment Name	Total Area (acres)	Maximum Reduction in Available Grazing Area (acres) <sup>1</sup>	Available AUMs <sup>2</sup> within Allotment	Maximum Reduction in AUMs <sup>3</sup>	Maximum Percentage Reduction in AUMs
Stewart Creek	177,616	1,561	9,753	86	0.9%
Cyclone Rim	308,608	333	42,975	46	0.1%

<sup>1</sup> The total reduction in grazing area is not equal to the total fenced area, since impacts to the Arapahoe Creek allotment are not considered in this analysis, and additional grazing restrictions are assumed around two wells.

<sup>2</sup> An AUM is a common unit of measure defined as the amount of forage needed to sustain one mature cow and calf or five sheep for one month.

<sup>3</sup> Calculated based on the maximum reduction in available grazing area.

When added to the 345 acres of mine unit and facility fencing currently authorized within the project area (all of which lies within the Cyclone Rim allotment), the maximum reduction in AUMs in the Cyclone Rim allotment would be 0.2 percent. The BLM Lost Creek EIS concluded that since less than 1 percent of the grazing allotments would be directly impacted, the temporary exclusion of livestock grazing is not expected to have a notable impact. Since the affected area of each allotment would remain less than 1 percent, the impacts to livestock grazing from the Proposed Action would be SMALL.

Fencing of mine units would also restrict or alter livestock movement within the project area. The maximum alteration to livestock movement within the Stewart Creek allotment would be up to 2 miles (around MU9 and MU10). Within the Cyclone Rim allotment, the maximum alteration to livestock movement would be up to 4 miles (from MU4 to MU7). In addition, as depicted on map 3.1-1, mine units (MU7 and MU8) would be developed on both sides of the existing allotment boundary fence. During construction the allotment boundary fence would be removed within the

fenced mine units. The allotment boundary fence would be replaced by the Applicant following reclamation. Livestock would not likely move around fenced mine units, which could restrict access to the two permitted stock wells within the project area (P13834P and P55112W; see map 3.1-1). Livestock would continue to have access to seven other stock water wells available near the project area (map 3.1-1). Access to the P55112W well would be altered from the north, since MU11 would be fenced across the existing secondary access road. Vehicles accessing the well from the north could use the two-track road around the mine unit that would be used by the Applicant to access the perimeter monitor wells. Access to the well from the south would not be altered or restricted.

Indirect effects to livestock grazing would include dust and noise. Air quality impacts are discussed in Section 4.10 and noise impacts in Section 4.11 of this EIS.

The impacts to livestock grazing under the Proposed Action would be short-term for the perimeter monitor wells, Class I UIC wells, secondary access roads, trunk lines, and pipelines, since these areas would be revegetated after construction. Since the fencing around the mine units would remain from construction through reclamation, the impacts to livestock grazing would be long term.

As described in the BLM Lost Creek EIS and NRC Lost Creek SEIS, the potential impacts to livestock grazing for all phases of the project would be minimal and would not result in residual impacts after reclamation. As the mine units are reclaimed (regraded and reseeded), the land would be returned to its current use of livestock grazing. Livestock grazing impacts under the Proposed Action would be similarly SMALL.

#### Wildlife Habitat

As described in Section 3.1.2 of this EIS, wildlife habitats near the project area include the Chain Lakes WHMA and Greater sage-grouse core areas. The project area also lies within two wild horse HMAs (Lost Creek and Stewart Creek). General impacts to wildlife habitat are discussed in this section. Impacts to vegetation are discussed in Section 4.7, impacts to specific wildlife species, including Greater sage-grouse, in Section 4.8, and impacts to wild horses in Section 4.9 of this EIS.

Potential impacts to wildlife habitat from the Proposed Action were identified based on the potential disturbance and fenced area. The following additional assumptions were used in the analysis of impacts to wildlife habitat resources:

- Fencing in the proposed LCE expansion area would restrict up to an additional 500 acres of wild horse habitat around wells P13834P and P55112W (see map 3.1-1).

Applicant-committed design features considered in the wildlife habitat impact analysis include the following:

- The Applicant would construct fences according to BLM Handbook H-1741-1 (BLM 1989) and WGFD criteria to allow the passage of antelope and other wildlife and with appropriate collision deterrents (Operations Plan Section OP 2.3 and Attachment OP-6, LCI 2011b).
- The Applicant would reclaim the surface and reestablish vegetation in areas disturbed by drilling, pipeline installation, and facility construction upon completion of construction. Disturbed areas would be reseeded with a permanent seed mix during the next appropriate

season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b).

- Weed prevention measures following BLM guidelines and recommendations would be implemented (Operations Plan Section OP 2.7, LCI 2018d). Weed prevention measures would include:
  - o Weeds would be controlled on project disturbed areas and native areas infested as a direct result of the project. The control methods would be in accordance with the approved weed management plan and guidelines established by the EPA, BLM, state, and local authorities. Prior to the use of pesticides, the Applicant would obtain written approval from the BLM Authorized Officer—Weed Coordinator.
  - o To further reduce the spread of invasive and noxious weeds following construction activities, inspections for noxious weeds would be conducted each year along with revegetation monitoring, during the first 5 years following construction. Thereafter, weed surveys would be conducted at least once every 3 years at appropriate times, as directed by the BLM, for the life of the project. Information from these surveys would be included in the annual report on reclamation status.
  - o To minimize the potential for the introduction of new weeds, the Applicant would thoroughly power wash construction equipment, including the undercarriage, before transporting it to the project area. If portable wash units are utilized, wastewater would only be disposed of at a previously approved facility/location. Compressed air would not be used as a method for cleaning equipment.
- The Applicant would install gates or cattle guards to minimize wild horse access to fenced mine units (Lost Creek ISR Project Technical Report [TR] Section 3.1.1, LCI 2017f).

The same type of impacts to wildlife habitat would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.2.4.2, pp. 4.2-5 through 4.2-7
- NRC Lost Creek SEIS – Section 4.2, pp. 4-4 through 4-8

Direct effects would include a loss of available habitat, including food sources (e.g., native plant species and prey), and reduced effectiveness of migration corridors. The Proposed Action would disturb up to 1,415 acres, which when added to the currently authorized disturbance would be approximately 18 percent of the project area. In addition, wild horses could be restricted from up to an additional 500 acres around wells P13834P and P55112W. The maximum impact to wildlife habitat would occur during the construction phase, when the majority of disturbance would occur. As described in Section 4.2.4.2 of the BLM Lost Creek EIS, since the surrounding area has similar habitat that is undisturbed, wild horses and other wildlife would likely avoid the project area.

Indirect effects to wildlife habitat would include dust and noise. Dust generated by the Proposed Action could accumulate on vegetation, which could potentially affect wildlife grazing. The greatest impact would be to vegetation located adjacent to untreated, unpaved roads located outside the project area. Noise from construction activities would also deter wildlife from the project area. Air quality impacts are discussed in Section 4.10 and noise impacts in Section 4.11 of this EIS.

The duration of wildlife habitat effects within fenced areas would be long term and would last the life of the project. Following final reclamation, the land would be returned to its current use, which supports wildlife habitat. Section 4.2 of the NRC Lost Creek SEIS concluded that the impacts to wildlife habitat would be insignificant, since the proposed disturbance would only affect a small portion of the currently undisturbed land in the region. Wildlife habitat impacts under the Proposed Action would be similarly SMALL.

### Recreation

Dispersed recreation activities near the project area include sightseeing, wild horse viewing, hunting, hiking, picnicking, rock hounding, horseback riding, mountain biking, camping, and off-highway vehicle use. The nearest recreation area is the Continental Divide National Scenic Trail, which is located approximately 5 miles northeast of the project area (map 3.1-1). Recreation activities within the project area are limited as a result of Lost Creek ISR Project operations. Signs located at the entrance of the east and west access roads indicate that the access roads are limited to authorized personnel. General public access is restricted from travel on the private access roads within the project area.

Due to the limited nature of recreation within and surrounding the project area, the impacts to recreational use were assessed qualitatively. The analysis is based on the assumptions that mine unit fencing would limit recreation access and the proposed facilities would alter viewing opportunities.

The same type of recreation impacts would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.2.4.3, pp. 4.2-5 through 4.2-8
- NRC Lost Creek SEIS – Section 4.2, pp. 4-4 through 4-8

To protect the health and safety of the public, access to the project area would be limited throughout the life of the project. Direct impacts to recreation would result through the restriction of portions of the project area, including fenced mine units and Class I UIC well houses. The Proposed Action would also alter wild horse and other wildlife movement, which would impact wildlife viewing and hunting. Wild horses and other wildlife would likely avoid the project area during the construction and reclamation phases, when noise disturbances would be most prevalent. Impacts to wildlife are discussed in Section 4.8 and impacts to wild horses in Section 4.9 of this EIS. The Continental Divide National Scenic Trail would not likely be impacted by the Proposed Action, since it is at least 5 miles from any proposed activities.

Indirect effects would include noise and visual changes within the project area. During construction, noise would increase as a result of machinery and equipment required to construct roads, wells, pipelines, and power lines. Noise impacts are discussed in Section 4.11 of this EIS. The presence of additional facilities would alter the scenery within the project area, making it look more industrial. This could deter people from recreating in the vicinity of the project area. Impacts to visual resources are discussed in Section 4.13 of this EIS.

The Proposed Action would cause long-term impacts to recreation, since portions of the project area would be disturbed or fenced and use of private access roads would be restricted for the life of the project. Indirect effects would be short term and isolated to areas near construction or reclamation. Following reclamation, the entire project area would be available for recreation use.

Section 4.2 of the NRC Lost Creek SEIS concluded that impacts to recreation would be minimal, since only a small area would be impacted by activities. While the Proposed Action would add up to 1,415 acres of disturbance within the project area, the affected area would still be only a small portion of the undisturbed area in the region. Therefore, the impacts from the Proposed Action would be SMALL.

#### Oil, Conventional Gas, and CBNG

As described in Section 3.1.4.2 of this EIS, there are no active oil and gas leases within the project area and no producing oil or gas wells within 2 miles of the project area. In 2017, BLM deferred analysis of the available parcels within the project area for lease sale (BLM 2017c). These parcels have been deferred through the third quarter 2018 lease sale, but could be leased in the future. There are four conventional gas wells and one CBNG well within 2 miles of the project area, but all of these wells have been plugged and abandoned.

As described in Section 3.1.4.2 of this EIS, the nearest producing oil fields are the Lost Soldier-Wertz fields, which are located approximately 11 miles east-northeast of the project area and produce from the Pennsylvanian Tensleep Sandstone and deeper formations at depths of approximately 5,000 to 8,000 feet. In addition, a considerable amount of conventional oil and gas exploration is taking place approximately 20 miles southwest of the project area. It is targeting the Almond Formation in the Mesaverde Group at depths between 8,000 and 12,000 feet (BLM 2016g). Since these formations are deeper than the formations targeted by the Proposed Action, including the injection intervals for Class I UIC wells, there would be no potential for impacts to the oil and gas producing formations.

Section 4.2 of the NRC Lost Creek SEIS concluded that there would be no impacts to CBNG or oil and gas production because these activities did not occur within the existing Lost Creek ISR Project area. The impacts from the Proposed Action would be SMALL, since there are no active oil and gas leases in the area.

#### Coal

As discussed in Section 3.1.4.3, the closest active coal mines are the Jim Bridger Mine and the Black Butte, which are located about 50 miles southwest of the project area. Since there are no coal mines or economical recoverable coal deposits in the area (as indicated by outcrops of Fort Union coal outcrops [Lynds and Carroll 2015]), the impacts from the Proposed Action would be SMALL, since there is no coal recovery in or near the project area.

#### **4.1.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or fenced. Similar to the Proposed Action, livestock grazing, wildlife habitat, and recreation impacts were identified based on potential disturbance and fenced areas. The assumptions used to analyze impacts as a result of Alternative 1 would be the same as the Proposed Action except for the following:

- The maximum added disturbance would be up to 1,244 acres within the fenced mine units plus 5 acres for construction of the perimeter monitor wells and 27 acres associated with Class I UIC wells, secondary access roads, trunk lines, and pipelines (1,276 acres total plus up to an additional 500 acres of restricted grazing access around wells P13834P and P55112W).

The slight reduction in the combined fenced and disturbance area under Alternative 1 (1,276 acres plus 500 acres of additional grazing restriction, compared to 1,415 acres plus 500 acres of additional grazing restriction under the Proposed Action), would slightly reduce the maximum reduction in AUMs for the Stewart Creek allotment (from 1.1 to 1.0 percent). No change would occur to the reduction in AUMs for the Cyclone Rim allotment.

The maximum length of fencing that would restrict or alter livestock movement within the project area would be nearly the same as the Proposed Action. However, the duration that the mine units would be fenced under Alternative 1 would be several years shorter than the Proposed Action. Indirect effects to livestock grazing under Alternative 1 would be the same as the Proposed Action and include noise and dust.

Under Alternative 1, direct and indirect effects to wildlife habitat and recreation would be similar to the Proposed Action. Approximately 139 fewer acres (primarily Upland Big Sagebrush Shrubland and Lowland Big Sagebrush Shrubland) would be disturbed, and the project duration would be shortened by several years. Overall, the impacts to wildlife habitat and recreation would be similarly SMALL.

## **4.2 Transportation**

This section describes the potential transportation impacts as a result of activities associated with the Proposed Action and alternatives. As described in Section 3.2, transportation routes to the project area include I-80, U.S. 287, Wyoming 73 and 220, and county and BLM roads.

### **4.2.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Proposed secondary and two-track access roads within the project area would not be constructed. Traffic increases on area roads would not occur due to an increase in the uranium production rate. Transportation activities associated with the currently authorized Lost Creek ISR Project would continue.

Since the evaluations and assumptions included in the NRC Dryer Amendment EA (NRC 2013b) represent the current uranium production limit and associated vehicle traffic at the Lost Creek ISR Project, the NRC Dryer Amendment EA describes traffic impacts for the No Action Alternative in this EIS. The impacts to transportation for the No Action Alternative are consistent with the impacts in Section 4.8 of the BLM Lost Creek EIS, Section 4.6 of the NRC Lost Creek SEIS, and Section 4.2.5 of the NRC Dryer Amendment EA.

### **4.2.2 Proposed Action**

Assumptions used to analyze the transportation impacts include:

- All vehicles accessing the project area would comply with local, state, and federal rules and regulations; for example, all oversize and overweight vehicles would comply with WYDOT permitting and safety regulations.
- All vehicles transporting radioactive materials such as ion exchange resin, yellowcake slurry, or dried yellowcake would comply with NRC 10 CFR Part 71 regulations and applicable DOT regulations in 49 CFR Parts 171 through 177 and 390 through 397.

- All use, modification, and maintenance to Sweetwater and Carbon County roads would be conducted in accordance with county regulations and the agreement between Sweetwater County and the Applicant (Sweetwater County and LCI 2012).
- Existing roads within the project area would be used to the extent practicable.
- Secondary access roads within the project area would be constructed in accordance with guidance in BLM Manual H-9113-1 (BLM 2011b).
- Secondary access roads used to access header houses and Class I UIC wells would be constructed with a finished gravel surface. The total length of secondary access roads constructed within the project area would be approximately 8 miles.
- Two-track access roads would be unconstructed new roads or unimproved existing roads that would be used during mine unit construction and during operations to access header houses and monitor wells.

Applicant-committed design features considered in the transportation impact analysis include the following:

- Restrict traffic to designated areas, demark areas where no traffic is allowed, and perform daily and weekly inspections to ensure only designated roads are used (Operations Plan Section 2.6, LCI 2011b).
- Impose speed limits on roads within the project area and the east and west access roads to reduce dust, accident risk, and potential impacts to wildlife and wild horses (Operations Plan Section 2.8, LCI 2011b and TR Section 7.1, LCI 2010d).
- Package and ship yellowcake and other licensed materials via DOT-approved containers and exclusive use carriers; ship ion exchange resin and yellowcake slurry in dedicated tanker trucks; and comply with all applicable provisions of 10 CFR Part 71 and 49 CFR Parts 171-177 and 390-397 regulations, as applicable (TR Sections 5.8 and 7.4.7, LCI 2010d).
- Implement a written program for prevention and mitigation of transportation accidents involving radioactive materials, including employee training, radiological surveys, pre-shipping inspections, and emergency response procedures (TR Section 5.8, LCI 2010d).
- In the event of a spill of yellowcake, yellowcake slurry, or ion exchange resin, clean up spilled materials and contaminated soils and reclaim disturbed areas in accordance with all applicable state and federal regulations (TR Section 7.4.7, LCI 2010d and Dryer Amendment Application, LCI 2012).

The same type of transportation impacts would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.8, pp. 4.8-1 through 4.8-7 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.6, pp. 4-40 through 4-58 (NRC 2011)
- NRC Dryer Amendment EA – Section 4.2.5, pp. 18 through 19 (NRC 2013b)

Transportation-specific impacts associated with the Proposed Action would result from extending the project life and increasing the frequency of material shipments related to the increase in the maximum yellowcake production rate. Under the Proposed Action, the amount of light vehicle traffic to and from the project area would not increase, since the number of employees would not increase. However, light vehicle traffic on regional and local transportation corridors would last 6 to 8 years longer due to the extension in the project life.

If toll milling were performed, ion exchange resin and/or yellowcake slurry would be transported from one or more uranium recovery facilities to the Plant. The Applicant states that one such potential facility is the Shirley Basin facility, which is owned by an affiliate of the Applicant (LCI 2017I). The Shirley Basin facility is approximately 125 miles away along the shipment route shown on map 4.2-1. It is a potential ISR project as well as a potential location of 11e.(2) byproduct material disposal from the Lost Creek ISR Project as described in Section 2.2.6.3 of this EIS. Toll milling would not include processing ore from conventional mining operations such as the Sheep Mountain Uranium Project. Dried yellowcake would continue to be transported to the NRC-licensed conversion facility in Metropolis, Illinois as described in the NRC Dryer Amendment EA.

Table 4.2-1 presents the maximum number of shipments corresponding to an increase of 0.2 million pounds per year of dried yellowcake equivalent. Under the Proposed Action, up to 0.21 additional heavy truck shipments would occur per day. When added to the current average of 0.61 shipment per day, the average daily heavy truck shipments could increase to 0.82 per day (round trips, corresponding to 1.6 one-way trips per day). This is consistent with the Applicant's estimate of up to two heavy truck shipments per day if all 2.2 million pounds per year are derived from toll milling ion exchange resin or yellowcake slurry from another facility (LCI 2017I).

**Table 4.2-1. Maximum Increase in Shipments under the Proposed Action**

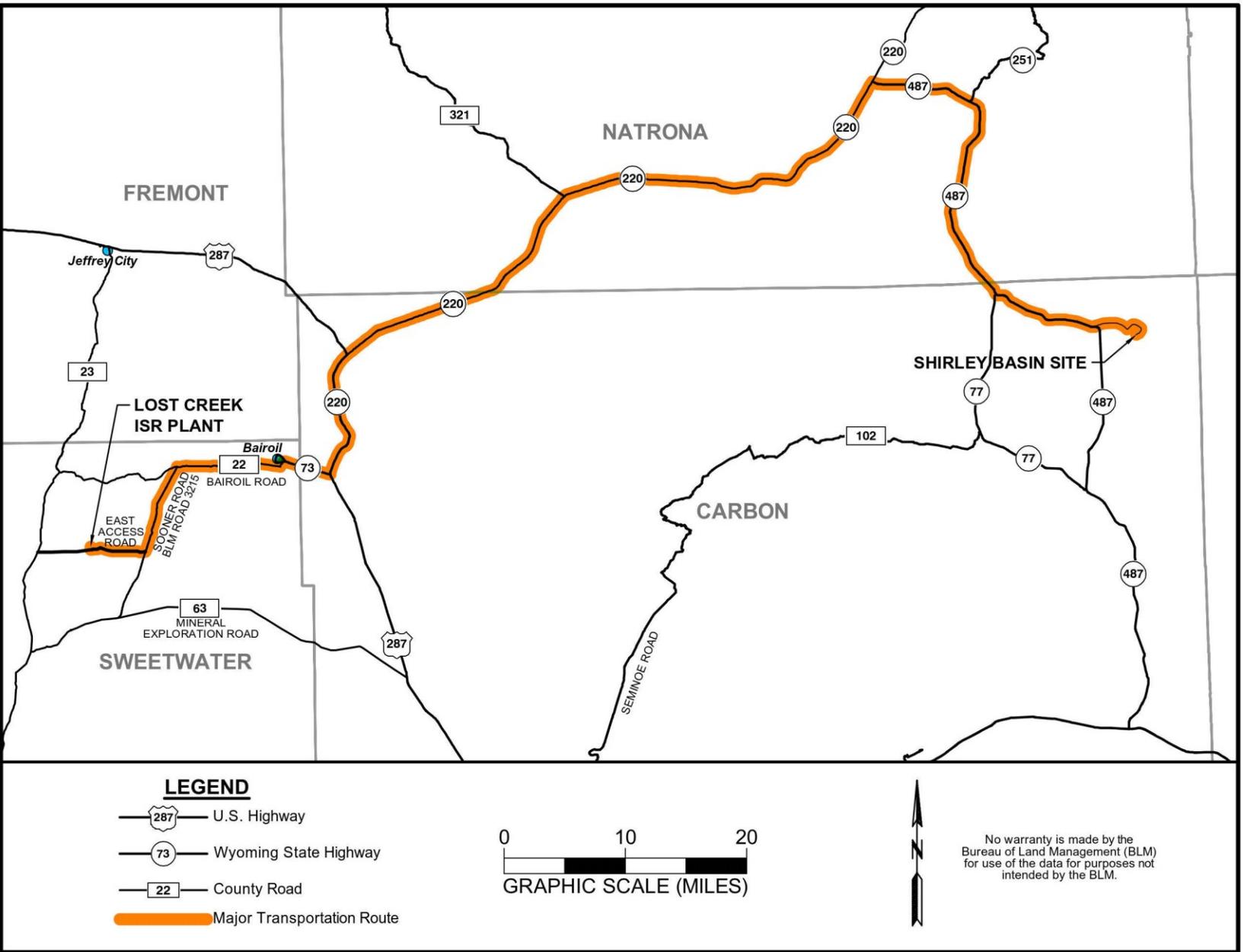
Shipment Type	Tractor Trailer Capacity (pounds of yellowcake equivalent <sup>1</sup> )	Maximum Increase in Truck Shipments per Year <sup>2</sup>	Maximum Increase in Truck Traffic per Day
Dried yellowcake	36,000	6	0.02
Ion exchange resin or Yellowcake slurry	6,500 or 15,000	31 or 14	0.09 or 0.04
11e.(2) byproduct material <sup>3</sup>	---	0	0.00
Process chemicals, fuel, and other materials <sup>4</sup>	---	38	0.10
<b>Total</b>	---	<b>76</b>	<b>0.21</b>

<sup>1</sup> Yellowcake equivalent estimates from LCI 2017I.

<sup>2</sup> Based on an increase of 0.2 million pounds per year from the 2 million pounds per year evaluated in the NRC Dryer Amendment EA.

<sup>3</sup> The Applicant states that the four to five annual shipments of 11e.(2) byproduct material would not change under the Proposed Action; however, the duration would be extended under the Proposed Action.

<sup>4</sup> Estimated by multiplying the number of current shipments by the ratio of 0.2 (i.e., 0.2 million pound increase compared to 1 million pounds per year current production). Current shipments of process chemicals, fuel, and other materials were estimated by multiplying the average daily tractor trailer shipments (0.61) by 365 and subtracting an estimated 28 shipments of dried yellowcake and 4 shipments of 11e.(2) byproduct material per year. This is a conservative estimate, since the quantities of chemicals used for lixiviant makeup and fuel are not proportional to the yellowcake production rate.



**Map 4.2-1. Potential Transportation Route for Ion Exchange Resin, Yellowcake Slurry, and 11e.(2) Byproduct Material**

Direct effects from the Proposed Action would include increased truck traffic and increased risk of accidents as compared with rates assessed in the NRC Dryer Amendment EA (which account for 2 million pounds of annual production). Most of this traffic would be related to shipments of ion exchange resin or yellowcake slurry and process chemicals and other materials (table 4.2-1). The total heavy truck shipments of up to 1.6 one-way trips per day would not cause a noticeable effect on highways. For example, the average annual daily truck traffic on U.S. 287 near Bairoil is about 541 (table 3.2-1). Project-related heavy truck traffic of up to 1.6 one-way trucks per day represents less than a 1 percent increase in current truck traffic on this highway.

The increase in truck traffic would be more noticeable on county and BLM gravel roads, where traffic is significantly less than on the highways. This includes portions of the Wamsutter-Crooks Gap Road (CR 23), Sooner Road (BLM 3215), and Bairoil Road (CR 22). This added truck traffic would cause additional degradation of the gravel roads. However, based on the Applicant's road maintenance agreement with Sweetwater County (Sweetwater County and LCI 2012) and the BLM's requirement that the Applicant have a maintenance use agreement for BLM-controlled roads outside of the project area (BLM 2012a), impacts on public gravel roads by increased traffic would be SMALL.

The risk of an accident would also increase slightly with the increase in truck traffic. The following describes the potential impacts of a spill or release that could result from an accident involving each type of shipment in table 4.2-1. Overall, traffic safety data presented in table 3.2-2 show that truck accidents rarely occur on area highways. Based on the current crash rates and the relatively low increase in traffic volumes associated with the Proposed Action, no measurable increase in truck accidents on the area roadways would be expected.

Potential effects of a transportation accident involving dried yellowcake are described in Section 4.2.1 of the NRC Dryer Amendment EA. In that analysis, NRC staff evaluated the risk of transporting up to 2 million pounds of dried yellowcake annually, or approximately 50 to 60 trucks per year. At the proposed production limit of 2.2 million pounds of yellowcake per year, the number of annual dried yellowcake shipments would increase by six trucks per year. For a trailer carrying dried yellowcake, a spill has the potential for dried yellowcake powder to affect soils, surface water (if present), vegetation, and wildlife. A spill also has the potential to become airborne and affect air quality and public health. However, due to the Applicant's commitments to comply with all applicable shipping regulations, implement a written program for transportation accident and mitigation, and clean up and reclaim areas affected by spilled materials, short-term effects would be minimal and there would not be any long-term effects from a release of dried yellowcake.

Potential effects of a transportation accident involving yellowcake slurry or 11e.(2) byproduct material are described in Section 4.3.1.2 of the NRC Lost Creek SEIS. That analysis describes how the risk to public health and the environment for yellowcake slurry would be lower than that for dried yellowcake, since the slurry would be significantly less concentrated and less dispersible in air than dried yellowcake. Similarly, the NRC staff determined that transporting up to five shipments of 11e.(2) byproduct material presents a low radiological risk due to a lower uranium concentration compared to dried yellowcake and fewer annual shipments. Since the Proposed Action would not increase the estimated annual 11e.(2) byproduct material shipments and would only increase the maximum number of yellowcake slurry shipments by 10 percent, the risk to public health and the environment from shipments of yellowcake slurry or 11e.(2) byproduct material under the Proposed Action would be SMALL.

A transportation accident resulting in release of ion exchange resin would pose less risk to the environment and public health than one involving yellowcake (slurry or dried). It could impact soil, vegetation, and surface water (if present) in the area of the release. However, an ion exchange resin release would be easier to salvage and remediate than a release of dried yellowcake or yellowcake slurry, since the uranium would be chemically bound to the resin, making it less likely to spread and easier to remediate. It would also result in low radiological risk, since the uranium concentration would be lower and could not become airborne.

Transportation risks associated with chemical and fuel shipments are evaluated in Section 4.3.1.2 of the NRC Lost Creek SEIS, which concluded that there would be no significant long-term environmental impact due to the Applicant's commitment to follow applicable DOT shipping regulations. If an accident were to occur, spill response would be handled by emergency response procedures and reportable to the appropriate state agency, EPA, and DOT. No new chemicals are proposed for shipment under the Proposed Action, since the same chemical shipping, spill response, and reporting procedures would be in place, there would not be long-term environmental impacts due to transportation accidents involving process chemicals or fuel.

Section 4.2.1 of the NRC Dryer Amendment EA concluded that impacts from truck traffic and operational transportation risks would be SMALL. Since the Proposed Action would only slightly increase truck traffic and operational transportation risks, impacts would continue to be SMALL.

#### **4.2.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, approximately 1 mile less of secondary access roads would be required compared to the Proposed Action. This would result in less direct and indirect effects related to the construction and use of secondary access roads. Impacts associated with shipments of ion exchange resin, yellowcake slurry, dried yellowcake, 11e.(2) byproduct material, process chemicals, fuel, and other materials would be the same as the Proposed Action, since the maximum annual production rate would be the same.

### **4.3 Geology and Seismology**

This section describes the potential geologic impacts as a result of activities associated with the Proposed Action and alternatives.

#### **4.3.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation would continue within the existing Lost Creek ISR Project area, as approved by BLM, NRC, and WDEQ. Exploratory drilling may continue within the project area under an NOI at a rate of approximately 5 acres of surface disturbance per year. Geologic impacts would include a permanent change to the chemical composition of the uranium-bearing rock formations and the minor impact on the geology due to the removal of subsurface materials as a result of the drill-cutting action. Under the No Action Alternative, geologic impacts would be consistent with the impacts stated in Section 4.4 of the BLM Lost Creek EIS and Section 4.4 of the NRC Lost Creek SEIS.

### 4.3.2 Proposed Action

Applicant-committed design features considered in the geologic impact analysis include the following:

- The Applicant would continuously monitor and record injection pressure and annulus pressure in Class I UIC wells and implement high level alarms (Operations Plan Attachment OP-2, LCI 2011b).
- The Applicant would measure and record daily injection manifold pressures of the Class III UIC wells (i.e., ISR injection wells). Further, the Applicant would not exceed the specified maximum injection pressure during wellfield operations (License SUA-1598 license condition 10.13, NRC 2016b).

The same type of geologic impacts would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.4, pp. 4.4-1 through 4.4-5 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.4, pp. 4-19 through 4-24 (NRC 2011)
- NRC Class V UIC Well Amendment EA – Section 4.2.2, p. 13 (NRC 2016a)

Other than minor impacts from drill-cutting action, construction activities associated with the Proposed Action would not result in impacts to bedrock geology, since the Battle Spring Formation subcrops beneath a veneer of Quaternary age sediments in the project area. In addition, based on completion results of the three existing Class I UIC wells, the addition of up to three additional Class I UIC wells would not impact the subsurface geologic conditions. The potential impact of fluid injection inducing movement of the faults in the project area was evaluated in the modification to the Class I UIC permit. Based on seismic data, the Applicant indicated that faults do not extend into the Lower Battle Spring Formation or the underlying Fort Union Formation (WDEQ-WQD 2017). Section 4.2.2 of the NRC Class V UIC Well Amendment EA evaluated the impacts to geology and concluded that the low injection pressure of the treated wastewater would result in only a small pressure change that would not cause significant geologic impacts.

Section 4.4 of the NRC Lost Creek SEIS concluded that impacts on geology would be SMALL. The removal of uranium from the target sandstones under the project area would result in a permanent change to the chemical composition of uranium-bearing rock formations. However, since the uranium ISR process does not remove the rock matrix or structure, there would be no impacts on the matrix or ground subsidence. Impacts on faults near the project area are described in Section 4.4.1.2 of the NRC Lost Creek SEIS, which indicated that it would be highly unlikely that ISR operation would reactivate any local faults. Activities under the Proposed Action would similarly only induce small pressure changes; therefore, it is unlikely that faults would be reactivated. The duration of geologic impacts would be long term, since they would last the life of the project. Since the Proposed Action is an extension of existing activities, the impacts to subsurface geology would continue to be SMALL.

### **4.3.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The impacts on geology would be similar to the Proposed Action, but the duration would be less. The impacts to geology under Alternative 1 would be SMALL.

## **4.4 Soils**

This section describes potential impacts to soils as a result of activities associated with the Proposed Action and alternatives.

### **4.4.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation would continue within the existing Lost Creek ISR Project area, as approved by BLM, NRC, and WDEQ. Exploratory drilling may continue within the project area under an NOI at a rate of approximately 5 acres of surface disturbance per year. Reclamation of exploration holes generally would occur within the same calendar year as the disturbance. Mining-related activities on BLM-managed lands would not result in over 5 acres of unreclaimed surface disturbance at any time during the life of the NOI filed for each action (43 CFR § 3809.21). The nature of direct and indirect soils effects would remain at or near current levels. The site-specific soils impacts for the No Action Alternative are consistent with the impacts stated in Section 4.5 of the BLM Lost Creek EIS and Section 4.4 of the NRC Lost Creek SEIS.

