Final Environmental Impact Statement

Caldwell Canyon Mine and Reclamation Plan

CARIBOU COUNTY, IDAHO

DOI-BLM-ID-I020-2016-0031-EIS

COOPERATING AGENCIES

U.S. Army Corps of Engineers

Idaho Department of Environmental Quality

Idaho Department of Lands

Idaho Governor's Office of Energy and Mineral Resources

May 2019

The estimated cost of producing this EIS by the proponent was $12 million.
The estimated cost of producing this EIS by the BLM was $57,000.

MISSION STATEMENT

The Bureau of Land Management's mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.

United States Department of the Interior
BUREAU OF LAND MANAGEMENT

Idaho Falls District Office
1405 Hollipark Drive
Idaho Falls, Idaho 83401
(208) 524-7500

Dear Reader:

Enclosed for your review and a 30-day availability period is the Final Environmental Impact Statement (Final EIS) for P4 Production, LLC's (P4 Production's) Caldwell Canyon Mine. Before issuing our Record of Decision (ROD) for the proposal, the Bureau of Land Management (BLM) will consider written comments on the Caldwell Canyon Mine proposal during the 30-day availability period, which starts when EPA publishes a Notice of Availability in the Federal Register. An electronic copy of the Final EIS is available for review and comment on the BLM Land Use Planning and NEPA Register (ePlanning) website at https://bit.ly/2SaxWcO. Submit written comments on the ePlanning website; by e-mail at blm_id_caldwell_canyon_mine_eis@blm.gov; or by mail sent to Caldwell Canyon Mine EIS, C/O Tetra Tech, 2525 Palmer Street, Suite 2, Missoula, MT 59808.

The BLM prepared this Final EIS, with cooperation from the U.S. Army Corps of Engineers, Idaho Department of Environmental Quality, Idaho Department of Lands, and the Idaho Governor's Office of Energy and Mineral Resources. The federal agencies recognize the treaty rights and interests of the Shoshone-Bannock Tribes relative to public lands that would be affected by the mine proposal and the BLM has consulted with the Shoshone-Bannock Tribes in the preparation of this Final EIS.

This Final EIS addresses those issues identified by the public and Shoshone-Bannock Tribes as well as identified by the BLM and other cooperating agencies. The Final EIS fully analyzes the direct, indirect, and cumulative effects of the planned 42-year mining operation including the proposed action, a preferred alternative (Alternative 1, adding a geomembrane backfill cover), and a no action alternative. The Final EIS considered but dismissed eight other alternatives. The preferred alternative (Alternative 1) consists of developing two new open pits, construction of haul and access roads, installation of a power line, water management features, monitoring wells, shop, ore transportation and office facilities, environmental protection measures including a geomembrane cover over portions of the pit backfill, and reclamation. The mine would be located on Schmidt Ridge and in Dry Valley, about 13 miles east northeast of Soda Springs in Caribou County, Idaho.

Following the 30-day availability period, the BLM will issue a Record of Decision (ROD). The BLM will announce issuance of the ROD via news release and e-mail, and the ROD will be available for viewing on the BLM ePlanning website at https://bit.ly/2SaxWcO.

The BLM appreciates your interest in the management of public lands. If you would like further information on this project, questions can be directed to Bill Volk, EIS Project Manager, (208) 236-7503.

Sincerely,

Mary D'Aversa

Mary D'Aversa
Idaho Falls District Manager

FINAL ENVIRONMENTAL IMPACT STATEMENT
CALDWELL CANYON MINE AND RECLAMATION PLAN
CARIBOU COUNTY, IDAHO
DOI-BLM-ID-I020-2016-0031-EIS

Responsible Official	Mary D'Aversa, Bureau of Land Management, Idaho Falls District Manager
Lead Agency	Bureau of Land Management
Cooperating Agencies	U.S. Army Corps of Engineers Idaho Department of Environmental Quality Idaho Department of State Lands Idaho Office of Energy and Mineral Resources
For More Information	Bill Volk, EIS Project Manager BLM Pocatello Field Office 4350 S. Cliffs Drive Pocatello, Idaho 83204 (208) 236-7503

Abstract:

The final Environmental Impact Statement (EIS) analyzes impacts expected from approving the Caldwell Canyon Mine and Reclamation Plan submitted by P4 Production, LLC to mine phosphate ore in Caribou County, Idaho, including modifying leases to add approximately 656 acres needed to achieve maximum ore recovery.

The Proposed Action consists of developing two new open mine pits, construction of haul and access roads, installation of a power line, water management features, monitoring wells, shop and office facilities, environmental protection measures, and reclamation. Ore would be hauled via truck to an existing railroad load out and then by rail to a processing plant in Soda Springs, Idaho. Mine overburden would be placed as backfill in the mined out Dry Valley Mine D Pit and the Caldwell Canyon pits as they are mined out. An earthen cover, designed to retain infiltrated rain water and snowmelt and then release it through evapotranspiration, would be placed over the overburden backfill to provide soil (growth media) for revegetation. In total, the mining and the support facilities would cause disturbance of approximately 1,559 acres, of which 153 acres are BLM-administered public land, 7 acres are previously disturbed National Forest System land, 230 acres are on Idaho State Endowment land, and 1,169 acres are on private land. The expected mine life would be 40 years, more or less. Reclamation would be concurrent with mining and is scheduled to conclude two years after mining ceases.

In addition to the No Action Alternative, which is to not approve the Mine and Reclamation Plan, an alternative was evaluated to install an earthen and geosynthetic membrane cover over strategic areas of the pit backfill to reduce water percolation through the backfill, resulting in a reduction of contaminants leaching into groundwater. Surface disturbance for the alternative would be the same as the Proposed Action.

Executive Summary

Introduction

P4 Production, LLC, a subsidiary of Bayer (formerly Monsanto) has submitted a phosphate mine and reclamation plan (MRP) for the Caldwell Canyon Project to Bureau of Land Management (BLM) and Idaho Department of Lands (IDL).

Before it approves the MRP and modifies the leases, the BLM must comply with the National Environmental Policy Act of 1969, as amended by analyzing the potential environmental impacts of the proposed mining and reclamation operations along with reasonable alternatives. As the Caldwell Canyon Project is likely to have significant impacts, an environmental impact statement (EIS) is the appropriate document for this review.

The BLM is the lead agency for this EIS. The U.S. Army Corps of Engineers (USACE), the Idaho Department of Environmental Quality (IDEQ), the IDL, and the Idaho Governor's Office of Energy and Mineral Resources are cooperating agencies.

Purpose and Need

The purpose of the Caldwell Canyon Project is for the BLM to evaluate and respond to the MRP submitted for the recovery of phosphate ore and to modify leases, in accordance with the Mineral Leasing Act of 1920. P4 Production has the exclusive right and privilege to recover phosphate from their leases, including the exploration, mining, and disposal of the phosphate or phosphate rock.

The need for the Caldwell Canyon Project is to develop the phosphate resources, using an economically viable method, in accordance with federal laws and regulations governing federal mineral leases, and to allow P4 Production to exercise its right to develop the leases.

Decision to be Made

The BLM Idaho State Director has delegated to the BLM Idaho Falls District Manager, the authority to decide whether, and under what conditions, to approve land use authorizations on BLM land, the MRP on leased lands, and to recommend the approval or disapproval of proposed lease modifications to the BLM Idaho State Branch Chief Lands and Minerals. The decision and recommendation will be documented in a Record of Decision (ROD). In making the decision, the BLM Idaho Falls District Manager will consider whether the Proposed Action or alternatives:

- Meet the purpose and need;
- Conform with the direction in the BLM Pocatello Field Office (PFO) Approved Resource Management Plan (ARMP) (BLM, 2012) as amended;
- Assure the ultimate maximum recovery of the phosphate resource as required by 43 Code of Federal Regulations (CFR) 3592.1;
- Meet the requirements of other federal and state laws and regulations; and
- Include the conditions under which the MRP (and the Dry Valley Mine MRP modification) would be approved, such as mitigation to minimize impacts.

The decision will be based on BLM's authority, the EIS analysis, other appropriate information and recommendations from the cooperating agencies under their permitting authorities. Before making the decision, the BLM Idaho Falls District Manager will consider comments made during scoping, on the draft EIS, and during the availability period of the final EIS.

The BLM Idaho State Director has delegated the authority to approve modifications to federal phosphate leases to the Idaho State Branch Chief Lands and Minerals.

The USACE will make decisions for a permit under Section 404 of the Clean Water Act. The USACE decision will be documented in a Section 404 Permit separate from the BLM ROD.

The IDL will make decisions on the MRP for the mine outside of Federally managed lands under Title 47, Chapter 15 – Idaho Code.

The IDEQ issued a Points of Compliance (POC) Determination under the Idaho Ground Water Quality Rule (Idaho Administrative Procedure Act 58.01.11.401.03).

A small portion of the haul road and the backfilling of the Dry Valley Mine pit occurs on previously impacted National Forest System lands. The Caribou-Targhee National Forest has delegated their federal decision authority to the BLM on this small portion of the Caldwell Canyon Project and decided not to participate as a cooperating agency.

Alternatives

Proposed Action

The Caldwell Canyon Project Proposed Action (i.e. MRP) includes construction and operation of infrastructure, mining, reclamation, and enlargement of existing leases at the proposed Caldwell Canyon Mine and construction and operation of infrastructure at the nearby mined out Dry Valley Mine and is summarized below. The MRP is viewable in its entirety during the EIS availability period online at https://bit.ly/2SaxWcO.

Lease Modifications

The Caldwell Canyon Mine would create two new pits (the North and South pits), portions of which extend beyond the current lease boundaries. To accommodate those portions of the pit that extend outside the current lease and allow maximize recovery of the phosphate resources, P4 Production is proposing to expand their leases in accordance with 43 CFR Subpart 3510.

Disturbance Summary

The project includes approximately 1,559 acres of new disturbance. Of those, 153 are on BLM-administered public land, 7 are on National Forest System land, 230 are on state endowment land, and 1,169 are on a mix of private surface/Federal mineral and private surface/private mineral land. The disturbed acres include a 50-foot buffer (140 acres) around the planned disturbance area to accommodate anticipated additional disturbance resulting from variations in pit slope due to unforeseen geological conditions, and construction of berms, run-on control ditches, pipelines, monitoring wells, and service roads.

Mining

Ore would be sequentially removed from two open pits (the North and South pits) in 10 phases lasting 3 to 6 years each. Overburden would be used to progressively backfill mined out pits starting with backfilling the existing mined out Dry Valley Mine D Pit, then proceeding sequentially through the South then North pits as they are depleted. As backfilling is completed, the overburden would be reclaimed by grading to contour, covering with an earthen cover, and revegetating.

A water management system would be constructed to capture water that has been in contact with disturbed soil or overburden or from the mine pit. The water would be stored onsite until sediment and constituents can be reduced to meet water quality standards, then infiltrated into bedrock or alluvium. This water will not be discharged to surface water.

Environmental protection measures and best management practices have been developed for water, air, wildlife, soil, cultural resources, and wetlands. After a pit is mined out, backfill and reclamation would occur as soon as possible to return the area to pre-mining land uses, as required by the BLM and the IDL.

Alternative 1

Alternative 1 includes all the features and methods in the Proposed Action, except that a cover consisting of geosynthetic membrane overlain with earthen material would be installed in selected locations to further reduce percolation of precipitation through backfill material carrying contaminants into groundwater.

No Action

The No Action Alternative could only be implemented if the BLM finds the Caldwell Canyon Project does not comply with the requirements under 43 CFR 3590 or could cause unnecessary or undue degradation as determined under the Federal Land Policy and Management Act of 1976. No mining would occur, but the lessee could submit a revised MRP for consideration and analysis.

Summary of Effects

Effects are summarized in **Table S-1**.

Table S-1. Comparison Summary of Effects

Component/Issue	No Action	Proposed Action	Alternative 1
Geology and Minerals (Section 3.3.3) • Which geologic resources would be removed and over what time period?	Conditions would continue as they are.	Over the 40-year mine life, phosphate ore would be permanently removed (an irreversible and irretrievable commitment of resources). All non-ore mined materials would lose their stratigraphic character due to mixing but would remain onsite as backfill or closure cover material in the mine pits or as construction materials. Phosphate would be mined, resulting in the benefits of its use. The Dry Valley Mine D Pit would receive additional backfill, which would improve the pit wall stability.	Same as Proposed Action.
Water (Section 3.4) • Effects on water rights and beneficial uses (i.e., flow, access, quality) estimated from the predictive model drawdown;	Conditions would continue as they are.	Mining would physically remove four springs in the North Pit and one spring in the South Pit; the flows from those springs would cease permanently. The water that fed the springs would either percolate to groundwater, evapotranspire or run-off to surface waters. Dewatering activities during mining phases 3 and 6 (mining years 6 through 8 and 14 through 16) would lower groundwater levels, but the lowering would not affect stream flows at permitted water rights points of diversion nor groundwater levels at locations of permitted water supply wells.	Same as Proposed Action.
• Changes in flows (quantities) of surface water, groundwater, wetlands, springs and seeps based on the predictive model results. • Effects on surface water and groundwater quality as indicated by predictive modeling and dust deposition.	Conditions would continue as they are.	Pit backfill is more permeable than the rocks removed during mining, resulting in water-level declines in the groundwater system near the mine. Water level declines were predicted at 3 of the 12 permitted water supply wells in the modeled area. Surface water right diversions along stream segment in the drawdown area do not normally depend on groundwater to support their flows; therefore, drawdown of groundwater levels would not measurably affect the surface flow at these locations. Operations conducted in accordance with the MRP and regulatory permits would result in no impacts to surface water quality from mine-related sources exceeding regulatory limits. The water quality of springs discharging from the shallow and intermediate groundwater system aquifers outside of the mine pits area would not be affected by the project. Under the Proposed Action, water containing COPCs that percolates through mine backfill would result in groundwater COPC plumes in the regional Wells Formation aquifer that	The mass loading of COPCs from the mine pit backfill into the groundwater system would be reduced compared to the Proposed Action (Sections 2.2.1 and 2.2.2). The reduced mass loading is predicted to result in much smaller COPC groundwater plumes. Concentrations of selenium in groundwater were predicted to exceed the **groundwater** standard in areas outside the immediate vicinity of the

