United States Department of the Interior
Office of Surface Mining Reclamation and Enforcement

Environmental Assessment
Dry Fork Mine
Amendment 3
Federal Mining Plan Modification

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1.0 Purpose and Need

1.1 Introduction

The Dry Fork Mine (DFM) is currently seeking approval from the Assistant Secretary, Land and Minerals Management (ASLM) to recover additional coal associated with federal coal lease WYW-0311810. The Dry Fork Mine Amendment 3 Federal Mining Plan Modification Environmental Assessment (the Project) has been prepared by the U.S. Department of the Interior (DOI) Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region. OSMRE will prepare a mining plan decision document (MPDD) in support of its recommendation to the ASLM regarding federal mining plan modifications (OSMRE 1999). The ASLM will decide whether the mining plan modification is approved, disapproved, or approved with conditions. Using criteria outlined in OSMRE's Directive REG-1, Handbook for Implementing the National Environmental Policy Act (NEPA) (OSMRE 1989), the DOI's Departmental Manual (DM) Part 516 (DOI 1980), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulation [CFR] Parts 1500-1508), and the DOI's regulations for implementation of NEPA (43 CFR Part 46), OSMRE determined that this EA could incorporate by reference the analyses included in the Dry Fork Mine Amendment 2, Tract 1 Federal Mining Plan Modification Environmental Assessment (A2TR1 EA [OSMRE 2017]) because the A2TR1 EA evaluated impacts related to mining federal coal immediately adjacent to the Amendment 3 Federal Mining Plan Modification Tract (A3 tract) and because the A2TR1 EA provides detailed discussions of the history and infrastructure at the DFM. Where appropriate, the A2TR1 EA will be incorporated by reference to reduce the length of this EA. Information gathered from federal, state, and local agencies, Western Fuels-Wyoming, Inc. (WFW), publicly available literature, and in-house OSMRE sources, such as the DFM Permit Application Package (PAP), were used in the preparation of this EA.

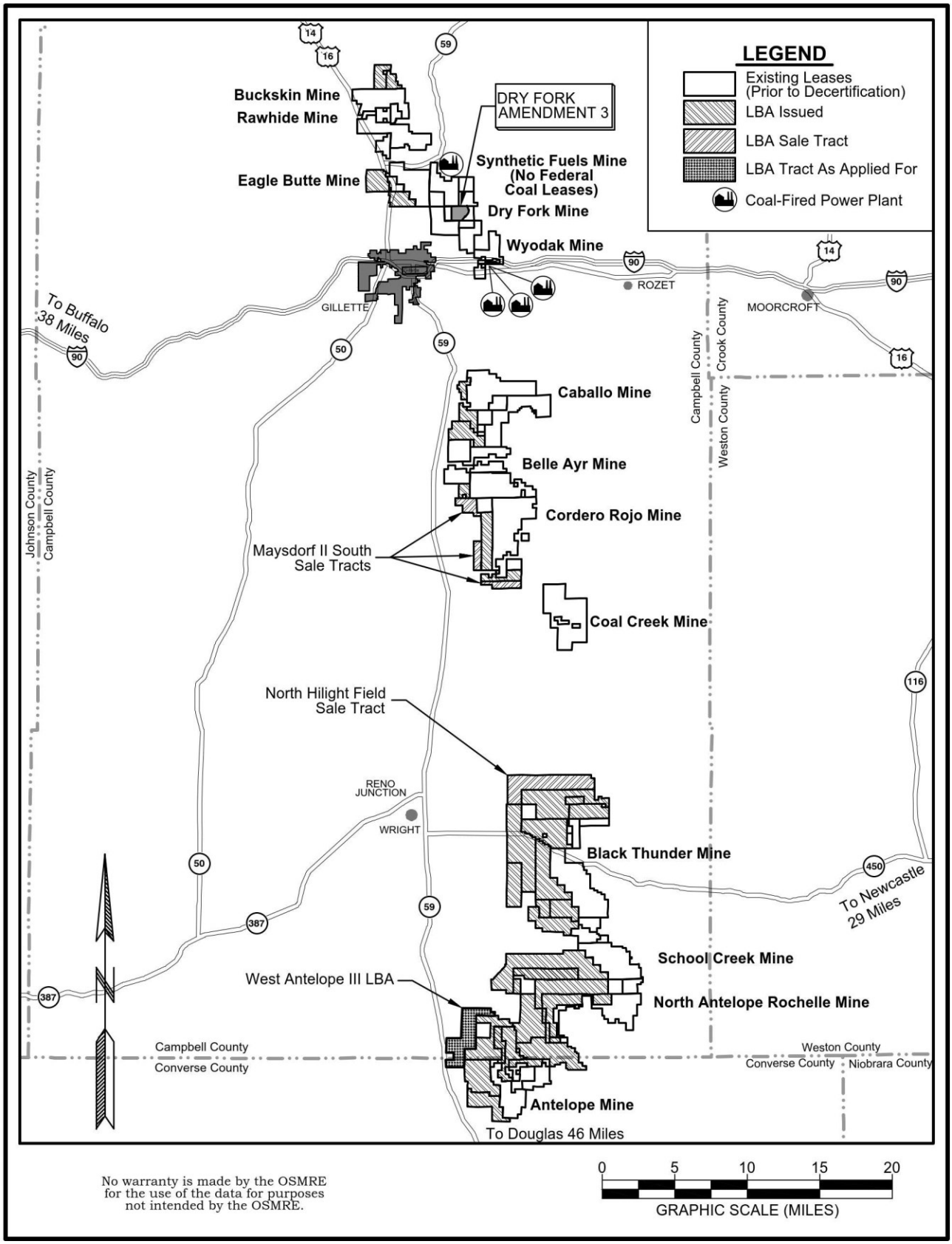
1.2 Background

1.2.1 Site History

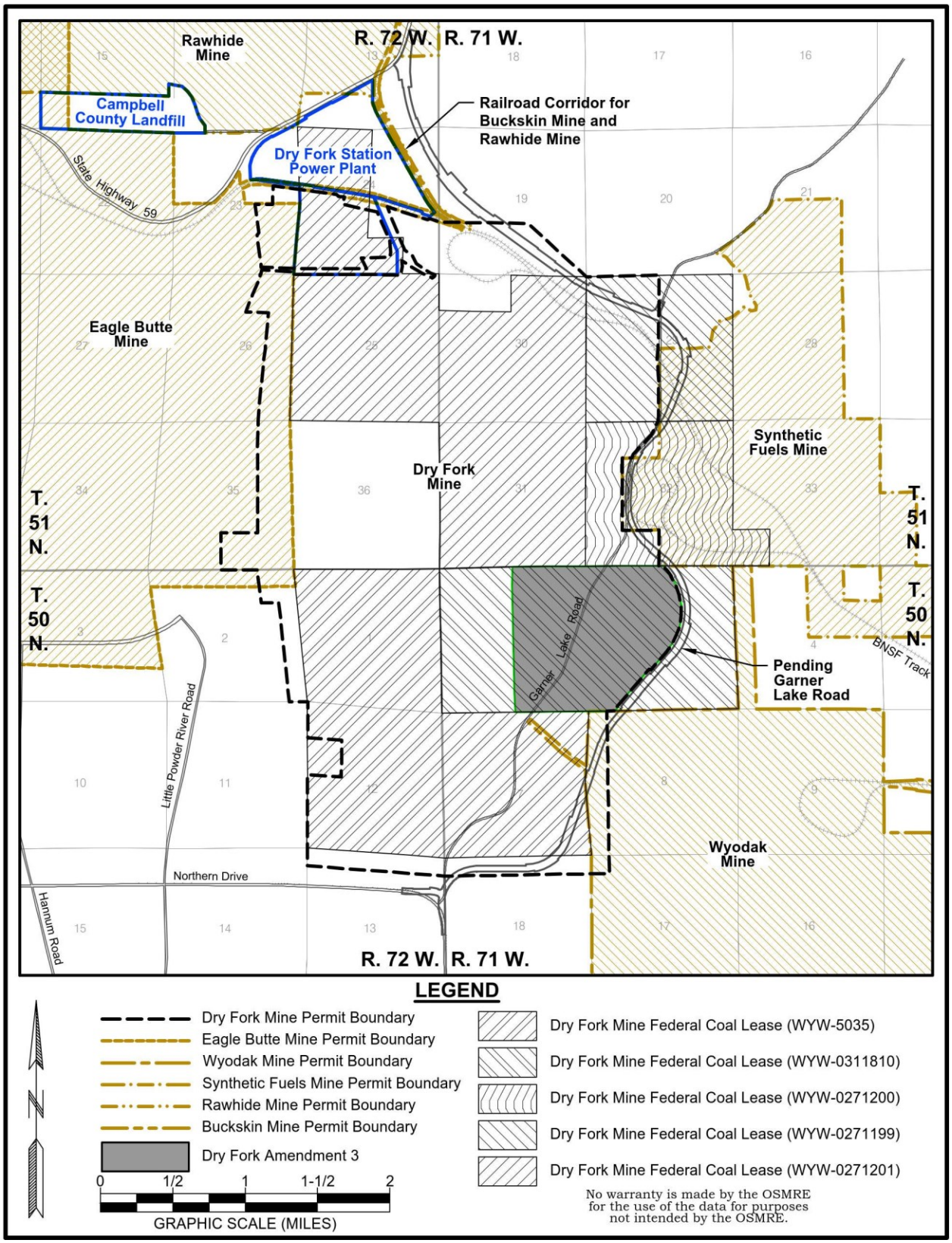
The DFM is located approximately 4.5 miles northeast of the City of Gillette in Campbell County, Wyoming (**map 1-1**), between Wyoming State Highway (SH) 59 and Garner Lake Road (County Road 38N) **(map 1-2)**. The Garner Lake Road currently bisects the tract, but the road will be relocated immediately adjacent to the tract prior to disturbance. The relocation was planned prior to the initial planning for the A3 tract. According to information provided by WFW, the DFM currently recovers coal from five federal coal leases, one state lease, and one private lease, as listed below (WFW 2019a).

1. Federal coal lease WYW-5035
2. Federal coal lease WYW-0271199
3. Federal coal lease WYW-0271200
4. Federal coal lease WYW-0271201
5. Federal coal lease WYW-0311810
6. State coal lease 0-26652
7. Marshall et al. private coal lease

Map 1-2 shows the federal coal leases associated with the DFM. The A3 tract contains a portion of federal coal lease WYW-0311810.



Map 1-1. General Location Map with Federal Coal Leases



Map 1-2. Federal Coal Leases Associated with the Dry Fork Mine

The DFM is located in the northern portion of the Wyoming Powder River Basin (PRB) region, a coal basin that spans from northeast Wyoming to southeast Montana. In 2017, the PRB produced 87 percent of the coal mined from federal government-owned coal leases in the U.S (DOI 2019). The region has also been heavily developed for oil and gas recovery, including coal bed natural gas (CBNG). All of the land surrounding the A3 tract is currently leased for coal mining (**map 1-2**). The DFM permit boundary overlaps two other approved mining operations (Eagle Butte and Woyak mines) and abuts the Rawhide and Synthetic Fuels mine permit areas. The A3 tract is within the currently approved DFM permit boundary. Several heavy industrial facilities are also near A3, including an oilfield wastewater injection business, an activated carbon refinery, and a septic waste disposal business. An industrial park is in the process of being developed within 0.75 mile of the tract.

Coal is mined at the DFM using truck and loader, multiple bench methods. The coal is transported by haul truck to the truck-dump hopper located near the mine silos. From the silos, coal is conveyed to the adjacent Dry Fork Station (DFS) power plant silos or to the railroad loadout facility, which is within the DFM railroad loop. The DFS power plant has a design capacity of 422 megawatts (MW). Construction of the plant was completed during 2011, and it began accepting coal from the DFM, which currently provides all of the coal for the power plant. The DFS is estimated to need approximately 2.0 million tons per year (Mtpy) through the life of the facility (estimated at 2071). Additionally, the DFM provides coal on the spot market (market in which coal is sold for immediate delivery), and coal is shipped to customers via an on-site rail spur connected to a BNSF Railway Company (BNSF) main line that can accommodate coal shipments to all portions of the U.S. Mining operations are described in detail in **chapter 2**.

WFW operates the DFM under Permit No. PT0599, issued by Wyoming Department of Environmental Quality (WDEQ)-Land Quality Division (LQD) in accordance with the approved Wyoming State Coal Regulatory Program (30 CFR Part 950). Permit No. PT0599 was recently amended to include the A3 tract. This EA considers potential effects from mining coal within the A3 tract and does not reevaluate existing federal mining areas and operations, except in terms of cumulative effects.

Based on 2012-2018 annual production numbers, the current optimal mining rate for the DFM is 6.0 Mtpy and coal sales are expected to continue at that rate unless market conditions change. Typically, most of the sales are to power plants in the region. The DFM shipped between 86 and 98 percent of its coal to power plants located in Wyoming during the period between 2012 and 2018. Since the DFS became fully operational in 2014, over 96 percent of DFM coal has been consumed in Wyoming. This trend of primarily selling coal to in-state power plants is expected to continue.

1.2.2 Project Background

As seen on **map 1-2**, the A3 tract is within the DFM permit boundary. Until a decision regarding the federal mining plan modification request for the A3 tract is made, WFW would continue to mine federal coal from the portions of federal coal leases WYW-0271199, WYW-0271200, WYW-0271201, WYW-5035, and WYW-0311810, approved in prior ASLM federal mining plan revisions in accordance with conditions to Permit No. PT0599.

WFW submitted the Amendment 3 permit revision/permit application package (Amendment 3 PAP) to Permit No. PT0599 to include the A3 tract (WFW 2018). The Amendment 3 PAP

included modifications to mine additional coal from lease WYW-0311810. WDEQ-LQD approved the Amendment 3 PAP on April 17, 2019 (WDEQ-LQD 2019).

DFM also submitted a federal mining plan modification request to OSMRE for federal coal related to lease WYW-0311810. Using criteria outlined in OSMRE's NEPA Handbook, OSMRE determined that an EA that incorporates by reference the analyses included in the DFM A2TR1 EA would be appropriate because the A2TR1 EA evaluated impacts related to mining federal coal immediately adjacent to the A3 tract and because the A2TR1 EA provides detailed discussions of the history and infrastructure at the DFM.

1.2.3 Statutory and Regulatory Background

The discussions included in section 1.2.3 of the A2TR1 EA provide details regarding the statutory and regulatory background associated with the DFM. These details have not changed and are incorporated by reference. For existing, approved federal mining plans that are proposed to be modified, pursuant to 30 CFR Part 746, OSMRE prepares a federal MPDD for a federal mining plan modification. The MPDD recommends approval, disapproval, or approval with conditions of a federal mining plan modification (OSMRE 1999). The ASLM reviews the MPDD and decides whether or not to approve the federal mining plan modification, and if approved, what, if any, conditions may be needed.

In compliance with other federal laws, regulations and executive orders (EOs), OSMRE also conducts consultation with other agencies before it makes its recommendation to the ASLM. This consultation includes the U.S. Fish and Wildlife Service (USFWS) Section 7 consultation for threatened and endangered species potentially affected by the proposed mining plan under the Endangered Species Act of 1973 (ESA) and Section 106 consultation under the National Historic Preservation Act (NHPA).

OSMRE will not reevaluate all potential impacts previously analyzed as part of the A2TR1 EA, which included analysis of all federal coal lands identified in the proposed mining plan modification. Rather, this EA considers potential changes to the extent or nature of those impacts based on information include in the Amendment A3 PAP for Permit No. PT0599 and new time-sensitive information specific to this action.

1.3 Purpose and Need

As described in 40 CFR § 1502.13, the purpose and need statement should briefly specify the purpose and need to which the agency is responding in proposing the alternatives including the Proposed Action.

1.3.1 Purpose

The purpose of the Proposed Action is established by the Mineral Leasing Act (MLA) and the Surface Mining Control and Reclamation Act of 1977 (SMCRA), which requires the evaluation of WFW's proposed federal mining plan modification for the DFM before WFW can conduct surface mining and reclamation operations in the A3 tract to develop federal coal lands included in federal lease WYW-0311810. OSMRE is the agency responsible for making a recommendation to the ASLM to approve, disapprove, or approve with conditions the proposed federal mining plan modification.

1.3.2 Need

The need for this action is to provide WFW the opportunity to exercise its valid existing rights granted by the Bureau of Land Management (BLM) under federal coal lease WYW-0311810 to access and mine these federal coal reserves associated with the A3 tract at the DFM. ASLM approval of the federal mining plan modification is necessary to mine the reserves.

1.4 Relationship to Statutes, Regulations, and Other Agency Plans

The following key laws, as amended, establish the primary authorities, responsibilities, and requirements for developing federal coal resources:

1. Mineral Leasing Act of 1920 (MLA),
2. National Environmental Policy Act (NEPA),
3. Mining and Minerals Policy Act of 1970 (MMPA),
4. Federal Coal Leasing Act Amendment, 1976 (FCLAA),
5. Federal Land Policy Management Act of 1976 (FLPMA),
6. Surface Mining Control and Reclamation Act of 1977 (SMCRA),
7. Multiple-Use Sustained Yield Act of 1960,
8. Endangered Species Act (ESA),
9. Clean Air Act (CAA),
10. Clean Water Act (CWA),
11. Safe Drinking Water Act (SDWA),
12. National Historic Preservation Act (NHPA),
13. American Indian Religious Freedom Act (AIRFA),
14. Paleontological Resources Preservation Act of 2009 (PRPA),
15. Bald and Golden Eagle Protection Act (16 U.S.C. 668 - Eagle Act), and
16. Migratory Bird Treaty Act (MBTA).

In addition, this EA follows guidance in DOI 516 DM (DOI 1980), which, as outlined in 43 CFR Part 46, is the DOI manual guiding the implementation of the NEPA process. An MPDD will be prepared and submitted to the ASLM for the reconsidered federal mining plan modification.

1.5 Public Outreach and Issues

Following a review of the A2TR1 EA, OSMRE determined that further analyses related to the A3 EA were appropriate, based on newly available information and changes to the environmental consequences of the Proposed Action that have occurred since the A2TR1 EA analysis. Internal discussions within OSMRE identified a preliminary set of issues to be considered during the NEPA analysis. OSMRE published a notice of intent (NOI) to prepare this EA in the Gillette News Record and announced the availability of the EA on their Initiatives webpage (OSMRE 2019) on March 22, 2019 (**appendix A**). Public outreach and tribal consultation letters were also sent out to stakeholders and tribes that could be affected by the Project. The public scoping period was conducted between March 22 and April 22, 2019. OSMRE received five written/emailed comments. Lists of agencies, tribes, and individuals included on mailing lists are included in **appendix B**. Substantive issues identified during public scoping were considered during the document preparation. The further-summarized issues and the number of comments received associated with each issue (in parentheses) include:

1. air quality (3),
2. level of NEPA/NEPA process (3),
3. climate change/global warming (3),

4. water quality (2),
5. compliance with current rules/regulations/permits (2),
6. wildlife (2),
7. economy/employment (2), and
8. transportation (1).

The EA and unsigned FONSI will be provided to the public for review and comment for a 30-day period, ending on August 8, 2019. The comments will be evaluated and considered before the EA is finalized and the FONSI is signed.

2.0 Proposed Action and Alternatives

Under the requirements of NEPA, an EA must evaluate the environmental impacts of a reasonable range of alternatives that meet the project's purpose and need. The DOI's NEPA implementing regulations define reasonable alternatives as those that are "technically and economically practical or feasible and meet the purpose and need of the proposed action" (43 CFR § 46.420). This chapter describes the Proposed Action and the No Action Alternative considered and analyzed in detail in this EA. In addition, it identifies alternatives considered but eliminated from detailed analysis.

2.1 Description of Alternatives

Descriptions of the alternatives analyzed by this EA are discussed below and a summary comparison of coal production, surface disturbance, mine life, and employees under the No Action Alternative and Proposed Action as of December 31, 2018 is provided in **table 2-1**. The No Action Alternative would leave operations as stated in the currently approved federal mining plan. The Proposed Action would add coal associated with federal lease WYW-0311810 to the federal mining plan. These scenarios are described in greater detail below.

Table 2-1. Summary Comparison of Coal Production, Surface Disturbance, Mine Life, and Employees for the Current Permit No. PT0599, the No Action Alternative, and the Proposed Action, as of December 31, 2018

Item	Current OSMRE Federal Mining Plan (No Action Alternative)	Projections Under Proposed Action
Remaining recoverable leased coal[1] (Mt)	204.0	262.1 (58.1 added)
Currently approved federal mine plan acres	5,837.5	6,493.9 (656.4 added)
WDEQ-LQD permit acres (PT0599)	7,133.8	7,133.8 (no change[2])
Total acres to be disturbed	5,005.1	5,005.1 (no change[2])
Estimated average annual production (Mt)	6.0	6.0 (no change)
Remaining years from recovering all leased coal	38.8	48.5 (9.7 added)
Average number of employees	82	82 (no change)

[1] Includes federal, state, and private coal leases
[2] The DFM permit area and affected area have been approved by WDEQ-LQD under the Amendment 3 PAP

2.1.1 Proposed Action

Under the Proposed Action, OSMRE would prepare a MPDD recommending approval of WFW's federal mining plan modification request to include the mining federal coal within the A3 tract associated with federal lease WYW-0311810, and the ASLM would approve the federal mining plan modification. The mine would use similar mining and reclamation methods to recover the coal as described in **section 1.2.1**. The operations within the proposed 656.4-acre project area are estimated to disturb a total of 640.3 acres.

Approving the Proposed Action would add approximately 58.1 Mt of recoverable federal coal to the mine's coal reserves. **Table 2-2** shows the effects of adding Proposed Action reserves on the estimated life of mine (LOM) under 6.0-Mtpy and 15.0-Mtpy scenarios. The 6.0-Mtpy scenario is based on current WFW contracts and anticipated demand. The 15.0-Mtpy scenario is included in the evaluation since this is the maximum annual production permitted under DFM's current Air Quality Permit No. P0023278.

Table 2-2. Mine Life Scenarios for the Proposed Action

Production Rate Scenarios	Current Anticipated LOM	Estimated Years Extended[1]	Anticipated LOM with the Proposed Action
6.0 Mtpy	October 2054	9.7	June 2064
15.0 Mtpy	July 2031	3.9	May 2035

[1] Estimated using 58.1 Mt of additional recoverable coal

2.1.2 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved by the ASLM, and WFW would continue to operate under the currently approved federal mining plan. Under this alternative, OSMRE would not recommend approval or approval with conditions of the federal mining plan modification, and the ASLM would issue a decision based on the No Action Alternative.

If the No Action Alternative is selected, WFW would bypass the coal in the project area, resulting in 58.1 Mt of federal coal not being recovered and 640.3 acres of previously undisturbed ground not being disturbed. The No Action Alternative would require revisions to the WDEQ-LQD approved Permit No. PT0599 and the BLM approved Resource Recovery and Protection Plan (R2P2) to modify the reclamation plan, maximum economic recovery conditions, and coal recovery plans for areas within the boundaries of Permit No. PT0599 to exclude mining activities within the A3 tract.

2.1.3 Alternatives Considered but Eliminated from Further Study

OSMRE considered alternative scenarios to the approval or denial of the federal mining plan modification. However, since OSMRE's decision would be limited to approving, approving with conditions, or denying the mining plan modification, OSMRE concluded that there are no other reasonable action alternatives that would meet the agency's purpose and need. The discussions included in section 2.4.3.1 of the A2TR1 EA provide details regarding the alternatives considered but eliminated from detailed analysis. The discussions included reasons the alternatives were eliminates from detailed analysis, as summarized below.

2.1.3.1 Underground Mining Alternative

This alternative was not brought forward for analysis because underground mining would not respond to the purpose and need for this action, is not in conformance with the maximum economic recovery requirements of the federal coal leases and the R2P2, and would result in a prohibitive economic burden on the mine. Given these factors, bringing this alternative forward for further review would not be reasonable.

2.1.3.2 Low or No Pollutant Emitting Equipment

OSMRE has not brought forward this alternative for full analysis because requiring natural gas and solar powered engine technology and retrofitting existing equipment is not economically or technologically feasible for all equipment at the DFM and would likely have substantially similar effects to other alternatives that are being analyzed. Given these factors, bringing this alternative forward for further review would not be reasonable.

2.1.3.3 Air Quality Mitigation Alternatives

Alternatives that mitigate air quality impacts, specifically by imposing more stringent emission limits at power plants fueled by coal from the DFM and by requiring oil and gas operators in the region to reduce their emissions are not alternatives to the mining plan being considered. The effects of coal combustion are analyzed in the Proposed Action as well as in the No Action Alternative because they are considered to be indirect effects. CEQ regulations at 40 CFR § 1508.8(b) define "indirect effects" as those "which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable". These indirect effects would occur as a result of burning the coal that is mined. Any mitigation measure proposed by OSMRE imposing more stringent emission limits on non-coal operators is beyond OSMRE's authority and its implementation would be highly remote and speculative. Given these factors, bringing this alternative forward for further review would not be reasonable.

2.2 Existing Conditions (Conditions Common to the Proposed Action and the No Action Alternative)

2.2.1 Mining Plan and Mining Operations

WFW operates the DFM in accordance with WDEQ-LQD-approved Permit No. PT0599. WFW owns or controls the surface estate and coal resources within the current DFM permit boundary. The surface ownership within the currently approved permit boundary includes 6,269.8 acres of private surface, 39.4 acres of federal surface, and 824.5 acres of state surface (WDEQ-LQD 2019). The coal ownership includes 195.3 acres of private coal, 6,197.9 acres of federal coal, and 740.7 acres of state owned coal. All mineable coal within the permit boundary is currently leased by WFW or affiliates. Surface and mineral estate within the A3 tract is discussed in detail in **section 3-10**.

Environmental studies for the DFM began in 1978. WDEQ-LQD originally approved Permit No. PT0599 on April 13, 1989 and mining operations began in 1989. **Section 1.2** discusses the various additions of other permitted lease areas related to the DFM. Permit renewals approved under WDEQ-LQD regulations are for a 5-year permit term and the permit must be updated with new information available at that time. Permit No. PT0599 for the DFM has been approved for renewal seven times since 1989. The current approved permit term (T7) for operations at the DFM is from April 13, 2019 to April 12, 2024.

The discussions included in section 2.3 of the A2TR1 EA provide details regarding the description of mining and reclamation operations in place at the DFM in 2017. These details have not changed and are incorporated here by reference. Coal recovery at the DFM is conducted using conventional surface mining techniques; vegetation would be removed in new disturbance areas in conjunction with topsoil removal; blasting and removal of the overburden, overburden/interburden, and coal; pit backfilling; and reclamation.

WFW's overall reclamation objectives are to reclaim the disturbed areas to the approved postminning land uses of cropland, livestock grazing, and wildlife habitat. Through December 31, 2018, mining at the DFM has disturbed approximately 2,194 acres, with a total of 727 acres having been backfilled and graded since the start of mining and 726 acres have been soiled and seeded using approved seed mixes suitable for livestock grazing and wildlife habitat. Revegetation of all tracts is monitored until the vegetation establishment meets the approved standards provided in the Amendment 3 PAP. In addition to permanent reclamation within the permit boundary, an additional 305 acres have been temporarily seeded, which are used by wildlife, with some agricultural use. The temporarily seeded areas include long-term topsoil and some seeded overburden storage areas and seeded hydrologic control structures. Approximately 1,031 acres of permanent reclamation and temporarily reclaimed lands, or about 47 percent of the total disturbed area, are available for use as wildlife habitat and for agricultural use.

2.2.2 Current Bonding and Bond Release Status

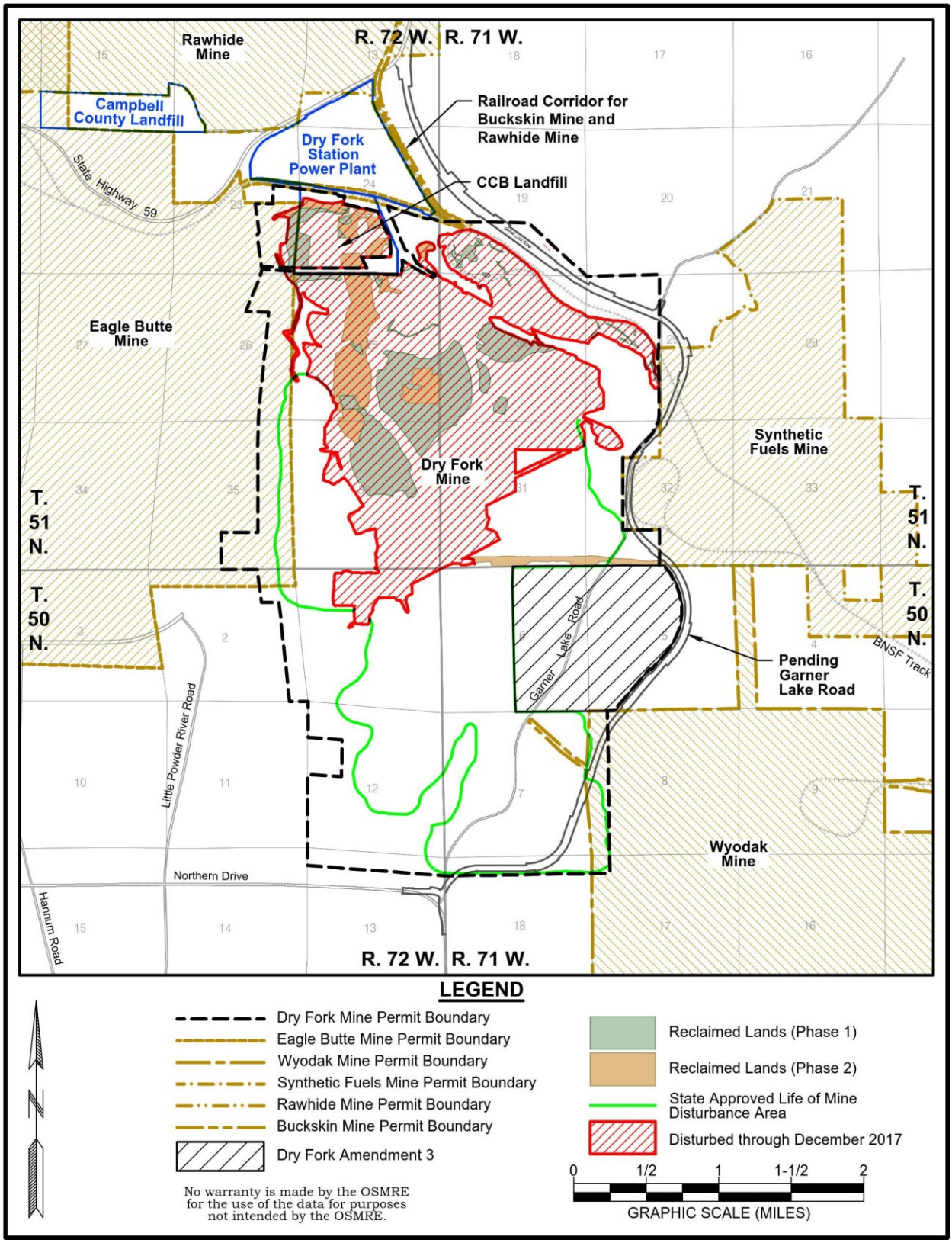
SMCRA provides that, as a prerequisite for obtaining or modifying a coal mining permit, permittees must post a reclamation bond to ensure that the regulatory authority would have sufficient funds to reclaim the site if the permittee fails to complete obligations set forth in the approved reclamation plan (OSMRE 2016). Reclamation liabilities at the DFM, as calculated by WDEQ-LQD as part of the annual report for Permit No. PT0599, are $30,521,892. The DFM bonding is guaranteed by a combination of surety and self-bonding. A Surety Bond provides $4,566,567, and Basin Electric Power Cooperative and Tri-State Generation and Transmission Association self bond for the remainder to cover all reclamation liabilities at the mine (WFW 2019a).

As outlined in WDEQ-LQD Guideline No. 20 (Bond Release Categories and Submittal Procedures for Coal Mines), there are four types of bond release, based on completion of certain portions of the reclamation plan (WDEQ-LQD 2014a). These include:

1. Area bond release;
2. Phase 1(Partial Incremental), which includes stream channel reconstruction verification and soil depth verification;
3. Phase 2 (Partial Incremental), which includes vegetation establishment verification, surficial stability verification, and permanent impoundment construction/renovation and State Engineer's Office (SEO) approval verification; and
4. Phase 3 (Full Incremental or Final release), which includes mitigation wetlands verification, revegetation success verification, and tree establishment verification.

Bond release is successive, meaning that reclaimed land must achieve Phase 1 bond release before being eligible for Phase 2 and must achieve Phase 2 bond release before being eligible for Phase 3. Each successive phase of bond release is a subset of the previous phase.

WFW has received approval for Phase I bond releases for areas within the DFM permit boundary. **Map 2-1** shows the reclaimed areas by bond release phase and **table 2-3** provides acreages for each phase of bond release within the DFM.



Map 2-1. Dry Fork Mine's Currently Approved Disturbance, Disturbance through August 2016, and Reclamation by Bond Release Phase.

Table 2-3. Summary of Phased Bond Release Acreages associated with the Proposed Action

Phased Bond Releases Status[1]	Mine Wide	Percent of Total	Specific to the A3 Tract
Total acres disturbed	2,194	--	0
Acres of long-term mining or facilities	759	35	0
Acres of active mining	708	32	0
Acres backfilling and graded	727	33	0
Total areas reclaimed (soiled and seeded/planted)	726	33	0
Acres that have achieved Phase 1 bond release	696	32	0
Acres that have achieved Phase 2 bond release	271	12	0
Acres that have achieved Phase 3 bond release	0	0	0

[1] As of December 31, 2018
Source: WFW 2019a

2.2.3 DFM Support Facilities

Mining activities are supported by existing, permitted facilities located within the DFM permit boundary and include facilities buildings, coal handling facilities, and ancillary facilities (roads, ponds, power lines, etc.). Other facilities not considered as the main facilities described above include the train loadout, railroad loop, explosives storage area, scoria pits, landfarm, sediment control ponds and diversions, the access road and miscellaneous haul roads and light use roads.

2.2.4 Existing Stipulations and Mitigation Measures

Mitigation measures stipulated for the A3 tract associated with the WYW-0311810 federal coal lease, in the context of resource-specific impacts, are summarized in **chapter 4**. The mitigation measures and stipulations presented in the decision record for the A2TR1 EA remain in effect and would be carried forward if the federal mining plan modification is approved by the ASLM.

3.0 Affected Environment

This chapter discusses the existing conditions of the physical, biological, cultural, and human resources that could be affected by implementation of the alternatives described in **chapter 2** as they relate to the approval of the federal mining plan modification for the DFM. The determination of adequacy of the description of baseline conditions in the A2TR1 EA was made if conditions have not substantively changed, no new data are available, the resource conditions have only been minimally affected as a result of current mining operations, and/or further presentation of information would not affect the decision-making process. Baseline information in the A2TR1 EA that has not substantively changed is incorporated by reference. Updated baseline information is presented in this chapter, when applicable.

3.1 General Setting

The baseline information presented in section 3.1 of the A2TR1 EA relating to the general setting has not substantively changed. The tract is located in the PRB, which has a semi-arid, high plains environment with relatively large seasonal and diurnal variations in temperature and seasonal variation in precipitation.

3.2 Topography and Physiography

The discussions included in section 3.2 of the A2TR1 EA provide details regarding the description of topography and physiography associated with the DFM in 2017. The DFM is physiographically part of the unglaciated Missouri Plateau section of the Great Plains Province (Fenneman 1931). This part of the Great Plains Province is characterized by broad plateaus that are dissected by incised stream valleys. In the western portion, the plateaus merge with the PRB and other broad regional downfolds. These basins are separated by major mountainous uplifts.

3.3 Geology, Minerals, and Paleontology

The general analysis area (northern group of mines) contains the following stratigraphic units or layers (in descending order from the surface): Quaternary (most recent) deposits, the Eocene-age Wasatch Formation, and the Paleocene-age Fort Union Formation. The Paleocene-age Fort Union Formation contains the coal seams that would be mined under the Proposed Action. The discussions included in section 3.3.1 of the A2TR1 EA provide details regarding the description of geologic units in the general analysis area associated with the DFM in 2017. The coal to be mined in the A3 tract is within the Wyodak-Anderson coal seam, which is the uppermost unit of the Tongue River Member of the Fort Union Formation. In the mine permit boundary, a claystone and carbonaceous coal lens separate the Wyodak-Anderson seam into the upper Anderson coal seam and the lower Canyon coal seam. Any general discussions of the coal will imply the Wyodak-Anderson seam. The Wyodak-Anderson coal seam is the primary shallow mineral resource associated with the Proposed Action and is ranked as sub-bituminous (35 to 45 percent carbon and 8,300 to 11,500 Btu [British thermal unit]/lb. (U.S. Department of Energy [USDOE] 2016 and U.S. Environmental Protection Agency [EPA] 1993). The Wyodak-Anderson coal seam is generally low in sulfur and ash.

The Wyodak-Anderson coal seam, which has been tapped for CBNG development, is the same seam that is being mined at the DFM. Conventional oil and gas and CBNG development associated with the A3 tract are discussed in **section 3.10**.

The discussions included in section 3.3.3 of the A2TR1 EA provide details regarding the description of the paleontological resources associated with the DFM in 2017. A majority of these details have not changed. A locality search showed that no known vertebrate fossil localities are recorded from within either the original mine permit boundary or the A3 tract (WFW 2018).

3.4 Air Quality and Climate Change

Air quality regulations applicable to surface coal mining include the National Ambient Air Quality Standards (NAAQS), Wyoming Ambient Air Quality Standards (WAAQS), Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), and the Federal Operating Permit Program (Title V). These regulatory programs are described in detail in section 3.4 of the A2TR1 EA.

Air quality information specific to the DFM is included in DFM's current Air Quality Permit No. P0023278. The discussions included in section 3.4 of the A2TR1 EA provide details regarding the description of the air quality in the general analysis area associated with the DFM in 2017.

The analysis presented herein serves to summarize attainment/nonattainment areas discussions; update discussions with recent air quality monitoring findings; summarize revised air quality modeling results; and update discussions on carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), hydrogen sulfide (H_2S), and Hazardous Air Pollutants (HAPs) (specifically mercury [Hg]).

The A3 tract is not in an area that is designated as nonattainment area for any criteria pollutant (EPA 2018a). The Proposed Action constitutes a minor permit modification to an existing minor source; therefore, PSD permitting is not required. Best Available Control Technology (BACT) for mining operations in the PRB is subject to categorical control requirements defined in the Wyoming Air Quality Standards and Regulations (WAQSR) and other mitigation measures as determined by the WDEQ-Air Quality Division (AQD) on a case-by-case basis. All sources being permitted in Wyoming must meet state-specific BACT. NSPS are a federal program of "end-of-stack" technology-based controls/approaches adopted by reference in the WAQSR. The discussions included in sections 3.4.4 and 3.4.5 of the A2TR1 EA provide details regarding the BACT methods and NSPS that were in place at the DFM in 2017. As noted in the A2TR1 EA, these NSPS are typically less stringent than state-level BACT limits. According to Air Quality Permit No. MD-11723 (the previous air quality permit issued on September 20, 2011), a PSD increment consumption analysis is not necessary and WFW is not required to obtain a Title V Operating Permit (WDEQ-AQD 2011).

3.4.1 Existing DFM Air Quality Summary

The discussions included in section 3.4.7 of the A2TR1 EA provide details regarding the air-quality monitoring background, procedures, and the facilities utilized to monitor air quality that were in place at the DFM in 2017. Detailed discussions of the existing air quality for 2012 through 2018 for the DFM are included in **appendix C**.

3.4.1.1 Air Quality-Monitoring Values

DFM currently operates four high-volume PM_{10} samplers (DF-2, DF-4S, DF-4N, and DF-4M). Samplers DF-4N, DF-4M, and DF-4S are collocated and operate on a 1-in-3 day schedule. Sampler DF-2 operates on a 1-in-6 day schedule. **Appendix C** provides details on the historical PM_{10} ambient data for the DFM.

The average annual mean PM_{10} values documented between 2012 and 2018 ranged between 4.8 and 14.7 µg/m^3, which are between 10 and 29 percent of the WAAQS annual standard of 50 µg/m^3. During the same time period, the 24-hour high PM_{10} values ranged between 15 and 72 µg/m^3. Thus, these maximum concentrations ranged between 10 and 48 percent of NAAQS and WAAQS 24-hour standard of 150 µg/m^3. Fluctuations in monitoring values occurred but all values were below the WAAQS annual standard of 50 µg/m^3 and the 24-hour standard of 150 µg/m^3.

Because $PM_{2.5}$ monitoring is not required by WDEQ-AQD, $PM_{2.5}$ data were not gathered onsite. However, $PM_{2.5}$ data gathered from three sites in the Wyoming PRB between 2012 and 2018 (**map 3-1**) were used to assess potential $PM_{2.5}$ emissions at the DFM. Regional monitoring during the period demonstrated that ambient concentrations of $PM_{2.5}$, as determined by the 98th Percentile 24-hour standard and annual average NAAQS and WAAQS values, were within the established 24-hour value (35 µg/m^3) and annual value (12 µg/m^3).

To further evaluate potential $PM_{2.5}$ emissions at the DFM, specific PM_{10} monitoring data from the DFM were used to estimate $PM_{2.5}$ ambient concentrations by application of a 0.2 factor ($PM_{2.5}$ to PM_{10}), as determined by Pace (2005). The data presented in **appendix C** show that the estimated $PM_{2.5}$ concentrations were below the prescribed 24-hour WAAQS and NAAQS (35 µg/m^3) and the annual WAAQS and NAAQS (12 µg/m^3), which supports the findings of regional $PM_{2.5}$ data evaluation.