### **4.4.2 Proposed Action**

The same type of direct and indirect effects to soils would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.5, pp. 4.5-1 through 4.5-12 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.4, pp. 4-19 through 4-24 (NRC 2011)

The following general assumptions were used to evaluate impacts:

- The duration of impacts would vary by construction activity. Mud pit and pipeline disturbance would be very short term (reseeded within weeks). Mine unit and Class I UIC well pad disturbance would be short term, since interim reclamation would occur upon completion of construction. Long-term impacts would be associated with secondary access roads, header houses, and Class I UIC well houses.
- The severity of soil impacts would depend on the number of acres disturbed, the type of disturbance, and the duration of disturbance.
- Topsoil removal would only be necessary at Class I UIC well sites, secondary access roads, pipelines, and mud pits, and the topsoil would be replaced after drilling.

Applicant-committed design features considered in the soils impact analysis include the following:

- Topsoil stripping depths would be determined based on soil surveys performed for each mine unit. Topsoil would be stripped from Class I UIC well sites, secondary access roads, pipelines, and mud pits (Operations Plan Section OP 2.5, LCI 2011b).
- Topsoil would be stockpiled in areas associated with long-term disturbance (e.g., header houses, secondary access roads, and Class I UIC well sites) (Operations Plan Section OP 2.5.2, LCI 2011b).
- Vehicular traffic would be restricted to specific routes during construction and operations (Operations Plan Section OP 2.5, LCI 2011b).
- Topsoil erosion control measures would be implemented in accordance with an approved SWPPP. Topsoil protection measures would include vegetative buffer strips, silt fence, check dams, or small berms/diversions (Operations Plan Sections OP 2.2 and 2.11.1.1.1, LCI 2011b).
- The Applicant would reclaim the surface and reestablish vegetation in areas disturbed by drilling, pipeline installation, and facility construction upon completion of construction. Disturbed areas would be reseeded with a permanent seed mix during the next appropriate season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b).
- In areas where soil would not be removed but would be compacted due to site operations (e.g., two-track access roads used to access monitor wells), soils would be scarified, ripped, or disced, as necessary, to aid in revegetation during reclamation (Reclamation Plan Section RP 4.5.3, LCI 2010a).
- Standard operating procedures (SOPs) addressing spill prevention and mitigation that are included in the current Operations Plan would be implemented for the Proposed Action (Operations Plan Section OP 2.9, LCI 2011b).
- Spill prevention and mitigation SOPs that have been modified to document changes to preventative measures and maintenance frequencies to address recent spills would be implemented for the Proposed Action (NRC 2017c).

Soil loss and sedimentation would result from water and wind erosion from soils directly and indirectly impacted by project activities. Section 4.5.4.1 of the BLM Lost Creek EIS concluded that the potential for water erosion would be minimal because of very low (flat) surface slopes, the limited amount of precipitation, and the lack of perennial and intermittent streams. There is similarly low potential for water erosion within the project area under the Proposed Action. Soil loss from water erosion would be reduced by performing timely reclamation and installing erosion controls in accordance with the approved SWPPP.

Most of the soils in the project area have a significant percentage of silt, which would increase the potential for wind erosion. Section 4.5.4.1 of the BLM Lost Creek EIS concluded that the potential for wind erosion of bare soils would be reduced by traffic restrictions, minimizing the disturbance area, and performing interim and final reclamation. Overall, impacts to soils would occur on up to 1,415 acres, or 14 percent of the 10,005-acre project area. When added to currently authorized disturbance (345 acres), the total area would increase to up to 1,760 acres, or 18 percent of the project area. Although the disturbance area would increase, phased project development and interim reclamation would ensure that the amount of bare soil present at any one time would be a

small fraction of this amount (typically limited to one or more mine units being developed). Therefore, wind erosion impacts are expected to be SMALL under the Proposed Action.

The Proposed Action would also directly impact soils as a result of soil compaction from vehicular travel over areas not scheduled for topsoil salvage and from equipment movement during topsoil salvage and laydown. Soil compaction would decrease infiltration, promoting increased runoff. All areas of soils compaction, either from soil salvage and laydown or from vehicle travel, would be scarified, ripped, or disced, as necessary, and reseeded with a permanent seed mix during the next appropriate season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b). Due the limited amount of direct topsoil compaction areas (approximately 18 percent of the 10,005-acre project area), the lack of clay loam soils susceptible to compaction, topsoil treatment prior to seeding, and timely reclamation, the impacts from soil compaction would be SMALL.

A summary of the soil suitability and salvage depths within the Proposed Action disturbance area is included in table 4.4-1. Based on the estimated stripping depth of salvaged topsoil and the estimated disturbance acres, topsoil would be redistributed at an average depth of 17.6 inches. Excavated soils would be replaced at the location from which they were excavated. Unused excavated soil would be used in another area where the original topsoil depth was thin or non-existent (e.g., areas disturbed by historical exploration activities), if such replacement is approved by BLM and WDEQ-LQD. The topsoil would be replaced along the contour, where necessary, to prevent soil erosion. To avoid the formation of clods, topsoil would not be replaced when the ground is wet or frozen. The replaced topsoil would be disced to create a proper seed bed.

As presented in Table 4.4.1, the soils within the project area are generally suitable as a plant growth medium. Where marginal soils were encountered, it was generally due to chemical limiting factors, such as low saturation percentage. When combined with suitable soils, these marginal quality soils would likely become suitable as a plant growth medium. Only one baseline soil sample was determined to be unsuitable for topsoil, based on the amount of coarse fragments. Map 3.4.1 shows the proposed disturbance extents from the Proposed Action, as related to soils. Based on this evaluation, there is limited potential to encounter unsuitable topsoil for use in reclamation, and the impacts of the Proposed Action from unsuitable topsoil material would be SMALL.

Section 4.4.1.2 of the NRC Lost Creek SEIS and Section 4.5.4.2 of the BLM Lost Creek EIS discuss potential impacts to soils from leaks, spills, or pipeline breaks. Temporary contamination of soils could occur due to leaks or spills from wellheads, header houses, or pipelines. However, spill detection and response techniques, along with radiological surveys during or prior to decommissioning of all potentially impacted soils and sediments, would limit the magnitude of impacts. The BLM Lost Creek EIS and NRC Lost Creek SEIS concluded that the impacts from spills would be temporary, and the overall long-term impact on soils would be SMALL due to the Applicant's implementation of a spill recovery and response plan and routine monitoring programs. Potential soils impacts from leaks, spills, or pipeline breaks under the Proposed Action would be similarly SMALL, since the same SOPs to address spill prevention and mitigation would apply.

**Table 4.4-1. Soil Survey Topsoil Suitability Analysis and Stripping Depths within the Proposed Action Disturbance Area**

Baseline Survey Soil Series	Area (acres) <sup>1</sup>	% of Area	Soil Suitability	Avg. Salvage Depth (in)
Ay - Almy sandy loam	401.8	28.5%	Suitable/marginally suitable	21.5
Br - Bluerim sandy loam	297.1	21.1%	Suitable/marginally suitable	16.5
Cl - Clowers sandy loam	45.0	3.2%	Suitable/marginally suitable	26.4
Cm - Carmody sandy loam	17.8	1.3%	Suitable/marginally suitable	9.0
By - Byrnie sandy loam	30.7	2.2%	Suitable	7.6
Tg - Teagulf sandy loam	145.5	10.3%	Suitable	18.7
Go - Goslin loamy sand	2.0	0.1%	Marginally suitable/unsuitable	0.0
D - Disturbed land	--	--	--	--
LMM - loamy, mixed, mesic	136.9	9.7%	Suitable/marginally suitable	10.0
FLMM - fine loamy, mixed, mesic	251.4	17.9%	Suitable/marginally suitable	18.0
FLOSMMM - fine loamy over sandy, mixed, mesic	80.1	5.7%	Suitable/marginally suitable	12.5
<b>Total<sup>2</sup></b>	1,415.0	100.0%	--	17.6 <sup>3</sup>

<sup>1</sup> Possible disturbance area, including fenced mine units, perimeter monitor wells, Class I UIC wells, secondary access roads, trunk lines, and pipelines to the Class I UIC wells.

<sup>2</sup> Calculated as the sum of the weighted average salvage depths.

<sup>3</sup> Totals may not sum due to rounding.

The duration of impacts would vary by ISR activity. Monitor well and pipeline disturbance would be regraded and reseeded within weeks. Mine unit disturbance also would be short term, except for secondary access roads and header houses. As mine units are constructed, interim reclamation would be completed using an approved interim seed mixture. An approved permanent seed mixture would be used for final reclamation. The interim and permanent seed mixtures and seeding rates are discussed in Section 4.7.1. Long-term impacts would be associated with secondary access roads, header houses, and Class I UIC well houses.

In summary, under the Proposed Action, potential direct and indirect impacts to soils resources would be SMALL. The site-specific soils impacts for the Proposed Action are consistent with the impacts stated in the BLM Lost Creek EIS and the NRC Lost Creek SEIS for the existing Lost Creek ISR Project.

#### **4.4.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The assumptions used to analyze impacts to soil resources as a result of Alternative 1 would be the same as the Proposed Action except for the following:

- The maximum added disturbance would be up to 1,244 acres of soils within the fenced mine units plus 5 acres for construction of the perimeter monitor wells and 27 acres associated with Class I UIC wells, secondary access roads, trunk lines, and pipelines (1,276 acres total).

The nature of direct and indirect effects would be the same as would occur under the Proposed Action; however, the magnitude and duration of the impacts would be less. There would be approximately 139 fewer acres of soil disturbance, and the duration of activities would be reduced

by several years. Overall, the potential direct and indirect impacts to soils resources related to Alternative 1 would be consistent with those occurring under the Proposed Action.

#### **4.5 Surface Water, Wetlands, and Aquatic Ecology**

This section describes potential impacts to surface water, wetlands, and aquatic ecology as a result of activities associated with the Proposed Action and alternatives.

##### **4.5.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation currently approved by BLM, NRC, and WDEQ would continue within the existing Lost Creek ISR Project area. Impacts could result from road construction and crossings, erosion runoff, spills or leaks of fuel and lubricants, discharges of storm water and process-related fluids, and discharge of wellfield fluids as a result of pipeline or wellhead leaks. Impacts to surface water and aquatic resources would be consistent with the impacts stated in Section 4.6 of the BLM Lost Creek EIS and Section 4.5.1 of the NRC Lost Creek SEIS.

##### **4.5.2 Proposed Action**

Potential impacts to surface water from the Proposed Action were identified based on the amount and duration of potential disturbance and proximity to surface water features. The following assumptions were used in the analysis of impacts:

- No wetlands occur within the project area (see Section 3.5.6 of this EIS).
- Surface water does not sustain aquatic life within the project area (see Section 3.5.7 of this EIS).
- The duration of impacts would vary by construction activity. Mud pit, pipeline, mine unit, and Class I UIC well pad disturbance would be short term, since interim reclamation would occur upon completion of construction. Long-term impacts would be associated with secondary access roads, header houses, and Class I UIC well houses.
- The severity of impacts to surface water and aquatic resources would depend on the number of acres disturbed, the type and duration of the disturbance, and proximity to surface water features.

Applicant-committed design features considered in the analysis of impacts to surface water and aquatic resources include the following:

- The Applicant would adhere to BMPs specified in its SWPPP.
- The Applicant would limit soil compaction and removal and protect excavated topsoil and subsurface material from erosion in accordance with SOPs and the Spill Prevention Control and Countermeasures (SPCC) Plan (BLM Lost Creek EIS ROD, BLM 2012b).
- The Applicant would ensure that runoff from disturbed areas meets WYPDES permit guidelines for storm water management and sediment reduction (BLM Lost Creek EIS ROD, BLM 2012b).

- The Applicant would reclaim the surface and reestablish vegetation in areas disturbed by drilling, pipeline installation, and facility construction upon completion of construction. Disturbed areas would be reseeded with a permanent seed mix during the next appropriate season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b).
- SOPs addressing spill prevention and mitigation that are included in the current Operations Plan would be implemented for the Proposed Action (Operations Plan Section OP 2.9, LCI 2011b).
- Spill prevention and mitigation SOPs that have been modified to document changes to preventative measures and maintenance frequencies to address recent spills would be implemented for the Proposed Action (NRC 2017c).
- Surface disturbing activities within 20 feet of the inner gorge (top of bank) of ephemeral stream channels would be avoided, unless exception is granted by the BLM based on an environmental analysis and site-specific engineering and mitigation (BLM Lost Creek EIS ROD, Table 4, BLM 2012b).
- Stream crossings would be constructed using either culvert installation or a ford oriented perpendicular to the channel (Operations Plan Section OP 2.6, LCI 2011b).
- Surface facilities would be removed, and drainages would be reestablished during reclamation, unless an access road and associated culvert are requested to be left in place (Reclamation Plan Section RP 4.5.2, LCI 2011b).
- The Applicant would correspond with BLM to ensure that stock reservoirs are not impacted in a manner that restricts the intended use (Operations Plan Section OP 2.11.2.2, LCI 2011b).

The same type and magnitude of direct and indirect effects to surface water and aquatic resources would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.6.4, pp. 4.6-5 through 4.6-7 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.5.1, pp. 4-24 through 4-29 (NRC 2011)

#### ***4.5.2.1 Surface Water Flow***

As described in Section 3.5.2 of this EIS, the ephemeral drainages throughout the project area flow only in response to precipitation events or snowmelt. The greatest impacts to surface water would occur during the construction phase when most of the surface disturbance would occur. Primary disturbances to the ground surface occurring during construction include wellfield drilling, road and facility construction, and pipeline installation. Under the Proposed Action, an estimated 19 acres of land would be disturbed during construction of secondary access roads, trunk lines, and pipelines to Class I UIC wells. The proposed road and pipeline network would cross ephemeral channels, which would require the installation of crossings that could impact surface water flow.

Map 3.5.2 shows the proposed disturbance extents from the Proposed Action, as related to surface water features. Because of the limited flows and the Applicant’s commitment to avoid disturbance

within 20 feet of the inner gorge (top of bank) of ephemeral stream channels, the impacts to surface water flows under the Proposed Action would be SMALL.

#### ***4.5.2.2 Surface Water Quality***

As described in Section 3.5.4 of this EIS, the surface water quality within the project area generally contains little or no dissolved uranium but higher concentrations of suspended uranium, radium-226, and thorium-230. A comparison of surface water quality to WDEQ-WQD criteria shows that only radium-226 exceeded the WDEQ-WQD surface water quality criteria at two upstream locations.

Potential impacts to the surface water quality in the ephemeral drainages within the project area relate to increased sediment transport and spills or leaks. Increased sediment would result from construction activities that cause ground disturbance (secondary access roads, mine units, Class I UIC wells, and pipelines). As described in Section 4.6.4.2 of the BLM Lost Creek EIS, the primary areas of concern for sedimentation accumulation are low spots along roads and drainages where runoff accumulates. Spills or leaks of fuel or lubricants could also be transported to surface drainages and impact surface water quality. The failure of pipeline fittings or valves or failure of well mechanical integrity could result in leaks or spills of liquid waste, which could impact surface water quality. To mitigate these potential impacts, the Applicant would be required to adhere to provisions of its general storm water construction WYPDES permit and SWPPP to protect surface water from contamination due to spills, leaks, and surface runoff. Activities associated with drilling, pipeline installation, and mine unit construction could reduce vegetative cover, which could increase soil compaction. Soil compaction would decrease infiltration, promoting increased surface runoff and surface erosion.

The site-specific surface water quality impacts for the Proposed Action would be consistent with the impacts stated in Section 4.6.4 of the BLM Lost Creek EIS and Section 4.5.1.1 of the NRC Lost Creek SEIS for the existing Lost Creek ISR Project. Therefore, under the Proposed Action, the potential direct and indirect impacts to surface water quality would be SMALL with appropriate erosion prevention/mitigation methods, maintenance, and effectiveness monitoring intervals employed. Impacts related to surface water quality would be reduced by performing timely reclamation and installing erosion controls, in accordance with the approved SWPPP.

#### ***4.5.2.3 Surface Water Use***

Impacts to surface water use could result from activities that reduce the quantity or quality of water available for existing surface water uses. As stated in Section 3.5.5 of this EIS, there are five permitted surface water rights and 10 unpermitted reservoirs within 3 miles of the project area. Ephemeral drainages within the project area could be affected by erosion and spills from ISR activities, which could impact surface water use. As stated above, the Applicant would be required to adhere to the provisions of its general WYPDES permit and SWPPP, including use of erosion controls and spill prevention/mitigation measures, which would minimize potential impacts to surface waters use due to contamination due to spills and leaks. In addition, no surface would be impounded or used under the Propose Action. Section 4.5.1 of the NRC Lost Creek SEIS concluded that the overall impacts to surface water would be SMALL. Under the Proposed Action, impacts to surface water use would be similarly SMALL, since the Applicant would be required to adhere to the same requirements.

### **4.5.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The impacts from Alternative 1 would be similar to the Proposed Action, but the amount of disturbance and the duration of the impacts would be less.

## **4.6 Groundwater**

This section describes the potential impacts on groundwater quantity and quality as a result of activities associated with the Proposed Action and alternatives.

### **4.6.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Groundwater impacts would be consistent with the impacts stated in Section 4.7 of the BLM Lost Creek EIS and Section 4.5.2 of the NRC Lost Creek SEIS. These impacts would include consumptive water use, potential horizontal and vertical excursions from the production zone, change in water quality in the production zone aquifer, and impacts to the deep aquifers from injection of wastewater.

Subsequent to the above EISs, the NRC Class V UIC Well Amendment EA indicated that the Class V UIC wells may have the potential to impact existing ISR operations, groundwater quality, consumptive use, groundwater use, and other energy resource operations (NRC 2016a). The NRC staff concluded in the EA that the existing ISR operations would not be affected, since the Class V UIC wells would be completed in the DE and FG horizons (above the HJ Horizon targeted for ISR) and routine monitoring at designated monitor wells would help ensure corrective actions are taken if an excursion is detected. The NRC staff also concluded that the groundwater quality would not be affected because the wastewater would be treated prior to injection to meet NRC release standards. Finally, the NRC staff determined that impacts to consumptive use would not be significant because the fluids would be injected into the aquifer at acceptable pressure levels.

### **4.6.2 Proposed Action**

Applicant-committed design features considered in the groundwater impact analysis include the following:

- The Applicant would monitor water quality and water levels in BLM stock wells near the project area and work with BLM to replace the water source if any wells are rendered unusable due to the Applicant's mining activities (Operations Plan Section OP 2.11.2.2, LCI 2011b).
- The Applicant would install flow meters and control valves in the individual well lines to monitor and control the individual well flow rates and pressures (Operations Plan Section OP 3.5, LCI 2011b).
- The Applicant would control mine unit flow and balance through flow set points and alarms, including header house injection and production flow, pressure, high/low set point alarms, and individual well alarms (Operations Plan Section OP 3.6, LCI 2011b).

- The Applicant would install perimeter monitor wells surrounding the production zone in the same horizon as the production zone to detect potential horizontal excursions. The Applicant also would install overlying and underlying monitor wells within the horizons overlying and underlying the production zone to detect potential vertical excursions (Operations Plan Section OP 3.2.2, LCI 2011b).
- The Applicant would perform aquifer pumping tests within each mine unit to determine whether the monitor well ring spacing and completion depths are adequate to detect lateral movement of lixiviant from the pattern area and whether there is adequate hydrogeologic confinement between the production zone and overlying and underlying horizons (Operations Plan Section OP 3.6.3.3, LCI 2011b).
- The Applicant would maintain an inward hydraulic gradient in each individual production area, starting when lixiviant is first injected and continuing until initiation of the stabilization monitoring period after groundwater restoration (License SUA-1598 license condition 10.7, NRC 2016b).
- Prior to the injection of lixiviant into a production unit, the Applicant would attempt to locate and plug and abandon all historic drillholes located within the perimeter monitor well ring such that the drillhole will not provide a conduit for the migration of production fluids (License SUA-1598 license condition 10.10, NRC 2016b).
- The Applicant would submit mine unit operational plans, including well layouts, in mine unit packages for NRC review and written verification before conducting operations in mine units (License SUA-1598 license condition 10.12, NRC 2016b).
- The Applicant would provide additional overlying and underlying monitor wells for mine units located within 100 feet of the Lost Creek Fault (License SUA-1598 license condition 10.11, NRC 2016b).
- Prior to injection of lixiviant in each production area, the Applicant would establish background groundwater quality for the production zone, underlying, and overlying aquifers. The production zone background water quality would be used to define the groundwater restoration standards (License SUA-1598 license condition 11.3, NRC 2016b).
- The Applicant would conduct excursion monitoring twice monthly during operations and notify NRC and conduct corrective actions in the event of an excursion (License SUA-1598 license condition 11.5, NRC 2016b).
- The Applicant would perform MIT on each injection and production well prior to use and retest each well at least once every 5 years (License SUA-1598 license condition 10.5, NRC 2016b).
- The Applicant would restore groundwater to the numerical groundwater protection standards as required by 10 CFR Part 40, Appendix A, Criterion 5B(5) (License SUA-1598 license condition 10.6, NRC 2016b).
- The Applicant would conduct stability monitoring for at least 12 months and until the Applicant demonstrates that the production zone groundwater is stable (i.e., there are no statistically increasing trends) (Reclamation Plan Section RP 2.4, LCI 2010a).

- The Applicant would continuously monitor and record injection pressure and annulus pressure in Class I UIC wells and implement high level alarms (Operations Plan Attachment OP-2, LCI 2011b).
- The Applicant would monitor liquid waste injected into Class V UIC wells to ensure that it meets effluent limits established according to receiving aquifer background water quality, EPA drinking water standards, and NRC requirements for waste disposal in 10 CFR Part 20, Subpart K (Class V UIC Permit, WDEQ-WQD 2016b; License SUA-1598 license condition 10.20, NRC 2016b).

The same type of groundwater impacts would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.7, pp. 4.7-1 through 4.7-37 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.5.2, pp. 4-29 through 4-40 (NRC 2011)
- NRC Class V UIC Well Amendment EA – Section 4.2.3, pp. 13 through 14 (NRC 2016a)

#### ***4.6.2.1 Groundwater Quantity***

The potential environmental impacts to groundwater in the production and surrounding aquifers are related to consumptive use and groundwater quality. Consumptive use of water is primarily due to production bleed during operations and bleed during the restoration of each mine unit. These activities require that a small percentage of the groundwater withdrawal be removed from the system in order to maintain an inward hydraulic gradient within each production area. Groundwater restoration also results in consumptive use during the groundwater sweep and groundwater treatment stages. Consumptive water use could potentially impact other water users by lowering water levels in nearby wells, which may reduce well yields. As described in Section 3.6.5 of this EIS, there are nine existing water wells (all used for livestock or livestock and miscellaneous purposes) within 3 miles of the project area. Only two of the wells (P55112W and P13834P) are located within the project area.

To assess potential impacts on groundwater quantity, the Applicant commissioned a study to model drawdowns from ISR operations and groundwater restoration in the HJ and KM horizons (Petrotek 2018). The model was prepared based on an operation and restoration schedule 1.75 years shorter than the schedule presented in figure 2.2-2. The model assumed simultaneous operations and restoration in the HJ and KM horizons over a 16-year modeled time period. The net modeled groundwater consumptive use varied throughout the modeled time period based on the number of mine units in operation. During early operations with only one mine unit in operation, the modeled net withdrawal rate ranged from 4 to 14 gpm. As more mine units were added, the modeled net withdrawal rate increased up to 116 gpm. Higher net withdrawal rates (up to 330 gpm) were also modeled at the start of restoration in MU1 and again at the start of restoration in MU9 and MU12 to simulate maximum withdrawals during restoration. Modeled annual consumptive withdrawals are summarized in Table 4.6-1.

**Table 4.6-1. Modeled Annual Consumptive Groundwater Withdrawals**

Modeled Year	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12
Consumptive Use (acre-feet)	3	11	19	22	103	173	177	174	174	181	148	181	87	119	177	163

Source: Petrotek 2018

Modeling results show that during operations, drawdowns ranging from 15 to 100 feet can be expected in the HJ and KM horizons within the project area. Well P55112W, which is likely completed within the HJ Horizon, would be impacted the most. Given its location within the project area, it may have to be shut in (closed off) temporarily to avoid interference with nearby ISR operations. Well P13834P is completed in the overlying FG Horizon and would not be affected directly by drawdowns in the HJ Horizon. However, the vertical gradient between the FG Horizon and HJ Horizon (table 3.6-2) would be increased during ISR operations in the nearby HJ Horizon. This may result in drawdown in the overlying FG Horizon if leakance were to occur from the FG Horizon into the HJ Horizon. Well P55113W and the East Eagle Nest Draw well are located within 1 mile of the project area. Both of these wells are completed in horizons above the HJ Horizon. The modeling results indicate that the maximum extent of simulated drawdown in the HJ Horizon near these wells is 45 feet. Since these wells are not completed in the HJ Horizon, drawdowns in the wells would likely be minimal unless significant leakance through the shales occurs in the area of the wells. The remaining wells are located over 1 mile outside the project area where drawdowns are predicted to be less than 15 and 10 feet in the HJ and KM horizons, respectively. These wells would likely only see minimal drawdowns due to operations and groundwater restoration. The results of the modeling study show that once withdrawals cease, recovery would occur quickly. Within 5 years after the end of groundwater restoration, water levels are expected to recover to within 10 feet of pre-operational levels within the project area for the HJ and KM horizons.

For the P13834P well, the Applicant has committed to determining whether the well has been properly plugged through the HJ Horizon prior to operations in MU5, MU9, and MU10 (LCI 2017m). If the determination cannot be made, the Applicant would attempt to drill to the original total depth and back plug the well using WDEQ-LQD-approved methods. The Applicant also commits to monitoring the potential water level response in well P13834P during the aquifer pumping tests of MU5, MU9, and MU10 to determine whether there is communication between the mining aquifers and the FG Horizon that could result in a vertical excursion. The results would be submitted to WDEQ-LQD and NRC for review. The Applicant has also committed to monitor water quality and water levels in BLM stock wells within and near the project area and work with BLM to replace the water source if any wells are rendered unusable due to ISR activities (LCI 2011b). Any observed impact to an existing water right, including well degradation or reduced flow, may be subject to WSEO priority regulation or other investigations.

Section 4.5.2.1.2.2 of the NRC Lost Creek SEIS determined that the short-term impact from consumptive groundwater use during ISR operations and groundwater restoration would be MODERATE, since several nearby stock wells affected by drawdown from ISR operations. It further concluded that the Applicant’s methods to mitigate impacts to stock wells within and near the project area would reduce the impact to SMALL. Since water levels are predicted to recover quickly once ISR activities cease, the NRC Lost Creek SEIS determined that long-term impacts to the stock wells would be SMALL. Based on the commitments and analysis presented herein, the short-term and long-term consumptive groundwater use impacts would be consistent with the impacts stated in Section 4.5.2.1.2.2 of the NRC Lost Creek SEIS.

#### **4.6.2.2 Groundwater Quality**

Potential impacts to groundwater quality would be consistent with those discussed in Section 4.5.2.1 of the NRC Lost Creek SEIS. These would include potential impacts to shallow groundwater due to leaks or spills, water quality impacts from ISR and groundwater restoration in the production zone, and potential horizontal or vertical excursions outside of the production zone.

Impacts to groundwater quality during wellfield and facility construction would be limited based on the nature of construction activities. Impacts to the shallow groundwater system during operations and reclamation also would be SMALL under the Proposed Action. Geologic and groundwater conditions within the proposed LCE expansion area are similar to the conditions within the existing Lost Creek ISR Project area analyzed in the NRC Lost Creek SEIS. As described Section 4.5.2.1.2.1 of the NRC Lost Creek SEIS, the depth to the water table from the surface and its separation from the surface by intervening shales would minimize the potential for any fluids released at the surface to reach the uppermost aquifer. In addition, the implementation of leak detection systems, monitoring, reporting, and corrective actions for spills or releases, along with the MIT program for the injection and production wells, would reduce the potential impacts to shallow groundwater systems. These natural conditions and protective measures would help ensure that the impacts to shallow groundwater systems are SMALL.

During ISR operations, the groundwater quality in the production zone would be impacted. The uranium would be oxidized and mobilized by the lixiviant, which would also oxidize and mobilize other constituents. Because the production zone aquifers would be exempted from protection as USDW, as described in Section 2.2 of this EIS, the changes in production zone water quality during ISR operations would not impact an aquifer that is used or protected for drinking water use now or in the future. Moreover, Sections 3.6.6 and 3.15.1 of this EIS describes how existing water quality in the production zone (HJ and KM horizons) exceeds EPA primary MCLs and WDEQ-WQD class of use criteria for drinking water. As described in Section 2.2.4.1 of this EIS, the Applicant would be required to restore the water quality in the production zone following ISR operations.

Potential impacts to groundwater quality may occur outside of the production zone due to horizontal or vertical excursions. The frequency, magnitude, and duration of potential impacts to surrounding aquifers from excursions would be limited by hydrogeologic confinement of the production zone from overlying and underlying aquifers, operational controls, and the required excursion monitoring and corrective actions programs. Prior to initiating ISR operations within each mine unit, the Applicant would be required to conduct aquifer pumping test(s) to determine whether there is adequate hydrogeologic confinement between the production zone and overlying and underlying horizons, as described in Section 2.2.2.1 of this EIS. During operations, the Applicant would be required to maintain an inward hydraulic gradient within each production area. The Applicant also would be required to conduct excursion monitoring twice monthly during operations and conduct corrective actions in the event of an excursion. To detect and prevent further contamination in the event of a Class V UIC well leak, the Applicant would be required to conduct semi-annual sampling of the monitor wells associated with the Class V UIC wells.

Section 4.5.2.1.2.2 of the NRC Lost Creek SEIS evaluated several distinctive hydrogeologic features at the Lost Creek ISR Project including the Lost Creek Fault, the hydrogeologic confinement of the overlying LC Shale and the underlying SB Shale, the occurrence of historic drillholes, and the occurrence of heterogeneous lithologies in the HJ Horizon. Based on the

analysis in the SEIS, the NRC staff concluded that the impact on water quality from excursions either horizontally in the production zone or vertically into the overlying or underlying aquifers would be SMALL under the following requirements: 1) that each proposed wellfield be subjected to further hydrological testing during the wellfield test stage to better understand site-specific hydrogeological conditions and ensure that operations and monitoring efforts are appropriate, 2) that the Applicant attempt to locate and plug all historic drillholes located within the perimeter monitor well ring, and 3) that the wellfield perimeter monitor wells be screened in the same horizon as the production wells.

As noted in Section 3.6.4.4 of this EIS, available data indicate that the level of confinement of the HJ Horizon is similar within the proposed LCE expansion area as evaluated in the existing Lost Creek ISR Project area. Specifically, aquifer pumping tests demonstrate that the confining characteristics of the LC Shale are similar to those evaluated in the NRC Lost Creek SEIS, whereas the confining characteristics of the SB Shale are better within the proposed LCE expansion area. Sections 3.3.2 and 3.6.3 of this EIS describe how several faults have been identified within the proposed LCE expansion area. Additional hydrological testing that is required before commencing ISR operations in each mine unit would evaluate the potential impacts of the faults on the hydrogeologic confinement of each production zone.

Section 3.6.4.4 of this EIS describes how the confining capacity of the K Shale (underlying confining layer for KM Horizon production zones) is limited within the existing Lost Creek ISR Project area compared to that within the proposed LCE expansion area. Aquifer testing conducted at two well clusters within the existing Lost Creek ISR Project area resulted in greater observed drawdowns in the underlying L Horizon compared to aquifer testing conducted at three well clusters in the proposed LCE expansion area, which resulted in minimal drawdown. The confining capacity of the K Shale in the proposed LCE expansion area is similar to the confining capacity of the units surrounding the HJ Horizon evaluated in Section 4.5.2.1.2.2 of the NRC Lost Creek SEIS. For reasons discussed in the SEIS, the potential impacts due to a vertical excursion within the proposed LCE expansion area would be SMALL.