Component/Issue	No Action	Proposed Action	Alternative 1
		migrate down gradient (west) of the proposed mine pits. Groundwater plumes containing the COPCs selenium and manganese at concentrations above groundwater standards are predicted to extend beyond the POC locations. The selenium and manganese plumes would not affect surface water near the mine site but could affect surface water at regional discharge locations. The groundwater exceeding standards would be at depths far below the land surface and would not be in hydrologic connection with surface water until they potentially discharged from the regional aquifer at locations (springs) west of the Aspen Range, about six miles west of the mine site. It is estimated to take 120 years for groundwater containing the selenium and manganese to reach those springs, although their concentrations would likely be attenuated due to dispersion, dilution and mixing along the way. The attenuation, of the groundwater, dilution upon discharge to the surface due to mixing with surface water flows at the regional discharge locations would result in negligible to no effects on fish or wildlife. Selenium carried on airborne dust from the mine could be deposited on surface water. A conservative model of the selenium in dust from the mine found negligible effects on selenium concentrations in surface water.	mine pits but not beyond the POC wells. Concentrations of manganese, cadmium, and sulfate above groundwater standards were predicted to remain within or very close to the mine pits area and not extend beyond POC location. Those areas of groundwater with selenium and/or manganese concentrations exceeding the groundwater standards beyond the mine pits but within the POC locations would be confined to the deep middle layer of the regional Wells Formation aquifer, and substantially below land surface, similar to conditions under the Proposed Action. Groundwater quality in the alluvial aquifers would not be affected. Because the selenium and manganese plumes would not extend beyond the POC wells, beneficial uses of groundwater at springs in the regional discharge area would not be affected.
Air Quality (Section 3.5.3) - Potential for PM10 emissions, indicated based	Conditions would continue as they are.	Fugitive dust emissions would be produced from mining operations including sizing of the ore, blasting, haulage and backfilling, and stripping and haulage of growth media. Selenium is present in the material to be mined and processed;	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
on components that would produce emissions.		therefore, selenium is expected to be a component of fugitive dust emissions. Fugitive dust emissions would be decreased with implementation of the fugitive dust control plan.	
• Annual greenhouse gas emissions, measured by calculating carbon dioxide equivalent (CO2e) emissions from proposed sources using greenhouse gas emissions calculation formulas from the USEPA's website to calculate greenhouse gases or published emission factors.	Conditions would continue as they are.	Greenhouse gas emissions based on the Greenhouse Gases Equivalencies Calculator are predicted to be less than 50,000 metric tons of carbon dioxide equivalent (CO2e), or 55,000 short tons of CO2e. The effect of vegetation (some of which would be forested) and soil removal, storage, and replacement on greenhouse gas emissions as the mine is developed although difficult to quantify with precision, would likely be a minor component of the total greenhouse gas effects of the project. Vegetated areas are CO2 sinks, and forests sequester more carbon than grasslands, so even after revegetation to a non-forest cover over most of the disturbed area there would be a net loss to the carbon stock from this activity.	Same as Proposed Action.
• Impacts from fugitive dust and selenium deposition, measured by modeled fugitive dust emissions, wind patterns, and wind speeds.	Conditions would continue as they are.	Fugitive dust emissions would be produced. A fugitive dust control plan would be submitted to the IDEQ as part of the Air Quality Permit to Construct (IDAPA 58.01.01). Selenium, as a component of fugitive dust emissions would become airborne from mining and hauling activities and deposited on soil and water near the Caldwell Canyon Project. The fugitive dust control plan, although not focused on selenium in dust, would minimize dust generation, thus minimize selenium deposition by using vegetated cover materials and water spray or surfactant on roads and other mine dust sources during operations. Modelled dust emissions indicate that selenium concentrations would not exceed the 5 milligrams per kilogram (mg/kg) dry weight BLM PFO ARMP vegetation action level in vegetation. With implementation of the fugitive dust control plan, the Caldwell Canyon Project would meet IDEQ permitting requirements. No long-term impacts on air quality would result from the fugitive dust air emissions.	Same as Proposed Action.
Noise (Section 3.6.3) • Impacts on sensitive receptors, measured as	Conditions would continue as they are.	Noise during construction, mining operations, and during reclamation would be generated by heavy equipment, vehicle use, and blasting. Sound levels would fluctuate but could affect	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
maximum noise at closest residence (1/4-mile):		the human environment and disturb wildlife. During construction and operation, noise at the nearest residence would meet USEPA recommended levels for outdoor activities but during reclamation equipment operation could temporarily exceed them.	
Soil or Growth Media (Section 3.7.3) - Effects on soil resources, indicated by acres of soil disturbance and post-mining reclamation (i.e. North Pit pit walls); volume of suitable soil available for reclamation and soil of poor quality that would be blended with better soil; changes to soil structure during salvage and storage operations; and potential effects on soil quality due to deposition of selenium.	Conditions would continue as they are.	Soil disturbance would occur on 1,559 acres, a majority of which would be reclaimed by replacement with growth media and seeding; approximately 130 acres of the North Pit wall would not receive growth media or seeding. Approximately 6.7 million cubic yards of soil would be disturbed and salvaged, which would result in a long-term reduction in soil functionality. Negative effects on soil or growth media due to long term storage would be mitigated through concurrent reclamation and direct soil placement on areas ready for soil placement thereby reducing the volume of soil requiring long term storage. Soil would be conserved by using erosion control measures on reclamation. The uptake of selenium by vegetation due to dust settling on soil is predicted to be minimal, and not cause exceedance of vegetation selenium action levels. In addition, dust would be minimized using management practices such as water spray and equipment enclosures.	Same as Proposed Action.
- Soil available to meet reclamation requirements (i.e. soil depth on reclaimed areas), measured by the volume of suitable soil versus volume necessary to achieve proposed reclaimed soil depths and timing of availability compared to need.	Conditions would continue as they are.	Growth media is planned to be salvaged in two lifts (Lift 1 and Lift 2). Lift 1 material is typically higher quality than the deeper Lift 2 material. Adequate Lift-1 growth media is available to reclaim support facilities and roads. The overburden backfill cover (18 inches of Lift-1 over 30 inches of Lift-2) require 2.6 million cubic yards of Lift-1 and4.3 million cubic yards of Lift-2. Adequate volume of Lift-1 material is available. An adequate volume for the 30 inches of Lift-2 material would be obtained by blending 2.4 cubic yards of Lift-2 material rated ideal to fair for plant growth with 1.9 million cubic yards of material rated not suitable due to coarse fragment content. The 18-inch Lift-1 growth media layer would be adequate for plant establishment and growth as the reclaimed thickness would be one inch thicker than the average pre-disturbance thickness.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
• Potential for erosion and sediment delivery due to mine activity, indicated by the volume and acreage of soil with moderate to high erosion hazard ratings, erosion from soil stockpiles and reclaimed areas, and route for sediment delivery between disturbed areas/stockpiles and surface water receptors.	Conditions would continue as they are.	One soil series is rated high for susceptibility to water and wind erosion, moderate when adjusted for coarse fragment content. It occurs within approximately 95 acres proposed for ground disturbance, 88 acres of which are within the mine pit boundary. Erosion would occur in disturbed areas but would be controlled using BMPs designed and applied through a storm water pollution prevention plan (SWPPP). The SWPPP would define the key components, structural BMPs, and other alternative sediment control measures such as silt fencing, straw wattles, rock check dams, which would be employed as needed to control erosion and sedimentation from disturbed or recently reclaimed backfill.	Same as Proposed Action.
Vegetation, Wetlands, and Riparian Areas (Section 3.8.3) • Impacts on vegetation types (including forest, rangeland, wetlands, and riparian areas) measured by the acres of disturbance in each vegetation type and percent change from existing vegetation type to reclamation type, and the anticipated years for reclamation success and potential for pre-disturbance vegetation communities to return.	Conditions would continue as they are.	Areas with ground disturbance would disturb vegetation in ten identified vegetation types. The acreage of vegetation removal and subsequent reclamation would vary over time as mining progresses. Mining activities would occur over a 40-year period resulting in a total disturbance of 1,559 acres. Shrubland and forested vegetation types would be removed during mining, with some types such as Aspen and Conifer/Aspen being eliminated in the long-term where the cover is placed or because aspen primarily reproduces clonally. Disturbed areas would be reclaimed, and vegetation would return; however, species composition and community structure would be different from pre-construction conditions. Effects on wetlands and other waters of the U.S. would be negligible, as the functions and services provided by the impacted wetlands are relatively low and would not be diminished. Mitigation would be completed using an appropriate functional equivalency ratio to offset the 0.21 acre of wetlands and 500 linear feet of other waters of the U.S. affected. Effects on the functions and services of one wetland, which scored as important for groundwater discharge/recharge, sediment removal, and wildlife habitat, would be negligible. Impacts on Dry Valley Creek and adjacent wetlands would be negligible. Dry Valley Creek is a man-made stream that was	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
		relocated and restored as part of the Dry Valley Mine. There would be no effect on functions and services from the culvert installation, as the culvert would not prohibit stream flow or alter function and service capacity.	
- Selenium to accumulate in vegetation in reclaimed areas. Qualitatively discuss the potential for bioaccumulation in the reclamation vegetation at concentrations in excess of stated ARMP guidance level (5 mg/kg plant dry weight); and the types of plants that may accumulate selenium, rooting depth of reclamation species, and proposed cover depth.	Conditions would continue as they are.	Plant species known to accumulate selenium (i.e., legumes and asters) or that grow roots deeper than the cover thickness would not be used for reclamation. Should these species encroach on these sites, they would be controlled using techniques described in the *Decision Record for the Upper Snake-Pocatello Integrated Weed Control Program Environmental Assessment* or the most current BLM PFO guidance. Soil covers on overburden would be thicker than the expected typical root depth of revegetation species, minimizing uptake of selenium from the underlying overburden. Contaminant concentration limits in vegetation specified in the ARMP are expected to be met. Post-closure vegetation monitoring would ensure final site compliance with the vegetation contaminant limits.	Same as Proposed Action.
- Invasive and noxious weed introduction and spread discussed qualitatively as to the potential for weeds found and common to southeast Idaho to spread in the reclaimed areas, and adequacy of EPMs and BMPs for control of weeds.	Conditions would continue as they are.	Potential for the introduction or encroachment of non-native plant species, including noxious weeds, would increase where vegetation is removed and soil surfaces are disturbed. Implementation of the reclamation plan and proposed noxious weed control measures would minimize noxious weed introduction and spread, thereby reducing impacts on vegetation composition from noxious weed invasions. Invasive, noxious, and selenium accumulator species control measures would adhere to methods and techniques in the most current BLM PFO guidance.	Same as Proposed Action.
Wildlife (Section 3.9.3) - The effect noise would have on wildlife and birds measured by comparing the anticipated noise levels with standards for specific species.	Conditions would continue as they are.	Noise during construction, mining operations, and during reclamation and closure generated by train haulage, heavy equipment, vehicle use, and blasting would fluctuate, but could affect and disturb wildlife. Noise disturbances could result in dispersal movements away from mining activities. Displacement may result in unnecessary energy expenditure and potential disruptions in behavior that could ultimately impact reproductive success and survival. Dispersal into adjacent	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
		habitats may result in increased competition for resources with other individuals or different species.	
• Potential displacement of raptors and other birds within and adjacent to mining areas, discussed by qualitatively evaluating avoidance and nest abandonment caused by increased human activity and noise, raptor nests that would need to be considered for seasonal restrictions, and acres of habitat types disturbed or lost and how it affects the avian community.	Conditions would continue as they are.	The distance at which raptors are sensitive to disturbance varies by species, habitat, topography, and even the habituation of individual birds to humans. Habitat loss and modification and avoidance of mining activities may affect individual birds, however, the abundance of similar habitat types within the rural and undeveloped wildlife analysis area should provide adequate opportunities for displaced birds to meet their life history needs.	Same as Proposed Action.
• Amphibian and reptile habitat that would be disturbed and effects this would have on amphibians and reptiles measured as the acres of wetland/riparian habitat type disturbed.	Conditions would continue as they are.	Amphibians and reptiles would be vulnerable to mortality or injury by mining activities. A total of 3 acres of wetlands would be affected.	Same as Proposed Action.
• Effects of surface water quality changes on amphibians and reptiles based on impacts on water quality from selenium and other pollutants.	Conditions would continue as they are.	Potential impacts on water quality could directly affect amphibians and reptiles that use riparian/wetland habitat types. Selenium is not expected to exceed acute or chronic levels in surface water. The water model did not predict changes in flow regime or timing.	Same as Proposed Action.
• Effects on big game due to mining disturbance and human activities measured by acres of habitat lost and altered by seasonal habitat types; whether reclamation	Conditions would continue as they are.	Wildlife could be indirectly affected by the loss or modification of habitat types after reclamation through reduction in functionality and by habitat fragmentation. Mortality - Mortality or injury could result from collisions with mining equipment or vehicles and by crushing or compaction	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
would return habitat to pre-disturbance conditions and if so, in what timeframe; indirect effects of avoidance caused by increased human activity and noise; and direct mortality caused by vehicle collisions		during vegetation removal and soil excavation.	
• Effects on Greater Sage-Grouse and Greater Sage-Grouse habitat in terms of acres of General Habitat Management Area (GHMA) that would be disturbed; number of lek(s) and distances from the Caldwell Canyon Project activities (features); status of lek(s) (e.g. pending, occupied, date last surveyed, new lek or date last occupied); and acres of IDFG key habitat outside of delineated habitat management areas disturbed by the Caldwell Canyon Project. Distance and source on the closest Greater Sage-Grouse lek and whether noise mitigation may be warranted.	Conditions would continue as they are.	Approximately 113 acres of GHMA and 868 acres of key habitat outside of the GHMA would be lost or modified. Of the 113 acres of GHMA affected, 69 acres are administered by the BLM. The Greater Sage-Grouse habitat assessment determined that 36.1 acres of that 69 acres is considered available habitat to Greater Sage-Grouse. A pending Greater Sage-Grouse lek (3C040) is located in Dry Valley, one mile east of the North Pit, approximately half a mile east of the Dry Valley Road and the Union Pacific Railroad and approximately 1½ miles north of the Dry Valley tipple area where a crusher will be operating. The pending lek is outside of designated habitat and outside of key habitat, which puts it outside the authority of the ARMPA , the Pocatello ARMP (BLM 2012) and the BLM Special Status Species Manual. Caldwell Canyon Project noise at the pending lek is expected to increase only by 11 A-weighted decibels (L50 dBA) over ambient (L90 dBA) conditions from predicted construction, reclamation, and operation noises in the East Caldwell Area. Similarly, predicted construction, reclamation, and operation noises emanating from mining equipment at the Caldwell Canyon Mine rim would not exceed the 10 dBA limit in the North Pit until year 20 of mining and only when the equipment is at the top of the North Pit rim . Other Greater Sage-Grouse leks are further away and not likely to be directly affected by noise from the project.	Same as Proposed Action.
• Effects on Columbian sharp-tailed grouse and	Conditions would continue as they are.	Up to 1,349 acres of suitable habitat would be removed. Given the proximity of the three known Columbian sharp-tailed grouse	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
their habitat as acres of Columbian sharp-tailed grouse habitat would be disturbed and number of lek(s).		leks to the mining activity (0.00 to 2.62 miles), it is likely that habitat loss and modification would reduce Columbian sharp-tailed grouse use of seasonal habitat.	
• Effects on BLM Sensitive species	Conditions would continue as they are.	Gray Wolf – Main prey (big game) in and around the mining activities would be disrupted by activities, which would have negligible impacts on transient individuals. Pygmy Rabbit – Loss of potential burrowing habitat in mixed shrub and big sagebrush habitat types. Effects would be negligible as there is a low likelihood pygmy rabbits occurring in the wildlife analysis area. Birds – There would be a temporary loss of bird habitat during active mining. There would be a long-term modification of 589 acres of riparian/wetland and forested habitat types. Raptors – Habitat modification would alter the prey base. Nesting habitats and structures occurring in the disturbed areas would be destroyed. Nests identified adjacent to the disturbed areas are within the spatial buffer of the seasonal restrictions identified by the ARMP, Appendix B, Table B-2. Northern Leopard Frog – Loss of riparian/wetland habitat types within the disturbed areas would likely result in mortality to this species. Reclamation of riparian/wetland habitat types would provide adequate replacement habitat.	Same as Proposed Action.
• Bald eagle nesting or roosting sites to be maintained and protected, measured by the distance(s) of known bald eagle nesting and roosting sites from the Caldwell Canyon Project activities; comparison of distance(s) to agency-recommended disturbance buffers; and whether electrocution prevention measures are	Conditions would continue as they are.	One bald eagle territory comes within 0.10 mile of the North Pit which is within the 0.5-mile agency recommended buffer distance. Intrusion into the buffer zone would occur if the nest is still occupied during years 37 through 42 of mining. P4 Production would develop an Eagle Conservation Plan which would address needs for take permits, if required. The power line would adhere to Avian Power Line Interaction Committee guidelines which would reduce or eliminate the risk of electrocution.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
included in power line designs as mitigation.			
Visual Quality (Section 3.10.3) • Effect on Visual Resource Management (VRM) class, based on views from key observation points (KOPs), and review of VRM classes for activities conflicts.	Conditions would continue as they are.	The visual contrast created by mining, and the long-term reclamation, and closure would not exceed the visual contrast with the VRM Class IV designation for the public land tracts.	Same as Proposed Action.
• Visual quality from KOPs affected by activities using visual contrast ratings and simulations in the MRP to characterize the changes in visuals.	Conditions would continue as they are.	There are limited publicly accessible viewing areas. For viewing areas where portions of the Caldwell Canyon Project would be visible, visual intrusion occurs at such distances that the change in form, color, line, and texture in contrast to adjacent undisturbed areas would be subtle. Effects would occur until the reclamation vegetation cover blends in with adjacent land areas.	Same as Proposed Action.
Transportation (Section 3.11.3) • Effects of increased traffic on public roads, potential for increased traffic accidents, estimated increase in average daily traffic, and increase in number of heavy-duty vehicles and heavy equipment on public roads.	Conditions would continue as they are.	A seven percent increase in traffic by personal vehicles during the approximate 40-year mine life on regional and public roadways could lead to more traffic accidents.	Same as Proposed Action.
• Change in traffic safety from increased use of railroad.	Conditions would continue as they are.	The Union Pacific railroad would run two trains per day, which would be the total use of this rail line. Traffic safety would not change due to the controls at the crossings (**Appendix B**, **Section B.15.8)**.	Same as Proposed Action.
Cultural Resources (Section 3.12.2)	Conditions would continue as they are.	No historic properties (cultural sites eligible for the National Register of Historic Places) have been identified in the disturbed areas. There are two eligible cultural sites (prehistoric	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
• **Effects** on historical and cultural locations and sites through identifying the number of historic properties affected, evaluation of effects on sites, and consultation with Idaho State Historic Preservation Office.		lithic scatters (10CU86 and 10CU434)) which occur 150 feet and 300 feet respectively from the disturbed areas. The project would have no direct or indirect effects on these eligible cultural sites.	
Tribal Treaty Rights and Interests (Section 3.13.3) • **Impacts on use of** the area and Tribe's ability to exercise inherent and treaty-reserved rights on unoccupied lands by measuring the acres of traditional use areas that would be available or unavailable and the length of time tribal use would be reduced.	Conditions would continue as they are.	During the 40-year life of the mine, 153 acres of unoccupied BLM land would not be available for traditional tribal use and treaty rights. There is currently no public access because private lands surround the public lands requiring private owner's permission. No Traditional Cultural Properties were identified during consultation. As noted above, two prehistoric lithic scatters (10CU86 and 10CU434), eligible for the National Register of Historic Places, were identified near the mine. Consultation on these sites is on-going.	Same as Proposed Action.
• Impacts on Natural Resources Important to Tribes.	Conditions would continue as they are.	Potential changes in the quality and quantity of natural resources may affect traditional hunting, fishing, and gathering areas. Refer to **Section 3.4** for water; **Section 3.5** for air; **Section 3.7** for soil; **Section 3.8** for vegetation, wetlands, and riparian areas; **Section 3.9** for wildlife; and **Section 3.10** for visual quality, for effects on natural resources important to the tribes.	Same as Proposed Action.
Social and Economic Conditions (Section 3.14.3) • Impacts on employment and tax revenue assessing the number of jobs maintained and income, property taxes, production	Employment of approximately 185 employees and contractors would cease in approximately three years when the reserves from the Blackfoot Bridge Mine are depleted, as would their income. Employment and	Approximately 185 people would continue to be employed in mining operations. No change would occur in the property tax paid. P4 Production would pay between $80 million and $120 million to the state and federal government in production royalties, and another $800,000 to $1.2 million in Idaho Mine License Tax to the state over the life of the mine.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
royalties, and Idaho Mine License Tax.	income would be reduced at P4 Production's phosphate processing plants. Property taxes would continue to be paid at current rates. No production royalties and no Idaho Mine License Tax would be paid. No phosphate would be mined, thus precluding the benefits of its use.		
• Impacts on grazing.	There would be no changes to the current grazing allocations and no reduction in AUMs, resulting in no impacts to the economic benefits of the grazing allotments.	There would be a short-term minor to moderate reduction of 78 allocated annual unit months (AUMs) for the leases proportionate to the land area affected. P4 Production holds the grazing leases and would not likely request a reallocation. Impacts on grazing would be negligible, localized, and short-term.	