3.4.1.2 Emissions of Nitrogen Dioxide (NO_2), Ozone (O_3), Sulfur Dioxide (SO_2), Mercury (Hg), Lead (Pb), and Carbon Monoxide (CO)

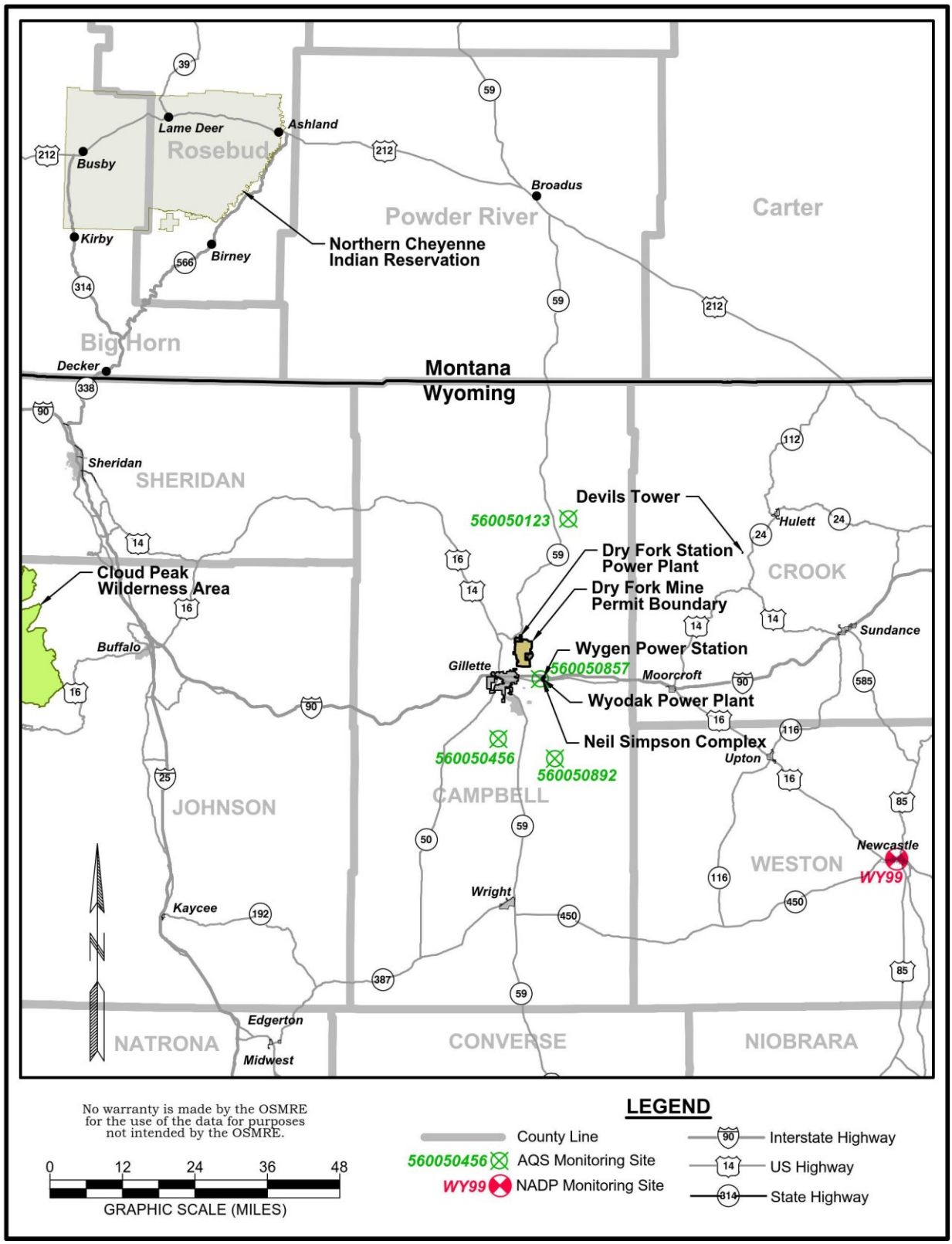
NO_2 concentrations (98th percentile, 1-hour) are currently being monitored in Campbell County at three Air Quality System (AQS) monitoring sites. These monitoring sites are at distances ranging between 17 and 37 miles from the A3 tract. As shown in **table 3-1**, all monitored NO_2 values were well below the NAAQS and WAAQS of 100 parts per billion (ppb).

Table 3-1. Measured NO_2 Concentrations (98th Percentile 1-Hour NO_2 Concentrations, in ppb) at Selected AQS Monitoring Sites, 2012-2018

AQS Site ID[1]	Sampler ID	2012	2013	2014	2015	2016	2017	2018
560050123	Thunder Basin Grassland Site	11	9	10	8	6	8	7
560050456	South Campbell County	32	32	32	32	28	31	32
560050892	Belle Ayr Ba-4, Ba-5n, and Ba-5s	34	35	35	32	26	28	30

[1] See **map 3-1** for locations
Source: EPA 2018b

O_3 monitoring is not required at the DFM but levels have been monitored at the Thunder Basin National Grassland AQS site (560050123), which is located approximately 22 miles north of the A3 tract, and at the South Campbell County AQS site (560050456), which is located approximately 17 miles south of the A3 tract (**map 3-1**). According to the NAAQS, an exceedance of the O_3 8-hour standard occurs if the 4th-highest daily maximum value is above the level of the standard (0.075 parts per million [ppm] prior to December 2015 and 0.070 ppm after December 2015). **Table 3-2** shows that there were no exceedances of the 8-hour standard for the NAAQS O_3 standards that were in effect at the time of data collection.



Map 3-1. Regional Air Quality Monitoring Sites Associated with the DFM

Table 3-2. Measured O_3 Concentrations (4th-Highest 8-hour Maximum Value, in ppm) at Selected AQS Monitoring Sites, 2012-2018

Parameter Measure	2012	2013	2014	2015	2016	2017	2018
Thunder Basin (560050123)[1]							
4th-Highest, 8-hour (ppm)[2]	0.071	0.061	0.058	0.059	0.057	0.064	0.064
# of days maximum exceeded	0	0	0	0	0	0	0
South Campbell County (560050456)[1]							
4th-Highest, 8-hour (ppm)	0.069	0.061	0.059	0.062	0.060	0.068	0.055
# of days maximum exceeded	0	0	0	0	0	0	0

[1] See **map 3-1** for locations
[2] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm (235 μg/m^3) is equal to or less than 1, as determined by Appendix H of 40 CFR Part 50.
Source: EPA 2018b

SO_2 concentrations (99th percentile, 1-hour) are currently being monitored in Campbell County at one AQS monitoring site. Wyodak Site 4 (56005857) is approximately 7 miles south of the A3 tract (**map 3-1**). All monitored SO_2 values are well below the NAAQS and WAAQS of 75 ppb (**table 3-3**).

Table 3-3. Measured SO_2 Concentrations in Campbell County, Wyoming (99th Percentile, 1-Hour SO_2 Concentrations in ppb) at a Selected AQS Monitoring Site, 2012-2018

AQS Site ID[1]	Sampler ID	2012	2013	2014	2015	2016	2017	2018[2]
560050857	Wyodak Site 4	39	37	32	16	14	11	*

[1] See **map 3-1** for location
[2] SO_2 was not monitored at the site in 2018
Source: EPA 2018b

Annual Hg (a HAP), Pb (a criteria pollutant), and CO (an indirect GHG) monitoring values are not collected specifically for the DFM. For a general discussion on Hg emissions, Hg air emissions (stack plus fugitive) from three coal-fired power plants in Campbell County were evaluated. In 2011, the EPA announced standards to limit mercury, acid gases, and other toxic pollution from coal-fired electric generating units (EGUs) with a capacity of 25 megawatts or greater (EPA 2019a). The Mercury and Air Toxics Standards (MATS) require power plants to apply mercury emission controls measures to comply with these standards. In 2017, the DFM supplied coal to four power plants (**table 3-4**). The table shows the Hg air emissions for these four power plants and the estimated emissions from coal supplied to the plants by the DFM. The 2017 Hg air emissions from DFM-supplied coal were approximately 91 percent lower than the 2012 emissions.

Table 3-4. Mercury Emissions (Tons) from Power Plants Supplied by DFM, 2012-2017

Power Plant	2012	2013	2014	2015	2016	2017[1]
Dry Fork Station (Wyoming)	0.034	0.034	0.025	0.020	0.014	0.015
Dave Johnston Plant (Wyoming)	0.131	0.121	0.089	0.038	0.021	0.021
Laramie River Station (Wyoming)	0.265	0.285	0.110	0.106	0.042	0.034
LCRA Fayette Power Project (Texas)	0.169	0.141	0.091	0.145	0.061	0.048
Basin Electric Leland Olds (North Dakota)	0.110	0.110	0.110	0.110	0.110	0.110
Power Plant Cumulative Total	0.708	0.439	0.224	0.164	0.077	0.069
Hg Emissions from DFM-supplied Coal	0.202	0.098	0.054	0.050	0.022	0.019

[1] Most current data available as of May 2019
Source: Calculated from EPA Toxics Release Inventory (TRI) Program (EPA 2019a)

The Pb stack emissions from three coal-fired power plants and Pb levels recorded at one AQS monitoring site in Campbell County as summarized in **table 3-5**. The Pb values from the Thunder Basin Grassland AQS site (the only station reporting in µg/m^3) were well below the NAAQS and WAAQS of 0.15 µg/m^3.

Table 3-5. Measured Annual Pb Air Emissions from Three Campbell County Power Stations and One Campbell County Coal Mine

Power Station or AQS Site	2013	2014	2015	2016	2017
Wyodak Plant (pounds)	43.1	35.3	33.2	19.7	27.3
Dry Fork Station (pounds)	9.0	21.0	8.6	14.0	10.0
Neil Simpson Complex (pounds)	60.0	31.0	24.0	24.0	23.0
Thunder Basin (56-005-0123) (µg/m^3)[1]	0.002	0.001	0.002	0.002	0.001

CO is created when carbon-containing fuels are burned incompletely. Through natural processes in the atmosphere, it is eventually oxidized to CO_2. CO is not monitored in Campbell County.

3.4.1.3 Air Quality Related Values

Discussions specific to air quality related values (AGRVs) at the DFM are included in section 3.4.7.3 of the A2TR1 EA in place at the DFM in 2017. A majority of these details have not changed. Where appropriate, information has been updated or restated for informational purposes.

3.4.1.3.1 Visibility

Figure 3-1 shows annual averages for the 20 percent clearest and haziest days, and visibility days at the Northern Cheyenne Indian Reservation monitoring site (the nearest operational PSD Class I area, see **map 3-1**) for 2003 through 2017 (most current data available, Interagency Monitoring of Protected Visual Environments [IMPROVE] 2018). Lower deciview (dv) values indicate better visibility conditions. As indicated on **figure 3-1**, the long-term trend in visibility at the Northern Cheyenne Indian Reservation appears to be relatively stable, if not improving slightly.

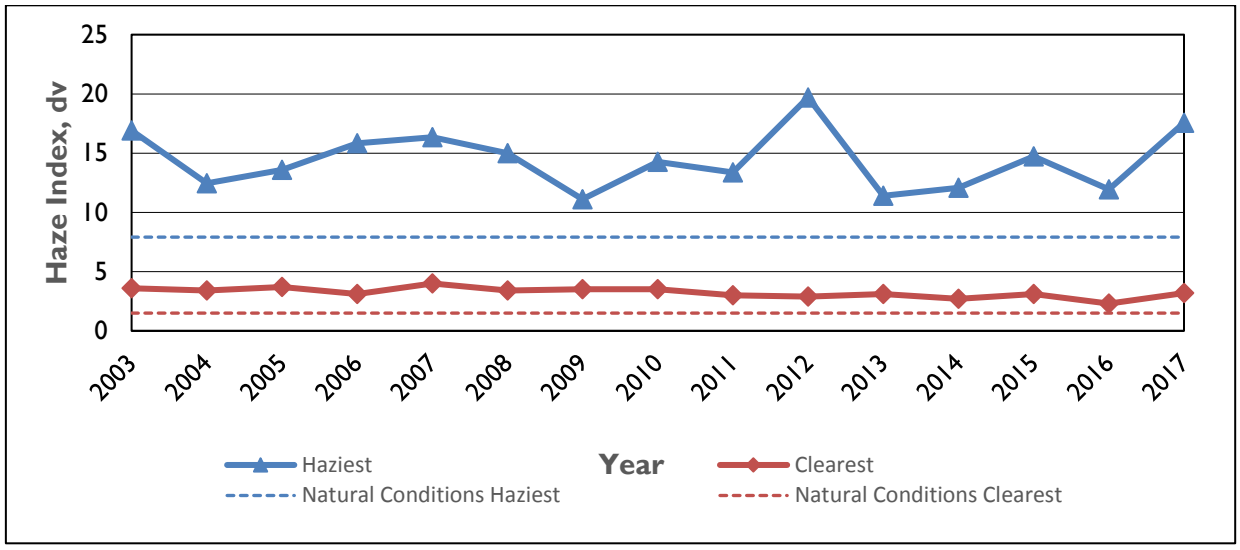


Figure 3-1. Visibility on Clearest and Haziest Days at the Northern Cheyenne Indian Reservation, 2003-2017

3.4.1.3.2 Air Quality Related Values Related to Coal Combustion

Emissions that affect AQRVs result from combustion of fossil fuels. **Table 3-6** presents the estimated PM_{10}, $PM_{2.5}$, SO_2, NO_X, Hg, and CO emissions estimates for coal mined at the DFM that was used for power generation between 2012 and 2018.

Table 3-6. Estimated Annual PM_{10}, $PM_{2.5}$, SO_2, NO_X, Hg, and CO Contributions from Combustion of Coal Mined at the DFM, 2012-2018

Source	2012	2013	2014	2015	2016	2017	2018
Tons of Coal Combusted	6,006,787	5,433,936	5,373,973	6,369,206	6,135,546	6,045,618	6,303,822
PM_{10} (Tons)	4,173.7	3,775.7	3,734.0	4,425.5	4,263.2	4,141.5	4,318.4
$PM_{2.5}$ (Tons)	3,218.1	2,911.2	2,879.0	3,412.2	3,287.1	3,238.9	3,377.2
SO_2 (Tons)	52,559.4	47,546.9	47,022.3	55,730.6	53,686.0	52,899.2	55,158.4
NO_X (Tons)	21,624.4	19,562.2	19,346.3	22,929.1	22,088.0	21,764.2	22,693.8
Hg (Tons)	0.20	0.10	0.05	0.05	0.02	0.02	0.02
CO (Tons)	1,501.7	1,358.5	1,343.5	1,592.3	1,533.9	1,511.4	1,576.0

Source: WWC Engineering (WWC) completed the calculations, which are provided in **appendix C**

3.4.1.3.3 Acidification of Lakes/Acid Deposition

Acid deposition causes acidification of lakes and streams, which has direct impacts on aquatic habitats and contributes to the damage of trees at high elevation and many sensitive forest soils (EPA 2016). Acid deposition is generally associated with SO_2 and NO_X emissions from coal-fired electric generating stations, which would include the DFS. SO_2 and NO_X emissions from coal produced at the DFM are discussed above. According to the EPA (2002), hydrogen ion (H^+) concentrations are the primary indicator of precipitation acidity. H^+ monitoring is not required at the DFM so measured H^+ concentrations determined at site WY99 (the closest H^+ monitoring site to the DFM) are provided in **table 3-7**. The location of WY99 in relationship to the DFM is indicated on **map 3-1**. As indicated in **table 3-7**, the 2012-2017 trends in pH and wet deposition at monitoring site WY99 appeared to be relatively stable. According to the EPA, national monitoring network data show significant improvements in the primary acid deposition indicators between 1989 and 2013 (EPA 2016).

Table 3-7. Measured Hydrogen Ion (H^+) Concentrations at Monitoring Site WY99, 2012-2017

Parameter[1]	2012	2013	2014	2015	2016	2017[2]
pH	5.8	No Data	5.7	5.9	5.9	5.8
Wet deposition (kg/hectare)	<0.01	No Data	0.01	0.01	<0.01	<0.01

[1] Measured as pH and wet-deposition
[2] Most current data as of May 2019
Source: National Atmospheric Deposition Program (NADP) 2018

3.4.1.4 Greenhouse Gases (GHG)

Discussions specific to GHG at the DFM are included in section 3.4.7.4 of the A2TR1 EA in place at the DFM in 2017. A majority of these details have not changed. Where appropriate, information has been updated or restated for informational purposes. According to the EPA, GHG include CO_2, methane (CH_4), nitrous oxide (N_2O), and several fluorinated species of gas (EPA 2018d). The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different GHG. Specifically, GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. For consistency between projects, OSMRE describes GHG emissions

in terms of carbon dioxide equivalent (CO_2e). For climate, climate change, and GHG analysis, there is no specific analysis area and project emissions are used as a proxy.

CO_2 is emitted from the combustion of fossil fuels, including coal. CH_4 can be emitted during the production and transport of coal and N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. CO_2 and other GHGs are naturally occurring gases in the atmosphere; their status as a pollutant is not related to their toxicity but instead is due to the added long-term impacts they have on climate because of their increased incremental levels in the earth's atmosphere. To allow different gases to be compared and added together, emissions can be converted into CO_2e emissions. This measure is used to compare the capacity of each GHG to trap heat (Global Warming Potential, or GWP) in the atmosphere relative to that of CO_2, which is used as a reference gas. The CO_2e for a gas is derived by multiplying the amount of gas emitted by its 100-year GWP conversion factor (CEC 2011).

The CO_2e emissions that occurred at the DFM from 2012 through 2018 were estimated based on annual coal production (**table 3-8**). The inventories included emissions from direct sources, including all types of carbon fuels used in the mining operations; electricity used on site (i.e., lighting for facilities, roads, and operations and conveyors); and mining processes (i.e., blasting, coal fires caused by spontaneous combustion, and methane released [vented] from exposed coal seams). CO_2e emissions from indirect sources (transportation of coal via rail and coal combustion) were also estimated (see **appendix C** for CO_2e emissions calculations).

As presented in **table 3-8**, the estimated emissions from DFM direct sources accounted for approximately 44,634 metric tons of CO_2e in 2018. This equates to approximately 0.4 percent of the total 2018 CO_2e emissions (10,632,440 metric tons) related to mining and combusting approximately 6.3 Mt of DFM coal.

Emissions from transporting the coal via rail to final destinations at power plants and loading terminals were calculated using annual average rail miles from the DFM to final destinations. The average haul distances were calculated using the weighted average of haul distances from the DFM for annual coal sales for 2012 through 2018 (WFW 2019a). As indicated in **table 3-8**, approximately 28,904 metric tons of CO_2e were produced in 2018 from the rail transport of the 4.3 Mt of coal mined at the DFM. The amount of CO_2e emitted during the combustion of fossil fuels varies according to the carbon content and heating value of the fuel used (EPA 2008). Approximately 10,558,902 metric tons of CO_2e were produced in 2018 from the combustion of the 6.3 Mt of coal mined at the DFM. Therefore, emissions from indirect sources accounted for approximately 10,587,806 metric tons of CO_2e, which is 99.6 percent of the estimated 2018 CO_2e emissions related to mining and combusting 6.3 Mt of DFM coal.

Discussions specific to the potential for emissions of dust from coal use/transportation produced at the DFM are included in section 3.4.7.4 of the A2TR1 EA in place at the DFM in 2017. These discussions have not changed and are incorporated here by reference.

Table 3-8. Estimated Emissions from Direct and Indirect CO_2e Sources at the DFM, 2012-2018

	2012	2013	2014	2015	2016	2017	2018	Average
General								
Mt of coal recovered	6.01	5.43	5.37	6.37	6.14	6.05	6.30	5.95
Mt of coal shipped by conveyor (all to DFS)	2.03	1.99	2.14	2.10	1.83	2.13	1.97	2.03
Mt of coal shipped by rail	3.98	3.44	3.24	4.27	4.30	3.92	4.33	3.93
Average transport miles (one way)	192	250	142	132	141	186	191	176.29
Number of train trips (one way)	257	222	209	276	278	273	280	256.43
Direct emissions sources[1]								
Fuel	19,624	17,752	17,556	20,808	20,026	19,765	20,581	19,445
Electricity consumed in mining process	16,039	14,509	14,349	17,006	16,368	16,154	16,822	15,892
Mining process	6,894	6,237	6,168	7,310	7,035	6,944	7,231	6,831
Total from Direct Sources[1]	**42,557**	**38,498**	**38,073**	**45,124**	**43,429**	**42,863**	**44,634**	**42,168**
Indirect Emissions Sources[1]								
Rail transport[2]	26,675	30,030	16,044	19,687	21,199	25,452	28,904	23,999
From coal combustion[3]	10,061,368	9,101,843	9,001,405	10,668,420	10,277,040	10,126,410	10,558,902	9,970,770
Total from indirect sources[1]	**10,088,043**	**9,131,873**	**9,017,449**	**10,688,107**	**10,298,239**	**10,151,862**	**10,587,806**	**9,994,769**
Total estimated CO_2e emissions[1]	**10,130,600**	**9,170,371**	**9,055,522**	**10,733,231**	**10,341,668**	**10,194,725**	**10,632,440**	**10,036,936**

[1] In metric tons - see **appendix C** for calculations.
[2] Coal haulage emissions based on 130-car trains with four locomotives, train trips per year; 488.2 kg CO_2e per mile per loaded train, 96.1 kg CO_2e per mile per empty train; and round-trip mileage to power plants. Coal haulage emissions calculations include a loaded train and a returning empty train, per train trip.
[3] Based on 1.675 metric tons CO_2e per ton of coal burned for electrical generation (EPA 2008) and calculated by WWC (2019).

3.4.1.5 Emissions Standards at Coal Combustion Sources

As stated in **section 1.2.1**, the DFM currently supplies the DFS with approximately 2.0 Mtpy of coal for power generation. The DFS is located adjacent to the DFM and is operated by Basin Electric Power Cooperative. The DFS consists of one coal-fired steam driven EGU with a net electric generating capacity of 422 MW. The DFM provides all of the coal utilized at the DFS. Actual emissions data for DFS are listed in **table 3-9**.

Table 3-9. Dry Fork Station Reported Emissions, 2012-2017

Emissions	2012	2013	2014	2015	2016	2017[1]
CO_2 (Tons)	3,555,746	3,588,183	3,635,576	3,415,773	3,096,028	3,618,571
NO_X (Tons)	619.6	635.6	657.2	672.0	632.1	697.2
SO_2 (Tons)	691.5	829.7	884.1	869.7	911.8	1,047
Hg (Tons)	0.034	0.034	0.025	0.020	0.014	0.015

[1] Most current data available as of May 2019
Source: SNL Financial 2018 (CO_2, NO_X, and SO_2), EPA 2018b (Hg)

3.5 Water Resources

The discussions included in section 3.5 of the A2TR1 EA provide details regarding the description of water resources associated with the DFM in 2017. The analyses included herein serve to update discussions with recent surface water and groundwater quality monitoring results and update water rights discussions.

3.5.1 Surface Water

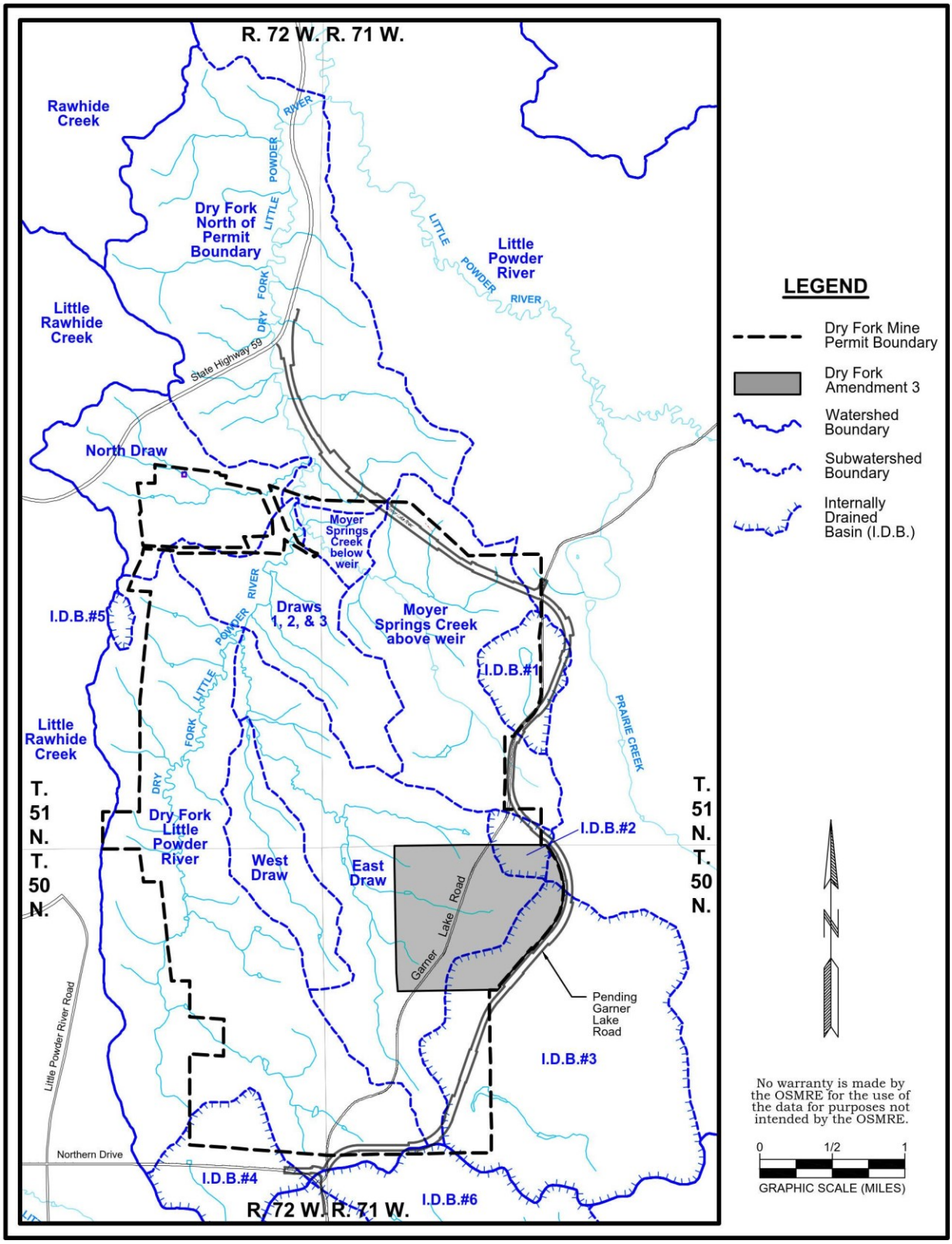
The surface water hydrologic system within the A3 tract is dominated by the East Draw drainage system (**maps 3-2** and **3-3**). This drainage systems is a tributary to Dry Fork Little Powder River (Dry Fork LPR). Portions of internally drained basin (IDB) #2 and #3 are also associated with the tract. According to information presented in Appendix D6 (Hydrology) of Permit No. PT0599, East Draw within the tract has ephemeral flows (responds only to rainfall or snowmelt events) (WFW 2011). Within the A3 tract, the drainage area of East Draw is approximately 451.0 acres, the drainage area of IDB #2 is approximately 48.0 acres, and the drainage area of IDB #3 is approximately 143.6 acres. The remaining 13.8 acres are within the Little Powder River Drainage.

The surface water quality varies with stream flow rate within the East Draw drainage; the higher the flow rate, the lower the total dissolved solids (TDS) concentration, but the higher the suspended solids concentration.

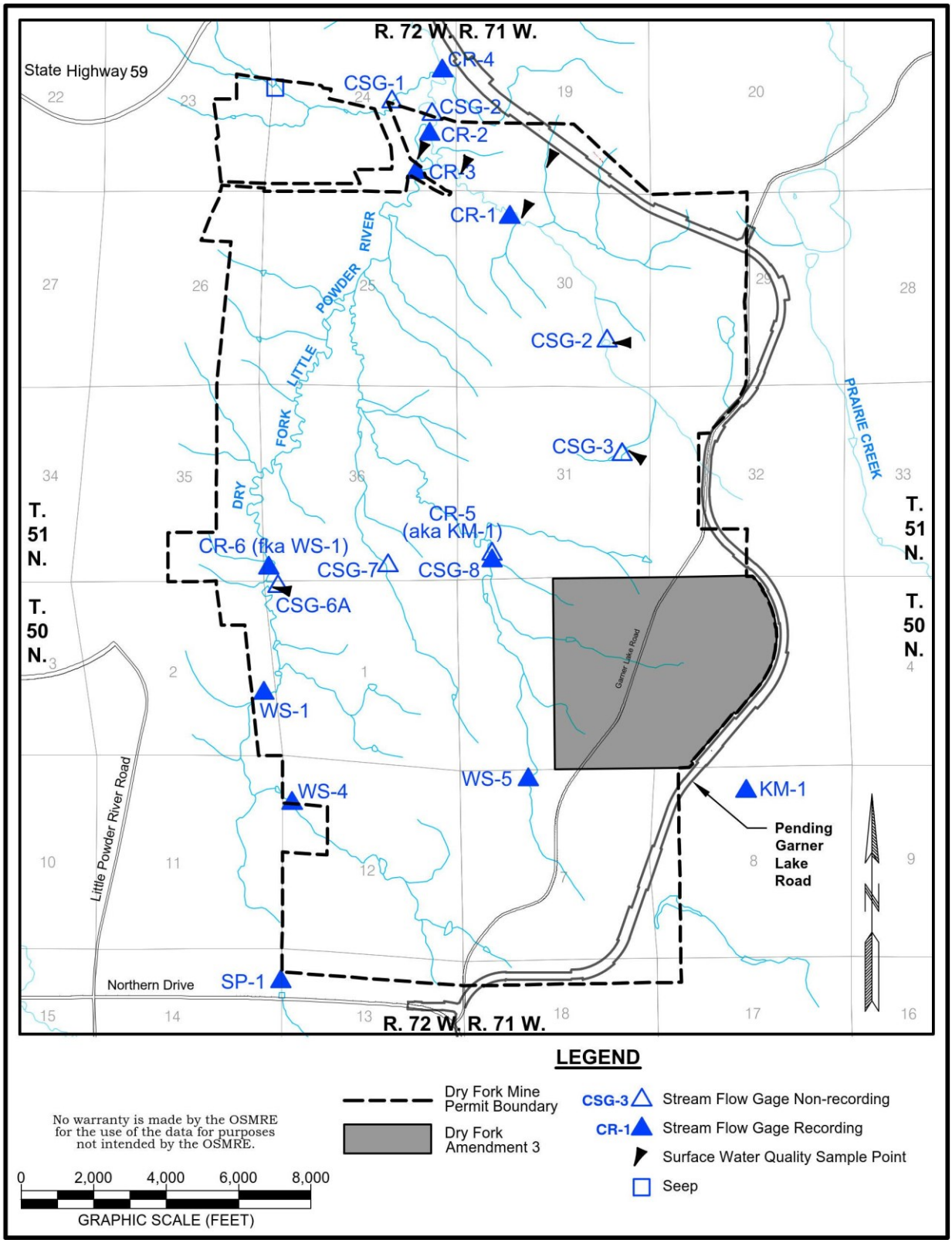
3.5.2 Groundwater

3.5.2.1 Alluvium

The 2019 Cumulative Hydrological Impact Assessment (CHIA) presented baseline water quality analysis from 50 alluvial wells associated with the northern group of mines (WDEQ-LQD/Lidstone 2019). Not all 50 wells were evaluated for all water quality constituents. When compared to select parameters with the WDEQ-WQD Class III livestock standards, exceedances were observed for selenium (1 well), aluminum (1 well), arsenic (1 well), pH (2 wells), boron (5 wells), chromium (9 wells), Pb (12 wells), sulfate (24 wells), TDS (24 wells), and Hg (44 wells). TDS concentrations ranged from 300 to 15,636 mg/L, with a median of 3,859 mg/L. The water quality of the alluvial aquifer generally exhibited the highest TDS concentrations among all the monitored aquifers.



Map 3-2. Watersheds and Surface Drainages Associated with the DFM



Map 3-3. Surface Water Monitoring Sites at the DFM

Hydraulic gradients were similar to the topographic and valley-bottom slopes on which the deposits resided. The alluvial aquifer tests indicated that saturated thicknesses ranged from 1.6 to 34.2 feet, with a median of 12.4 feet. The hydraulic conductivities in the 30 wells tested in the alluvial aquifer ranged from 0.42 to 203 feet per day (ft/d), with a median value of 12 ft/d. The hydraulic conductivities of wells associated with the alluvial aquifer were generally higher when they were in close proximity to the clinker. Additionally, the hydraulic conductivity in the alluvial aquifer varied due to the discontinuous nature of the lenses within the sediments.

3.5.2.2 Clinker (Wyoming Porcelanite or Scoria)

The 2019 CHIA presented baseline water quality analysis from 14 clinker wells (WDEQ-LQD/Lidstone 2019). Not all 14 wells were evaluated for all water quality constituents. The analysis showed that the water quality of the clinker was poor, with six parameters exceeding the Class III livestock standards, including: chromium (one well), Pb (one well), pH (one well), sulfate (two wells), TDS (two wells), and Hg (seven wells). TDS concentrations ranged from 530 to 7,930 mg/L, with a median of 2,051 mg/L. A water quality type analysis (piper diagram) indicated that the dominant baseline water quality type in the clinker was calcium sulfate.

Aquifer tests were conducted at a total of 17 wells completed in the clinker at the Dry Fork, Rawhide, and Synthetic Fuels mines (WDEQ-LQD/Lidstone 2019). Clinker aquifer tests indicated that saturated thickness ranged from 8 to 50 feet, with a median of 28 feet. Hydraulic conductivities ranged from 3.0 to 504,000 ft/d, with a median of 414 ft/d. The high hydraulic conductivities calculated for the clinker likely incorporated a considerable level of uncertainty due to the difficulty of calculating conductivity from the small amount of drawdown measured in the observation wells.

3.5.2.3 Wasatch (Overburden) Formation

The 2019 CHIA presented baseline water quality analysis collected from 29 overburden wells associated with the northern group of mines (WDEQ-LQD/Lidstone 2019). Not all 29 wells were evaluated for all water quality constituents. When compared to select parameters with the WDEQ-WQD Class III livestock standards, exceedances were observed for aluminum (1 well), TDS (2 wells), chromium (2 wells), Pb (2 wells), sulfate (2 wells), pH (6 wells), and Hg (12 wells). TDS concentrations ranged from 180 to 7,066 mg/L, with a median of 2,057 mg/L. In general, TDS concentrations were less variable and lower in concentration than in the alluvial wells. A water quality type analysis (piper diagram) indicated that the baseline water type in the overburden varied between calcium sulfate, sodium sulfate, and sodium bicarbonate.

Aquifer tests were conducted at 38 overburden wells associated with the northern group of mines (WDEQ-LQD/Lidstone 2019). Aquifer tests indicated that saturated thicknesses ranged from 2 to 236 feet. The median saturated thickness in the overburden was 60 feet. The median hydraulic conductivity of the wells was 0.34 ft/d, with a maximum of 103 ft/d and a minimum of 0.001 ft/d. The variability in conductivity was likely due to the discontinuous nature of the sediments and the difficulty in testing wells that were low yielding.

3.5.2.4 Coal Aquifers

The 2019 CHIA presented baseline water quality analysis collected from 79 coal wells associated with the northern group of mines (WDEQ-LQD/Lidstone 2019). Not all 79 wells were evaluated for all water quality constituents. When compared to select parameters with the

WDEQ-WQD Class III livestock standards, exceedances were observed for cadmium (1 well), aluminum (1 well), boron (2 wells), Pb (3 wells), chromium (4 wells), TDS (5 wells), sulfate (6 wells), pH (13 wells), and Hg (30 wells). TDS concentrations ranged from 243 to 7,988 mg/L, with a median of 1,181 mg/L. The water quality type in the coal was highly variable as it was dependent on several factors including the proximity of a coal well to the clinker and the alluvial aquifers, depth of the well, and the local geochemistry.

There were 58 aquifer tests conducted in the Wyodak-Anderson coal aquifer by the 6 coal mines. Saturated thicknesses in the coal aquifer ranged from 4 to 130 feet, with a median of 93 feet. The permeability of coal is characterized by cleat permeability (natural opening-mode fractures in coal beds) and secondary permeability (related to folding and faulting). The median hydraulic conductivity was 1.1 ft/d, with a maximum of 715 ft/d and a minimum of 0.01 ft/d.

3.5.2.5 Backfill Aquifer

The 2019 CHIA presented during mining (1980-2017) water quality analysis collected from 37 deeper backfill wells located within the Dry Fork, Rawhide, Buckskin, Eagle Butte, and Wyodak mines. Not all 37 wells were evaluated for all water quality constituents. TDS concentrations ranged from 328 to 13,760 mg/L, with a median of 4,562 mg/L. For the entire during-mining period, Class III exceedances were noted for chloride (1 well), nitrite as nitrogen (1 well), mercury (2 wells), lead (3 wells), selenium (3 wells), chromium (6 wells), sulfate (20 wells), TDS (22 wells), and field pH (26 wells). The TDS concentration time-series plots for two wells monitored over the long term showed trends of increasing TDS concentrations until the mid-1990s and then concentrations generally stabilized. The predominant water quality type in the backfill was calcium sulfate or magnesium sulfate. Although calcium and sulfate were the dominant ions, significant quantities of bicarbonate, sodium, and magnesium ions were also present.

The 2019 CHIA presented water quality analysis collected from five shallow alluvial valley floor (AVF) backfill wells associated with the northern group of mines (WDEQ-LQD/Lidstone 2019). TDS concentrations have varied between and within the alluvial backfill wells. TDS concentrations exceeded the WDEQ-WQD Class III livestock standard of 5,000 mg/L at 4 of the 5 wells. From 2001 to 2013, TDS concentrations at one alluvial backfill well generally increased, reaching a maximum value of 31,200 mg/L in 2013 but TDS at this well then slightly decreased over the 2013 to 2017 period to 18,800 mg/L. Recent data from two of the alluvial backfill wells suggests that water quality was comparable to premining conditions but TDS concentrations at two wells were elevated relative to baseline conditions.

There were eight aquifer tests conducted by the mines in the backfill aquifer (WDEQ-LQD/Lidstone 2019). Saturated thicknesses from the aquifer tests ranged from 21 to 89 feet. The median saturated thickness from all tests was approximately 38 feet. The median hydraulic conductivity was 0.07 ft/d, with a maximum of 2.7 ft/d and a minimum of 0.004 ft/d.

3.5.3 Water Rights

The SEO administers water rights in Wyoming, which are granted for both surface water and groundwater. SEO records indicate that, as of May 2018, 21 permits for surface-water rights were within 2 miles of the A3 tract. Surface-water rights for non-coal applicants are listed in **appendix D**. The breakdown of uses for non-coal surface water rights is as follows:

- 11 Stock
- 5 Irrigation
- 2 Industrial
- 1 CBNG; Industrial
- 1 CBNG; Irrigation
- 1 Industrial; Stock

SEO records indicate that, as of May 2018, 94 permits for groundwater rights were within 2 miles of the A3 tract. Valid ground-water rights for non-coal applicants are listed in **appendix D**. The breakdown of uses non-coal ground-water rights is as follows:

- 30 Stock
- 12 Miscellaneous
- 13 Monitoring
- 9 CBNG
- 9 Domestic
- 9 Domestic, Stock
- 5 Industrial
- 2 Industrial, Miscellaneous
- 2 Municipal Groundwater*
- 1 Domestic, Industrial
- 1 Domestic, Miscellaneous
- 1 Domestic, Miscellaneous, Stock

*All for the same well, the City of Gillette Fox Hills #5 well.

3.6 Alluvial Valley Floors (AVFs)

As described in the Amendment 3 PAP, no AVFs have been delineated within the A3 tract (WFW 2018).

3.7 Wetlands/Aquatic Features

The discussions included in section 3.6 of the A2TR1 EA provide details regarding the description of wetlands/aquatic features associated with the DFM in 2017. Where appropriate, information regarding wetlands/aquatic features has been updated or restated for informational purposes.

Aquatic resources within the A3 tract were assessed for wetlands according to the 1987 USACE Wetlands Delineation Manual and the 2010 Great Plains Regional Supplement (USACE 1987 and 2010, respectively). Other Waters of the United States were determined according to definitions in 33 CFR § 328.3. Potential aquatic resources were identified by examining topographic maps and utilizing National Wetlands Inventory (NWI) mapping. All potential wetlands identified through those reviews were surveyed in the field from May through September 2010. Surveys were also conducted on the remainder of the lands in traverses across the study area. Vegetation, hydrology, and soil characteristics of aquatic sites and uplands were recorded on field data sheets and locations of observations were plotted on topographic maps.

Five aquatic features within the A3 tract were evaluated for wetland characteristics in 2016 by Intermountain Resources (WFW 2018). Based on the results of the survey, one isolated stockpond in the A3 tract qualified as a wetland but the 0.3-acre stockpond feature did not

qualify as a jurisdictional wetland. The USACE determined that Department of Army authorization is not required for the coal mining activities within the consolidated DFM permit boundary because there would be no discharges of dredge or fill material into waters of the United States (USACE 2018).

3.8 Soils

The following discussions on soils resources are summarized from Appendix D7 (Soils) of the Amendment 3 PAP (WFW 2018). A detailed discussion of the 11 soil map units (plus disturbed lands, reclaimed lands, and water) within the A3 tract is included in **appendix E**. Soil survey information for adjacent and nearby permitted areas was reviewed to determine whether soils and their recommended salvage depths were similar to those observed within the A3 tract. WDEQ-LQD determined that the soils within the tract were similar to those currently being salvaged and utilized for reclamation at the DFM, and these soils have been previously sampled a sufficient number of times.

According to information provided on the Natural Resources Conservation Service (NRCS) website, approximately 55 percent (362 acres) of the soil map units within the A3 tract were classified as prime or unique farmlands if irrigated (NRCS 2019).