The limited confining capacity of the K Shale within the existing Lost Creek ISR Project area poses an increased risk for vertical excursions into the underlying L Horizon from ISR operations in the KM Horizon beyond that previously evaluated. The programs established for monitoring vertical excursions at ISR facilities are established to provide redundancy, where the natural confinement of the geology and maintenance of an inward hydraulic gradient are the primary controls, and the monitoring is a secondary control for the mitigation of any excursion. The lack of a confining unit could be remedied by the primary control (i.e., inward hydraulic gradient) and other management controls, as proposed by the Applicant. However, due to the increased risk for vertical excursions, the Applicant withdrew MU3 and MU12 (i.e., the KM Horizon mine units within the existing Lost Creek ISR Project area) from the application (LCI 2018a). The Applicant may elect to pursue licensing of those mine units in a future action. At that time, it is anticipated that the mitigation measures that would be developed would result in a risk for an excursion similar to those currently approved. Therefore, this EIS concludes that the potential impacts would be SMALL should the mitigation measures result in the same level of risk.

Given the Applicant's withdrawal of MU3 and MU12 from its application, the groundwater quality impacts for the Proposed Action would be consistent with the impacts described in Sections 4.7.6.2 and 4.7.7.2 of the BLM Lost Creek EIS and Sections 4.5.2.1.2 and 4.5.2.1.3 of the NRC Lost Creek SEIS. The NRC staff concluded in the SEIS that, due to Applicant design features and the

requirement to restore groundwater, impacts to groundwater quality would be SMALL. Under the Proposed Action, impacts to groundwater quality would be similarly SMALL, since the Applicant would be required to adhere to the same requirements.

#### **4.6.2.3 Deep Aquifers**

Impacts to deep aquifers from injection into the Class I UIC wells would be consistent with the impacts described in Section 4.5.2.1.2.3 of the NRC Lost Creek SEIS. NRC staff concluded in the SEIS that impacts would be SMALL based on the Applicant's requirement to obtain a Class I UIC permit from WDEQ-WQD and the fact that the deep aquifers are isolated from the overlying aquifers. Under the Proposed Action, the Applicant would construct up to three Class I UIC wells within the project area in addition to the five currently permitted wells. Since the Applicant would be required to modify the Class I UIC permit to add the additional wells and construction and operation of the wells would be the same as those currently used at the Lost Creek ISR Project, impacts to the deep aquifers would be SMALL.

#### **4.6.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The nature of impacts would be the same as would occur under the Proposed Action. However, the magnitude and duration of potential impacts would be less than the Proposed Action, since impacts to the KM Horizon groundwater quantity and quality would be reduced compared to the Proposed Action. Overall, the impacts to groundwater related to Alternative 1 would be SMALL.

### **4.7 Vegetation**

This section describes potential impacts to vegetation as a result of activities associated with the Proposed Action and alternatives. As described in Section 3.7, vegetation is dominated by Wyoming big sagebrush, with the majority of the project area classified as an Upland Big Sagebrush Shrubland vegetation community. No state or county-listed noxious weeds, selenium indicator species, T&E species, or BLM sensitive plant species have been identified within the project area.

#### **4.7.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation currently approved by BLM, NRC, and WDEQ would continue within the existing Lost Creek ISR Project area. Exploratory drilling would continue within the project area under an NOI at a rate of approximately 5 acres of surface disturbance per year. Reclamation of exploration holes generally would occur within the same calendar year as the disturbance. Mining-related activities on BLM-managed lands would limit unreclaimed surface disturbance to 5 acres at any time during the life of the NOI filed for each action (43 CFR § 3809.21). Impacts to vegetation would include removal of vegetation, modification of vegetative communities, the potential for loss of sensitive plants and habitats, and the potential spread of noxious weeds and invasive species. The magnitude of direct and indirect vegetation impacts would remain at or near current levels. The vegetation impacts for the No Action Alternative are consistent with the impacts stated in Section 4.8.4 of the BLM Lost Creek EIS and Section 4.6.1 of the NRC Lost

Creek SEIS. These would include removal of vegetation, modification of vegetative communities, loss of sensitive plants and habitats, and potential spread of noxious weeds and invasive species.

#### **4.7.2 Proposed Action**

Potential impacts to vegetation from the Proposed Action were identified based on the locations of potential disturbance. The following assumptions were used in the analysis of impacts to vegetation:

- Vegetation would be removed only as necessary, since vegetation removal over the entire disturbance area could be detrimental to shrub recovery given the relative resilience of sagebrush and other vegetation to mechanical disturbance.
- Final revegetation would be deemed complete no earlier than the fifth growing season after seeding.
- Mine units would remain fenced and vehicular access restricted until vegetation has been reestablished.
- Some areas would be reseeded after construction with a temporary seed mixture; however, the potential impacts are evaluated based on the maximum vegetation disturbance.

Applicant-committed design features considered in the vegetation impact analysis include the following:

- The Applicant would reclaim the surface and reestablish vegetation in areas disturbed by drilling, pipeline installation, and facility construction upon completion of construction. Disturbed areas would be reseeded with a permanent seed mix during the next appropriate season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b).
- Vegetation species diversity and composition in reclaimed areas would be compared to those in a delineated comparison area in an undisturbed portion of the site using quantitative methods approved by WDEQ-LQD (Reclamation Plan Section RP 4.5.5, LCI 2010a).
- Vehicular traffic would be restricted to specific routes during construction and operations (Operations Plan Section OP 2.5, LCI 2011b).
- Active work areas would be checked to ensure employees are minimizing impacts to vegetation. Any problems would be brought to the attention of the area supervisor for correction (Operations Plan Section OP 2.7, LCI 2011b).
- Weed prevention measures following BLM guidelines and recommendations would be implemented (Operations Plan Section OP 2.7, LCI 2018d). Weed prevention measures would include:
  - o Weeds would be controlled on project disturbed areas and native areas infested as a direct result of the project. The control methods would be in accordance with the approved weed management plan and guidelines established by the EPA, BLM, state, and local authorities. Prior to the use of pesticides, the Applicant would obtain written approval from the BLM Authorized Officer—Weed Coordinator.

- o To further reduce the spread of invasive and noxious weeds following construction activities, inspections for noxious weeds would be conducted each year along with revegetation monitoring, during the first 5 years following construction. Thereafter, weed surveys would be conducted at least once every 3 years at appropriate times, as directed by the BLM, for the life of the project. Information from these surveys would be included in the annual report on reclamation status.
- o To minimize the potential for the introduction of new weeds, the Applicant would thoroughly power wash construction equipment, including the undercarriage, before transporting it to the project area. If portable wash units are utilized, wastewater would only be disposed of at a previously approved facility/location. Compressed air would not be used as a method for cleaning equipment.
- In areas where soil would not be removed but would be compacted due to site operations (e.g., two-track access roads used to access monitor wells), soils would be scarified, ripped, or disced, as necessary, to aid in revegetation during reclamation (Reclamation Plan Section RP 4.5.3, LCI 2010a).
- Surface disturbing activities within 20 feet of the inner gorge (top of bank) of ephemeral stream channels would be avoided unless exception is granted by the BLM based on an environmental analysis and site-specific engineering and mitigation (BLM Lost Creek EIS ROD, Table 4, BLM 2012b).

The same type of direct and indirect effects to vegetation would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.8, pp. 4.8-1 through 4.8-7 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.6, pp. 4-40 through 4-58 (NRC 2011)

As described Section 4.6.1.1 in the NRC Lost Creek SEIS, direct impacts to vegetation would include removal of vegetation from the project area, modification of existing vegetation communities, and potential spread of invasive species and noxious weed populations.

The Proposed Action would add up to 1,415 acres of disturbance within the project area, including about 1,316 acres of Upland Big Sagebrush Shrubland and 99 acres of Lowland Big Sagebrush Shrubland (see map 3.7-1). During construction, vegetation within each mine unit would be removed or crushed. As mine units are put into operation, interim reclamation would be completed using the seed mixture provided in table 4.7-1. The seed mixture is the approved permanent seed mix but is also used for interim revegetation. In areas where vegetation would be crushed (e.g., driven over during facility installation), the vegetation would not be removed. Reseeding may be needed in such areas to prevent erosion. During final reclamation, the permanent seed mixture would be applied and the area would be restricted until vegetation is successfully reestablished. Deviations from the seed mixture would be approved by BLM and WDEQ-LQD.

The Proposed Action would result in modification of existing vegetation communities, since native shrubland would be converted to a grass-dominated vegetation cover. Since sagebrush shrubland is slow to reestablish, post-reclamation vegetation communities may be different from pre-construction communities for several years. This could alter the composition and abundance of plant and wildlife species in the project area.

**Table 4.7-1. Permanent Seed Mix**

Common Name <sup>1</sup>	Scientific Name	Application (pounds per acre)
Thickspike wheatgrass	<i>Agropyron dasystachyum</i>	2.0
Slender wheatgrass	<i>Agropyron trachycaulum</i>	2.5
Western wheatgrass	<i>Agropyron smithii</i>	2.0
Indian ricegrass	<i>Achnatherum hymenoides</i>	2.0
Needleandthread	<i>Hesperostipa comata</i>	3.0
Bottlebrush squirreltail	<i>Elymus elymoides</i>	1.5
Sandberg's bluegrass	<i>Poa secunda</i>	1.0
Winterfat	<i>Ceratoides lanata</i>	1.5
Big sagebrush <sup>2</sup>	<i>Artemisia tridentata</i>	1.0
Scarlet globemallow	<i>Sphaeralcea coccinea</i>	0.5
<b>TOTAL</b>		<b>16.5</b>

<sup>1</sup> Alternative selections if one or two of primary selections (other than big sagebrush) are not available: needle-and-thread (*Stipa comata*) and bottlebrush squirreltail (*Elymus elymoides*).

<sup>2</sup> Sage seed would not be mixed with the other seeds but would be broadcast separately after the other seed has been drilled.

The Proposed Action could cause the spread of invasive species and noxious weed populations within the project area. During construction, increased soil disturbance and higher traffic volumes could stimulate the introduction and spread of undesirable and invasive, non-native species. Non-native species often out-compete desirable species, rendering an area less productive as a source of forage for livestock and wildlife. Additionally, sites dominated by invasive, non-native species often have a different visual character that may negatively contrast with the surrounding undisturbed vegetation. As mentioned above, the Applicant would implement weed prevention measures that follow BLM guidelines.

During operation, direct impacts to vegetation could also result from spills or leaks. Since a spill or leak would also impact soils, the impacts to vegetation would be the same as those discussed in Section 4.4 of this EIS.

The duration of impacts would vary by construction activity. Mud pit and pipeline disturbance would be very short term (reseeded within weeks). Mine unit and Class I UIC well pad disturbance would be short term, since interim reclamation would occur upon completion of construction. Long-term impacts would be associated with secondary access roads, header houses, and Class I UIC well houses. Modification of vegetation communities would be a long-term impact, since the success of vegetation reestablishment cannot be deemed complete any earlier than the fifth growing season after seeding (LCI 2017j).

As stated in Section 4.6.1.1 of the NRC Lost Creek SEIS, during the construction phase, impacts to vegetation would be MODERATE due to habitat destruction and the slow reestablishment of the sagebrush shrubland community. For all other phases of the project, the impacts to vegetation would be SMALL. Noxious weeds would be controlled with appropriate spraying techniques, and therefore impacts would be SMALL. Vegetation impacts under the Proposed Action would be consistent with those described in the NRC Lost Creek SEIS. Overall, impacts to vegetation would occur on up to 1,415 acres, or 14 percent of the project area. When added to currently authorized disturbance, the total area would increase to up to 1,760 acres, or 18 percent of the project area. Due to the Applicant's commitments to reclaim and reseed disturbed areas and demonstrate the adequacy of revegetation for at least 5 years after seeding, long-term impacts following final reclamation would be SMALL.

### **4.7.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The assumptions used to analyze impacts to vegetation from Alternative 1 would be the same as the Proposed Action except for the following:

- The maximum added disturbance would be up to 1,244 acres of vegetation within the fenced mine units plus 5 acres for construction of the perimeter monitor wells and 27 acres associated with Class I UIC wells, secondary access roads, trunk lines, and pipelines (1,276 acres total).

Direct and indirect effects to vegetation under Alternative 1 would be similar to the Proposed Action, although the duration and magnitude would be less. The exclusion of the mine units targeting the KM Horizon would reduce the vegetation disturbance by about 139 acres. Initially, the impacts to vegetation under Alternative 1 would be SMALL to MODERATE, until final reclamation, with SMALL long-term impacts for the reasons described above.

## **4.8 Wildlife**

This section describes potential impacts to wildlife resources as a result of activities associated with the Proposed Action and alternatives.

### **4.8.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation currently approved by BLM, NRC, and WDEQ would continue within the existing Lost Creek ISR Project area. Exploratory drilling would continue within the project area under an NOI at a rate of approximately 5 acres of surface disturbance per year. Reclamation of exploration holes generally would occur within the same calendar year as the disturbance. Mining-related activities on BLM-managed lands would limit unreclaimed surface disturbance to 5 acres at any time during the life of the NOI filed for each action (43 CFR § 3809.21). Impacts would continue to result from construction and reclamation of mine units within the existing Lost Creek ISR Project area and from vehicular traffic for material transport, workers commuting, and maintenance and inspections. Under the No Action Alternative, impacts to wildlife would be consistent with the impacts stated in Section 4.9 of the BLM Lost Creek EIS and Section 4.6 of the NRC Lost Creek SEIS.

### **4.8.2 Proposed Action**

The following general assumptions were used to evaluate impacts to wildlife resources:

- The severity of impacts to wildlife resources would depend on the number of acres disturbed, the type of disturbance, and the duration of disturbance.
- The impacts assessment is based on monitoring of wildlife resources in and near the project area that is completed on an annual basis, as required by WDEQ-LQD Permit to Mine PT788 (LCI 2010c). The purpose of the annual monitoring is to document wildlife resources, population trends, and habitat conditions to help minimize adverse impacts to wildlife.

- There are no aquatic species present within the project area.
- The amount of disturbance to Greater sage-grouse (1,838 acres) used to calculate the DDCT was based on disturbance within the existing Lost Creek ISR Project area and an early estimate of the disturbance within the project area. While this acreage does not match the disturbance acreage included in table 2.1-1 (1,760 acres), the DDCT analysis is still valid since the acreage is greater than the amount included in table 2.2-1.

Applicant-committed design features considered in the wildlife impact analysis include the following:

- The Applicant would construct new overhead power lines to regional raptor specifications (Operations Plan Section OP 1.1, LCI 2011b).
- The Applicant would use direct burial cable to provide electricity to the new production wells from the header houses (Operations Plan Section OP 1.1, LCI 2011b).
- The Applicant would enforce speed limits on main and secondary access roads to minimize vehicle collisions with wildlife (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would implement a Greater sage-grouse habitat enhancement plan that has been formulated with the assistance of BLM and WGFD rangeland specialists, if ISR activities negatively influence sage-grouse populations (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would construct all fencing to be wildlife friendly fencing, with appropriate collision deterrents and designed for the type of livestock and potentially affected wildlife species, except for the fencing around the storage ponds, which would be exclusion fencing (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would implement an adaptive management plan to address potential threats to Greater sage-grouse populations within the area of impact of the project in the event that population declines are noted on Affected Leaks (BLM Lost Creek EIS ROD, Table 4, BLM 2012b).
- The Applicant would work with BLM and WGFD to complete wildlife and livestock enhancements in the project area and nearby areas; these enhancements could include placement of new raptor nest platforms, creation of new water sources, habitat modifications/improvements to improve specific habitat conditions for Greater sage-grouse or other high-interest species, or rangeland improvements for livestock (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would adhere to the Wildlife Protection Plan and Wildlife Monitoring Plan (LCI 2010b), including:
  - o implementation of surface activity timing restrictions included in Table OP-A6-2 (Section OP 2.5.2 Operations Plan, LCI 2011b);
  - o locating access roads to follow existing two-track roads to the extent possible to help minimize disturbance of habitat;
  - o siting the necessary support facilities, in part, based on distance from existing occupied Greater sage-grouse leks;

- o fencing or screening mine units, mud pits used during well installation, and the storage ponds that require a visual deterrent, as outlined in Section OP 2.5.2 of the Operations Plan;
- o train all new employees on speed limits within the project area, with refresher training at least once per year;
- o implementation of procedures to minimize the likelihood of starting a wildfire (including but not limited to procedures for hot work permits, site inspections, proper storage of waste, etc.); and
- o monitoring of wildlife in and near the project area on an annual basis through the life of the mine using monitoring methods and the monitoring schedule included in Section OP 2.0 of the Operations Plan.

The wildlife resources and ecology within the existing Lost Creek ISR Project area are described in detail in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.9, pp. 4.9-22 through 4.9-48 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.6.1, pp. 4-40 through 4-59 (NRC 2011)

As part of the approved Permit to Mine PT788, the Applicant has developed a Wildlife Protection Plan and Wildlife Monitoring Plan for the Lost Creek ISR Project, which is consistent with USFWS, BLM, WGFD, and WDEQ-LQD recommendations and requirements (LCI 2011b).

#### ***4.8.2.1 General Wildlife***

Section 4.6.1 of the NRC Lost Creek SEIS concluded that impacts to most wildlife species would be SMALL. This conclusion was based on the relatively limited amount of projected disturbance (345 acres) compared to the overall available habitat (4,254 acres) and the Applicant's commitment to implement mitigation measures included in the Wildlife Protection Plan and Wildlife Monitoring Plan, which would limit impacts to most other species. Mitigation measures currently implemented include the use of seasonal timing restrictions on certain ISR activities, the use of wildlife friendly fencing to facilitate wildlife movement, burying power lines to reduce the opportunity for predation, and operator enforcement of speed limits to limit dust and collisions with wildlife.

The Proposed Action would increase the total disturbance by approximately 1,415 acres, which when added to the currently authorized disturbance, would be approximately 18 percent of the 10,005-acre project area. However, the disturbance associated with the Proposed Action would be sequential, and not all of the disturbance would occur at one time. The disturbance could result in additional direct mortality to less mobile species and displacement of mobile species into the surrounding habitats. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce.

Since the disturbance associated with the Proposed Action would be sequential and the Applicant would continue implementation of mitigation measures, the additional impact to wildlife species in general would remain SMALL but would be long term.

#### 4.8.2.2 Greater Sage-grouse

Greater sage-grouse are a species of concern because the project area is within a BLM PHMA, as delineated in BLM’s recently issued ARMPA (BLM 2015a), and within the Greater South Pass Greater sage-grouse core population area, as delineated in the Wyoming Greater Sage-Grouse Core Area Protection strategy (Wyoming Executive Order 2015-4, Office of the Governor 2015).

Potential direct impacts to Greater sage-grouse would include loss of nesting/brood-rearing/wintering habitat, decreased population productivity due to impacts to nesting/brood-rearing habitat, increased predation due to increased roosting sites for raptors on power poles and other structures, mortality due to exposure from toxic chemicals, and displacement of birds into adjacent areas. Increased human-caused noise and activity may reduce lek attendance, which could reduce the Greater sage-grouse population. The Proposed Action would increase the disturbance to Greater sage-grouse habitat by approximately 1,415 acres and reduce the disturbance distance to five historical leks (three lek complexes) within the Greater sage-grouse Total Affected Area (table 4.8-1). The disturbance distance to the Green Ridge Lek would remain the same under the Proposed Action as the current disturbance distance. According to the most recent disturbance limits information provided by LCI, only two leks (Crooked Well and Green Ridge) will experience increased physical disturbance within the 0.6-mile (724-acre) buffer as a result of the Proposed Action. Since WGFD currently considers the Crooked Well Lek as inactive, it does not receive protections by Wyoming Executive Order 2015-4. The additional disturbance within the Green Ridge Lek buffer would be approximately 11.5 acres (2% of the buffer).

As specified above in the Applicant-committed design features for wildlife, the Applicant has committed to implement an adaptive management plan to address potential threats to Greater sage-grouse populations within the area of impact of the project in the event that population declines are noted on Affected Leks (BLM Lost Creek EIS ROD, Table 4, BLM 2012b). The result of current monitoring has not provided definitive data regarding the level of effects of ISR activities on Greater sage-grouse. As such, the adaptive management plan has not been formulated. BLM, WGFD, and the Applicant are participating in annual wildlife monitoring meetings to assess the current-year monitoring results, including Greater sage-grouse. The need to proceed with formulation and implementation of the adaptive management plan is a primary topic of these annual meetings.

**Table 4.8-1. Greater Sage-grouse Lek Counts and Lek Status for Leks with Additional Disturbance as a Result of the Proposed Action**

Lek	2012	2013	2014	2015	2016	2017	2017 Annual Status <sup>1</sup>	2017 Management Status <sup>1</sup>	Distance (in feet) from Disturbance <sup>2</sup>
Green Ridge	55	32	26	27	42	43	Active	Occupied	2,460/2,460
Crooked Well	0	0	0	0	0	0	Inactive	Unoccupied	2,990/2,140
Prospects/ Prospects South	39	29	14	19	38	34	Active	Occupied	12,230/4,025
Sooner/Sooner Oil	19	4	2	0	0	0	Inactive	Occupied	19,450/14,230

<sup>1</sup> LWR 2017, WGFD 2017b

<sup>2</sup> Existing/proposed; the distance is calculated from the nearest lek within a lek complex.

The Proposed Action would result in the short-term and long-term loss of approximately 1,415 acres of potential habitat for Greater sage-grouse. According to information included in past annual wildlife monitoring reports, the project area provides Greater sage-grouse habitat for

breeding, nesting, brood-rearing, summering, and winter use (LWR/WWC Inc. 2012). However, vast areas of similar vegetation and habitat are available within and beyond the project area.

There is a potential for indirect impacts to Greater sage-grouse from the approximately 850 feet of overhead power line proposed near MU4. According to Wyoming Executive Order 2015-4, new overhead lines located within Greater sage-grouse core areas should be located at least 0.6 mile from the perimeter of occupied Greater sage-grouse leks and employ BMPs specific to electric utility facilities (Office of the Governor 2015). At its closest point, this power line would be approximately 1.2 miles from the nearest lek (Discover East), and appropriate anti-perching and anti-roosting devices would be placed on power poles and cross arms (LCI 2010b).

Noise impacts to Greater sage-grouse are discussed in detail in Section 4.9.5.3 of the BLM Lost Creek EIS. A summary of noise effects on wildlife populations includes reference to measured average traffic noise levels at 50 feet of 54 to 62 dBA for passenger cars and 58 to 70 dBA for heavy trucks (Federal Highway Administration 2004). Using the highest value of 70 dBA for the starting source, a calculation from Golden et al. (1979), and a distance of 300 feet, noise from heavy trucks would not exceed average traffic noise levels (58 dBA at 200 feet). Furthermore, the bulk of increased traffic would not occur in the time frame of most concern for Greater sage-grouse (6 p.m. to 8 a.m.). As shown in table 4.2-1, toll milling (ion exchange resin or yellowcake slurry) associated with the Proposed Action could increase traffic along Sooner Road (BLM 3215) by 0.09 truck per day (31 trucks per year). The Green Ridge Lek is currently located approximately 2,460 feet from Sooner Road.

The DDCT prepared for the existing Lost Creek ISR Project was updated to ensure that the Proposed Action would be in compliance with the maximum disturbance process, as outlined in Wyoming Executive Order 2015-4 (Office of the Governor 2015). WGFD reviewed and approved the revised DDCT, which indicated that the Proposed Action would be in compliance with the maximum allowable disturbance (disturbance percentages, location, and number of disturbances) of suitable Greater sage-grouse habitat.

As described in Section 4.6.1.1.4 of the NRC Lost Creek SEIS, impacts to Greater sage-grouse would be MODERATE. Due to the sequential nature of proposed disturbance, continued coordination with BLM and WGFD, implementation of the Applicant's mitigation and monitoring plan, and a requirement to implement a Greater sage-grouse adaptive management plan in the event that population declines are noted on Affected Leaks, the potential impacts to Greater sage-grouse would remain MODERATE. While project construction would result in moderate long-term direct impacts to Greater sage-grouse within the Total Affected Area, monitoring within the Large Greater Sage-grouse Monitoring Area indicates that a population-level effect is not likely for the surrounding areas.

#### ***4.8.2.3 Selected Mammal Species***

As described in Section 4.6.1.1.5 of the NRC Lost Creek SEIS, the impacts to pygmy rabbit would be MODERATE. Survey results indicate that Lowland Big Sagebrush Shrubland habitat within the project area is occupied by pygmy rabbits. Although evidence of pygmy rabbit use was documented each year within the project area, the actual number of rabbits observed were low, with only one or two pygmy rabbits observed during each annual survey. Approximately 99 acres of Lowland Big Sagebrush Shrubland habitat would be disturbed under the Proposed Action, which could impact pygmy rabbits through direct mortality and through loss of available habitat.

However, due to the sequential nature of disturbance and the low numbers of pygmy rabbits observed, the impacts on the species under the Proposed Action would be SMALL.

The NRC Lost Creek SEIS did not include an evaluation of the Wyoming pocket gopher. The BLM Lost Creek EIS indicated that, while project construction would result in long-term direct impacts to Wyoming pocket gophers within the existing Lost Creek ISR Project area, a population-level effect is not likely for the surrounding areas. Based on observations from surveys conducted in 2010 and 2013, the Wyoming pocket gopher is found on a limited based in suitable habitat within the project area (Section 3.8-2). The Wyoming pocket gopher is found in suitable habitat throughout the Great Divide Basin surrounding the project area (LWR 2017). Wyoming pocket gophers could be impacted through direct mortality and through loss of available habitat. However, due to the sequential nature of disturbance and the relatively low numbers of Wyoming pocket gophers observed, the impacts on the species under the Proposed Action would be SMALL.

#### **4.8.2.4 Raptors**

Potential impacts to raptors include loss of nesting and foraging habitat, collisions with structures and vehicles, nest abandonment and reproductive failure due to increased human activities, reduction in prey populations, and displacement of birds into adjacent areas. As described in Section 4.6.1.1.1.2 of the NRC Lost Creek SEIS, the impacts to raptors would be SMALL. While the NRC Lost Creek SEIS and the BLM Lost Creek EIS described the general impacts to raptors, the Proposed Action would increase the potential for disturbance to nesting and foraging areas by increasing the scale and duration of disturbance. Some raptor species are protected under the MBTA. The Applicant would continue to implement mitigation measures included in its Wildlife Protection Plan and Wildlife Monitoring Plan (LCI 2010b) to ensure that development activities do not cause preventable raptor fatalities and to ensure that the company remains in compliance with the MBTA. Based on the sequential nature of disturbance, the low number of active raptor nests in the area, and mitigation measures included in the Wildlife Protection Plan and Wildlife Monitoring Plan, the estimated impact on raptor species would be SMALL but would be long term.

#### **4.8.2.5 T&E Species**

At the time the NRC Lost Creek SEIS was published, the federally listed, proposed, or candidate vertebrate T&E species with the potential to occur in the area included the black-footed ferret (*Mustela nigripes*), mountain plover (*Charadrius montanus*), bald eagle (*Haliaeetus leucocephalus*; delisted but still protected under the MBTA and Bald and Golden Eagle Protection Act), and Greater sage-grouse. As described in Section 4.6.1.1.4 of the NRC Lost Creek SEIS, the impacts to T&E species could be SMALL to LARGE, depending on site conditions and the species encountered. However, according to the most current list of USFWS-designated T&E species with the potential of occurring in the area, no T&E vertebrate species are known to occur in the project area, and the USFWS has not designated critical habitat for any T&E species in the vicinity of the project area (USFWS 2017). BLM has determined that the Proposed Action will have no effect on T&E species. Since no T&E species or habitats critical to T&E species have been documented within the project area, impacts to T&E species under the Proposed Action would be SMALL.

#### **4.8.2.6 Other Species of Special Interest**

For the purpose of this impact analysis discussion, SOSI include USFWS BCC, BLM Sensitive Species, and WGFD SGCN. As stated in Section 3.8.5 and included in appendix B of this EIS,

185 vertebrate SOSI have the potential of occurring in the region. Of this number, 15 SOSI are indicated in the WYNDD database as overlapping with the T25N, R92-93W evaluation area. Other than the sagebrush sparrow, all SOSI observed in the area are discussed in the NRC Lost Creek SEIS. The habitat preference and occurrence for the sagebrush sparrow are discussed in Section 3.8.5. As described in the NRC Lost Creek SEIS (Section 4.6.1.1.5, p. 4-53), the impacts to SOSI would be SMALL to MODERATE.

The Proposed Action would result in both short-term and long-term loss of approximately 1,415 acres of habitat for SOSI within the project area. Activities could displace SOSI to lower quality habitat areas and could result in localized reduced reproduction and increased predation. Another direct impact on SOSI is mortality during construction and from collisions with vehicles. Impacts could be MODERATE; however, the sequential nature of disturbance would reduce impacts to SOSI. Seasonal guidelines for wildlife exclusion periods and Applicant-committed design features would reduce impacts to SOSI to SMALL. Since some SOSI are protected under the MBTA, the Applicant would be required to take precautions to minimize the risk that its development activities would cause preventable bird fatalities in order to remain in compliance with the MBTA.

#### **4.8.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or fenced. The effects on wildlife would be similar to the Proposed Action, but the magnitude and duration would be less. Impacts would be reduced for two Greater sage-grouse leks (Prospect/Prospect South and Green Ridge), since the removal of the KM mine units would increase the distance to disturbance for these two leks.

#### **4.9 Wild Horses**

This section describes potential impacts to wild horses as a result of activities associated with the Proposed Action and alternatives.

##### **4.9.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Construction and operation currently approved by BLM, NRC, and WDEQ would continue within the existing Lost Creek ISR Project area. Exploratory drilling would continue within the project area under an NOI at a rate of approximately 5 acres of surface disturbance per year. Reclamation of exploration holes generally would occur within the same calendar year as the disturbance. Mining-related activities on BLM-managed lands would limit unreclaimed surface disturbance to 5 acres at any time during the life of the NOI filed for each action (43 CFR § 3809.21). Impacts would result from construction, fencing, and reclamation of mine units within the existing Lost Creek ISR Project area and from vehicular traffic for material transport, workers commuting, and maintenance and inspections. Under the No Action Alternative, impacts to wild horses would continue to be consistent with the impacts stated in Section 4.10 of the BLM Lost Creek EIS and Section 4.6 of the NRC Lost Creek SEIS.

#### 4.9.2 Proposed Action

Potential impacts to wild horses from the Proposed Action were identified based on the potential disturbance and restriction of movements related to fencing. The following assumptions were used in the analysis of impacts to wild horses:

- The impacts assessment is based on the current status of wild horse populations and AMLs within the Lost Creek, Stewart Creek, and Green Mountain HMAs.

Applicant-committed design features considered in the wild horse impact analysis include the following:

- All new employees would receive training on speed limits within the project area, with refresher training at least once per year (Operations Plan Attachment OP-6, LCI 2011b).
- Mine units, mud pits outside of fenced mine units, and storage ponds that require a visual deterrent would be fenced or screened. The specific types of deterrent, fencing, or screening for these activities are outlined in Section OP 2.5.2 of the Operations Plan (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would provide gates or cattle guards to minimize wild horse access to fenced mine units (TR Section 3.1.1, LCI 2010d).
- The Applicant would implement procedures to minimize the likelihood of starting a wildfire (including but not limited to hot work permits, site inspections, proper storage of waste, etc.). All field personnel would be trained in emergency response procedures, including reporting of fires (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would work with BLM and WGFD to complete wildlife and livestock enhancements in the project area and nearby areas; these enhancements could include creation of new water sources, habitat modifications/improvements to improve specific habitat conditions for specific species, or rangeland improvements for livestock (Operations Plan Attachment OP-6, LCI 2011b).

The same type of direct and indirect effects to wild horse would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.10, pp. 4.10-1 through 4.10-6 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.6, pp. 4-40 through 4-59 (NRC 2011)

As shown in table 3.9-1 (Section 3.9 of this EIS), the number of wild horses within each potentially affected HMA is currently well above the AML established by BLM for the effective management of the land. The potential maximum amount of disturbance to wild horse habitats under the Proposed Action, based on fencing all mine units and disturbance associated with the Class I UIC wells, secondary roads, and pipelines, is shown in table 4.9-1.

**Table 4.9-1. Maximum Anticipated Impacts to HMAs under the Proposed Action**

<b>HMA</b>	<b>Total Area (acres)</b>	<b>Maximum Reduction in Available Area (acres)</b>	<b>Maximum Percentage Reduction in Area</b>
Stewart Creek	168,000	1,048	0.6
Lost Creek	251,000	338	0.1
Combined HMAs	419,000	1,386	0.3
Not Included in HMA	--	29	--
Total Disturbed	--	1,415	--

Due to the apparent interchange between the Stewart Creek HMA and Green Mountain HMA herds, there could be SMALL impacts to the Green Mountain HMA as well. Wild horse numbers in the Red Desert Complex are well above the AML established by BLM for the HMAs included in the complex (BLM 2016e), which increases the potential for interchange between these two HMAs (Warren 2017). The Red Desert Complex includes the Lost Creek, Stewart Creek, Green Mountain, Crooks Mountain, and Antelope Hills HMAs.