Acronyms and Abbreviations

Acronym	**Definition**
AADT	average annual daily traffic
ARMP	Approved Resource Management Plan
ARMPA	Approved Resource Management Plan Amendment
BLM	Bureau of Land Management
BMPs	best management practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COPC	constituents of potential concern
dBA	A-weighted decibel
DSAYs	Discounted Service Acre Years
EIS	environmental impact statement
EPMs	environmental protection measures
GAP	Gap Analysis Program
GHMA	General Habitat Management Area for Greater Sage-Grouse
gpm	gallons per minute
HEA	Habitat Equivalency Assessment
HGM	hydrogeomorphic
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IG	infiltration gallery
KOP	key observation point
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
mg/kg	milligrams per kilogram

mg/L	milligrams per liter
MRP	mine and reclamation plan
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969, as amended
PFO	Pocatello Field Office
PM	particulate matter
PM_{10}	particulate matter with a nominal diameter of 10 microns or less
$PM_{2.5}$	particulate matter with a nominal diameter of 2.5 microns or less
POC	Points of Compliance
RCP	run-off containment pond
SCP	sediment control pond
SP	spring monitoring station
SW	surface water right
SWPPP	storm water pollution prevention plan
TMDL	Total Maximum Daily Load
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VRM	Visual Resource Management
WEG	Wind Erodibility Factor or Group
WMP	water management pond

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Chapter 1
Purpose and Need

1.1 Introduction

P4 Production, LLC (P4 Production) submitted a phosphate mine and reclamation plan (MRP) for the Caldwell Canyon Project (P4 Production, 2017) to the Bureau of Land Management (BLM) and Idaho Department of Lands (IDL) on May 4, 2016. The BLM and the IDL reviewed the MRP to determine if it and other application materials complied with requirements in the Code of Federal Regulations (CFR) (43 CFR 3592.1) and were complete. They informed P4 Production that additional information was needed. A revised MRP was submitted on September 21, 2016 and was determined complete and in compliance with the 43 CFR 3592.1 requirements on February 2, 2017 (BLM, 2017a). Minor changes to the disturbance area were made and the MRP was resubmitted again on March 27, 2017. Since then, additional minor adjustments to the MRP have been made, the MRP was refined, and the analysis requirements identified. The MRP (Proposed Action) analyzed in this environmental impact statement (EIS) is the March 27, 2017 version, and errata submitted by P4 Production on June 27, 2018 (NewFields, 2018a) which includes minor refinements.

The mine would be located on Schmid Ridge, approximately 13 miles east northeast of Soda Springs in Caribou County, Idaho on federal phosphate leases and State of Idaho leases (**Figure 1**). The leases issued under the Mineral Leasing Act of 1920 and Idaho Code § 47-708, grant exclusive rights to mine and otherwise dispose of the federal and state phosphate deposit.

Before the BLM approves the MRP and modifies the leases, the BLM must comply with the National Environmental Policy Act of 1969, as amended (NEPA), by analyzing the environmental impacts of mining and reclamation operations along with reasonable alternatives. As the Caldwell Canyon Project is likely to have significant impacts, an EIS is appropriate to document this analysis.

The BLM is the lead agency for this EIS. The U.S. Army Corps of Engineers (USACE), the Idaho Department of Environmental Quality (IDEQ), the IDL, and the Idaho Office of Energy and Mineral Resources are cooperating agencies.

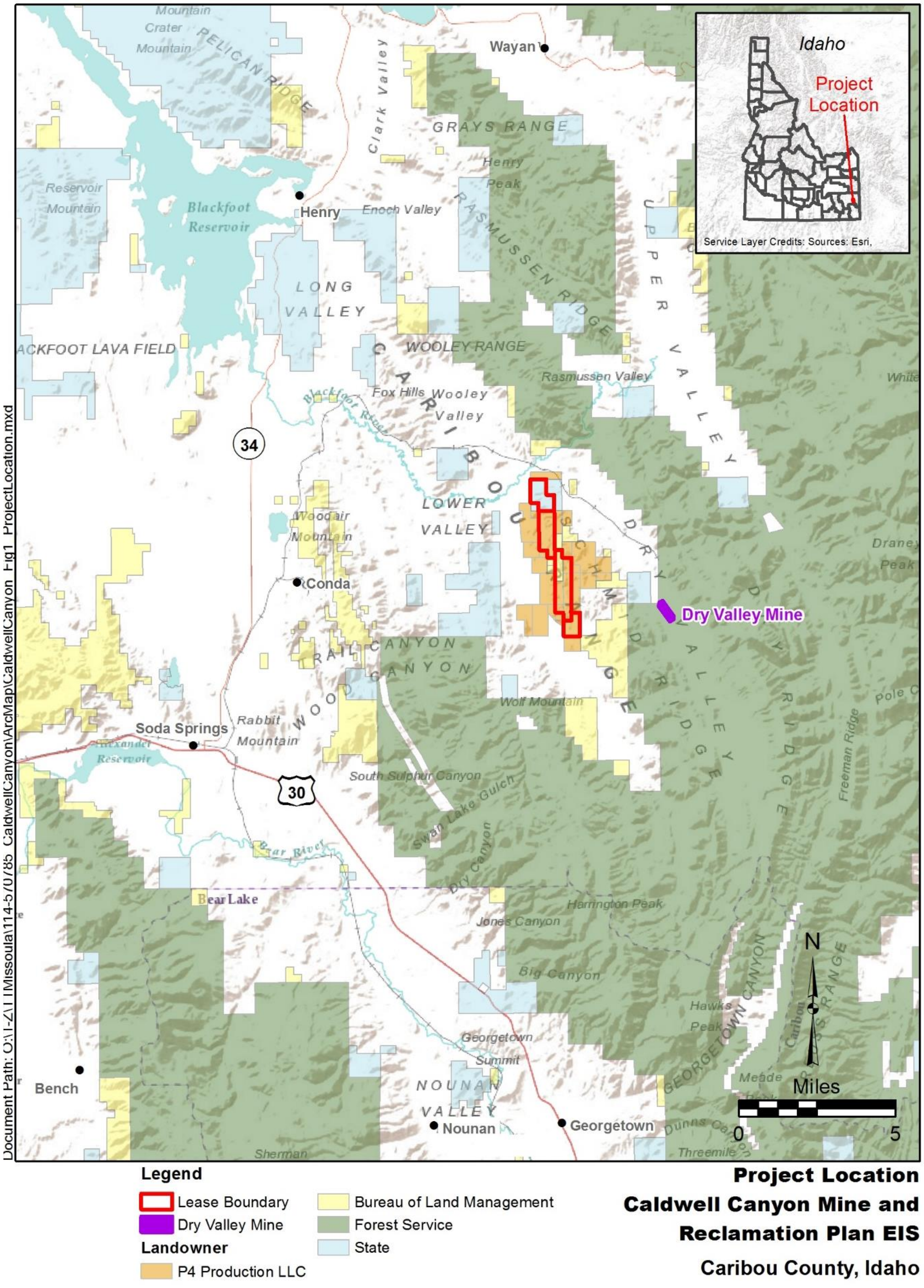
1.2 Location

Operations would occur on the Federal Mineral Leases IDI-0000002, IDI-0014080, IDI-0013738, and State of Idaho Mineral Lease E07959 (**Figure 1**). P4 Production is also requesting modifications to the phosphate lease boundaries for the mine pits. The project is in portions of Township 7 South, Range 43 East, Section 36; Township 8 South, Range 43 East, Sections 1, 12, 13, and 24; and Township 8 South, Range 44 East, Sections 7, 18, 19; Boise Meridian.

1.3 Purpose and Need

The purpose of the Caldwell Canyon Project is for the BLM to evaluate and respond to the MRP submitted for the recovery of phosphate ore and to modify leases, in accordance with the Mineral Leasing Act of 1920. P4 Production has the exclusive right and privilege to recover phosphate from their leases, including the exploration, mining, and disposal of the phosphate or phosphate rock. The need for the Caldwell Canyon Project is to develop the phosphate resource, using an economically viable method, in accordance with federal laws and regulations governing federal mineral leases, and to allow P4 Production to exercise its right to develop the leases.

Figure 1. Project Location



1.4 Authorities

1.4.1 Mineral Leasing Act

The Mineral Leasing Act of 1920 requires ultimate maximum mineral recovery. P4 Production would pay rent and a gross value royalty on phosphate production to the U.S., half of which would go to the Idaho state government.

1.4.2 Mining and Mineral Policy Act

It is the policy of the federal government under the Mining and Mineral Policy Act of 1970 "*to foster and encourage private enterprise in (1) the development of economically sound and stable domestic mining, minerals, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs, (3) mining, mineral, and metallurgical research, including the use and recycling of scrap to promote the wise and efficient use of our natural and reclaimable mineral resources, and (4) the study and development of methods for the disposal, control, and reclamation of mineral waste products, and the reclamation of mined land, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities.*"

1.5 Decisions to Be Made

The BLM Idaho Falls District Manager, who was delegated decision authority by the BLM Idaho State Director, will decide whether, and under what conditions, to approve the MRP on leased land, to approve land use authorizations on BLM lands, and to recommend the lease modifications to the BLM Idaho State Branch Chief Lands and Minerals. In making the decision, the BLM Idaho Falls District Manager will consider whether the Proposed Action or alternatives:

- Meet the purpose and need;
- Conform with the direction in the BLM Pocatello Field Office (PFO) Approved Resource Management Plan (ARMP) (BLM, 2012);
- Assure the ultimate maximum recovery of the phosphate resource required by 43 CFR 3592.1;
- Meet the requirements of other federal and state laws and regulations; and
- Include the conditions under which the MRP (and the Dry Valley Mine MRP modification) would be approved, such as mitigation to minimize impacts.

The decision will be based on BLM's authority, the EIS analysis, and recommendations from the cooperating agencies under their permitting authorities. In making the decision, the authorized officer will consider comments made during scoping and on the draft and final EIS.

The USACE will make decisions for a permit under Section 404 of the Clean Water Act. The USACE decision will be documented in a Section 404 Permit.

The IDL will make decisions on the reclamation plan under Title 47, Chapter 15 – Idaho Code.

The IDEQ issued a Points of Compliance (POC) Determination under the Idaho Ground Water Quality Rule (Idaho Administrative Procedure Act (IDAPA) 58.01.11.401.03).

A small piece of the haul road would be on National Forest lands. The Caribou-Targhee National Forest delegated their federal decision authority to the BLM and is not a and EIS cooperator.

1.5.1 Permits and Approvals

BLM's approval of the MRP is one of several approvals and permits required before mining operations begin. **Table 1** identifies those known to be needed at the time this EIS was published.

Table 1. Anticipated Permits and Authorizations Needed

Permit/Authorization	Authority	Agency
MRP approval or modification of approved MRP	43 CFR 3590.2(a), 3592.1(a)	BLM
Lease Modification	43 CFR 3510	BLM
Right-of-way	90 Statute 2776; 43 U.S. Code (U.S.C.) 1761	BLM
Phosphate Use Permit	43 CFR 3501.10, 43 CFR 3516	BLM
High Explosives Permit	18 U.S.C. 40; 27 CFR 555	Bureau of Alcohol, Tobacco, and Firearms
POC under the Idaho Ground Water Quality Rule (already obtained)	IDAPA 58.01.11.401	IDEQ
Certification of Water Quality (Clean Water Act, Section 401)	IDAPA 39-101 et seq.; Idaho Code Parts 39-3601 et seq.	IDEQ
Water Rights	Idaho Code Parts 42-201 et seq.; IDAPA 37.03.08, Water Appropriation Rules and 37.03.11 Conjunctive Management of Surface and Ground Water.	Idaho Department of Water Resources
Multi-Sector General Permit for storm water discharges, National Pollutant Discharge Elimination System	Clean Water Act (Title 33 U.S.C. 1251 et seq.)	U.S. Environmental Protection Agency (USEPA)
Section 404 Permit - surface disturbance and placement of fill less than 0.5 acres of wetlands and 500 feet of stream channels	Clean Water Act (Title 33 U.S.C. 1344, Section 404(e)(2)).	USACE
Stream Channel Alteration Permit	IDAPA 42-3801	Idaho Department of Water Resources
Air Quality Permit to Construct	IDAPA 58.01.01	Idaho Department of Environmental Quality
Reclamation Plan approval and modification of approved Reclamation Plan and state mineral lease	IDAPA 20.03.02.010, 20.03.02.120, and 20.03.02.140	IDL
Conditional Use Permit for facilities within an approved land use	Caribou County Zoning Ordinance, Chapter 13	Caribou County

1.6 Public Scoping

1.6.1 Scoping

The BLM began engaging the public in the NEPA process by publication of a notice of intent to prepare an EIS in the Federal Register (Federal Register, 2017) on March 22, 2017 followed by a 30-day scoping period, which closed on April 21, 2017. The BLM hosted open-house public meetings in Pocatello and Soda Springs, Idaho (**Table 2**) to provide information on the Caldwell Canyon Project. The BLM posted a press release on their website announcing the scoping period and the public meetings. Media outlets were included in the scoping mailing, and the project is on BLM's ePlanning website. Written comments were accepted by mail, email, or hard copy.

Table 2. Public Scoping Meetings

Where	When	Number Who Signed In
City Hall, Soda Springs, Idaho	April 5, 2017	4
BLM Office, Pocatello, Idaho	April 6, 2017	10
Total Signed In		**14**

During scoping, seven documents were submitted in the form of letters or comments left at the public meetings. The Shoshone-Bannock Tribe submitted their comments after the scoping period. Submittals were reviewed to identify the scope, the significant issues to be analyzed (Section 2.5 and Chapter 3), and issues and alternatives to be eliminated from detailed study (Section 2.4).

1.7 Land Use Plan Conformance

To be approved, the MRP must comply with agency regulations, policies, plans, and programs. The BLM PFO ARMP (BLM, 2012) as amended, guides land use on federal lands in conformance with the planning regulations and guidance of the Federal Land Policy and Management Act of 1976.

A conformance review of the action alternatives was completed considering the ARMP (BLM, 2012) as amended; the Proposed Action and Alternative 1 are consistent with management direction. No amendments to the ARMP are needed for the Caldwell Canyon Project.

The current Record of Decision (ROD) and Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) for the Great Basin Region (BLM, 2019) identifies measures to protect and restore Greater Sage-Grouse habitat. The proponent has, of its own accord, offered and committed to Greater Sage-Grouse Mitigation Plan that is in conformance the ARMPA.