3.9 Vegetation

The following discussion on vegetation is summarized from Appendix D8 (Vegetation) of the Amendment 3 PAP (WFW 2018). The vegetation community types identified on the study area included grassland, upland sagebrush, pastureland, hayland, cultivated crops, and disturbed land. A detailed discussion of the six vegetation community types associated with the A3 tract is included in **appendix E**.

Threatened or endangered plants or other plant species of special concern, as listed by the USFWS and other agencies, were not encountered within the A3 tract (WFW 2018). Habitat for the Ute ladies'-tresses (*Spiranthes diluvialis*) was not found in the area due to the lack of suitable wetlands. However, the marginal wetlands were surveyed on August 4, 2016 and no Ute ladies'-tresses were found.

The State of Wyoming maintains a list of designated noxious weeds (Wyoming Department of Agriculture [WDOA] 2018). This list includes invasive and nonnative plant species that, once established, can out-compete and eventually replace native species thereby reducing forage productivity and the overall vigor and diversity of existing native plant communities. The state-listed noxious weed species that were found within the A3 tract included Canada thistle (*Cirsium arvense*), Scotch thistle (*Onopordum acanthium*), dalmatian toadflax (*Linaria dalmatica*), skeletonleaf bursage (*Franseria discolor Nutt.*), and field bindweed (*Convolvulus arvensis*) (WFW 2018). These noxious weeds were not abundant. Selenium indicator species were not common on the A3 tract in 2016. Total annual grasses comprised from 0.2 to 7.7 percent of the total relative vegetative cover on the 2016 vegetation survey areas. Cheatgrass brome (*Bromus tectorum*) and field brome (Japanese brome [*Bromus japonicus*]) were the major annual grass species encountered during the 2016 vegetation survey (WFW 2018). Cheatgrass brome and field brome are not state-designated noxious weeds in Wyoming and not county-designated noxious weeds in Campbell County but cheatgreass brome is considered a noxious weed in some Wyoming counties.

3.10 Wildlife

The discussions included in section 3.9 of the A2TR1 EA provide details regarding the description of wildlife resources associated with the DFM in 2017. The information included in A2TR1 EA was derived from the baseline data and the subsequent studies and WDEQ-LQD annual reports. Where appropriate, information regarding wildlife has been restated for informational purposes and updated from the 2019 Annual Wildlife Report (WFW 2019b). No significant changes to wildlife use areas for big game, other mammals, upland game birds (excluding the Greater sage-grouse [*Centrocercus urophasianus*]), other birds, reptiles and amphibians, or aquatic species populations have been noted from the previous discussion presented. There have been changes in discussions related to raptors; threatened, endangered, and candidate (T&E) species; and species of special interest (SOSI). The status of Greater sage-grouse has also changed since publication of the A2TR1 EA. Updated wildlife information is provided in **Appendix E**.

3.10.1 Raptors

Eleven raptor species (northern harrier [*Circus cyaneus*], ferruginous hawk [*Buteo regalis*], Swainson's hawk [*Buteo swainsoni*] red-tailed hawk [*Buteo jamaicensis*], golden eagle [*Aquila chrysaetos*], bald eagle [*Haliaeetus leucocephalus*], prairie falcon [*Falco mexicanus*], American kestrel [*Falco sparverius*], great horned owl [*Bubo virginianus*], short-eared owl [*Asio flammeus*], and burrowing owl [*Athene cunicularia*]) were recorded within the raptor monitoring area during DFM baseline inventories. The ferruginous hawk, red-tailed hawk, Swainson's hawk, golden eagle, burrowing owl, and great horned owl are raptor species common to the region that are known to have nested within the DFM raptor monitoring area in the past. The 2019 Annual Wildlife Report identified the location and annual status of raptor nests for 2018 (WFW 2019b). Four intact raptor nests (SH-4b, SH-11c/GHO7a, SH11f, and SH11g) were located within the A3 tract in 2018 and all four nests are within the proposed disturbance boundary for the tract. Two other nests (SH-4c/RTH-18 and Sh-4a) were located immediately adjacent north of the A3 tract and would likely be impacted as a result of the Proposed Action. Nest SH-4b is a platform nest and the other five nests are located in trees associated with a ranch facility and home site (WFW 2019b). SH-4c/RTH-18 was successful in 2018 when two red-tailed hawks fledged from the nest and SH-11c/GHO7a was successful in 2018, producing two great horned owls. SH-11g, a new Swainson's hawk nest, was active in 2018 but was not successful. The other three nests were inactive in 2018. BLM sensitive raptor species that could potentially occur in the area include the burrowing owl, ferruginous hawk, golden eagle, northern goshawk (*Accipiter gentilis*), Swainson's hawk, and peregrine falcon (*Falco peregrinus*) (**appendix E**). The Swainson's hawk is the only BLM sensitive raptor species has been documented as nesting within the tract (WFW 2019b).

3.10.2 Greater Sage-grouse

The project area is not within a core population area, as delineated in the Wyoming Greater Sage-Grouse Core Area Protection strategy and a 2-mile seasonal buffer (March 15 to June 30) applies to occupied leks within non-core population areas (Office of the Governor 2015). One historical Greater sage-grouse lek complex (Dry Fork II/IIA) has been documented within 2 miles of the A3 tract. However, the Dry Fork II lek was destroyed by mining in 2005 and the Dry Fork IIA lek was destroyed by mining in 2017. Both leks within this complex had been designated as unoccupied by the WGFD. The summary of Greater sage-grouse strutting ground inventories included in **appendix E** indicates that while bird numbers on these leks have

fluctuated over the past 17 years, the counts from 2000 through 2018 showed that overall lek attendance numbers for the monitored leks within 2 miles of the A3 tract had declined to zero.

3.10.3 Threatened, Endangered, Proposed, and Candidate Species and Vertebrate Species of Special Interest

The information presented in this section was obtained from the USFWS Information for Planning and Conservation (IPaC) system and Natural Resource and Energy Explorer (NREX), which is a web GIS-based software tool that supports pre-planning development considerations that facilitates the assessment of energy, environmental, cultural, socioeconomic and infrastructural assets in Wyoming (NREX 2019).

3.10.3.1 Threatened, Endangered, Proposed, and Candidate (T&E) Species

The 2018 USFWS list of T&E species includes the northern long-eared bat (*Myotis septentrionalis*), which is listed as threatened. The analysis area for most T&E species included the DFM permit boundary.

Due to the proximity of the DFM to the DFS power plant and due to the fact that some of the coal mined from the A3 tract would likely be used at the DFS, the analysis area for the northern long-eared bat included the airshed analysis boundary for Hg deposition from mining and coal combustion. Additional information was gathered through incidental observations of species recorded during other field surveys. No critical habitat for this species has been identified in the area (USFWS 2018a).

While USFWS information indicates that the northern long-eared bat could occur in the area, habitat (caves and mine shafts as winter habitat and caves, mine shafts, and trees for summer habitat, USFWS [2016b]) is not present in the A3 tract to support the threatened northern long-eared bat (USFWS 2018a).

3.10.3.2 Vertebrate Species of Special Interest (SOSI)

Information provided on the NREX website was utilized for the determination of SOSI species that could occur in the area. For the purposes of this discussion, SOSI include BLM sensitive species, Wyoming Natural Diversity Database (WYNDD) species of concern (SOC), species protected under MBTA, and WGFD species of greatest conservation need (SGCN). USFWS T&E species are not included in this category. There is a considerable amount of crossover between the species occurrence on the various lists included in SOSI (**appendix E**). BLM sensitive species include those species listed or proposed for listing under the ESA together with species designated internally as BLM sensitive in accordance with BLM Manual 6840 (BLM 2008). WYNDD has developed a list (with supporting documentation) of SOC in Wyoming that are rare, endemic, disjunct, threatened, or otherwise biologically sensitive. The MBTA prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations. Except for introduced species and some upland game birds, almost all birds occurring in the wild in the United States are protected (50 CFR § 10.13) (USFWS 2018a). WGFD SGCN includes wildlife species with low and declining populations that are indicative of the diversity and health of the Wyoming's wildlife (WGFD 2017). The WGFD's SGCN designation process is based upon its Native Species Status (NSS) classification system. The WGFD then places each SGCN into one of three tiers of management based on its total score: Tier I (highest priority), Tier II (moderate priority), and Tier III (lowest priority).

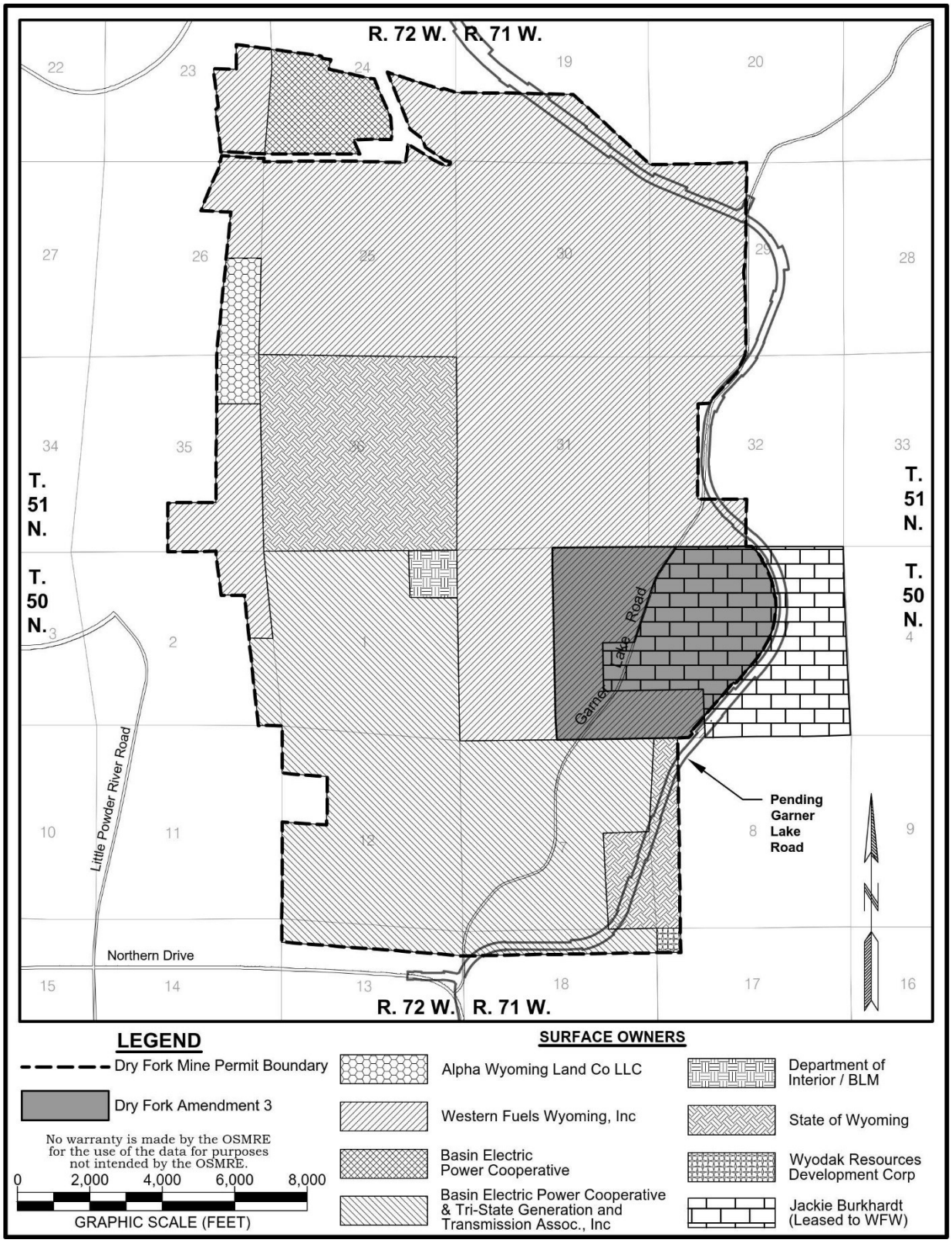
As determined from the NREX list, 46 terrestrial-vertebrate SOSI have the potential of occurring within the project area. As shown in **appendix E**, 42 WGFD SGCN, 31 species protected under the MBTA, 17 WYNDD SOC, 13 BLM sensitive species, and 2 WGFD-designated Tier I terrestrial-vertebrate species have the potential of occurring within the project area. According to monitoring results, 15 of these SOSI have been confirmed as occurring within or adjacent to the A3 tract during baseline or annual monitoring. Eight of the BLM sensitive species and seven the WYNDD SOC have been observed during wildlife surveys within the project area. One of the WGFD designated Tier I species (burrowing owl) has been observed within the project area.

3.11 Land Use and Recreation

Campbell County completed a comprehensive countywide land use plan in 2013, which provides general goals and policies for land use in the county, including countywide coal and mineral extraction and its integral part of the overall plan for Campbell County (Campbell County 2013). The A3 tract is within an area recognized by Campbell County as a mining land use.

The surface ownership within the DFM permit boundary includes 6,269.8 acres of private surface, 39.4 acres of federal surface, and 824.5 acres of state surface (**map 3-4**). Approximately 320.0 acres of the 656.4-acre A3 tract are owned by WFW. The remainder is owned by a private party who has leased it to WFW for mining. All of the coal reserves associated with the A3 tract are federally owned, whereas the remaining subsurface minerals (i.e., oil and gas reserves) are privately owned. All oil and gas production infrastructure located in the tract is privately owned. As of October 4, 2018, 149 Conventional and CBNG wells had been completed within the general analysis area (WOGCC 2018), with 7 conventional wells completed within the tract. All of the wells drilled in the tract have been plugged and abandoned. No CBNG wells have been drilled in the tract, indicating that there are not sufficient quantities of methane in the tract to justify exploratory drilling for CBNG in the tract. Coal mining has been ongoing in the A3 tract since 1918 (Wyodak Mine) and coal mining has been the primary land use in the general analysis area since the mid-1980s. Secondary land uses include pastureland (ranching), dryland cropland, transportation, wildlife habitat, and CBNG development.

WFW owns two residences in the A3 tract, which will be vacated by mid-2020. Two other currently occupied residences within the tract are privately owned, but the land is being leased to WFW for the purpose of mining the land. Provisions for vacating the property and opportunity to salvage or relocate structures are included in the surface mining lease and it is expected that the houses will be vacated and/or removed prior to 2022 (WFW 2019a).



Map 3-4. Surface Ownership within the DFM

3.12 Cultural Resources

Information regarding background cultural resources within the A3 tract was summarized from Appendix D-2.3 (Historic Cultural Resources Inventory, Amendment 3 Area) of the Amendment 3 PAP (WFW 2018). According to information provided in Appendix D-2.3, four cultural resources sites (48CA1298, 48CA1299, 48CA7245, and 48CA7246) were identified in the A3 survey area. All four sites are associated with historic activity (post-1920 era) and are ineligible for listing on the National Register of Historic Places (NRHP) and do not require further investigation (SHPO 2018).

3.13 Visual Resources

The discussions included in section 3.12 of the A2TR1 EA provide details regarding the description of visual resources associated with the DFM in 2017. According to Map 3-24 of the 2015 Buffalo Approved Resource Management Plan, the general analysis area is classified as Visual Resource Management (VRM) Class IV because of the industrial nature of the energy development and active farming and residential use in the area (BLM 2015). The overall natural scenic quality of Class IV area is considered relatively low. Currently, mine facilities and mining activities at the Dry Fork Mine are visible from State Highway 59 and the Garner Lake Road.

3.14 Noise

The discussions included in section 3.13 of the A2TR1 EA provide details regarding the description of noise associated with the DFM in 2017. A majority of these details have not changed. No site-specific noise level data are available for the A3 tract; however, the physical setting and general land uses are similar to those at the DFM. The current median noise level is estimated to be 40-60 dBA for day and night, with the noise level increasing with proximity to the currently active mining operations. Mining activities are characterized by noise levels of 85-95 dBA in the immediate vicinity of mining operations and activities (BLM 1992). As discussed in **section 3.11**, four residences are currently located within the A3 tract. It is expected that the houses will be vacated prior to year 2022 (WFW 2019a).

3.15 Transportation Facilities

The discussions included in section 3.14 of the A2TR1 EA provide details regarding the description of transportation facilities associated with the DFM in 2017. A majority of these details have not changed. Power lines, utility corridors, and oil and gas pipelines are present within and adjacent to the A3 tract. Several overhead power lines run through the tract.

3.16 Hazardous and Solid Wastes

The discussions included in section 3.15 of the A2TR1 EA provide details regarding the description of hazardous and solid wastes associated with the DFM in 2017. Potential sources of hazardous or solid waste on the tract include spilled, leaked, or dumped hazardous substances, petroleum products, and/or solid waste associated with coal and oil and gas exploration, oil and gas development, utility line installation and maintenance, and agricultural activities.

3.17 Socioeconomics

This section describes existing socioeconomic conditions in Wyoming and Campbell County specific to the local and state economy, population, employment, and environmental justice. The discussions included in section 3.16 of the A2TR1 EA provide details regarding the

socioeconomics conditions associated with the DFM in 2017. Discussions related to housing, local government services, and environmental justice have not changed enough to require reevaluation in this EA. The following includes updated discussions on the local economy, population, and employment.

3.17.1 State and Local Economy

Wyoming's coal mines produced an estimated 304.2 million tons in 2018, a decrease of about 162.1 million tons (35 percent) from the record 466.3 million tons produced in 2008 but slightly increased from the low of 297.5 million tons sold in 2016. Coal produced from 14 active mines in Campbell County, which makes up approximately 5 percent of the surface area of Wyoming, accounted for approximately 97 percent of total statewide coal production in 2017 (Wyoming Department of Workforce Services [WDWS] 2017). According to coal production numbers from the U.S. Energy Information Administration (USEIA), the coal from Campbell County accounted for approximately 44 percent of the coal produced in the U.S. in 2017 (USEIA 2017).

The estimated total fiscal impact from coal production in Campbell County to the State of Wyoming in 2018 was calculated based on coal produced from the county in 2017. The sale of coal from Campbell County in 2017 resulted in an estimated $457,591,386 of federal revenues and $649,266,546 in state revenues for a total of $1,106.9 million (see **appendix F** for calculations).

3.17.2 Population

According to U.S. census data, in 2017 Campbell County had a population of 46,242, which ranked it as the third most populous of Wyoming's 23 counties (U.S. Census Bureau 2018).

The majority of the Campbell County mine employees and support services resided in Gillette. It is estimated that the total population in the Gillette city limits increased from 29,947 in 2010 to 30,560 in July 2017, an increase of only 2.0 percent over the period (U.S. Census Bureau 2018). **Table 3-10** presents the population changes for Campbell County and Gillette. As of July 2017, Gillette accounted for roughly 66.1 percent of the county's residents. Gillette was the fourth largest city in the state, following Cheyenne, Casper, and Laramie.

Table 3-10. Campbell County and City of Gillette Population Change, 2010-2017

	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017 Increase	2010-2017 Percent Change
Campbell County	46,233	46,560	47,861	48,051	48,192	49,293	48,800	46,242	9	0.02
City of Gillette	29,947	30,392	31,378	31,637	31,820	32,611	32,290	30,560	613	2.05

Source: U.S. Census Bureau 2018

3.17.3 Employment

Table 3-11 presents the employment changes for Wyoming and Campbell County for 2012 through 2018. The statewide total employment force decreased 4.8 percent from 2012 to 2018, while the employment force in Campbell County decreased 15.7 percent during the same time period. The average unemployment rate in Campbell County for 2012 was 4.6 percent and 4.0 percent for 2018 (Bureau of Labor Statistics 2018).

Table 3-11. Wyoming and Campbell County Employment Rate Change, 2012-2018

	2012	2013	2014	2015	2016	2017	2018[1]
Wyoming (number employed)	290,935	292,132	293,657	293,264	285,055	281,016	276,834
Wyoming (number unemployed)	16,337	14,479	12,675	12,752	15,868	12,329	11,335
Wyoming unemployment rate	5.3	4.7	4.1	4.2	5.3	4.2	4.1
Campbell County (number employed)	24,907	24,607	25,376	24,844	22,697	21,945	20,986
Campbell County (number unemployed)	1,212	1,091	878	1,023	1,739	1,138	843
Campbell County unemployment rate	4.6	4.2	3.3	4.0	7.1	4.9	4.0

[1] 2018 data are preliminary as of February 2019 as of February 2019
Source: Bureau of Labor Statistics (2018)

Employment in mining bottomed out in the third quarter of 2016 with slightly fewer than 18,000 jobs, the lowest level in more than 10 years. Since then, however, mining has seen over-the-month increases in each of the 6 months prior to the base period (second quarter of 2017). Wyoming's employment is expected to grow by 7,333 jobs (2.7 percent) from the second quarter of 2017 to second quarter of 2019, with job growth forecast for all sectors. The largest job growth is expected in mining, including oil and gas, at 2,410 jobs (12.5 percent), due to favorable oil prices (WDWS 2018).

4.0 Environmental Consequences/Cumulative Effects

4.1 Introduction

This chapter discusses the potential direct, indirect, and cumulative effects of the Proposed Action and the No Action Alternative, as described in **chapter 2**. The discussion is organized by the affected resource in the same order as they are described in **chapter 3** and then by alternative. The environmental consequences have been assessed assuming an estimated 6.0 Mtpy production rate, which was provided by WFW based on current contract and anticipated demand (WFW 2019a). The estimated annual production is in line with recent (2012-2018) annual production.

An impact, or effect, is defined as a modification to the environment brought about by an outside action. Impacts vary in significance from no change, or only slightly discernible change, to a full modification or elimination of the resource. Impacts can be beneficial (positive) or adverse (negative) and can be described by their level of significance (i.e., significant, moderate, minor, negligible, or no impact). The discussions included in section 4.1 of the A2TR1 EA provide details regarding the description of levels of significance and these descriptions have not changed.

The direct, indirect, and cumulative effects of the Proposed Action and No Action Alternative are described below. In addition to addressing the specific issues identified in **chapter 1**, the environmental consequences analysis reflects changes to the mining operations included in **chapter 2** and updated descriptions of the affected environment included in **chapter 3**.

Regarding other relevant regional activity, WDEQ-LQD recently approved the permit renewal for Permit No. PT0599 (WDEQ-LQD 2019). The Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines (northern group of mines) are adjacent to or in the immediate vicinity of the A3 tract (**map 1-1**). Information regarding ownership, permitted acres, and 2018 coal production from these mines is included in **table 4-1**.

Table 4-1. Ownership, Permitted Acres, and Production of the Northern Group of Mines

Mine	Ownership	Permitted Acres	2018 Production (Mt)
Dry Fork Mine	Western Fuels Wyoming, Inc.	7,134	6.3
Rawhide	Peabody Caballo Mining, LLC	9,231	9.5
Buckskin	Buckskin Mining Company	9,020	13.5
Eagle Butte	Contura Coal West, LLC	10,254	17.1
Synthetic Fuels	Green Bridge Holdings Inc.	2,370	0.0
Wyodak	Wyodak Resources Development Corporation	5,998	4.1
Total		**44,007**	**50.5**

Source: WDEQ-LQD 2018 (Permit Acres), WDWS 2017 (2017 Production)

Several heavy industrial facilities are also near the A3 tract, including an oilfield wastewater injection business, an activated carbon refinery, and a septic waste disposal business. An industrial park is in the process of being developed within 0.75 mile of the tract. These facilities are privately owned and there are no publicly accessible data/information available to aid in the discussion of cumulative impacts. In addition, three power plants are located adjacent to or in the vicinity of the A3 tract (**map 3-1**). Information regarding ownership and power output of the power plants is included in **table 4-2**.

Table 4-2. Ownership and Power Output of Power Plants Near the DFM

Power Plant	Ownership	Power Output (MW)
Dry Fork Station	Basin Electric Power Cooperative	422
Wyodak Power Plant	PacifiCorp	402
Neil Simpson Complex[1]	Black Hills Corporation	383

[1] Includes the Neil Simpson II, Wygen I, Wygen II, and Wygen III units

The environmental and cumulative effects discussions below for the Proposed Action assume that the federal mining plan modification to mine coal in the federal coal leases within the A3 tract would be approved. Coal recovery would continue within the DFM permit boundary at an estimated annual rate of 6.0 Mt using coal recovery methods outlined in Permit No. PT0599. The recovery of the federal coal would continue for approximately 9.7 additional years beyond the No Action Alternative.

Under the No Action Alternative, the mining plan modification to recover the federal coal within the A3 tract would not be approved. Currently approved mining operations associated with existing coal leases would continue for approximately 36 years within federal coal leases WYW-5035, WYW-0271199, WYW-0271200, WYW-0271201, and WYW-0311810, state coal lease 0-26652, and Marshall et al. private coal lease.

4.2 Topography and Physiography

4.2.1 Direct and Indirect Effects

4.2.1.1 Proposed Action

The Proposed Action would impact the topography and physiography of lands included in the A3 tract but these impacts would be similar to those currently occurring on the existing DFM coal leases as coal is mined and the mined-out areas are reclaimed. Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. Following reclamation, the average postminning topography would be slightly lower in elevation than the premining topography due to removal of the coal. The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted, excavated, and backfilled. The direct effects on topography and physiography resulting from the Proposed Action are expected to be moderate and permanent on the tract. There would be no indirect effects under the Proposed Action.

4.2.1.2 No Action Alternative

The impacts to topography under the No Action Alternative would be similar to those under the Proposed Action, although the impacts to approximately 640.3 acres to recover federal coal within the tract would not occur.

4.2.2 Cumulative Effects

The cumulative impacts to topography and physiography would not be substantially different from those described in the existing DFM federal mining plan. According to the 2019 CHIA, approximately 20,247 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2019). The cumulative effects primarily would be related to the northern group of mines. Following surface coal mining and reclamation, topography would

be modified. The cumulative effects on topography and physiography resulting from the Proposed Action and other disturbance associated with the northern group of mines are expected to be moderate and permanent.

4.2.3 Mitigation Measures

No mitigation measures would be necessary for topography and physiography.

4.3 Geology, Mineral Resources, and Paleontology

4.3.1 Direct and Indirect Effects

4.3.1.1 Proposed Action

The direct and indirect effects to geology, mineral resources, and paleontology would not be substantially different from those described in the A2TR1 EA. The geology from the base of the Wyodak-Anderson coal seam to the land surface would be subject to permanent change on the areas of coal removal, and mining would substantially alter the resulting subsurface physical characteristics of these lands. These impacts are occurring on the existing DFM coal leases as coal is mined and the mined-out areas are reclaimed. The Proposed Action would result in the recovery of approximately 58.1 Mt of federal coal within the Wyodak-Anderson coal seam. The Proposed Action would also result in the loss of CBNG though venting and/or depletion of hydrostatic pressure in Wyodak-Anderson coal resulting from mining adjacent areas.

As described in **section 3.11**, seven conventional oil and gas wells have been completed within the tract. All of the wells drilled in the tract have been plugged and abandoned. No CBNG wells were drilled in the tract, indicating that there are not sufficient quantities of methane in the tract to justify exploratory drilling for CBNG.

A locality search for paleontological resources (conducted through geological references and paleontological records) that included the A3 tract showed that no known vertebrate fossil localities are recorded from within either the original mine permit boundary or the A3 tract. However, site specific paleontological ground surveys have not been conducted and the tract lies on the Eocene-aged Wasatch Formation, which is known to yield significant paleontological resources in nearby areas. If vertebrate fossils do exist, they could be negatively impacted by mining operations. Potential impacts to vertebrate fossils during construction could be both direct and indirect. Ground disturbance of significant fossil beds could result in direct damage to or destruction of fossils. Indirect effects during construction include erosion of fossil beds due to slope re-grading and vegetation clearing and unauthorized collection of significant fossils by construction workers or the public due to increased public access to fossil localities. Lease and permit conditions require that should previously unknown, potentially significant paleontological sites be discovered, work in that area must stop and measures must be taken to assess and protect the site.

The direct and indirect effects on mineral resources and paleontology are expected to be moderate and permanent on the tract.

4.3.1.2 No Action Alternative

The impacts to geology, mineral resources, and paleontology under the No Action Alternative would be similar to those under the Proposed Action, although approximately 640.3 acres would not be disturbed to recover federal coal within the tract and the duration of potential impacts in

the area would be reduced by approximately 9.7 years. Impacts to CBNG resources could still occur as a result of mining activities on adjacent lands.

4.3.2 Cumulative Effects

The cumulative effects on geology, mineral resources, and paleontology would primarily be related to the northern group of mines. As presented in **table 4-1**, the combined area of the permit boundaries of the northern group of Campbell County mines totals approximately 68.8 square miles (44,007 acres), or approximately 0.4 percent of the 19,500-mi^2 Montana/Wyoming PRB coalfield (WDEQ-LQD 2018 and Luppens et al. 2015). The U.S. Geological Survey (USGS) estimated that in 2015 there were approximately 162 billion tons of recoverable coal in the Montana/Wyoming PRB, of which, an estimated 25 billion tons were considered economically recoverable coal, with a maximum stripping ratio of 10:1 (Luppens et al. 2015). Information in **table 4-1** shows that 50.5 Mt of coal were recovered at the 6 northern mines in 2018, or approximately 0.2 percent of the recoverable coal in the Montana/Wyoming PRB.

According to February 2019 information from the WOGCC website, 20,901 CBNG and 3,282 conventional oil and gas wells have been drilled in Campbell County. The WOGCC records indicate that a majority of the Campbell County wells are privately held or state minerals, with approximately 53.1 percent of the wells drilled (12,831 of 24,183) being state/private minerals. The status of these wells includes shut-in, producing, plugged and abandoned, and injection. The gas production in Wyoming continues to be significantly lower than the high observed in 2009 and oil production is down from a recent peak in 2015 (WOGCC 2018). As stated above, no producing oil or gas wells are located within the A3 tract. Therefore, the Proposed Action would not contribute to cumulative impacts on oil and gas wells.

Impacts to paleontological resources as a result of the currently authorized and reasonably foreseeable cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and would result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

4.3.3 Mitigation Measures

No mitigation measures would be necessary for geology or mineral resources. Should significant paleontological resources be encountered as a result of the Proposed Action, work in the area would stop and the appropriate agencies would be consulted.

4.4 Air Quality and Climate Change

4.4.1 Particulate Matter

4.4.1.1 Direct and Indirect Effects

4.4.1.1.1 Proposed Action

Direct particulate matter emissions from the Proposed Action would include fugitive dust emissions generated from coal excavation and reclamation activities and tailpipe emissions from

equipment. Fugitive particulate emissions would also result from dust being generated during dragline operation, coal haulage, bulldozers, scrapers, loaders, and other equipment operating at the DFM. The DFM triennial emission inventory for 2017 was used to estimate direct particulate matter emissions for the Proposed Action. Particulate matter emissions for the Proposed Action and the State of Wyoming are tabulated in **table 4-3**.

Table 4-3. Comparison of DFM Emissions (from Operations Only) to Wyoming Particulate Matter Emissions

	Proposed Action (tpy)	2017 Wyoming State Tier I (tons)	Anticipated Percent Change to State Emissions from Proposed Action
$PM_{2.5}$	6.3	38,115	0.02
PM_{10}	290.0	195,180	0.2

Source: WFW 2019a, EPA 2019b

Dispersion modeling was conducted in 2017 to determine if modifications to DFM's current air quality permit would be compliant with short-term and long-term WAAQS for PM_{10}, $PM_{2.5}$, and NO_2 (WFA and Redhorse Corporation 2017). Source emissions were based on maximum permitted coal production for the worst-case years selected to be analyzed in the DFM modeling analysis (2019 and 2025) and were taken from year-by-year emissions calculations for each mine. The results of this modeling are presented in **appendix C**.

Based on PM_{10} dispersion modeling and on historical ambient monitoring at DFM and other mines north of Gillette, which have recorded no monitored exceedances of PM_{10} ambient standards, the Proposed Action would be in compliance with short-term and long-term ambient air quality standards for PM_{10}. Finally, potential impacts from emissions of $PM_{2.5}$ will continue to be below the ambient $PM_{2.5}$ standards, based on ambient monitoring data collected at the Buckskin Mine and on estimated DFM $PM_{2.5}$ ambient concentrations.

Public exposure to particulate emissions from surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of residences in the area could also be affected. Four occupied residences are currently within the A3 tract but, as discussed in **section 3.11**, these residences will be vacated prior to 2022. The closest public transportation route is the Garner Lake Road, which currently bisects the tract, but the road will be relocated immediately adjacent to the tract prior to disturbance. The nearest recreational opportunities are within the Gillette city limits, approximately 9,000 feet from the A3 tract.

4.4.1.1.2 No Action Alternative

Impacts from particulate matter emissions have resulted from current mining activity and therefore under this alternative, particulate matter emission impacts in the area would be similar to those under the Proposed Action but would not be extended for an additional 9.7 years.

4.4.1.2 Cumulative Effects

The northern group of mines would contribute particulate matter emissions to the surrounding area. Cumulative impacts from particulate matter emissions could be higher in the short term in this area due to coal mining activities if surface inversions occur in the northern portion of the PRB. This would be temporary, lasting only during the inversion event. Air quality impacts would

cease to occur after mining and reclamation are completed. The effects of particulate matter emissions from coal combustion are included in **section 4.4.5**. Modeling conducted for DFM's current Air Quality Permit No. P0023278 included effects due to the northern group of mines. As the revised model indicated, the requested modification to DFM's federal mining plan would not contribute to a violation of the federal annual PM_{10} WAAQS/NAAQS of 50 µg/m^3 (WFA and Redhorse Corporation 2017). The cumulative effects from particulate matter emissions are expected to be moderate and would be extended by approximately 9.7 years.

4.4.1.3 Mitigation Measures

No mitigation measures would be implemented for emissions of particulate matter beyond those included in the DFM air quality permit (WDEQ-AQD 2018).

4.4.2 Emissions of Nitrogen Oxides (NO_X) and Ozone (O_3)

4.4.2.1 Direct and Indirect Effects

4.4.2.1.1 Proposed Action

The DFM is not required to monitor NO_X or O_3 so a direct comparison between current NO_X or O_3 at the mine and state or federal standards is not possible. However, NO_2 data collected at the currently active AQS monitoring sites in Campbell County nearest to the DFM were below the 1-hour WAAQS and NAAQS 98th percentile concentration of 100 ppb (188 µg/m^3). Therefore, ambient air quality within the vicinity of the Proposed Action is currently in compliance with the NO_2 WAAQS and NAAQS.

Dispersion modeling conducted in 2017 demonstrated that modifications to WFW's current permit would be compliant with short-term and long-term WAAQS for NO_2 (WFA and Redhorse Corporation 2017). The results of this modeling are presented in **appendix C**.

Public exposure to NO_2 emissions caused by surface mining operations is most likely to occur along publicly accessible roads and highways that pass through the area of the mining operations. Occupants of residences in the area could also be affected. The closest public transportation route is the Garner Lake Road, which currently bisects the tract but will be relocated immediately adjacent to the tract prior to disturbance, and occupied dwellings Four occupied residences are currently within the A3 tract but, as discussed in **section 3.11**, these residences will be vacated prior to 2022. The nearest recreational opportunities are within the Gillette city limits, approximately 9,000 feet from the A3 tract. The direct and indirect effects from NO_X emissions resulting from the Proposed Action are expected to be moderate and would be extended by approximately 9.7 years on the tract.

As indicated in **section 3.4.1.2**, O_3 monitoring is not required at the DFM but O_3 levels have been monitored at AQS sites 560050123 and 560050456, which are located approximately 22 miles north and 17 miles south of the A3 tract, respectively (**map 3-1**). No exceedances of the 8-hour O_3 standard have occurred at either monitoring site since monitoring began in 2010. Based on information provided by WFW that mining methods would not be significantly different that those currently employed at the mine (WFW 2019a), the direct and indirect effects from O_3 emissions resulting from the Proposed Action are expected to be minor and would be extended by approximately 9.7 years.

4.4.2.1.2 No Action Alternative

Impacts from NO_X and O_3 emissions have resulted from current mining activity and therefore the impacts related to NO_X and O_3 emissions under the No Action Alternative would be similar to those under the Proposed Action but would not be extended for an additional 9.7 years.

4.4.2.2 Cumulative Effects

The northern group of mines would contribute additional NO_X and O_3 emissions to the surrounding area. Modeling conducted for DFM's Air Quality Permit P0023278 included effects from the northern group of mines. WDEQ-AQD determined that, based on the modeling analysis and past monitoring, the Proposed Action would not likely substantially degrade air quality (WDEQ-AQD 2018). Cumulative impacts from NO_X and O_3 could be higher in the short term in this area due to coal mining activities if surface inversion occurs in the northern portion of the PRB. This would be temporary, lasting only during the inversion. Air quality impacts would cease to occur after mining and reclamation are complete. The cumulative effects from NO_X and O_3 emissions are expected to be moderate and would be extended by approximately 9.7 years.

4.4.2.3 Mitigation Measures

No mitigation measures would be implemented for emissions of NO_X or O_3 beyond those included in the DFM air quality permit.

4.4.3 Emissions of Sulfur Dioxide (SO_2), Mercury (Hg), Lead (Pb), and Other Non-Greenhouse Gases (Non-GHG)

4.4.3.1 Direct and Indirect Effects

4.4.3.1.1 Proposed Action

Direct air emissions for SO_2, Hg, Pb, and other non-GHG from the Proposed Action would include emissions generated from coal excavation and reclamation activities and tailpipe emissions from equipment. The data presented in **section 3.4.1.2** show that SO_2, Hg, and Pb in Campbell County are in compliance with applicable standards.

In addition, the DFM triennial emission inventory for 2017 was used to estimate direct SO_2, CO, and other non-GHG emissions for the Proposed Action. These are compared to emissions estimates for the State of Wyoming in **table 4-4**.

Table 4-4. Comparison of Direct to Wyoming SO_2, Hg, Pb, and Other Non-GHG Emissions

Source	Proposed Action (tpy)	2017 Wyoming State Tier 1 (tons)	Anticipated % change to State Emissions from Proposed Action
VOC	5.08	271,481	0.002
HCOH	0.001	NA	-
CO	124.98	250,232	0.05
SO_2	10.88	52,354	0.02
Other HAPs	0.002	NA	-
Total HAPs	0.002	NA	-

NA – Not available
Source: WFW 2019a, EPA 2019b

Under the Proposed Action, coal recovery at the DFM would continue at an estimated annual rate of 6.0 Mt. Since the direct emissions from the Proposed Action would be minor when compared to Wyoming state emissions and given the results of ongoing SO_2, Hg, and Pb monitoring in the area that show no exceedances of these parameters, the effects of emissions of SO_2, Hg, Pb, and other non-GHGs from the Proposed Action would be minor and short-term.

4.4.3.1.2 No Action Alternative

Impacts from non-GHG emissions have resulted from current mining activity and therefore the impacts related to non-GHG emissions under the No Action Alternative would be similar to those under the Proposed Action but would not be extended for an additional 9.7 years.

4.4.3.2 Cumulative Effects

The northern group of mines would contribute additional non-GHG emissions to the surrounding area. Based on past monitoring, the Proposed Action would not likely increase these emissions. While cumulative impacts from non-GHG emissions could be higher in the short-term in this area due to coal mining activities if surface inversion occurs in the northern portion of the PRB, this would be temporary, lasting only during periods of inversions. Air quality impacts from mining would cease to occur after reclamation is complete. Therefore, the cumulative effects from non-GHG emissions are expected to be minor and short-term.

4.4.3.3 Mitigation Measures

No mitigation measures beyond those required by the DFM air quality permit would be required for emissions of non-GHGs.

4.4.4 Air Quality Related Values (AQRVs)

4.4.4.1 Direct and Indirect Effects

4.4.4.1.1 Proposed Action

Visibility

WDEQ-ADQ has determined that the DFM is not a major stationary source, in accordance with Chapter 6, Section 4 of the WAQSR (WDEQ-AQD 2011). While the state of Wyoming does not require mines to evaluate impacts on Class I areas, OSMRE considers such issues during the federal mining plan modification review process.

Because WDEQ does not require an evaluation of visibility impacts on Class I areas, WFW does not monitor visibility associated with the DFM. Therefore, a direct comparison with the Wyoming standards is not possible. The impacts to visibility from mining the A3 tract have been inferred from the currently permitted impacts of mining the existing coal leases at the DFM. The nearest Class I area is located approximately 74 miles northwest of the A3 tract at the Northern Cheyenne Indian Reservation. As indicated on **figure 3-1**, the long-term trend in visibility at the Northern Cheyenne Indian Reservation appears to be relatively stable, if not improving slightly. If the coal within the tract is mined, the tract would be mined as an integral part of the DFM.

Overburden is similar in thickness in the tract as compared with the current permit boundary. Thus, emissions from blasting are not expected to increase substantially. All blasting would be conducted in compliance will applicable local, state, and federal laws and regulations, including WDEQ-LQD Rules and Regulations, Chapter 6. All blasting operations are conducted under the direction of a certified blaster. The expected levels of pollutants and particulates that effect

visibility would be within the limits included in DFM's Air Quality Permit P0023278. The proposed project area is not directly influenced by other air quality regulations (i.e., Class I air shed). The direct and indirect effects to visibility resulting from the Proposed Action are expected to be moderate and would be extended by approximately 9.7 years.

Acidification of Lakes/Acid Deposition

As described in **section 3.4.1.3.3**, H^+ concentrations are the primary indicator of precipitation acidity. H^+ monitoring is not required at the DFM so measured H^+ concentrations determined at site WY99 (the closest H^+ monitoring site to the DFM) were evaluated to estimate the potential effects of the Proposed Action on regional acidification of lakes. Nationwide data were also evaluated to assess the potential for impacts over a much larger area. As indicated in **section 3.4.1.3.3,** the 2012-2018 trend in H^+ at monitoring site WY99 appears to be relatively stable. According the EPA, national monitoring network data show significant improvements in the primary acid deposition indicators between 1989 and 2013 (EPA 2016). Because factors affecting H^+ emissions would not change as a result of the Proposed Action, the direct and indirect effects have been inferred from the currently permitted impacts of mining the existing coal leases at the DFM.