Of the 1,415 acres of disturbance under the Proposed Action, approximately 1,371 acres would be fenced to keep out cattle and wild horses. The added exclusion (fenced) areas would account for approximately 0.3 percent of the combined Lost Creek and Stewart Creek HMAs. The mine unit fencing under the Proposed Action would be wildlife friendly, to allow passage of smaller animals but exclude cattle and wild horses.

Nearly all water available to wild horses around the project area is from stock water wells. Wild horses would not likely move around fenced mine units, which could restrict access to the two permitted stock water wells within the project area (P13834P and P55112W; see map 3.9-1). Wild horses would continue to have access to seven other stock water wells available near the project area (map 3.9-1).

During operation, wild horses could be exposed to spills around wellheads and leaks from pipelines that could migrate to surface water drainages. The Applicant's leak detection systems and spill prevention and mitigation SOPs, including survey and removal (if necessary) of affected soils and capture of release fluids, would eliminate or reduce such impacts. Noise from construction and reclamation activities could cause indirect impacts. Impacts related to noise are discussed in Section 4.11 of this EIS.

In summary, wild horses are mobile, with exchange between unaffected nearby HMAs, and only a very small percentage of range would be influenced by the Proposed Action. Access to two stock water wells could be restricted due to mine unit fencing, but seven other water wells would be available near the project area. The Applicant would also enforce speed limits to limit dust and collisions with wild horses. Therefore, no significant impacts to the population are expected. The impacts to wild horses occurring under the Proposed Action would be SMALL.

#### **4.9.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or fenced. The effects on wild horses would be similar to the Proposed Action, but the amount of fenced area would be less and the duration of the impacts would be several years less.

## **4.10 Air Quality**

This section describes potential air quality and GHG impacts that as a result of activities associated with the Proposed Action and alternatives.

### **4.10.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Air quality impacts associated with the currently authorized Lost Creek ISR Project would continue and would include fugitive dust from construction activities and vehicles, combustion engine emissions from diesel equipment, and radiological airborne effluent releases. Under the No Action Alternative, air quality and GHG impacts would be consistent with the impacts stated in Section 4.11.4 of the BLM Lost Creek EIS, Sections 4.7 and 5.7.2.3 of the NRC Lost Creek SEIS, and Section 4.2 of the NRC Dryer Amendment EA (NRC 2013b).

### **4.10.2 Proposed Action**

Potential air quality impacts from the Proposed Action were evaluated based on the following assumptions:

- The severity of impacts to air quality would depend on the number of acres disturbed at any one time, the type and duration of the disturbance, and weather-related factors.
- The Applicant would revise WDEQ-AQD Air Quality Permit CT-7896 to incorporate the Proposed Action. The revision would be completed following approval of the BLM Plan of Operations modification and the NRC license amendment.

Nonradiological and radiological airborne effluents would continue to be released under the Proposed Action, which could affect regional air quality. Nonradiological airborne impacts would be limited to gaseous emissions and fugitive dust. Radiological air emissions would include radon gas releases from well system relief valves, resin transfer, and elution. Potential radiological impacts to air quality, including those resulting from radon release, are addressed in Section 4.15 of this EIS.

Applicant-committed design features considered in the air quality impact analysis include the following:

- In accordance with Air Quality Permit CT-7896, the Applicant would treat the gravel access roads from the Wamsutter-Crooks Gap Road to the Plant and from BLM Sooner Road to the Plant (i.e., the east and west access road) with water and/or chemical dust suppressants on a schedule sufficient to control fugitive dust from vehicular traffic (WDEQ-AQD 2010).
- The Applicant would reclaim the surface and reestablish vegetation in areas disturbed by drilling, pipeline installation, and facility construction upon completion of construction. Disturbed areas would be reseeded with a permanent seed mix during the next appropriate season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b).

- The Applicant would use standardized procedures for the delivery of materials used on-site that minimize accidental material loss and use efficient construction practices to minimize generation of airborne particulates (Operations Plan Section OP 5.1.1, LCI 2011b).
- The Applicant would restrict vehicular traffic to specific routes and enforce speed limits on main and secondary access roads to minimize dust from roads (Operations Plan Section OP 5.1.1, LCI 2011b).
- The Applicant would implement additional dust control measures that may include water spraying, application of gravel, or application of organic/chemical dust suppressants (Operations Plan Section OP 5.1.1, LCI 2011b).

The same type of air quality impacts would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.11, pp. 4.11-1 through 4.11-11 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.7, pp. 4-59 through 4-68 and Section 5.7.2, pp. 5-39 through 5-43 (NRC 2011)
- NRC Dryer Amendment EA – Section 4.2.3, pp. 15 through 16 (NRC 2013b)

#### ***4.10.2.1 Nonradiological Air Quality Impacts from the Proposed Action***

As described Section 4.7 in the NRC Lost Creek SEIS, nonradiological air emission impacts would primarily involve fugitive dust from construction, operation, and decommissioning activities and combustion emissions from diesel equipment associated with these same activities. Section 4.7 of the NRC Lost Creek SEIS also discussed factors that the NRC staff used in determining the significance of the potential air quality impacts, including (i) whether the air quality for the site region of influence was in compliance with the NAAQS and WAAQS and (ii) whether the facility would be classified as a major source under the New Source Review or operating (Title V of the Clean Air Act) permit programs. An additional concern was whether PSD Class I areas within the region would be impacted by emissions from the existing Lost Creek ISR Project.

Under the Proposed Action, surface disturbance within the project area would contribute to fugitive dust emissions. Disturbance with the mine units would be short term, since the disturbed areas would be reseeded during the first available seeding window. Fugitive dust from vehicle traffic would be long term since it would last the life of the project.

As shown in table 3.10-1 of this EIS, the regional air quality around the project area continues to be in compliance with NAAQS and WAAQS. Section 4.7 of the NRC Lost Creek SEIS described how the Lost Creek ISR Project would not be classified as a major source under New Source Review or Title V of the Clean Air Act, would continue to be in attainment for all NAAQS primary pollutants, and would not likely affect the closest PSD Class I area. Since the project area is in an area that is in attainment with the NAAQS (EPA 2017c) and since the Proposed Action would not qualify as a major source or modification to an existing source, additional PSD impacts assessments are not included in this EIS.

Section 4.11.4 of the BLM Lost Creek EIS included estimated emissions for the Lost Creek ISR Project. These estimated emissions are presented in table 4.10-1. The emission estimates in the

table would not increase under the Proposed Action, although the duration would be extended by 6 to 8 years.

Section 4.7.1 of the NRC Lost Creek SEIS concluded that the impacts to air quality during construction would be SMALL; however, NRC staff also concluded that, depending on site-specific conditions, MODERATE dust impacts would be possible on or near access roads (in particular for unpaved access roads). According to Section 4.2.3 of the NRC Dryer Amendment EA, the air quality impacts of increasing the annual yellowcake production rate to 2 million pounds per year would be SMALL. Due to the Applicant's commitments for the reduction of air quality impacts, which are enforceable by WDEQ-AQD Air Quality Permit CT-7896, and due to the fact that the current air quality within the project area continues to be in compliance with NAAQS and WAAQS, air quality impacts from the Proposed Action would be SMALL. According to Section 4.11.4.2 of the BLM Lost Creek EIS, impacts from other particulates or gaseous emissions would be minor. Therefore, although the Proposed Action would extend the duration of activities, the magnitude of air quality impacts associated with construction fugitive dust and emissions would similarly be SMALL.

#### ***4.10.2.2 Climate Change Impacts from GHGs***

As described in Section 5.7.2 of the NRC Lost Creek SEIS, NRC staff determined that a meaningful approach to address the impacts of GHG emissions, including CO<sub>2</sub>, is to recognize that such emissions contribute to climate change and that the carbon footprint is a relevant factor in evaluating potential impacts of an alternative. Section 4.7 of the NRC Lost Creek SEIS states that all phases of uranium ISR would result in GHG emissions, principally CO<sub>2</sub>. The majority of these direct emissions would be from the use of diesel-powered equipment (including well drilling rigs) during the construction and decommissioning phases. Indirect emissions would result from GHGs emitted during electricity generation at nuclear power plants using uranium (nuclear fission) produced at the Lost Creek ISR Project.

According to Section 5.7.2.2 of the NRC Lost Creek SEIS, the maximum annual direct CO<sub>2</sub> emission from diesel-powered equipment calculated for the Lost Creek ISR Project was 2,100 short tons per year, based on emission factors for various diesel engines and the annual drilling or construction schedule. Since these input parameters (equipment types and horsepower, fuel consumption and emission factors by fuel type, and equipment operating times) are not expected to change as a result of the Proposed Action, the Proposed Action would not result in an increase in the annual CO<sub>2</sub> emissions beyond what was evaluated for the Lost Creek ISR Project. For comparison purposes, the calculated maximum annual emissions represent 0.003 percent of the 71.4 million short tons of CO<sub>2</sub> produced in Wyoming in 2015 (U.S. Energy Information Administration 2015). The duration of the direct CO<sub>2</sub> emissions would be extended by 6 to 8 years under the Proposed Action, but the annual emission rate would not increase.

Sections 3.7.1.6 and 5.7.2 of the NRC Lost Creek SEIS thoroughly describe the regional conditions regarding climate change and GHGs in the project area.

**Table 4.10-1. Estimated Annual Emissions for the Existing Lost Creek ISR Project**

Activity	GHG <sup>1</sup>	Other <sup>1</sup>							
	CO <sub>2</sub>	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM <sub>10</sub>	Formaldehyde	VOCs	Soda Ash (lbs/year)	Salt (lbs/year)
<b>Initial Construction</b>									
Commuting Traffic	279	0.66	8.6	-- <sup>2</sup>	<0.01	--	--	--	--
Truck Deliveries	251	5.24	0.48	--	<0.1	--	<0.1	--	--
Construction Equipment	94	2.5	0.55	0.17	0.18	0.00068	0.20	--	--
<i>Total Emissions</i>	<i>624</i>	<i>8.4</i>	<i>9.63</i>	<i>0.17</i>	<i>0.18</i>	<i>0.00068</i>	<i>0.20</i>	--	--
<b>Mine Unit Development</b>									
Commuting Traffic	126	0.3	3.9	--	<0.01	--	--	--	--
Truck Deliveries	186	3.6	0.33	--	<0.1	--	<0.1	--	--
Mine Unit Well Drilling & Support Equipment	800	17	4.2	0.44	0.66	0.0013	0.66	--	--
<i>Total Emissions</i>	<i>1,112</i>	<i>20.9</i>	<i>8.43</i>	<i>0.44</i>	<i>0.66</i>	<i>0.013</i>	<i>0.66</i>	--	--
<b>Operation</b>									
Commuting Traffic	25.4	0.06	0.78	--	<0.01	--	--	--	--
Truck Deliveries	258	5.39	0.50	--	<0.1	--	<0.1	--	--
Plant Deliveries and Drilling	--	--	--	--	--	--	--	13.5	17.5
<i>Total Emissions</i>	<i>283</i>	<i>5.45</i>	<i>1.28</i>	--	<i>0.1</i>	--	<i>&lt;0.1</i>	<i>13.5</i>	<i>17.5</i>
<b>Reclamation</b>									
Commuting Traffic	101	0.24	3.1	--	<0.01	--	--	--	--
Truck Deliveries	430	8.98	0.83	--	0.11	--	0.11	--	--
Equipment Needed for Reclamation of One Mine Unit & Plant Facilities	620	17	3.6	1.1	1.2	0.0045	1.3	--	--
<i>Total Emissions</i>	<i>1,151</i>	<i>26.2</i>	<i>7.53</i>	<i>1.1</i>	<i>1.31</i>	<i>0.0045</i>	<i>1.41</i>	--	--
<b>Combined Total Emissions</b>	<b>3,170</b>	<b>60.95</b>	<b>26.87</b>	<b>1.71</b>	<b>2.25</b>	<b>0.01</b>	<b>2.27</b>	<b>13.5</b>	<b>17.5</b>

<sup>1</sup> tons per year unless otherwise noted

<sup>2</sup> Dashes (--) indicate information not provided in reference.

Source: BLM 2012a

From 2013-2017, U.S. civilian nuclear power reactors purchased an average of 52.2 million pounds of yellowcake (U<sub>3</sub>O<sub>8</sub> equivalent) per year (U.S. Energy Information Administration 2018a). Over the same time frame, the net electricity generation from U.S. civilian nuclear power reactors averaged about 798,800 gigawatt-hours per year (U.S. Energy Information Administration 2018b). Based on this analysis, about 15,300 gigawatt-hours of electricity are produced from each 1 million pounds of yellowcake purchased. Based on the currently authorized yellowcake production rate of up to 2 million pounds per year, the Lost Creek ISR Project could supply enough yellowcake to generate about 30,600 gigawatt-hours of electricity annually. The amount of GHGs emitted during the entire lifecycle of nuclear power generation at nuclear power plants (including uranium mining) has been estimated to be about 29 metric tons (32 short tons) of CO<sub>2</sub> equivalent per gigawatt-hour (World Nuclear Association 2011). Therefore, it is estimated that up to about 0.98 million short tons of GHG emissions (direct and indirect) may result from yellowcake produced at the Lost Creek ISR Project.

Under the Proposed Action, the maximum annual yellowcake production rate would increase from 2 million pounds to 2.2 million pounds. This could result in an increase in the maximum electricity generated from the yellowcake from 30,600 to 33,660 gigawatt-hours annually and an increase in the lifecycle GHG emissions from 0.98 to 1.08 million short tons CO<sub>2</sub> equivalent annually. By comparison, coal-fired power plants have average lifecycle GHG emissions of about 888 metric tons (979 short tons) CO<sub>2</sub> equivalent per gigawatt-hour (World Nuclear Association 2011). Generating up to 33,660 gigawatt-hours of electricity annually using nuclear power would help offset up to 31.9 million short tons of GHG emissions annually.

Section 5.7.2.3 of the NRC Lost Creek SEIS concluded that the impacts of GHGs from the Lost Creek ISR Project would be SMALL. Since annual direct GHG emissions would not increase and indirect emissions would increase only slightly under the Proposed Action, potential impacts from the Proposed Action would be also be SMALL but would be extended by 6 to 8 years.

#### **4.10.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or mined, which would reduce emissions due to less drilling and surface disturbance. The effects on air quality would be similar to the Proposed Action, but the duration would be several years less.

#### **4.11 Noise**

This section describes the potential noise impacts as a result of activities associated with the Proposed Action and alternatives. Noise impacts to wildlife, including Greater sage-grouse, are discussed in Section 4.8, and occupational noise exposure is discussed in Section 4.15 of this EIS. As described in Section 3.11, the nearest residences are located in the town of Bairoil, approximately 13 miles northeast of the project area.

##### **4.11.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Noise impacts would result from construction and reclamation of mine units within the existing Lost Creek ISR Project area and from vehicular traffic for material transport, commuting workers, and

maintenance and inspections. Under the No Action Alternative, noise impacts would be consistent with the impacts stated in Section 4.12 of the BLM Lost Creek EIS and Section 4.8 of the NRC Lost Creek SEIS.

#### **4.11.2 Proposed Action**

Noise impacts from the Proposed Action included both mobile and stationary sources. Applicant-committed design features considered in the noise impact analysis include the following:

- The Applicant would locate continuously operating equipment (e.g., pumps) inside well houses or buildings (Operations Plan Attachment OP-6, LCI 2011b).
- The Applicant would limit mine unit construction to daylight hours (Environmental Report Section 4.7.1.2, LCI 2017j).

The same type of noise impacts would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.12, pp. 4.12-1 through 4.12-5 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.8, pp. 4-68 through 4-72 (NRC 2011)

As described in Section 4.8 of the NRC Lost Creek SEIS, environmental impacts from noise could occur during all phases of the project from (i) the operation of equipment such as trucks, bulldozers, and compressors; (ii) commuter traffic or material and waste shipments; and (iii) wellfield activities and equipment.

According to Section 4.8.1.1 of the NRC Lost Creek SEIS, the greatest impacts from noise would occur during the construction phase, from construction equipment, motor vehicles, and drill rigs, although activities would be limited to daylight hours. Construction noise would generate sound above background levels (30 to 35 dBA). The maximum noise measured during exploration activities was from a cement mixer and a generator running concurrently, which was 102 dBA at 4 feet from the source (LCI 2017j). As described in Section 4.12.4.1 of the BLM Lost Creek EIS, beginning at a distance of 50 feet, noise levels diminish by 6 dBA for each doubling of distance from the source. Due to natural attenuation, project related noise would not be audible above background noise levels in the nearest community of Bairoil. Therefore, noise levels related to project activities at the project area boundary would be less than near construction activities (e.g., mine units and Class I UIC wells) but may be audible above background levels.

Since no additional employees would be hired, the noise generated by commuter traffic would be the same as described in the BLM Lost Creek EIS and NRC Lost Creek SEIS, although the duration would be extended by 6 to 8 years. As described in Section 4.2 of this EIS, average daily heavy truck shipments could increase by up to about 0.2 shipment per day under the Proposed Action. Section 4.8.1.2 of the NRC Lost Creek SEIS indicated that the noise from commuting and truck traffic could have a MODERATE impact on lightly traveled rural roads through smaller communities such as Bairoil and Jeffrey City and a SMALL impact on more highly traveled major roadways. Since the additional truck shipments would not cause a noticeable effect on highways (Section 4.2.2 of this EIS), the impacts would be similar to those described in the NRC Lost Creek SEIS. Noise from stationary sources (e.g., pumps) would have no impact on off-site receptors, since they would be inside well houses or buildings and the nearest residence is approximately 13 miles from the project area.

The duration of noise impacts would be short term on-site and long term off-site, since construction activities would diminish over time but truck shipments would last the duration of the project. Section 4.8 of the NRC Lost Creek SEIS concluded that the impacts to residences and communities would be SMALL, while the noise from commuting and truck traffic could have a MODERATE impact on lightly traveled rural roads through smaller communities. The Proposed Action would continue to have a SMALL impact given the distance to the nearest residences and a MODERATE impact on smaller communities located along transportation routes. Overall, the noise impacts from the Proposed Action would be SMALL.

#### **4.11.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or fenced. The effects from noise would be similar to the Proposed Action, but the duration would be less.

### **4.12 Historic, Cultural, and Paleontological Resources**

This section describes potential impacts to historic, cultural, and paleontological resources as a result of activities associated with the Proposed Action and alternatives.

#### **4.12.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Therefore, there would be no effects to historic, cultural, and paleontological resources that were not previously evaluated in Section 4.13 of the BLM Lost Creek EIS and Section 4.9 of the NRC Lost Creek SEIS.

#### **4.12.2 Proposed Action**

##### Historic and Cultural Resources

Potential impacts to historic and cultural resources from the Proposed Action were identified based on the locations of potential disturbance. Applicant-committed design features considered in the historic and cultural resource impact analysis include the following:

- Construction and operation activities occurring near significant cultural properties would be monitored by an archaeologist (Operations Plan Section OP 2.4, LCI 2011b).
- The Applicant would avoid disturbing potentially NRHP-eligible historic sites by clearly marking site boundaries and maintaining disturbance buffers around site (Operations Plan Section OP 2.4, LCI 2011b).
- In the event that an NRHP-eligible site cannot be avoided, a site-specific treatment plan would be developed to guide data recovery and mitigation. The plan would be subject to review and approval by BLM, NRC, and SHPO and review and comment by concerned Native American Tribes (Operations Plan Section OP 2.4, LCI 2011b).
- Any work resulting in the discovery of previously unknown cultural artifacts would cease. The artifacts would be inventoried and evaluated in accordance with 36 CFR Part 800, and no disturbance of the area would occur until the Applicant has received authorization from BLM, NRC, and SHPO (License SUA-1598 license condition 9.8, NRC 2016b).

The same type of direct and indirect effects to historic and cultural resources would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.13, pp. 4.13-1 through 4.13-4 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.9, pp. 4-72 through 4-77 (NRC 2011)

As described in Section 3.12.4 of this EIS, 12 archaeological sites were identified within the APE during the Class III surveys. One site within the proposed LCE expansion area was determined to be eligible for the NHRP under Criterion D. In the finding of effect, the BLM concluded that the eligible site would be avoided by project design so that no historic properties would be affected by the undertaking. In addition, the BLM stipulated that a 100-foot buffer would be required around the eligible site boundary (BLM 2016h).

Direct impacts could include temporary restriction of access to historic and cultural resources and loss of or damage to unidentified historic and cultural resources. Access from the fenced mine units to any historic and cultural resources would be restricted throughout the life of the project. During construction, surface disturbing activities would have the greatest potential to damage unidentified cultural and historic resources. However, Applicant-committed design features and license conditions would reduce the potential for impacts to unidentified resources. Access would be restricted throughout the life of the project to any historic and cultural resources that may be identified in the future within fenced mine units.

Vegetation removal and erosion of soils under the Proposed Action could result in inadvertent or unanticipated impacts. As described in Section 4.13.4 of the BLM Lost Creek EIS, erosion could result in deposition of material onto archaeological sites or removal of soil and subsequent exposure of sites.

The direct and indirect impacts would be long term, since they could occur for the duration of the project. Section 4.9.1.1.1 of the NRC Lost Creek SEIS concluded that impacts to historic and cultural resources would be MODERATE during construction due to the adverse effects to an eligible site. During all other phases of the project, the impacts would be SMALL. Under the Proposed Action, the eligible site within the project area would be avoided. Therefore, it is expected that impacts to historic and cultural properties under all phases of the Proposed Action would be SMALL.

#### Paleontological Resources

As described in Section 3.12.6, there are no known paleontological resources within the project area. Impacts to paleontological resources were evaluated in Section 4.9.1 of the NRC Lost Creek SEIS for the existing Lost Creek ISR Project area, and the same potential impacts would apply to the proposed LCE expansion area. The assumptions and Applicant-committed design features described for historic and cultural resources are also applicable to paleontological resources.

Under the Proposed Action, paleontological resources could be impacted by land disturbing activities. Section 4.9.1.1.2 of the NRC Lost Creek SEIS concluded that impacts to fossils would be SMALL during all phases of the Lost Creek ISR Project based on the geology of the existing Lost Creek ISR Project area and poor exposure of fossil-bearing sediment. Paleontological resource impacts under the Proposed Action would be consistent with those described in the NRC

Lost Creek SEIS, due to the similarity of the geology and sediments, and are expected to continue to be SMALL.

#### **4.12.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or fenced. The impacts from Alternative 1 would be the same as the Proposed Action except for the following:

- Alternative 1 would result in disturbance of approximately 139 fewer acres (approximately 1,276 acres, as described in Section 4.1).

The nature of direct and indirect effects to historic, cultural, and paleontological resources would be the same as would occur under the Proposed Action; however, the magnitude and duration of the impacts would be less. Under Alternative 1, impacts would be SMALL.

#### **4.13 Visual and Scenic Resources**

This section describes potential impacts to visual and scenic resources as a result of activities associated with the Proposed Action and alternatives. As described in Section 4.14.4.2 of the BLM Lost Creek EIS, the largest impact to visual and scenic resources within the project area is the Plant, which has been constructed. Impacts to visual and scenic resources from the Plant were evaluated in the BLM Lost Creek EIS and NRC Lost Creek SEIS. Therefore, a viewshed analysis is not included in this EIS.

##### **4.13.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Exploratory drilling would continue under an NOI at a rate of approximately 5 acres per year. Reclamation of exploration holes generally would occur within the same calendar year as the disturbance. Mining-related activities on BLM-managed lands would not result in over 5 acres of unreclaimed surface disturbance at any time during the life of the NOI filed for each action (43 CFR § 3809.21). The nature of direct and indirect effects to visual and scenic resources would remain at or near current levels, and would be less than the Proposed Action. The visual and scenic resources impacts for the No Action Alternative are consistent with the impacts stated in Section 4.14 of the BLM Lost Creek EIS and Section 4.10 of the NRC Lost Creek SEIS.

##### **4.13.2 Proposed Action**

Impacts were evaluated by determining whether the visual changes resulting from the Proposed Action would be consistent with the BLM visual resource classification of the area. As described in Section 3.13 of this EIS, the project area is within VRM Class IV. The level of change to the characteristic landscape in a Class IV area can be high, but every effort should be made to minimize the impact of modifications to the landscape.

Applicant-committed design features considered in the visual and scenic resources impact analysis include the following:

- The Applicant would reclaim the surface and reestablish vegetation in areas disturbed by drilling, pipeline installation, and facility construction upon completion of construction. Disturbed areas would be reseeded with a permanent seed mix during the next appropriate

season, or with a temporary seed mix to prevent erosion until the next appropriate season (Operations Plan Section OP 2.5.1, LCI 2011b).

- Header houses would be painted a neutral color that blends with the background (Operations Plan Section OP 2.5, LCI 2011b).
- To help maintain the overall objectives of visual resource class, paint colors would conform to the BLM Standard Environmental Color Chart CC-001 (BLM Lost Creek EIS ROD, BLM 2012b).

The same type of direct and indirect effects to visual and scenic resources would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.14, pp. 4.14-1 through 4.14-8 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.10, pp. 4-77 through 4-82 (NRC 2011)

Direct impacts to visual and scenic resources would include changes in the visual and scenic setting of the project area and impacts from fugitive dust. The greatest visual impact would occur during construction, when multiple drill rigs would be operating simultaneously within a mine unit. Each completed production and injection well would be covered with a wellhead cover to protect it from freezing. Section 4.10.1.1 of the NRC Lost Creek SEIS describes how the structures would not be visible from a distance of 0.6 mile because of the gently rolling terrain within the project area. In addition to the wellhead covers, surface structures added under the Proposed Action would include header houses and Class I UIC well houses. Section 4.14.4.2 of the BLM Lost Creek EIS concluded that header houses would only have a weak effect on the form and line of the landscape from key observation points on Sooner Road. Similarly, roads would not be visible unless the angle of view is directly in line with Sooner Road, due to the height and abundance of sagebrush throughout the project area. Under the Proposed Action, mine units within the proposed LCE expansion area would be closer to Sooner Road, making header houses and Class I UIC well houses more visible from Sooner Road. The proximity to the road would have a stronger effect on the form and line of the landscape.

Temporary and short-term visual impacts from dust emissions during construction would occur as a result of the Proposed Action. Fugitive dust emissions are discussed in Section 4.10 of this EIS.

Impacts to visual and scenic resources would be long term, since they would last the life of the project. Drill rigs would be visible within the project area as each mine unit is constructed. Header houses would be dismantled during reclamation and mine units would be revegetated.

Section 4.10 of the NRC Lost Creek SEIS concluded that impacts on visual and scenic resources would be SMALL, since the area surrounding the Lost Creek ISR Project area had been classified as VRM Class III and the activities would be consistent with ongoing activities in the area and BLM's management objectives. As previously discussed, the VRM classification in the vicinity of the project area has been changed to VRM Class IV, which allows for major modifications of the existing character of the landscape. Therefore, the Proposed Action would be within the BLM's management objectives. Based on this evaluation, the visual and scenic resources impacts occurring under the Proposed Action would be SMALL.

### **4.13.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The nature of direct and indirect effects would be the same as would occur under the Proposed Action; however, the magnitude and duration of the impacts would be less. There would be fewer injection and production wells and fewer header houses constructed, and the duration of activities would be reduced by several years. Overall, the potential direct and indirect impacts to visual and scenic resources related to Alternative 1 would be consistent with those occurring under the Proposed Action and would be SMALL.

## **4.14 Socioeconomics**

This section describes potential socioeconomic impacts as a result of activities associated with the Proposed Action and alternatives.

### **4.14.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Under the No Action Alternative, impacts related to socioeconomic factors would continue to be consistent with the impacts stated in Section 4.15 of the BLM Lost Creek EIS and Section 4.11 of the NRC Lost Creek SEIS.

### **4.14.2 Proposed Action**

Potential socioeconomic impacts from the Proposed Action were evaluated based on the following assumptions:

- Since no new employees would be added under the Proposed Action, impacts to demographics, income, housing (other than temporary housing), employment structure, education, and health and social services are not analyzed in this EIS.
- Yellowcake is the product sold by the mine and the value of the yellowcake sold is the basis for the severance tax as well as production taxes. W.S. 39-14-503(ii) states that “[t]he value of the gross product shall be the fair market value of the product at the mouth of the mine where produced, after the mining or production process is completed.” Subsection (vi) of that same statute states that “[t]he department shall calculate the fair market value of uranium by multiplying the individual producer's sales value of yellow cake [emphasis added] less all royalties, ad valorem production taxes, and severance taxes multiplied by the industry factor. The industry factor will be an average of all uranium producers' ratios of total mining costs to total mining and processing costs incurred to produce yellow cake calculated by the department. Nonexempt royalties, ad valorem production taxes and severance taxes will then be added to determine taxable value.”
- As new wellfields are constructed, the total cost of the facilities would increase. However, as the new wellfields are constructed and brought on line, the old well fields would cease to produce mineral and their value would decrease. Only the county assessor can determine the assessed valuation at any point in time, but the total area of producing wellfields and total value of the facilities would generally increase under the Proposed Action compared to the No Action Alternative.

- Tax revenues associated with toll milling are not included in this analysis, since the source and timing of the toll milling are speculative.

The following documents describe the socioeconomic impacts related to the Lost Creek ISR Project, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.15, pp. 4.15-1 through 4.15-15 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.11, pp. 4-82 through 4-87 (NRC 2011)

Under the Proposed Action, up to 30 contractors would be hired to drill and construct wells. While some of the contractors may be local, the impact analysis assumes that all would require temporary housing. Within Carbon County, there are 1,486 hotel and motel rooms and 385 recreational vehicle spots (table 3.14-2). The 30 contractors would use 2 percent or less of the temporary housing in the county, which would result in a SMALL impact to temporary housing.

Table 4.14-1 provides the estimated project construction, operation, and reclamation costs. Due to the sequential development of mine units, some of the facility construction costs would be distributed through the life of the project. However, these costs would be less than initial project development (e.g., Plant, storage ponds, and main access roads), which is complete. These costs are for the currently authorized Lost Creek ISR Project and additional mine units and other facilities that would be added under the Proposed Action (i.e., estimated life-of-mine costs).

**Table 4.14-1. Estimated Project Costs**

Item	Present Worth (U.S. dollars x 1,000)
Obtaining the right to mine (claims and permits)	13,000 <sup>1</sup>
Facility construction	68,000 <sup>2</sup>
Operation and maintenance <sup>3</sup>	139,000 <sup>4</sup>
Groundwater restoration	12,000 <sup>4</sup>
Decommissioning (including decontamination)	12,000 <sup>4</sup>
Surface reclamation	3,000 <sup>4</sup>

<sup>1</sup> Amounts previously spent

<sup>2</sup> Due to the sequential development of mine units, some of the facility construction costs are distributed throughout the life of the project, rather than concentrated during the initial project development, which has already occurred.

<sup>3</sup> Includes manpower costs during restoration

<sup>4</sup> Amounts remaining to be spent

Source: LCI 2017j

The Proposed Action would contribute to local and state economies in the form of tax revenue generated. Tax revenues would be dependent on the production of yellowcake and the cost of production.

A 4 percent severance tax of taxable market value would be levied by the State of Wyoming’s Mineral Tax Division of the Department of Revenue. Assuming an estimated production of approximately 6,500,000 pounds of U<sub>3</sub>O<sub>8</sub> from the mine units added by the Proposed Action (TREC 2016), and a market value of \$50 per pound of U<sub>3</sub>O<sub>8</sub> under extended long-term contracts already in place, the severance tax revenues generated from the Proposed Action would average approximately \$1,625,000 annually over 8 years.

Sweetwater County would receive revenue resulting from *ad valorem* production and property taxes. Assuming an estimated production of 6,500,000 pounds of U<sub>3</sub>O<sub>8</sub> from the mine units added by the Proposed Action, a market value of \$50 per pound of U<sub>3</sub>O<sub>8</sub>, and a mill levy of 67.737, the *ad valorem* tax revenues generated from the project would be approximately \$2,750,000 annually

over 8 years. Property taxes in 2017 were \$1,062,147 and are not assumed to change over the life of the project (Sweetwater County 2018b).

Actual taxes paid to the State of Wyoming would be less, since W.S. 39-14-503(vi) states that “[t]he department shall calculate the fair market value of uranium by multiplying the individual producer’s sales value of yellow cake less all royalties, ad valorem production taxes, and severance taxes multiplied by the industry factor.” In 2017, the uranium industry factor was 0.585139 (Wyoming Department of Revenue 2018). This means that the actual *ad valorem* production taxes may be about 41.5 percent less than those estimated above.