Displaying (strutting) male Greater Sage-Grouse have been observed on private land in Dry Valley, north of the tipple area and east of the North Pit in 2016, 2017 and 2018. The Idaho Governor’s Office of Species Conservation and Idaho Department of Fish and Game have labeled the observations a pending lek. The pending lek is outside of designated and key habitat, which puts it outside the authority of the ARMPA (BLM, 2019), the Pocatello Field Office ARMP (BLM 2012), and the BLM Special Status Species Manual.

Reclamation practices would be implemented to meet objectives as set by 43 CFR 3592.1, consistent with BLM requirements and Idaho’s Reclamation Plan Title 47, Chapter 15 – Idaho Code. The reclamation plan is consistent with the BLM rangeland health standards in that seed mixes were developed to contain native grass, forb, and shrub species adapted to site conditions; species selected could provide forage for wildlife and livestock; disturbed areas are anticipated to return to baseline habitat quality or would meet post-reclamation land uses; and weed control measures would be implemented. Best management practices (BMPs) and erosion control measures would be implemented to stabilize soils and streambanks. Reclamation would return a diverse mix of native vegetation to the landscape; therefore, impacts on vegetation would be minor over the long-term, primarily due to changes in vegetation type (i.e., changes in species composition, conversion of mixed shrub to grassland/shrub types). Uptake of constituents of potential concern (COPCs) by vegetation would be minimized by construction of a thick post-closure cover design and exclusion of plants known for bioaccumulation of selenium and monitoring to assure performance.

Chapter 2
Alternatives

2.1 Proposed Action

The Proposed Action (i.e. MRP) includes mining, reclamation, and modification of existing leases and is summarized below. The MRP is viewable in its entirety during the EIS review period online at https://bit.ly/2SaxWcO. Also included in the Proposed Action are the components of the POC application (P4 Production, 2016a) under the Idaho Groundwater Quality Rule (IDAPA 58.01.11.401.01). P4 Production's POC application submitted to the State of Idaho is also available online at https://bit.ly/2SaxWcO during the EIS review period.

The Proposed Action includes the construction and operation of two open mine pits, construction of haul and access roads, a power line, water management features, monitoring wells, shop and office facilities, environmental protection measures (EPMs), and reclamation. The MRP also includes disposing of and reclaiming the Caldwell Canyon Mine overburden in the nearby closed Dry Valley Mine D Pit, on Federal Phosphate Lease I-014184.

2.1.1 Leases and Lease Modifications

Portions of the two new proposed pits (the North and South pits) extend beyond the current lease boundaries (**Figure 2**). To maximize recovery of the phosphate resource as per 43 CFR 3590, P4 Production is proposing modifications under 43 CFR 3510 to expand the existing lease boundaries. **Table 3** provides the legal description and surface owners of the Caldwell Canyon mineral leases and lease modifications.

Table 3. Legal Descriptions and Surface Owners of Caldwell Canyon Mineral Leases and Proposed Lease Modifications

Mineral Leases	Township	Range	Section	Subdivision	Surface/ Subsurface Owner
Caldwell Canyon Mineral Leases					
Lease IDI-0000002 (438 acres)	8S	43E	1	SENW1/4, SWNE1/4, E½SW1/4, W½SE1/4	Private/Federal
	8S	43E	1	Lots 2, 3	Private/Federal
	8S	43E	12	W½ NE1/4, NE1/4NW1/4	Private/Federal
Lease IDI-0014080 (697 acres)	8S	43E	12	SE1/4NE1/4, E½ SE1/4	BLM/Federal
	8S	43E	13	NE1/4NE1/4	BLM/Federal
	8S	43E	13	SE1/4NE1/4, E½ SE1/4	Private/Federal
	8S	43E	24	NE1/4NE1/4	Private/Federal
	8S	44E	7	Lots 3,4	Private/Federal
	8S	44E	18	Lots 1-4	Private/Federal
	8S	44E	19	Lots 1,2	Private/Federal
Lease IDI-0013738 (212 acres)	8S	44E	19	SENW, E1/2SW	Private/Federal
	8S	44E	19	Lots 3,4	Private/Federal
State Lease E07959 (363 acres)	7S	43E	36	NW1/4, W1/2SE1/4, N1/2SW1/4, SE1/4SW1/4	State/State

Mineral Leases	Township	Range	Section	Subdivision	Surface/ Subsurface Owner
Proposed Mineral Lease Modifications					
State Modification	7S	43E	36	SWSW	State/State
Lease Modification Area 1 (39.21 acres)	8S	43E	1	Lot 4	Private/Federal
Modification 2 (295.47 acres)	8S	43E	1	Govt Lot 1; SENE, NESE	Private / Federal
	8S	43E	1	SESE	Federal / Federal
	8S	43E	12	NENE	Federal / Federal
	8S	44E	7	Government Lot 1 and Lot 2	Private / Federal
Modification 3 (40 acres)	8S	43E	12	SENW	Private / Federal
Modification 4 (40 acres)	8S	43E	12	NWSE	Federal / Federal
Modification 5 (240.00 acres)	8S	44E	7	SESW	Private / Federal
	8S	44E	18	NENW, SENW, NESW, SESW	Private / Federal
	8S	44E	19	NENW	Private / Federal
Modification 6 (40 acres)	8S	43E	24	SENE	Private / Federal

Source: (NewFields, 2018a), Master Title Plats.
Note: S = South, E = East, W = West, and N = North
Private land is owned by P4 Production.

2.1.2 Disturbance Summary

The approximate acreage of areas of new disturbance for the mine components is provided in **Table 4** and shown on **Figure 3**. These acres include a 50-foot buffer (140 acres) around the planned disturbance areas to accommodate variations in pit slope, berms, run-on control ditches, pipelines, monitoring wells, and service roads. Disturbance listed in **Table 4** does not include 99 acres of redisturbance of previously disturbed areas at the Dry Valley Mine D Panel pit, rail facilities, and office complex.

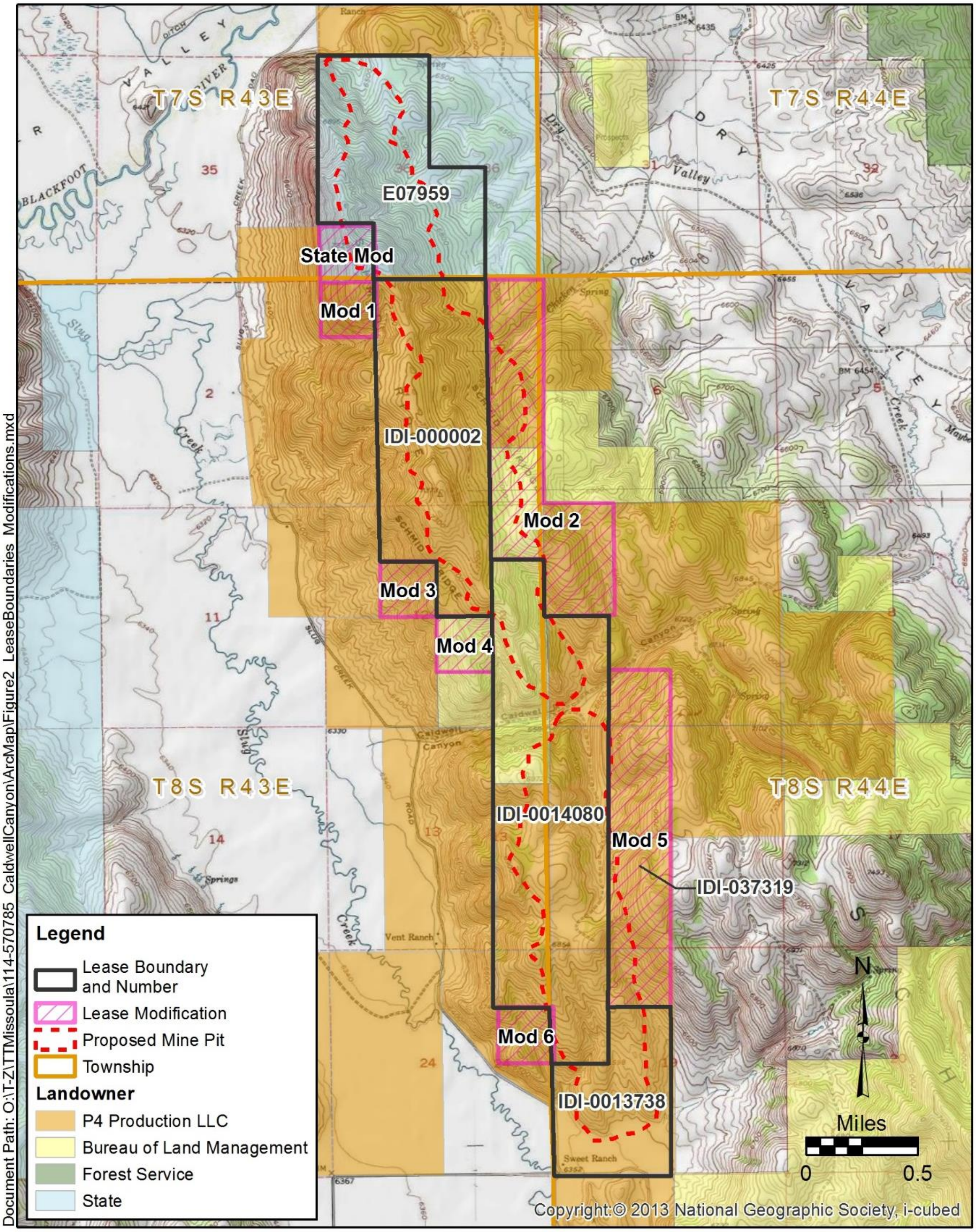
Table 4. Proposed New Mine Surface Disturbance

Mine Component	BLM Acres[1]	National Forest Acres	State Acres	Private Acres	Total Acres
North and South Mine Pits	137	0	205	864	1,206
Caldwell Canyon Service Road, East Caldwell Area Haul Road, and Dry Valley Haul Road[1]	16	5	22	42	85
Water Management System[1]	0	0	3	61	64
Growth Media Stockpiles[1]	0	2	0	20	22
Ore Stockpile and Tipple Area[1]	0	0	0	98	98
Internal Buffer Areas	0	0	0	84	84
Total	153	7	230	1,169	1,559

Source: (NewFields, 2018a).
Notes: Rounding may cause numbers to total differently than the table.
[1] Includes re-disturbance of land reclaimed in the East Caldwell Area; Dry Valley Mine D Pit backfill area not included.

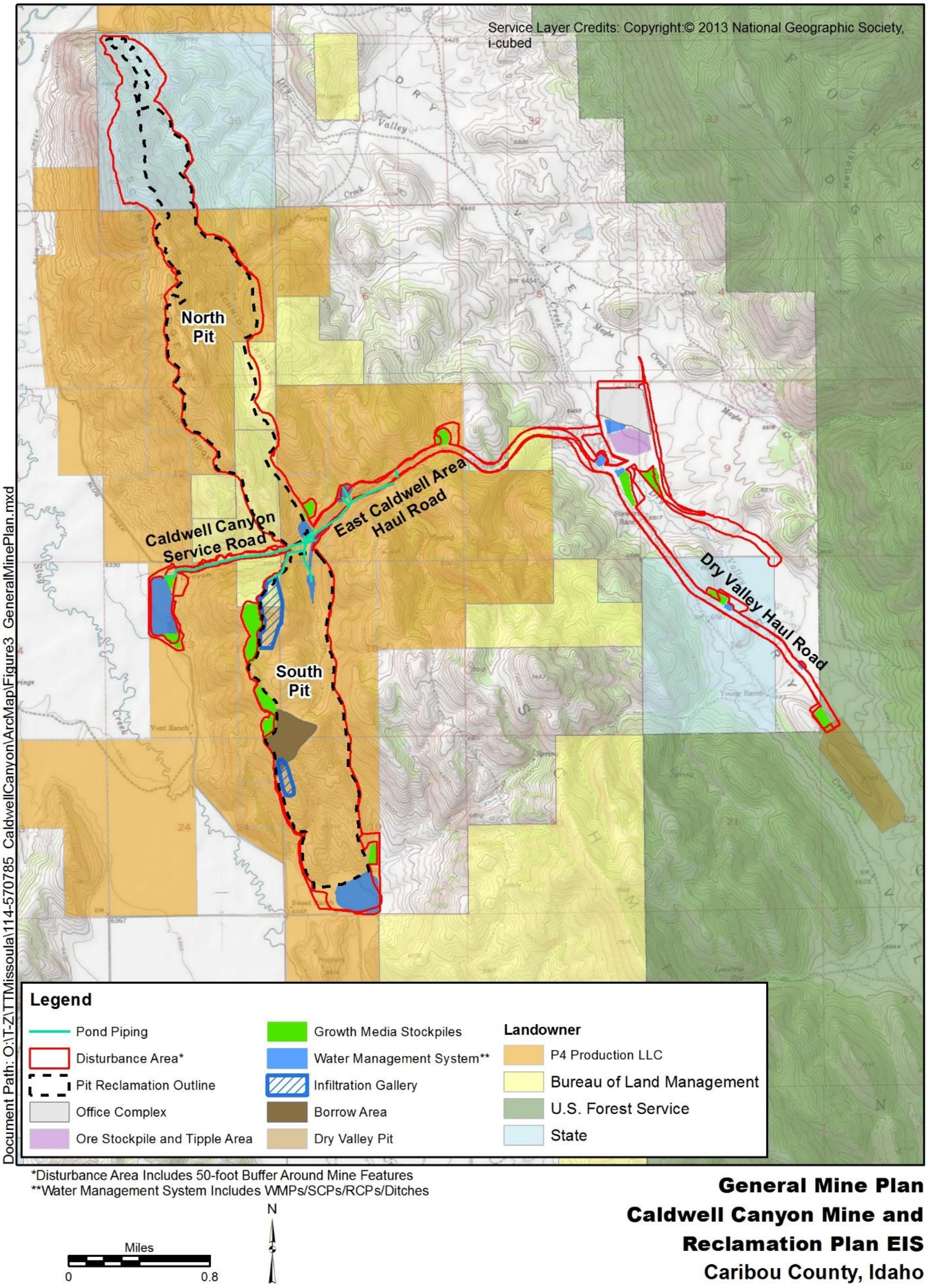
Once construction of infrastructure is sufficiently complete, mining would begin (stripping growth media, overburden excavation, ore recovery, and progressive backfill). Vegetation removal and growth media salvage would precede all ground disturbing mining activity.

Figure 2. Lease Boundaries and Modifications



Lease Boundaries and Modifications
Caldwell Canyon Mine and
Reclamation Plan EIS
Caribou County, Idaho

Figure 3. General Mine Plan



*Disturbance Area Includes 50-foot Buffer Around Mine Features
**Water Management System Includes WMPs/SCPs/RCPs/Ditches

General Mine Plan
Caldwell Canyon Mine and Reclamation Plan EIS
Caribou County, Idaho

2.1.3 Ore Removal and Backfill

Mining would occur year-round over about 40 years, 4 to 5 days per week in 2 10-hour shifts. Depending on the needs of the Soda Springs processing plant, ore production from the Caldwell Canyon Project would begin in about 2023 and may fluctuate over time, depending on plant needs and market conditions, increasing or decreasing the mine life. Material meeting the economic cutoff (based on ore quality, mining and processing costs) would be mined from the enriched phosphate rock in the Meade Peak Member stratigraphically overlying the Wells Formation. Ore resources near and underlying Caldwell Creek and the contiguous ore resource between the north end of the North Pit and the Blackfoot River would not be mined to protect surface water and adjacent riparian habitats. Ore resources under the water table in the North Pit would also not be mined.

The pits would be mined sequentially in segments. Mining would start in the mid-point of the South Pit and proceed southward. Mining would then proceed northward in the South Pit and advance into the North Pit as shown in **Figure 4**. The phases and production years are:

Phase 1	Years 1-3
Phase 2	Years 4-6
Phase 3	Years 7-9
Phase 4	Years 10-12
Phase 5	Years 13-15
Phase 6	Years 16-19
Phase 7	Years 20-25
Phase 8	Years 26-32
Phase 9	Years 33-36
Phase 10	Years 37-40

Sequencing details are presented in Table 4-3, Appendix C of the MRP (P4 Production, 2017).

The South Pit would be developed above the water table and below the water table during years 6 through 8 on the south end, and years 14 through 16 at the north end. The North Pit would be mined in sequence from south to north.