Based on the evaluation of the currently available information, the Proposed Action is not expected to contribute to increased direct or indirect effects from acidification of lakes or to acid deposition that may affect soils. The direct and indirect effects from acid deposition related to the Proposed Action would be negligible but would be extended by approximately 9.7 years.

4.4.4.1.2 No Action Alternative

Impacts to AQRVs have resulted from current mining activity and therefore the impacts related to AQRVs under the No Action Alternative would be similar to those under the Proposed Action but would not be extended by 9.7 years.

4.4.4.2 Cumulative Effects

The cumulative AQRVs would be affected by mines in Campbell County. One method of evaluating the cumulative effects of the Proposed Action on AQRVs would be to assess the air quality index (AQI) for Campbell County. As described by the AirNow website, the AQI provides an index of how clean or polluted the air is within an area and what associated health effects might be a concern (AirNow 2016). The AQI focuses on health affects experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), CO, SO_2, and NO_2. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. The AQI evaluates air quality based on six levels (categories) of health concern that correspond to a different level of health concern.

The six categories of health concern are discussed in section 4.4.4.2 of the A2TR1 EA and are incorporated here by reference.

According to information obtained from the AirNow website, for Campbell County approximately 98.8 percent of the days between 2012 and 2018 were classified as having a good or moderate AQI and no days were classified as very unhealthy or hazardous (**table 4-5**).

Table 4-5. Average Annual Campbell County Air Quality Index Values, 2012-2018

Year	Days Evaluated	Good or Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	Hazardous
2012	366	351	13	2	0	0
2013	365	364	1	0	0	0
2014	365	364	1	0	0	0
2015	365	362	2	1	0	0
2016	366	365	1	0	0	0
2017	365	358	4	3	0	0
2018	365	361	2	2	0	0
Average	**365.3**	**360.7**	**3.4**	**1.1**	**0**	**0**
Percent of Average Number of Days[1]	**--**	**98.7**	**0.9**	**0.3**	**0.0**	**0.0**

[1] Indicated values may not equal calculated values due to rounding
Source: EPA 2018c

Using nationwide date obtained from the AirNow website, approximately 98.2 percent of the days between 2012 and 2018 were classified as having a good or moderate AQI and 0.03 percent of the days were classified as very unhealthy or hazardous (**table 4-6**).

A comparison between **tables 4-5** and **4-6** shows that Campbell County AQI values were generally better than the U.S. average.

Table 4-6. Average Annual Nationwide Air Quality Index Values, 2012-2018

Year	Days Evaluated	Good or Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	Hazardous
2012	330,939	320,035	9,139	1,612	99	20
2013	328,133	322,978	4,203	836	70	24
2014	329,018	324,655	3,664	643	25	9
2015	330,622	325,881	3,848	824	36	14
2016	330,536	325,922	3,856	685	35	14
2017	340,954	335,403	4,187	1,148	153	40
2018	211,735	208,512	2,756	384	23	4
Average[1]	**331,700.3**	**325,812.3**	**4,816.2**	**958.0**	**69.7**	**20.2**
Percent of Average Number of Days[1]	**--**	**98.2**	**1.5**	**0.3**	**0.02**	**0.01**

[1] Indicated values may not equal calculated values due to rounding
Source: EPA 2018c

Blasting, coal crushing, loading and hauling of coal, moving equipment, and other activities associated with surface coal mining and the combustion of coal at power plants produce particulates that can be released into the air, which could impact AQRVs. The cumulative effects on AQRVs are expected to be minor but would be extended by approximately 9.7 years. Impacts to AQRVs from mining the federal coal within the A3 tract would cease to occur after mining and reclamation are completed.

4.4.4.3 Mitigation Measures

No mitigation measures would be implemented for AQRVs beyond those included in the DFM air quality permit.

4.4.5 Air Quality Related to Coal Combustion

4.4.5.1 Direct and Indirect Effects

4.4.5.1.1 Proposed Action

Emissions that affect air quality also result from combustion of fossil fuels. Discussions of PM_{10}, $PM_{2.5}$, SO_2, NO_X, Hg, and CO emissions estimates from combustion of coal mined at the DFM used for power generation are included in **table 4-7**. **Appendix C** includes details on emissions estimates. Using information included in **appendix C**, comparisons can be made between combustion emissions from coal mined at the DFM and emissions from coal mined from Campbell County. Comparisons to total U.S. emissions are also included.

Table 4-7. Estimated Annual PM_{10}, $PM_{2.5}$, SO_2, NO_X, Hg, and CO Contributions from Combustion of Coal Mined at the DFM for 2012-2017 and 2018-2064 Estimated Annual Average, Compared to Campbell County and U.S. Total Emissions

Year	Coal Combusted (Mt)	PM_{10} (Tons)	$PM_{2.5}$ (Tons)	SO_2 Emissions (Tons)	NO_x Emissions (Tons)	Hg Emissions (Tons)	CO Emissions (Tons)
2012	6.0	4,114.9	3,218.1	52,559.4	21,624.4	0.20	1,501.7
2013	5.4	3,722.5	2,911.2	47,546.9	19,562.2	0.10	1,358.5
2014	5.4	3,681.4	2,879.0	47,022.3	19,346.3	0.05	1,343.5
2015	6.4	4,363.2	3,412.2	55,730.6	22,929.1	0.05	1,592.3
2016	6.1	4,203.1	3,287.1	53,686.0	22,088.0	0.02	1,533.9
2017	6.0	4,141.5	3,238.9	52,899.2	21,764.2	0.02	1,511.4
2012-2017 Average	5.9	4,037.8	3,157.7	51,574.1	21,219.0	0.07	1,473.5
Estimated 2018-2064 Annual Average	6.0	4,110.3	3,214.4	52,500.0	21,600.0	0.07	1,500.0
Average 2012-2017 Campbell County[1]	349.6	239,519.6	187,316.6	3,059,360.2	1,258,708.2	14.5	87,410.3
2018-2064 Annual Average Percent of Campbell Co.	--	1.72	1.72	1.72	1.72	0.48	1.72
Total U.S. Emissions (2017)	824.8	573,077.7	448,176.2	7,216,720.0	2,969,164.8	34.2	206,192.0
2018-2064 Annual Average Percent of U.S.	--	0.73	0.73	0.73	0.73	0.20	0.73

[1] Based on average of 2012 through 2017 production
Source: WWC 2019, calculations provided in **appendix C**

Impacts to air quality related to coal combustion under the Proposed Action would be similar to the conditions currently experienced. When compared to Campbell County emissions, direct and indirect effects would be minor (less than 2 percent of the Campbell County average emissions) but would be extended by approximately 9.7 years.

Power plants can release trace metals, such as Hg, during the combustion of coal to generate electricity. Hg is a heavy metal that is a known persistent, bioaccumulative, and toxic (PBT) substance that occurs naturally in coal and air releases of Hg are associated with a variety of important environmental and human health consequences (CEC 2011). The estimated on-site Hg emissions from combustion of DFM-supplied coal are indicated in **table 4-8**.

Table 4-8. On-site Mercury (Hg) Emissions (in Tons) from Coal Fired Power Plants Using DFM-supplied Coal, 2012-2017 and 2018-2064 Estimated Annual Average

	2012	2013	2014	2015	2016	2017	2018-2064 Annual Average
Dry Fork Station (Wyoming)	0.034	0.034	0.025	0.020	0.014	0.015	0.023
Dave Johnston Plant (Wyoming)	0.131	0.121	0.089	0.038	0.021	0.021	0.070
Laramie River Station (Wyoming)	0.265	0.285	0.110	0.106	0.042	0.034	0.140
LCRA Fayette Power Project (Texas)	0.169	0.141	0.091	0.145	0.061	0.048	0.109
Basin Electric Leland Olds (North Dakota)	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Power Plant Cumulative Total	0.708	0.439	0.224	0.164	0.077	0.069	0.280
Emissions from DFM-supplied Coal[1]	0.202	0.098	0.054	0.050	0.022	0.019	0.074
Percent of Hg Emissions from DFM	28.5	22.3	24.1	30.5	28.6	27.5	26.4

[1] Based on percent of coal combusted at the power plant that came from the DFM, calculations provided in **appendix C**
Source: EPA 2017

Based on the average of 2012 through 2017 emissions from the power plants using coal from the DFM (average coal use of 5.9 Mtpy), the estimated Hg emissions resulting from DFM-produced coal would contribute approximately 0.074 ton of Hg emissions per year (WWC 2019). As indicated in **table 4-8**, Hg emissions from the five power plants supplied by DFM have been steadily decreasing over the 2012-2017 time period. The DFM provides all of the coal utilized at the DFS. The Proposed Action would not increase Hg emissions from power plants using DFM-supplied coal but would extend the emissions by approximately 9.7 years.

4.4.5.1.2 No Action Alternative

The air quality impacts directly resulting coal combustion under the No Action Alternative would be less than those under the Proposed Action and would not be extended by approximately 9.7 years.

4.4.5.2 Cumulative Effects

In 2018, approximately 95 percent of coal mined at the DFM was burned at three Wyoming power plants (WFW 2019a). Therefore, the majority of the cumulative effects area would be related to coal combustion within the state of Wyoming.

The Proposed Action would not increase cumulative Hg emissions but would extend the emissions from coal-fired power plants by approximately 9.7 years. When compared to emissions from these Wyoming power plants, cumulative effects from the Proposed Action would be minor but would be extended by approximately 9.7 years.

4.4.5.3 Mitigation Measures

A majority (approximately 99.7 percent) of the GHG identified in this EA are from non-mining activities, not controlled by WFW (e.g., rail transportation to and combustion at power plants). The DOI generally has no regulatory authority over GHG emissions from rail transportation and coal combustion. Air emissions, both direct and indirect, are regulated by other regulatory entities, including WDEQ-AQD (for emissions at the DFM and Wyoming Power Plants) and other states' regulatory agencies (for emissions from out-of-state power plants), through permit limits. Given these facts, OSMRE has determined that no additional mitigation is required.

4.4.6 Greenhouse Gas Emissions

4.4.6.1 Direct and Indirect Effects of the Proposed Action

4.4.6.1.1 Proposed Action

Each GHG has a different lifetime in the atmosphere and a different ability to trap heat in the atmosphere. To allow different gases to be compared and added together, emissions can be converted into CO_2e emissions. WFW estimated 2012-2018 and 2019-2064 CO_2e emissions from direct emissions sources based on known and estimated annual coal recovery and variables. As shown in **table 4-9**, the 2019-2064 annual emissions estimations from direct sources account for approximately 0.42 percent of the total emissions. Indirect effects from GHG emissions would occur as a result of emissions from indirect sources such as transporting and burning coal that is mined at the DFM. As shown in **table 4-9**, the 2019-2064 annual emissions estimations from indirect sources account for approximately 99.58 percent of the total emissions.

Table 4-9. Estimated Annual Equivalent CO_2 (CO_2e) Emissions for the Proposed Action from Coal Mined at the DFM (2012-2018 and 2019-2064 Average)

	2012-2018		2019-2064	
General				
Mt of coal recovered	5.95		6.00	
Mt of coal shipped by conveyor (all to	2.03		2.00	
Mt of coal shipped by rail	3.93		4.00	
Average transport miles (one way)	176		204	
Number of train trips (one way)	256		259	
Direct emissions sources[1]	**Avg.**	**% of Total**	**Avg.**	**% of Total**
Fuel	19,445	0.19%	19,601	0.19%
Electricity consumed in mining process	16,111	0.16%	16,021	0.16%
Mining process	6,925	0.07%	6,886	0.07%
Total from Direct Sources	**42,481**	**0.42%**	**42,508**	**0.42%**
Indirect Emissions Sources[1]	**Avg.**	**% of Total**	**Avg.**	**% of Total**
Rail transport[2]	23,999	0.24%	28,444	0.28%
From coal combustion[3]	9,970,770	99.34%	10,050,000	99.30%
Total from indirect sources[1]	**9,994,768**	**99.58%**	**10,078,444**	**99.58%**
Total estimated CO_2e emissions	**10,037,249**	**100.00%**	**10,120,952**	**100.00%**

[1] In metric tons based on 1.683 metric tons CO_2e per ton of coal burned for electrical generation (EPA 2008) and calculated by WWC (2019)

[2] Coal haulage emissions based on train trips per year; 452.7 kg CO_2e per mile per loaded train, 87.2 Kg CO_2e per mile per empty train; and round-trip mileage to power plants. Coal haulage emissions calculations includes a loaded train and a returning empty train, per train trip. 2017-2053 Rail distance calculated as the average 2011-2016 rail miles

Source: WWC 2019, calculations are provided in **appendix C**

The Proposed Action would result in combined direct and indirect estimated average annual CO_2e emissions of 10.1 million metric tons for an additional 9.7 years. According to the EPA (2018) in 2016 (the most recent year of available CO_2 data at this time), CO_2e emissions in the U.S. totaled 6,511.3 million metric tons. Using the 2016 U.S. estimate for comparison purposes, the estimated CO_2e contribution from the DFM coal would be approximately 0.16 percent of the U.S. total CO_2e emissions. The direct and indirect effects of the Proposed Action on annual CO_2e emissions would be moderate and short-term.

4.4.6.1.2 No Action Alternative

The impacts from GHG emissions under the No Action Alternative would be similar to those under the Proposed Action but would not be extended by approximately 9.7 years. While annual CO_2e emissions would remain the same as the Proposed Action for approximately 39 years, the LOM CO_2e emissions would decrease by approximately 25 percent as a result of the No Action Alternative, based primarily on 9.7 fewer years of combustion of DFM coal.

4.4.6.2 Cumulative Effects

The analyses provided above include direct and indirect effects analysis for GHG emissions. Due to the global nature of climate change and the difficulty of predicting climate change impacts caused by an incremental increase in GHG emissions from specific actions separately or together, a separate cumulative impacts analysis for GHG emissions is not appropriate.

4.4.6.3 Mitigation Measures

A majority (approximately 99.6 percent) of the GHG identified in this EA are from non-mining activities, not controlled by WFW (e.g., rail transportation to and combustion at power plants). The DOI generally has no regulatory authority over GHG emissions from rail transportation and coal combustion. Air emissions, both direct and indirect, are regulated by other regulatory entities, including WDEQ-AQD (for emissions at the DFM and Wyoming Power Plants) and other states' regulatory agencies (for emissions from out-of-state power plants), through permit limits. Given these facts, OSMRE has determined that no additional mitigation is required.

4.4.7 Climate Change Cause and Effect

4.4.7.1 Direct and Indirect Effects

4.4.7.1.1 Proposed Action

Although the effects of GHG emissions and other contributions to climate change in the global aggregate are estimable, it is currently not feasible to determine what effect GHG emissions in a specific area resulting from a specific activity might have on climate change and the resulting environmental impacts. Since it is not currently possible to associate any particular action with the creation or mitigation of any specific climate-related environmental effects, including the costs-benefits of an action, the GHG emissions are calculated as a relative indicator to allow comparison of the Proposed Action and the No Action Alternative based on their potential contribution to climate change.

Historically, the coal mined in the PRB has been used as one of the sources of fuel to generate electricity in power plants located throughout the U.S. Coal-fired power plant emissions include CO_2, which has been identified as a principal anthropogenic greenhouse gas. According to the EPA (2018) in 2016 (the most recent year of available CO_2 data at this time):

1. CO_2 emissions represent approximately 82 percent of the total 2016 U.S. GHG emissions.
2. Estimated CO_2 emissions in the U.S. totaled 5,310.9 million metric tons in 2016, which was a 13.2 percent decrease from the estimated high emissions in 2007.
3. Estimated CO_2e emissions from fossil-fuel combustion consumption in the U.S. totaled 4,966.0 million metric tons in 2016.

4. Estimated CO_2 emissions from the electric power sector totaled 1,809.3 million metric tons, or approximately 34 percent of total U.S. energy-related CO_2 emissions in 2016.

Approximately 626.5 Mt of coal were used to generate electricity in the U.S. in 2016, of which approximately 46.5 percent was produced in Wyoming (USEIA 2017). Approximately 97 percent of the coal mined in Wyoming in 2016 came from the PRB (WDWS 2016). Therefore, coal production from the Wyoming PRB coal represented approximately 45.1 percent of the coal used for power generation in 2016. Applying this percentage to the estimated 1,809.3 million metric tons of total U.S. CO_2 emissions from fossil fuel electric power generation, Wyoming PRB surface coal mines were responsible for approximately 816 million metric tons of CO_2 emissions from coal power generation in 2016. The DFM produced 6.1 Mt of coal in 2016, which represents approximately 2.1 percent of the Wyoming PRB coal used for power generation in 2016, or about 17.7 million metric tons of CO_2 emissions. In 2018, approximately 95 percent of coal mined at the DFM was burned in Wyoming power plants (WFW 2019a).

Section 4.4.7.1 of the A2TR1 EA provides general discussions of the "social cost of carbon" (SCC) associated with GHG emissions associated with the DFM. A protocol to estimate SCC associated with GHG emissions was developed by a federal Interagency Working Group (IWG) to assist agencies in addressing EO 12866, which required federal agencies to assess the cost and the benefits of intended regulations as part of their regulatory impact analyses. The SCC protocol was also developed for use in cost-benefit analyses of proposed regulations that could impact cumulative global emissions (Shelanski and Obstfeld 2015). However, EO 13783, issued March 28, 2017, directed that the IWG be disbanded and that technical documents issued by the IWG be withdrawn as no longer representative of federal policy. The 2017 EO further directed that when monetizing the value of changes in GHG emissions resulting from regulations, agencies follow the guidance contained in Circular A-4 (Office of Management and Budget 2003). It was determined that a federal agency should ensure that its consideration of the information and other factors relevant to its decision be consistent with applicable statutory or other authorities, including requirements for the use of cost-benefit analysis.

In any event, NEPA does not require a cost-benefit analysis (40 CFR § 1502.23) or the presentation of the SCC estimates; therefore, that analysis was not undertaken here. Without a complete monetary cost-benefit analysis, which would include the social benefits of energy production to society as a whole and other potential positive benefits, inclusion solely of an SCC analysis would be unbalanced, potentially inaccurate, and not useful.

Given the uncertainties associated with assigning a specific and accurate SCC estimate resulting from 9.7 additional years of operation under the mining plan modification, and that the SCC protocol and similar models were developed to estimate impacts of regulations over long time frames, this EA quantifies direct and indirect GHG emissions and evaluates these emissions in the context of U.S. GHG emission inventories, as discussed in **section 4.4.6**.

4.4.7.1.2 No Action Alternative

The climate change cause and effect on the No Action Alternative would be similar to the cause and effect on the Proposed Action but would not be extended by approximately 9.7 years.

4.4.7.2 Cumulative Effects

USGS predicted GHG potential impacts between 2025 and 2049 using the conservative climate change scenario (RCP8.5), which assumes no new climate change regulations or reductions would be implemented (USGS 2016). According to the USGS National Climate Change Viewer (USGS 2016), potential climate change impacts in Campbell County could include:

1. annual maximum temperature increases of up to 6.5 degrees Fahrenheit,
2. annual minimum temperature increases of up to 6.3 degrees Fahrenheit,
3. annual mean precipitation increases of up to 0.1 inch per month,
4. annual mean snowfall decreases of up to 0.1 inch per year,
5. annual mean soil water storage decreases of up to 0.1 inch per year,
6. annual mean evaporation deficit increase of up to 0.3 inch per month, and
7. annual mean runoff does not change.

For analysis purposes, this EA assumes that the maximum annual mean values would be realized during the life of the mine.

<u>Hydrology</u>

The potential changes to the annual snowfall, precipitation levels, and streamflow could impact area surface water body levels, groundwater recharge, and soil erosion. During the anticipated 9.7-year life of the project, natural variations result in dryer or wetter years. Considering the overall long-term climate change timeframe, it is possible that decreased snowpack may or may not be observable locally during the project timeframe. Likewise, decreases in streamflow may be observed, but during the mining dewatering timeframe of 9.7 years, mine dewatering may compensate for climate change-related streamflow reduction or may have no additional influence on streamflow. Therefore, there will be no climate change impacts on streamflows where project impacts occur or they may be negligible during the project timeframe. The Proposed Action would have moderate, short-term impacts to surface water bodies and groundwater. However, the impact from changes to these resources based on climate change would be negligible and long term.

<u>Soils</u>

The Proposed Action would involve new surface disturbance of approximately 640.3 acres. As described in **section 4.8.1.1**, the direct and indirect effects related to the Proposed Action to soils would be moderate and would be extended by approximately 9.7 years. The USGS climate viewer does not predict any significant annual mean changes to runoff so there would be negligible impacts from climate change on soils.

<u>Greater Sage-grouse</u>

The Proposed Action is consistent with Executive Order 2015-4 guidance (Office of the Governor 2015) and BLM's Approved Resource Management Plan (BLM 2015), which take into account potential climate change. Impacts from climate change on the Greater sage-grouse during the life of the project are anticipated to be negligible.

<u>Reclamation</u>

The post-reclamation land use would consist of vegetation cover of grasses and shrubs, which would be suitable as wildlife habitat and grazing. Potential changes to the natural environment, as listed above, could result in the need to consider different plant species during reclamation to

account for the higher temperatures and increased precipitation levels. WDEQ-LQD regulates surface coal mining operations and the surface effects of underground coal mining on federal lands within the State of Wyoming. Federal coal leaseholders in Wyoming must submit a permit application package to OSMRE and WDEQ-LQD for any proposed revisions to reclamation operations on federal lands in the state. Therefore, any change to reclamation practices (e.g., seed mix) at the DFM would require the approval of WDEQ. Climate change impacts on reclamation during the life of the project would be negligible. Reestablishment of wildlife and vegetation in areas that have been disturbed is reliant on the reclamation process, which would be negligibly impacted by climate change; therefore, climate change impacts to wildlife and vegetation in reclaimed areas would be negligible and long term.

4.4.7.3 Mitigation Measures

A majority (approximately 99.6 percent) of the GHG identified in this EA are from non-mining activities, not controlled by WFW (e.g., rail transportation to and combustion at power plants). The DOI generally has no regulatory authority over GHG emissions from rail transportation and coal combustion. Air emissions, both direct and indirect, are regulated by other regulatory entities, including WDEQ-AQD (for emissions at the DFM and Wyoming power plants) and other states' regulatory agencies (for emissions from out-of-state power plants), through permit limits. Given these facts, OSMRE has determined that no additional mitigation is required.

4.5 Water Resources

4.5.1 Surface Water

4.5.1.1 Direct and Indirect Effects

4.5.1.1.1 Proposed Action

Changes in surface runoff characteristics and sediment discharges would occur during mining on the A3 tract because of disturbance to and reconstruction of drainage channels as mining progresses and because of the use of sediment control structures to manage discharges of surface water from the mine permit areas. Because the A3 tract would be mined as extension of the existing DFM, there would not be a significant increase in the size of the area that is disturbed at any given time. According to WDEQ LQD Rules and Regulations (WDEQ-LQD 2012), reclamation would be ongoing and concurrent with mining.

As stated in Addendum MP-T (Permit Application for Industrial Solid Waste Landfill) of Permit No. PT0599, the coal combustion byproduct (CCB) facility (discussed in section 3.15 of the A2TR1 EA) is not expected to have a detrimental effect on surface water quality (WFW 2011). There are no surface water intake structures located within 1,000 feet of the facility. The potential impacts to local surface water systems will be minimized through proper engineering design of the landfill and associated storm water controls, as discussed in Addendum MP-T of the Amendment 3 PAP (WFW 2018).

The overall results of the 2019 CHIA stated that material damage has not occurred to surface water quality outside the mine permit areas (WDEQ-LQD/Lidstone 2019). The additional mining proposed for the A3 tract is not expected to change the potential for material damage to surface water quality. Therefore, the direct and indirect effects to surface water would not be significantly different from those described in the existing DFM federal mining plan and are expected to be moderate but would be extended by approximately 640.3 acres. The increased timeframe of

mining does not serve as reasonable timeframe for recovery of hydrologic resources as the hydrologic system takes time to recover post-reclamation.

4.5.1.1.2 No Action Alternative

The impacts to surface water (disturbance to and reconstruction of drainage channels) under the No Action Alternative would be similar to those under the Proposed Action but the extent of surface water feature removal would be reduced by approximately 640.3 acres. Since there are no stream channels, jurisdictional wetlands, or other aquatic features in the A3 tract, the implementation of the No Action Alternative would have negligible effect on reducing the magnitude of impacts to surface water features.

4.5.1.2 Cumulative Effects

The cumulative impact area for potential surface water impacts includes proposed LOM disturbance areas within local drainage basins associated with the northern group of mines (**map 4-1**). Cumulative mining-related impacts to surface water resources within the Little Powder River cumulative impacts area (CIA) were analyzed in the 2019 CHIA (WDEQ-LQD/Lidstone 2019). According to the 2019 CHIA, the postminning water quality in the CIA should be similar to premine water quality and the potential for material damage to water rights downstream of the mines is therefore minimal (WDEQ-LQD/Lidstone 2019).

Mining-related cumulative impacts to surface water are expected to be measurable in the short term within and below mined area drainages but would be moderate and would diminish with reclamation and distance downstream.

4.5.1.3 Mitigation Measures

The WDEQ-LQD Environmental Protection Performance Standards require surface coal mine permittees to enhance or restore the hydrologic conditions of disturbed land surfaces and minimize adverse impacts to the hydrologic balance (WDEQ-LQD 2012). And, as stated above, proposed mining operations must be designed and conducted in a way to prevent material damage to the hydrologic balance outside the permit boundary. WFW is required to be in compliance with Wyoming Pollutant Discharge Elimination System (WYPDES) Permit WY-0032964 issued by the WDEQ-WQD.

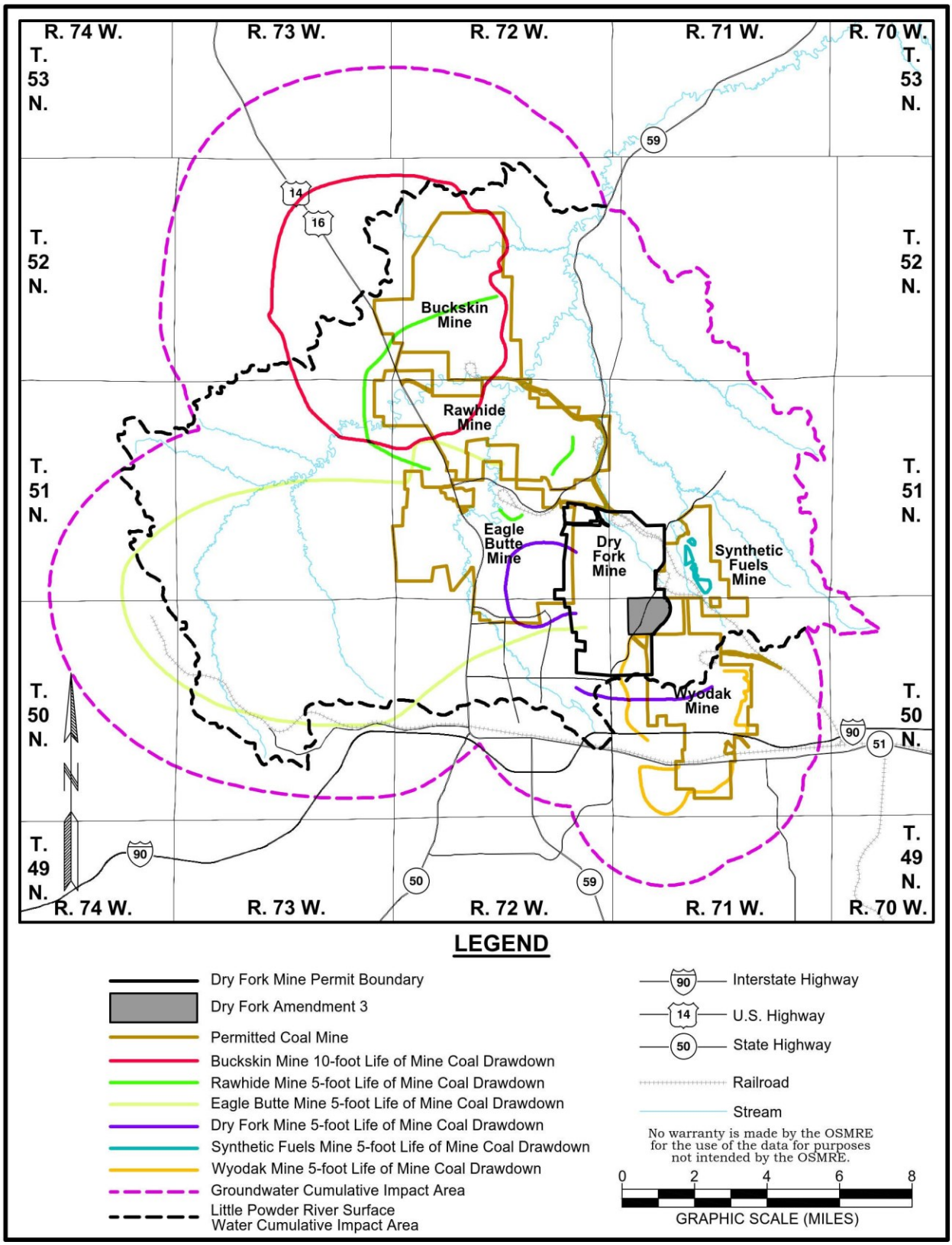
4.5.2 Groundwater

4.5.2.1 Direct and Indirect Effects

4.5.2.1.1 Proposed Action

The general impacts to groundwater as a result of surface coal mining include the following:

1. The removal of the alluvial, clinker, overburden, and coal aquifer would continue, as would the replacement of these aquifers with backfilled overburden material.
2. A lowering of static water levels in the coal and overburden aquifers around the mine would continue due to dewatering associated with removal of these aquifers within the mine boundary. This reduction in static water levels would not be permanent, and recharge to the backfill and adjacent undisturbed aquifers would occur as mined areas are reclaimed.



Map 4-1. Cumulative Impact Area for Potential Surface and Groundwater Impacts and Predicted Drawdowns for the Wyodak-Anderson Coal Seam

3. Other groundwater impacts that may or may not occur, or may occur only at specific locations, include changes in water quality (usually deterioration) outside the area that is mined and reclaimed. This would result from communication between the reclaimed aquifer and the unmined aquifer, and changes in recharge-discharge conditions and/or groundwater flow patterns.

Alluvial, clinker, overburden, and Wyodak-Anderson coal aquifers would be removed during coal recovery associated with the A3 tract during the mining process. These aquifers would be replaced with backfilled overburden and interburden materials. The physical characteristics of the reclaimed backfill material are dependent upon mining methods and premining overburden lithology. Overall, the permeability and porosity of the spoils within the tract are expected to be greater than the original material. The reclaimed spoil aquifer could provide adequate water quantity for stock wells. Predicted drawdowns for the Wyodak-Anderson coal seam resulting from mining the A3 tract are presented on **map 4-1**.

According to the 2019 CHIA, when the backfill aquifer is saturated to the premining groundwater levels, the groundwater gradients should return to the premining condition. Until that time, the pit and the backfill aquifer act as groundwater sinks that will have an impact on the hydrologic balance of the aquifer system. The ability of the backfill aquifer within the permit boundary to store and transmit water will determine how productive the backfill aquifer will be to support the postminning land use (WDEQ-LQD/Lidstone 2019).

As stated in the Addendum MP-T of Permit No. PT0599 (WFW 2011), the CCB from the facility is not expected to have a detrimental effect on groundwater quality. The single stock watering well within the A3 tract is permitted by WFW. The potential impacts to local groundwater systems will be minimized through proper engineering design of the landfill and associated storm water controls, as discussed in Addendum MP-T of Permit No. PT0599.

Overall, evaluation of the three material damage indicators (physical characteristics, water level recovery, and water quality of the backfill aquifer) suggests that there is limited potential for the A3 tract development to cause material damage to the native aquifers outside the coal mine permit boundaries (WDEQ-LQD/Lidstone 2019). Therefore, the direct and indirect effects to groundwater resources resulting from the Proposed Action are expected to be moderate but would be extended by approximately 640.3 acres. The increased timeframe of mining does not serve as a reasonable timeframe for recovery of hydrologic resources as the hydrologic system takes time to recover post-reclamation.

4.5.2.1.2 No Action Alternative

The impacts to groundwater under the No Action Alternative would be similar to those under the Proposed Action but the extent of groundwater aquifers removal would be reduced by approximately 640.3 acres. Impacts to groundwater aquifers have already occurred within the tract related to coal recovery on adjacent federal coal leases, as approved by Permit No. PT0599, as well as impacts from mining the adjoining mines. Therefore, implementation of the No Action Alternative would slightly reduce the magnitude of impacts to groundwater features.

4.5.2.2 Cumulative Effects

The effects of removal of the alluvial, clinker, overburden, and coal aquifers and replacing them with backfilled overburden are the primary groundwater concerns regarding cumulative effects. Mining of the A3 tract would increase the cumulative size of the backfill area in the northern

group of mines. The extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines is expected to increase slightly from the predicted impacts without mining the tract. Impacts will increase slightly due to changes related to the recovery of additional coal resulting from the previously planned relocation of Garner Lake Road. Impacts are also considered from pumping from the adjacent Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mines, causing additional water level declines due to concurrent operations.

As described in the 2019 CHIA, CBNG dewatering in the CIA has caused drawdown of water levels in the Wyodak-Anderson coal aquifer within the CIA (WDEQ-LQD/Lidstone 2019). This has made it difficult to accurately distinguish the impacts caused by mining and to estimate groundwater recovery rates. However, the saturated thickness of the coal seams increases to the west as the coal seams dip below the water table. Therefore, the effect of this predicted mining induced drawdown on the Wyodak-Anderson coal seam is likely negligible.

The cumulative effects to groundwater resources resulting from the Proposed Action are expected to be moderate and would be extended by approximately 640.3 acres. The increased timeframe of mining does not serve a as reasonable timeframe for recovery of hydrologic resources as the hydrologic system takes time to recover post-reclamation.

4.5.2.3 Mitigation Measures

WDEQ-LQD Environmental Protection Performance Standards require surface coal mine permittees to replace any domestic, agricultural, industrial, or any other legitimate use groundwater supplies if, as a result of mining, a supply is diminished, interrupted, or contaminated to the extent of precluding use of the water. The WDEQ-LQD Environmental Protection Performance Standards also require surface coal mine permittees to enhance or restore the hydrologic conditions of disturbed land surfaces and minimize adverse impacts to the hydrologic balance. The mine and reclamation plan is designed to enhance or restore the premine hydrologic conditions and minimize adverse impacts to the hydrologic balance in the permit boundary and in adjacent areas (WDEQ-LQD 2012).

Surface water control structures associated with the CCB facility will be used to divert surface water flows around active landfill areas (run-on control), and to collect and contain surface water run-off from active landfill areas (run-off control).

Materials from overburden or alluvial aquifer that are critical to the area's hydrologic balance (restoration of the essential hydrologic functions can only be achieved by reestablishment of the aquifer) may be selectively salvaged and replaced.

4.5.3 Water Rights

4.5.3.1 Direct and Indirect Effects

4.5.3.1.1 Proposed Action

Impacts to water rights would be similar to those described in Section 4.5.3 of the A2TR1 EA. Prior to energy development in the area, water appropriations (both groundwater and surface water) were typically for livestock use. However, mining companies hold the majority of the water rights. According to Wyoming Statue (W.S.) 35-11-415(b) (xii), WFW must replace the water supply of an owner of interest in real property, who obtains all or part of his supply of water for domestic, agricultural, industrial or any other legitimate use from an underground or

surface source where the supply has been affected by contamination, diminution or interruption resulting from the surface coal mine operation.

Numerous livestock water wells have been removed in the general area over the years to facilitate mining operations, but no effects to domestic supplies have been reported. No material damage has been identified outside the DFM permit boundary and, based on hydrologic analyses, no material damage to water rights is anticipated (WDEQ-LQD/Lidstone 2019).

In general, the Proposed Action would contribute to additional, more extensive mining disturbance that may impact surface-water and groundwater rights in the DFM area. As stated in **section 3.5.2**, current groundwater conditions have already changed in the DFM area as a result of CBNG development and ongoing mining operations at the northern group of mines. Therefore, the Proposed Action would not result in substantial declines in the groundwater availability due to reduced groundwater quantity and quality over what is currently being experienced. In addition, only a slight reduction in streamflow downstream of the DFM during mining is expected because runoff is currently being controlled within the DFM as a result of mining unrelated to the Proposed Action. Since, impacts to groundwater and surface-water rights have already occurred from mining within the DFM and from CBNG development, implementation of the Proposed Action would have negligible additional impacts on water rights.

4.5.3.1.2 No Action Alternative

The impacts to surface and groundwater rights under the No Action Alternative would be similar to those under the Proposed Action but the extent of surface water feature and groundwater aquifers removal would be reduced by approximately 640.3 acres. Impacts to water rights have already occurred within the tract related to coal recovery on adjacent federal coal leases, as approved by Permit No. PT0599 and OSMRE's prior federal MPDDs. In addition, currently approved state and federal mining plans include disturbance of lands adjacent to the A3 tract for recovery of Wyodak Mine coal. Therefore, implementation of the No Action Alternative would have negligible effect on reducing the magnitude of impacts on water rights.

4.5.3.2 Cumulative Effects

The approval of the Proposed Action would contribute to additional surface feature and groundwater aquifer disturbance in the Dry Fork, Rawhide, Buckskin, Eagle Butte, Synthetic Fuels, and Wyodak mine areas. However, only minor additional cumulative water rights impacts would occur because groundwater systems have already been affected by CBNG removal and ongoing mining and because runoff is currently being controlled within the northern group of mines.

4.5.3.3 Mitigation Measures

WDEQ-LQD Environmental Protection Performance Standards require surface coal mine permittees to replace any domestic, agricultural, industrial, or any other legitimate use groundwater supplies if such supplies are diminished, interrupted, or contaminated, to the extent of precluding use of the water as a result of mining. The regulations also require restoration of the essential hydrologic function of disturbed land surfaces. Therefore, no additional mitigation measures are required to protect water rights.

4.6 Alluvial Valley Floors

4.6.1 Direct and Indirect Effects

4.6.1.1 Proposed Action

The direct and indirect effects to AVFs would not be significantly different from those described in Section 4.6.1 of the A2TR1 EA. According to Appendix D11 (Alluvial Valley Floor Assessment of the Amendment 3 PAP), there are no unconsolidated stream-laid deposits and no AVFs have been delineated within the A3 tract (WFW 2018). The ephemeral drainages within the A3 tract contribute an insignificant amount of runoff to the Dry Fork LPR, so there would be no direct or indirect effects to AVFs from the Proposed Action.

4.6.1.2 No Action Alternative

The impacts to AVFs under the No Action Alternative would be similar to those under the Proposed Action because no AVFs have been delineated within the tract.

4.6.2 Cumulative Effects

The identified AVFs for all coal mines in the PRB Coal Review study area are described in the updated 2012 Task 1D Report and are based on individual mine state decision documents (BLM 2012). The formal AVF designation and related regulatory programs described above are specific to coal mining operations; however, other development-related activities in the study area would potentially impact AVF resources. The portions of the PRB Coal Review study area that lie outside of the mine permit areas have generally not been surveyed for the presence of AVFs; therefore, the locations and extent of the AVFs outside of the mine permit areas have not been determined. Since no AVFs are present in the A3 tract, the Proposed Action would not contribute to the cumulative effects to area AVFs.

4.6.3 Mitigation Measures

No mitigation measures would be necessary for AVFs.

4.7 Wetlands/Aquatic Features

4.7.1 Direct and Indirect Effects

4.7.1.1 Proposed Action

No jurisdictional wetlands features are present within the A3 tract so there would be no direct or indirect effects to jurisdictional wetlands from the Proposed Action. The Proposed Action would result in the loss of approximately 0.3 acre of aquatic features. Disturbed non-jurisdictional aquatic features would be replaced during the reclamation phase of mining. The direct and indirect effects to aquatic features are expected to be minor and short term. WDEQ-LQD Environmental Protection Performance Standards require postmine reclamation plans that restore wetlands (WDEQ-LQD 2012). There would be no impacts to jurisdictional wetlands resulting from the Proposed Action and impacts to non-jurisdictional wetlands/aquatic resources would be minor.

4.7.1.2 No Action Alternative

The impacts to wetlands and aquatic features under the No Action Alternative would be similar to those under the Proposed Action, although 0.3 acre of non-jurisdictional wetlands or aquatic features would not be disturbed to recover federal coal within the tract.

4.7.2 Cumulative Effects

No jurisdictional wetlands have been delineated within the A3 tract and the Proposed Action would not contribute to the cumulative effects to area jurisdictional wetlands. In addition, disturbed jurisdictional and non-jurisdictional features would be restored as required by the authorized federal, state, or private surface landowner, as specified in the mining permits, which are approved by WDEQ-LQD before mining operations would be conducted. Therefore, there would be no net loss of jurisdictional or non-jurisdictional features, and cumulative impacts would be negligible.

4.7.3 Mitigation Measures

No mitigation measures would be necessary for wetlands or aquatic resources beyond the WDEQ-LQD requirement to replace non-jurisdictional aquatic features during reclamation.

4.8 Soil

4.8.1 Direct and Indirect Effects

4.8.1.1 Proposed Action

Approximately 640.3 acres of soil resources within the tract would be altered under the Proposed Action. The direct and indirect effects to soils would similar to those described in Section 4.8.1 of the A2TR1 EA. Following reclamation, the replaced topsoil should support a stable and productive native vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., rangeland, cropland, and wildlife habitat). Currently approved and proposed disturbance would be progressively reclaimed according to contemporaneous reclamation requirements by planting appropriate vegetation species to restore soil productivity and prevent soil erosion. As discussed in **section 3.8**, approximately 362 acres of soil types within the tract have a rating of "prime farmland if irrigated." Vegetation mapping shows that approximately 186 acres of hayland/cultivated land are within the A3 tract but none of the areas are irrigated and no surface-water or groundwater irrigation rights within the A3 tract are designated with an irrigation use. An indirect effect of the Proposed Action on soils would be impacts from acid deposition resulting from coal combustion, but these impacts would be negligible (see **section 4.4.4.1.1**). The direct and indirect effects related to the Proposed Action on soils would be moderate and short term.