Other tax revenues would include sales and use taxes, which would result in an increase in local revenues throughout the region. The Proposed Action would contribute to local, regional, and state revenues through the purchase of goods and services and through the taxes levied on such goods and services. Sales taxes and increased demand for goods and services would support the local economy. Additional spending would result from payrolls and other ongoing expenditures. Expenditures generally multiply as the monies are circulated throughout the community several times. As described in the BLM Lost Creek EIS, money would be reinvested in area communities throughout the life of the project, including costs associated with exploration and evaluation, maintenance, sustaining capital, and routine operation. Increases in taxes and revenues would provide counties and communities with more discretionary dollars to develop infrastructure and support the population. Receipt of taxes generally lags one year behind production.

Overall, the impacts on local finances from the Proposed Action would be similar to those impacts stated in the BLM Lost Creek EIS and the NRC Lost Creek SEIS for the existing Lost Creek ISR Project. However, the Proposed Action would extend the duration of the impacts by 6 to 8 years. The NRC Lost Creek SEIS stated that the operation of the Lost Creek ISR Project would have a SMALL impact on local finances. Therefore, the Proposed Action would similarly have a SMALL impact on local finances.

#### **4.14.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or mined. The effects on socioeconomic factors would be similar to the Proposed Action on an average annual basis, but the duration would be several years less.

#### **4.15 Public and Occupational Health**

This section describes potential radiological and nonradiological impacts to public and occupational health as a result of activities associated with the Proposed Action and alternatives. As described in Section 3.11 of this EIS, the nearest residences are located in the Town of Bairoil, approximately 13 miles northeast of the project area. Uranium processing and chemical storage facilities at the Plant represent the greatest source of potential radiological and nonradiological impacts to occupational health. These are not discussed in this EIS, since impacts from the Plant were evaluated in Section 4.17 of the BLM Lost Creek EIS and Section 4.13 of the NRC Lost Creek SEIS and no changes would occur to any processes or equipment within the Plant. In addition, public and occupational health impacts associated with the yellowcake vacuum dryers were evaluated in the NRC Dryer Amendment EA, and occupational health impacts associated with the Class V UIC wells were evaluated in the NRC Class V UIC Well Amendment EA.

#### **4.15.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. The public and occupational health impacts would remain at or near current levels. Potential nonradiological impacts on public and occupational health would include fugitive dust and exposure to chemicals. Potential radiological impacts on public and occupational health would include exposure to radon gas in the Plant and the mine units. The public and occupational health impacts for the No Action Alternative are consistent with the impacts stated in Section 4.17 of the BLM Lost Creek EIS, Section 4.13 of the NRC Lost Creek SEIS, and Section 4.2.4 of the NRC Dryer Amendment EA.

As described in the NRC Class V UIC Well Amendment EA, the treatment equipment associated with the Class V UIC wells has the potential to increase the activity of alpha, beta, and gamma emitters associated with the concentrated radionuclides in the brine from the RO treatment and the radium accumulated on the resins in the ion exchange tank. Since the water treatment system is a closed system and the brine would be disposed in Class I UIC wells, the risk of exposure would be minimal.

#### **4.15.2 Proposed Action**

Applicant-committed design features considered in the public and occupational health impact analysis include the following:

- The Applicant would provide fencing and signage around each mine unit to prevent inadvertent entry by members of the public (TR Section 5.6.1, LCI 2010d).
- The Applicant would conduct routine airborne effluent and environmental monitoring to evaluate the release of radioactive effluent to the environment and to estimate doses to the public (TR Section 5.7.7, LCI 2010d).
- The Applicant would provide radiation safety training, including annual refresher training and quarterly updates for all permanent employees (TR Section 5.5, LCI 2010d).
- The Applicant would monitor radiation workers via use of dosimeters and area air sampling to ensure that radiological doses remain within regulatory limits and are ALARA (TR Section 5.7.2, LCI 2010d).
- The Applicant would protect workers from radon exposure through building ventilation, PPE, and limited exposure durations (Operations Plan Section OP 5.1.2, LCI 2011b).
- The Applicant would provide engineering and administrative controls to prevent or minimize potential impacts of chemical spills and other accident scenarios (TR Sections 7.5 and 7.6, LCI 2010d).
- The Applicant would prepare Spill Prevention and Response Plans to reduce the possibility of accidental release and provide for appropriate action in the event of a release (Operations Plan Section OP 5.0, LCI 2011b).
- The Applicant would follow NRC guidance to ensure that occupational radiation exposures would be ALARA (License SUA-1598 license condition 9.7, NRC 2016b).

- At least 12 months prior to initiation of any planned final site decommissioning, the Applicant would submit for review and approval a detailed decommissioning plan (License SUA-1598 license condition 10.3, NRC 2016b).
- SOPs for operational and non-operational activities and emergency procedures, including emergency procedures for potential accidents that are included in the current Operations Plan would be implemented for the Proposed Action (License SUA-1598 license condition 10.4, NRC 2016b).

The same type of radiological and nonradiological impacts to the public and workers would occur under the Proposed Action as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.17, pp. 4.17-1 through 4.17-11 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.13, pp. 4-91 through 4-100 (NRC 2011)
- NRC Dryer Amendment EA – Section 4.2.4, pp. 16 through 18 (NRC 2013b)
- NRC Class V UIC Well Amendment EA – Section 4.2.4, pp. 14 through 15 (NRC 2016a)

During construction, workers would be exposed to low levels of background radiation through direct exposure, inhalation or ingestion of radionuclides from well construction and construction activities that disturb surface soil, and fugitive dust from vehicular traffic. As described in Section 4.13.1.1 of the NRC Lost Creek SEIS, since the average concentration of radionuclides measured in the soil at the Lost Creek ISR Project is low, radiological impacts from inhalation of fugitive dust would not result in any significant dose to the public and workers. Diesel emissions from construction equipment could also affect the public and workers; however, exposure would be minimal since releases would be of short duration and readily dispersed into the atmosphere.

Potential worker impacts during operations would be similar to the impacts analyzed in Section 4.17.4.1 of the BLM Lost Creek EIS and Section 4.13.1.2 of the NRC Lost Creek SEIS. To evaluate the radiological impacts to the public from normal operations, the Applicant estimated the radiological emissions from all concurrent activities associated with the Proposed Action (LCI 2017k). Sources of radon that the Applicant identified and modeled included well development, Plant operation, and production and restoration bleed. The Applicant used the computer code MILDOS-AREA to model the radiological impacts on individual boundary receptors using site-specific data that included radon release estimates, meteorological, and population data. The estimated radiological impacts from routine project activities were compared to the applicable public dose limit in 10 CFR Part 20 (100 mrem/yr) and to baseline radiological conditions (Section 3.15 of this EIS). Results of the Applicant's MILDOS-AREA modeling indicate that the maximum off-site TEDE of 8.6 mrem/yr would occur at the project boundary directly north of the Plant (LCI 2017k). This calculated dose is approximately 9 percent of the 100 mrem/yr public dose limit found in 10 CFR § 20.1301. Dose calculations performed by the NRC staff using MILDOS-AREA were in agreement with the Applicant's maximum off-site dose estimate.

As required by NRC regulations and license conditions, the Applicant performs an environmental monitoring program at the Lost Creek ISR Project. The maximally exposed members of the public at the Lost Creek ISR Project are either a package delivery driver or a short-term on-site contractor. The annual calculated dose to the maximally exposed member of the public, based on actual

monitoring data, has been below the annual dose limit for members of the public. For the second half of 2017, the Applicant estimated a TEDE of 3.3 mrem/yr (approximately 3 percent of the 100 mrem/yr public dose limit found in 10 CFR § 20.1301) based on monitoring data (LCI 2018c). In comparison, Section 4.13.1.2.1 of the NRC Lost Creek SEIS describes how the maximum off-site TEDE for the Lost Creek ISR Project was 3.0 mrem/yr, based on modeling. The NRC Lost Creek SEIS concluded that overall radiological impacts on public and occupational health and safety from normal operations would be SMALL, and this is consistent with the results of environmental monitoring conducted since operations began.

Radiological impacts to public and workers from accidents were evaluated in Section 4.13.1.2.2 of the NRC Lost Creek SEIS. The accident scenarios included a thickener failure and spill and pregnant lixiviant and load ion exchange resin spills. For both accident scenarios, NRC staff concluded that impacts from potential accidents for both occupationally exposed workers and members of the public would be SMALL. In addition, Section 4.2.4 of the NRC Dryer Amendment EA indicated that the potential for accidents involving yellowcake dryers to public and occupational health would be SMALL. Since the Proposed Action does not include changes to the Plant, the accident analyses in the NRC Lost Creek SEIS and NRC Dryer Amendment EA are bounding. An accident scenario related to the Proposed Action would include a wellfield leak, the impacts from which would be minimized through monitors, alarms, an automatic emergency shutdown system, and NRC spill reporting requirements. Section 4.2 of this EIS describes the potential effects of transportation accidents involving ion exchange resin, yellowcake slurry, or dried yellowcake and concludes that there would be a low risk to public and occupational health.

Nonradiological impacts to the public and workers during normal operations and accidents are described in Sections 4.13.1.2.3 and 4.13.1.2.4 of the NRC Lost Creek SEIS, respectively. The Proposed Action would not increase the potential for exposure to hazardous and nonhazardous chemicals. The NRC Lost Creek SEIS concluded that impacts from the use of chemicals would be SMALL. Similarly, it concluded that impacts from potential accidents related to the use of chemicals for both occupationally exposed workers and members of the public would be SMALL.

Radiological and nonradiological impacts to the public and workers would be the same as those described in the BLM Lost Creek EIS, NRC Lost Creek SEIS, NRC Dryer Amendment EA, and NRC Class V UIC Well Amendment EA. NRC staff concluded that all impacts on public and occupational health and safety would be SMALL. Since public and occupational health and safety impacts under the Proposed Action would be consistent with those described in the previous analyses, impacts would continue to be SMALL. However, the duration of potential impacts would be extended by 6 to 8 years.

#### **4.15.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The nature of impacts would be the same as would occur under the Proposed Action; however, the duration of the impacts would be shorter. Overall, the potential radiological and nonradiological impacts on public and occupational health and safety related to Alternative 1 would be consistent with those occurring under the Proposed Action and would be SMALL.

## **4.16 Waste Management**

This section describes the potential waste management impacts as a result of activities associated with the Proposed Action and alternatives.

### **4.16.1 No Action Alternative**

Under the No Action Alternative, BLM would deny the Applicant's proposed modifications to the Plan of Operations and/or NRC would not approve the license amendment application. Impacts from the management of liquid and solid waste would continue as described in Section 4.18 of the BLM Lost Creek EIS and Section 4.14 of the NRC Lost Creek SEIS.

As described in the NRC Class V UIC Well Amendment EA, the treatment process associated with the Class V UIC wells would generate approximately 2 cubic yards of spent radium recovery resin per year. The resin would be disposed of as AEA-regulated solid waste at a licensed disposal facility.

### **4.16.2 Proposed Action**

Potential waste management impacts from the Proposed Action were evaluated based on the following assumptions:

- Potential waste management impacts from the Proposed Action would occur due to management and disposal of liquid and solid wastes.
- The Applicant would continue to be a conditionally exempt small quantity generator of hazardous wastes as defined in 40 CFR § 261.5.

Applicant-committed design features considered in the waste management impact analysis include the following:

- The Applicant would dispose of AEA-regulated liquid waste in Class I or Class V UIC wells, in accordance with applicable WDEQ/WQD permit conditions (Operations Plan Section OP 5.2.3, LCI 2017c).
- The Applicant would dispose of well development water and pump testing water unaffected by ISR operations under the provisions of a general WYPDES permit, in a manner that mitigates erosion, or reuse the water in drilling (Operations Plan Section OP 5.1.1.1, LCI 2011b).
- Solid AEA-regulated waste would be disposed of at a site that is authorized by the NRC or an NRC Agreement State to receive byproduct material. The Applicant is required to establish and maintain a disposal agreement with a licensed facility (License SUA-1598 license condition 9.9, NRC 2016b).
- Treated liquid byproduct material disposal in Class V UIC wells would not exceed 200 gpm and would remain within specified effluent limits (License SUA-1598 license condition 10.20, NRC 2016b).

The same type of waste management impacts would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.18, pp. 4.18-1 through 4.18-8 (BLM 2012a)

- NRC Lost Creek SEIS – Section 4.14, pp. 4-100 through 4-112 (NRC 2011)
- NRC Dryer Amendment EA – Section 4.2.5, pp. 18 through 19 (NRC 2013b)
- NRC Class V UIC Well Amendment EA – Section 4.2.5, p. 15 (NRC 2016a)

Under the Proposed Action, solid waste would include both AEA-regulated and non-AEA-regulated wastes. AEA-regulated solid waste would include scale and sludge from equipment maintenance, contaminated soil, contaminated solids from wells, contaminated PPE, spent resin and other materials resulting from ongoing Plant operations, and contaminated materials and equipment from reclamation that cannot be decontaminated to NRC unrestricted release standards. Non-AEA-regulated solid waste would include construction debris, solid hazardous waste, and decontaminated material and equipment. As described in Section 2.2.6.3 of this EIS, the Proposed Action would not change the solid waste generation rates; however, the duration would be extended by 6 to 8 years. AEA-regulated solid waste would be stored temporarily in restricted areas and then transported by truck for final disposal at a licensed disposal facility. Non-AEA-regulated solid waste would be recycled or disposed of at an appropriately permitted disposal facility, such as a landfill.

TENORM would be generated during well construction and development. It would be disposed of in mud pits constructed adjacent to the wells or discharged under a temporary WYPDES permit, as described in Section 2.2.6.3 of this EIS. The annual generation rate of TENORM would not increase under the Proposed Action, but the duration would be extended by 6 to 8 years.

AEA-regulated liquid wastes would be generated from production and groundwater restoration bleed, groundwater restoration wastewater, wastewater from injection and production well work-over and enhancement operations in the wellfield, wastewater from spills and leaks, and liquid process waste. As described in Section 2.2.6.3 of this EIS, the Proposed Action would increase the AEA-regulated liquid waste generation rate by about 1 gpm as a result of the increase in the annual yellowcake production rate. The additional liquid waste from increasing the drying production by 0.2 million pounds would minimally affect the liquid waste impacts evaluated in the NRC Dryer Amendment EA. AEA-regulated liquid waste would be disposed of in Class I UIC wells or treated for disposal in Class V UIC wells. Under the Proposed Action, the Applicant would construct up to three Class I UIC wells within the proposed LCE expansion area. The Applicant would amend its current WDEQ-WQD Class I UIC permit to include the additional wells. As described in Section 4.14.1.1.2 of the NRC Lost Creek SEIS, the WDEQ-WQD permit application review evaluates whether potential USDWs would be affected by proposed Class I UIC wells before authorizing the wells.

Non-AEA regulated liquid wastes would include liquid hazardous waste, waste petroleum products, and storm water runoff. The generation rate of non-AEA regulated liquid wastes would not increase under the Proposed Action, but the duration would be extended by 6 to 8 years. Liquid hazardous waste and waste petroleum products would be disposed of by a contracted waste disposal operator at an approved off-site waste disposal facility such as a commercial recycling facility or permitted disposal facility. Storm water runoff from construction and industrial operating activities would be discharged under WYPDES permits WYR103695 and WYR001378. The Applicant would be required to update the SWPPP.

The duration of waste management impacts would be long term, since they would last the life of the project. Section 4.14 of the NRC Lost Creek SEIS concluded that, based on the type and

quantity of expected waste generation and the availability of disposal options, the impacts related to waste management would be SMALL. Since the Proposed Action would extend the duration of the impacts without increasing the generation rates other than a small increase in AEA-regulated liquid waste, waste management impacts would continue to be SMALL.

#### **4.16.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed. The types and rates of waste generated would be the same as would occur under the Proposed Action; however, the duration of the impacts would be reduced by several years. Overall, the potential waste management impacts related to Alternative 1 would be consistent with those occurring under the Proposed Action and would be SMALL.

### **4.17 Environmental Justice**

This section describes the potential environmental justice impacts as a result of the activities associated with the Proposed Action and alternatives.

#### **4.17.1 No Action Alternative**

Under the No Action Alternative, environmental justice impacts would be consistent with the impacts stated in Section 4.16 of the BLM Lost Creek EIS and Section 4.12 of the NRC Lost Creek SEIS. Those assessments determined that there would be no disproportionately high and adverse impacts on minorities and low-income populations for the construction, operation, and reclamation of the Lost Creek ISR Project.

#### **4.17.2 Proposed Action**

Assumptions used in the analysis of environmental justice impacts include:

- The nearest residences are located in Bairoil, approximately 13 miles from the project area.

The same type and magnitude of environmental justice impacts would occur under the Proposed Action as discussed in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Section 4.16, pp. 4.16-1 through 4.16-6 (BLM 2012a)
- NRC Lost Creek SEIS – Section 4.12, pp. 4-87 through 4-91 (NRC 2011)

The detailed analyses of minority and low-income populations included in the BLM Lost Creek EIS and the NRC Lost Creek SEIS concluded that there would be no disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the project area.

Minority and low-income populations are subsets of the general public residing around the project area, and all segments would be exposed to the same health and environmental effects generated from the Proposed Action. Sections 3.14.1 and 3.14.2 of this EIS include discussions of minority and low-income populations, respectively. Additional discussion is provided in Section 3.13 of this EIS. Impacts to these segments of the population from the Proposed Action are consistent with the impacts stated in the BLM Lost Creek EIS and the NRC Lost Creek SEIS for the existing Lost Creek ISR Project. In addition, noise (see Section 4.11 of this EIS) and dust impacts (see

Section 4.10 of this EIS) would be consistent with the impacts described in the BLM Lost Creek EIS and NRC Lost Creek SEIS, although the duration would be extended by 6 to 8 years.

The NRC Lost Creek SEIS analyzed the risk of radiological exposure through the consumption patterns of special pathway receptors, including subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of plant materials. The NRC staff concluded that radiation doses through special pathway receptors from ISR facility operations are expected to be well below regulatory limits. The risk of radiation exposure from the Proposed Action would be consistent with the impacts described in the BLM Lost Creek EIS and NRC Lost Creek SEIS, although the duration would be extended by 6 to 8 years.

Based on the information provided above, and the analysis of human health and environmental impacts presented in Chapter 4 of this EIS, there would be no disproportionately high and adverse impacts on minority and low-income populations from the construction, operation, and reclamation related to the Proposed Action.

#### **4.17.3 Alternative 1 - Exclusion of the KM Horizon**

Under Alternative 1, mine units targeting the KM Horizon would not be constructed or fenced. The environmental justice effects would be similar to the Proposed Action, but the duration would be less. Consistent with the Proposed action, there would be no disproportionately high and adverse impacts on minority and low-income populations from the construction, operation, reclamation related to this alternative.

## **5.0 CUMULATIVE IMPACTS**

### **5.1 Introduction**

Cumulative impacts are defined in the CEQ regulations (40 CFR § 1508.7) as “the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.”

Cumulative impacts for the Lost Creek ISR Project were previously evaluated, as described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Chapter 5, pp. 5-1 through 5-27 (BLM 2012a)
- NRC Lost Creek SEIS – Chapter 5, pp. 5-1 through 5-68 (NRC 2011)
- Sheep Mountain Uranium Project EIS – Chapter 5, pp. 5-1 through 5-34 (BLM 2016d)
- Continental Divide-Creston Natural Gas Development Project Final EIS – Chapter 5, pp. 5-1 through 5.52 (BLM 2016g)

The following sections supplement the referenced documents with updated discussions.

#### **5.1.1 Analysis Methodology**

In assessing potential cumulative impacts, the individual resources areas and issues identified in Chapter 3 of this EIS and in Chapters 4 and 5 of the NRC Lost Creek SEIS were used to define the resource parameters evaluated in this analysis. Similarly, direct and indirect impacts identified in Chapter 4 of this EIS and in Chapters 4 and 5 of the NRC Lost Creek SEIS form the basis for the analysis in this chapter. The following describes the methodology used to assess cumulative impacts:

1. Identify the potential cumulative impact resource areas and issues associated with the Proposed Action based on the affected environment, the direct and indirect impacts of the Proposed Action, and the cumulative impacts identified in the NRC Lost Creek SEIS.
2. Identify the geographic scope for the analysis of each resource area. This scope varies by resource area and is dependent on the geographic extent over which the potential impacts may occur. For this analysis, the geographic areas are the same or slightly larger than those identified in the NRC Lost Creek SEIS, since the Proposed Action would expand the areal and vertical extents of uranium ISR at the Lost Creek ISR Project.
3. Identify the time frame for assessing cumulative impacts. In the NRC Lost Creek SEIS, cumulative impacts were considered through the expected life of the Lost Creek ISR Project, which at that time was expected to continue through 2020. For this analysis, it is assumed that the Proposed Action would extend activities through 2032.
4. At the time the NRC Lost Creek SEIS was published, the Great Divide Basin was experiencing growth due to various types of energy development activities. As stated in Section 5.6 of the NRC Lost Creek SEIS, the trend was projected to continue in the future.
5. Since the publication of the NRC Lost Creek SEIS, the mining industry in Wyoming has experienced a downturn. The Research and Planning section of the Wyoming Department

of Workforce Services projects that the jobs in the mining industry (including oil and gas) will experience a 22.5 percent decrease from 2014-2024 (Bullard 2016). The NRC Lost Creek SEIS was published in 2011, prior to the downturn, and is based on higher mining industry employment than currently predicted. Therefore, the analysis in the NRC Lost Creek SEIS and future expansion is conservative when applied to the Proposed Action. The projected growth in the mining industry in the NRC Lost Creek SEIS was compared to the projected downturn reported by the Wyoming Department of Workforce Services. Based on that comparison, it was concluded that if the projected downturn does not continue through 2032, or if growth resumes at the rates projected in the NRC Lost Creek SEIS, the mining industry activity in the region would not exceed the amounts project in the NRC Lost Creek SEIS. This is because the currently projected downturn would result in significantly lower total activity by the end of 2024 such that, even if very high growth rates resume after that period, it will take a significant amount of time for activity to recover to the rates at or above those used in the NRC Lost Creek SEIS. Therefore, the NRC Lost Creek SEIS analysis is bounding.

6. Identify other past, present, and reasonably foreseeable future actions in the area surrounding the project area that could affect the same resource areas as the Proposed Action.
7. Assess the cumulative impacts on each resource area from the Proposed Action. The cumulative impacts are the incremental effects from the Proposed Action when added to the effects from other past, present, and reasonably foreseeable future actions.
8. The cumulative impacts are described using the same significance levels (SMALL, MODERATE, and LARGE) that were used in assessing the direct and indirect impacts of the Proposed Action in Chapter 4 of this EIS.

### **5.1.2 Other Past, Present, and Reasonably Foreseeable Future Actions**

Other past, present, and reasonably foreseeable future actions considered in this analysis are described below.

- Past, existing, and potential future uranium recovery sites within the Great Divide Basin are listed in table 5-1 of the NRC Lost Creek SEIS and Sections 5.3.1 and 5.3.2 of the Sheep Mountain Uranium Project EIS. No other past or present uranium recovery projects have been identified in the Great Divide Basin. Some of the potential future uranium recovery sites listed in the NRC Lost Creek SEIS and Sheep Mountain Uranium Project EIS are currently not being pursued due to low uranium prices. However, they are still considered as reasonably foreseeable future actions that could be developed if uranium prices increase.
- Existing surface coal mines and one potential future coal mine within the Great Divide Basin are described in Section 5.1.1.2 of the NRC Lost Creek SEIS. No other past, present, or reasonably foreseeable future actions associated with surface or underground coal mines have been identified in the Great Divide Basin. According to the Wyoming State Geological Survey, Wyoming experienced a 21 percent decrease in coal production between 2015 and 2016 and an 11 percent decrease in coal mining employment from March through December 2016 (WSGS 2018). Although Wyoming coal production rebounded in 2017, it was still below 2015 levels. This supports the conclusion that the

NRC Lost Creek SEIS, which projected a potential increase in coal mining in the area, provides a bounding analysis of the potential cumulative impacts from coal mining and related employment in this EIS.

- Other coal-related development within the Great Divide Basin is described in Section 5.1.2.3 of the BLM Lost Creek EIS. This includes a pilot underground coal gasification project that was conducted in the 1990s about 10 miles west of Rawlins. No other past, present, or reasonably foreseeable future actions associated with other coal-related development (other than mining and CBNG extraction) have been identified within the Great Divide Basin.
- Section 5.1.2.2 of the BLM Lost Creek EIS and Section 5.3.2 of the Sheep Mountain Uranium Project EIS describe the past, existing, and potential future oil and gas projects within the Great Divide Basin, including CBNG. In addition, table 5.0-1 of the Continental Divide-Creston Natural Gas Development Project EIS lists natural gas and oil projects that are ongoing and reasonably foreseeable future actions within south-central Wyoming. No other past, present, or reasonably foreseeable future actions associated with oil and gas development have been identified in the Great Divide Basin.
- Section 5.1.2.4 of the BLM Lost Creek EIS, Section 5.1.1.5 of the NRC Lost Creek SEIS, and Section 5.4.15 of the Sheep Mountain Uranium Project EIS describe past, existing, and potential future wind power generation projects within the Great Divide Basin and south-central Wyoming. Rocky Mountain Power (2018) issued a press release indicating plans to construct a 500 MW wind project in Carbon and Albany counties and a 250 MW wind project in Carbon County. Pending regulatory approval and acquisition of rights of way, construction of the new wind projects is expected to begin in 2019. No other past, present, or reasonably foreseeable future actions associated with wind power generation projects have been identified in the Great Divide Basin.
- Past, existing, and potential future transmission line projects in the region are described in Section 5.1.2.5 of the BLM Lost Creek EIS and Section 5.4.15 of the Sheep Mountain Uranium Project EIS. In addition, table 5.0-1 of the Continental Divide-Creston Natural Gas Development Project EIS lists ongoing transmission line projects and reasonably foreseeable future projects within south-central Wyoming. No other past, present, or reasonably foreseeable future transmission line projects have been identified in the Great Divide Basin.

## **5.2 Land Use**

The geographic study area considered for the analysis of cumulative land use impacts is the same as evaluated in Section 5.2 of the NRC Lost Creek SEIS. This consists of the Great Divide Basin and the RFO planning area (see figure 5-3 in the NRC Lost Creek SEIS). The total area of the cumulative impact land use study area is 18,835 square miles. It includes a portion of Sweetwater County, a portion of Carbon County, a portion of Fremont County, and all of Albany and Laramie counties. The NRC Lost Creek SEIS states that the land use cumulative impacts study area was selected to include the Great Divide Basin, which contains numerous energy development projects that either have or are likely to affect land use, and the BLM RFO planning area, for which BLM developed land use data and land use planning and management direction within the Rawlins RMP

(BLM 2008a). For these reasons, the same land use cumulative impacts study area is appropriate for this EIS.

Past, present, and reasonably foreseeable future actions considered in the NRC Lost Creek SEIS as part of the land use cumulative impact analysis included: (i) livestock grazing, (ii) oil and gas development, (iii) coal production, and (iv) uranium recovery. The NRC staff determined that the Lost Creek ISR Project would have a SMALL incremental effect on land use when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions. This conclusion was based on the fact that the Lost Creek ISR Project would disturb only a small percentage of the land that either has been or was projected to be disturbed by the identified projects within the land use study area, project fencing would be incremental over the life of the project, and fencing would be removed and the land reclaimed in accordance with BLM and WDEQ-LQD requirements.

Section 4.1 of this EIS describes how the Proposed Action would add up to 1,415 acres of disturbance within the project area. When added to the approximately 345 acres of disturbance associated with the currently authorized Lost Creek ISR Project, the total surface disturbance within the project area would be up to about 1,760 acres. In comparison, the NRC Lost Creek SEIS states that the cumulative disturbance from past, present, and reasonably foreseeable future actions within the land use cumulative impacts study area could be as much as 57,346 acres. Since the area disturbed by the Proposed Action is a small percentage (3 percent) of the cumulative land disturbance within the land use cumulative impacts study area and since all fencing would be removed and the land reclaimed, the Proposed Action would have a similarly SMALL incremental effect on land use when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If not all of the potential future oil and gas, coal mining, and uranium mining projects identified in the NRC Lost Creek SEIS are developed due to the downturn in the Wyoming mining industry, the Proposed Action disturbance could make up a larger percentage of the cumulative land disturbance within the land use cumulative impacts study area. However, this would not affect the incremental impact from the Proposed Action (up to 1,760 acres of disturbance out of 18,835 square miles in the land use cumulative impacts study area). It is also unlikely that the downturn would change the determination that other past, present, and reasonably foreseeable future actions would have MODERATE cumulative impacts within the study area.

### **5.3 Transportation**

The geographic study area considered for the analysis of cumulative transportation impacts is the same as that evaluated in Section 5.3 of the NRC Lost Creek SEIS, consisting of Sweetwater, Fremont, Natrona, and Carbon counties. This geographic area was selected for the NRC Lost Creek SEIS because major transportation routes within the region (including Interstates and/or U.S. highways) occur within the four counties. Since the transportation routes associated with the Proposed Action are the same as those evaluated in the NRC Lost Creek SEIS, the same transportation cumulative impacts study area is appropriate for this EIS.

Past, present, and reasonably foreseeable future impacts on transportation resources would be the same as those discussed in the NRC Lost Creek SEIS, except that impacts associated with the Sheep Mountain Uranium Project were not included in that analysis. As described in Section 4.4.6.1 of the Sheep Mountain Uranium Project EIS, on-site processing would result in 27 to 115

vehicle round trips per day, whereas off-site processing at the Sheep Mountain Uranium Project would result in 53 to 181 vehicle round trips per day. The Sheep Mountain Uranium Project EIS concluded that project vehicles in either case would create a notable increase in traffic on Wamsutter-Crooks Gap Road (CR 23). The Sheep Mountain Uranium Project would have a MODERATE impact on Wamsutter-Crooks Gap Road; however, the regional impact from that project would be SMALL.

In the NRC Lost Creek SEIS, NRC staff concluded that the Lost Creek ISR Project would result in up to 70 to 188 vehicle round trips per day and, thus, would have a SMALL incremental effect on the MODERATE cumulative impacts to transportation resulting from past, ongoing, and future ISR projects, CBNG projects, other oil and gas operations, surface coal mining activities, and other development with transportation requirements within the transportation cumulative impact study area.

Section 4.2 of this EIS describes how the Proposed Action would add up to 0.2 truck shipment (vehicle round trips) per day, which would result in a SMALL impact on the regional road network. Since the Proposed Action would only slightly increase the number of material shipments, it would have a SMALL incremental effect on the MODERATE cumulative impacts to transportation expected from other past, present, and reasonably foreseeable future actions in the cumulative impact analysis area. The determination in the NRC Lost Creek SEIS that the cumulative transportation impacts resulting from other past, present, and reasonably foreseeable future projects would be MODERATE is bounding for this EIS, since not all of the other past, present, and reasonably foreseeable future projects identified in the NRC Lost Creek SEIS may be developed due to the downturn in the Wyoming mining industry.

#### **5.4 Geology and Soils**

The geographic study area considered for the analysis of cumulative geology and soils impacts is the same as that evaluated in Section 5.4 of the NRC Lost Creek SEIS. It is the Crooks Gap Uranium District, which includes portions of northeastern Sweetwater and southeastern Fremont counties. This geographic area was selected because it includes the project area and similar geologic units with uranium mineralization.

The past, present, and reasonably foreseeable future actions in the geology and soils cumulative impacts study area evaluated in the NRC Lost Creek SEIS included (i) non-energy related activities such as grazing, herd management, and recreation (hunting); (ii) mineral exploration and production (predominantly uranium recovery); and (iii) extraction of energy resources such as coal, oil, natural gas, and CBNG. Of these, livestock grazing was found to be the primary non-energy related past, present, and reasonably foreseeable future land use in the vicinity. NRC staff determined that the most likely way that grazing could contribute to potential cumulative impacts to geology and soils within the cumulative impacts study area would be through the settling of fugitive dust emissions associated with increased traffic on unpaved roads. NRC staff concluded that the potential cumulative impact of fugitive dust settling on soil from other past, present, and reasonably foreseeable future actions would be SMALL. NRC staff also indicated that the incremental impacts to soil from the deposition of fugitive dust emissions associated with the Lost Creek ISR Project would be SMALL when compared with dust deposited in the area used for rangeland grazing.