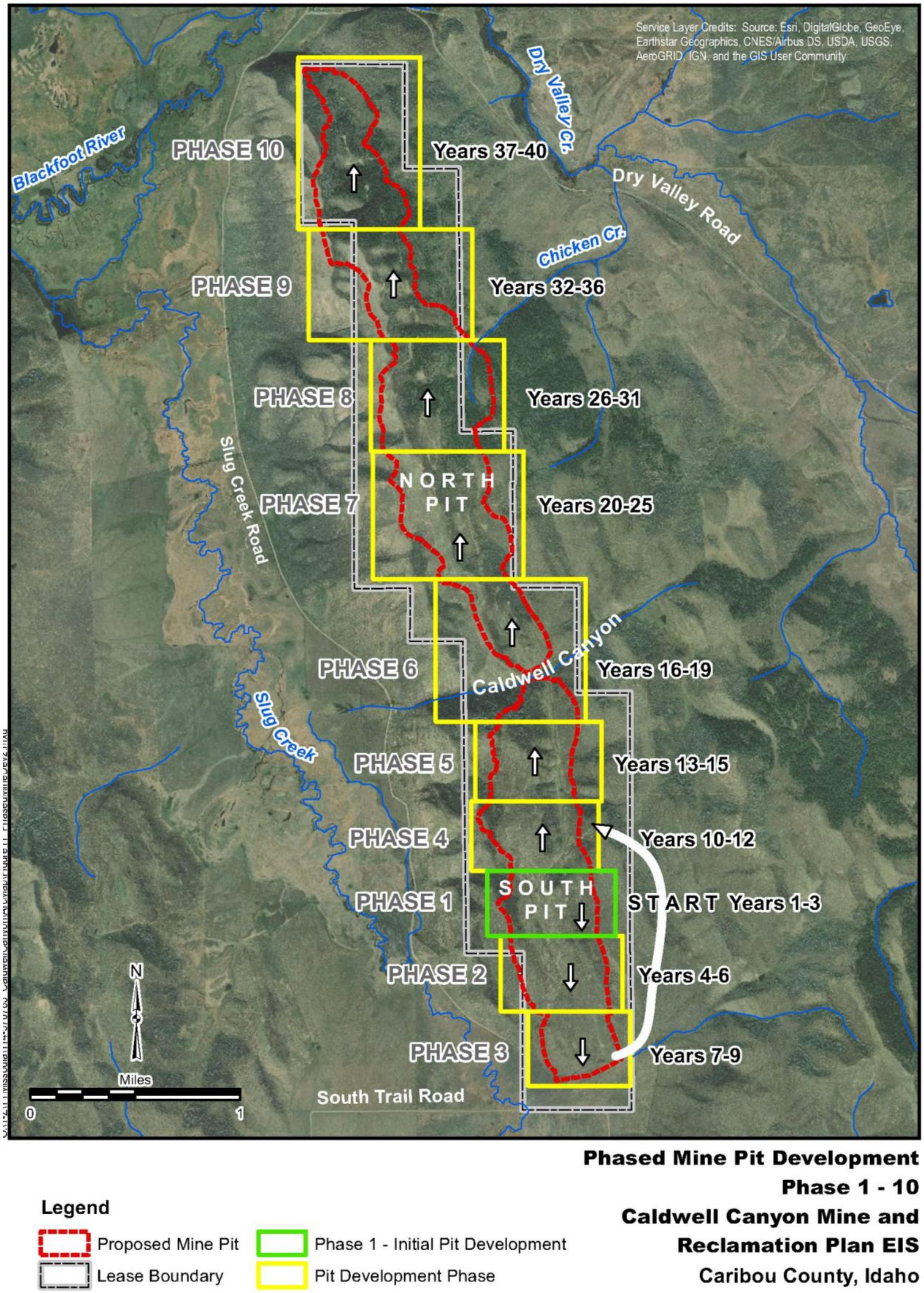
In the first two to three years of mining, five to six million cubic yards of overburden from the South Pit would be placed as backfill in the ore depleted Dry Valley Mine D Pit (partially filling the pit).

Once haulage of this initial overburden is completed, overburden from Caldwell Canyon would be placed as backfill in mined-out areas of the South and North pits as mining progresses.

Overburden would be compacted during backfilling to reduce backfill settlement and restrict air and water movement within the backfill to reduce the risk of selenium leaching into surface waters and groundwater. Backfill would be shaped to maximum slopes of three horizontal to one vertical (3H:1V) in preparation for cover placement and final reclamation. Growth media salvaged from active mine areas would be hauled and placed over the shaped backfill, increasing the opportunity for native seed germination and minimizing the risk that growth media would degrade if stockpiled.

At the north end of the South Pit, two chimney drains consisting of a 10-foot thick layer of Rex Chert and limestone overburden would be constructed along the western limestone pit wall to intercept groundwater inflow from the Dinwoody Formation and rain and snowmelt water from the pit cover and natural slopes. The drains would channel water to the bottom of the backfilled pit (see **Section 2.1.5**). Lower Chert and limestone would be used to backfill predicted saturated portions in the bottom of the South Pit to reduce the concentration of manganese and sulfate that could be released to groundwater if run-of-mine overburden were placed in the saturated zone. Run-of-mine material would be placed over the Lower Chert and limestone backfill in the remaining unsaturated portion of the pits (P4 Production, 2016a).

Figure 4. Phased Mine Pit Development



The combined North and South pits are 26,250 feet long and average 2,900 feet wide. Pit depth ranges from approximately 200 feet to 860 feet below the pit crest.

2.1.4 Backfill Cover

An earthen cover, designed to retain infiltrated rain water and snowmelt and then remove it to the atmosphere through evapotranspiration, would be placed over the backfill and provide soil (growth media) for revegetation. The cover is designed to reduce deep percolation of precipitation (rain or snow) into the backfill, thus limiting the generation of leachate containing selenium and other COPCs. The cover would be constructed of overburden material consisting of two feet of Rex Chert or limestone placed on the shaped overburden and then overlain with four feet of finer grained growth media consisting of alluvium and colluvium.

The Rex Chert/limestone layer is used as a capillary break that impedes downward movement of percolating water by retaining moisture in the finer material for vegetation, promotes evapotranspiration thus reducing infiltration of precipitation into underlying overburden.

2.1.5 Water Management System

The water management system and BMPs are designed to minimize or capture soil erosion and sedimentation to protect surface water and groundwater quality in and adjacent to the project. The MRP, POC application, and IDEQ’s POC determination provide the Water Management Plan discussed in **Appendix B**, **Section B.2** to manage mine dewatering flows, “contact-water” (precipitation that has come in contact with mined materials, overburden, disturbed areas, or surface water sources that are close to mine development) and non-contact water (water from natural areas unaffected by mining that is diverted away from disturbed areas and returned to natural drainages).

2.1.6 Service and Haul Roads

Mine access would be provided through new service road construction and existing road widening. A new haul road between the Caldwell Canyon Mine and the East Caldwell Area would be constructed. The Dry Valley Haul Road would be reopened. Haul roads would be constructed with a road running surface width of 90 feet. The Caldwell Canyon Service Road that intersects with the Slug Creek Road would be widened to a running width of 25 feet to accommodate construction equipment and light vehicle access. To provide a place to park equipment and temporarily store materials during initial mine infrastructure development, a staging area and stormwater management pond totaling 4 acres would be constructed on the west side of Slug Creek Road just north of the intersection of Slug Creek Road and the Caldwell Creek access road.

2.1.7 East Caldwell Area Facilities and Ore Haulage

Infrastructure at the inactive Dry Valley Mine and new facility construction that would be in the East Caldwell Area are shown on **Figure 5.** The ore stockpile pad, tipple, rail loadout, and water management facilities would be in the same general areas used during the previous Dry Valley Mine operations. The site would also provide equipment and material staging areas.

Ore would be transported by haul trucks from the Caldwell Canyon pits to ore stockpiles at the East Caldwell Area adjacent to a rail loading tipple. The ore would then be processed using a sizer, loaded onto rail cars and shipped 22 miles to the Soda Springs processing plant. One train per day would deliver ore to the Soda Springs processing plant, and one empty train would return to the East Rail Loop at the Soda Springs Processing Plant

The rail spur at the East Caldwell Area and part of the Maybe Creek rail line would be upgraded and extended to accommodate a maximum of 130-car trains. New disturbance would total approximately 22 acres. A rail loop for unloading ore would be constructed at the Soda Springs processing plant. The rail loop, covering 118 acres, would be on private land and would tie into the existing Union Pacific rail line (**Figure 7**). Vegetation would be cleared, and rock and soil excavated. Growth media would be salvaged and temporarily stockpiled. After construction, the growth media would be placed along the fill slope face of the railbed and then seeded.

2.1.8 Dry Valley Mine MRP Modifications

Backfilling the reclaimed Dry Valley Mine D Pit for disposal of overburden during Phase 1 of the Caldwell Canyon Mine as discussed in **Section 2.1.3**, would require a modification to the current approved Dry Valley Mine MRP. For ease of reference, the modifications required are listed here:

- Reopen the Dry Valley Haul Road (**Figure 3**), then reclaim. Reseed with the seed mix as described in Appendix A;
- Place backfill in the Dry Valley Mine D Pit and construct cover on backfill (**Figure 3**). Reseed with the seed mix as described in **Appendix A**;
- Construct, use, and reclaim run-off containment ponds (RCPs -1 and -2), sediment control pond (SCP-5), and water management pond (WMP-3) (**Appendix B**, **Figure B-1)**;
- Remove and reconstruct mine facilities at the East Caldwell Canyon Area (**Figure 5**);
- Develop and subsequently reclaim growth media stockpiles (Appendix B, **Figure B-2**); and
- Add EPMs and BMPs listed in Appendix B, Sections B.14 and B.15 as appropriate.

Caldwell Area each day. Union Pacific would deliver empty rail cars to the East Caldwell Area rail yard for ore loading, then transport loaded rail cars to the Soda Springs processing plant. Ore haulage would occur seasonally from May to November.

2.1.9 Power

A 46-kilovolt electrical power line would be constructed along Slug Creek Road linking into existing power lines at the north end of Schmid Ridge. Power to the mining area (primarily to power water pumping equipment) would be provided by Rocky Mountain Power (**Figure 6**). The new power line would be built on private property and not cross federal or state land. The power line and ancillary power facilities would be constructed within a 40-foot wide right-of-way, approximately 6 miles long and in accordance with Rocky Mountain Power's design and specifications.

2.1.10 Environmental Protection Measures and Best Management Practices

P4 Production has committed to implementing EPMs and BMPs to ensure responsible mining operations and reduce adverse environmental impacts. Key components of the EPMs are described in the MRP (P4 Production, 2017) and BMPs are included in the POC application (P4 Production, 2016a) and listed in detail in **Appendix B**, **Section B.14**.

Figure 5. East Caldwell Area Mine Site Facilities

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

East Caldwell Area Mine Site Facilities
Caldwell Canyon Mine and
Reclamation Plan EIS
Caribou County, Idaho

Figure 6. Power Supply Line

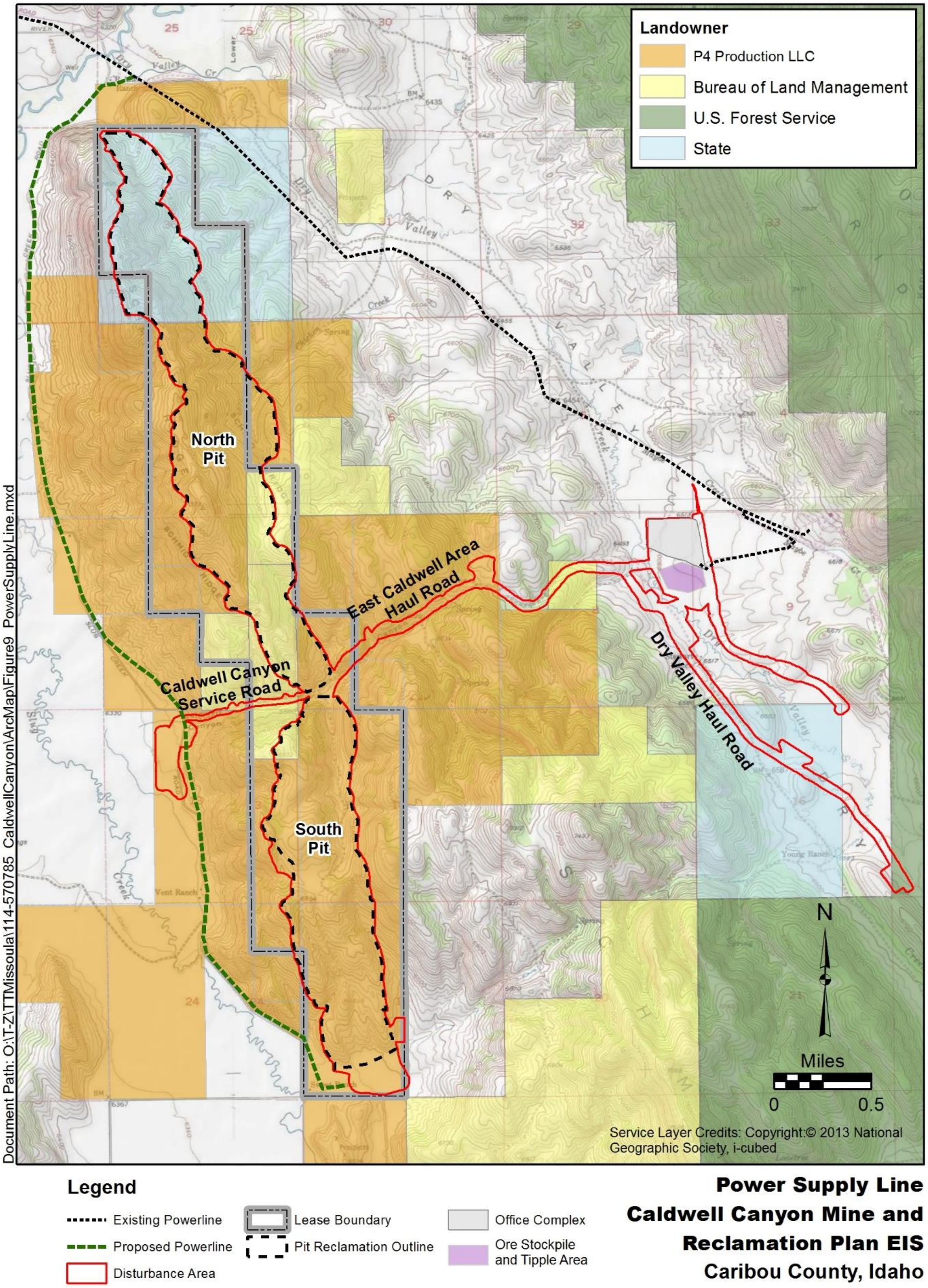
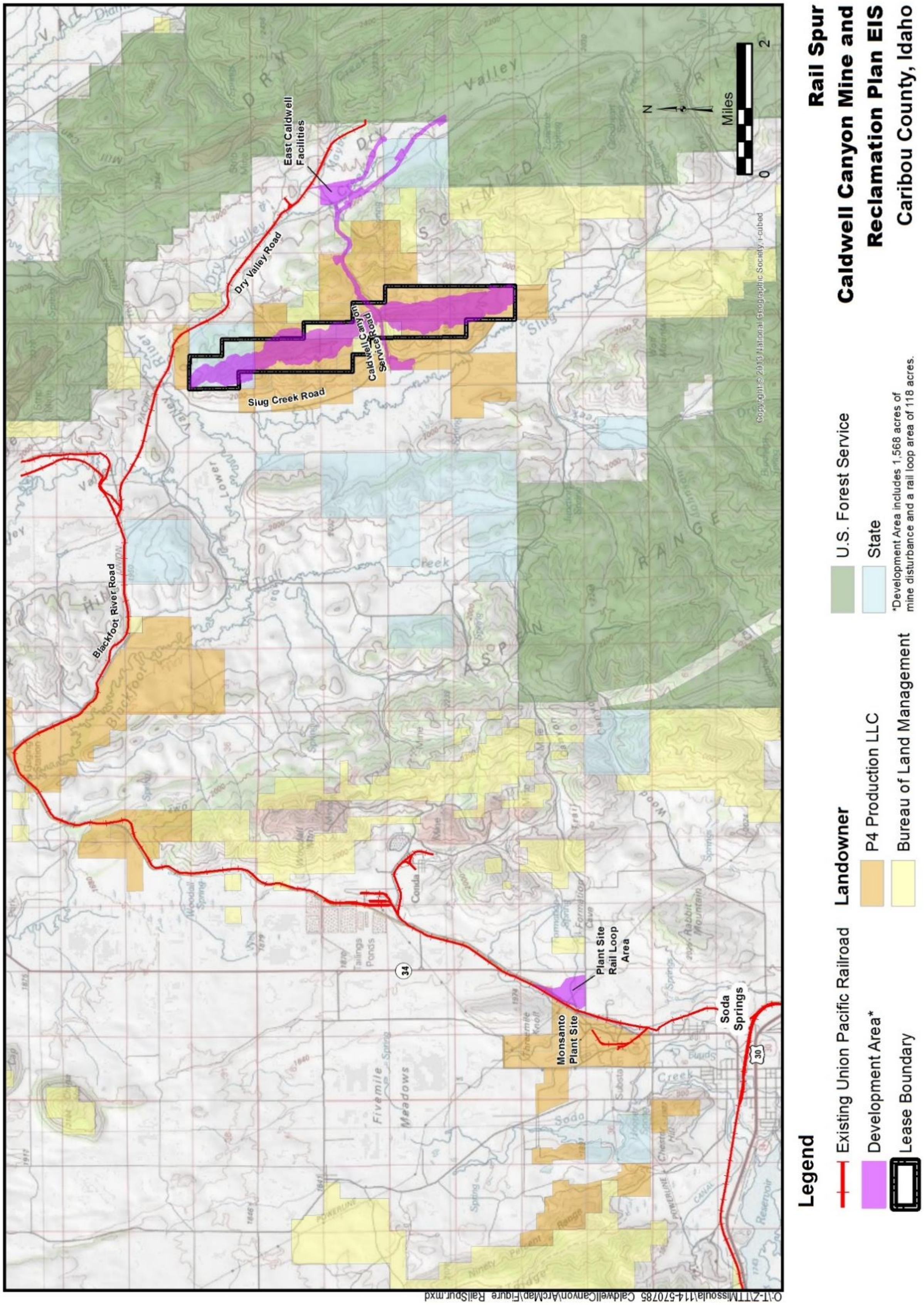


Figure 7. Rail Spur



The BLM has reviewed the MRP against the requirements in the ARMP (BLM, 2012) which references the Idaho Standards for Rangeland Health (BLM, 1997) (**Section 1.7**). In addition to EPMs and BMPs specified in the MRP and POC, P4 Production has agreed to include the following additional measures in the MRP to ensure conformance.