4.8.1.2 No Action Alternative

The impacts to soils resources under the No Action Alternative would be similar to those under the Proposed Action, but 640.3 acres of soil resources would not be disturbed to recover federal coal within the tract.

4.8.2 Cumulative Effects

Cumulative effects would be related to disturbance at the northern group of mines. According to the 2019 CHIA, approximately 20,247 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2019). Following reclamation, the replaced topsoil should support a stable and productive native vegetation community adequate in quantity and quality to support planned postminning land uses (i.e., rangeland, cropland, and wildlife habitat). Areas within active mines are progressively disturbed and are progressively reclaimed. This sequence of disturbance/reclamation would maintain a relatively constant amount of

disturbance over time. The cumulative effects related to soils would be moderate and would be extended by approximately 9.7 years.

4.8.3 Mitigation Measures

Prompt seeding as well as the building of sediment control structures to trap eroded soil would reduce wind erosion. Topsoil would also be protected from acid or toxic materials and would be preserved in a usable condition for sustaining vegetation when placed over affected land (WDEQ-LQD 2012). These measures are required by state regulations and are therefore considered part of the Proposed Action.

4.9 Vegetation

4.9.1 Direct and Indirect Effects

4.9.1.1 Proposed Action

The direct and indirect effects to vegetation would not be significantly different from those described in Section 4.9.1 of the A2TR1 EA. Short-term impacts associated with the removal of vegetation from the A3 tract would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts on reclaimed lands include loss of habitat or loss of habitat carrying capacity for some wildlife species as a result of reduced plant species diversity or plant density, particularly big sagebrush. However, livestock and grassland-dependent wildlife species would benefit from the increased grass cover and production.

Reclamation of disturbed lands within the DFM permit boundary is performed according to WDEQ-LQD Rules and Regulations (WDEQ-LQD 2012). Reclamation would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. In an effort to approximate premining conditions, WFW would plan to reestablish vegetation types during the reclamation operation that are similar to the premine types. Reestablished vegetation would be dominated by species mandated in the reclamation seed mixtures approved by WDEQ-LQD. The reclamation plan for the DFM includes steps to control invasion by weedy (invasive nonnative) plant species. The direct and indirect effects related to the Proposed Action on vegetation would be moderate and would be extended by approximately 9.7 years.

4.9.1.2 No Action Alternative

The impacts to vegetation under the No Action Alternative would be similar to those under the Proposed Action, although approximately 640.3 acres of vegetation would not be disturbed to recover federal coal within the tract.

4.9.2 Cumulative Effects

Cumulative effects would be related to disturbance at the northern group of mines. According to the 2019 CHIA, approximately 20,247 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2019). The overall contribution to cumulative impacts to vegetation under Proposed Action would be minor due to the localized effects and the improved vegetation productivity on mined lands that have been reclaimed.

4.9.3 Mitigation Measures

No mitigation measures beyond the normal vegetation husbandry required in the DFM Permit No. PT0599 would be necessary for vegetation resources.

4.10 Wildlife

The direct and indirect effects to wildlife would not be different from those described in Section 4.10 of the A2TR1 EA. Impacts to wildlife that would result from mining the A3 tract have been addressed by the WGFD and WDEQ-LQD when Permit No. PT0599 was amended to include the tract. The environmental consequences related to mining the A3 tract for big game and other mammals; upland game birds (excluding the Greater sage-grouse); other birds; and amphibians, reptiles, and aquatic species are not significantly different from those presented in existing DFM federal mining plan and are not presented herein. Updated discussions for raptors, Greater sage-grouse, T&E species, and SOSI are included below.

4.10.1 Raptors

4.10.1.1 Direct and Indirect Effects

4.10.1.1.1 Proposed Action

Four intact raptor nests (SH-4b, SH-11c/GHO7a, SH11f, and SH11g) were located within the A3 tract in 2018 and all four nests are within the proposed disturbance boundary for the tract (**appendix E**). WFW has an approved Raptor Management Plan in place to minimize impacts to nesting raptors and ensure proper reclamation techniques are implemented to enhance habitat in the postmine landscape for raptors and their primary prey species. Based on WFW's approved plans and procedures in place to reduce impacts to raptors, the direct and indirect effects related to the Proposed Action on site-specific raptors would be moderate and would be extended by approximately 9.7 years.

4.10.1.1.2 No Action Alternative

Under this alternative, disturbance related impacts to raptors in the area would be reduced.

4.10.1.2 Cumulative Effects

The cumulative effects on regional raptor populations would be moderate and would be extended by approximately 9.7 years.

4.10.1.3 Mitigation Measures

No mitigation measures specific to raptors are necessary. The approved Raptor Management Plan and general reclamation practices for establishing or enhancing post-mine wildlife habitat at the DFM described in the Reclamation Plan of Permit No. PT0599 are in place. WFW also has developed plans and procedures to minimize impacts to nesting raptors and ensure proper reclamation techniques are implemented to enhance habitat in the postmine landscape for raptors and their primary prey species.

4.10.2 Greater Sage-grouse

4.10.2.1 Direct and Indirect Effects

4.10.2.1.1 Proposed Action

There are no occupied Greater sage-grouse leks within 2 miles of the A3 tract. Additionally, the A3 tract is located outside the Greater sage-grouse core area. One historical Greater sage-grouse lek complex (Dry Fork II/IIA) has been documented within 2 miles of the A3 tract. However, the Dry Fork II lek was destroyed by mining in 2005 and the Dry Fork IIA lek was destroyed by mining in 2017. Using mapping included in Executive Order 2015-4, it has been determined that the closest core area to the A3 tract is over 10 miles distant.

Long-term results from annual lek monitoring suggest that Greater sage-grouse populations in the DFM annual monitoring area are cyclic, with periodic peaks and declines. These data suggest that the DFM area may only support larger groups of Greater sage-grouse when regional populations are especially high (WFW 2019b).

WDEQ-LQD Permit No. PT0599 contains multiple monitoring and protection plans that include specific protection measures for Greater sage-grouse and their habitats, including those mentioned above. The WDEQ-LQD has strict bonding, reclamation, and bond-release requirements for all surface coal mines in Wyoming, including detailed reclamation plans and post-reclamation monitoring requirements that extend 10 years or more to ensure that all reclamation standards have been successfully met prior to full bond release.

Potential impacts to Greater sage-grouse would likely be limited primarily to indirect influences resulting from habitat disturbance, though loss of individual birds may occur at times. Ongoing DFM operations may adversely impact individual Greater sage-grouse but are not likely to result in a loss of population viability in the wildlife monitoring area or cause a trend toward federal listing. The use of appropriate timing and spatial buffers, timely implementation of reclamation, and application of targeted conservation measures in suitable habitats both on- and off-property throughout the region are expected to sufficiently reduce overall impacts to maintain a viable population within the area. The direct and indirect effects related to the Proposed Action on Greater sage-grouse would be moderate and long term.

Executive Order No. 2015-4 is applicable to activities inside the Greater sage-grouse core population areas. The A3 tract is outside any core population area and since there are no intact leks within 2 miles of the A3 tract, non-core area stipulations contained in Executive Order 2015-4 are also not applicable The WGFD evaluated the Proposed Action as it relates to Executive Order 2015-4 and found that it was in compliance with the executive order (WGFD 2018a).

4.10.2.1.2 No Action Alternative

The impacts to Greater sage-grouse under the No Action Alternative would be similar to those under the Proposed Action, although approximately 640.3 acres of potential habitat would not be disturbed to recover federal coal within the tract and the duration of potential impacts would be reduced by approximately 9.7 years.

4.10.2.2 Cumulative Effects

Cumulative effects would be related to disturbance at the northern group of mines. As described in the updated 2012 Task 1D Report, substantial areas of habitats have been altered from their natural conditions as a result of past and on-going human activities in the Wyoming PRB study area (BLM 2012). Human disturbances include, but are not limited to, agriculture, mining, roads, urban areas, and oil and gas development. Potential temporary impacts arise from habitat removal and disturbance associated with a project's development and operation (e.g., coal mines and CBNG wells) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of permanent loss of habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success, and habitat disturbance related to longer term projects (e.g., power plant facilities and rail lines). The severity of both temporary and long-term impacts to Greater sage-grouse would depend on factors such as seasonal use patterns, type and timing of a project's activities, and physical parameters (e.g., topography, cover, forage, and climate).

The Greater sage-grouse population in the Northeast Wyoming Sage-grouse Working Group area (including the A3 tract) appears to follow a 10-year cycle (Northeast Wyoming Sage-grouse Working Group 2014). WGFD information indicated that over 2,030 male sage grouse were recorded 2018 in Wyoming, based on counts of 383 leks. The average number of male grouse per lek was 5.3, which was down from the 7.6 males per lek observed in 2017 (WGFD 2018b).

The cumulative effects related to the Proposed Action on regional Greater sage-grouse populations would be moderate and long term.

4.10.2.3 Mitigation Measures

No mitigation measures specific to Greater sage-grouse are necessary. The general reclamation practices for establishing or enhancing postmine wildlife habitat at the DFM described in the Reclamation Plan of WDEQ-LQD Permit No. PT0599 are in place. Shrub seedlings will be planted in shrub pockets to improve the potential beneficial effects of shrub reestablishment for wildlife.

4.10.3 Threatened, Endangered, and Candidate Species and Species of Special Interest

4.10.3.1 Direct and Indirect Effects

<u>4.10.3.1.1 Proposed Action</u>

As discussed in **section 3.10.3.1**, the northern long-eared bat, which is listed as threatened, is the only vertebrate T&E wildlife species with the potential of occurring in the area. There are no critical habitats for this T&E species within the A3 tract or within Campbell County. According to the USFWS, the primary threat to the northern long-eared bat is white-nose syndrome, a disease caused by the cold-loving fungus (*Pseudogymnoascus destructans*) (USFWS 2016). The northern long-eared bat is also threatened by the loss and degradation of summer habitat, by collision with or barotrauma (injury to the lungs due to a change in air pressure) caused by wind turbines, and mine closures and vandalism of winter roosts and hibernacula. No wind turbines are within the general area and, as described in **section 3.10.3.1**, preferred roosting and reproductive habitats are limited in the DFM permit area and surrounding 1.0-mile monitoring area. However, potential foraging areas are present throughout the permit area and surrounding

monitoring area. No northern long-eared bat populations have been documented within the DFM survey area (permit area and 1.0-mile perimeter) (WFW 2019b).

The discussions included in sections 3.9.3.1 and 4.10.4.1.1 of the A2TR1 EA provide details regarding the effects of Hg deposition on long-eared bats near the DFM in 2017. A majority of these details have not changed and are incorporated here by reference. A portion of the A3 tract falls within the area of influence; therefore, OSMRE has complied with the programmatic biological opinion and fulfilled the Section 7 consultation requirements under the ESA through submission of the Northern Long-eared Bat 4(d) rule streamlined consultation form to the USFWS, Wyoming Ecological Field Services Office.

A discussion of SOSI that could potentially occur in the area is included in **section 3.10.3.2** and a list of these species is included in **appendix E**. This impacts assessment related to the Proposed Action will focus on WGFD SGCN and the WGFD tier ranking. Of the 46 SOSI that could occur in the DFM area, 42 are SGCN, of which 7 have been observed in the area. Two of the WGFD SGCN (burrowing owl and mountain plover) are classified as Tier I species and both of these species have been observed in the area. The burrowing owl has been documented as nesting in the area, while the mountain plover nesting has not been recorded.

If present, these T&E species and SOSI would be temporarily displaced but current mining and reclamation practices in place at the DFM would protect species, if present, and promote the return of these species once reclamation has been completed. Specifically, the mine typically strips topsoil each year after species breeding/nesting periods, which significantly reduces the potential for taking species protected under the MBTA, including the two Tier I species observed in the area. In an effort to approximate premining conditions, WFW would plan to reestablish vegetation types during the reclamation operation that are similar to the premine types. The direct and indirect effects related to the Proposed Action on T&E species and SOSI would be moderate and short term (extended by approximately 9.7 years).

4.10.3.1.2 No Action Alternative

Under this alternative, disturbance-related impacts to T&E species and SOSI would continue, but the duration of impacts would be reduced by approximately 9.7 years.

4.10.3.2 Cumulative Effects

The cumulative effects on regional T&E species and SOSI populations would be related to disturbance at the northern group of mines and would be moderate and short-term.

4.10.3.3 Mitigation Measures

No mitigation measures specific to T&E species and SOSI are necessary. General reclamation practices for establishing or enhancing post-mine wildlife habitat at the DFM described in the Reclamation Plan of WDEQ-LQD Permit No. PT0599 are in place. In addition, bald eagles and golden eagles are also both protected under the Bald and Golden Eagle Protection Act and the MBTA.

4.11 Ownership and Use of Land

4.11.1 Direct and Indirect Effects

4.11.1.1 Proposed Action

Surface ownership in the area includes federal, state, and private lands and the proposed coal removal area is managed by the BLM, the State of Wyoming, and WFW. The primary adverse environmental consequences of mining the A3 tract on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of other mineral development on about 640.3 additional acres during active mining. Wildlife and livestock would be displaced while the tract is being mined and reclaimed. Hunting on the tract is currently not allowed by the landowners and would continue to be disallowed during mining and reclamation. Approximately 166 acres of the project area are identified as hayland or cropland. The production from these lands would be lost during mining. Following reclamation, the land would be suitable for wildlife uses and livestock grazing, which are the historic land uses. Hayland/cropland would not be replaced according to DFM WDEQ-LQD Permit No. PT0599. The direct and indirect effects related to the ownership and use of the land would be moderate and would be extended by approximately 9.7 years.

4.11.1.2 No Action Alternative

The impacts to ownership and use of the land under the No Action Alternative would be similar to those under the Proposed Action, although approximately 640.3 acres would not be disturbed to recover federal coal within the tract and the duration of potential impacts would be reduced by approximately 9.7 years.

4.11.2 Cumulative Effects

Cumulative effects would be related to disturbance at the northern group of mines. According to the 2019 CHIA, approximately 20,247 acres of land have been approved for disturbance within the northern group of mines (WDEQ LQD/Lidstone 2019). The cumulative impacts on ownership and use of the land would be similar to the direct and indirect impacts, discussed above.

4.11.3 Mitigation Measures

No mitigation measures specific to ownership and use of the land are necessary.

4.12 Cultural Resources

4.12.1 Direct and Indirect Effects

4.12.1.1 Proposed Action

Information regarding background cultural resources within the current WDEQ-LQD Permit No. PT0599 boundary was summarized from Appendices D-2.2 (Historic Cultural Resources Inventory, Amendment 3 Area) and D-3.2 (Prehistoric and Paleontological Resources Inventory, Amendment 3 Area) of the Amendment 3 PAP. According to information provided in these documents, four cultural resources sites (48CA1298, 48CA1299, 48CA7245, and 48CA7246) were identified in the overall A3 survey area, which includes the A3 tract. All four sites are associated with historic activity (post-1920 era), are ineligible for listing on the NRHP, and do

not require further investigation (SHPO 2018). The direct and indirect effects on cultural resource from the Proposed Action would be negligible but long term.

4.12.1.2 No Action Alternative

The impacts to cultural resources under the No Action Alternative would be similar to those under the Proposed Action, although approximately 640.3 acres would not be disturbed to recover federal coal within the tract.

4.12.2 Cumulative Effects

Cumulative effects would be related to disturbance at the northern group of mines. According to the 2019 CHIA, approximately 20,247 acres of land have been approved for disturbance within the northern group of mines (WDEQ-LQD/Lidstone 2019). The overall contribution to cumulative impacts to cultural resources under Proposed Action would be negligible through avoidance of sensitive site types and through data recovery for all unavoidable disturbance to NRHP eligible sites. The cumulative impacts on cultural resource as a result of the Proposed Action would be negligible but long term.

4.12.3 Mitigation Measures

No mitigation measures specific to cultural resources are necessary other than avoidance of sensitive site types and through data recovery for all unavoidable disturbance to NRHP eligible sites.

4.13 Noise

4.13.1 Direct and Indirect Effects

4.13.1.1 Proposed Action

Existing noise sources associated with the A3 tract area include coal mining activities; rail traffic; traffic on nearby federal and state highways, county, and access roads; natural gas compressor stations; and wind. Four occupied residences are currently within the A3 tract but, as discussed in **section 3.11**, these residences will be vacated prior to 2022. The Garner Lake Road, which currently bisects the tract, will be relocated immediately adjacent to the tract prior to disturbance. Noise levels in wildlife habitat adjacent to the A3 tract might increase, but anecdotal observations indicate wildlife can adapt to mine noise, especially since similar mining operations have been conducted in the area for many years. No increase in average daily railroad traffic or railroad noise would occur under the Proposed Action.

Given the distance from active mining, direct and indirect noise effects to residences from the Proposed Action would be moderate and short term. Impacts to people using the Garner Lake Road would increase over current conditions but would be minor considering the short duration of noise exposure.

4.13.1.2 No Action Alternative

The impacts from noise under the No Action Alternative would be similar to those under the Proposed Action, although the duration of potential impacts would be reduced by approximately 9.7 years.

4.13.2 Cumulative Effects

Cumulative effects would be related to disturbance at the northern group of mines. Potential sources of noise disturbances include, but are not limited to, agriculture, mining, roads, urban areas, and oil and gas development. Potential impacts would cease upon project completion and successful reclamation in a given area. Recreational users, local residents, and grazing lessees using lands surrounding active mining areas hear mining-related noise, but this has not been reported to cause a substantial impact. The cumulative impacts related to noise as discerned by the public would be moderate but short term.

4.13.3 Mitigation Measures

No mitigation measures specific to noise impacts are necessary.

4.14 Visual Resources

4.14.1 Direct and Indirect Effects

4.14.1.1 Proposed Action

Mining would affect landscapes classified by the BLM as visual resource management Class IV, where the overall natural scenic quality of that class rating is considered relatively low. Impacts of coal mining on visual resources in the general analysis area would be minor and short term. Mining activities would be visible from Garner Lake Road, though the extent and duration of visibility would vary under the Proposed Action. The Garner Lake Road, which currently bisects the tract, will be relocated immediately adjacent to the tract prior to disturbance. No unique visual resources have been identified in or near the A3 tract and the landscape character would not be significantly changed following reclamation. Current mining activities (blasting procedures and sizes, coal haul rates and distances, dust suppression, etc.) at the DFM would not change if the federal mining plan modification is approved. Current BACT measures for particulates that could contribute to impaired visibility would continue to be employed. While the direct and indirect effects related to the visual resources on the general area would be minor due to the ongoing mining activities in the area, the direct and indirect effect specific to the project area would be moderate but long term.

4.14.1.2 No Action Alternative

The impacts to visual resources under the No Action Alternative would be similar to those under the Proposed Action, although approximately 640.3 acres would not be disturbed to recover federal coal within the tract.

4.14.2 Cumulative Effects

Cumulative visual resources effects would be related to disturbance at the northern group of mines. Human disturbances include, but are not limited to, agriculture, mining, roads, urban areas, and oil and gas development. Potential temporary impacts arise from disturbance associated with a project's development and operation (e.g., coal mines and CBNG wells) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of permanent changes to existing topography and the vegetative component of the area, irrespective of reclamation success. The cumulative effects related to the visual resources would be moderate but long term.

4.14.3 Mitigation Measures

No mitigation measures specific to visual resources are necessary.

4.15 Transportation Facilities

4.15.1 Direct and Indirect Effects

4.15.1.1 Proposed Action

Major roads and railroads in the general area of the A3 tract are presented on **maps 1-1** and **1-2**. Existing transportation facilities, including roads, railroads, coal conveyors, and overhead electrical transmission lines associated with the A3 tract would continue to be used under the Proposed Action. Those existing facilities on the tract will be abandoned prior to mining. The Garner Lake Road, which currently bisects the tract, will be relocated immediately adjacent to the tract prior to disturbance. The power line serving northern industrial and residential facilities will be relocated as the mine encroaches upon it. Several abandoned pipelines and one active pipeline run through the A3 tract. If still in use at the time of disturbance, the active pipeline will also be relocated.

Based on an estimated annual rate of 4 Mt of coal shipped by rail and an estimated 15,470 tons of coal per train, the Proposed Action would result in approximately 260 one-way train trips per year. The variation in coal destinations and multiple rail transportation routes make it speculative to analyze the potential impacts to the entire rail corridor in detail. Under the Proposed Action, the number of trains shipping coal from DFM would not change, but the duration would be extended by 9.7 years.

Employees and vendors travel the Garner Lake Road to access the mine. No traffic count data are available for the road but the Proposed Action would not result in increased mine-related traffic. Therefore, mining the A3 tract would not increase the current level of traffic on the Garner Lake Road or the BNSF railroad.

The potential for emissions of coal dust from the large volumes of coal transported to large generating stations can be an environmental concern (Ramboll Environ 2016). The discussions included in section 4.15.1.1 of the A2TR1 EA provides details regarding the potential for emissions of coal dust during coal transportation. These details have not changed and are incorporated here by reference. WFW has cooperated with BNSF in implementing dust controlling modifications at its load out system. The mine also operates a coal topper facility that sprays a BNSF-approved dust control agent on each car as specified in the individual coal contracts.

The addition of mining coal within the A3 tract would extend the time period over which WFW would produce coal, which would extend the period of time coal would be transported from the mine. The added direct and indirect effects of the Proposed Action on transportation would be minor but would be extended by approximately 9.7 years.

4.15.1.2 No Action Alternative

The impacts to transportation under the No Action Alternative would be similar to those under the Proposed Action, although the impacts would be reduced by approximately 9.7 years.

4.15.2 Cumulative Effects

Cumulative impacts to transportation are related to coal production levels. If coal production levels increase, cumulative impacts to transportation would increase. Highway traffic accidents and delays at grade crossings could result from train traffic. The transportation facilities for the northern group of mines are already in place and coal production and employment levels would not change with the Proposed Action.

Coal extracted from the existing surface coal mines in the Wyoming PRB is transported in rail cars along the BNSF and UP rail lines. The coal mines north of Gillette, including the DFM, ship most of their coal via the east-west BNSF rail line that runs through Gillette for destinations in the Midwest. The coal mines south of Gillette ship most of their coal via the Gillette to Douglas BNSF and UP joint trackage that runs south through Campbell and Converse counties and then east over separate BNSF and Union Pacific (UP) mainlines for destinations in the Midwest. The Proposed Action would extend the duration of mining by approximately 9.7 years at the DFM and the duration of utilization of the BNSF rail line would be extended by that amount. The added cumulative impacts related to transportation would be minor but would be extended by approximately 9.7 years.

4.15.3 Mitigation Measures

No mitigation measures specific to transportation are necessary.

4.16 Hazardous and Solid Waste

4.16.1 Direct and Indirect Effects

4.16.1.1 Proposed Action

The direct and indirect effects to hazardous and solid waste would not be different from those described in Section 4.17.1 of the A2TR1 EA. Non-hazardous, hazardous, and universal wastes are generated during mining operations at the DFM. Under the Proposed Action hazardous and solid waste would not increase but generation would be extended by 9.7 years. Direct and indirect effects on hazardous and solid wastes would be minor and short term. No hazardous wastes are transported to the municipal landfill or any onsite solid waste pits. The DFM operates an onsite landfarm for treatment of oil- or glycol-contaminated soils at the DFM. While coal mining and associated coal processing under with the Proposed Action would yield additional coal waste, mining wastes are currently being generated on site and are handled according to WDEQ-LQD rules and regulations. No increase in direct or indirect effects from hazardous and solid waste are anticipated as a result of the Proposed Action. The direct and indirect effects of the Proposed Action from hazardous wastes would be minor but would be extended by approximately 9.7 years.

4.16.1.2 No Action Alternative

Under the No Action Alternative, hazardous and solid wastes would continue to be generated at the DFM, but the duration of the impacts would be reduced by approximately 9.7 years.

4.16.2 Cumulative Effects

Cumulative hazardous and solid wastes effects would be related to mining at the northern group of mines. The Proposed Action would extend the duration of mining by approximately 9.7 years at the DFM and, thus, the duration of effects from hazardous and solid wastes would be extended.

4.16.3 Mitigation Measures

No mitigation measures specific to hazardous and solid wastes are necessary.

4.17 Socioeconomics

4.17.1 Direct and Indirect Effects

4.17.1.1 Proposed Action

The State of Wyoming, Campbell County, Campbell County School District 1, the City of Gillette, and many other governmental entities across the state receive revenues derived directly and indirectly from taxes and royalties related to the production of federal coal, including coal mined at the DFM. Such revenues include ad valorem taxes, severance taxes, royalty payments, sales and use taxes on equipment and other taxable purchases, portions of required contributions to the Abandoned Mine Lands (AML) program, and the Black Lung Disability Trust Fund. A summary of federal and state revenues generated from recovery of federal coal within the DFM, including federal coal within the A3 tract, is provided in **table 4-10**. T**able 4-11** provides an estimate of the revenues derived from recovering the federal coal specific to the A3 tract.

Table 4-10. Estimated LOM Federal and State Revenues from Federal Coal Recovery at the DFM

Revenue Source	Total $ Collected (Million $)	Federal Revenue (Million $)	State Revenue (Million $)
Federal Mineral Royalties	454.7	227.3	227.3
Abandoned Mine Lands Fund	81.5	40.7	40.7
Severance Tax	188.2	--[1]	188.2
Bonus Bid Annual Revenues[2]	--[1]	--[1]	--[1]
Ad Valorem Tax	153.5	--[1]	153.5
Black Lung	12.3	12.3	--[1]
Sales and Use Tax	23.2	--[1]	23.2
Totals	**913.4**	**280.3**	**632.9**

[1] No revenues disbursed
[2] No bonus bid revenues collected after 2016
Source: WWC 2019, calculations provided in **appendix F**.

Table 4-11. Estimated LOM Federal and State Revenues from Federal Coal Recovery from the A3 Tract

Revenue Source	Total Revenue Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	90.8	45.4	45.4
Abandoned Mine Lands Fund	16.3	8.1	8.1
Severance Tax	36.0	--[1]	36.0
Bonus Bid Annual Revenues[2]	--[1]	--[1]	--[1]
Ad Valorem Tax	30.7	--[1]	30.6
Black Lung	2.4	2.4	--[1]
Sales and Use Tax	4.6	--[1]	4.7
Totals	**180.8**	**55.9**	**124.8**

[1] No revenues disbursed
[2] No bonus bid revenues collected after 2016
Source: WWC 2019, calculations provided in **appendix F**

Under the Proposed Action, LOM Wyoming revenues could be increased by approximately $124.8 million and federal revenues could be increased by $55.9 million. The primary difference

between state and federal revenues is related to the fact that severance taxes are only paid to the State of Wyoming. The Proposed Action would extend the duration of the economic impacts related to mining the federal coal.

Mining the federal coal associated with the A3 tract would not directly create new jobs; therefore, the availability of housing units would not be impacted. No additional employees are anticipated as a result of the tract being mined, although the Proposed Action would extend the duration of employment for current employees and extend the economic impacts related to mining the federal coal.

No additional changes in the current socioeconomic situation are anticipated. Direct and indirect effects on socioeconomics under the Proposed Action would be moderate and would be extended by approximately 9.7 years.

4.17.1.2 No Action Alternative

In terms of coal conservation, the No Action Alternative would mean that approximately 58.1 Mt of federal coal within the A3 tract would not be recovered. Wyoming revenues of approximately $124.8 million and federal revenues of approximately $55.9 million related to this coal would not be realized over the LOM. The selection of the No Action Alternative would likely not result in direct job losses, but any revenue, state program funding, AML fees, and black lung fees that might otherwise be generated by extending the LOM by 9.7 years would not be collected. In addition, the duration of employment for current employees would be reduced by 9.7 years. The No Action Alternative would result in moderate direct and indirect socioeconomic effects.

4.17.2 Cumulative Effects

Cumulative effects would be related to socioeconomic conditions in Campbell County. Cumulative impacts related to the Proposed Action are not significantly different from those described in **section 4.17.1.1** because Wyoming, Campbell County, Campbell County School District 1, the City of Gillette, and many other governmental entities across the state receive revenues derived directly and indirectly from taxes and royalties on the production of federal coal from Campbell County. The cumulative effects on socioeconomics are expected to be moderate and long term.

4.17.3 Mitigation Measures

No mitigation measures specific to socioeconomic impacts are needed.

4.18 Short-Term Uses and Long-Term Productivity

This section relates to the balance or trade-off between short-term uses and long-term productivity for each resource in relation to the Proposed Action. The discussions contained throughout this environmental consequences chapter, in the existing DFM federal mining plan, and in the A2TR1 EA provide adequate analyses and relationships of short-term uses (such as mining coal) and long-term productivity (such as generating electricity for homes, schools, and industry).

4.19 Unavoidable Adverse Effects

Unavoidable adverse impacts are the effects on natural and human resources that would remain after mitigation measures have been applied. Details regarding these impacts for the Proposed Action have been presented in the preceding resource sections and in the existing DFM federal mining plan.

5.0 Consultation and Coordination

5.1 Public Comment Process

OSMRE developed a project-specific website that provided legal notices, outreach notice letters, mailing address, and an email address for comments to be sent. The website was activated on July 10, 2019 and was available at: https://www.wrcc.osmre.gov/initiatives/dryForkMine/dryForkMineA3EA.shtm.

OSMRE published the legal NOI in the Gillette News Record on March 22, 2019. Public outreach letters describing the EA and soliciting scoping comments were mailed on March 22, 2019 to city governments, adjacent landowners, and other interested parties. The legal notices and letters invited the public to comment on issues of concern related to the EA. OSMRE also sent letters of notification to tribes/tribal representatives. These tribal notification letters were mailed on March 22, 2019.

A total of five comment letters were received during the public scoping period. Comment letters received during the public review period for this EA will be considered during the ASLM approval process.

5.2 Preparers and Contributors

OSMRE personnel that contributed to the development of this EA are listed in **table 5-1**.

Table 5-1. OSMRE Personnel

Name	Organization	Project Responsibility
Logan Sholar/Gretchen Pinkham	OSMRE	Project Lead/Project Coordination
Gretchen Pinkham	OSMRE	Air Quality
Roberta Martinez Hernandez	OSMRE	Hydrology
Ed Vasquez	OSMRE	Ecology
Stephanie Hamlett	OSMRE	Environmental Protection Specialist
Jeremy Iliff	OSMRE	Cultural/Historical/Paleontological

Third party contractors who contributed to the development of this EA are identified in **table 5-2**.

Table 5-2. Third Party Contractor Personnel

Name	Organization	Project Responsibility	Education/Experience
John Berry	WWC Engineering	Project Manager, Primary Author	B.S. Wildlife Management
Jack Fritz	WWC Engineering	Quality Assurance/Quality Control	B.S. Chemical Engineering

5.3 Distribution of the EA

This EA will be distributed to individuals who specifically request a copy of the document. It will also be made available electronically on the OSMRE website at: https://www.wrcc.osmre.gov/initiatives/dryForkMine/dryForkMineA3EA.shtm.

6.0 References and Abbreviations/Acronyms

6.1 References

AirNow, 2016, Outdoor Air Quality Data. Air Quality Index Report. Available on the Internet on the Internet as of April 2019: https://www.epa.gov/outdoor-air-quality-data/air-quality-index-report.

BNSF 2016, BNSF Railway Statement on STB Coal Dust Decision. Available on the Internet as of April 2017: http://www.bnsf.com/customers/what-can-i-ship/coal/coal-dust.html.

Bureau of Land Management (BLM), 1992, Final West Rocky Butte Coal Lease Application Environmental Impact Statement, FES 92-1. Electronic Copy Only. Available on request from OSMRE.

Bureau of Land Management (BLM), 2008, BLM Manual 6840 – Special Status Species Management. Available on the Internet as of December 2018: https://www.blm.gov/sites/blm.gov/files/uploads/mediacenter_blmpolicymanual6840.pdf.

Bureau of Land Management (BLM), 2009. Environmental Impact Statement for the South Gillette Area Coal Lease Applications WYW172585, WYW173360, WYW172657, WYW161248. Available on the Internet as of April 2019: https://eplanning.blm.gov/epl-front-office/eplanning/legacyProjectSite.do?methodName=renderLegacyProjectSite&projectId=67025.

Bureau of Land Management (BLM), 2012, Powder River Basin Coal Review, Task 1D, Prepared for the BLM State Office and BLM Wyoming Casper Field Office. Available on the Internet as of April 2019: https://eplanning.blm.gov/epl-front-office/projects/nepa/64842/78267/88468/06Task1D-EnvConditions.pdf.

Bureau of Land Management (BLM), 2015, Record of Decision and Approved Resource Management Plan Amendments for the Rocky Mountain Region, Including the Greater Sage-Grouse Sub-Regions. Available on the Internet as of April 2019: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=48300.

Campbell County, 2013, Campbell County, Wyoming 2013 Comprehensive Plan. Available on the Internet as of April 2019: https://www.ccgov.net/DocumentCenter/View/227/2013-Comprehensive-Plan.

Commission for Environmental Cooperation (CEC), 2011, North American Power Plant Air Emissions. Available on the Internet as of April 2017: http://www3.cec.org/islandora/en/item/10236-north-american-power-plant-air-emissions-en.pdf.

Fenneman, Nevin M., 1931, *Physiography of Western United States,* McGraw-Hill, pages 54-60.

Interagency Monitoring of Protected Environments (IMPROVE), 2018, Data Acquired from Interagency Monitoring of Protected Visual Environments. Available on the Internet as of January 2019: http://vista.cira.colostate.edu/improve/.

Luppens, J.A., Scott, D.C., Haacke, J.E, Osmonson, L.M., and Pierce, P.E., 2015, Coal geology and assessment of coal resources and reserves in the Powder River Basin, Wyoming and Montana: U.S. Geological Survey Professional Paper 1809, 218 p. Available on the Internet as of January 2019: http://dx.doi.org/10.3133/pp1809.

National Atmospheric Deposition Program (NADP), 2018, National Atmospheric Deposition Program Publications. Wisconsin State Laboratory of Hygiene, University of Wisconsin-Madison, WI. Available on the Internet as of January 2019: https://nadp.slh.wisc.edu/lib/dataReports.aspx.

Natural Resources Conservation Service (NRCS), 2019, Web Soil Survey (WSS) database. Available on the Internet as of as of April 2019: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

Natural Resource and Energy Explorer (NREX), 2019, Mapping Tool for Wyoming. Available on the Internet as of April 2019: https://nrex.wyo.gov/.

Northeast Wyoming Sage-grouse Working Group, 2014, Northeast Wyoming Sage-Grouse Conservation Plan Addendum. Available on the Internet as of January 2019: https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/Sage%20Grouse/SG_NE_CONSERVPLAN.pdf.

Office of the Governor, 2015, State of Wyoming Executive Department Executive Order 2015-4, Greater Sage-Grouse Core Area Protection, July 29, 2015, Available on the Internet as of January 2017: http://psc.state.wy.us/pscdocs/dwnload/SageGrouseExecOrder2015-7.pdf.

Office of Management and Budget, 2003, *Circular A-4: Regulatory Analysis*. Washington, DC. Available on the Internet as of June 2019: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/assets/OMB/inforeg/2003_cost-ben_final_rpt.pdf.

Office of Surface Mining Reclamation and Enforcement (OSMRE), 1989, Handbook on Procedures for Implementing the National Environmental Policy Act of 1969. Available on the Internet as of April 2019: https://www.osmre.gov/LRG/docs/directive490_NEPAHandbook.pdf.

Office of Surface Mining Reclamation and Enforcement (OSMRE), 1999, REG-31 881-Preparation of Mining Plan Decision Documents. Available on the Internet as of January 2017: http://www.osmre.gov/lrg/directives.shtm.

Office of Surface Mining Reclamation and Enforcement (OSMRE), 2016, Reclamation Performance Bonds: Bonding Overview. Available on the Internet as of January 2017: https://www.osmre.gov/resources/bonds/bondsoverview.shtm.

Office of Surface Mining Reclamation and Enforcement (OSMRE), 2019, Initiatives – Dry Fork Mine. Available on the Internet as of March 8 2019: https://www.wrcc.osmre.gov/initiatives/dryForkMine/dryForkMineA3EA.shtm.

Pace, Thomas G., 2005, Examination of the Multiplier Used to Estimate PM2.5 Fugitive Dust Emissions from PM_{10}. Available on the Internet as of May 2016: http://www3.epa.gov/ttnchie1/conference/ei14/session5/pace_pres.pdf.

Ramboll Environ, 2016, Coal Dust from Rail Transport. Available on the Internet as of April 2017: https://ngskmc-eis.net/wp-content/uploads/2016/09/NGS-KMC-Railroad-Coal-Dust-White-Paper-2016.1.16.pdf.

SNL Financial, 2018, Dry Fork Station Plant Environmental Profile. Electronic Copy Only. Available on request from OSMRE.

Shelanski, H., M. Obstfeld. 2015. Estimating the Benefits from Carbon Dioxide Emissions Reductions. https://obamawhitehouse.archives.gov/blog/2015/07/02/estimating-benefits-carbon-dioxide-emissions-reductions.

U.S. Army Corps of Engineers (USACE), 1987, Corps of Engineers Wetlands Delineation Manual, by the Environmental Laboratory, Department of the Army, Waterways Experiment Station. Available on the Internet as of April 2017: https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/4530.

U.S. Army Corps of Engineers (USACE), 2010, Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0). Available on the Internet as of December 2018: https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7613.

U.S. Army Corps of Engineers (USACE), 2018, Dry Fork Mine A3 NWI Delineated Wetlands. Available on the Internet as of December 2018: https://www.fws.gov/wetlands/data/Mapper.html.

U.S. Census Bureau, 2018, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2017. Available on the Internet as of April 2017: https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

U.S. Department of Agriculture-Natural Resources Conservation Service (NRCS), 2019, Web Soil Survey (WSS) database. Available on the Internet as of May 2019: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

U.S. Department of Energy (USDOE), 2016, National Energy Technology Laboratory. Coal and Biomass Coal Ranks. Available on the Internet as of February 2017: https://www.netl.doe.gov/research/coal/energy-systems/gasification/gasifipedia/coal.

U.S. Department of Interior (DOI), 1980, Department of the Interior Departmental Manual Part 516. Available on the Internet as of Aril 2019: https://www.fws.gov/r9esnepa/DOINEPAProced/516dmCh6.PDF.

U.S. Department of Interior (DOI), 2019, Natural Resources Revenue Data. Available on the Internet as of April 2019: https://revenuedata.doi.gov/explore/.

U.S. Department of Labor – Bureau of Labor Statistics, 2018, Employment Status of the Civilian Noninstitutional Population, 1976 to 2016 Annual Averages, Available on the Internet as of February 2017: https://www.bls.gov/web/laus/ststdnsadata.zip.

U.S. Energy Information Administration (USEIA), 2017, Annual Coal Distribution Report 2017. Available on the Internet as of October 2018: https://www.eia.gov/coal/distribution/annual/pdf/acdr_fullreport2016.pdf.

U.S. Energy Information Administration (USEIA), 2018, API Query Browser, EIA Data Sets-Coal-Average price by rank-Subbituminous. Available on the Internet as of January 2019: https://www.eia.gov/opendata/qb.php?sdid=COAL.PRICE_BY_RANK.PRB-SUB.A.

U.S. Environmental Protection Agency (EPA), 1993, Emission Factor Documentation for AP-42 Section 1.1 Bituminous and Subbituminous Coal Combustion, April 1993.

U.S. Environmental Protection Agency (EPA), 2002, Latest Findings on National Air Quality, 2002 Status and Trends. Available on the Internet as of January 2017: https://www.epa.gov/sites/production/files/2017-11/documents/trends_brochure_2002.pdf.

U.S. Environmental Protection Agency (EPA), 2008, Direct Emissions from Stationary Combustion Sources. Available on the Internet as of January 2017: https://www.epa.gov/climateleadership.

U.S. Environmental Protection Agency (EPA), 2014. Emission Factors for Greenhouse Gas Inventories. Available on the Internet as of April 2017: https://www.epa.gov/sites/production/files/2015-07/emission-factors_2014.xlsx.

U.S. Environmental Protection Agency (EPA), 2016, Report on the Environment, Acid Rain. Available on the Internet as of January 2017: https://cfpub.epa.gov/roe/indicator.cfm?i=1.

U.S. Environmental Protection Agency (EPA), 2017, Toxics Release Inventory (TRI) Program. Available on the Internet on the Internet as of January 2017: https://www.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-2015. U.S.

U.S. Environmental Protection Agency (EPA), 2018a, Current Nonattainment Counties for All Criteria Pollutants, Available from the website as of December 2018: https://www.epa.gov/green-book.

U.S. Environmental Protection Agency (EPA), 2018b, Monitor Values Report, Available from the website as of December 2018: https://www.epa.gov/outdoor-air-quality-data/monitor-values-report.

U.S. Environmental Protection Agency (EPA), 2018c, Air Quality Index Report, Available from the website as of December 2018: https://www.epa.gov/outdoor-air-quality-data/air-quality-index-report.

U.S. Environmental Protection Agency (EPA), 2018d. U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2016. Available on the Internet as of December 2018: https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf.

U.S. Environmental Protection Agency (EPA), 2019a, Mercury and Air Toxics Standards, Basic Information about Mercury and Air Toxics Standards. Available from the website as of May 2019: https://www.epa.gov/mats/basic-information-about-mercury-and-air-toxics-standards.