The NRC Lost Creek SEIS also evaluated the cumulative geology and soils impacts from energy-related activities including coal, oil, natural gas, and CBNG. NRC staff concluded that the cumulative geology and soils impacts from these energy-related activities would be SMALL, based on limited activity in the cumulative impact study area and the distance from energy-related activities to the study area. The NRC Lost Creek SEIS indicated that the most likely potential contributor to cumulative impacts on geology and soils would be development of other uranium deposits within the Crooks Gap Uranium District. However, since these uranium projects would be required to comply with NRC and WDEQ regulatory requirements for mining and reclamation, the NRC staff concluded that the Lost Creek ISR Project would have a SMALL incremental effect on geology and soils when added to the SMALL cumulative impacts from other past, present, and reasonably foreseeable future actions. The previous determination that other past, present, and reasonably foreseeable future actions would have SMALL cumulative impacts is valid even if some the potential future uranium projects identified in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry.

Potential geology and soils impacts from the Proposed Action are described in Sections 4.3 and 4.4 of this EIS, respectively. Since the Proposed Action is an extension of existing activities, the impacts to geology and soils would continue to be SMALL. Therefore, the Proposed Action would have a similarly SMALL incremental effect on geology and soils when added to the SMALL cumulative impacts from other past, present, and reasonably foreseeable future actions.

## **5.5 Water Resources**

### **5.5.1 Surface Water and Wetlands**

The geographic study area considered for the analysis of cumulative surface water and wetlands impacts is the same as that evaluated in Section 5.5.1 of the NRC Lost Creek SEIS. The area is delineated by a 50-mile radius surrounding the Lost Creek ISR Project, which encompasses most of the Great Divide Basin (a closed hydrologic basin with no surface water outflow to the surrounding areas). It includes the project area watersheds, watersheds downstream from these areas, and Battle Spring Flat and Chain Lakes Flat, into which the project area watersheds drain.

NRC staff concluded in the NRC Lost Creek SEIS that based on the ephemeral nature of the streams in the Great Divide Basin, the cumulative impacts on surface water and wetlands from past, present, and reasonably foreseeable future actions within the surface water cumulative impacts study area would be SMALL. Other past, present, and reasonably foreseeable future actions considered in the NRC Lost Creek SEIS include CBNG production, other oil and gas development, minerals extraction, other ISR and conventional uranium milling, and rangeland grazing. NRC staff concluded that the Lost Creek ISR Project would have a SMALL incremental impact on surface water and wetlands when added to the SMALL cumulative impacts anticipated from other past, present, and reasonably foreseeable future actions in the surface water cumulative impacts study area.

As described in Section 4.5 of this EIS, the potential impacts to surface water quantity and quality from the Proposed Action would be consistent with those evaluated for the Lost Creek ISR Project. In addition, the USACE verified that an application for a jurisdictional determination is not necessary since no waters of the U.S. have been identified in the Great Divide Basin. Therefore, the Proposed Action would have a SMALL incremental impact on surface water and wetlands when added to the SMALL cumulative impacts from other past, present, and reasonably

foreseeable future actions. The previous determination that other past, present, and reasonably foreseeable future actions would have SMALL cumulative impacts is valid even if some the potential future projects identified in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry.

### **5.5.2 Groundwater**

The geographic study area considered for the analysis of cumulative groundwater impacts is the same as evaluated in Section 5.5.2 of the NRC Lost Creek SEIS. This consists of potentially affected surface waters and a portion of the Lower Tertiary aquifer, specifically the aquifer within the Battle Spring Formation within the Great Divide Basin. Since the uranium production horizons and overlying and underlying water-bearing horizons associated with the Proposed Action are all in the Battle Spring Formation, the same groundwater cumulative impacts study area is used for this EIS.

The NRC Lost Creek SEIS calculated a total consumptive use of water from the Battle Spring aquifer within the groundwater cumulative impacts study area. Other past, present, and reasonably foreseeable future actions considered in the NRC Lost Creek SEIS included existing water supply wells (mostly stock watering wells), other ISR projects, and a conventional uranium mill (Kennecott's Sweetwater Uranium Mill). The NRC Lost Creek SEIS determined that when the SMALL impact from the Lost Creek ISR Project is added to anticipated consumptive groundwater use from other past, present, and reasonably foreseeable future actions, the potential groundwater cumulative impacts within the Battle Springs Formation in the Great Divide Basin would be MODERATE. Regarding groundwater quality, the NRC staff determined that the Lost Creek ISR Project would have a SMALL incremental impact on groundwater quality when added to the SMALL cumulative impacts on groundwater quality from other past, present, and reasonably foreseeable future actions.

Section 4.6 of this EIS indicates that impacts to groundwater quantity and quality from the Proposed Action would be SMALL. Groundwater quality within the project area would be restored in accordance with license conditions. Following completion of the project, groundwater levels within the project area would recover with time. Therefore, the Proposed Action would have a SMALL incremental impact on groundwater quantity and quality in the Battle Spring Formation when added to the MODERATE groundwater quantity and SMALL groundwater quality cumulative impacts from other past, present, and reasonably foreseeable future actions.

If other past, present, and reasonably future actions considered in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry, the cumulative groundwater quantity impacts from other past, present, and reasonably foreseeable future actions could be reduced. Specifically, much of the groundwater consumptive use evaluated in the NRC Lost Creek SEIS was tied to other ISR and conventional uranium milling projects. If these projects are not developed, the cumulative groundwater quantity impacts from other past, present, and reasonably future actions could be reduced from MODERATE to SMALL; however, the Proposed Action would still have a SMALL incremental impact due to the recovery of groundwater levels following completion of the project. Therefore, the NRC Lost Creek SEIS is a bounding analysis of potential cumulative groundwater resources impacts for this EIS.

## **5.6 Ecological Resources**

The geographic study area considered for the analysis of cumulative ecological resources impacts is the same as evaluated in Section 5.6 of the NRC Lost Creek SEIS. This includes the Great Divide Basin, which is a closed drainage basin characterized primarily by big sagebrush shrubland habitat similar to that within the project area.

### **5.6.1 Terrestrial Ecology**

In Section 5.6.1 of the NRC Lost Creek SEIS, the NRC staff concluded that the cumulative impact on terrestrial ecology within the study area resulting from other past, present, and reasonably foreseeable future actions would be MODERATE. The activities considered in the NRC Lost Creek SEIS included grazing and herd management, hunting, other recreational activities, and mineral exploration. The projected amount of land disturbance from these activities would negatively affect habitat and vegetation by promoting spread of noxious weeds and fragmenting vegetative communities. In addition, species of nongame/migratory birds, raptors, and sage-grouse would experience impacts due to loss, alteration, or incremental fragmentation of habitat; various stresses associated with human disturbance; and direct or indirect mortalities.

Section 4.7 of this EIS indicates that during the construction phase the impacts to vegetation would be MODERATE, whereas vegetation impacts from operation and restoration would be SMALL. Potential wildlife impacts from the Proposed Action are described in Section 4.8 of this EIS. Potential impacts to Greater sage-grouse would be MODERATE, while potential impacts to general wildlife, raptors, T&E species, and other species of special interest would be SMALL. When added to the approximately 345 acres of disturbance associated with the currently authorized Lost Creek ISR Project, the total surface disturbance would be up to about 1,760 acres. In comparison, the NRC Lost Creek SEIS states that the cumulative disturbance from other past, present, and reasonably foreseeable future actions within the ecological resources cumulative impacts study area could be as much as 57,346 acres. Based on this evaluation, the Proposed Action would have a SMALL incremental impact on terrestrial ecology when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If not all of the potential future oil and gas, coal mining, and uranium mining projects identified in the NRC Lost Creek SEIS are developed due to the downturn in the Wyoming mining industry, the Proposed Action disturbance could make up a larger percentage of the cumulative land disturbance within the ecological resources cumulative impacts study area. However, this would not affect the incremental impact from the Proposed Action (up to 1,760 acres of disturbance out of 3,500 square miles in the ecological resources cumulative impacts study area). It is also unlikely that the downturn would change the determination that other past, present, and reasonably foreseeable future actions would have MODERATE cumulative impacts within the study area.

### **5.6.2 Aquatic Ecology**

In Section 5.6.2 of the NRC Lost Creek SEIS, the NRC staff concluded that the cumulative impact on aquatic ecology within the study area resulting from other past, present, and reasonably foreseeable future actions would be SMALL to MODERATE. While the majority of the Great Divide Basin is characterized by ephemeral or seasonal surface water features offering no or limited aquatic habitat, there is the potential for development-related impacts to aquatic habitat

associated with the unique alkaline desert lake systems within the Chain Lakes Wildlife Management Area.

Section 4.8 of this EIS describes how there are no aquatic species present within the project area. Therefore, there would be no potential aquatic ecology impacts resulting from the Proposed Action. The Proposed Action would not have an incremental impact on aquatic ecology when added to the SMALL to MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions. The SMALL to MODERATE range of cumulative impacts evaluated in the NRC Lost Creek SEIS is not expected to change whether or not fewer future projects are developed due to the downturn in the Wyoming mining industry.

### **5.6.3 Federally Listed Species**

In Section 5.6.3 of the NRC Lost Creek SEIS, the NRC staff evaluated the cumulative impacts on federally listed (T&E) species within the study area resulting from other past, present, and reasonably foreseeable future actions. The NRC staff determined that impacts would range from SMALL to LARGE for these species.

As described in Section 4.8 of this EIS, according to the most current list of USFWS-designated T&E species with the potential of occurring in the area, no T&E vertebrate species are known to occur in the project area and the USFWS has not designated critical habitat for any T&E species in the vicinity of the project area at this time. Therefore, the cumulative impacts to T&E species would be SMALL.

## **5.7 Air Quality**

The geographic area considered for the analysis of cumulative air quality impacts is the same as that evaluated in Section 5.7 of the NRC Lost Creek SEIS. This is delineated by a 100-mile radius around the Lost Creek ISR Project, with particular emphasis on areas within the path of the predominant wind direction. This air quality cumulative impacts study area was determined by NRC staff based on other regional air modeling studies addressing larger scale emission sources applicable to oil and gas activities, CBNG production, and conventional coal mining, which suggested that the region of influence for air emissions could range from about 37 to 150 miles.

As described in the NRC Lost Creek SEIS, the cumulative impact analysis focused on fugitive dust and nitrogen oxide emissions. The NRC staff calculated the cumulative fugitive road dust within the air quality cumulative impacts study area and concluded that fugitive dust would be spatially dispersed and would not represent a single point source. In addition, since fugitive road dust settles a short distance from the unpaved road surface, the cumulative effects of fugitive dust emissions on regional air quality were not evaluated. For nitrogen oxide emissions, the NRC staff concluded that air quality impacts from the Lost Creek ISR Project would have a SMALL incremental effect when added to the MODERATE cumulative air quality impacts from existing activities and reasonably foreseeable future actions. The NRC staff also concluded that the potential impact of GHG emissions from the Lost Creek ISR Project would be SMALL. Overall, the NRC staff concluded that the Lost Creek ISR Project would have a SMALL incremental effect when added to the MODERATE cumulative air quality impacts resulting from other past, present, and reasonably foreseeable future actions.

As described in Section 4.10 of this EIS, the Proposed Action would have a SMALL impact on air quality, including fugitive dust and diesel engine emissions. Therefore, the Proposed Action would

have a SMALL incremental impact on air quality when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If other past, present, and reasonably future actions considered in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry, the cumulative air quality impacts from other past, present, and reasonably foreseeable future actions could be reduced. However, the Proposed Action would still have a SMALL incremental impact due to the small emissions generated from uranium ISR. Therefore, the NRC Lost Creek SEIS is a bounding analysis of the potential cumulative air quality impacts for this EIS.

## **5.8 Noise**

The geographic study area considered for the analysis of cumulative noise impacts in Section 5.8 of the NRC Lost Creek SEIS included a 5-mile radius around the existing Lost Creek ISR Project area. The NRC Lost Creek SEIS stated that the 5-mile radius was chosen because noise attenuates quickly with distance from the source. For the same reason, the analysis in this EIS designates a 5-mile radius around the project area (existing Lost Creek ISR Project area and proposed LCE expansion area) for the noise cumulative impacts study area.

NRC staff concluded in the NRC Lost Creek SEIS that the Lost Creek ISR Project would have a SMALL incremental impact on noise when added to the SMALL cumulative impacts expected from other past, present, and reasonably foreseeable future actions in the study area. The other noise sources evaluated within the noise cumulative impacts study area include operating heavy equipment and traffic noise associated with energy extraction. NRC staff also considered the potential noise impacts along lightly traveled highways that pass through smaller towns (Bairoil, Jeffrey City) and concluded that traffic associated with the Lost Creek ISR Project would have a temporary and MODERATE incremental impact on noise when added to the MODERATE cumulative impacts expected from other past, present, and reasonably foreseeable future actions.

Past, present, and reasonably foreseeable future noise impacts would be the same as those discussed in the NRC Lost Creek SEIS, except that impacts associated with the Sheep Mountain Uranium Project were not included in that analysis. As described in Section 5.3 of this EIS, the Sheep Mountain Uranium Project would have a MODERATE impact on the traffic and related noise on the Wamsutter-Crooks Gap Road. However, this does not change the determination that other past, present, and reasonably foreseeable future actions would have a SMALL to MODERATE cumulative noise impact within the study area.

As described in Section 4.11 of this EIS, the Proposed Action would have a SMALL impact on noise at the nearest residences and a MODERATE noise impact on communities located along transportation routes. Therefore, the Proposed Action would have a SMALL to MODERATE incremental impact on noise when added to the SMALL to MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If other past, present, and reasonably future actions considered in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry, the cumulative noise impacts from other past, present, and reasonably foreseeable future actions could be reduced, particularly noise associated with traffic. If these projects are not developed, the cumulative noise impacts from other past, present, and reasonably future actions could be reduced from MODERATE to SMALL; however, the Proposed Action would still have a SMALL incremental impact due the small

increase in truck shipments. Therefore, the NRC Lost Creek SEIS is a bounding analysis of potential cumulative noise impacts for this EIS.

## **5.9 Historic and Cultural Resources**

The geographic study area considered for the analysis of cumulative historic and cultural resources impacts is the same as that evaluated in Section 5.9 of the NRC Lost Creek SEIS, which is the same study area used for the land use analysis (Section 5.2 of this EIS). The total area of the historic and cultural resources cumulative impacts study area is 18,835 square miles. It includes a portion of Sweetwater County, a portion of Carbon County, a portion of Fremont County, and all of Albany and Laramie counties. The NRC Lost Creek SEIS states that the study area was selected since it includes the Great Divide Basin, within the project area is located, and the planning area of the BLM RFO, whose charter includes land management. For the same reasons, this study area is appropriate for this EIS.

The NRC Lost Creek SEIS indicated that any potential impacts to historic and cultural resources would likely be minimized for projects occurring on federal lands, licensed or permitted by federal agencies, or which are licensed or funded in part by the government, because these projects would be subject to the NHPA Section 106 consultation process and applicable federal and state statutes. It also indicated that the greatest cumulative impact to cultural resources would be from development activities occurring on private or state lands with no federal jurisdiction. Based on this, the NRC staff concluded that the cumulative impact to historic and cultural resources within the study area from other past, present, and reasonably foreseeable future actions would be MODERATE. In addition, the NRC staff concluded that the Lost Creek ISR Project would have a MODERATE incremental impact on historic and cultural resources, which would be noticeable but not destabilizing to the historic and cultural resources within the study area and would not change the MODERATE cumulative impact finding.

Section 4.12 of this EIS indicates that since the eligible site within the project area would be avoided, potential impacts to historic and cultural resources from the Proposed Action would be SMALL. Based on this, the Proposed Action would have a SMALL incremental impact on historic and cultural resources when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If other past, present, and reasonably future actions considered in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry, the cumulative historic and cultural resources impacts from other past, present, and reasonably foreseeable future actions could be reduced. If these projects are not developed, the cumulative historic and cultural resources impacts from other past, present, and reasonably future actions could be reduced from MODERATE to SMALL; however, the Proposed Action would still have a SMALL incremental impact. Therefore, the NRC Lost Creek SEIS is a bounding analysis of potential cumulative historic and cultural resources impacts for this EIS.

## **5.10 Visual and Scenic Resources**

The geographic study area considered for the analysis of cumulative visual resources impacts is consistent with that evaluated in Section 5.10 of the NRC Lost Creek SEIS. The SEIS analysis designated a 12-mile radius around the existing Lost Creek ISR Project area, whereas the analysis in this EIS includes a 12-mile radius around the project area. The 12-mile radius was selected by

the NRC staff since it represents the maximum line of sight (taking into account the curvature of the earth) on a flat plane for a structure with a height of about 100 feet above the surroundings. In the NRC Lost Creek SEIS, the NRC staff indicated that this was a conservative estimate for the Great Divide Basin, since the rolling topography in the basin would further reduce the distance over which tall structures would be visible.

The NRC Lost Creek SEIS concluded that cumulative impacts to visual and scenic resources from other past, present, and reasonably foreseeable future actions would be SMALL to MODERATE. The past, ongoing, and reasonably foreseeable future actions evaluated in the SEIS included mineral exploration and production (predominantly uranium) and extraction of energy resources such as coal, oil, natural gas, and CBNG. The NRC staff concluded that the SMALL incremental impacts to visual and scenic resources from the Lost Creek ISR Project would not likely contribute a perceptible increase to the SMALL viewshed impacts within 12 miles of the existing Lost Creek ISR Project area when added to other past, present, and reasonably foreseeable future actions. This conclusion was based on (i) the existing classification of the viewshed as VRM Class III; (ii) the lack of significant oil, gas, coal, and CBNG resources within 12 miles; (iii) the relatively low profile of the buildings; (iv) mitigation measures to reduce the contrast of the structures with the existing visual inventory; and (v) the longer time frames that would be necessary to license and bring nearby uranium properties into production.

As described in Section 3.13 of this EIS, the RFO portion of the project area was reclassified to VRM Class IV in 2011, which allows for major modifications of the existing character of the landscape. Section 4.13 of this EIS describes how the potential visual resource impacts from the Proposed Action would be SMALL. Therefore, the Proposed Action would have a SMALL incremental effect on visual resources when added to the SMALL to MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions. The previous determination that other past, present, and reasonably foreseeable future actions would have SMALL to MODERATE cumulative impacts is valid even if some the potential future projects identified in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry.

## **5.11 Socioeconomics**

As described in Section 4.14 of this EIS, the Proposed Action would not add any employees and therefore, cumulative impacts on employment, education, and public services would be consistent with those described in the NRC Lost Creek SEIS and are not further evaluated in this EIS.

### **5.11.1 Temporary Housing**

The geographic study area considered for the analysis of cumulative temporary housing impacts is the same as that evaluated in Section 5.11.2 of the NRC Lost Creek SEIS. This area consists of Sweetwater, Fremont, Natrona, and Carbon counties. If construction of all or some of the ongoing or reasonably foreseeable future actions were to overlap concurrently, there would be a MODERATE cumulative impact on temporary housing. As described in Section 4.14.2, the Proposed Action would use 2 percent or less of the total temporary housing in Carbon County. Therefore, the Proposed Action would have a SMALL incremental impact on temporary housing when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If other ongoing and reasonably future actions are not developed due to the downturn in the Wyoming mining industry, the cumulative impacts on temporary housing from other past, present, and reasonably foreseeable future actions could be reduced from MODERATE to SMALL; however, the Proposed Action would still have a SMALL incremental impact.

### **5.11.2 Local Finance**

The geographic study area considered for the analysis of cumulative local finance impacts is the same as that evaluated in Section 5.11.5 of the NRC Lost Creek SEIS, namely Sweetwater County, because that is where most of the tax revenue would accrue. The NRC staff concluded that with the projected growth in oil and gas, CBNG, and uranium extraction expected in Sweetwater County, there would be a MODERATE cumulative impact on local finance. Given that the Lost Creek ISR Project was at the time only one of the numerous potential future projects, contributions from the Lost Creek ISR Project were determined to have a SMALL incremental impact on local finance.

Section 4.14 of this EIS indicates that the Proposed Action would have a SMALL impact on local finance, which is consistent with the finding in the NRC Lost Creek SEIS. Therefore, the Proposed Action would have a SMALL incremental impact on local finance when added to the MODERATE cumulative impacts from other past, present, and reasonably foreseeable future actions.

If other past, present, and reasonably future actions considered in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry, the cumulative impacts on local finance from other past, present, and reasonably foreseeable future actions could be reduced. If these projects are not developed, the cumulative impacts on local finance from other past, present, and reasonably future actions could be reduced from MODERATE to SMALL; however, the Proposed Action would still have a SMALL incremental impact.

## **5.12 Public and Occupational Health**

The geographic study area considered for the analysis of cumulative public and occupational health and safety impacts is the same as that evaluated in Section 5.13 of the NRC Lost Creek SEIS, consisting of a 50-mile radius around the Lost Creek ISR Project. The 50-mile radius is the standard bounding geographic area used by NRC staff to evaluate population doses from releases at ISR facilities.

The NRC Lost Creek SEIS concluded that due to the remote, sparsely populated area with limited public access, the exposure to members of the public would be limited. In addition, occupational health hazards would be limited because licensees are required to implement an NRC-approved radiation protection program to protect occupational workers and would follow standard industrial safety standards and practices. Based on this, the NRC staff concluded that the cumulative impact on public and occupational health within a 50-mile radius of the Lost Creek ISR Project from other past, present, and reasonably foreseeable future actions (including former, current [on standby], and potential future uranium recovery facilities) would be SMALL. The NRC staff also concluded that the Lost Creek ISR Project would have a SMALL incremental impact on public and occupational health and safety when added to the SMALL cumulative impacts expected from other past, present, and reasonably foreseeable future actions.

As described in Section 4.15 of this EIS, impacts to public and occupational health and safety under the Proposed Action would be SMALL. Therefore, the Proposed Action would have a similarly SMALL incremental effect on public and occupational health and safety when added to the SMALL cumulative impacts from other past, present, and reasonably foreseeable future actions. The previous determination that other past, present, and reasonably foreseeable future actions would have SMALL cumulative impacts is valid even if some the potential future projects identified in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry.

### **5.13 Waste Management**

The geographic study area considered for the analysis of cumulative waste management impacts is the same as that evaluated in Section 5.14 of the NRC Lost Creek SEIS. This area is defined by the Crooks Gap Uranium District and the Gas Hills Uranium District. This boundary was identified by the NRC staff since it includes facilities that would generate solid, hazardous, or radioactive wastes that would likely use some of the same disposal facilities as the Lost Creek ISR Project.

NRC staff concluded in the NRC Lost Creek SEIS that based on the assumption that the Applicant would obtain the necessary permits and contractual agreements for disposing of its byproduct wastes, the incremental impacts on waste management from the Lost Creek ISR Project would be SMALL. NRC staff also concluded that based on the disposal options available now and in the future for the wastes that would be generated over the facility lifecycle, and the disposal agreement that NRC requires prior to operations for disposal of solid byproduct wastes, the SMALL incremental impacts are not likely to contribute to a perceptible increase in the SMALL cumulative impacts to waste management in the study area resulting from other past, present, and reasonably foreseeable future actions.

Section 4.16 of this EIS indicates that although the Proposed Action would extend the duration of the waste management impacts, the generation rates would not increase (other than a small increase in AEA-regulated liquid waste). Therefore, waste management impacts would be SMALL. Since the Proposed Action would not increase the waste generation rates, it would have a SMALL incremental effect on the SMALL cumulative waste management impacts expected from other past, present, and reasonably foreseeable future actions. The previous determination that other past, present, and reasonably foreseeable future actions would have SMALL cumulative impacts is valid even if some the potential future projects identified in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry.

### **5.14 Environmental Justice**

The geographic study area considered for the analysis of cumulative environmental justice impacts is the same as that evaluated in Section 5.12 of the NRC Lost Creek SEIS. This area consists of Sweetwater, Carbon, Fremont, and Natrona counties. It includes the county in which the project area is located (Sweetwater County), the county containing Rawlins, which is the nearest city and source of mining services, retail, and business and customer service establishments (Carbon County), and two nearby counties potentially affected by transportation and employment from the Lost Creek ISR Project (Fremont and Natrona counties). Fremont County also contains the nearest minority and low-income population, which is on the Wind River Indian Reservation in northern Fremont County. The Wind River Indian Reservation is more than 100 roads miles from the project area.

The NRC Lost Creek SEIS stated that there are no concentrations of people living below the poverty level or minority populations located near the Lost Creek ISR Project. Based on this, the NRC staff concluded that the potential for incremental, disproportionately high and adverse impacts to environmental justice populations from past, present, or reasonably foreseeable future development within the study area would be SMALL. The NRC staff also concluded that the Lost Creek ISR Project would have a SMALL incremental effect on environmental justice issues when considered with other past, present, and reasonably foreseeable actions.

Section 4.17 of this EIS indicates that the Proposed Action would not result in any disproportionately high or adverse impacts on minority or low-income populations. Therefore, the Proposed Action would have a SMALL incremental effect on environmental justice when added to the SMALL cumulative impacts from other past, present, or reasonably foreseeable future actions. The previous determination that other past, present, and reasonably foreseeable future actions would have SMALL cumulative impacts is valid even if some the potential future projects identified in the NRC Lost Creek SEIS are not developed due to the downturn in the Wyoming mining industry.

## **6.0 CONSULTATION AND COORDINATION**

This chapter provides a list of agencies and organizations consulted, a brief history of the public involvement undertaken for the preparation of this EIS, a list of the preparers with their expertise, and a list of recipients of this EIS.

### **6.1 Consultation**

The consultation processes for the previous NEPA evaluations for the Lost Creek ISR Project are thoroughly described in the following documents, and these specific sections are incorporated by reference:

- BLM Lost Creek EIS – Chapter 6, pp. 6-1 through 6-5 (BLM 2012a)
- NRC Lost Creek SEIS – Section 1.7, pp. 1-9 through 1-15 (NRC 2011)

Notifications of the scoping process for this NEPA evaluation were published in the Federal Register (80 FR 55149) and in local newspapers, and were posted on the BLM and NRC project websites. EPA, USFWS, State of Wyoming, WGFD, state and local government representatives, Native American Tribes, local media, and interested organizations and individuals received a public scoping notification (postcard invitation) via mail (BLM 2017f).

Coordination and consultation activities were initiated through the scoping process, which is described in the Scoping Report for this EIS (BLM 2017f). The scoping report contains a list of the 125 agencies, tribes, counties, municipalities, conservation districts, non-governmental organizations, grazing associations, and individuals contacted. These were selected for the coordination and consultation process due to jurisdiction, special expertise, or potential interest in the EIS development process. USFWS, EPA Region 8, Wyoming Department of Agriculture, Carbon County Commissioners, Sweetwater County Commissioners, Fremont County Commissioners, and Sweetwater County Conservation District agreed to participate as cooperating agencies.

Section 1.6 of this EIS provides a description of the consultation and coordination process undertaken for this EIS. No consultation with the USFWS under Section 7(a)(2) of the ESA was required, since there is no effect to endangered or threatened species or designated critical habitats within the project area. The BLM initiated consultation with Native American Tribes under Section 106 of the NHPA in October and December 2015 (BLM 2015b, 2015c, 2015d). None of the Tribes responded to the invitation to be cooperating agencies for this NEPA review. Section 3.5.6 of this EIS describes how the USACE verified that an application for jurisdictional determination was not necessary, as no waters of the U.S. have been identified in the Great Divide Basin (USACE 2010, LCI 2013b).

### **6.2 Public Scoping Process**

A public scoping meeting was held at the BLM RFO on October 14, 2015. Media interviews were conducted with the Rawlins Daily Times and Bigfoot 99-KTGA 99.3 FM, a radio network broadcasting to south-central Wyoming. During the 45-day scoping period, BLM received a total of 13 comment submittals (i.e., letter, email, or comment form) containing 61 individual comments. These comments were evaluated to identify key issues and concerns and to develop alternatives. This information assisted BLM in identifying the potential environmental issues,

alternatives, and mitigation measures associated with development of the proposed project. The process provided a mechanism for narrowing the scope of issues so that the EIS could focus the analysis on areas of high interest and concern. Most scoping comments were related to wildlife, land use, and cumulative impacts. Section 1.7 of this EIS lists issues and concerns identified through formal scoping as well as consultation and coordination with federal, state, and local agencies, interested groups, and individuals. The BLM interdisciplinary team (IDT) conducted internal scoping by reviewing the proposed development and project location to identify potentially affected resources and land uses and the IDT analysis record checklist and the reasoning behind their decisions is included in appendix C.

### 6.3 List of Preparers

As required by NEPA regulations (40 CFR § 1502.17), table 6-1 lists the individuals responsible for preparing this EIS.

**Table 6-1. List of Preparers**

<b>Agency/Company</b>	<b>Role/Area of Expertise</b>
<b>BLM Rawlins Field Office</b>	
Annette Treat	Project Lead
Dennis J. Carpenter	Field Manager
Nancy Baker	Assistant Field Manager (AFM), Minerals & Lands
Timothy Novotny	AFM, Resources
Vacant	GIS
Susan Foley	Planning & Environmental
Brandon Snyder	Realty
Garth Ross	Wildlife
Vacant	Hydrology
Andrew Mowery	Recreation/Visual
Jennifer Skeldon	Soils, Weeds
Bonni Bruce	Archeology
Andy Warren	Range Management
Ed Vandenburg	Wild Horses
Mark Newman	Geology/Paleontology
Andrew Skordas	Civil Engineering
Ryan Shively	Natural Resource Specialist
Raymond Ogle	Reclamation
Maureen Hartshorn	Forestry
<b>BLM Lander Field Office</b>	
Benjamin Kniola	AFM, Minerals & Lands
Kristin Yannone	Planning & Environmental
Thomas Sunderland	Geologist
<b>BLM High Desert District</b>	
Sonja Hunt	Resource Advisor, Minerals

**Table 6-1. List of Preparers (continued)**

<b>Agency/Company</b>	<b>Role/Area of Expertise</b>
<b>BLM Wyoming State Office</b>	
George Varhalmi	Geology
Jennifer Schein Dobb	Socioeconomics
Melissa Hovey	Air Quality
Jennifer Fleuret McConchie	Planning & Environmental
<b>BLM National Operations Center</b>	
Joshua Siddon	Socioeconomics
<b>NRC</b>	
Christine Pineda	Project Manager – Environmental
John Saxton	Project Manager – Safety
Lloyd Desotell	Technical Reviewer – Safety
Anthony Huffert	Technical Reviewer – Safety
<b>WWC Engineering</b>	
John Berry	Project Manager/EIS Lead
Ben Schiffer	Co-Project Manager/ISR Lead
Beth Kelly	Document Preparation
Jack Fritz	QAQC Lead
Doyle Fritz	Socioeconomics/QAQC
Wade Filkins	Document Preparation
Ray Moores	Groundwater Hydrology/Modeling
Mike Evers	QAQC
Mal McGill	Graphics/AutoCAD
Condia Gonzales	Graphics/GIS
<b>The WordSmith</b>	
Linda Schuemaker	Administrative Record
<b>Centennial Archaeology</b>	
Kristin Gensmer	Historic and Cultural Resources
<b>LWR Consultants, Inc.</b>	
Eric Berg	Wildlife
<b>IML Air Science</b>	
Ronn Smith	Air Quality
<b>Wyoming Game and Fish Department</b>	
Linda Cope	Wildlife

## 6.4 EIS Distribution List

The BLM is providing copies of this EIS to the agencies, organizations, and individuals listed below. BLM will provide copies to other interested organizations and individuals upon request.