- P4 Production would submit its noxious weed treatment plan to the BLM for review of the effectiveness of proposed treatments on BLM-administered public lands (Action VE-2.1.4). If the treatment plan includes herbicide use, BLM will review for conformance with current policy (Action VE-2.1.5), and its effects on special status species (VR-2.1.6).
- Straw wattles and straw bales used on BLM-administered public lands and the National Forest System lands would be state-certified noxious weed free (VE-2.1.11).
- P4 Production has also volunteered a Greater Sage-Grouse Mitigation Plan (**Appendix C**) to address the loss of Greater Sage-Grouse habitat due to the mine. The Pocatello Approved Resource Management Plan (BLM, 2012) as amended by the ARMPA for the Great Basin Region (BLM, 2019) identifies measures to protect and restore Greater Sage-Grouse habitat. To accommodate any changes in the ARMP as amended, prior to issuance of a ROD, the proponent has committed to a Greater Sage-Grouse Mitigation Plan (**Appendix C**) that would be in conformance with that version of the ARMPA in force when the Caldwell Canyon Mine ROD is issued. BLM will base their final conformance determination in the ROD on whichever version of the ARMPA is in effect when the decision is issued.

2.1.11 Reclamation

Reclamation of mine pit areas would be concurrent with mining. Reclamation of other areas of the Caldwell Canyon Mine site are scheduled to be completed within 2 years after cessation of mining. Reclamation is designed to restore the site to beneficial post-mining multiple land uses, prevent undue or unnecessary degradation of the environment, and reclaim disturbed areas to conditions compatible with the surrounding landscape. **Appendix B**, **Section B.16** summarizes the reclamation plan included in Section 6.2 of the MRP (P4 Production, 2017).

Reclamation practices would meet the objectives set by 43 CFR 3592.1 and Idaho’s Reclamation Plan Title 47, Chapter 15 – Idaho Code. The reclamation plan is intended to stabilize (protect from erosion) disturbed areas and to meet the final multiple land use goals of wildlife habitat, and grazing.

2.1.12 Financial Assurance

The BLM and the IDL would determine reclamation performance bond amounts under their respective authorities. The lease holders at the Caldwell Canyon Mine (P4 Production) and Dry Valley Mine (Nu-West Industries) would post reclamation performance bonds or other instruments (financial assurance), required by the Idaho Surface Mining Act (Idaho Code Title 47, Chapter 15) and 43 CFR 3504.50. Per 43 CFR 3504.71 and in accordance with the BLM actual-cost reclamation bonding policy, *Bond Requirement for Phosphate Mining Operations, September 10, 2013*, that prescribes the procedures for ensuring that an accurate actual-cost reclamation bond is in effect for phosphate mines in Idaho. The reclamation bond is to assure that the obligations in the approved MRP and ROD are met, the project site is reclaimed, and resources are not adversely affected. A BLM production royalty bond for separation of phosphate ore from the federal lease is also required.

The bond amount would be calculated when requirements have been identified and may be adjusted due to operational changes or the economy. Because the bond amount is calculated based on the alternative selected in the ROD, it is not available to report in this EIS. The bond would provide adequate funding to complete reclamation, pre- and post-closure maintenance, and monitoring until affected areas are determined to meet reclamation goals consistent with the ROD and existing rules, regulations, and standards by the IDL and BLM.

2.2 Alternatives Development

BLM conducted public and internal scoping (Section 1.6.1) to identify concerns about the Proposed Action and issues best resolved by developing an alternative. These alternatives, and the issues they resolve are discussed below. Additionally, the No Action Alternative is required in an EIS.

2.2.1 Geosynthetic Membrane Enhanced Backfill Cover – Alternative 1

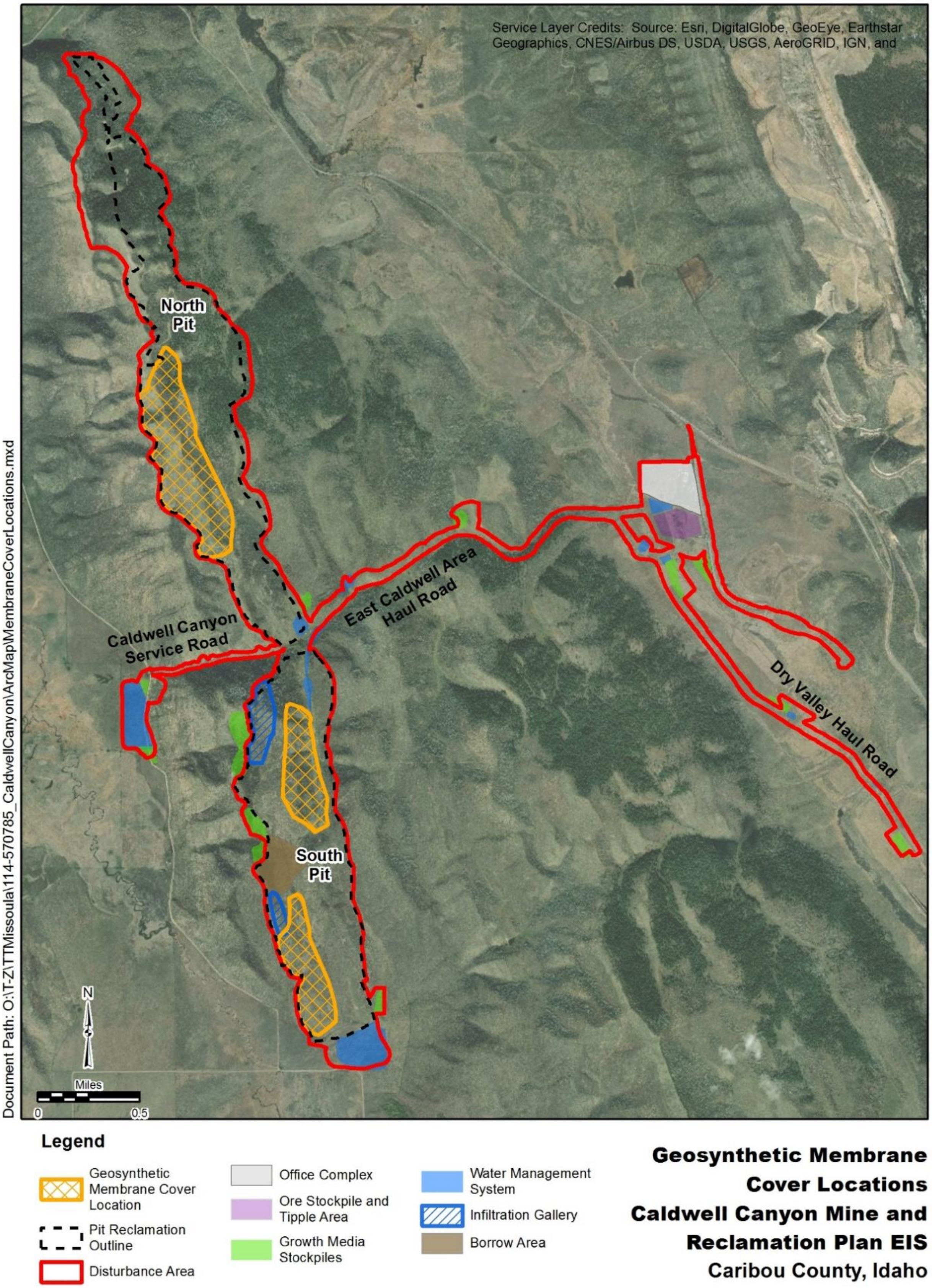
The Geosynthetic Membrane Enhanced Backfill Cover Alternative (Alternative 1) was developed to address groundwater quality issues with the Proposed Action. The final alternative design was developed in two phases of cover performance and groundwater fate and transport modeling. The first phase of modeling conducted in 2015-2016 (Tetra Tech, Inc., 2018a) and described in P4 Production's POC application (P4 Production, 2016a) was used by the IDEQ to position POC wells relative to the mine and predicted groundwater COPC plumes. The modeling in phase one incorporated initial estimates of percolation rates through the cover and initial concentrations of the COPCs, selenium and manganese expected to leach from the backfill.

In phase two, COPC leachate concentrations and percolation rate estimates through the cover and backfill were refined. Predicted COPC leachate concentrations from overburden were finalized (NewFields, 2017b) and cover infiltration/percolation rates were updated to consider an expected increase in cover permeability as the earthen cover aged over time (Tetra Tech, Inc., 2018b). A project-specific groundwater fate and transport model (Tetra Tech, Inc., 2018a) was used that included the revised assumptions about the rate of percolation through the cover and the finalized concentrations of selenium leaching from the overburden. This model predicted higher cover percolation rates, leading to higher backfill percolation rates, resulting in higher predicted COPC loading rates to the groundwater as compared to the phase one prediction.

The results of the cover and the fate and transport modeling (Tetra Tech, Inc., 2018b) of the Proposed Action water balance cover (described in **Section 2.1.4**), predicted groundwater plumes exceeding the water quality standards would extend beyond the POC wells at three locations causing P4 Production, BLM, and IDEQ to be concerned about the design performance of the Proposed Action cover in select areas. As a result, P4 Production developed an alternative cover for BLM's and IDEQ's consideration that consists of placing low permeability geosynthetic membrane over three areas of backfill that represented the source areas for the extended plumes (see **Figure 8**). The geomembrane cover is predicted to reduce the percolation rate where it is used to 0.42 inches per year (NewFields, 2018b). The reduced percolation results in reducing the rate COPCs reach groundwater, resulting in the COPC plumes above groundwater standards not extending beyond the POC well locations thus maintaining compliance with the Idaho Ground Water Rule.

- The geosynthetic membrane would be a double-sided textured, low density polyethylene geomembrane, placed on the backfill in areas of the North and South pits shown on **Figure 8**; For membrane stability, a 0.5-foot bedding layer could be placed below the membrane.
- The 60 mil (about 0.06-inch thick) synthetic barrier would intercept infiltrating water and convey the water horizontally to the perimeter of the pit instead of allowing it to percolate

Figure 8. Geosynthetic Membrane Cover Locations



through the backfill. Horizontal drainage would be managed through a perforated pipe collection system installed above the geosynthetic membrane; The drainage water would be conveyed to where it could be infiltrated without increasing COPC loading to groundwater.

- A 2-foot thick capillary break layer (to reduce water moving from the growth media layer to the backfill) would be placed on top of the membrane. The capillary break would be constructed in the same manner as the Proposed Action, if the pit backfill would provide a firm, non-yielding surface, as expected. Where the 0.5-foot bedding layer is placed below the membrane, the capillary break layer would be 1.5 feet thick; and
- The capillary break would be covered by a four-foot layer of fine-grained growth media to retain water (same as the Proposed Action).

2.2.2 EPMs for the Geosynthetic Membrane Cover

Additional EPMs would be included under Alternative 1:

- As part of the final closure design, shear strength testing of the cover components including the geomembrane interface would be conducted to affirm design performance;
- Standard quality assurance/quality control measures would be performed as the membrane and cover components are installed;
- The cover components would be designed to be stable considering planned and expected shear properties, backfill slopes, and maximum precipitant/snowmelt events;
- Water collecting on top of the geosynthetic membrane would be directed into 6-inch diameter perforated pipes which would convey the water into larger collection pipes then into the perimeter of the pit or to specified locations for infiltration outside the pit;
- The drainage layer/capillary break and drain piping would be designed to prevent excess pore pressure build-up thus avoiding mechanical failure of the cover; and
- The coarse fraction of the bedding layer and the drainage layer would be designed to avoid puncturing the membrane.

All other components in this alternative would be the same as described for the Proposed Action.

2.3 No Action Alternative

The No Action Alternative would consist of the BLM not approving the MRP, with or without additional mitigation. The analysis of the No Action Alternative was conducted assuming:

- None of the activities proposed in the MRP would occur, including backfilling the Dry Valley Mine open pit or modifying the leases;
- A new or different MRP to mine phosphate in the same area would not be submitted in the foreseeable future;
- Current P4 Production mining operations at the Blackfoot Bridge Mine are expected to continue into the early 2020s; and
- P4 Production would continue to operate their plant in Soda Springs using phosphate otherwise available in the district after the Blackfoot Bridge Mine is depleted.

2.4 Alternatives Considered but not Studied in Detail

BLM considered public comments and potential project effects when determining what alternatives should be evaluated in this EIS. Some alternatives were suggested during scoping, but after a preliminary evaluation of their effects or benefits, it was determined that the alternatives suggested did not need to be considered in detail. Additionally, P4 Production evaluated several alternatives while developing their MRP that addressed some known issues. In their MRP, P4 Production provided an analysis of why they chose not to use specific options concerning the location, design, operation, and closure methods for components of the project. P4 Production's analysis methods and rationale are described in Appendix A of the MRP (P4 Production, 2017).

This section describes how the alternatives not studied in detail differ from the Proposed Action, the reasons for considering the alternatives, and then provides the rationale for why the alternatives were not considered in detail.

In general, alternatives to the Proposed Action may be eliminated from detailed analysis if (BLM NEPA Handbook H-1790-1):

- It is ineffective (it would not respond to the purpose and need).
- It is technically or economically infeasible (consider whether implementation of the alternative is likely given past and current practice and technology; this does not require cost-benefit analysis or speculation about an applicant's costs and profits).
- Its implementation is remote or speculative.
- It is inconsistent with the basic policy objectives for the management of the area (such as, not in conformance with the land use plan.
- It is substantially similar in design to an alternative that is analyzed.
- It would have substantially similar effects to an alternative that is analyzed.

In general, alternatives to the Proposed Action that are considered in detail should:

- Address an issue raised or the need to meet a standard, rule, management plan, or policy;
- Reduce or eliminate one or more impacts that could result from the Proposed Action;
- Be technically and economically feasible; and
- Be effective and adequately respond to the purpose and need (**Section 1.3**).

2.4.1 Maximizing Ore Recovery

2.4.1.1 Mining through Caldwell Creek

The Caldwell Canyon ore deposit extends under Caldwell Creek. The Proposed Action avoids mining through Caldwell Creek, and its riparian area as a means of minimizing environmental impacts. P4 Production has indicated that ore reserves beneath Caldwell Creek are approximately 380,000 tons. This alternative was evaluated by P4 Production during development of the MRP (Appendix A, Section 5 of the MRP) (P4 Production, 2017).

An alternative that would recover more ore from beneath Caldwell Creek was originally considered that would have similar affects to mining the proposed pit, but also add the removal of the riparian area and the potential long-term effects of managing the creek where it would cross over pit backfill, to minimize infiltration into backfill and the potential leaching of COPCs into groundwater and surface water.