U.S. Environmental Protection Agency (EPA), 2019b, State Average Annual Emissions Trends. Available on the internet as of May 2019: https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data.

U.S. Fish and Wildlife Service (USFWS), 2016, Endangered Species Midwest Region Fact Sheet: Northern Long-Eared Bat *Myotis septentrionalis,* Available on the Internet as of January 2017: https://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html.

U.S. Fish and Wildlife Service (USFWS), 2018a, List of Threatened and Endangered Species that may occur in your Proposed Project Location, and/or may be Affected by your Proposed Project. Electronic copy only, available on request from OSMRE.

U.S. Fish and Wildlife Service (USFWS), 2018b, Endangered Species Midwest Region Fact Sheet: Northern Long-Eared Bat *Myotis septentrionalis,* Available on the Internet as of January 2017: https://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html.

U.S. Geological Survey (USGS), 2016. National Climate Change Viewer (NCCV). Available on the Internet as of May 2019: https://www2.usgs.gov/climate_landuse/clu_rd/nccv.asp.

Western Fuels-Wyoming Inc. (WFW), 2011, Dry Fork Mine WDEQ-LQD Permit No. PT0599. Electronic Copy Only. Available on request from OSMRE.

Western Fuels-Wyoming Inc. (WFW), 2018, Dry Fork Mine Permit No. PT0599 Permit Revision/Permit Application Package. Electronic Copy Only. Available on request from OSMRE. Includes WFW 2011.

Western Fuels-Wyoming Inc. (WFW), 2019a, Information provided by Dry Fork Mine. Electronic Copy Only. Available on request from OSMRE.

Western Fuels-Wyoming Inc. (WFW), 2019b, 2019 Annual Wildlife Report Report-Permit 599. Submitted to WDEQ-LQD. Electronic Copy Only. Available on request from OSMRE.

Western Fuels Association (WFA) and Redhorse Corporation, 2017, Air Quality Application to Modify the Dry Fork Mine Wyoming Air Quality Division Permit #MD-11723 Technical Support Document, June 2017. Electronic Copy Only. Available on request from OSMRE.

WWC Engineering (WWC), 2019. GHG, Air Quality, and Revenue Calculations located in Appendices C and F.

Wyoming Consensus Revenue Estimating Group (CREG), 2018, Wyoming State Government Revenue Forecast Fiscal Year 2019 – Fiscal Year 2024. Available on the Internet on the Internet as of January 2017: http://eadiv.state.wy.us/creg/GreenCREG_Oct18.pdf.

Wyoming Department of Agriculture (WDOA), 2018, Wyoming Weed & Pest Control Act, State Designated Weeds and Pests. Available on the Internet as of November 2018: https://wyoweed.org///wp-content/uploads/2018/07/StateDesignatedList_2018.pdf.

Wyoming Department of Environmental Quality-Air Quality Division (WDEQ-AQD), 2011, Permit No. MD-11723. Electronic Copy Only. Available on request from OSMRE.

Wyoming Department of Environmental Quality-Air Quality Division (WDEQ-AQD), 2012, FY 2012 Annual Inspection of the Dry Fork Station. Electronic Copy Only. Available on request from OSMRE.

Wyoming Department of Environmental Quality-Air Quality Division (WDEQ-AQD), 2018, Air Quality Permit P0023278. Electronic copy only. Available on request from OSMRE.

Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD), 2012, Chapter 4: Environmental Protection Performance Standards. Available on the Internet as of February 2017: https://rules.wyo.gov/DownloadFile.aspx?source_id=8882&source_type_id=81&doc_type_id=110&include_meta_data=Y&file_type=pdf&filename=8882.pdf&token=0001180840270172242390340701712430902240182291 00

Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD), 2014a, Guideline No. 20 - Bond Release Categories and Submittal Procedures For Coal Mines. Available on the Internet as of February 2017: http://deq.wyoming.gov/media/attachments/Land%20Quality/Guidelines/Guidelines-20_Coal-Bond-Release-guide-20.pdf.

Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD), 2018, WDEQ-LQD Mine Information. Electronic copy only. Available on request from OSMRE.

Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD), 2019, Approval of Amendment for Western Fuels WY, Inc., Dry Fork Mine, PT0599, TFN 6 4/207, Amendment No. 3, Change No. 20. Electronic copy only. Available on request from OSMRE.

Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD) /Lidstone and Associates, 2019, Cumulative Hydrological Impact Assessment of Coal Mining in the Northern Powder River Basin, Wyoming (WDEQ-CHIA-), WDEQ-LQD, . Electronic Copy Only. Available on request from OSMRE.

Wyoming Department of Revenue (WDOR), 2018a, State of Wyoming Department of Revenue, 2018 Annual Report. Available on the Internet as of December 2018: https://sites.google.com/a/wyo.gov/wy-dor/dor-annual-reports.

Wyoming Department of Revenue (WDOR), 2018b, Total Distribution by Major Business Class and by County. Available on the Internet as of December 2018: http://revenue.wyo.gov/tax-distribution-reports/major-industry-code-by-month-year-1.

Wyoming Department of Workforce Services (WDWS), 2012, Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2012. Available on the Internet as of December 2018: http://www.wyomingworkforce.org/_docs/mines/ar/2012.pdf.

Wyoming Department of Workforce Services (WDWS), 2013, Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2013. Available on the Internet as of December 2018: http://www.wyomingworkforce.org/_docs/mines/ar/2013.pdf.

Wyoming Department of Workforce Services (WDWS), 2014, Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2014. Available on the Internet as of December 2018: http://www.wyomingworkforce.org/_docs/mines/ar/2014.pdf.

Wyoming Department of Workforce Services (WDWS), 2015, Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2015. Available on the Internet as of December 2018: http://www.wyomingworkforce.org/_docs/mines/ar/2015.pdf.

Wyoming Department of Workforce Services (WDWS), 2016, Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2016. Available on the Internet as of December 2018: http://www.wyomingworkforce.org/_docs/mines/ar/2016.pdf.

Wyoming Department of Workforce Services (WDWS), 2017, Annual Report of the State Inspector of Mines of Wyoming, Year Ending December 31, 2017. Available on the Internet as of October2018: http://www.wyomingworkforce.org/_docs/mines/ar/2017.pdf.

Wyoming Department of Workforce Services (WDWS), 2018, Wyoming Labor Force Trends, May 2018. Available on the Internet as of December 2018: https://doe.state.wy.us/lmi/trends/0518/0518.pdf.

Wyoming Game and Fish Department (WGFD), 2017, Wyoming Species of Greatest Conservation Need – Introduction. Available on the Internet as of December 2018: https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/SWAP/SGCN-Introduction.pdf.

Wyoming Game and Fish Department (WGFD), 2018a, State of Wyoming's Sage Grouse Executive Order 2015-4 Compliance Letter. Electronic copy only. Available on request from OSMRE.

Wyoming Game and Fish Department (WGFD), 2018b, Wyoming Game and Fish Department Unpublished Data – 2009-2018 Annual Lek Monitoring. Electronic copy only, available on request from OSMRE.

Wyoming Oil and Gas Conservation Commission (WOGCC), 2018. Well Data Search. Available on the Internet as of October 2018: http://wogcc.state.wy.us/urecordsMenu.cfm?Skip='Y'&oops=ID83640.

Wyoming State Engineer's Office (SEO), 2018, e-Permit Application and Water Rights Database. Available on the Internet as of December 2018: https://sites.google.com/a/wyo.gov/seo/.

6.2 Abbreviations/Acronyms

A3	Amendment 3
AIRFA	American Indian Religious Freedom Act
AML	Abandoned Mine Lands
ANFO	ammonium nitrate and fuel oil
AQI	air quality index
AQRVs	air quality related values
AQS	Air Quality System
ASLM	Assistant Secretary, Land and Mineral Management
AVF	alluvial valley floor
BACT	Best Available Control Technology
BLM	Bureau of Land Management
BNSF	BNSF Railway Company
Btu	British thermal unit
CBNG	coal bed natural gas
CAA	Clean Air Act
CCB	coal combustion byproduct
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CHIA	Cumulative Hydrological Impact Assessment
CIA	cumulative impacts area
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	Equivalent CO_2
CWA	Clean Water Act
dBA	adjusted decibels, a logarithmic unit of sound levels
DFM	Dry Fork Mine
DFS	Dry Fork Station
DL	disturbed land
DM	Department Manual
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
dv	deciview
EA	Environmental Assessment
EGU	electric generating unit
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
FCLAA	Federal Coal Leasing Act Amendment, 1976
FLPMA	Federal Land Policy Management Act of 1976
FONSI	Finding of No Significant Impact
GDP	gross domestic product
GHG	greenhouse gas
GWP	Global Warming Potential

ft/d	feet per day
HAP	Hazardous Air Pollutant
H^+	hydrogen ion
H_2S	hydrogen sulfide
Hg	mercury
IDB	internally drained basin
IMPROVE	Interagency Monitoring of Protected Visual Environments
in.	inches
IPaC	Information for Planning and Conservation
ISCLT3	Industrial Source Complex Long Term 3
IWP	Interagency Working Group
lb.	pounds
LNCM	lands necessary to conduct mining
LOM	life of mine
LPR	Little Powder River
$\mu g/m^3$	micrograms per cubic meter
MATS	Mercury and Air Standards
MBCY	million-bank cubic yards
MBTA	Migratory Bird Treaty Act of 1918, as amended
mg/L	milligrams per liter
MLA	Mineral Leasing Act (1920)
MPDD	mining plan decision document
Mt	million tons
Mtpy	million tons per year
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act (1969)
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOA	notice of availability
NOI	notice of intent
NO_X	oxides of nitrogen
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NWI	National Wetlands Inventory
NSS	Native Species Status
O_3	ozone
OSMRE	Office of Surface Mining Reclamation and Enforcement
PAP	Permit Application Package
Pb	lead
PBT	persistent, bioaccumulative, and toxic
pH	power of hydrogen
$PM_{2.5}$	fine particulates less than 2.5 microns
PM_{10}	fine particulates less than 10 microns

PRB	Wyoming Powder River Basin
ppb	parts per billion
ppm	parts per million
PRPA	Paleontological Resources Preservation Act of 2009
PSD	Prevention of Significant Deterioration
R2P2	Resource Recovery and Protection Plan
RL	reclaimed land
SCC	social cost of carbon
SEO	State Engineer's Office
SGCN	species of greatest conservation concern
SH	State Highway
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMCRA	Surface Mining Control and Reclamation Act (1977)
SO_2	sulfur dioxide
SOC	species of concern
SOSI	species of special interest
STP	standard temperature and pressure
SDWA	Safe Drinking Water Act
T&E	threatened and endangered
TDS	total dissolved solids
tpy	tons per year
TRI	Toxic Release Inventory
UP	Union Pacific
USACE	U.S. Army Corps of Engineers
USEIA	U.S. Energy Information Administration
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations
WDEQ	Wyoming Department of Environmental Quality
WDEQ-AQD	Wyoming Department of Environmental Quality – Air Quality Division
WDEQ-LQD	Wyoming Department of Environmental Quality – Land Quality Division
WDEQ-WQD	Wyoming Department of Environmental Quality – Water Quality Division
WDOA	Wyoming Department of Agriculture
WDWS	Wyoming Department of Workforce Services
WFW	Western Fuels-Wyoming, Inc.
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WRS	Wyoming Revised Statutes
W.S.	Wyoming Statue
WYNDD	Wyoming Natural Diversity Database
WYPDES	Wyoming Pollutant Discharge Elimination System

APPENDICES

Appendix A LEGAL NOTICES for FEDERAL LEASE MODIFICATION APPROVAL WYW-0311810

Appendix B PUBLIC SCOPING MAILING LISTS

Appendix C GENERAL AIR QUALITY DISCUSSIONS
GREENHOUSE GAS EMISSIONS CALCULATIONS
PM_{10}, $PM_{2.5}$, SO_2, NO_X, HG, CO, and CO_2e CONTRIBUTIONS from COAL COMBUSTION CALCULATIONS

Appendix D SURFACE-WATER RIGHTS WITHIN 2 MILES of the A3 TRACT and GROUNDWATER RIGHTS WITHIN 2 MILES of the A3 TRACT

Appendix E BIOLOGICAL (SOILS, VEGETATION, and WILDLIFE) ASSESSMENT RELATED to the A3 TRACT

Appendix F STATE and FEDERAL REVENUE CALCULATIONS RELATED to the A3 TRACT

APPENDIX A

LEGAL NOTICES
for FEDERAL LEASE MODIFICATION APPROVAL
WYW-0311810

Public Notice
Dry Fork Mine Mining Plan Modification
Environmental Assessment

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region Office, will prepare an environmental assessment (EA) for the Dry Fork Mine's (DFM) mining plan modification for federal coal lease WYW-0311810 (the Project). In accordance with the Mineral Leasing Act of 1920 (MLA), The DOI Assistant Secretary for Land and Minerals Management (ASLM) must approve the Project before any mining and reclamation can occur on lands containing leased federal coal. Western Fuels-Wyoming Inc. (WFW) operates the DFM under Permit No. PT0599 issued by Wyoming Department of Environmental Quality Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) in accordance with the approved Wyoming State Coal Regulatory Program (30 CFR Part 950). Permit No. PT0599 is in the process of being amended to include the A3 Tract. If approved, the revised federal mining plan would include the condition that WFW could not mine coal from the federal coal within the A3 Tract prior to receiving approval from the ASLM.

OSMRE is preparing an EA to evaluate the environmental impacts resulting from the Project, pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA). The DFM is located approximately 4.5 miles north of Gillette, Wyoming. The DFM uses a truck and loader mining method. The amount of remaining recoverable federal coal authorized for removal within the currently approved federal mining plan is approximately 204 million tons (Mt). The Project proposes to add approximately 640.3 acres and 58.1 Mt of federal coal to the approved federal mining plan. The annual production rate used to calculate the environmental impacts resulting from the Proposed Action will be 6.0 million tons per year (Mtpy), which is the estimated future annual production rate suggested by DFM and is below the maximum permitted production rate of 15 Mtpy set by WDEQ/AQD air quality permit P0023278. DFM started operation in 1990 and the mine will continue to operate until 2054 under the current, approved mining plan. Using the estimated 6.0 Mtpy production rate, the Project would extend the life of the mine by approximately 9.7 years, to 2064.

The EA will update, clarify, and provide new and additional environmental information for the Project. As a result of the EA process, OSMRE will determine whether or not there are significant environmental impacts. An environmental impact statement will be prepared if the EA identifies significant impacts. If a finding of no significant impact is reached, and pursuant to 30 CFR 746.13, OSMRE will prepare and submit to the ASLM a mining plan decision document recommending approval, disapproval, or conditional approval of the mining plan modification. The ASLM will approve, disapprove, or conditionally approve the mining plan modification, as required under the Mineral Leasing Act of 1920.

OSMRE is soliciting public comments on the Project. Your comments will help to determine the issues and alternatives that will be evaluated in the environmental analysis. You are invited to direct these comments to:

ATTN: Dry Fork Mine A3 EA
C/O: Gretchen Pinkham,
OSMRE Western Region
1999 Broadway, Suite 3320
Denver, CO 80202-3050

Comments may also be emailed to: osm-nepa-wy@osmre.gov, ensure the subject line reads: ATTN: OSMRE, Dry Fork Mine A3 EA. Comments should be received or postmarked no later than April 22, 2019 to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record for this project and will be available for public inspection. Additional information regarding the Project may be obtained from Logan Sholar, telephone number (303) 293-5036 and the Project website provided below. When available, the EA and other supporting documentation will be posted at:

http://www.wrcc.osmre.gov/initiatives/DryForkMineAmendment3.shtm. Comments should be received or postmarked no later than to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record and will be available for public inspection. Additional information regarding the project may be obtained from Logan Scholar, telephone number (303) 293-5036 and the project website provided below. When available, the EA and other supporting documentation will be posted at:

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT
Western Region
1999 Broadway St., Suite 3320
Denver, CO 80202-3050

March 22, 2019

Dear Stakeholders and Interested Parties,

The U.S. Department of the Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), Western Region Office, will prepare an environmental assessment (EA) for the Dry Fork Mine's (DFM) mining plan modification for federal coal lease WYW-0311810 (the Project). In accordance with the Mineral Leasing Act of 1920 (MLA), The DOI Assistant Secretary for Land and Minerals Management (ASLM) must approve the Project before any mining and reclamation can occur on lands containing leased federal coal. Western Fuels-Wyoming Inc. (WFW) operates the DFM under Permit No. PT0599 issued by Wyoming Department of Environmental Quality Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) in accordance with the approved Wyoming State Coal Regulatory Program (30 CFR Part 950). Permit No. PT0599 is in the process of being amended to include the A3 Tract. If approved, the revised federal mining plan would include the condition that WFW could not mine coal from the federal coal within the A3 Tract prior to receiving approval from the ASLM.

OSMRE is preparing an EA to evaluate the environmental impacts resulting from the Project, pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA). The DFM is located approximately 4.5 miles north of Gillette, Wyoming. The DFM uses a truck and loader mining method. The amount of remaining recoverable federal coal authorized for removal within the currently approved federal mining plan is approximately 204 million tons (Mt). The Project proposes to add approximately 640.3 acres and 58.1 Mt of federal coal to the approved federal mining plan. The annual production rate used to calculate the environmental impacts resulting from the Proposed Action will be 6.0 million tons per year (Mtpy), which is the estimated future annual production rate suggested by DFM and is below the maximum permitted production rate of 15.0 Mtpy set by WDEQ-Air Quality Division (AQD) air quality permit P0023278. DFM started operation in 1990 and the mine will continue to operate until 2054 under the current, approved mining plan. Using the estimated 6.0 Mtpy production rate, the Project would extend the life of the mine by approximately 9.7 years, to 2064.

The EA will update, clarify, and provide new and additional environmental information for the Project. As a result of the EA process, OSMRE will determine whether or not there are significant environmental impacts. An environmental impact statement will be prepared if the EA identifies significant impacts. If a finding of no significant impact is reached, and pursuant to 30 CFR § 746.13, OSMRE will prepare and submit to the ASLM a mining plan decision document recommending approval, disapproval, or conditional approval of the mining plan modification. The ASLM will approve, disapprove, or conditionally approve the mining plan modification, as required under the Mineral Leasing Act of 1920.

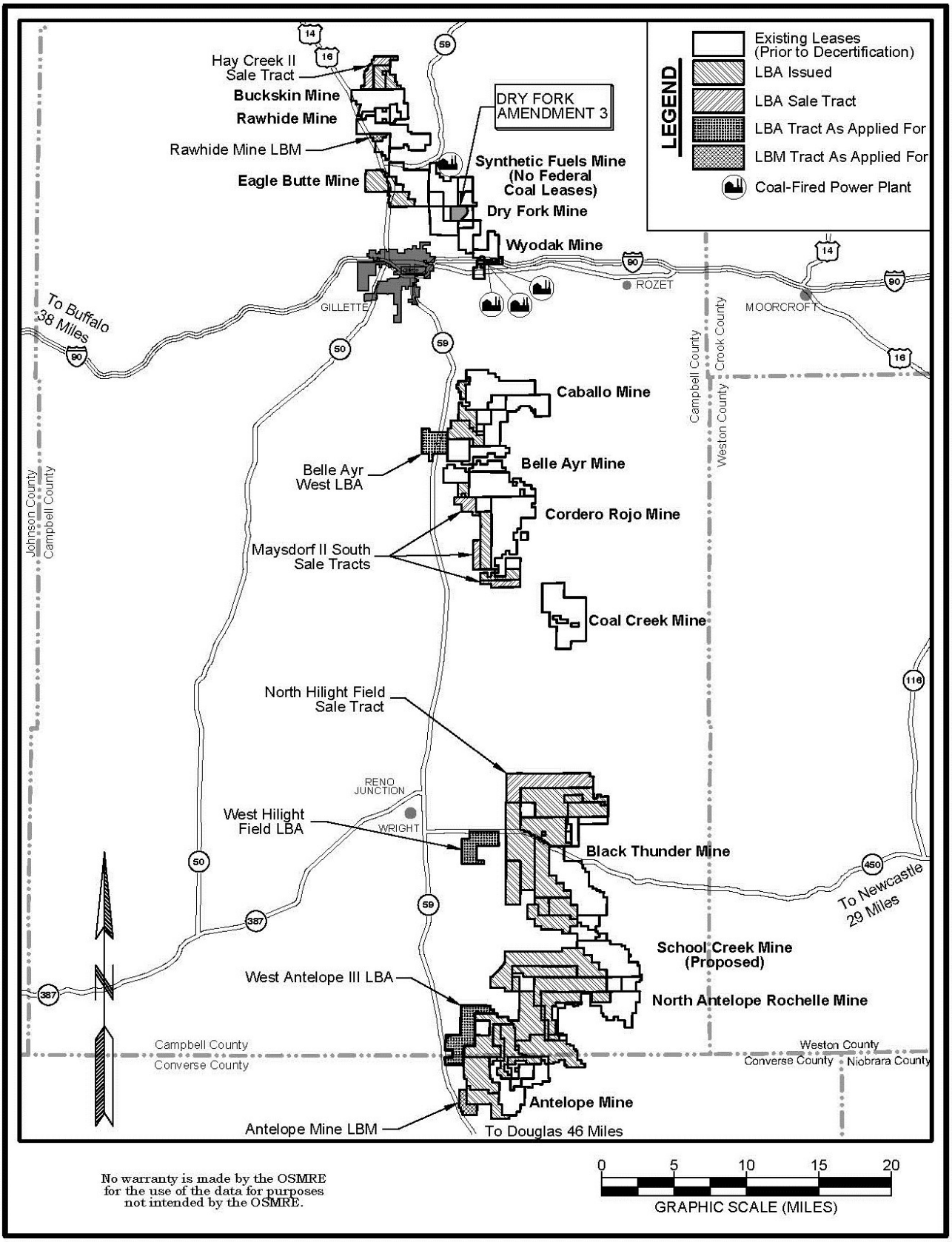
OSMRE is soliciting public comments on the Project. Your comments will help to determine the issues and alternatives that will be evaluated in the environmental analysis. You are invited to direct these comments to:

Comments may also be emailed to: osm-nepa-wy@osmre.gov, ensure the subject line reads: ATTN: OSMRE, Dry Fork Mine A3 EA. Comments should be received or postmarked no later than April 22, 2019 to be considered during the preparation of the EA. Comments received, including names and addresses of those who comment, will be considered part of the public record for this project and will be available for public inspection. Additional information regarding the Project may be obtained from Logan Sholar, telephone number (303) 293-5036 and the Project website provided below. When available, the EA and other supporting documentation will be posted at:
http://www.wrcc.osmre.gov/initiatives/DryForkMineAmendment3.shtm.

Sincerely,

Elizabeth Shaeffer,
Manager
Field Operations Branch

Attachment: Location Map


LEGEND
Existing Leases (Prior to Decertification)
LBA Issued
LBA Sale Tract
LBA Tract As Applied For
LBM Tract As Applied For
Coal-Fired Power Plant
DRY FORK AMENDMENT 3
Hay Creek II Sale Tract
Buckskin Mine
Rawhide Mine
Rawhide Mine LBM
Eagle Butte Mine
Synthetic Fuels Mine (No Federal Coal Leases)
Dry Fork Mine
Wyodak Mine
GILLETTE
ROZET
MOORCROFT
To Buffalo 38 Miles
Caballo Mine
Belle Ayr West LBA
Belle Ayr Mine
Cordero Rojo Mine
Maysdorf II South Sale Tracts
Coal Creek Mine
North Hilight Field Sale Tract
RENO JUNCTION
WRIGHT
West Hilight Field LBA
Black Thunder Mine
To Newcastle 29 Miles
School Creek Mine (Proposed)
West Antelope III LBA
North Antelope Rochelle Mine
Antelope Mine
Antelope Mine LBM
To Douglas 46 Miles
Johnson County
Campbell County
Crook County
Weston County
Converse County
Niobrara County
No warranty is made by the OSMRE for the use of the data for purposes not intended by the OSMRE.
0 5 10 15 20
GRAPHIC SCALE (MILES)

APPENDIX B

PUBLIC SCOPING MAILING LISTS

Mailing List

Name	Title	Agency
Vernon Hill	Chairman	Eastern Shoshone Business Council
Dean Goggles	Chairman	Northern Arapaho Business Council
Shaun Chapoose	Chairperson	The Ute Tribe of the Uintah and Ouray Reservation
Harold C. Frazier	Chairman	Cheyenne River Sioux Tribal Government
Roxanne Sazue	Chairwoman	Crow Creek Sioux Tribe
Wanda Wells	Cultural Affairs	Crow Creek Sioux Tribe
Anthony Reider	President	Flandreau Santee Sioux Tribe
Michael Jandreau	Chairman	Lower Brule Sioux Tribe
Clair Green	Cultural Resources/Public Affairs	Lower Brule Sioux Tribe
John Yellow Bird Steele	President	Oglala Sioux Tribal Council
William Kindle	President	Rosebud Sioux Tribe
Garryl Rousseau Sr.	Vice-Chairman or Acting Chairman	Sisseton-Wahpeton Oyate Tribes
Robert Flying Hawk	Chairman	Yankton Sioux Tribe
Lyman Guy	Tribal Chairman	Apache Tribe of Oklahoma
Lisa Martin	Tribal Council Coordinator	Cheyenne-Arapaho Tribes of Oklahoma
Wallace Coffey	Chairman	Comanche Nation Tribe
Amber Toppah	Lady Chairman	Kiowa Business Committee
Roger Trudell	Chairman	Santee Sioux Tribe of Nebraska
Mark Fox	Chairman	MHA Nation Tribal Council, Three Affiliated Tribes
Dave Archambault II	Chairman	Standing Rock Sioux Tribe
Vernon Finley	Chairman	Confederated Salish and Kootenai Tribes of the Flathead Reservation
Floyd Azure	Chairman	Ft. Peck Assiniboine and Sioux Tribes
Harry Barnes	Chairman	Blackfeet Tribal Business Council
Darrin Old Coyote	Chairman	Crow Tribal Council
Llevando “Cowboy” Fisher Sr.	President	Northern Cheyenne Tribal Council
Blaine Edmo	Chairman	Shoshone-Bannock Tribes of the Fort Hall Reservation

Name	Title	Agency
Doug Miyamoto	Director	Wyoming Department of Agriculture
Todd Parfitt	Director	Wyoming Department of Environmental Quality
Mark Rogaczewski	District 3 Supervisor	WDEQ Land Quality Division
David Waterstreet	Manager	WDEQ Watershed Protection Section
Scott Talbott	Director	Wyoming Department of Game and Fish
Mary Hopkins	SHPO	Wyoming Historic Preservation Office
Darin J. Westby	Director	Wyoming Department of State Parks and Cultural Resources
Stephanie Pyle	Senior Administrator	Wyoming Department of Public Health
Jenifer Scoggin	Director	Office of State Lands and Investment
Bill Crapser	State Forester	Wyoming Forestry Division
Maj. Gen. Luke Reiner	Director	Wyoming Department of Transportation
Brian Lovett	Administrator	Wyoming Industrial Siting Agency
Erin Campbell	Director/State Geologist	Wyoming Geological Survey
Dan Noble	Director	Wyoming Department of Revenue
Mark W. Watson	Director	Wyoming Oil and Gas Conservation Commission
Patrick T. Tyrrell	State Engineer	Wyoming State Engineer's Office
Domenic Bravo	Division Administrator	Wyoming State Parks, Historic Sites & Trails Division
Harry C. LaBonde	Director	Wyoming Water Development Commission
		Wyoming Office of the Governor
Robin Sessions Cooley	Director	Wyoming Department of Workforce Services
Diane Shober	Executive Director	Wyoming Office of Tourism Board
Kara B. Fornstrom	Chairman	Wyoming Public Service Commission
	Economic Analysis Division	Wyoming Department of Administration and Information
Curt Meier	Wyoming State Treasurer	Office of the State Treasurer
Nancy Vehr	Air Quality Administrator	WY DEQ Air Quality Division
Kyle Wendtland	LQD Administrator	Wyoming LQD - DEQ
		Wyoming State Board of Land Commissioners

Name	Title	Agency
Tony Glover	Manager	WY Dept of Workforce Services, Research & Planning
Chris Wichmann	Manager	Wyoming Dept of Agriculture - Natural Resources & Policy Section
Mark Christensen		Campbell County Commissioners
DG Reardon		Campbell County Commissioners
Bob Maul		Campbell County Commissioners
Rusty Bell		Campbell County Commissioners
Del Shelstad		Campbell County Commissioners
		Campbell County Airport
Keith Bowar	Chief Building Official	Campbell County Building Division
Megan Nelms	AICP, County Planner & Zoning Administrator	Campbell County Planning & Zoning Division
David King	CCEMA Coordinator	Campbell County Emergency Management
Bill Shank	Fire Chief	Campbell County Fire Department
Dave McCormick	Executive Director	Campbell County Parks and Recreation
Kevin King, P.E.	Director	Campbell County Department of Public Works
Kevin F. Geis, P.E.	Executive Director	Campbell County Road & Bridge
Quade Schmelzle	Director	Campbell County Weed & Pest
		Campbell County Conservation District
		Campbell County School District 1
	Executive Director	Campbell County Economic Development Corporation
		Campbell County Public Land Board
Tom Langston		Gillette Department of Commercial Development
Louise Carter-King	Mayor	City of Gillette
Shawn Neary	City Council	City of Gillette
Tim Carsrud	City Council	City of Gillette
Nathan McLeland	City Council	City of Gillette
Bruce Brown	City Council	City of Gillette
Billy Montgomery	City Council	City of Gillette
Shay Lundvall	City Council	City of Gillette

Name	Title	Agency
Ry Muzzarelli	Development Services Director	City of Gillette
Sawley Wilde	Public Works Director	City of Gillette
Mike Cole	Director of Utilities	City of Gillette
Jim Hloucal	Chief of Police	City of Gillette
Pam Boger	Administrative Services Director	City of Gillette
Patrick Davidson	City Administrator	City of Gillette
Hon. Mark Gordon	Governor	Wyoming Governor
Representative Scott Clem	District HD31	Wyoming Legislature
Representative Roy Edwards	District HD53	Wyoming Legislature
Representative Bill Pownall	District HD52	Wyoming Legislature
Senator Ogden Driskill	District SD01	Wyoming Legislature
Senator Michael Von Flatern	District SD24	Wyoming Legislature
Darryl LaCounte	Director	Rocky Mountain Regional Office, Bureau of Indian Affairs
Carlie Ronca	Area Manager	Wyoming Area Office, Bureau of Reclamation
		Wyoming Regulatory Office, US Army Corps of Engineers, Omaha District
Mary Jo Rugwell	State Director	Wyoming State Office, Bureau of Land Management
Rick Miller	Acting District Manager	High Plains District Office, Bureau of Land Management
Mitchell Leverette	Chief, Solid Minerals	Bureau of Land Management
Todd Yeager	Field Manager	Buffalo Field Office, Bureau of Land Management
Lonny Bagley	Field Manager	Casper Field Office, Bureau of Land Management
		Library, Bureau of Land Management
	Coal Coordinator	Wyoming State Office, Bureau of Land Management
Lawrence S. Roberts	Acting Assistant Secretary	Bureau of Indian Affairs
	Environmental Division	US Air Force Headquarters/CEVP
		National Park Service
		National Park Service Air Resources Division
		National Park Service 2310
		U.S. Department of Energy

Name	Title	Agency
Doug Benevento	Administrator	US Environmental Protection Agency, Region 8
Tyler Abbott	Field Supervisor	Wyoming Ecological Services Field Office, US Fish and Wildlife Service
Dennis Jaeger	Forest Supervisor's Office	Thunder Basin National Grassland, USDA Forest Service
		Devils Tower National Monument, National Park Service
Astrid Martinez	State Conservationist	Wyoming State Office, Natural Resources Conservation Service
Marcello Calle		Office of Surface Mining Reclamation and Enforcement Program Support Division, Field Operations Branch
		Advisory Council on Historic Preservation
		US Army Corps of Engineers
		US Environmental Protection Agency
	Ecological Services	US Fish and Wildlife Service
	BLM Cooperator Lead	USDA-FS Douglas Ranger District
		USGS Water Resources Division
		US Geological Survey
Michael Enzi	US Senate	Gillette Office
John Barrasso	US Senate	Casper Office
Liz Cheney	US House of Representatives	Casper Office
BTU Western Resources, Inc.		
Mark Thrall		Belle Ayr Mine
Mitchell J. Reneau		VP Land, Bill Barrett Corporation
		Biodiversity Conservation Alliance
		BNSF Railway Company
		Casper Star Tribune
Amy M. Atwood		Center for Biological Diversity
		Converse County Commission
Dr. Dan Espelan		Converse County School District #1
Kirk M. Hughes		Converse County School District #2
Paul W. Musselman		Converse Cty, Special Projects
		Defenders of Wildlife

Name	Title	Agency
Matt Adelman		Publisher, Douglas Budget
		Environmental Policy and Culture Program
		Federation for North American Wild Sheep
Energy Reporter		Gillette News-Record
Steve Bullock		Governor of Montana
Greg Julian		Mineral Management Service
Hal Quinn		National Mining Association
		National Wildlife Federation
		Natural Resources Defense Council
Shannon Anderson		Powder River Basin Resource Council
Phil Dinsmoor		Powder River Coal Company
Bob Comer		Rocky Mtn Region Solicitor
Peter Morgan		Sierra Club
Ralph Kingan		Mayor, Town of Wright
Roger Miller		President, Trout Unlimited
Lance Fritz		President, Chief Executive Officer, Union Pacific Railroad
		US West Communications (Qwest Corp.)
Jason M. Ryan		Business Analytics Director, US Western Surface Operations
Wendi Chatman		UW Libraries
Taylor Jones		WildEarth Guardians
Brady Lewis		WWC Engineering
		WY Business Council
Bill Schilling		Wyoming Business Alliance
Travis Deti		Wyoming Mining Association
Gary Wilmont		Wyoming Outdoor Council
Niels Hansen		Wyoming Stock Growers Assoc
Steve Kilpatrick		Wyoming Wildlife Federation
Amy Wallop-Hendrickson		Wyoming Wool Growers Association, Executive Director

Name	Title	Agency
Mike McCraken	Publisher	Wyoming-Tribune Eagle
Katie Parker		Yates Petroleum Corp et al
Green Bridge Holdings Inc		
Green Bridge Holdings Inc		
Macintosh Property Group Inc		
Jackie and Michael Burkhardt		
Basin Electric Power Coop &	Tri-State Generation & Transmission	

APPENDIX C

GENERAL AIR QUALITY DISCUSSION

GREENHOUSE GAS EMISSIONS CALCULATIONS
(Completed by WWC Engineering)

PM_{10}, $PM_{2.5}$, SO_2, NO_X, Hg, CO, and CO_2e CONTRIBUTIONS from COAL COMBUSTION CALCULATIONS
(Completed by WWC Engineering)

Existing DFM Air Quality Summary

Air Quality-Monitoring Values

Table C-1 lists the current estimated annual mean, annual high, and high-second high PM_{10} micrograms per cubic meter (µg/m^3) recorded at the four PM_{10} sites associated with the DFM.

Table C-1. Historical PM_{10} Ambient Data (µg/m^3) and Production (PM_{10} WAAQS: 50 µg/m^3 Annual, 150 µg/m^3 24-Hour), 2012-2018

Year	Site #[1]	Annual Arithmetic Mean	Highest 24-Hour Reading	2nd Highest 24-Hour Reading	Mt Coal Produced	MBCY[3] Overburden
2012	DF-2	14.3	52	49	6.01	9.33
	DF-3M and DF-3N[2]	5.6	15	14		
	DF-3S[2]	4.8	15	10		
	DF-4N and 4M	13.0	43	40		
	DF-4S	13.5	39	38		
2013	DF-2	14.7	57	39	5.43	8.74
	DF-4N and 4M	8.2	23	21		
	DF-4S	7.3	20	17		
2014	DF-2	12.0	28	22	5.38	8.74
	DF-4N and 4M	7.8	30	23		
	DF-4S	6.9	16	15		
2015	DF-2	13.7	61	41	6.34	8.06
	DF-4N and 4M	9.6	54	31		
	DF-4S	9.2	53	29		
2016	DF-2	12.1	36	30	6.14	9.61
	DF-4N and 4M	6.7	21	19		
	DF-4S	7.8	24	20		
2017	DF-2	14.7	50	48	6.05	8.91
	DF-4N and 4M	10.3	72	49		
	DF-4S	9.1	38	31		
2018	DF-2	13.4	48	33	6.30	9.37
	DF-4N and 4M	9.2	40	24		
	DF-4S	8.6	39	22		

[1] See **map 3-1** for locations
[2] Monitoring at DF-3M, DF-3N, and DF-3S was discontinued in 2013 and moved to DF-4M, DF-4N, and DF-4S
[3] MBCY - Million bank cubic yards
Source: WFW 2019a

Table C-2 shows the regional results for monitoring during the 2012-2018 period.

Table C-2. Measured $PM_{2.5}$ Concentrations in Campbell County, Wyoming, 2012-2018

Site ID[1]	Year	24-hour (µg/m³)	Annual (µg/m³)
Btm-36-2 (Black Thunder Mine) (560050891)	2012	16	4.9*
	2013	14	4.2*
	2014	10	3.9
	2015	22	4.9*
	2016	12	3.3*
	2017	26	5.5*
	2018	19	4.4
Belle Ayr Ba-4,5n,5s (560050892)	2012	22	7.9*
	2013	14	6.4*
	2014	10	5.2
	2015	18	5.0
	2016	14	4.6*
	2017	23	5.4
	2018	18	2.7
Buckskin Mine North Site (560051899)	2012	18	5.9*
	2013	14	4.8
	2014	12	5.5
	2015	21	2.2
	2016	10	2.5*
	2017	26	5.6
	2018	21	4.7

[1] See **map 3-1** for locations
* Indicates the mean does not satisfy minimum data completeness criteria
Source: EPA 2018b

To further evaluate potential $PM_{2.5}$ emissions at the DFM, specific PM_{10} monitoring data from the DFM were used to estimate $PM_{2.5}$ ambient concentrations by application a 0.2 factor ($PM_{2.5}$ to PM_{10}), as determined by Pace (2005). The estimated annual high 24-hour and annual mean $PM_{2.5}$ values are included in tables C-3 and C-4, respectively.

Table C-3. Estimated Annual Highest 24-Hour STP $PM_{2.5}$ Concentrations (µg/m³) ($PM_{2.5}$ Annual, 24-hour WAAQS: 35 µg/m³), 2012-2018

Site Name[1]	2012	2013	2014	2015	2016	2017	2018
DF-2	10.4	11.4	5.6	12.2	7.2	10.0	9.6
DF-4N and 4M	8.6	4.6	6	10.8	4.2	14.4	8.0
DF-4S	7.8	4	3.2	10.6	4.8	7.6	7.8

[1] See **map 3-1** for site locations
Source: Calculated (PM_{10} annual highest 24-hour values from table C-1 multiplied by 0.2)

Table C-4. Estimated Annual Mean STP $PM_{2.5}$ Concentrations (µg/m³) ($PM_{2.5}$ Annual Mean, NAAQS and WAAQS: 12 µg/m³), 2012-2018

Site Name[1]	2012	2013	2014	2015	2016	2017	2018
DF-2	2.9	2.9	2.4	2.7	2.4	2.9	2.7
DF-4N and 4M	2.6	1.6	1.6	1.9	1.3	2.1	1.8
DF-4S	2.7	1.5	1.4	1.8	1.6	1.8	1.7

[1] See **map 3-1** for site locations
Source: Calculated (PM_{10} annual mean values from table C-1 multiplied by 0.2)

DFM Air Quality Modeling Discussions

The following information is from the 2017 Western Fuels Association, Dry Fork Mine Air Quality Permit Application (WFA and Redhorse Corporation 2017).

The permitted coal production limit will remain at 15 Mtpy and coal preparation plant equipment specifications and controls will remain as currently permitted under MD-11723. Best Available Control Technology (BACT) is achieved at DFM through a comprehensive dust control program, point source control, and best mining practices. The mine has mitigation procedures in place and an action plan for ambient air quality standard exceedances at the four ambient monitoring sites at the mine for PM_{10} and has in place mitigation procedures to control coal fires.

Emission calculations estimates indicate that DFM will emit 238 tpy of PM_{10} during 2019 operations and 514 tpy of PM_{10} during 2025 operations. These emissions include those from all mine-associated activities (including overburden and coal removal, scraper and dozer operation, blasting, haul road travel and maintenance, coal dumping, and wind erosion of disturbed and un-reclaimed areas). The 2025 PM_{10} emissions estimate represents the highest value of any year in the mine plan, which includes mine years 2017 through 2065. PM_{10} emissions occurring from all North Group mines (Dry Fork Mine, Eagle Butte Mine, Wyodak Mine, Rawhide Mine, Buckskin Mine) as well as the Atlas Carbon facility for 2019 and 2025 were calculated to be 3,979 tpy and 1,277 tpy, respectively. **Table C-5** presents total projected particulate and gaseous emissions for 2017 through 2065. The emissions totals in **table C-5** include point, fugitive, non-road, and mobile sources.

Table C-5. Dry Fork Mine 15 Mtpy Mine Plan Emissions Summary

Year	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	GHG (CO_2e) (tpy)
2017	238	54	564	91	101	30	24,989
2018	236	54	564	91	101	30	24,972
2019	238	54	567	92	101	30	25,105
2020	256	58	615	101	110	32	27,558
2021	276	63	679	112	121	35	30,683
2022	281	64	690	115	123	35	31,265
2023	279	63	675	112	120	35	30,570
2024	282	63	668	111	119	34	30,204
2025	514	120	1,432	251	249	70	67,680
2026	505	118	1,401	245	244	68	66,198
2027-2030	107	28	331	40	72	22	12,525
2031-2035	212	54	709	101	135	39	32,616
2036-2040	237	59	782	114	147	42	36,225
2041-2045	217	55	720	103	137	39	33,220
2046-2050	253	63	834	124	156	45	38,832
2051-2055	287	71	930	141	172	49	43,552
2056-2060	200	51	674	94	129	37	30,971
2061-2065	213	54	705	100	134	39	32,485

The NO_2 analysis includes emissions from all mines in the northern group of mines plus other regional NO_X sources located within the northern group of mines analysis extents. Mine years

2019 and 2025 were also used for the NO_2 modeling analysis. These mine years represent the highest DFM and cumulative projected NO_X emissions. Maximum modeled NO_2 concentrations at all model receptors were below the annual NO_2 NAAQS/WAAQS of 100 μg/m^3 (WFA and Redhorse Corporation 2017).