### 6.4.1 Federal Agencies

BLM, Field Office and District Office, Casper, Wyoming  
 BLM, High Desert District, Rock Springs, Wyoming  
 BLM, Rawlins Field Office, Rawlins, Wyoming

BLM, Wyoming State Office, Cheyenne, Wyoming  
Bureau of Indian Affairs (BIA), Wind River Agency, Ft. Washakie, Wyoming  
EPA, Region 8, Denver, Colorado  
National Park Service (NPS), National Trails System, Salt Lake City, Utah  
NRC, Rockville, Maryland  
U.S. Department of Energy (USDOE), Washington, D.C.  
USACE, Wyoming Regional Office, Cheyenne, Wyoming  
USDA, Natural Resources Conservation Service, Riverton and Casper, Wyoming  
USDOJ, Office of the Secretary, Denver, Colorado  
USFWS, Mountain-Prairie Region, Wyoming Field Office, Cheyenne, Wyoming  
USGS, Denver Federal Center, Denver, Colorado

#### **6.4.2 Tribal Governments**

Eastern Shoshone Tribe, Tribal Historic Preservation Office, Ft. Washakie, Wyoming  
Northern Arapaho Tribe, Tribal Historic Preservation Office, Ft. Washakie, Wyoming  
Ute Tribe of the Uintah and Ouray Reservation, Tribal Historic Preservation Office, Fort  
Duchesne, Utah

#### **6.4.3 State Agencies**

WGFD, Cheyenne, Wyoming  
WGFD, Lander Regional Office, Lander, Wyoming  
WOGCC, Cheyenne, Wyoming  
Wyoming Department of Agriculture, Cheyenne, Wyoming  
Wyoming Department of Transportation, Cheyenne, Wyoming  
Wyoming Department of Workforce Services, Rock Springs Workforce Center, Rock Springs,  
Wyoming  
Wyoming DEQ, Administration, Cheyenne, Wyoming  
Wyoming DEQ, AQD, Cheyenne, Wyoming  
Wyoming DEQ, LQD, Cheyenne, Wyoming  
Wyoming DEQ, LQD, Lander, Wyoming  
Wyoming DEQ, Solid and Hazardous Waste Division, Cheyenne, Wyoming  
Wyoming DEQ, WQD, Cheyenne, Wyoming  
Wyoming Office of State Lands and Investments, Cheyenne, Wyoming  
Wyoming Office of the Governor, Cheyenne, Wyoming  
Wyoming SEO, Cheyenne, Wyoming  
Wyoming SHPO, Cheyenne, Wyoming  
Wyoming State Geological Survey (WSGS), Cheyenne, Wyoming  
Wyoming State Grazing Board, Cheyenne, Wyoming

#### **6.4.4 Counties and Local Agencies**

Carbon County Board of County Commissioners  
Carbon County, County Clerk  
Carbon County Higher Education Center  
City of Rawlins, City Clerk  
City of Rock Springs, City Clerk

Fremont County Board of County Commissioners  
Sweetwater County Board of County Commissioners  
Sweetwater County, County Clerk  
Sweetwater County Conservation District, Rock Springs, Wyoming  
Sweetwater County, Engineering Department  
Sweetwater County, Public Works Director  
Town of Wamsutter, Town Clerk  
Wyoming County Commissioners Association

#### **6.4.5 Other Organizations and Individuals**

Bairoil Branch Library, Bairoil, Wyoming  
Bartlett, Jess & Debbi, Bairoil, Wyoming  
Biodiversity Conservation Alliance, Laramie, Wyoming  
Carbon County Economic Development Corporation, Rawlins, Wyoming  
Carbon County Library System, Rawlins, Wyoming  
Carter, Richard, Ten Sleep, Wyoming  
Clean Water Action, Washington, D.C.  
Earthworks, Washington, D.C.  
Fremont County Public Library, Lander, Wyoming  
Gould, James F., Bairoil, Wyoming  
Natural Resources Defense Council, Washington, D.C.  
Powder River Basin Resource Council, Sheridan, Wyoming  
Reason, M., Bairoil, Wyoming  
Rock Springs Branch Library, Rock Springs, Wyoming  
Sweetwater County Library, Green River, Wyoming  
UR-Energy USA, Inc., Casper, Wyoming  
Wamsutter Branch Library, Wamsutter, Wyoming  
Weller, David, Bairoil, Wyoming  
Western Watersheds Project, Wyoming Office, Pinedale, Wyoming  
WildEarth Guardians, Laramie, Wyoming  
Wyoming Mining Association, Cheyenne, Wyoming  
Wyoming Outdoor Council, Lander, Wyoming  
Wyoming Wild Horse Coalition, Cody, Wyoming  
Wyoming Wildlife Federation, Lander, Wyoming  
Hill Land and Livestock, Saratoga, Wyoming  
Stewart Creek LLC, Alcova, Wyoming  
Stratton Sheep Co., Shoshoni, Wyoming  
Jolley Livestock Grazing Association, Wamsutter, Wyoming  
Peterson Livestock, LLC, Rawlins, Wyoming  
Salisbury Livestock Co., Savery, Wyoming

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**APPENDIX A**

Responses to Scoping Comments

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Jean Public	Opposition - no comments	No response	None
Sarah Fields, Uranium Watch	I believe that it is premature to publish a notice of opportunity to comment on the scope of the EIS before the NRC and Wyoming DEQ have determined that the applications to these agencies regarding the expansion are complete.	The BLM NEPA process is separate from the Wyoming DEQ permitting process. NRC is a major licensing cooperating agency on the NEPA process and accepted LCI's application on May 2, 2017.	None
Gerry Dewey	1) Concern about Eagle Nest artifacts.	The Eagle Nest artifacts are located along the Cheyenne and Black Hills stage route in Goshen and Niobrara counties, over 100 miles east of the project area. The 2012 BLM Lost Creek EIS completed Section 106 consultation, and cultural surveys were completed. A treatment plan was developed in consultation with the BLM, NRC, Wyoming SHPO, Eastern Shoshone Tribe, and Northern Arapaho Tribe for the one site that would be disturbed by project activities. Cultural surveys also have been completed in the proposed LCE expansion area. No NRHP-eligible historic sites are anticipated to be disturbed by project activities. LCI would avoid NRHP-eligible historic sites. The NRC license also includes a stop work requirement for unanticipated discoveries.	None
Gerry Dewey	2) Shoshone Tribe should be included in the discussion of project.	The Eastern Shoshone Tribe was included in the consultation for the 2012 BLM Lost Creek EIS and was invited to participate in the development of this EIS.	None
Dennis Robertson	Concerns on downstream and downwind impacts in Cheyenne, WY	The 2012 BLM Lost Creek EIS evaluated impacts to surface water, groundwater, and air quality. These same impacts are evaluated in this EIS.	None
Sweetwater County Board of County Commissioners	1) The EIS needs to address the cumulative transportation impacts of the Sheep Mountain Project when coupled with the Proposed Action on Wamsutter Crooks Gap Road.	The 2012 BLM Lost Creek EIS evaluated the cumulative impacts of the Sweetwater Mine but did not evaluate the cumulative impacts of the Sheep Mountain Uranium Project. This EIS evaluates cumulative transportation impacts in Section 5.3.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Sweetwater County Board of County Commissioners	2) Sweetwater County encourages Ur-Energy to comply with the latest BLM Sage-grouse Record of Decision and the most recent Sage-grouse Executive Order.	The Proposed Action has been evaluated for conformance with the ARMPA and Wyoming Executive Order 2015-4.	None
National Park Service	The EIS analysis should include potential direct and indirect impacts to the national historic trails that may be incurred by the Proposed Action and alternatives.	The 2012 BLM Lost Creek EIS indicated that the nearest national historic trail was the Rawlins-Fort Washakie Stage Road, approximately 4 miles northeast of the project area. The 2012 BLM Lost Creek EIS concluded that the Plant would be visible along about 7 miles of the Rawlins-Fort Washakie Stage Road, but the closest distance would be about 6.5 miles. The Plant would continue to be the most prominent feature. This EIS also evaluates impacts to the Continental Divide National Scenic Trail.	None
WGFD	1) Recommend a DDCT be conducted	A DDCT was done for 2012 BLM Lost Creek EIS and a DDCT was done for this EIS.	Will the project impact Greater sage-grouse and core areas as defined in Wyoming Executive Order 2015-4?
WGFD	2) EIS should include cumulative analyses of potential impacts to big game species including mule deer and pronghorn, raptors, sage-grouse, passerines, small mammals, reptiles and amphibians and any SGCN species endemic or migratory to the project vicinity.	Section 4.8 of this EIS addresses potential impacts to wildlife.	None

Commenter	Comment	Response	Issues for EIS
Wild Earth Guardians	1) The comment expresses concern that the proposed surface facilities will have a direct and cumulative negative effect on sage-grouse leks and associated nesting habitats. The comment also states that BLM must also consider in its range of alternatives for this project requiring the proponent to implement scientifically adequate sage-grouse protections included in the 2011 National Technical Team recommendations.	This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM Priority Habitat Management Areas (PHMAs), the Wyoming Density and Disturbance Calculation Tool (DDCT) outlined in Wyoming Executive Order 2015-4, and the 2015 Approved Resource Management Plan Amendments for Greater sage-grouse (ARMPA). Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium <i>in-situ</i> recovery (ISR) within the project area.	Will the project impact Greater sage-grouse and core areas as defined in Wyoming Executive Order 2015-4?

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wild Earth Guardians	2) BLM also will need to analyze the potential impacts of the project on sensitive wildlife species. The adjacent Lost Creek uranium mine project began construction in 2012, so there are three years of data on how this project has affected sage-grouse, Wyoming pocket gophers, birds of prey, and other species. Please provide detailed analysis regarding changes in sage-grouse lek populations at different distances from project facilities and infrastructure of different types, changes in ferruginous hawk nest-site activity at different distances from project facilities and infrastructure, and changes in the abundance and location of Wyoming pocket gopher colonies subjected to surface disturbance or habitat fragmentation through surface-disturbing activities. Please reference available WGFD data and previous consultant reports for the original Lost Creek uranium EIS as part of the baseline information that NEPA requires the agency to assemble.	LCI conducts annual wildlife surveys and submits reports to BLM, WGFD, and WDEQ-LQD. This EIS uses the most recent wildlife survey data. The EIS analyzes the potential impacts of the project on sensitive wildlife species, including Greater sage-grouse, raptors, threatened and endangered species, birds of conservation concern, BLM sensitive species, and WGFD species of greatest conservation concern. The analysis provides sufficient detail to assess potential impacts to these species.	None
Wild Earth Guardians	3) The Wyoming Basins Ecoregional Assessment publication (“WBEA”)1 was completed in 2011, and BLM should reference the findings of this report as they apply to this project, which falls within the Wyoming Basins Ecoregion, in order for the BLM to meet its obligation to “use the best available science” including publications specifically mandated under the Strategy. BLM must incorporate the findings of this study into its EIS.	The WBEA’s main focus is open landscapes dominated by sagebrush Communities and conserving sagebrush ecosystems. Wyoming Executive Order 2015-4 and the ARMPA provide more current guidance related to sagebrush management and protections for wildlife species associated with this habitat type. The Proposed Action has been evaluated for conformance with the ARMPA and Wyoming Executive Order 2015-4.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wild Earth Guardians	4) We have no confidence that the sage-grouse protection measures prescribed in the Wyoming RMPA are adequate to protect sage-grouse, BLM Sensitive Species, and their habitats. Accordingly, to avoid unnecessary or undue degradation, BLM should apply more stringent, scientifically adequate sage-grouse protections in the context of this project.	The analysis included in the EIS is based on the DDCT outlined in Wyoming Executive Order 2015-4 and in the ARMPA. These documents provide the most current directives from the State of Wyoming, WGFD, and BLM.	Will the project impact Greater sage-grouse and core areas as defined in Wyoming Executive Order 2015-4?
Wild Earth Guardians	5) With these results in mind, BLM should ensure that roads are re-sited to avoid significant impacts to sage-grouse from noise or visual disturbance.	The main access roads were evaluated in the 2012 BLM Lost Creek EIS. The modifications only propose secondary and two-track access roads.	None
Wild Earth Guardians	6) Noise must be limited to a maximum of 10 dBA above the ambient natural noise level after the recommendations of Patricelli et al. (2012).	Noise impacts were evaluated in Sections 4.9 and 4.12 of the 2012 BLM Lost Creek EIS. Noise and the impacts of excessive noise on wildlife are discussed in this EIS.	None
Wild Earth Guardians	7) The ambient level for allowable noise under the project should instead be set at 15 dBA, and maximum noise allowed should not exceed 25 dBA to prevent lek declines due to noise. In addition, these noise levels should not be allowed to be exceeded in any sage-grouse habitats during their season of use to adequately protect nesting habitats, wintering habitats, and broodrearing habitats from significant noise impacts.	The noise impacts included in this EIS are based on the DDCT outlined in Wyoming Executive Order 2015-4 and in the ARMPA. These documents provide the most current directives from the State of Wyoming, WGFD, and BLM. This EIS evaluates conformance with the ARMPA, which requires that the noise level at the margin of the leks does not exceed 10 dBA above baseline during the established hours from March 1 to May 15.	None
Wild Earth Guardians	8) In accordance with this review of the best available science, BLM should apply the following restrictions on development in designated winter habitats: (1) close all lands within 1.2 miles of winter habitats to all surface disturbing activities; (2) apply a limit of 3% surface disturbance and one energy or mining site per square-mile section.	The analysis included in this EIS are based on the DDCT outlined in Wyoming Executive Order 2015-4 and in the ARMPA. These documents provide the most current directives from the State of Wyoming, WGFD, and BLM.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wild Earth Guardians	9) The National Technical Team (NTT 2011) recommended that Priority Habitats be exclusion areas for overhead powerlines, and that General Habitats should be avoidance areas for overhead lines. As the project is proposed in PHMA and SFA lands, this restriction should be adopted for use throughout this project, and existing overhead lines that were installed for the original Lost Creek uranium project should be buried underground in partial compensation for the unavoidable impacts associated with both projects.	The analysis included in the EIS is based on the DDCT outlined in Wyoming Executive Order 2015-4 and in the ARMPA. These documents provide the most current directives from the State of Wyoming, WGFD, and BLM.	None
Wild Earth Guardians	10) BLM cannot rely on perch inhibitors to reduce impacts to sage-grouse, as these do not address the behavioral avoidance of sage-grouse of tall structures, and don't even completely prevent raptor perching.	The analysis included in the EIS is based on the DDCT outlined in Wyoming Executive Order 2015-4 and in the ARMPA. These documents provide the most current directives from the State of Wyoming, WGFD, and BLM.	None
Wild Earth Guardians	11) BLM must survey for Wyoming pocket gopher within the new proposed expansion area to determine baseline distribution of this species. In addition, BLM must re-assess population size and distribution within the original Lost Creek uranium mine site to determine the level of impact that the past three years of development has had on this species. Protections must be put in place to prevent roads or energy extraction facilities from being constructed in or immediately adjacent to occupied Wyoming pocket gopher habitats.	USFWS determined that listing of the Wyoming pocket gopher was not warranted because the species was not likely in danger of extinction throughout all or significant portions of its range. The species was again petitioned for listing in 2016, and the USFWS again determined that listing was not warranted. However, the Wyoming pocket gopher is included on the list of BLM sensitive species and is a WGFD species of greatest conservation concern, so discussions of this species are included in the EIS to a level that is appropriate for all sensitive species. The analysis is in sufficient detail to assess potential impacts to this species.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wild Earth Guardians	12) BLM should map nesting localities for birds of prey species and provide detailed analyses of impacts, as well as protective measures to keep surface-disturbing activities and roads at least 1 mile from nest sites.	LCI is currently monitoring raptor nesting within the approved wildlife monitoring area and provides the results to BLM and WDEQ-LQD in the form of annual reports. This information, including raptor nest locations, is discussed in the EIS. Recommendations for species-specific raptor nesting buffers are based on the most current recommendations provided by the USFWS.	None
Wild Earth Guardians	13) 1-mile buffers prohibiting surface disturbance should apply to ferruginous hawk nest sites as well as all other raptor nest sites.	Recommendations for raptor nesting buffers are based on the most current recommendations provided by the USFWS.	None
Delvey	1) Since operations began at the Lost Creek ISR site, environmental violations and safety issues have occurred.	Sections 4.2, 4.4, 4.5, 4.6, 4.7, 4.9, and 4.15 of this EIS describe Applicant-committed design features and evaluate potential impacts for spills, leaks, and excursions. LCI is required to report excursions and spills to NRC, WDEQ-LQD, and BLM. Section 4.15 of this EIS evaluates potential public and occupational health impacts.	None
Delvey	2) Section 4.10 of the original EIS noted that the dust generated by mining operations was expected to settle on vegetation. Thus, dust is being ingested by wildlife and wild horses while they are foraging and even while they are merely breathing. The dust is likely causing digestive and dental complications in addition to respiratory and cardiovascular problems for the horses. This potential impact was not fully addressed. Such contamination of the environment to the detriment of wildlife is unacceptable, especially in a dedicated wild-horse habitat.	Section 4.2.1 of the 2012 BLM Lost Creek EIS indicated that increased dust from construction activities could make forage along the access roads less palatable, but impacts would be reduced by wetting unpaved roads and establishing speed limits on roads. Applicant-committed design features and potential impacts from dust are provided in Chapter 4 of this EIS.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Delvey	3) The Lost Creek ISR mine took away 3,088 acres from the wild horses without BLM's providing compensatory land of equal quality elsewhere in the vicinity. This pattern of taking but not giving back needs to end. By law, the HMAs are supposed to be managed principally for the wild horses. Thus, their needs must take priority and be fully met. The expansion-project would surely involve more loss of habitat, more disturbances, and more contaminated groundwater.	As discussed in Section 4.10 of the 2012 BLM Lost Creek EIS, wild horses are only limited from the fenced areas around the currently authorized mine units and plant area (300 acres). Section 4.9 of this EIS evaluates the maximum anticipated impacts to HMAs.	Will there be additional restrictions to grazing allotments and impacts of fencing on livestock and wild horses from the project?
Delvey	4) long-term likely adverse effects on the wild horses, whether those impacts can be mitigated, and if so, how. Superficial consideration of potential hazards, such as fencing around certain parts of the project, does not begin to address potential adverse effects. Loss of habitat, fragmentation of habitat, contamination of habitat, pollution of surface-water and groundwater, traffic-hazards, and so forth must be studied.	Section 4.9 of this EIS includes Applicant-committed design features and evaluates potential impacts to wild horses.	Will there be additional restrictions to grazing allotments and impacts of fencing on livestock and wild horses from the project?
Delvey	5) If the Red Desert Complex truly exists, then all the herds that are alleged to freely roam therein must be considered.	The BLM manages 16 wild horse HMAs, but only two are located within the project area. Section 4.9 of this EIS evaluates the maximum anticipated impacts to these two HMAs along with a nearby HMA.	Will there be additional restrictions to grazing allotments and impacts of fencing on livestock and wild horses from the project?

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Delvey	6) Preparatory to drafting the expansion-EIS, BLM-Rawlins should correct deficiencies in the planning and evaluation process for this project and all others that impact the wild horse herds. BLM needs to implement coordinated resource management (CRM) with regard to its wild horse stakeholders.	Impacts to wild horses were evaluated in the 2012 BLM Lost Creek EIS and in this EIS. This EIS will conform to the Rawlins RMP for wild horses.	None
Delvey	7) The original EIS' focus on reclamation activities around the immediate site did not serve to prevent the problem or to truly solve it. Therefore, this mine is surely having widespread impact on the Red Desert vegetation. The Wyoming 2010 State Wildlife Action Plan (SWAP) had cited invasive species -- particularly cheatgrass -- as a leading conservation challenge. BLM should have properly considered the impact of weeds on the greater surrounding area, not just the relatively limited area of active mine operations.	LCI submits an annual report to WDEQ-LQD and BLM that includes an inventory of noxious weeds. To date, no noxious weeds have been identified, and stipulations are in place in the event that noxious weeds are identified.	None
Delvey	8) The original 2012 proposal touted direct and indirect potential job creation -- 119 to 148 positions -- and boasted that tax revenue would inure to the benefit of federal, state and local coffers. But how many of those jobs actually materialized? How many were permanent, full-time positions?	Section 3.14.4 of this EIS describes that the Lost Creek ISR Project currently employees approximately 55 workers.	None
Delvey	9) If the mine closes prematurely for economic reasons, waivers can likely be secured that would allow delays in reclamation that might last for years.	As discussed in Section 2.1.5.2 of the 2012 BLM Lost Creek EIS, LCI is required to establish and maintain a reclamation performance bond, in an amount approved by NRC, BLM and WDEQ-LQD, to cover the costs for third-party restoration and reclamation. Prior to initiation of activities for the modification, LCI would be required to increase the bond to include any additional restoration and reclamation. This is addressed in Section 2.2.5 of this EIS.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wy Dept of Agriculture	1) We urge the BLM to analyze the individual effects upon livestock grazing in the EIS including: large areas fenced off from grazing, decreased Animal Unit Months (AUMs), ground and surface water quality potential impacts, increased off- and on-road traffic, increased number of speeding vehicles, construction of new roads and modifications to existing roads, increased number of vehicles in the area with potential conflicts with livestock, cut fences, opened gates, damaged range improvements, decreased palatability of vegetation and forage from road dust and development activities, unsuccessful reclamation of disturbed areas, introduction and spread of noxious weeds, and other detrimental social and economic impacts on livestock operators and livestock management operations.	The 2012 BLM Lost Creek EIS evaluated the impacts to livestock grazing. Section 4.1 of this EIS evaluates the impacts from the Proposed Action and alternatives.	Will there be additional restrictions to grazing allotments and impacts of fencing on livestock and wild horses from the project? Will the project impact access to water supply wells (livestock, wild horses, and wildlife)?
Wy Dept of Agriculture	2) We strongly encourage BLM staff and ISR Project operators to work closely and consistently with affected grazing permittees and agriculture producers to learn of their concerns and recommendations regarding this project. It is imperative BLM staff continuously inform all livestock grazing permittees directly and indirectly affected of the issues, decisions, and resulting actions regarding this ISR Project.	The grazing Allottees are included in the scoping process, and the BLM-RFO range specialist assigned to the allotment has monthly to quarterly contact with the Allottee.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wy Dept of Agriculture	3) We support compensatory mitigation discussions between the operator and livestock permittees to lessen the burden and reduce economic impacts to grazing permittees from this development.	Mitigation will adhere to WO IM-2008-204 and WO IM-2005-069. WO IM-2008-204 states that it is the BLM's policy is to mitigate impacts to an acceptable level onsite whenever possible through avoidance, minimization, remediation, or reduction of impacts over time. Offsite mitigation may be used only when the BLM can demonstrate that the proposed mitigation is reasonably necessary to accomplish an authorized BLM purpose. Offsite mitigation may be offered voluntarily by a project proponent, incorporated into the project proposal, and approved by the BLM as a condition of the permit authorization.	None
Wy Dept of Agriculture	4) We strongly recommend the EIS includes a full and thorough social and economic impact analysis. Since grazing on public lands represents a vital economic value to agriculture producers and local communities, we specifically suggest the analysis includes the impacts upon livestock grazing in and adjacent to the planning area. The cumulative impacts of energy developments upon livestock grazing may jeopardize the livelihoods of grazing permittees. The evaluation of the loss or impaired ability of livestock grazing operations in the EIS is imperative.	The 2012 BLM Lost Creek EIS provided an economic impact of cattle and sheep for each affected allotment and concluded that impacts on livestock grazing would be minimal. Section 4.1 of this EIS evaluates potential impacts to livestock grazing.	None
Wy Dept of Agriculture	5) BLM should require timely and successful reclamation and mitigation. Reclamation and mitigation requirements and the consequences for energy developers failing to accomplish this reclamation and mitigation should be clearly stated in the EIS.	The 2012 BLM Lost Creek EIS described the reclamation, which is required by the Rawlins RMP, NRC license, and WDEQ-LQD Permit to Mine. Section 2.2.4 of this EIS describes reclamation practices. Chapter 4 describes Applicant-committed design features.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wy Dept of Agriculture	6) The EIS should evaluate the impact of this project upon the intent expressed in the Federal Land Policy and Management Act of 1976 to manage public lands in a manner that will provide "food and habitat for fish, wildlife, and domestic animals." The impacts upon food and habitat for fish and wildlife are usually well documented in NEPA documents. The consequences of the ISR project upon food and habitat for domestic animals deserve the same degree of study and documentation.	Under the FLPMA, the BLM has the obligation to allow and encourage claim holders to develop their claims, subject to restrictions to ensure this development will not cause unnecessary or undue degradation of public lands. Potential impacts to livestock grazing are evaluated in Section 4.1 of this EIS.	None
Wy Dept of Agriculture	7) The EIS needs to Include 1) these positive effects of livestock grazing upon the environment and as a tool to achieve environmental objectives and 2) the impacts of this project on limiting the ability of livestock grazing management to achieve these positive effects.	The 2012 BLM Lost Creek EIS described the impacts to livestock grazing and concluded that they would be minimal. Section 4.1 of this EIS also evaluated impacts. The analysis has been done in accordance with 40 CFR § 1508.8.	None
Wy Dept of Agriculture	8) WDA recommends BLM develops a proposed alternative with flexibility to make the best site-specific, case-by-case decisions in the best interests of the affected resources and citizens throughout the life of this plan.	The 2012 BLM Lost Creek EIS included reasonable alternatives that were technically, economically, and environmentally practical and feasible as required by 40 CFR § 1502.14. This EIS does the same.	None
Alice Hindman	1) I think a close look should be made as to what this expansion will do to the wild life and the environment.	Chapter 4 of this EIS evaluates potential environmental impacts including wildlife impacts.	None
Alice Hindman	2) Will this company reclaim the land when they decide to leave the area. Will they clean up the tailings? The previous mine did not.	As discussed in Section 2.1.5.2 of the 2012 BLM Lost Creek EIS, LCI is required to establish and maintain a reclamation performance bond, in an amount approved by NRC, BLM and WDEQ-LQD, to cover the costs for third-party restoration and reclamation. Prior to initiation of activities for the modification, LCI would be required to increase the bond to include any additional restoration and reclamation. This is addressed in Section 2.2.5 of this EIS.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Alice Hindman	3) How will this affect the Lost Creek itself?	Section 3.5 of this EIS describes how surface water in the project area drains into Battle Spring Flat or Chain Lakes Flat, approximately 9 to 15 miles southwest of the project area. Section 4.5 evaluates potential impacts to surface water.	None
Wyoming Outdoor Council	1) Sage-grouse issues are a primary part of many of these comments and we believe they should be considered again, particularly the issue of ensuring that BLM's response to the proposed Lost Creek mine expansion complies fully with the State of Wyoming's Greater Sage-grouse EO 2015-4 and recently revised and amended BLM Resource Management Plans for Wyoming: namely, the Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region, including the Greater Sage-Grouse Sub-Regions in Wyoming (September 20 15) (hereinafter the "sage-grouse ROD") and the BLM Casper, Kemmerer, Newcastle, Pinedale, Rawlins and Rock Springs Field Offices Approved Resource Management Plan Amendment for Greater Sage-Grouse (September 2015) (hereinafter "approved RMP amendments"). And, as will be discussed below, science-based avoidance, minimization and mitigation measures are required to ensure that the proposed Lost Creek mine expansion does not undermine sage-grouse conservation efforts taking place within Wyoming and across the western United States. These measures are also needed if BLM is to meet its statutory and regulatory responsibility to prevent "unnecessary or undue degradation" (UUD) of the public lands.	This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM PHMAs, the Wyoming DDCT outlined in Wyoming Executive Order 2015-4, and the 2015 ARMPA. Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium ISR within the project area.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wyoming Outdoor Council	2) Threshold issue #1: Establishing the Existence of Valid Mining Claims. In order to properly implement the BLM's National Sage-grouse Conservation Strategy, including adoption of the "avoidance first" mitigation option required in Sagebrush Focal Areas, the BLM should determine whether Lost Creek ISR, LLC, has valid mining claims under the General Mining Law of 1872.	The BLM has confirmed that LCI has valid mining claims.	None
Wyoming Outdoor Council	3) Threshold issue #2: The Duty to Prevent Unnecessary or Undue Degradation. The BLM must prevent unnecessary or undue degradation of the public lands and define in this EIS the specific actions or effects that would constitute UUD.	Under the FLPMA, the BLM has the obligation to allow and encourage claim holders to develop their claims, subject to restrictions to ensure this development will not cause unnecessary or undue degradation of public lands.	None
Wyoming Outdoor Council	4) BLM must ensure compliance with the agency's national and regional mitigation policies and Wyoming's Greater Sage-Grouse Mitigation Assessment to ensure a net conservation gain benefitting the sage-grouse. The Lost Creek Project Draft EIS must carefully evaluate all opportunities and options for avoidance of impacts to Greater sage-grouse in the project area.	This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM PHMAs, the Wyoming DDCT outlined in Wyoming Executive Order 2015-4, and the 2015 ARMPA. Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium ISR within the project area.	None

Commenter	Comment	Response	Issues for EIS
Wyoming Outdoor Council	<p>5) If relocation of the project to an area outside of core/PHMA habitat is not possible, and as a result development takes place within core/PHMA, the BLM must ensure that the applicable requirements provided for in the approved RMP amendments and EO are applied in this area. Most significantly these include: 1) In applying the Density Disturbance Calculation Tool (DDCT), the BLM should apply the analysis to a 4-mile radius that identifies 75 percent of the greater sage-grouse use around the perimeter of leks. 2) Ensure surface disturbance is limited to 5 percent of suitable greater sage-grouse habitat per an average of 640 acres over the entire DDCT assessment area. 3) Apply a 0.6 mile no surface occupancy (NSO) stipulation around the perimeter of occupied sage-grouse leks. 4) Not allow activities outside of the 0.6-mile NSO area of occupied leks from March 15 to June 30 in breeding, nesting, and early brood-rearing habitat. 5) Ensure collector or arterial roads are located greater than 1.9 miles from the perimeter of occupied leks, and locate local roads greater than 0.6 mile from the perimeter of occupied leks. 6) Ensure compliance with overhead power line stipulations. 7) Meet the 10 dB noise level above ambient noise at the perimeter of leks from 6:00 p.m. to 9:00 a.m. from March 1 to May 15 during the breeding season. 8) And as provided for in the stipulations for mining, ensure that "[t]he number of active mining development areas... is not to exceed an average of one site per square mile (1/640) within the DDCT."</p>	<p>This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM PHMAs, the Wyoming DDCT outlined in Wyoming Executive Order 2015-4, and the 2015 ARMPA. Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium ISR within the project area.</p>	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wyoming Outdoor Council	6) We encourage BLM to solicit and consider draft recommendations from the Regional Mitigation Team, and in the interim to adopt the State of Wyoming's recently finalized Wyoming Greater Sage-Grouse Mitigation Assessment, which was sent to the Wyoming BLM Acting State Director on October 9, 2015.	This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM PHMAs, the Wyoming DDCT outlined in Wyoming Executive Order 2015-4, and the 2015 ARMPA. Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium ISR within the project area.	None
Wyoming Outdoor Council	7) The BLM must analyze and disclose the location of the Project in relation to the Priority Habitat Management Areas ("PHMA") and General Habitat Management Areas ("GHMA") in Sweetwater County.	This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM PHMAs, the Wyoming DDCT outlined in Wyoming Executive Order 2015-4, and the 2015 ARMPA. Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium ISR within the project area.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wyoming Outdoor Council	8) According to the ARMPA, although the Project is a valid existing right, the development of this Project will limit the possibility of other surface disturbing activities in the area. ROD at 1-18 "Apply a disturbance density cap of 1 energy or mining facility per 640 acres." The BLM must evaluate what activities, if any, will be foreclosed including reasonably foreseeable development in the area.	The 2012 BLM Lost Creek EIS described the reasonably foreseeable future actions, and Chapter 5 of this EIS does the same.	None
Wyoming Outdoor Council	9) It is important to note that all mitigation actions considered in the Lost Creek Project DEIS should be consistent with the Department of the Interior's National "Strategy for Improving Mitigation Policies and Practices of the Department of the Interior" (April 2014).	The Department of the Interior's National "Strategy for Improving Mitigation Policies and Practices of the Department of the Interior" (April 2014) was rescinded. Mitigation will adhere to WO IM-2008-204 and WO IM-2005-069. WO IM-2008-204 states that it is the BLM's policy is to mitigate impacts to an acceptable level onsite whenever possible through avoidance, minimization, remediation, or reduction of impacts over time. Offsite mitigation may be used only when the BLM can demonstrate that the proposed mitigation is reasonably necessary to accomplish an authorized BLM purpose. Offsite mitigation may be offered voluntarily by a project proponent, incorporated into the project proposal, and approved by the BLM as a condition of the permit authorization.	None
Wyoming Outdoor Council	10) The BLM must ensure that these sagebrush obligate species receive needed and adequate protections.	Covered in the Rawlins RMP and the Migratory Bird Treaty Act.	None
Wyoming Outdoor Council	11) The Draft EIS must include an assessment of both "cumulative actions" and "cumulative impacts."	The 2012 BLM Lost Creek EIS described the cumulative impacts, and Chapter 5 of this EIS does the same.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wyoming Outdoor Council	12) Significant issues raised in these comments that should also be considered and mitigated in the Lost Creek Project environmental impact statement include, but are not limited to: 1) Ensuring all leks in or near the project area are fully considered and protected. 2) Preventing unneeded new or upgraded roads from being constructed. 3) Carefully considering and mitigating the impacts of increased vehicular activity. 4) Identifying and protecting winter concentration, relief and use areas in the project area. 5) Ensuring that all fencing, new and existing, at all distances from leks in the project area, do not have negative impacts on sage-grouse by prohibiting the fencing or ensuring it is adequately marked. 6) Ensuring new and existing power lines do not have unnecessary impacts on sage-grouse by burying them or ensuring they are co-located along existing power lines. 7) Ensuring nesting and brood-rearing habitat within four miles of the perimeter of leks is protected. 8) Ensuring noise levels are kept low enough to not negatively impact sage-grouse.	The 2012 BLM Lost Creek EIS evaluated these issues, and Chapter 4 of this EIS similarly evaluates potential impacts.	None
Wyoming Outdoor Council	13) The BLM and the project proponent must ensure that noise impacts are controlled/minimized to avoid impacts to the sage-grouse. The Lost Creek Draft EIS should either adopt the statewide, baseline ambient noise value recommended by Patricelli (15 dBA) or alternatively, establish a project-specific ambient baseline value in accordance with established and scientifically-defensible methods and procedures endorsed by Patricelli, et al.	The noise impacts included in this EIS are based on the DDCI outlined in Wyoming Executive Order 2015-4 and in the ARMPA. These documents provide the most current directives from the State of Wyoming, WGFD, and BLM. This EIS will adhere to the ARMPA, which requires that the noise level at the margin of the leks does not exceed 10 dB above baseline during the established hours from March 1 to May 15.	None

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Wyoming Outdoor Council	14) The Lost Creek Draft EIS should disclose and discuss in detail the apparent and potentially extreme conflict between the goals and objectives of the BLM's GSG Conservation Strategy (as described in the Sage-grouse ROD and approved RMP amendments) and the impact the development of the Lost Creek project amendments will have on achieving those goals. In addition, the Draft EIS should describe and comply with the BLM's Greater Sage-Grouse Habitat Management Strategy, which is the BLM's "framework for implementation of Greater Sage-Grouse conservation measures within BLM Field Offices." See approved RMP. Finally, the Draft EIS should disclose and discuss any inconsistency between the action proposed by Lost Creek and the current Wyoming Sage-Grouse EO, and a plan to reconcile the proposed action with the EO.	This EIS includes a thorough discussion of impacts to Greater sage-grouse breeding and nesting habitats from the Proposed Action and alternatives. The analysis includes discussions of Greater sage-grouse core areas, BLM PHMAs, the Wyoming DDCT outlined in Wyoming Executive Order 2015-4, and the 2015 ARMPA. Wyoming Executive Order 2015-4 and the ARMPA provide the most current directives from the State of Wyoming, WGFD, and BLM. The EIS uses guidance set forth in the BLM NEPA Handbook H-1790-1, which outlines the development of a range of reasonable alternatives. It should be noted that the PHMAs are subject to valid existing rights, and the Applicant holds valid existing rights for uranium ISR within the project area.	None
Sweetwater County Conservation District	1) BLM should also apply a 500-foot buffer from the core of ephemeral channels because ephemeral channels are managed as riparian areas for purposes of rangeland health and are ephemeral due largely to the lack of precipitation in the region, rather than the lack of hydrologic connection.	The 2012 BLM Lost Creek EIS and this EIS conform to the Rawlins RMP for riparian area management.	None
Sweetwater County Conservation District	2) The Project area should be subject to stipulations that ensure that drilling and pumping does not adversely affect existing potable water supplies.	LCI has a license condition that requires quarterly sampling of nearby private wells. The 2012 BLM Lost Creek EIS (Section 4.7.1.2) discussed additional mitigation measures if significant impacts were observed in the BLM stock wells. Potential impact to nearby wells are evaluated in Section 4.6 of this EIS.	Will the project degrade groundwater quality as a result of ISR mining?