2.4.1.2 Mining below the Water Table at the North End of the North Pit

In the Proposed Action, P4 Production would not mine below the water table in the north portion of the North Pit, leaving behind approximately 454,500 tons of minable phosphate ore on the state phosphate lease. An alternative to the Proposed Action could be to mine below the water table in the North Pit to recover the ore. If P4 Production mined the ore below the water table in this area, that portion of the pit below the water table would need to be backfilled with overburden to a level above the groundwater table in the pit to prevent a perineal pit lake from forming. Pit lakes have been considered detrimental to wildlife because the water might contain deleterious constituents such as selenium. However, placing overburden below the water table could also lead to leachates from the backfill contaminating groundwater which could migrate north to the nearby Blackfoot River. The Blackfoot River is currently listed as impaired due to elevated levels of selenium.

Contaminants, including selenium, from backfill placed below the water table in the North Pit could still affect the nearby Blackfoot River, despite preliminary results of Phase 1 fate and transport modeling (Tetra Tech, Inc., 2015a; Tetra Tech, Inc., 2015b; Tetra Tech, Inc., 2016a; Tetra Tech, Inc., 2016b) indicating that selenium concentrations in alluvium at the north end of the North Pit would not exceed the surface water standard (0.005 mg/L). Modeling did indicate that selenium concentrations would exceed the surface water standard in the Wells Formation more than 1,000 feet below the Blackfoot River; indicating that the river would not be affected.

Because water quality modeling did not predict impacts to the Blackfoot River, this alternative would have substantially similar effects to the proposed action and was not considered in detail. Also, P4 Production considered the risk of contaminating the Blackfoot River close to the pit to be too great, and this portion of the project is not subject to the federal maximum ore recovery regulations (43 CFR 3594.1) because it is state minerals and not federal.

2.4.2 Not Mining below the Water Table in the South Pit

In the Proposed Action, mining in the South Pit would occur below the water table. An alternative to the Proposed Action was suggested to eliminate mining below the water table in the South Pit if it would reduce the amount of groundwater management necessary to keep the pit operations dry and possibly reduce the size and disturbance from infiltration galleries and WMPs.

This alternative was evaluated by P4 Production during development of the MRP (Appendix A, Section 5 of the MRP) (P4 Production, 2017). Approximately 2.5 million tons of phosphate ore would not be recovered. Federal regulations, per 43 CFR 3594.1, state that mining operations shall be conducted in a manner to yield the ultimate maximum recovery of mineral deposits, consistent with the protection and use of other natural resources and the protection and preservation of the environment.

The Water Management Plan (i.e., dewatering wells and infiltration of excess water) in the Proposed Action would provide an adequate method to manage water encountered during mining below the water table in the South Pit while meeting surface water standards and requirements of the POC determined by IDEQ (as demonstrated by the analysis in **Section 3.4** of this EIS). The Proposed Action also includes mitigation of water quality impacts by selective handling of overburden to be placed below the water table based on its chemical properties (**Section 2.1.3**). Because the Water Management Plan would adequately address potential water quality issues while allowing for recovery of 2.5 million tons of phosphate ore, not mining below the water table in the South Pit would have substantially similar effects to the proposed action and was not analyzed in detail.

2.4.3 Overburden Cover System Alternatives

Several alternatives were suggested regarding the cover system design to reduce the infiltration into the backfilled overburden and thereby potential for selenium or other contamination in groundwater. These are discussed below.

2.4.3.1 Earthen Covers Using Dinwoody Formation Material

Based on public comment and the need to design a cover that meets performance requirements to protect groundwater uses, P4 Production considered several earthen cover designs. These included silt/clay covers using weathered Dinwoody Formation material, a monolithic earthen design employing a capillary break, and earthen covers of varying thickness. An analysis of the cover options evaluated is detailed in the Water Balance Cover Design Report (NewFields, 2016a), which is an appendix to the POC application. Although covers using these designs do reduce infiltration, P4 Production did not consider these methods further because of the tendency for the Dinwoody Formation clay material to develop desiccation soil structure, becoming less effective over time at reducing infiltration. These alternatives would not reduce impacts compared to the Proposed Action.

2.4.3.2 Geosynthetic Clay Laminate Cover

Public comments suggested the analysis of a geosynthetic clay laminate cover over all waste or just over center waste shale to minimize potential surface water and groundwater contamination from water infiltration into overburden. This alternative was not considered in detail because the Proposed Action and Alternative 1, selected areas of geosynthetic cover placed over the overburden pit backfill, would meet requirements for protecting beneficial uses of groundwater as required by the Idaho Groundwater Rule and IDEQ POC determination (IDEQ, 2016). This alternative is substantially similar in design to Alternative 1 and would have substantially similar effects to the Proposed Action and Alternative 1.

2.4.4 Ore Transportation/Haulage from Dry Valley Tipple to Soda Springs Processing Plant Alternatives

Under the Proposed Action, transportation of ore to the Soda Springs processing plant from the ore loadout facility at the Dry Valley tipple would use the existing Union Pacific Railroad rail line extending from Dry Valley to Soda Springs that was previously used by the Dry Valley Mine which is now in closure. A rail spur, yard, and car unloading facility would be constructed near P4 Production’s Soda Springs processing plant.

P4 Production evaluated hauling ore to the Soda Springs processing plant by truck, conveyor, and rail and a combination of these in the MRP (Appendix A, Section 2.1 of the MRP) (P4 Production, 2017).

The following criteria were used to compare the ore haul and haulage methods. Surface area disturbances were based on preliminary design layouts of disturbed acres:

- Acres of wetland disturbances based on the National Wetlands Inventory and individual design layouts;
- Land ownership;

- Environmental risk based on potential impacts from spills of ore, fuel, or chemicals transported to support operations based on the route's number of drainage channel crossings, and proximity to open water based on the length of the route within 100 feet of perennial streams (Blackfoot River, Slug Creek, Dry Valley Creek, and Caldwell Creek);
- Visual impacts of each route viewable from public access roads, trails, or private residences;
- Noise or vibration impacts to residences within one mile of each route;
- Proximity of the haul route to critical habitats or nests including eagles, Greater Sage-Grouse, mule deer, and elk.

The haulage options considered by P4 Production included the following:

- Ore truck haulage using tractors with triple trailers capable of hauling 70 tons each (210 tons, fully loaded) from the mine to the processing plant at Soda Springs. The route would trend northwesterly from the mine, crossing Slug Creek into higher land, above the Blackfoot River valley, ultimately linking to an existing haul road to the Soda Springs processing plant.
- However, using trucks similar to above, the route would trend along the Slug Creek and Blackfoot River valleys, encountering minimal elevated topography. The proximity of this route to perennial streams could cause more impacts on watercourses due from spills or overturns and disturbance of wetlands. Several Greater Sage-Grouse leks are within one mile of this route.
- Ore transportation via an overland conveyor. The proposed route would include a relatively direct route from the Caldwell Canyon Mine to the Soda Springs processing plant. The total length of overland conveyor would be approximately 14 miles. No previously identified Greater Sage-Grouse leks are near this course and only minimal disturbance of wetlands (<5 acres) would result from construction of the system.
- Ore transport via mine trucks traveling in a northwesterly direction to an ore stockpile point just west of Trail Creek. Stockpiling, crushing, and screening would take place at this location prior to loading ore trucks. The route would cross the Slug Creek Valley, disturbing approximately 16 acres of wetlands that would require mitigation. The ore truck portion of this route was near 2 unoccupied/inactive and 1 occupied/active Greater Sage-Grouse leks and was considered to have a high-risk of impact on habitat.

The Proposed Action avoids sensitive habitat and wetlands, takes advantage of existing facilities, minimizes risks associated with haul trucks (distracted driving over long distances, spillage, noise) and results in new disturbance on only 118 acres. Because the Proposed Action and Alternative 1 results in fewer potential impacts (including on waters of the U.S. (NewFields, 2017g)), alternative methods of hauling ore and storage options were not considered in detail.

2.4.5 Power Supply Alternatives

2.4.5.1 Bury the Power Line

To reduce the potential for wildlife injury, death, and increase avoidance, an alternative was evaluated to bury the proposed Slug Creek Road overhead power line. This alternative would entail digging a trench or boring to install the power line underground, including boring under the road crossing and stream crossings. This alternative was not considered in detail because the expense is prohibitive, underground placement poses risks for inadvertent contact through digging, difficulty in maintaining the power line, and the fact that risks to wildlife from overhead power lines are mitigated (**Appendix B**, **Sections B.14** and **B.15**). This alternative would have substantially similar effects as the other action alternatives and therefore was not analyzed in detail.

2.4.5.2 Use Generators

Electrical power would operate dewatering wells and lift stations. The Proposed Action includes the Slug Creek Road overhead power line. Diesel power would still be required occasionally for diesel powered pumps and generator sets for submersible pumps. Additionally, small generators would be needed on a short-term basis to provide power where running a power line is not feasible.

Public comment suggested minimizing disturbance from power line construction by using electrical generators to power the mine facilities. If generators were used for all the electrical power requirements, they would be at the mine office facilities and throughout the mine area to power pumps used in the water management system. Diesel for the generators would be delivered to storage tanks by tanker truck as often as necessary.

This alternative was not considered in detail because using diesel generators for all electrical power needs would have more adverse impacts on air quality, traffic, and noise than constructing a power line as in the Proposed Action.

2.4.5.3 Eliminate the Generators

Public comment suggested eliminating the generators. While a new power line would be the primary source of electricity, generators are needed for short-term and mobile sources of power for diesel-powered pumps and submersibles because in these cases, a power line is not feasible. Therefore, this alternative is not technically feasible.

2.4.5.4 Route Power Line Along Haul Road in Dry Valley

Public comment suggested routing the power line along the haul road to minimize visual impacts and ground disturbance near a private landowner. Rerouting would require significant cost and cause more disturbance and impacts along the haul road between the mine and Dry Valley, especially in areas where the canyon is very narrow where Caldwell Creek flows.

2.4.6 Treating Contaminated Groundwater

Public comment suggested the development of a contingency plan that addresses intercepting and treating any contaminated groundwater leaving the site. The potential for release of contaminants to groundwater was evaluated in the MRP (P4 Production, 2017) and in this EIS (**Section 3.4.3**). This alternative was not considered in detail because the Proposed Action (i.e. MRP) and Alternative 1 included design components and BMPs to prevent contaminated groundwater from leaving the site. Monitoring at the POC locations would be used to verify that contaminated groundwater is not leaving the site. Potential impacts from selenium are disclosed in several resource sections in **Chapter 3**. The action alternatives include monitoring of water quality to ensure that beneficial uses are met and treating contaminated water would not be required (**Appendix B**, **Section B.14.1**). This alternative would have substantially similar effects to the proposed action and was not analyzed in detail.

2.4.7 Selenium Bio Treatment

Public comment suggested the use of selenium bio treatment to improve surface and groundwater quality. The potential for selenium release was evaluated and accounted for in the MRP (P4

Production, 2017) and this EIS (**Section 3.4.3**). This alternative was not considered in detail because the MRP included design components and BMPs to limit and mitigate the generation of groundwater contamination. Potential impacts from selenium are disclosed in several resource sections in **Chapter 3**. The action alternatives include monitoring of water quality to ensure that beneficial uses are met and treating contaminated water would not be required (**Appendix B**, **Section B.14.1**). This alternative would not reduce impacts.

2.4.8 No Lease Modifications

An alternative that would approve a mine plan but without the lease modifications was suggested in a public comment to address impacts to Greater Sage-Grouse habitat that could result from the lease modification. This alternative would eliminate disturbance of approximately 113 acres in General Habitat Management Area (see **Section 3.9.3**). Not modifying the leases would result in a need to redesign the pit walls.

Modification of lease boundaries are allowed in accordance with 43 CFR 3510. Authorization of the lease modification require meeting one of two criteria, either:

1. the adjoining acreage to be added contains known deposits of the same mineral deposit that can be mined only as part of the mining operation on the original Federal lease; or
2. the acreage to be added does not contain known deposits of the mineral, but the adjoining acreage is necessary for the recovery of the mineral deposit on the original Federal lease and including the acreage in the original lease at the time of that lease’s issuance would have resulted in the original Federal lease being reasonably compact.

The Caldwell Canyon lease modifications, if warranted, will allow recovery of ore in accordance with and development of a pit configuration providing for safe mining operations. In Idaho, BLM-administered surface includes 4.1 million acres of primary habitat management area, 2.7 million acres of important habitat management areas, and another 450,000 acres of the mineral estate ad primary or important habitat. Both primary and important habitat are higher quality for Greater Sage-Grouse than GHMA (BLM, 2019). This alternative was not analyzed in detail because the disturbance of 113 acres pf GHMA when there is 7.25 million acres of primary and important habitat protected in Idaho is a negligible impact and not modifying the lease boundary would result in the approximately 11.2 million tons of ore not being mined in the leases and the lease modifications (Leatherman, 2019), which would not allow ultimate maximum recovery and use of all known mineral resources in accordance with 43 CFR 3590.

2.5 Comparison of Alternatives

Table 5 summarizes the potential effects of the action alternatives on issues analyzed. This summary briefly describes the issues analyzed in **Chapter 3** (and refers to the **Chapter 3** sections where it is discussed), the measures used to indicate the impacts, and a summary of the impacts.

The Proposed Action (water balanced cover only) and Alternative 1 (addition of geomembrane cover) would have the same effects on all resources except water.

2.6 Agency Preferred Alternative

Alternative 1 (Geosynthetic Membrane Enhanced Backfill Cover) is the BLM’s and the IDEQ’s preferred alternative.

Table 5. Comparison of Effects

Component/Issue	No Action	Proposed Action	Alternative 1
Geology and Minerals (Section 3.3.3) • Which geologic resources would be removed and over what time period?	Conditions would continue as they are.	Over the 40-year mine life, phosphate ore would be permanently removed (an irreversible and irretrievable commitment of resources). All non-ore mined materials would lose their stratigraphic character due to mixing but would remain onsite as backfill or closure cover material in the mine pits or as construction materials. Phosphate would be mined, resulting in the benefits of its use. The Dry Valley Mine D Pit would receive additional backfill, which would improve the pit wall stability.	Same as Proposed Action.
Water (Section 3.4) • Effects on water rights and beneficial uses (i.e., flow, access, quality) estimated from the predictive model drawdown;	Conditions would continue as they are.	Mining would physically remove four springs in the North Pit and one spring in the South Pit; the flows from those springs would cease permanently. The water that fed the springs would either percolate to groundwater, evapotranspire or run-off to surface waters. Dewatering activities during mining phases 3 and 6 (mining years 6 through 8 and 14 through 16) would lower groundwater levels, but the lowering would not affect stream flows at permitted water rights points of diversion nor groundwater levels at locations of permitted water supply wells.	Same as Proposed Action.
• Changes in flows (quantities) of surface water, groundwater, wetlands, springs and seeps based on the predictive model results. • Effects on surface water and groundwater quality as indicated by predictive modeling and dust deposition.	Conditions would continue as they are.	Pit backfill is more permeable than the rocks removed during mining, resulting in water-level declines in the groundwater system near the mine. Water level declines were predicted at 3 of the 12 permitted water supply wells in the modeled area. Surface water right diversions along stream segment in the drawdown area do not normally depend on groundwater to support their flows; therefore, drawdown of groundwater levels would not measurably affect the surface flow at these locations. Operations conducted in accordance with the MRP and regulatory permits would result in no impacts to surface water quality from mine-related sources exceeding regulatory limits. The water quality of springs discharging from the shallow and intermediate groundwater system aquifers outside of the mine pits area would not be affected by the project. Under the Proposed Action, water containing COPCs that percolates through mine backfill would result in groundwater COPC plumes in the regional Wells Formation aquifer that migrate down gradient (west) of the proposed mine pits.	The mass loading of COPCs from the mine pit backfill into the groundwater system would be reduced compared to the Proposed Action (**Sections 2.2.1** and **2.2.2**). The reduced mass loading is predicted to result in much smaller COPC groundwater plumes. Concentrations of selenium in groundwater were predicted to exceed the groundwater standard in areas outside the immediate vicinity of the mine pits but not beyond the POC wells. Concentrations of manganese, cadmium, and sulfate above groundwater