Table C-14. DFM Particulate Matter Dispersion Modeling Results (μg/m^3)

Pollutant	Averaging Period	Modeled Concentration	Background Concentration	Total Concentration	WAAQS/NAAQS
		2015	**Mine**	**Year**	
PM_{10}	Annual[a]	38.4 [b]	11.4	49.8	50 [c]
		2019	**Mine**	**Year**	
PM_{10}	Annual[a]	37.7 [b]	12.0	49.7	50 [c]

a Violation occurs with more than one expected exceedance per calendar year, averaged over 3 years
b Highest modeled value
c Violation occurs when the 3-year average of the arithmetic means over a calendar year exceeds the value. EPA revoked the annual PM_{10} standard effective December 17, 2006.

WDEQ-AQD has determined that the DFM is not a major stationary source, in accordance with Chapter 6, Section 4 of the WAQSR (WDEQ-AQD 2011); therefore, a PSD increment consumption analysis was not necessary.

GHG Calculations Assumptions

Direct Emissions Variables

Source	CO_2e/Mt Coal Mined
FUEL subtotal	3,267
ELECTRICITY subtotal	2,670
PROCESS subtotal	1,148

Source: SGAC Calculations (BLM 2009)

Indirect Emissions Assumptions

Train: 130 Cars/Train, 1/2 aluminum rotary, 1/2 aluminum bottom dump (From DFM)
23 Tons/car empty - 1/2 are 21 tons and 1/2 are 25 tons (BNSF 2016)
119 Tons of Coal/Car (BNSF 2016)
15,470 Tons of Coal/Train (calculated)
200 Tons/locomotive – four per train (BNSF 2016)
3,790 Weight of empty 130-car train (tons) (calculated)
19,260 Weight of loaded coal train (tons) (calculated)

Transportation Emissions Variables

Emission Rate	(kg/gal)	CO_2e Conversion Rate	Kg CO_2e/Gal Diesel	Kg CO_2e/Mile/Ton
CO_2	10.21	1	10.21	0.023417431
CH_4	0.0000112	25	0.00028	0.000001
N_2O	0.0000224	298	0.0066752	0.000015
Total			**10.2169552**	**0.0234**

Source: EPA 2014

Transportation Variables

	Miles/gal/1 Ton[1]	Miles	Kg CO_2e/Mile/Ton[2]	Tons	Gal/Train	Kg CO_2e/Mile	Kg CO_2e/Trip	Metric Tons CO_2e/Trip
Loaded	436	1,090	0.0234	19,260.0 (Calculated)	451.3 (Calculated)	4,611.2 (Calculated)	5,026,194.3 (Calculated)	5,026.2 (Calculated)
Empty	436	1,090	0.0234	3,790.0	88.8	907.4	989,059.0	989.1

[1] FactCheck 2008
[2] EPA 2014

DFM Production, 2012-2018

	2012	2013	2014	2015	2016	2017	2018	Average
Production (Tons)	6,006,787	5,433,936	5,373,973	6,369,206	6,135,546	6,045,618	6,304,022	5,952,727

Source: WDWS 2012 through 2018

Estimated 2012 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel (Metric Tons)	19,624
Electricity (Metric Tons)	16,039
Mining Process (Metric Tons)	6,894
Total Direct (Metric Tons)	**42,557**
Indirect	
Rail Transport	
2012 Coal Production (Short Tons)	6,006,787
2012 Coal to DFS (Short Tons)	2,027,692
2012 Coal Shipped by Rail (Short Tons)	3,979,095
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	257
# Empty Trains/year	257
Rail miles to power plant	192
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	4,386,008
Kg CO2e/year Loaded	22,288,791
Kg CO2e/year Total	26,674,799
Total Metric Tons CO_2e/year	26,675
Combustion (CO_2e)	10,061,368
Total Indirect CO_2e	**10,088,043**
Total Direct + Indirect CO_2e	**10,130,600**

100% Coal shipped to U.S. power plants

Estimated 2013 DFM Equivalent CO_2e

Source	**Metric Tons**
Direct	
Fuel (Metric Tons)	14,509
Electricity (Metric Tons)	6,237
Mining Process (Metric Tons)	17,752
Total Direct (Metric Tons)	**38,498**
Indirect	
Rail Transport	
2013 Coal Production (Short Tons)	5,433,936
2013 Coal to DFS (Short Tons)	1,993,629
2013 Coal Shipped by Rail (Short Tons)	3,440,307
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	222
# Empty Trains/year	222
Rail miles to power plant	250
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	4,937,659
Kg CO2e/year Loaded	25,092,167
Kg CO2e/year Total	30,029,826
Total Metric Tons CO_2e/year	30,030
Combustion (CO_2e)	9,101,843
Total Indirect CO_2e	**9,131,873**
Total Direct + Indirect CO_2e	**9,170,371**

100% Coal shipped to U.S. power plants

Estimated 2014 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel (Metric Tons)	17,556
Electricity (Metric Tons)	14,349
Mining Process (Metric Tons)	6,168
Total Direct (Metric Tons)	**38,073**
Indirect	
Rail Transport	
2014 Coal Production (Short Tons)	5,373,973
2014 Coal to DFS (Short Tons)	2,138,037
2014 Coal Shipped by Rail (Short Tons)	3,235,936
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	209
# Empty Trains/year	209
Rail miles to power plant	142
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	2,637,984.0
Kg CO2e/year Loaded	13,405,692.0
Kg CO2e/year Total	16,043,676.0
Total Metric Tons CO_2e/year	16,044
Combustion (CO_2e)	9,001,405
Total Indirect CO_2e	**9,017,449**
Total Direct + Indirect CO_2e	**9,055,522**

100% Coal shipped to U.S. power plants

Estimated 2015 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel (Metric Tons)	20,808
Electricity (Metric Tons)	17,006
Mining Process (Metric Tons)	7,310
Total Direct	**45,124**
Indirect	
Rail Transport	
2015 Coal Production (Short Tons)	6,369,206
2015 Coal to DFS (Short Tons)	2,097,518
2015 Coal Shipped by Rail (Short Tons)	4,271,688
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	276
# Empty Trains/year	276
Rail miles to power plant	132
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	3,237,109
Kg CO2e/year Loaded	16,450,323
Kg CO2e/year Total	19,687,432
Total Metric Tons CO_2e/year	19,687
Combustion (CO_2e)	10,668,420
Total Indirect CO_2e	**10,688,107**
Total Direct + Indirect CO_2e	**10,733,231**

100% Coal shipped to U.S. power plants

Estimated 2016 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel (Metric Tons)	20,026
Electricity (Metric Tons)	16,368
Mining Process (Metric Tons)	7,035
Total Direct (Metric Tons)	**43,429**
Indirect	
Rail Transport	
2016 Coal Production (Short Tons)	6,135,546
2016 Coal to DFS (Short Tons)	1,829,403
2016 Coal Shipped by Rail (Short Tons)	4,306,143
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	278
# Empty Trains/year	278
Rail miles to power plant	141
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	3,485,712
Kg CO2e/year Loaded	17,713,669
Kg CO2e/year Total	21,199,381
Total Metric Tons CO_2e/year	21,199
Combustion (CO_2e)	10,277,040
Total Indirect CO_2e	**10,298,239**
Total Direct + Indirect CO_2e	**10,341,668**

100% Coal shipped to U.S. power plants

Estimated 2017 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel (Metric Tons)	19,765
Electricity (Metric Tons)	16,154
Mining Process (Metric Tons)	6,944
Total Direct (Metric Tons)	**42,863**
Indirect	
Rail Transport	
2017 Coal Production (Short Tons)	6,045,618
2017 Coal to DFS (Short Tons)	2,126,452
2017 Coal Shipped by Rail (Short Tons)	3,919,166
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	253
# Empty Trains/year	253
Rail miles to power plant	186
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	4,184,952
Kg CO2e/year Loaded	21,267,066
Kg CO2e/year Total	25,452,018
Total Metric Tons CO_2e/year	25,452
Combustion (CO_2e)	10,126,410
Total Indirect CO_2e	**10,151,862**
Total Direct + Indirect CO_2e	**10,194,725**

100% Coal shipped to U.S. power plants

Estimated 2018 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel (Metric Tons)	20,581
Electricity (Metric Tons)	16,822
Mining Process (Metric Tons)	7,231
Total Direct (Metric Tons)	**44,634**
Indirect	
Rail Transport	
2018 Coal Production (Short Tons)	6,303,822
2018 Coal to DFS (Short Tons)	1,969,647
2018 Coal Shipped by Rail (Short Tons)	4,334,175
Tons Coal/Train (Short Tons)	15,470
Empty Train Tons (Short Tons)	3,790
Loaded Train Tons (Short Tons)	19,260
# Loaded Trains/year	280
# Empty Trains/year	280
Rail miles to power plant	191
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.81
Kg CO2e/year Empty	4,752,517
Kg CO2e/year Loaded	24,151,315
Kg CO2e/year Total	28,903,832
Total Metric Tons CO_2e/year	28,904
Combustion (CO_2e)	10,558,902
Total Indirect CO_2e	**10,587,806**
Total Direct + Indirect CO_2e	**10,632,440**

100% Coal shipped to U.S. power plants

Estimated Annual 2019-2064 DFM Equivalent CO_2e

Source	**Quantity**
Direct	
Fuel	19,601
Electricity	16,021
Mining Process	6,886
Total Direct	**42,508**
Indirect	
Rail Transport	
2017-2065 Coal Production (Short Tons/Year)	6,000,000
2017-2065 Coal to DFS (Short Tons/ Year)	2,000,000
2017-2065 Coal Shipped by Rail (Short Tons/Year)	4,000,000
Tons Coal/Train	15,470
Empty Train Tons	35
Loaded Train Tons	15,505
# Loaded Trains/year	259
# Empty Trains/year	259
Rail miles to power plant	204
Kg CO2e/Mi/Loaded Train	451.33
Kg CO2e/Mi/Empty Train	88.8
Kg CO2e/year Empty	4,676,962
Kg CO2e/year Loaded	23,767,358
Kg CO2e/year Total	28,444,320
Total Metric Tons CO2e/year	28,444
Combustion (CO_2e)	10,050,000
Total Indirect CO_2e	**10,078,444**
Total Direct + Indirect CO_2e	**10,120,952**

100% Coal shipped to U.S. power plants

Summary of Estimated Annual Average DFM 2012-2018 and 2019-2064 CO_2e Emissions (in metric tons)

CO_2e Source	**2012 - 2018**		**2019 - 2064**	
	Avg.	**Percent of Total**	**Avg.**	**Percent From Indirect**
Direct Emissions				
Fuel	19,445	0.19	19,601	0.19
Electricity	16,111	0.16	16,021	0.16
Mining Process	6,925	0.07	6,886	0.07
Total Direct	**42,481**	**0.42**	**42,508**	**0.42**
Indirect Emissions				
Rail Transport	23,999	0.24	28,444	0.28
Power Plant Combustion	9,970,770	99.34	10,050,000	99.30
Total Indirect Emissions	**9,994,768**	**99.58**	**10,078,444**	**99.58**
Total Emissions	**10,037,249**	**100.00**	**10,120,952**	**100.00**

Annual CO_2e Emissions Values

CO_2e Source	Year									
	2011	2012	2013	2014	2015	2016	2017	2018	Avg.	2019-2064 Avg.
Direct Emissions (tons)										
Fuel	18,853	19,624	17,752	17,556	20,808	20,026	19,765	20,581	19,445	19,601
Electricity	15,409	16,039	14,509	14,349	17,006	16,368	16,154	16,822	15,892	16,021
Mining Process	6,623	6,894	6,237	6,168	7,310	7,035	6,944	7,231	6,831	6,886
Combustion at DFS										
Total Direct Emissions	**40,886**	**42,556**	**38,498**	**38,073**	**45,124**	**43,429**	**42,862**	**44,634**	**42,168**	**42,508**
Indirect Emissions (tons)										
Rail Transport	60,693	26,675	30,030	16,044	19,687	21,199	25,452	28,904	23,999	28,444
Power Plant Combustion	9,666,365	10,061,368	9,101,843	9,001,405	10,668,420	10,277,040	10,126,410	10,558,902	9,970,770	10,050,000
Total Indirect Emissions	**9,727,058**	**10,088,043**	**9,131,873**	**9,017,448**	**10,688,107**	**10,298,239**	**10,151,862**	**10,587,806**	**9,994,768**	**10,078,444**
Total Emissions (tons)	**9,767,943**	**10,130,599**	**9,170,370**	**9,055,521**	**10,733,231**	**10,341,668**	**10,194,725**	**10,632,439**	**10,036,936**	**10,120,953**

APPENDIX D

SURFACE-WATER RIGHTS within 2 MILES of the A3 TRACT and
GROUNDWATER RIGHTS within 2 MILES of the A3 TRACT

Surface-water Rights within 2 Miles of THE A3 Tract

Permit No.	Priority	Twn	Rng	Sec	Qtr-Qtr	Applicant	FacilityName	Status	Stream Source	Uses
P4492.0S	3/6/1962	050N	071W	4	NW1/4NW1/4	EUGENE SPRINGEN	CHRIS STOCK RESERVOIR	Complete	Chris Draw	STO
P4493.0S	3/6/1962	050N	071W	4	SE1/4SW1/4	EUGENE SPRINGEN	KENIS STOCK RESERVOIR	Complete	Garner Lake Draw	STO
P2618.0S	1/19/1959	050N	071W	8	NW1/4SW1/4	O. H. KENITZER	SPRING STOCK RESERVOIR	Complete	Spring Draw	STO
P5275.0S	5/27/1963	050N	072W	1	NW1/4SE1/4	BASIN ELECTRIC POWER COOP	RATTLESNAKE STOCK RESERVOIR	Complete	Rattlesnake Draw	STO
P1697.0S	11/19/1956	050N	072W	12	NW1/4SE1/4	BASIN ELECTRIC POWER COOP	DUBOIS STOCK RESERVOIR	Complete	Little Powder River	STO
P12840.0S	1/21/1997	050N	072W	13	SW1/4NW1/4	DUTTON FAMILY LIVING TRUST	DUTTON NO. 1	Complete	Dutton Draw	STO
P13002.0R	8/2/2007	050N	072W	13	NW1/4SE1/4	L & J OPERATING	KLUVER RESERVOIR	Complete	Dutton Draw	CNG; IRR
P8887.0S	6/25/1981	050N	072W	14	SW1/4NE1/4	JAMES A. AND DOROTHY VAUGHN	VAUGHN STOCK RESERVOIR	Complete	Vaughn Draw	STO
P7235.0S	5/2/1972	051N	071W	1	NE1/4SE1/4	COW CREEK RANCH I, LLLC	AMOCO STOCK RESERVOIR	Complete	Green Hill Draw	STO
P5725.0S	10/12/1966	051N	071W	27	NW1/4SW1/4	TOTAL CONSTRUCTION	ELMORE #1 STOCK RESERVOIR	Complete	Elmore Draw	STO
P6529.0S	11/28/1969	051N	071W	28	NW1/4NE1/4	ELMORE LIVESTOCK	ELMORE #5 STOCK RESERVOIR	Complete	Elmore Draw	STO
P13782.0R	4/12/2010	051N	071W	32	SE1/4NE1/4	LANDRICA DEVELOPMENT COMPANY	FACILITIES AREA SEDIMENT POND #7 RESERVOIR	Complete	Facilities Area Draw	IND
P13783.0R	4/19/2010	051N	071W	32	SE1/4NW1/4	LANDRICA DEVELOPMENT COMPANY	RAILROAD LOOP SEDIMENT POND #6 RESERVOIR	Complete	Railroad Loop Draw	IND
P8898.0R	8/22/1984	051N	071W	32	SE1/4NW1/4	LANDRICA DEVELOPMENT CO.	RAILROAD LOOP TS-1 CONTAINMENT RESERVOIR	Complete	Railroad Loop Draw (Drainage of)	CNG; IND
P8020.0R	3/27/1979	051N	071W	33	NE1/4NW1/4	GREEN BRIDGE HOLDINGS INC	FT. UNION SEDIMENT POND NO. 4 RESERVOIR	Complete	Little Prairie Creek	IND; STO
P5798.OR	1/11/1967	051N	071W	34	NW1/4NE1/4	EUGENE D AND PHYLLIS SPRINGEN	BLACK BUTTE STOCK RESERVOIR	Fully Adjudicated	Elmore Draw	STO
P24541.0D	1/16/1975	052N	072W	1	SW1/4SE1/4	D HOLLER	D.C.H. SPREADER SYSTEM NO. 1	Complete	Little Powder River	IRR
P24542.0D	1/16/1975	052N	072W	1	SW1/4SE1/4	D HOLLER	D.C.H. SPREADER SYSTEM NO. 2	Complete	Little Powder River	IRR
75736.0	09/06/1890	052N	072W	25	NW1/4SW1/4	MIKE ELMORE	PRESTON RESERVOIR			IRR
P11700.0D	2/3/1913	052N	072W	25	SE1/4NW1/4	LYDIA ELMORE	ELMORE PIPE LINE	Complete	Elmore Spring	IRR
75735.0D	09/06/1890	052N	072W	25	NW1/4SW1/4	MIKE ELMORE	PRESTON DITCH			IRR

Source: SEO 2018

Primary search was conducted on SEO database as of May 2018. Water rights with a Status Code of ELI (Eliminated), ABA (Abandoned), CAN (Cancelled) or REJ (Rejected) have been removed from the listing provided above, as they do not represent a valid current right. Record suffixes are denoted as follows:

"A" Indicates adjudicated or finalized water rights and unless the right is a territorial appropriation, there will be a match in the reference column from one of the following permit types for the unadjudicated portion of the water right.
"D" signifies a ditch or pipeline permit.
"E" signifies an enlargement of a ditch or pipeline permit.
"S" signifies a stock reservoir permit.
"R" signifies a reservoir permit.

ABBREVIATIONS FOR USES:

CNG	Coal Bed Natural Gas
DOM	Domestic
IND	Industrial
IRR	Irrigation
MIS	Miscellaneous
MON	Monitoring
MUN	Municipal
STO	Stock

Groundwater Rights within 2 Miles of the A3 Tract

Permit No.	Priority	Twn	Rng	Sec	Qtr-Qtr	Applicant	Facility Name	Status	Uses	Yield (GPM)	TD (Feet)
P101307.0W	11/13/1995	051N	071W	32	SW1/4SE1/4	GREEN BRIDGE HOLDINGS INC.	KFX-4	Fully Adjudicated	MIS	200	1,747
P101309.0W	1/5/1996	051N	071W	32	NW1/4NE1/4	GREEN BRIDGE HOLDINGS INC.	MED #3	Fully Adjudicated	MIS	25	144
P102453.0W	5/16/1996	050N	072W	13	SE1/4NW1/4	JOHN/JUDY MCCORMICK	MAC #3	Complete	DOM_GW	20	824
P104994.0W	2/6/1997	050N	072W	1	SW1/4SW1/4	JIMS WATER SERVICE, INC	FORT UNION LTD 1-14-1	Complete	CBM	27	329
P107571.0W	7/28/1997	050N	072W	12	NE1/4SW1/4	JIMS WATER SERVICE, INC	FORT UNION LTD. 4-23-12	Complete	CBM	24	178
P107573.0W	7/28/1997	050N	072W	12	NW1/4NE1/4	JIMS WATER SERVICE, INC	FORT UNION LTD. 5-31-12	Complete	CBM	23.5	305
P107574.0W	7/28/1997	050N	072W	12	NE1/4NW1/4	JIMS WATER SERVICE, INC	FORT UNION LTD. 2-21-12	Complete	CBM	26	275
P107664.0W	9/17/1997	051N	071W	32	NW1/4SE1/4	GREEN BRIDGE HOLDINGS INC.	ENL KFX-4	Fully Adjudicated	IND_GW; MIS	20	1,747
P107860.0W	10/15/1997	051N	071W	28	SE1/4NE1/4	BELLE FOURCHE PIPELINE CO.	ER-1	Complete	MON	0	20.24
P107861.0W	10/15/1997	051N	071W	28	SE1/4NE1/4	BELLE FOURCHE PIPELINE CO.	ER-2	Complete	MON	0	20.25
P107862.0W	10/15/1997	051N	071W	28	SE1/4NE1/4	BELLE FOURCHE PIPELINE CO.	ER-3	Complete	MON	0	20.24
P107863.0W	10/15/1997	051N	071W	28	NE1/4SE1/4	BELLE FOURCHE PIPELINE CO.	ER-4	Complete	MON	0	20.27
P108708.0W	5/6/1996	050N	072W	13	SE1/4NE1/4	CITY OF GILLETTE	FOX HILLS NO. 5 WELL	Fully Adjudicated	MUN_GW	600	4,170
P108950.0W	2/20/1998	051N	071W	32	SW1/4NE1/4	GREEN BRIDGE HOLDINGS, INC	KFP-1	Complete	MON	0	136.9
P111735.0W	9/9/1998	050N	072W	13	SE1/4SW1/4	LONNY & BONNIE BARTLETT	Bud #1	Complete	DOM_GW; STK		160
P111736.0W	9/9/1998	050N	072W	13	NE1/4SW1/4	John M. Kluver	Milo #2	Complete	DOM_GW; STK	7	106
P115023.0W	3/29/1999	050N	072W	13	NW1/4SW1/4	STEVEN J/RACHEL A DUTTON, TRUSTEES OF THE DUTTON FAMILY REVOCABLE LIVING TRUST, DATED JUNE 16, 1994	PT-6	Incomplete	DOM_GW; MIS; STK	25	212
P124047.0W	3/16/2000	050N	072W	13	NW1/4NE1/4	KEVAN FRALICK	FRALICK #1	Complete	DOM_GW	20	980
P130125.0W	9/28/2000	052N	072W	25	SE1/4NW1/4	REDSTONE RESOURCES OF WYOMING INC.	TRITON 14C-1922	Complete	CBM	25	426
P130688.0W	11/3/2000	051N	071W	31	NW1/4NE1/4	RMG I, LLC	WALLS 31-31-A	Complete	CBM	25	398
P131854.0W	12/29/2000	051N	071W	31	NW1/4NE1/4	RMG I, LLC	ENL Walls 31-31-A	Complete	CBM	75	398
P131855.0W	12/29/2000	051N	071W	31	SW1/4NE1/4	RMG I, LLC	ENL Walls 31-32-A	Complete	CBM	75	453
P131856.0W	12/29/2000	051N	071W	31	NW1/4SE1/4	RMG I, LLC	ENL Walls 31-33	Complete	CBM	75	571
P131974.0W	1/17/2001	052N	072W	25	SE1/4NW1/4	LEGACY RESERVES OPERATING LP	ROURKE # 1	Complete	IND_GW	0	2,525

Permit No.	Priority	Twn	Rng	Sec	Qtr-Qtr	Applicant	Facility Name	Status	Uses	Yield (GPM)	TD (Feet)
P14810.0W	7/21/1972	051N	071W	28	NE1/4SE1/4	Amoco Production Co.	SPRINGEN RANCH WATER SUPPLY #2	Fully Adjudicated	IND_GW	450	3,620
P170569.0W	9/27/2005	050N	072W	13	NW1/4SW1/4	THE DUTTON FAMILY REOCABLE LIVING TRUST	DUTTON #1	Incomplete	DOM_GW; MIS	20	585
P182018.0W	4/25/2007	051N	071W	29	NE1/4NW1/4	BASIN ELECTRIC POWER COOPERATIVE	LANCE-FOX HILLS MONITOR #1	Complete	MON	0	3754
P182039.0W	8/18/2006	051N	071W	29	SE1/4NW1/4	BASIN ELECTRIC POWER COOPERATIVE	LANCE-FOX HILLS NO. 2 WELL	Fully Adjudicated	IND_GW; MIS	525	3,628.3
P190131.0W	4/15/2009	050N	072W	13	SE1/4NE1/4	CITY OF GILLETTE	ENL FOX HILLS NO. 5 WELL	Fully Adjudicated	MUN_GW	25	
P191997.0W	12/21/2009	050N	071W	10	NW1/4NW1/4	CRYSTAL PLUMB	PLUMB #1 STOCK WELL	Complete	STK	15	565
P193976.0W	9/24/2010	050N	071W	10	NW1/4NW1/4	CRYSTAL PLUMB	ENL PLUMB #1 STOCK WELL	Complete	STK	0	
P197516.0W	2/17/2012	051N	071W	32	NW1/4NE1/4	QUALITY ENVIRONMENTAL TECH SOLUTIONS, LLC	QE #1	Incomplete	MIS	25	
P199713.0W	10/4/2012	052N	072W	25	SE1/4NW1/4	LEGACY RESERVE OPERATING, LP	OVERFILINGING OF ROURKE #1	Complete	STK	0	2,525
P20318.0W	3/13/1973	050N	072W	11	SW1/4SE1/4	ROBERT MAUL	MAUL #1	Complete	DOM_GW	20	420
P204916.0W	11/17/2015	050N	071W	3	NE1/4NE1/4	ERIC FALLON	FALLON #1	Incomplete	DOM_GW; STK	25	
P20536.0W	4/3/1973	050N	072W	14	NW1/4NE1/4	PETER WAYNE JODOZI	JODOZI #1	Complete	DOM_GW	20	290
P205754.0W	6/17/2016	050N	072W	13	SE1/4SE1/4	RTFO PROPERTIES	RTFO PROPERITES	Incomplete	MIS	15	380
P21638.0P	1/10/1973	050N	071W	18	SW1/4NW1/4	CHARLES S. KENITZER	OTTO #1	Complete	DOM_GW; STK	25	206
P21674.0P	3/31/1955	050N	071W	5	SW1/4NW1/4	Arthur J. & Edna E. Burkhardt	JINGLES #1	Complete	STK	10	80
P21675.0P	12/31/1943	051N	071W	33	SE1/4SW1/4	Arthur J. & Edna E. Burkhardt	JINGLES #3	Complete	STK	4	230
P21676.0P	12/31/1925	050N	071W	5	SW1/4NW1/4	Arthur J. & Edna E. Burkhardt	JINGLES #2	Complete	DOM_GW; STK	15	60
P21677.0P	9/30/1943	050N	071W	5	NW1/4SW1/4	Arthur J. & Edna E. Burkhardt	CORRAL #1	Complete	STK	4	100
P2267.0W	7/26/1968	051N	071W	32	SW1/4SW1/4	GLENN M. GROVES	GROVES #1	Complete	DOM_GW; STK	18	738
P22983.0P	7/31/1963	050N	071W	3	NW1/4SE1/4	PHYLLIS A. SPRINGEN	SPRINGEN #1	Complete	STK	10	420
P22984.0P	8/31/1960	051N	071W	34	NE1/4NW1/4	PHYLLIS A. SPRINGEN	SPRINGEN #2	Complete	STK	10	52
P22985.0P	12/31/1944	051N	071W	28	NE1/4NW1/4	PHYLLIS A. SPRINGEN	SPRINGEN #3	Complete	STK	15	85
P22986.0P	12/31/1944	051N	071W	33	NW1/4NW1/4	PHYLLIS A. SPRINGEN	SPRINGEN #4	Complete	STK	15	100
P22987.0P	12/31/1944	050N	071W	4	SE1/4NW1/4	PHYLLIS A. SPRINGEN	SPRINGEN #5	Complete	STK	15	90
P22988.0P	12/31/1955	051N	071W	28	SE1/4NW1/4	PHYLLIS A. SPRINGEN	SPRINGEN #6	Complete	DOM_GW; STK	15	25
P22989.0P	12/31/1953	051N	071W	28	SE1/4NW1/4	PHYLLIS A. SPRINGEN	SPRINGEN #7	Complete	DOM_GW	15	25

Permit No.	Priority	Twn	Rng	Sec	Qtr-Qtr	Applicant	Facility Name	Status	Uses	Yield (GPM)	TD (Feet)
P22990.0P	12/31/1943	051N	071W	27	NW1/4NE1/4	PHYLLIS A. SPRINGEN	SPRINGEN #8	Complete	STK	7.5	5
P22991.0P	12/31/1955	051N	071W	29	SE1/4NE1/4	PHYLLIS A. SPRINGEN	SPRINGEN #9	Complete	STK	7.5	130
P24358.0W	9/10/1973	050N	071W	6	NE1/4NW1/4	JEAN M. RYAN	JEAN M RYAN #2	Complete	STK	5	50
P24605.0W	6/28/1973	050N	071W	18	SW1/4NW1/4	COUNTRY SIDE WATER USERS COMPANY	COUNTRY SIDE WATER USERS CO #1	Fully Adjudicated	MIS	150	1,190
P24662.0P	9/10/1973	050N	071W	6	SW1/4NE1/4	JOE KAWULOK	JAY KAY #1	Complete	STK	10	250
P24663.0P	9/10/1973	050N	071W	6	SE1/4SE1/4	JOE KAWULOK	JAY KAY #2	Complete	STK	3	240
P24664.0P	9/10/1973	050N	071W	6	SW1/4SE1/4	JOE KAWULOK	JAY KAY #3	Complete	STK	2	80
P25069.0W	12/11/1973	050N	072W	13	NE1/4SW1/4	JOHN M. KLUVER	MILO #1	Complete	DOM_GW; STK	3	140
P26526.0W	4/29/1974	051N	071W	33	NE1/4NE1/4	REX L. MONAHAN	SPRINGEN RANCH MUDDY FORMATION UNIT BATTERY #1	Complete	IND_GW	250	-1
P26527.0W	4/29/1974	051N	071W	32	NE1/4SE1/4	REX MONAHAN	SPRINGEN RANCH MUDDY FORMATION UNIT BATTERY #2	Complete	IND_GW	300	-1
P27745.0W	8/15/1974	051N	071W	30	NW1/4NE1/4		PEABODY T H C	Expired	MIS	0	171
P27917.0W	9/12/1974	050N	072W	14	NW1/4NE1/4	MCKENNEY SUBDIVISION HOMEOWNER'S ASSOCIATION	MCKENNEY #1 (DEEPENDED)	Complete	DOM_GW	25	900
P28762.0W	12/24/1974	052N	072W	1	SW1/4NE1/4	D. C. HOLLER	HOLLER #1	Complete	STK	25	50
P30792.0W	7/31/1975	050N	072W	14	NW1/4NE1/4	GENE PARNELL	CP #1	Complete	DOM_GW	20	314
P31460.0W	11/6/1975	050N	071W	6	SE1/4NE1/4	JOE KAWULOK	BINKY #1	Complete	DOM_GW; STK	20	700
P31775.0W	12/30/1975	050N	071W	16	NW1/4NE1/4	Wyo State Board of Land Commissioners	EG-13B	Complete	MON	0	305
P3188.0P	4/30/1943	052N	072W	1	SW1/4NE1/4	60 Bar Ranch	60 BAR 4	Complete	STK	2	70
P32378.0P	3/3/1976	050N	071W	10	SE1/4NW1/4	WANDA L. BRICKER	BRICKER #1	Complete	STK	5	235
P33655.0W	6/4/1976	050N	071W	7	NE1/4NE1/4	Carter Oil Co.	TCOC #201	Complete	STK	25	292
P34327.0W	7/16/1976	050N	072W	11	SW1/4SE1/4	SHELDON ANDERSON	WRIGHT #1	Complete	DOM_GW	20	168
P35602.0W	11/24/1976	050N	072W	13	SW1/4NW1/4	STEVEN J/RACHEL A DUTTON TRUSTEES OF THE DUTTON FAMILY REVOCABLE LIVING TRUST	CARTER M-4-SC	Complete	MON	0	360
P36701.0W	3/23/1977	050N	071W	17	NW1/4NE1/4	Jacobs Ranch Coal Co.	WELL #17	Complete	STK	8	320
P40362.0W	8/29/1977	050N	071W	5	SE1/4NW1/4	Arthur Burkhardt	JACK #1	Complete	STK	10	300
P41682.0W	1/18/1978	050N	072W	14	NE1/4SE1/4	PAUL & PATTY MCGEE	NORTHLAND VILLAGE #1	Fully Adjudicated	MIS	45	2,100

Permit No.	Priority	Twn	Rng	Sec	Qtr-Qtr	Applicant	Facility Name	Status	Uses	Yield (GPM)	TD (Feet)
P42656.0W	3/31/1978	050N	072W	13	NW1/4SW1/4	STEVEN J/RACHEL A DUTTON TRUSTEES OF THE DUTTON FAMILY REVOCABLE LIVING TRUST	CARTER M-24-C	Complete	MON	0	365
P43849.0W	6/13/1978	051N	071W	33	NW1/4NW1/4	GREEN BRIDGE HOLDINGS, INC	EP 01A	Complete	MON	0	75
P43853.0W	6/13/1978	051N	071W	28	NW1/4NW1/4	Fort Union Ltd.	EP 04	Complete	MON	0	35
P43860.0W	6/13/1978	051N	071W	29	SE1/4NE1/4	Fort Union Ltd.	EP-10	Complete	MON	0	30
P43861.0W	6/13/1978	051N	071W	33	SE1/4SE1/4	GREEN BRIDGE HOLDINGS, INC	EP-11	Complete	MON	0	140
P5227.0W	4/10/1970	051N	071W	28	SE1/4SE1/4	N. C. GINTHER GASOLINE PLANTS	GINTHER #1	Incomplete	DOM_GW; IND_GW	10	578
P56344.0W	8/11/1980	051N	071W	28	NW1/4NW1/4	ELMORE LIVESTOCK COMPANY	FT UNION #2 E	Complete	STK	25	22
P56727.0W	5/6/1981	050N	071W	18	SW1/4SE1/4	LEMASTER ENTERPRIZES	LEMASTER ENTERPRIZES 10	Complete	STK	20	380
P6523.0P	12/31/1949	051N	071W	31	SW1/4SE1/4	GLENN M. GROVES	SHAW #1	Complete	STK	2	180
P6524.0P	12/11/1959	051N	071W	32	SW1/4SW1/4	GLENN M. GROVES	SHAW #2	Complete	STK	2	311
P6525.0P	8/21/1968	051N	071W	31	SW1/4SW1/4	JEAN RYAN	RYAN #1	Complete	STK	10	19
P6536.0W	9/18/1970	050N	071W	5	NW1/4SW1/4	ARTHUR J. BURKHARDT	JINGLES #1	Complete	STK	3	744
P66935.0W	4/12/1984	050N	072W	11	SW1/4SE1/4	WALLY & GEORGIA CASH	CASH #1	Complete	DOM_GW	24	1,228
P69075.0W	10/31/1984	050N	072W	14	NE1/4SE1/4	PAUL & PATTY MCGEE	NORTHLAND VILLAGE #2	Fully Adjudicated	MIS	75	1,040
P69918.0W	7/14/1977	050N	071W	18	NE1/4SW1/4	COUNTRYSIDE WATER USERS INC	COUNTRYSIDE WATER USERS NO. 3 WELL	Fully Adjudicated	MIS	100	1,256
P69919.0W	7/13/1978	050N	071W	18	SW1/4NW1/4	COUNTRYSIDE WATER USERS INC	ENL COUNTRYSIDE WATER USERS CO WELL NO. 1	Fully Adjudicated	MIS	0	
P70505.0W	6/27/1985	050N	072W	11	SW1/4SE1/4	WALLY & GEORGIA CASH	ENL CASH #1	Complete	STK	0	1,228
P76017.0W	11/19/1987	051N	071W	32	NW1/4SE1/4	GREEN BRIDGE HOLDINGS INC.	ENERGY BROTHERS #1	Fully Adjudicated	MIS	45	843
P9787.0W	7/15/1971	050N	071W	18	SE1/4SW1/4	GILLETTE STOCK CAR RACING ASSN.	THUNDER SPEEDWAY #1	Incomplete	MIS	25	380
P9928.0W	7/26/1971	051N	071W	33	NE1/4NE1/4	GREEN BRIDGE HOLDINGS INC.	SPRINGEN RANCH WATER SUPPLY WELL NO. 1	Fully Adjudicated	IND_GW	510	3,685

Source: SEO 2018

Notes:

GPM – Gallons per minute

Primary search was conducted on SEO database as of May 2018. Water rights with a Status Code of ABA (Abandoned), A&C (Abandoned & Cancelled), CAN (Cancelled) or EXP (Expired) have been eliminated from the listing provided above, as none of these well codes represent a current valid right. Record suffixes are denoted as follows:

ABBREVIATIONS FOR USES:

CBM	Coal Bed Methane
DOM	Domestic
IND	Industrial
MIS	Miscellaneous
MON	Monitoring
MUN	Municipal
STK	Stock

APPENDIX E

BIOLOGICAL (SOILS, VEGETATION, and WILDLIFE) ASSESSMENT RELATED
to the A3 TRACT

Soils

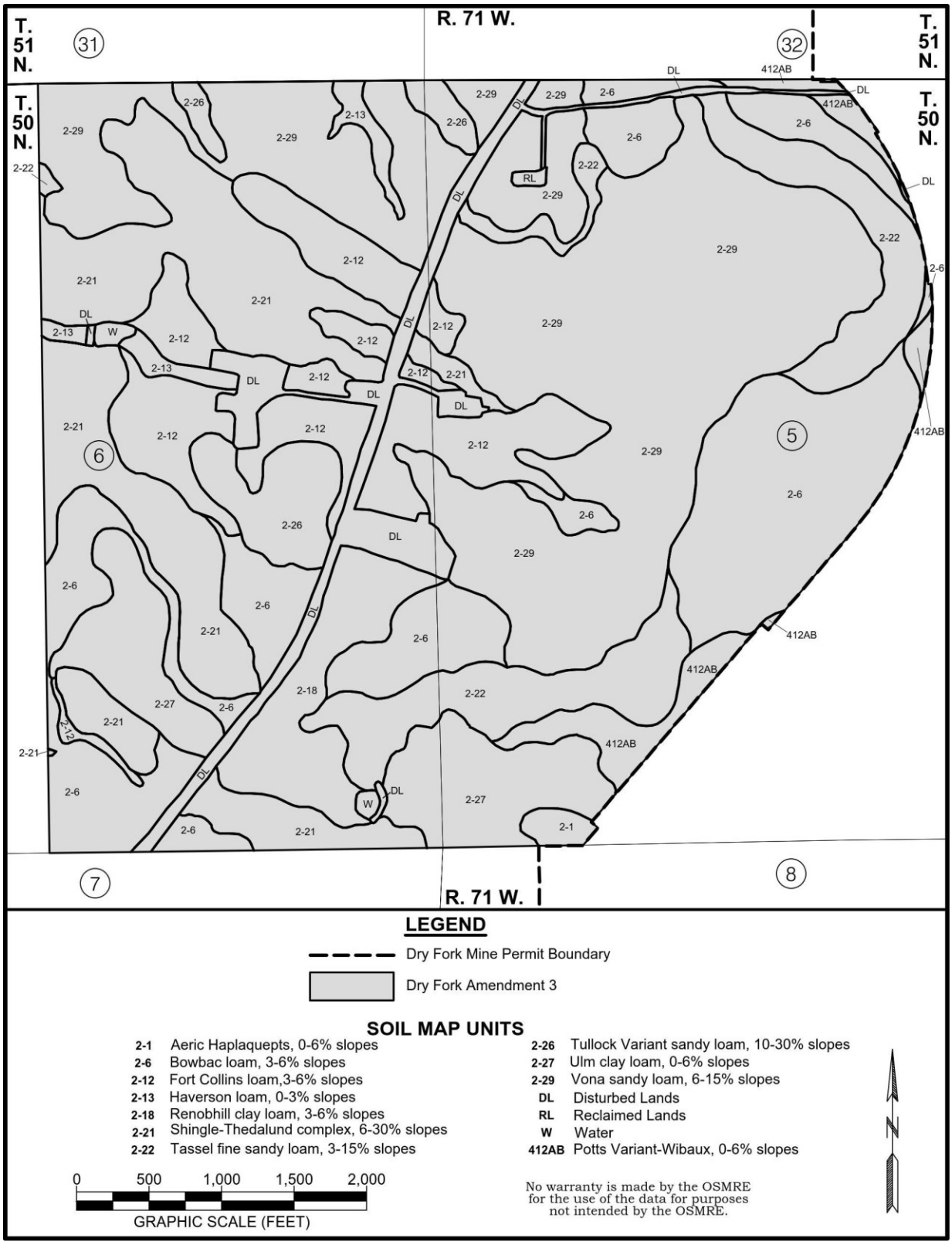
The following discussions on soils resources are summarized from Appendix D7 (Soils) of the Amendment 3 PAP (WFW 2018).

The soil resources of the A3 tract (the analysis area) were investigated by Jim Nyenhuis, Certified Professional Soil Scientist/Soil Classifier, during the spring and summer of 2016 (**table E-1**, **map E-1**). All lands within the area were mapped at the Order 1-2 level of intensity. The entire area was traversed on foot. Soil map unit boundaries were delineated by observing surface conditions, vegetation, slope position, and soil profiles exposed using a sharpshooter shovel and/or bucket auger. Soil survey information for adjacent and nearby permitted areas was reviewed to determine whether soils and their recommended salvage depths were similar to those observed within the A3 tract. WDEQ-LQD determined that the soils within the tract were similar to those currently being salvaged and utilized for reclamation at the DFM, and these soils have been previously sampled a sufficient number of times.

According to information provided on the Natural Resources Conservation Service (NRCS) website, approximately 55 percent (362 acres) of the soil map units within the A3 tract were classified as prime or unique farmlands if irrigated (NRCS 2019).