<b>Commenter</b>	<b>Comment</b>	<b>Response</b>	<b>Issues for EIS</b>
Sweetwater County Conservation District	3) The BLM must develop a comprehensive reclamation and weed plan and the Districts specifically request that the BLM work closely with the Districts to develop a plan that addresses noxious weeds, interim reclamation and final reclamation.	LCI submits an annual report to WDEQ-LQD and BLM that includes an inventory of noxious weeds. To date, no noxious weeds have been identified, and stipulations are in place in the event that noxious weeds are identified.	None
Sweetwater County Conservation District	4) The BLM must evaluate cumulative impacts of existing projects and reasonably foreseeable projects in the anticipated EIS. Specifically, Sheep Creek Mine anticipates 40 to 70 heavy vehicles a day on the same road. Thus, the cumulative impacts of Sheep Creek Mine and the Project must be analyzed here. BLM must develop a transportation plan to combat these likely impacts.	The 2012 BLM Lost Creek EIS evaluated the cumulative impacts of the Sweetwater Mine but did not evaluate the cumulative impacts of the Sheep Mountain Uranium Project. This EIS evaluates cumulative transportation impacts in Section 5.3.	None

**APPENDIX B**

Species of Special Interest

Group	Scientific Name	Common Name	USFWS BCC	BLM Sensitive	WGFD SGCN	Documented by WYNDD	Observed by LWR
Amphibian	<i>Ambystoma mavortium</i>	Tiger Salamander			Yes	Yes	
Amphibian	<i>Anaxyrus baxteri</i>	Wyoming Toad			Yes		
Amphibian	<i>Anaxyrus boreas boreas</i>	Boreal Western Toad (Northern Rocky Mountain Population)			Yes		
Amphibian	<i>Anaxyrus boreas</i>	Boreal Western Toad (Southern Rocky Mountain Population)			Yes		
Amphibian	<i>Anaxyrus cognatus</i>	Great Plains Toad			Yes		
Amphibian	<i>Lithobates pipiens</i>	Northern Leopard Frog			Yes	Yes	
Amphibian	<i>Lithobates sylvaticus</i>	Wood Frog (Southern Rockies Wood Frog)			Yes		
Amphibian	<i>Rana luteiventris</i>	Columbia Spotted Frog			Yes		
Amphibian	<i>Rana pipiens</i>	Northern Leopard Frog		Yes	Yes		
Amphibian	<i>Spea intermontana</i>	Great Basin Spadefoot			Yes	Yes	
Bird	<i>Accipiter gentilis</i>	Northern Goshawk			Yes	Yes	
Bird	<i>Aechmophorus clarkii</i>	Clark's Grebe			Yes	Yes	
Bird	<i>Aegolius funereus</i>	Boreal Owl			Yes		
Bird	<i>Aimophila cassinii</i>	Cassin's Sparrow					
Bird	<i>Ammodramus bairdii</i>	Baird's Sparrow	Yes				
Bird	<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Yes	Yes	Yes	Yes	
Bird	<i>Amphispiza belli</i>	Sage Sparrow					
Bird	<i>Anthus spragueii</i>	Sprague's Pipit	Yes				
Bird	<i>Aphelocoma californica</i>	Western Scrub-jay			Yes		
Bird	<i>Aquila chrysaetos</i>	Golden Eagle	Yes			Yes	Yes
Bird	<i>Artemisiospiza nevadensis</i>	Sagebrush Sparrow	Yes		Yes	Yes	Yes
Bird	<i>Asio flammeus</i>	Short-eared Owl	Yes		Yes	Yes	
Bird	<i>Athene cunicularia</i>	Burrowing Owl	Yes		Yes	Yes	
Bird	<i>Aythya collaris</i>	Ring-necked Duck				Yes	
Bird	<i>Baeolophus ridgwayi</i>	Juniper Titmouse	Yes		Yes		
Bird	<i>Bartramia longicauda</i>	Upland Sandpiper	Yes				
Bird	<i>Botaurus lentiginosus</i>	American Bittern	Yes		Yes	Yes	
Bird	<i>Bucephala albeola</i>	Bufflehead				Yes	
Bird	<i>Bucephala clangula</i>	Common Goldeneye				Yes	
Bird	<i>Buteo regalis</i>	Ferruginous Hawk	Yes		Yes	Yes	Yes
Bird	<i>Buteo swainsoni</i>	Swainson's Hawk	Yes				Yes
Bird	<i>Calamospiza melanocorys</i>	Lark Bunting	Yes				
Bird	<i>Calcarius mccownii</i>	McCown's Longspur	Yes		Yes		
Bird	<i>Calcarius ornatus</i>	Chestnut-collared Longspur	Yes		Yes		
Bird	<i>Carpodacus cassinii</i>	Cassin's Finch	Yes				

Group	Scientific Name	Common Name	USFWS BCC	BLM Sensitive	WGFD SGCN	Documented by WYNDD	Observed by LWR
Bird	<i>Catharus fuscescens</i>	Veery	Yes				
Bird	<i>Catherpes mexicanus</i>	Canyon Wren				Yes	
Bird	<i>Catostomus discobolus</i>	Bluehead Sucker		Yes	Yes		
Bird	<i>Centrocercus urophasianus</i>	Greater Sage-grouse			Yes	Yes	Yes
Bird	<i>Charadrius alexandrinus</i>	Snowy Plover	Yes				
Bird	<i>Charadrius melodus</i>	Piping Plover					
Bird	<i>Charadrius montanus</i>	Mountain Plover	Yes		Yes	Yes	
Bird	<i>Chlidonias niger</i>	Black Tern (Breeding Colonies)			Yes		
Bird	<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	Yes		Yes		
Bird	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	Yes				
Bird	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Yes			Yes	
Bird	<i>Coturnicops noveboracensis</i>	Yellow Rail	Yes				
Bird	<i>Cygnus buccinator</i>	Trumpeter Swan			Yes		
Bird	<i>Cypseloides niger</i>	Black Swift	Yes				
Bird	<i>Dolichonyx oryzivorus</i>	Bobolink			Yes		
Bird	<i>Egretta thula</i>	Snowy Egret			Yes		
Bird	<i>Empidonax hammondii</i>	Hammond's Flycatcher				Yes	
Bird	<i>Empidonax traillii</i>	Willow Flycatcher	Yes				
Bird	<i>Falco columbarius</i>	Merlin			Yes	Yes	
Bird	<i>Falco mexicanus</i>	Prairie Falcon	Yes				Yes
Bird	<i>Falco peregrinus</i>	Peregrine Falcon	Yes	Yes	Yes	Yes	
Bird	<i>Gavia immer</i>	Common Loon			Yes		
Bird	<i>Glaucidium gnoma</i>	Northern Pygmy-owl			Yes		
Bird	<i>Grus americana</i>	Whooping Crane					
Bird	<i>Grus canadensis</i>	Sandhill Crane			Yes	Yes	
Bird	<i>Gymnorhinus cyanocephalus</i>	Pinyon Jay	Yes				
Bird	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Yes	Yes	Yes	Yes	
Bird	<i>Himantopus mexicanus</i>	Black-necked Stilt				Yes	
Bird	<i>Hiodon alosoides</i>	Goldeye			Yes		
Bird	<i>Histrionicus histrionicus</i>	Harlequin Duck			Yes		
Bird	<i>Hydroprogne caspia</i>	Caspian Tern				Yes	
Bird	<i>Icterus parisorum</i>	Scott's Oriole			Yes		
Bird	<i>Junco hyemalis</i>	Dark-eyed Junco				Yes	
Bird	<i>Junco hyemalis aikeni</i>	White-winged Junco				Yes	
Bird	<i>Lagopus leucurus</i>	White-tailed Ptarmigan					
Bird	<i>Lanius ludovicianus</i>	Loggerhead Shrike	Yes	Yes	Yes	Yes	Yes
Bird	<i>Larus argentatus</i>	Herring Gull				Yes	

Group	Scientific Name	Common Name	USFWS BCC	BLM Sensitive	WGFD SGCN	Documented by WYNDD	Observed by LWR
Bird	<i>Larus californicus</i>	California Gull				Yes	
Bird	<i>Larus delawarensis</i>	Ring-billed Gull				Yes	
Bird	<i>Leucosticte atrata</i>	Black Rosy-finch	Yes	Yes	Yes	Yes	
Bird	<i>Leucosticte australis</i>	Brown-capped Rosy-finch	Yes		Yes		
Bird	<i>Limosa fedoa</i>	Marbled Godwit	Yes				
Bird	<i>Loxia leucoptera</i>	White-winged Crossbill				Yes	
Bird	<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	Yes				
Bird	<i>Melanerpes lewis</i>	Lewis's Woodpecker	Yes		Yes	Yes	
Bird	<i>Myiarchus cinerascens</i>	Ash-throated Flycatcher			Yes		
Bird	<i>Numenius americanus</i>	Long-billed Curlew	Yes	Yes	Yes	Yes	
Bird	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron			Yes		
Bird	<i>Oreoscoptes montanus</i>	Sage Thrasher	Yes	Yes	Yes	Yes	Yes
Bird	<i>Oreothlypis virginiae</i>	Virginia's Warbler				Yes	
Bird	<i>Otus flammeolus</i>	Flammulated Owl	Yes				
Bird	<i>Pelecanus erythrorhynchos</i>	American White Pelican			Yes	Yes	
Bird	<i>Phalaropus lobatus</i>	Red-necked Phalarope				Yes	
Bird	<i>Picoides arcticus</i>	Black-backed Woodpecker			Yes		
Bird	<i>Picoides dorsalis</i>	American Three-toed Woodpecker			Yes		
Bird	<i>Plegadis chihi</i>	White-faced Ibis			Yes	Yes	
Bird	<i>Podiceps auritus</i>	Horned Grebe					
Bird	<i>Psaltriparus minimus</i>	Bushtit			Yes		
Bird	<i>Rallus limicola</i>	Virginia Rail			Yes	Yes	
Bird	<i>Recurvirostra americana</i>	American Avocet		Yes			
Bird	<i>Regulus satrapa</i>	Golden-crowned Kinglet				Yes	
Bird	<i>Setophaga nigrescens</i>	Black-throated Gray Warbler				Yes	
Bird	<i>Sitta pygmaea</i>	Pygmy Nuthatch			Yes		
Bird	<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker	Yes				
Bird	<i>Spiza americana</i>	Dickcissel	Yes		Yes		
Bird	<i>Spizella breweri</i>	Brewer's Sparrow	Yes		Yes	Yes	Yes
Bird	<i>Spizella pallida</i>	Clay-colored Sparrow				Yes	
Bird	<i>Stellula calliope</i>	Calliope Hummingbird	Yes	Yes			
Bird	<i>Sterna forsteri</i>	Forster's Tern			Yes		
Bird	<i>Sterna hirundo</i>	Common Tern				Yes	
Bird	<i>Strix nebulosa</i>	Great Gray Owl			Yes		
Bird	<i>Tympanuchus cupido</i>	Greater Prairie Chicken					
Bird	<i>Tympanuchus phasianellus columbianus</i>	Columbian Sharp-tailed Grouse			Yes		

Group	Scientific Name	Common Name	USFWS BCC	BLM Sensitive	WGFD SGCN	Documented by WYNDD	Observed by LWR
Fish	<i>Catostomus latipinnis</i>	Flannelmouth Sucker		Yes	Yes		
Fish	<i>Etheostoma exile</i>	Iowa Darter			Yes		
Fish	<i>Etheostoma spectabile</i>	Orangethroat Darter			Yes		
Fish	<i>Gila robusta</i>	Roundtail Chub		Yes	Yes		
Fish	<i>Hybognathus argyritis</i>	Western Silvery Minnow			Yes		
Fish	<i>Hybopsis gelida</i>	Sturgeon Chub			Yes		
Fish	<i>Lepidomeda copei</i>	Northern Leatherside Chub		Yes	Yes		
Fish	<i>Lota lota</i>	Burbot			Yes		
Fish	<i>Luxilus cornutus</i>	Common Shiner			Yes		
Fish	<i>Margariscus margarita</i>	Pearl Dace			Yes		
Fish	<i>Nocomis biguttatus</i>	Hornyhead Chub		Yes	Yes		
Fish	<i>Oncorhynchus clarkii bouvieri</i>	Yellowstone Cutthroat Trout		Yes	Yes		
Fish	<i>Oncorhynchus clarkii lewisi</i>	Westslope Cutthroat Trout					
Fish	<i>Oncorhynchus clarkii pleuriticus</i>	Colorado River Cutthroat Trout		Yes	Yes		
Fish	<i>Oncorhynchus clarkii</i>	Snake River Cutthroat Trout			Yes		
Fish	<i>Oncorhynchus clarkii utah</i>	Bonneville Cutthroat Trout			Yes		
Fish	<i>Phoxinus neogaeus</i>	Finescale Dace			Yes		
Fish	<i>Rhinichthys osculus thermalis</i>	Kendall Warm Springs Dace			Yes		
Fish	<i>Scaphirhynchus platyrhynchus</i>	Shovelnose Sturgeon			Yes		
Fish	<i>Stizostedion canadense</i>	Sauger			Yes		
Mammal	<i>Antrozous pallidus</i>	Pallid Bat			Yes		
Mammal	<i>Bos bison bison</i>	Plains Bison				Yes	
Mammal	<i>Brachylagus idahoensis</i>	Pygmy Rabbit			Yes	Yes	Yes
Mammal	<i>Canis lupus</i>	Gray Wolf				Yes	
Mammal	<i>Corynorhinus townsendii townsendii</i>	Townsend's Western Big-eared Bat			Yes		
Mammal	<i>Cynomys leucurus</i>	White-tailed Prairie Dog			Yes	Yes	
Mammal	<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog			Yes		
Mammal	<i>Euderma maculatum</i>	Spotted Bat			Yes		
Mammal	<i>Glaucomys sabrinus</i>	Northern Flying Squirrel (Black Hills Population)			Yes		
Mammal	<i>Gulo gulo luscus</i>	North American Wolverine			Yes		
Mammal	<i>Ictidomys tridecemlineatus</i>	Thirteen-lined Ground Squirrel				Yes	
Mammal	<i>Lasionycteris noctivagans</i>	Silver-haired Bat			Yes		

Group	Scientific Name	Common Name	USFWS BCC	BLM Sensitive	WGFD SGCN	Documented by WYNDD	Observed by LWR
Mammal	<i>Lasiurus cinereus</i>	Hoary Bat			Yes		
Mammal	<i>Lontra canadensis</i>	River Otter			Yes		
Mammal	<i>Lynx canadensis</i>	Canada Lynx			Yes		
Mammal	<i>Martes americana</i>	American Marten (Bighorn Mountain Population)			Yes		
Mammal	<i>Martes pennanti</i>	Fisher			Yes		
Mammal	<i>Microtus richardsoni</i>	Water Vole (Statewide)			Yes		
Mammal	<i>Microtus richardsoni</i>	Water Vole (Bighorn Mountain Population)			Yes		
Mammal	<i>Mustela nigripes</i>	Black-footed Ferret			Yes		
Mammal	<i>Mustela nivalis</i>	Least Weasel			Yes		
Mammal	<i>Myotis ciliolabrum</i>	Western Small-footed Myotis			Yes	Yes	
Mammal	<i>Myotis evotis</i>	Long-eared Myotis			Yes		
Mammal	<i>Myotis lucifugus</i>	Little Brown Myotis				Yes	
Mammal	<i>Myotis thysanodes</i>	Fringed Myotis (Statewide)			Yes		
Mammal	<i>Myotis volans</i>	Long-legged Myotis			Yes		
Mammal	<i>Neotamias dorsalis utahensis</i>	Cliff Chipmunk			Yes		
Mammal	<i>Ovis canadensis</i>	Bighorn Sheep			Yes		
Mammal	<i>Perognathus fasciatus</i>	Olive-backed Pocket Mouse			Yes	Yes	
Mammal	<i>Peromyscus crinitus</i>	Canyon Mouse			Yes		
Mammal	<i>Peromyscus truei</i>	Piñon Deermouse			Yes		
Mammal	<i>Sciurus aberti</i>	Abert's Squirrel			Yes		
Mammal	<i>Sorex haydeni</i>	Hayden's Shrew			Yes		
Mammal	<i>Sorex hoyi montanus</i>	Southern Rocky Mountain Pygmy Shrew			Yes		
Mammal	<i>Sorex nanus</i>	Dwarf Shrew			Yes	Yes	
Mammal	<i>Sorex preblei</i>	Preble's Shrew			Yes		
Mammal	<i>Spermophilus armatus</i>	Uinta Ground Squirrel			Yes		
Mammal	<i>Thomomys clusius</i>	Wyoming Pocket Gopher		Yes	Yes	Yes	Yes
Mammal	<i>Thomomys idahoensis</i>	Idaho Pocket Gopher			Yes		
Mammal	<i>Urocitellus elegans</i>	Wyoming Ground Squirrel		Yes	Yes	Yes	
Mammal	<i>Ursus arctos arctos</i>	Grizzly Bear			Yes	Yes	
Mammal	<i>Vulpes velox</i>	Swift Fox			Yes	Yes	
Mammal	<i>Zapus hudsonius preblei</i>	Preble's Meadow Jumping Mouse					
Reptile	<i>Aspidoscelis sexlineata viridis</i>	Prairie Racerunner			Yes		
Reptile	<i>Charina bottae</i>	Rubber Boa			Yes		
Reptile	<i>Coluber constrictor flaviventris</i>	Eastern Yellowbelly Racer			Yes		

Group	Scientific Name	Common Name	USFWS BCC	BLM Sensitive	WGFD SGCN	Documented by WYNDD	Observed by LWR
Reptile	<i>Crotalus oreganus concolor</i>	Midget Faded Rattlesnake		Yes	Yes		
Reptile	<i>Holbrookia maculata</i>	Lesser Earless Lizard			Yes		
Reptile	<i>Lampropeltis triangulum</i>	Milk Snake			Yes		
Reptile	<i>Pituophis catenifer deserticola</i>	Great Basin Gopher Snake			Yes		
Reptile	<i>Plestiodon multivirgatus</i>	Northern Many-lined Skink		Yes	Yes		
Reptile	<i>Sceloporus consobrinus</i>	Northern Prairie Lizard			Yes		
Reptile	<i>Sceloporus undulatus elongatus</i>	Northern Plateau Lizard			Yes		
Reptile	<i>Sceloporus undulatus erythrocheilus</i>	Red-lipped Prairie Lizard			Yes		
Reptile	<i>Storeria occipitomaculata pahasapae</i>	Black Hills Redbelly Snake			Yes		
Reptile	<i>Tantilla nigriceps</i>	Plains Blackhead Snake			Yes		
Reptile	<i>Terrapene ornata</i>	Ornate Box Turtle			Yes		

10	Amphibian
98	Bird
20	Fish
43	Mammal
14	Reptile
<b>185</b>	<b>Total</b>

<i>BLM Sensitive</i>	Wyoming BLM Sensitive Species list as occurring in Rawlins or Lander Field Office areas
<i>USFWS BCC</i>	USFWS Birds of Conservation Concern, from Wyoming Ecological Services Birds of Conservation Concern
<i>WGFD SGCN</i>	WGFD Species of Greatest Conservation Need
<i>WYNDD</i>	Wyoming Natural Diversity Database Species of Concern as occurring in the area
<i>LWR</i>	LWR Consultants, Inc. observed within the project area, as presented in annual wildlife reports

## **APPENDIX C**

### **Interdisciplinary Team Project Issues Assessment**

**Interdisciplinary Team Project Issues Assessment  
 Lost Creek Uranium *In-Situ* Recovery Project Modifications  
 Resources and Issues Considered (Includes Supplemental Authorities Appendix 1, H-1790-1)**

Determination of Staff:

NP = Not present in the proposed project area.

NI = Present, but not impacted by the action alternatives.

PI = Present with potential for impacts that need to be analyzed.

*Table 1: Resources and issues considered (includes supplemental authorities Appendix 1 H-1790-1:*

Determination	Resource/Issue	Rationale for Determination	Resource Specialist
PI	Air Quality	There is a potential for air quality impacts related to the Proposed Action. Air quality impacts associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS. Current air quality conditions and potential impacts of the Proposed Action are analyzed in this EIS. The Applicant has committed to the reduction of air-quality impacts, which are enforceable by WDEQ-AQD Air Quality Permit CT-7896.	Hovey

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
NP	Areas of Critical Environmental Concern	No Areas of Critical Environmental Concern (ACECs) are present in the proposed project area.	Mowrey/Ross

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Cultural Resources	<p>There is a potential for impacts to cultural resources related to the Proposed Action. Cultural resources impacts associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS. Potential impacts of the Proposed Action are analyzed in this EIS. Twelve archaeological sites were identified within the APE during the Class III surveys. One site within the proposed LCE expansion area was determined to be eligible for the NHRP under Criterion D. The eligible site would be avoided by project design so that no historic properties would be affected by the undertaking.</p>	Bruce
PI	Drinking Water/Ground Water Quality	<p>There is a potential for impacts to drinking water/groundwater quality related to the Proposed Action. Impacts to groundwater resources associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to groundwater resources related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing groundwater impacts (groundwater quality, consumptive use, groundwater use, and other energy resource operations) are discussed in this EIS and described in the Applicant's Operations Plan. Of particular interest are impacts from Class I and V UIC wells.</p>	Fleuret

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Environmental Justice	Minority and low-income populations reside in the vicinity of the proposed project area. Environmental-justice impacts associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential environmental justice impacts related to the Proposed Action are analyzed in this EIS. There would be no disproportionately high or adverse impacts on minority and low-income populations related to the Proposed Action.	Schein Dobb
NI	Fire and Fuels Management	There would be no negative impacts to fire and fuels management from the proposed project. The Proposed Action could reduce the risk of wildfire spread since vegetation would be removed and mine employees would be available in the event rangeland fires occur in the area.	Warren
NP	Fisheries	There are no fishery resources within the proposed project area.	Tribby
NP	Floodplains	There are no floodplains present in the proposed project area.	Mowrey
NP	Forest Management	Forestry resources do not exist within the proposed project area.	Hartshorn
PI	Hazardous and solid waste	Under the Proposed Action, solid waste would include both AEA-regulated and non-AEA-regulated wastes. Hazardous and solid waste impacts associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts from hazardous and solid wastes related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing impacts from hazardous and solid wastes are discussed in this EIS and described in the Applicant's Operations Plan.	Layton

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Invasive, Non-native Species	There is a potential for impacts from invasive, non-native vegetation species that can be found in the general project area. Potential impacts from non-native vegetation species related to the Proposed Action are analyzed in this EIS. The Applicant would follow BLM guidelines for weed prevention and conduct annual surveys to locate and eradicate invasive plant species, as outlined in the Operations Plan.	Skeldon/Warren
NP	Lands with Wilderness Characteristics (LWC)	There are no Lands with Wilderness Characteristics in the proposed project area.	Mowrey
PI	Livestock Management	There is a potential for impacts to livestock management (from fencing, restricted access to water, and forage removal) related to the Proposed Action. Impacts to livestock management associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts related to the Proposed Action are analyzed in this EIS. There are two BLM grazing allotments on BLM surface associated with the proposed project and approximately 104 AUM's could be impacted. As the mine units are reclaimed and revegetated, the land would be returned to its current use of livestock grazing.	Warren
PI	Minerals	There is a potential for impacts to mineral development (uranium, oil, natural gas, CBNG, and coal) related to the Proposed Action. Impacts to mineral development associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts related to the Proposed Action are analyzed in this EIS. Although there are mineral development projects in the general vicinity, they would not be directly or indirectly (limiting access) impacted.	Newman

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Noise	There is a potential for noise impacts from the Proposed Action from both mobile and stationary sources. Potential impacts from noise related to the Proposed Action are analyzed in this EIS. The noise generated the Proposed Action would be similar to impacts associated with the currently approved Lost Creek ISR Project described in the BLM Lost Creek EIS and NRC Lost Creek SEIS. Applicant-committed design features related to reducing noise impacts are discussed in this EIS and described in the Applicant's Operations Plan.	Ross
PI	Native American Concerns	There is a potential for impacts to Native American concerns impacts from the Proposed Action. Native American concerns associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts related to the Proposed Action are analyzed in this EIS. BLM made a reasonable and good faith effort to identify Native American tribes to be consulted during the Section 106 consultation process. None of the Tribes consulted responded to the consultation letters or follow-up telephone calls.	Bruce

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Off Highway Vehicles (OHV)	There is a potential for impacts to dispersed recreation activities near the proposed project area, including OHV use. Impacts to dispersed recreation associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to recreation activities related to the Proposed Action are analyzed in this EIS.	Warren
PI	Paleontology	While there are no known paleontological resources within the proposed project area, there is potential for impacts related to the Proposed Action. Impacts to paleontological resources with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to recreation activities related to the Proposed Action are analyzed in this EIS.	Newman
NP	Prime or Unique Farmlands	There are no Prime or Unique Farmlands within the proposed project area.	Warren
PI	Reclamation	Since successful reclamation affects a number of resources, including surface water quality, air quality, soils, vegetation, and wildlife, there is potential that the success of reclamation will impact these resources. Applicant-committed design features related to reducing impacts to these resources are discussed in this EIS and described in the Applicant's Reclamation Plan and Operations Plan.	Ogle
PI	Recreation	There is a potential for impacts to dispersed recreation activities near the proposed project area. Impacts to recreation associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to recreation activities related to the Proposed Action are analyzed in this EIS.	Mowrey

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Socioeconomic	There is a potential for socioeconomic impacts on revenues, demographics, income, housing, employment structure, education, and health and social services from the Proposed Action. Socioeconomic impacts associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential socioeconomic impacts related to the Proposed Action are analyzed in this EIS.	Schein Dobb/Siddon
PI	Soils	The Proposed Action would disturb an additional 1,415 acres beyond the currently approved disturbance acres. Impacts to soils associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to soils related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing impacts to soils are discussed in this EIS and described in the Applicant's Reclamation Plan.	Skeldon/Krassin
NP	Special Designations and Management Areas	No Special Designations or Management Areas exist within the proposed project area.	Mowrey
PI	Surface-Water Resources	There is a potential for impacts to surface water and aquatic ecology from construction (well installation and road crossings), filling, erosion, runoff, and spills or leaks of fuels and lubricants from construction equipment. Impacts to surface-water resources associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to surface-water resources related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing surface-water impacts are discussed in this EIS and described in the Applicant's Operations Plan.	Mowrey

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Threatened, Endangered or Candidate Animal or Plant Species	There is a potential for impacts to T&E animal and plant species from the Proposed Action. T&E impacts associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to T&E species related to the Proposed Action are analyzed in this EIS. A list of federally listed and candidate species with the potential to occur in area has been compiled. No T&E species or habitats critical to T&E species have been documented within the proposed project area.	Ross
PI	Transportation and Access Management	There is a potential that the proposed project could impact transportation and access. Transportation impacts associated with the currently approved Lost Creek ISR Project were analyzed in the NRC Dryer Amendment EA, the BLM Lost Creek EIS, and the NRC Lost Creek SEIS. Potential transportation impacts related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing transportation impacts are discussed in this EIS and described in the Applicant's Operations Plan and the NRC Dryer Amendment Application.	Wrigley

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Vegetation	The Proposed Action would disturb an additional 1,415 acres beyond the currently approved disturbance acres. Impacts to vegetation associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to vegetation related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing vegetation impacts are discussed in this EIS and described in the Applicant's Reclamation Plan.	Warren
PI	Visual Resource Management	Direct impacts to visual and scenic resources would include changes in the visual and scenic setting of the proposed project area and impacts from fugitive dust. Impacts to visual resources associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential visual resources impacts related to the Proposed Action are analyzed in this EIS.	Mowrey
PI	Wild Horses	There is a potential for impacts to wild horses near the proposed project area. Impacts to wild horses associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to wild horses related to the Proposed Action are analyzed in this EIS. Two wild-horse habitat management areas are associated with the proposed project. Applicant-committed design features related to reducing impacts to wild horses are discussed in this EIS and described in the Applicant's Operations Plan.	Vanenburg/Krassin/ Warren
NP	Wilderness Characteristics	No areas identified as potential lands with wilderness characteristics exist within the proposed project area.	Mowrey

<b>Determination</b>	<b>Resource/Issue</b>	<b>Rationale for Determination</b>	<b>Resource Specialist</b>
PI	Wildlife	<p>There is a potential for impacts to wildlife species near the proposed project area. Of particular interest are impacts to raptors, Greater sage-grouse, and other species of special interest. Impacts to wildlife species associated with the currently approved Lost Creek ISR Project were analyzed in the BLM Lost Creek EIS and the NRC Lost Creek SEIS, and potential impacts to wildlife species related to the Proposed Action are analyzed in this EIS. Applicant-committed design features related to reducing impacts to wildlife species are discussed in this EIS and described in the Applicant's Operations Plan, including the Wildlife Protection Plan and Wildlife Monitoring Plan.</p>	Ross