Table E-1. List of Soil Map Units and Topsoil Salvage Depths for the A3 Tract

Map Unit Symbol	Map Unit Name	Total Soil Depth (in.)	Total Salvage Depth (in.)	Limitations to Deeper Salvage
2-1	Aeric Haplaquepts, 0 to 6 percent slopes (Felix clay)	60+	60	Heavy clay texture >40 percent, possible saline-sodic at depth, wetness (hydric soil)
2-6	Bowbac loam, 3 to 6 percent slopes	20-40	30	Heavy clay texture below 24"
2-12	Fort Collins loam, 3 to 6 percent slopes	60+	40	Low organic matter content below 40"
2-13	Haverson loam, 0 to 3 percent slopes	60+	40	No major limitations
2-18	Renohill clay loam, 3 to 6 percent slopes	20-40	30	Weathered bedrock at depth
2-21	Shingle-Thedalund complex, 6 to 30 percent slopes	Sh: 10-20, Th: 20-40	Sh: 12" Th: 30" Avg. = 15	Weathered bedrock
2-22	Tassel fine sandy loam, 3 to 15 percent slopes	Ta: 10-20	18	Weathered bedrock
2-26	Tullock variant sandy loam, 10 to 30 percent slopes	20-40	30	Weathered bedrock, loamy sand texture at depth
2-27	Ulm clay loam, 0 to 6 percent slopes	60+	35	Heavy clay texture and low organic matter content below 36"
2-29	Vona sandy loam, 6 to 15 percent slopes	60+	36	Low organic matter content and possible loamy sand or sand textures below 33"
DL	Disturbed Land	--	0	No soil salvage
RL	Reclaimed Land	--	18	No more topsoil to salvage
W	Water	--	0	No soil salvage
412AB	Potts Variant (PV)-Wibaux (Wi), 0 to 6 percent slopes, 10 percent rock outcrop	PV: 20-40, Wi: 5-18	18	High percent of scoria fragments, scoria bedrock



Source: WFW 2018

Map E-1. Soil Types Associated with the A3 Tract

Vegetation

The following discussions on vegetation are summarized from Appendix D8 (Vegetation Assessment) of the Amendment 3 PAP (WFW 2018).

The field mapping of the area was completed in 2016 by Intermountain Resources. This 2016 survey was designed to map vegetation types, prepare a plant species list, and collect sampling data. Cover data associated with the A3 tract was collected in late June and early July for the grassland, sagebrush shrubland, pastureland, as well as a reference area. Shrub density sampling was completed on the grassland, upland sagebrush, and pastureland community types. Vegetation types were determined through identification of major plant species, approximate coverage of these species, dominant ground cover classes, and percentage of bare ground.

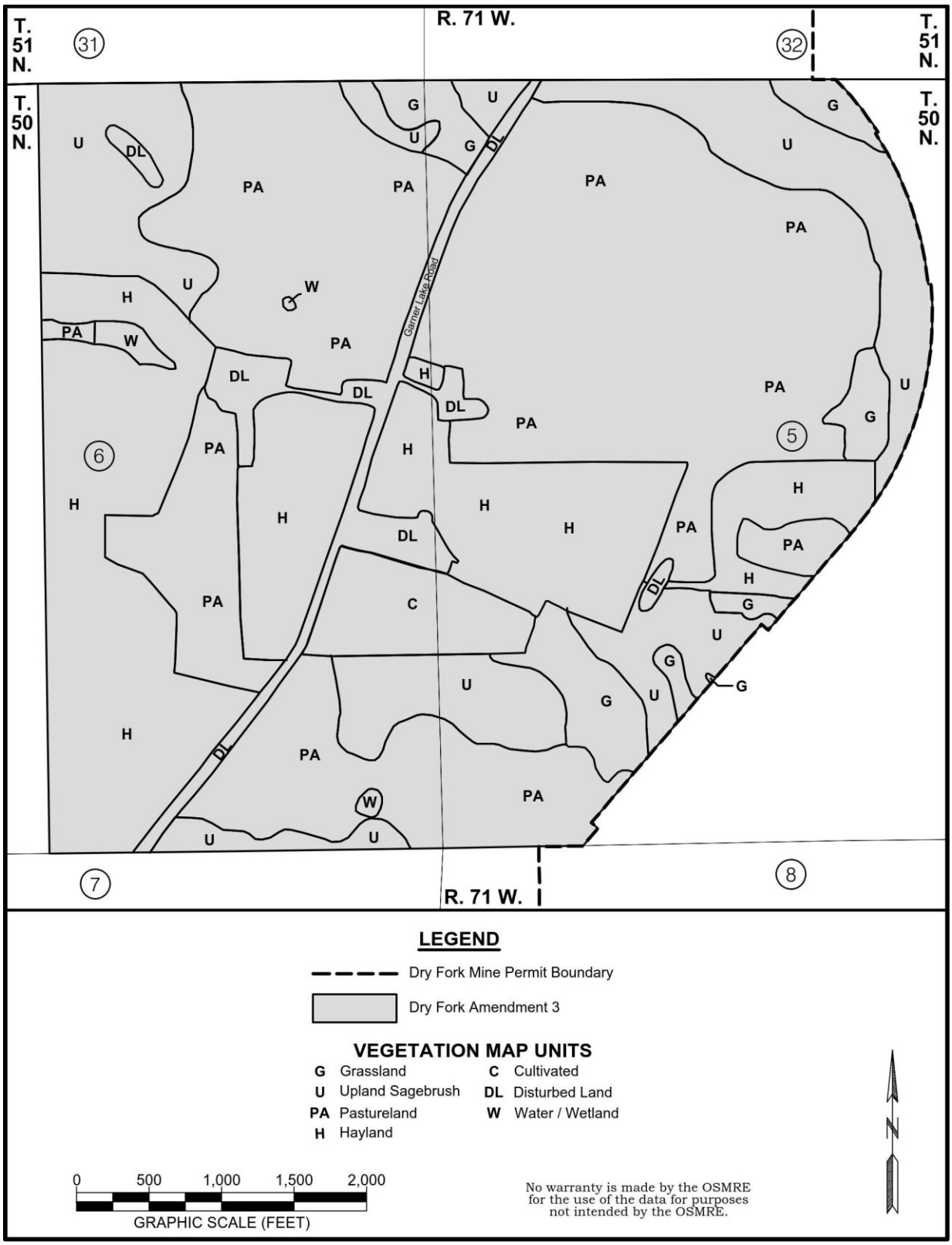
The vegetation community types identified on the study areas included grassland, upland sagebrush, pastureland hayland, cultivated crops, and disturbed land (**map E-2**).

Vegetation Community Types

Grassland – Needleandthread (*Stipa comata*) was the dominant plant species recorded on this vegetation type, followed by blue grama (*Bouteloua gracilis*), threadleaf sedge (*Carex filifolia*), crested wheatgrass (*Agropyron cristatum*), and western wheatgrass (*Pascopyrum smithii*). Annual grass species made up 7.4 percent of the total absolute vegetation cover for the grassland vegetation type. The shrub density data for the area showed that silver sagebrush (*Artemisia cana*) was the most dominant subshrub species associated with this vegetation type, while fringed sagewort (*Artemisia frigida*) was the most dominant subshrub species. Other common shrub species recorded on this type included big sagebrush (*Artemisia tridentata*) and Woods rose (*Rosa woodsia*). Other commonly recorded subshrubs on this type included broom snakeweed (*Gutierrezia sarothrae*), and Louisiana sagebrush (*Artemisia ludoviciana*).

Pastureland - Crested wheatgrass was the dominant plant species recorded on this vegetation type, accounting for approximately 78.6 percent of the total vegetation cover. Other plant species were also recorded but in lower numbers. Perennial forb species made up 3.4 percent of the total absolute vegetation cover for the pastureland vegetation type. Silver sagebrush was the most dominant shrub species recorded on this vegetation type and fringed sagewort was the most dominant subshrub species recorded in shrub density transects. Other shrub and subshrub species were also recorded but were observed in limited numbers.

Hayland – This type is managed specifically for the production of grass hay but may be mixed with alfalfa (*Medicago sativa*) on some sites. Dominant plant species were crested wheatgrass, alfalfa, and a small amount of smooth brome (*Bromus inermis*). Shrub density sampling was not conducted for this vegetation type since shrub species have been removed by hay production operations.



Map E-2. Vegetation Map Units (Community Types) Associated with the A3 Tract

Disturbed Land - This type is typically paved roads, gravel roads, dwellings, and ranch operations. These sites were not sampled during the 2016 vegetation survey because of the limited amount of vegetation present on those areas.

Cultivated Crops – This type was planted to barley (*Hordeum vulgare*) during the 2016 vegetation survey period. In various prior years, plantings included oats (*Avena sativa*), wheat (*Triticeum aestivum*), or other crops.

Water/Wetland - This type is discussed in detail in **sections 3.5** and **3.7** and consists of stockponds, playas, and small depressions.

Trees

The trees found within the A3 tract were typically associated with dwellings and ranch facilities. The most abundant trees observed were Siberian elm (*Ulus pumila*), followed by the plains cottonwood (*Populus deltoides*), and juniper (*Juniper* spp.).

Plant Special Status Plant Species

Threatened or endangered plants or other plant species of special concern, as listed by the USFWS and other agencies, were not encountered within the A3 tract (WFW 2018). Habitat for the Ute ladies'-tresses (*Spiranthes diluvialis*) was not found in the area due to the lack of suitable wetlands. However, the marginal habitats were surveyed on August 4, 2016 and no Ute ladies'-tresses were found.

The State of Wyoming maintains a list of designated noxious weeds (Wyoming Department of Agriculture [WDOA] 2018). This list includes invasive and nonnative plant species that, once established, can out-compete and eventually replace native species thereby reducing forage productivity and the overall vigor and diversity of existing native plant communities. The following 30 plant species are currently designated as noxious weeds by the State of Wyoming:

1. Field bindweed (*Convolvulus arvensis*),
2. Canada thistle (*Cirsium arvense*),
3. Leafy spurge (*Euphorbia esula*),
4. Perennial sowthistle (*Sonchus arvensis*)
5. Quackgrass (*Agropyron repens*),
6. Hoary cress (*Cardaria draba*),
7. Perennial pepperweed (giant whitetop) (*Lepidium latifolium*),
8. Ox-eye daisy (*Chrysanthemum leucanthemum*),
9. Skeletonleaf bursage (*Franseria discolor Nutt.*),
10. Russian knapweed (*Centaurea repens*),
11. Yellow toadflax (*Linaria vulgaris*),
12. Dalmatian toadflax (*Linaria dalmatica*),
13. Scotch thistle (*Onopordum acanthium*),
14. Musk thistle (*Carduus nutans*),
15. Common burdock (*Arctium minus*),
16. Plumeless thistle (*Carduus acanthoides*),

17. Dyers woad (*Isatis tinctoria*),
18. Houndstongue (*Cynoglossum officinale*),
19. Spotted knapweed (*Centaurea maculosa*),
20. Diffuse knapweed (*Centaurea diffusa*),
21. Purple loosestrife (*Lythrum salicaria.*),
22. Saltcedar (*Tamarix* spp.),
23. Common St. Johnswort (*Hypericum perforatum*),
24. Common tansy (*Tanacetum vulgare*),
25. Russian olive (*Elaeagnus angustifolia.*),
26. Black henbane (*Hyoscyamus niger*),
27. Common mullein (*Verbascum thapsus*),
28. Yellow starthistle (*Centaurea solstitialis*),
29. Ventenata (*Ventenata dubia*), and
30. Medusahead rye (*Taeniatherum caput-medusae*).

In addition to those listed above, the following four plant species are currently designated as noxious weeds by Campbell County:

1. Buffalobur (*Solanum rostratum*),
2. Common cocklebur (*Iva xanthifolia*),
3. Poison hemlock (*Conium maculatumand*), and
4. Jointed goatgrass (*Aegilops cylindrical*).

The state listed noxious weed species that were found within the A3 tract included Canada thistle, Scotch thistle, dalmatian toadflax, skeletonleaf bursage, and field bindweed (WFW 2018). These noxious weeds were not abundant. Selenium indicator species were not common on this amendment area in 2016.

Total annual grasses comprised from 0.2 to 7.7 percent of the total relative vegetative cover on the 2016 vegetation survey areas. Cheatgrass brome (*Bromus inermis*) and field brome (Japanese brome [*Bromus japonicus*]) were the major annual grass species encountered during the 2016 vegetation survey (WFW 2018). Cheatgrass brome and field brome are not state designated noxious weeds in Wyoming and not county-designated noxious weeds in Campbell County but cheatgreass brome is considered a noxious weed in some Wyoming counties.

Wildlife

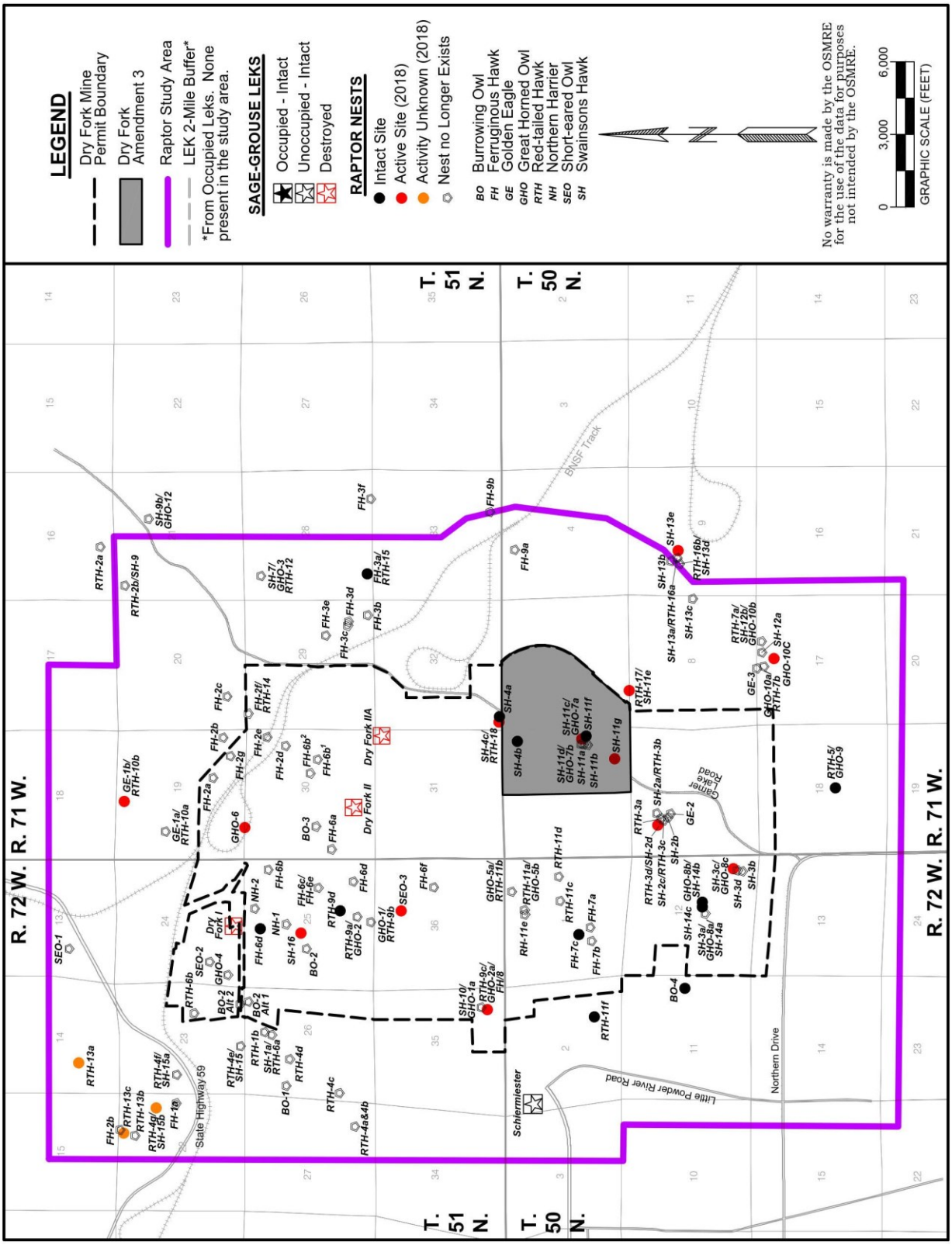
The discussions included in section 3.9 of the A2TR1 EA provide details regarding the description of wildlife resources associated with the DFM in 2017. A majority of these details have not changed and are incorporated here by reference. Where appropriate, information has been updated or restated for informational purposes. In addition, the following discussions on wildlife resources are summarized from Appendix D9.2 (Wildlife) of the Amendment 3 PAP (WFW 2018).

Raptors

Eleven raptor species (northern harrier [*Circus cyaneus*], ferruginous hawk [*Buteo regalis*], Swainson's hawk [*Buteo swainsoni*] red-tailed hawk [*Buteo jamaicensis*], golden eagle [*Aquila chrysaetos*], bald eagle [*Haliaeetus leucocephalus*], prairie falcon [*Falco mexicanus*], American kestrel [*Falco sparverius*], great horned owl [*Bubo virginianus*], short-eared owl [*Asio flammeus*], and burrowing owl [*Athene cunicularia*]) were recorded within the raptor monitoring area (**map E-3**) during DFM baseline inventories. The ferruginous hawk, red-tailed hawk, Swainson's hawk, golden eagle, burrowing owl, and great horned owl are raptor species common to the region that are known to have nested within the DFM raptor monitoring area in the past. The 2017 Annual Wildlife Report identified the location of and annual status of raptor nests for 2017 (WFW). The location and status of raptor nests as of 2017 are included on **map E-3**. Two intact raptor nests (SH-4b and SH-11f) are located within the A3 tract. Nest SH-4b is located on an artificial platform but it has not been utilized since at least 2006. SH-11f, located in a tree associated with a ranch facility home site, was active in 2017, producing three young. As shown on **map E-3**, Nest SH-4C/RTH-18 is located immediately adjacent (north) of the A3 tract and this nest was active in 2017, producing two young. BLM sensitive raptor species that could potentially occur in the area include the burrowing owl, ferruginous hawk, golden eagle, northern goshawk (*Accipiter gentilis*), Swainson's hawk, and peregrine falcon (*Falco peregrinus*). None of these species has been documented as nesting within the tract (WFW 2019b).

Greater Sage-grouse

The project area is not within a core population area, as delineated in the Wyoming Greater Sage-Grouse Core Area Protection strategy and a 2-mile seasonal buffer (March 15 to June 30) applies to occupied leks within non-core population areas (Office of the Governor 2015). One historical Greater sage-grouse lek complex (Dry Fork II/IIA) has been documented within 2 miles of the A3 tract. However, the Dry Fork II lek was destroyed by mining in 2005 and the Dry Fork IIA lek was destroyed by mining in 2017. Both leks within this complex have been designated as unoccupied by the WGFD. The summary of Greater sage-grouse strutting ground inventories for leks near the A3 tract shown in **table E-3** indicates that while bird numbers on these leks have fluctuated over the past 17 years, the counts from 2000 through 2018 showed that overall lek attendance numbers for the monitored leks had declined to zero.



Map E-3. Wildlife Use Associated with the A3 Tract

Threatened, Endangered, Proposed, and Candidate Species, and Vertebrate Species of Special Interest

The information presented in this section was obtained from the USFWS Information for Planning and Conservation (IPaC) system and Natural Resource and Energy Explorer (NREX), which is a web GIS-based software tool that supports pre-planning development considerations andfacilitates the assessment of energy, environmental, cultural, socioeconomic and infrastructural assets in Wyoming (NREX 2019).

Threatened, Endangered, Proposed, and Candidate (T&E) Species

The 2018 USFWS list of T&E species includes the northern long-eared bat (*Myotis septentrionalis*), which is listed as threatened. The analysis area for most T&E species included the DFM permit boundary.

Due to the proximity of the DFM to the DFS power plant and due to the fact that some of the coal mined from the A3 tract would likely be used at the DFS, the analysis area for the northern long-eared bat included the airshed analysis boundary for Hg deposition from mining and coal combustion. Additional information was gathered through incidental observations of species recorded during other field surveys. No critical habitat for this species has been identified in the area (USFWS 2018a).

While USFWS information indicates that the northern long-eared bat could occur in the area, habitat (caves and mine shafts as winter habitat and caves, mine shafts, and trees for summer habitat, USFWS [2016d]) is not present in the A3 tract to support the threatened northern long-eared bat (USFWS 2018b).

Vertebrate Species of Special Interest (SOSI)

Information provided on the NREX website was utilized for the determination of SOSI species that could occur in the area. For the purposes of this discussion, SOSI include BLM sensitive species, Wyoming Natural Diversity Database (WYNDD) species of concern (SOC), species protected under MBTA, and WGFD species of greatest conservation need (SGCN). USFWS T&E species are not included in this category. There is a considerable amount of crossover between the species occurrence on the various lists included in SOSI (**table E-4**). BLM sensitive species include those species listed or proposed for listing under the ESA together with species designated internally as BLM sensitive in accordance with BLM Manual 6840 (BLM 2008). WYNDD has developed a list (with supporting documentation) of SOC in Wyoming that are rare, endemic, disjunct, threatened, or otherwise biologically sensitive. The MBTA prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations. Except for introduced species and some upland game birds, almost all birds occurring in the wild in the United States are protected (50 CFR § 10.13) (USFWS 2018a). WGFD SGCN includes wildlife species with low and declining populations that are indicative of the diversity and health of the Wyoming's wildlife (WGFD 2017). The WGFD's SGCN designation process is based upon its Native Species Status (NSS) classification system. The WGFD then places each SGCN into one of three tiers of management based on its total score: Tier I (highest priority), Tier II (moderate priority), and Tier III (lowest priority).

As determined from the NREX list, 46 terrestrial-vertebrate SOSI have the potential of occurring within the project area. As shown in **table E-4**, 42 WGFD SGCN, 31 species protected under the MBTA, 17 WYNDD SOC, 13 BLM sensitive species, and 2 WGFD-designated Tier I terrestrial-vertebrate species have the potential of occurring within the project area. According to monitoring results, 15 of these SOSI have been confirmed as occurring within or adjacent to the A3 tract during baseline or annual monitoring. Eight of the BLM sensitive species and seven the WYNDD SOC have been observed during wildlife surveys within the project area. One of the WGFD designated Tier I species (burrowing owl) has been observed within the project area.

Table E-2. Raptor Production Summary for Nests Located within and Adjacent to the A3 Tract, 2014-2018

Species/ Nest No.	Nest Substrate	Status	Year				
			2014	2015	2016	2017	2018
SH-4a	Tree	Intact	ALT	ALT	ALT	ALT	ALT
SH-4b	Platform C-M/1995	Intact	ALT	ALT	ALT	ALT	ALT
SH-4c	Tree	Intact	RTH-18	RTH-18	RTH-18	RTH-18	RTH-18
SH-11a	Tree	D-N/2000					
SH-11b	Tree	D-N/2003					
SH-11c	Tree	Intact	--	--	--	--	GHO-7a
SH-11d	Tree	D-N/2014	GHO-7b				
SH-11e	Power Pole	Intact	--	--	--	--	A-T
SH-11f	Tree	Intact	--	--	A,2+,2+	A,3,3	I
SH-11g	Tree	Intact	--	--	--	--	A,0,0
GHO-7a	Tree	Intact	--	--	--	--	A,2,2
GHO-7b	Tree	D-N/2014	A,0,0/D-N				
RTH-18	Tree	Intact	A,3,3	A,2,2	A,2+,2	A,2,2	A,2,2

Species: SH – Swainson's hawk
GHO – Great horned owl
RTH – Red-tailed hawk

Status: -- Status unknown
I – Inactive nest
A – Nest active, # young hatched, # young fledged
A-T – Nest tended but no incubating birds were observed
ALT - Alternate nest site for a breeding pair (nest inactive)
D-N - Nest destroyed by natural causes/year nest was last intact
C-M – Nest created as mitigation/year created

Table E-3. Greater Sage-grouse Lek Survey Results (Maximum Male Attendance) for Leks Near the A3 Tract[1], 2000-2018

Lek / Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Dry Fork I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dry Fork II[2]	20	15	15	6	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dry Fork IIA[2]	*	*	*	*	*	6	6	4	0	2	0	1	0	0	0	0	0	--	--
Schiermiester[2]	12	12	7	8	5	5	1	0	0	0	0	0	0	0	0	0	0	0	0

[1] Lek locations are shown on **map E-3**
[2] WGFD currently classifies the lek as unoccupied
* Lek not in existence
-- Lek destroyed by mining
Source: WGFD 2018b

Table E-4. Vertebrate Species of Special Interest Associated with the Proposed Action

Common Name	Scientific Name	Status Under the ESA	Protected Under the MBTA	Listed as a BLM Sensitive Species	Listed as a WYNDD SOC	WGFD			Observed in the Area
						SGCN	NNS	Tier	
Western tiger salamander	*Ambystoma mavortium*					Yes	NSS4(Bc)	III	
Great plains toad	*Anaxyrus cognatus*					Yes	NSSU(U)	II	
Northern leopard frog	*Lithobates pipiens*	NW		Yes	Yes	Yes	NSS4(Bc)	II	
Plains spadefoot	*Spea bombifrons*				Yes	Yes	NSS4(Bc)	II	
Western grebe	*Aechmophorus occidentalis*		Yes			Yes	NSSU(U)	II	
Baird's sparrow	*Ammodramus bairdii*	NW	Yes	Yes	Yes	Yes	NSS4(Bc)	II	
Grasshopper sparrow	*Ammodramus savannarum*		Yes			Yes	NSS4(Bc)	II	Yes
Golden eagle	*Aquila chrysaetos*		Yes			Yes	NSS4(Bc)	II	Yes
Great blue heron	*Ardea herodias*		Yes			Yes	NSS4(Bc)	II	
Short-eared owl	*Asio flammeus*		Yes		Yes	Yes	NSS4(Bc)	II	Yes
Burrowing owl	*Athene cunicularia*		Yes	Yes	Yes	Yes	NSSU(U)	I	Yes
Redhead	*Aythya americana*		Yes						
Canvasback	*Aythya valisineria*		Yes						
Upland sandpiper	*Bartramia longicauda*		Yes			Yes	NSSU(U)	II	Yes
Ferruginous hawk	*Buteo regalis*	NW	Yes	Yes	Yes	Yes	NSS4(Cb)	II	Yes
Swainson's hawk	*Buteo swainsoni*		Yes			Yes	NSSU(U)	II	Yes
Lark bunting	*Calamospiza melanocorys*		Yes						Yes
Chestnut-collared longspur	*Calcarius ornatus*		Yes		Yes	Yes	NSS4(Bc)	II	
Greater Sage-grouse	*Centrocercus urophasianus*	NW		Yes	Yes	Yes	NSS4(Bc)	II	Yes
Mountain plover	*Charadrius montanus*	NW	Yes	Yes	Yes	Yes	NSSU(U)	I	
Black tern	*Chlidonias niger*		Yes		Yes	Yes	NSS3(Bb)	II	
Black-billed cuckoo	*Coccyzus erythropthalmus*		Yes		Yes	Yes	NSS4(Bc)	II	
Bobolink	*Dolichonyx oryzivorus*		Yes		Yes	Yes	NSS4(Bc)	II	
Willow flycatcher	*Empidonax traillii*		Yes			Yes	NSS3(Bb)	III	
Merlin	*Falco columbarius*		Yes			Yes	NSSU(U)	III	
American kestrel	*Falco sparverius*		Yes			Yes	NSS4(Bc)	III	Yes
Common yellowthroat	*Geothlypis trichas*		Yes			Yes	NSS4(Bc)	III	
Bald eagle	*Haliaeetus leucocephalus*	DM	Yes	Yes	Yes	Yes	NSS3(Bb)	II	Yes
Loggerhead shrike	*Lanius ludovicianus*		Yes	Yes	Yes	Yes	NSS4(Bc)	II	Yes
Red-headed woodpecker	*Melanerpes erythrocephalus*		Yes			Yes	NSS4(Bc)	II	
Long-billed curlew	*Numenius americanus*		Yes	Yes	Yes	Yes	NSS3(Bb)	II	Yes
Sage thrasher	*Oreoscoptes montanus*		Yes	Yes		Yes	NSS4(Bc)	II	Yes
White-faced ibis	*Plegadis chihi*		Yes	Yes	Yes	Yes	NSS3(Bb)	II	
Virginia rail	*Rallus limicola*		Yes			Yes	NSSU(U)	III	
Dickcissel	*Spiza americana*		Yes			Yes	NSSU(U)	II	
Brewer's sparrow	*Spizella breweri*		Yes	Yes		Yes	NSS4(Bc)	II	Yes

Table E-4. Vertebrate Species of Special Interest Associated with the Proposed Action

Common Name	Scientific Name	Status Under the ESA	Protected Under the MBTA	Listed as a BLM Sensitive Species	Listed as a WYNDD SOC	WGFD			Observed in the Area
						SGCN	NNS	Tier	
Black-tailed prairie dog	*Cynomys ludovicianus*	NW		Yes	Yes	Yes	NSS4(Cb)	II	
Sagebrush vole	*Lemmiscus curtatus*					Yes	NSS4(Cb)	II	
Prairie vole	*Microtus ochrogaster*								
Little brown myotis	*Myotis lucifugus*	UR				Yes	NSS3(Bb)	II	
Olive-backed pocket mouse	*Perognathus fasciatus*					Yes	NSS4(Cb)	III	
Western painted turtle	*Chrysemys picta bellii*					Yes	NSS4(Bc)	III	
Prairie rattlesnake	*Crotalus viridis*					Yes	NSS4(Bc)	III	
Plains hog-nosed snake	*Heterodon nasicus*					Yes	NSSU(U)	II	
Western milksnake	*Lampropeltis gentilis*					Yes	NSS3(Bb)	II	
Plains gartersnake	*Thamnophis radix*					Yes	NSSU(U)	III	

USFWS: ESA – status as a T&E species: NW-not warranted for listing, DM-delisted, UR-petition for listing under review
BCC – status as a USFWS bird of conservation concern
MBTA – protected under the Migratory Birds Treaty Act
BLM: Listed as a sensitive species by BLM
WYNDD: Determined to be a species of concern
WGFD: SGCN – species of greatest conservation need, which is based upon the NSS classification system
Source: NREX 2019

Vertebrate Species of Special Interest Summary

Amphibians	4
Birds	32
Mammals	5
Retiles	5
Total	46

31	MBTA
13	BLM Sensitive
17	WYNDD SOC
42	WGFD SGCN
42	NSS

Highest Priority	- Tier I	2
Moderate Priority	- Tier II	30
Lowest Priority	- Tier III	10

NSSU	11	NSSU	11	Undetermined
NSS1	0	NSS1	0	Imperiled/Extreme
NSS2	0	NSS2(Ba)	0	Vulnerable/Extreme
NSS3	7	NSS3(Bb)	7	Vulnerable/Severe
NSS4	24	NSS4(Bc)	20	Vulnerable/Moderate
		NSS4(Cb)	4	Stable/Severe

APPENDIX F

STATE and FEDERAL REVENUE CALCULATIONS RELATED to the A3 TRACT

Estimated 2018 Fiscal Revenue from 2017 Coal Production in Campbell Co. (Million U.S. Dollars)

Revenue Source	Total Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	477.5	238.8	238.8
Abandoned Mine Lands Fund	85.6	57.6	28.0
Severance Tax	196.1		196.1
Bonus Bid Annual Revenues	0.0	0.0	0.0
Ad Valorem Tax	161.2		161.2
Black Lung	161.3	161.3	
Sales and Use Tax	25.3		25.3
Totals	**1106.9**	**457.6**	**649.3**
$/Ton			**$2.05**

Total Future Revenues from DFM (No Action Alternative) (Million U.S. Dollars)

Revenue Source	Total Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	363.9	181.9	181.9
Abandoned Mine Lands Fund	65.2	32.6	32.6
Severance Tax	152.2		152.2
Bonus Bid Annual Revenues	0.0	0.0	0.0
Ad Valorem Tax	122.81		122.8
Black Lung	9.81	9.8	
Sales and Use Tax	18.6		18.6
Totals	**732.5**	**224.3**	**508.1**
$/Ton			**$2.18**

Future Revenues added by the A3 tract only (Million U.S. Dollars)

Revenue Source	Total Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	90.8	45.4	45.4
Abandoned Mine Lands Fund	16.3	8.1	8.1
Severance Tax	36.0	0.0	36.0
Bonus Bid Annual Revenues	0.0	0.0	0.0
Ad Valorem Tax	30.7	0.0	30.6
Black Lung	2.4	2.4	0.0
Sales and Use Tax	4.6	0.0	4.7
Totals	**180.8**	**55.9**	**124.8**
$/Ton			**$2.25**

Total Future Revenues from DFM (existing mine plus A3 tract) (Million U.S. Dollars)

Revenue Source	Total Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	454.7	227.3	227.3
Abandoned Mine Lands Fund	81.5	40.7	40.7
Severance Tax	188.2	0.0	188.2
Bonus Bid Annual Revenues	0.0	0.0	0.0
Ad Valorem Tax	153.5	0.0	153.5
Black Lung	12.3	12.3	0.0
Sales and Use Tax	23.2	0.0	23.2
Totals	**913.4**	**280.3**	**632.9**
$/Ton			**$2.18**

Difference Between the No Action Alternative and the Proposed Action (Million U.S. Dollars)

Revenue Source	Total Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	90.8	45.4	45.4
Abandoned Mine Lands Fund	16.3	8.1	8.1
Severance Tax	36.0	0.0	36.0
Bonus Bid Annual Revenues	0.0	0.0	0.0
Ad Valorem Tax	30.6	0.0	30.6
Black Lung	2.4	2.4	0.0
Sales and Use Tax	4.7	0.0	4.7
Totals	**180.8**	**56.0**	**124.8**

Estimated 2022 Campbell Co. Fiscal Revenue (Million U.S. Dollars)

Revenue Source	Total Collected	Federal Revenue	State Revenue
Federal Mineral Royalties	438.2	219.1	219.1
Abandoned Mine Lands Fund	78.5	39.3	39.3
Severance Tax	173.7		173.7
Bonus Bid Annual Revenues	0.0	0.0	0.0
Ad Valorem Tax	147.9		147.9
Black Lung	11.8	11.8	
Sales and Use Tax	22.4		22.4
Totals	**872.4**	**270.2**	**602.3**
$/Ton			**$2.15**

All revenues were calculated using variables presented below.

Bonus Bid Payments, 2008-2017

Bonus Bids	Lease-Month	Tons	Total Bid	$/Ton	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
WYW155132	Eagle Butte West - May	255,000,000	$180,540,000.00	$0.71	$36,108,000.00	$36,108,000.00	$36,108,000.00	$36,108,000.00	$36,108,000.00					
					$144,432,000.00	$108,324,000.00	$72,216,000.00	$36,108,000.00	$0.00					
WYW174407	South Maysdorf - August	288,100,000	$250,800,000.00	$0.87	$50,160,000.00	$50,160,000.00	$50,160,000.00	$50,160,000.00	$50,160,000.00					
					$200,640,000.00	$150,480,000.00	$100,320,000.00	$50,160,000.00	$0.00					
WYW154432	North Maysdorf - August	54,657,000	$48,098,424.00	$0.88		$9,619,684.80	$9,619,684.80	$9,619,684.80	$9,619,684.80	$9,619,684.80				
						$38,478,739.20	$28,859,054.40	$19,239,369.60	$9,619,684.80	$0.00				
WYW177903	West Antelope South	56,356,000	$49,311,500.00	$0.88				$9,862,300.00	$9,862,300.00	$9,862,300.00				
								$39,449,200.00	$29,586,900.00	$0.00				
WYW163340	West Antelope North	350,263,000	$297,723,228.00	$0.85				$59,544,645.60	$59,544,645.60	$59,544,645.60	$59,544,645.60	$59,544,645.60		
								$238,178,582.40	$178,633,936.80	$119,089,291.20	$59,544,645.60	$0.00		
WYW161248	Belle Ayr North	221,734,800	$210,648,060.00	$0.95				$42,129,612.00	$42,129,612.00	$42,129,612.00	$42,129,612.00	$42,129,612.00		
								$168,518,448.00	$126,388,836.00	$84,259,224.00	$42,129,612.00	$0.00		
WYW172657	Caballo West	130,196,000	$143,417,403.80	$1.10				$28,683,480.76	$28,683,480.76	$28,683,480.76	$28,683,480.76	$28,683,480.76		
								$114,733,923.04	$86,050,442.28	$57,366,961.52	$28,683,480.76	$0.00		
WYW174596	South Hilight	222,676,000	$300,001,011.66	$1.35					$60,000,202.33	$60,000,202.33	$60,000,202.33	$60,000,202.33	$60,000,202.33	
									$240,000,809.33	$180,000,607.00	$120,000,404.66	$60,000,202.33	$0.00	
WYW176095	South Porcupine LBA	401,830,508	$446,031,864.00	$1.11					$89,206,372.80	$89,206,372.80	$89,206,372.80	$89,206,372.80	$89,206,372.80	
									$356,825,491.20	$267,619,118.40	$178,412,745.60	$89,206,372.80	$0.00	
WYW173408	North Porcupine LBA	721,154,828	$793,270,311.00	$1.10					$158,654,062.20	$158,654,062.20	$158,654,062.20	$158,654,062.20	$158,654,062.20	
									$634,616,248.80	$475,962,186.60	$317,308,124.40	$158,654,062.20	$0.00	
Average				**$0.98**	**$86,268,000.00**	**$95,887,684.80**	**$95,887,684.80**	**$236,107,723.16**	**$543,968,360.49**	**$457,700,360.49**	**$438,218,375.69**	**$438,218,375.69**	**$307,860,637.33**	**$0.00**

Source: BLM 2017. Bids are paid off in equal four annual payments, after the initial 1/5 amount payment attached to the bid.

Revenue Variables

Coal Surface #	Units of Taxable Valuation	Taxable Valuation	Taxable Valuation Per Unit	Average Tax Levy (Mills)	Estimated Ad Valorem Tax Levied	Average Tax Per Unit	Sev. Tax Rate %	Estimated Severance Tax Collectible	Average Sev. Tax Per Unit
2017 Wyoming	295,805,879	$2,879,630,622	9.73	59.910	$172,518,671	0.5832	0.07	201,574,144	$0.6814
2017 Campbell Co.	270,867,980	$2,458,928,638	9.08	59.554	$146,439,036	0.5406	0.07	172,125,005	$0.6355
2017 Wyoming	314,755,317	$2,995,345,054	9.52	62.462	$187,095,243	0.5944	0.07	209,674,154	$0.6661
2017 Campbell Co.	292,994,954	$2,592,159,599	8.85	59.610	$154,518,634	0.5274	0.07	181,451,172	$0.6193

Source: WDOR 2017 and 2018

Revenue Calculations Variables

Coal Production Values		Campbell	Wyoming
	2017 Tons Produced[1]	292,994,954	314,755,317
	2022 Tons Produced (Estimated)	280,430,000	290,000,000
	% From Campbell Co.	93.09	
	DFM Tract[2]	Tons Minable	Tons Recoverable
	No Action Alternative	250,401,075	232,873,000
	Added by Proposed Action	67,119,133	58,128,000
	Average 2017 Sales Price ($/ton)		
	2017 PRB Subbituminous Coal	$12.52[2]	$12.50[3]
	2017 Price without BLT[4]	$12.48	$12.46
Federal Royalties	Federal Royalties[3]	$457,804,615.63	
	Wyoming Share = 0.5 x FR	$228,902,307.81	
Abandoned Mine Lands Funds[5]	AML From Campbell County Total	$82,038,587.12	
	WY Share[6]	$28,000,000.00	
Severance Taxes[7]	Campbell ST Rate/Ton	$0.6193	
	2017 Severance Taxes[8]	$194,927,319.95	
Lease Bonus Bids (2017 Payments)	Total 2017+ Bonus Bid Payments	$0.00	
	WY share	$0.00	
Campbell Ad Valorem Taxes (AVT)[7]	AVT Rate/ton	$0.53	
	AVT (Total)	$154,150,547.03	
Black Lung	2017 BLT Rate/Ton[9]	$0.528	
	2017 BLT Collected[10]	$154,602,548.14	
	Future BLT Rate/Ton[11]	$0.52682	
	Future BLT Collected	$147,736,111.11	
2017 Campbell Co. Employment (mining)[12]	Buckskin	202	
	Belle Ayr	244	
	Eagle Butte	271	
	Cordero Rojo	366	
	Antelope	526	
	Caballo	160	
	NARM	1,364	
	Rawhide	113	
	Black Thunder	1,220	
	Coal Creek	155	
	Dry Fork	79	
	Wyodak	63	
	Total	4,763	
Federal Income Tax[13]	Head of Household income info:		
	10% on first $12,750		
	15% on next (up to $48,600)		
	Rate[10]	13.6%	
	Tax/employee	$6,197.23	
	Fed Tax	$29,517,409.88	
Fiscal Year 2017 Sales and Use Tax[14]	Coal Mining	$25,262,023.00	
	$/ton	$0.0803	

1 Source: WDWS 2017
2 USEIA 2018
3 Calculated – 2017 Tons produced x 2017 sales price per ton x 12.5%
4 Black lung tax removed since it is included in the sale price
5 Calculated - AML = $0.28 per ton produced - through 2021, WY share = 0.5 x AML (Max $28,000,000/yr. as of September 2013), Price from CREG 2018
6 Calculated - Wyoming's portion of 2017+ AML Funds (Max out at $75,000,000)
7 WDOR 2018a, recalculated using Campbell Co. numbers only
8 CREG 2018
9 Calculated - Maximum per ton rate is $0.55 [(.10)(12750) + (.15)(45487-12750)]
10 IRS 2011
11 Calculated - Rate x 2022 Estimated Production
12 WDWS 2017
13 WDOE 2015 (This is the most current document as of January 2019)
14 WDOR 2018b