Component/Issue	No Action	Proposed Action	Alternative 1
		Groundwater plumes containing the COPCs selenium and manganese at concentrations above groundwater standards are predicted to extend beyond the POC locations. The selenium and manganese plumes would not affect surface water near the mine site but could affect surface water at regional discharge locations. The groundwater exceeding standards would be at depths far below the land surface and would not be in hydrologic connection with surface water until they potentially discharged from the regional aquifer at locations (springs) west of the Aspen Range, about six miles west of the mine site. It is estimated to take 120 years for groundwater containing the selenium and manganese to reach those springs, although their concentrations would likely be attenuated due to dispersion, dilution and mixing along the way. The attenuation, of the groundwater, dilution upon discharge to the surface due to mixing with surface water flows at the regional discharge locations would result in negligible to no effects on fish or wildlife. Selenium carried on airborne dust from the mine could be deposited on surface water. A conservative model of the selenium in dust from the mine found negligible effects on selenium concentrations in surface water.	standards were predicted to remain within or very close to the mine pits area and not extend beyond POC location. Those areas of groundwater with selenium and/or manganese concentrations exceeding the groundwater standards beyond the mine pits but within the POC locations would be confined to the deep middle layer of the regional Wells Formation aquifer, and substantially below land surface, similar to conditions under the Proposed Action. Groundwater quality in the alluvial aquifers would not be affected. Because the selenium and manganese plumes would not extend beyond the POC wells, beneficial uses of groundwater at springs in the regional discharge area would not be affected.
Air Quality (Section 3.5.3) • Potential for PM_{10} emissions, indicated based on components that would produce emissions.	Conditions would continue as they are.	Fugitive dust emissions would be produced from mining operations including sizing of the ore, blasting, haulage and backfilling, and stripping and haulage of growth media. Selenium is present in the material to be mined and processed; therefore, selenium is expected to be a component of fugitive dust emissions. Fugitive dust emissions would be decreased with implementation of the fugitive dust control plan.	Same as Proposed Action.
• Annual greenhouse gas emissions, measured by calculating carbon dioxide equivalent (CO_2e)	Conditions would continue as they are.	Greenhouse gas emissions based on the Greenhouse Gases Equivalencies Calculator are predicted to be less than 50,000 metric tons of carbon dioxide equivalent (CO_2e), or 55,000 short tons of CO_2e. The effect of vegetation (some of which would be	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
emissions from proposed sources using greenhouse gas emissions calculation formulas from the USEPA's website to calculate greenhouse gases or published emission factors.		forested) and soil removal, storage, and replacement on greenhouse gas emissions as the mine is developed although difficult to quantify with precision, would likely be a minor component of the total greenhouse gas effects of the project. Vegetated areas are CO_2 sinks, and forests sequester more carbon than grasslands, so even after revegetation to a non-forest cover over most of the disturbed area there would be a net loss to the carbon stock from this activity.	
• Impacts from fugitive dust and selenium deposition, measured by modeled fugitive dust emissions, wind patterns, and wind speeds.	Conditions would continue as they are.	Fugitive dust emissions would be produced. A fugitive dust control plan would be submitted to the IDEQ as part of the Air Quality Permit to Construct (IDAPA 58.01.01). Selenium, as a component of fugitive dust emissions would become airborne from mining and hauling activities and deposited on soil and water near the Caldwell Canyon Project. The fugitive dust control plan, although not focused on selenium in dust, would minimize dust generation, thus minimize selenium deposition by using vegetated cover materials and water spray or surfactant on roads and other mine dust sources during operations. Modelled dust emissions indicate that selenium concentrations would not exceed the 5 milligrams per kilogram (mg/kg) dry weight BLM PFO ARMP vegetation action level in vegetation. With implementation of the fugitive dust control plan, the Caldwell Canyon Project would meet IDEQ permitting requirements. No long-term impacts on air quality would result from the fugitive dust air emissions.	Same as Proposed Action.
Noise (Section 3.6.3) • Impacts on sensitive receptors, measured as maximum noise at closest residence (1/4-mile):	Conditions would continue as they are.	Noise during construction, mining operations, and during reclamation would be generated by heavy equipment, vehicle use, and blasting. Sound levels would fluctuate but could affect the human environment and disturb wildlife. During construction and operation, noise at the nearest residence would meet USEPA recommended levels for outdoor activities but during reclamation equipment operation could temporarily exceed them.	Same as Proposed Action.
Soil or Growth Media (Section 3.7.3) • Effects on soil resources, indicated by acres of soil	Conditions would continue as they are.	Soil disturbance would occur on 1,559 acres, a majority of which would be reclaimed by replacement with growth media and seeding; approximately 130 acres of the North Pit wall would not receive growth media or seeding. Approximately 6.7 million	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
disturbance and post-mining reclamation (i.e. North Pit pit walls); volume of suitable soil available for reclamation and soil of poor quality that would be blended with better soil; changes to soil structure during salvage and storage operations; and potential effects on soil quality due to deposition of selenium.		cubic yards of soil would be disturbed and salvaged, which would result in a long-term reduction in soil functionality. Negative effects on soil or growth media due to long term storage would be mitigated through concurrent reclamation and direct soil placement on areas ready for soil placement thereby reducing the volume of soil requiring long term storage. Soil would be conserved by using erosion control measures on reclamation. The uptake of selenium by vegetation due to dust settling on soil is predicted to be minimal, and not cause exceedance of vegetation selenium action levels. In addition, dust would be minimized using management practices such as water spray and equipment enclosures.	
• Soil available to meet reclamation requirements (i.e. soil depth on reclaimed areas), measured by the volume of suitable soil versus volume necessary to achieve proposed reclaimed soil depths and timing of availability compared to need.	Conditions would continue as they are.	Growth media is planned to be salvaged in two lifts (Lift 1 and Lift 2). Lift 1 material is typically higher quality than the deeper Lift 2 material. Adequate Lift-1 growth media is available to reclaim support facilities and roads. The overburden backfill cover (18 inches of Lift-1 over 30 inches of Lift-2) require 2.6 million cubic yards of Lift-1 and4.3 million cubic yards of Lift-2. Adequate volume of Lift-1 material is available. An adequate volume for the 30 inches of Lift-2 material would be obtained by blending 2.4 cubic yards of Lift-2 material rated ideal to fair for plant growth with 1.9 million cubic yards of material rated not suitable due to coarse fragment content. The 18-inch Lift-1 growth media layer would be adequate for plant establishment and growth as the reclaimed thickness would be one inch thicker than the average pre-disturbance thickness.	Same as Proposed Action.
• Potential for erosion and sediment delivery due to mine activity, indicated by the volume and acreage of soil with moderate to high erosion hazard ratings, erosion from soil stockpiles and reclaimed areas, and route for sediment delivery between disturbed	Conditions would continue as they are.	One soil series is rated high for susceptibility to water and wind erosion, moderate when adjusted for coarse fragment content. It occurs within approximately 95 acres proposed for ground disturbance, 88 acres of which are within the mine pit boundary. Erosion would occur in disturbed areas but would be controlled using BMPs designed and applied through a storm water pollution prevention plan (SWPPP). The SWPPP would define the key components, structural BMPs, and other alternative sediment control measures such as silt fencing, straw wattles, rock check dams, which would be employed as needed to control	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
areas/stockpiles and surface water receptors.		erosion and sedimentation from disturbed or recently reclaimed backfill.	
Vegetation, Wetlands, and Riparian Areas (Section 3.8.3) • Impacts on vegetation types (including forest, rangeland, wetlands, and riparian areas) measured by the acres of disturbance in each vegetation type and percent change from existing vegetation type to reclamation type, and the anticipated years for reclamation success and potential for pre-disturbance vegetation communities to return.	Conditions would continue as they are.	Areas with ground disturbance would disturb vegetation in ten identified vegetation types. The acreage of vegetation removal and subsequent reclamation would vary over time as mining progresses. Mining activities would occur over a 40-year period resulting in a total disturbance of 1,559 acres. Shrubland and forested vegetation types would be removed during mining, with some types such as Aspen and Conifer/Aspen being eliminated in the long-term where the cover is placed or because aspen primarily reproduces clonally. Disturbed areas would be reclaimed, and vegetation would return; however, species composition and community structure would be different from pre-construction conditions. Effects on wetlands and other waters of the U.S. would be negligible, as the functions and services provided by the impacted wetlands are relatively low and would not be diminished. Mitigation would be completed using an appropriate functional equivalency ratio to offset the 0.21 acre of wetlands and 500 linear feet of other waters of the U.S. affected. Effects on the functions and services of one wetland, which scored as important for groundwater discharge/recharge, sediment removal, and wildlife habitat, would be negligible. Impacts on Dry Valley Creek and adjacent wetlands would be negligible. Dry Valley Creek is a man-made stream that was relocated and restored as part of the Dry Valley Mine. There would be no effect on functions and services from the culvert installation, as the culvert would not prohibit stream flow or alter function and service capacity.	Same as Proposed Action.
• Selenium to accumulate in vegetation in reclaimed areas. Qualitatively discuss the potential for bioaccumulation in the reclamation vegetation at concentrations in excess of stated ARMP guidance	Conditions would continue as they are.	Plant species known to accumulate selenium (i.e., legumes and asters) or that grow roots deeper than the cover thickness would not be used for reclamation. Should these species encroach on these sites, they would be controlled using techniques described in the *Decision Record for the Upper Snake-Pocatello Integrated Weed Control Program Environmental Assessment* (BLM, 2017b) or the most current BLM PFO guidance.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
level (5 mg/kg plant dry weight); and the types of plants that may accumulate selenium, rooting depth of reclamation species, and proposed cover depth.		Soil covers on overburden would be thicker than the expected typical root depth of revegetation species, minimizing uptake of selenium from the underlying overburden. Contaminant concentration limits in vegetation specified in the ARMP (BLM, 2012) are expected to be met. Post-closure vegetation monitoring would ensure final site compliance with the vegetation contaminant limits.	
• Invasive and noxious weed introduction and spread discussed qualitatively as to the potential for weeds found and common to southeast Idaho to spread in the reclaimed areas, and adequacy of EPMs and BMPs for control of weeds.	Conditions would continue as they are.	Potential for the introduction or encroachment of non-native plant species, including noxious weeds, would increase where vegetation is removed and soil surfaces are disturbed. Implementation of the reclamation plan and proposed noxious weed control measures would minimize noxious weed introduction and spread, thereby reducing impacts on vegetation composition from noxious weed invasions. Invasive, noxious, and selenium accumulator species control measures would adhere to methods and techniques in the most current BLM PFO guidance.	Same as Proposed Action.
Wildlife (Section 3.9.3) • The effect noise would have on wildlife and birds measured by comparing the anticipated noise levels with standards for specific species.	Conditions would continue as they are.	Noise during construction, mining operations, and during reclamation and closure generated by train haulage, heavy equipment, vehicle use, and blasting would fluctuate, but could affect and disturb wildlife. Noise disturbances could result in dispersal movements away from mining activities. Displacement may result in unnecessary energy expenditure and potential disruptions in behavior that could ultimately impact reproductive success and survival. Dispersal into adjacent habitats may result in increased competition for resources with other individuals or different species.	Same as Proposed Action.
• Potential displacement of raptors and other birds within and adjacent to mining areas, discussed by qualitatively evaluating avoidance and nest abandonment caused by increased human activity and noise, raptor nests that would need to be	Conditions would continue as they are.	The distance at which raptors are sensitive to disturbance varies by species, habitat, topography, and even the habituation of individual birds to humans. Habitat loss and modification and avoidance of mining activities may affect individual birds, however, the abundance of similar habitat types within the rural and undeveloped wildlife analysis area should provide adequate opportunities for displaced birds to meet their life history needs.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
considered for seasonal restrictions, and acres of habitat types disturbed or lost and how it affects the avian community.			
• Amphibian and reptile habitat that would be disturbed and effects this would have on amphibians and reptiles measured as the acres of wetland/riparian habitat type disturbed.	Conditions would continue as they are.	Amphibians and reptiles would be vulnerable to mortality or injury by mining activities. A total of 3 acres of wetlands would be affected.	Same as Proposed Action.
• Effects of surface water quality changes on amphibians and reptiles based on impacts on water quality from selenium and other pollutants.	Conditions would continue as they are.	Potential impacts on water quality could directly affect amphibians and reptiles that use riparian/wetland habitat types. Selenium is not expected to exceed acute or chronic levels in surface water. The water model did not predict changes in flow regime or timing.	Same as Proposed Action.
• Effects on big game due to mining disturbance and human activities measured by acres of habitat lost and altered by seasonal habitat types; whether reclamation would return habitat to pre-disturbance conditions and if so, in what timeframe; indirect effects of avoidance caused by increased human activity and noise; and direct mortality caused by vehicle collisions	Conditions would continue as they are.	Wildlife could be indirectly affected by the loss or modification of habitat types after reclamation through reduction in functionality and by habitat fragmentation. Mortality - Mortality or injury could result from collisions with mining equipment or vehicles and by crushing or compaction during vegetation removal and soil excavation.	Same as Proposed Action.
• Effects on Greater Sage-Grouse and Greater Sage-Grouse habitat in terms of	Conditions would continue as they are.	Approximately 113 acres of GHMA and 868 acres of key habitat outside of the GHMA would be lost or modified. Of the 113 acres of GHMA affected, 69 acres are administered by the BLM.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
acres of General Habitat Management Area (GHMA) that would be disturbed; number of lek(s) and distances from the Caldwell Canyon Project activities (features); status of lek(s) (e.g. pending, occupied, date last surveyed, new lek or date last occupied); and acres of IDFG key habitat outside of delineated habitat management areas disturbed by the Caldwell Canyon Project. Distance and source on the closest Greater Sage-Grouse lek and whether noise mitigation may be warranted.		The Greater Sage-Grouse habitat assessment determined that 36.1 acres of that 69 acres is considered available habitat to Greater Sage-Grouse. A pending Greater Sage-Grouse lek (3C040) is located in Dry Valley, one mile east of the North Pit, approximately half a mile east of the Dry Valley Road and the Union Pacific Railroad and approximately 1½ miles north of the Dry Valley tipple area where a crusher will be operating. The pending lek is outside of designated habitat and outside of key habitat, which puts it outside the authority of the ARMPA (BLM, 2019), the Pocatello ARMP (BLM 2012) and the BLM Special Status Species Manual. Caldwell Canyon Project noise at the pending lek is expected to increase only by 11 A-weighted decibels (L_{50} dBA) over ambient (L_{90} dBA) conditions from predicted construction, reclamation, and operation noises in the East Caldwell Area. Similarly, predicted construction, reclamation, and operation noises emanating from mining equipment at the Caldwell Canyon Mine rim would not exceed the 10 dBA limit in the North Pit until year 20 of mining and only when the equipment is at the top of the North Pit rim (Big Sky Acoustics, 2018). Other Greater Sage-Grouse leks are further away and not likely to be directly affected by noise from the project.	
• Effects on Columbian sharp-tailed grouse and their habitat as acres of Columbian sharp-tailed grouse habitat would be disturbed and number of lek(s).	Conditions would continue as they are.	Up to 1,349 acres of suitable habitat would be removed. Given the proximity of the three known Columbian sharp-tailed grouse leks to the mining activity (0.00 to 2.62 miles), it is likely that habitat loss and modification would reduce Columbian sharp-tailed grouse use of seasonal habitat.	Same as Proposed Action.
• Effects on BLM Sensitive species	Conditions would continue as they are.	Gray Wolf – Main prey (big game) in and around the mining activities would be disrupted by activities, which would have negligible impacts on transient individuals. Pygmy Rabbit – Loss of potential burrowing habitat in mixed shrub and big sagebrush habitat types. Effects would be negligible as there is a low likelihood pygmy rabbits occurring in the wildlife analysis area.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
		Birds – There would be a temporary loss of bird habitat during active mining. There would be a long-term modification of 589 acres of riparian/wetland and forested habitat types. Raptors – Habitat modification would alter the prey base. Nesting habitats and structures occurring in the disturbed areas would be destroyed. Nests identified adjacent to the disturbed areas are within the spatial buffer of the seasonal restrictions identified by the ARMP, Appendix B, Table B-2. Northern Leopard Frog – Loss of riparian/wetland habitat types within the disturbed areas would likely result in mortality to this species. Reclamation of riparian/wetland habitat types would provide adequate replacement habitat.	
• Bald eagle nesting or roosting sites to be maintained and protected, measured by the distance(s) of known bald eagle nesting and roosting sites from the Caldwell Canyon Project activities; comparison of distance(s) to agency-recommended disturbance buffers; and whether electrocution prevention measures are included in power line designs as mitigation.	Conditions would continue as they are.	One bald eagle territory comes within 0.10 mile of the North Pit which is within the 0.5-mile agency recommended buffer distance. Intrusion into the buffer zone would occur if the nest is still occupied during years 37 through 42 of mining. P4 Production would develop an Eagle Conservation Plan which would address needs for take permits, if required. The power line would adhere to Avian Power Line Interaction Committee guidelines (APLIC, 2006) which would reduce or eliminate the risk of electrocution.	Same as Proposed Action.
Visual Quality (Section 3.10.3) • Effect on Visual Resource Management (VRM) class, based on views from key observation points (KOPs), and review of VRM classes for activities conflicts.	Conditions would continue as they are.	The visual contrast created by mining, and the long-term reclamation, and closure would not exceed the visual contrast with the VRM Class IV designation for the public land tracts.	Same as Proposed Action.
• Visual quality from KOPs affected by activities using	Conditions would continue as they are.	There are limited publicly accessible viewing areas. For viewing areas where portions of the Caldwell Canyon Project would be	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
visual contrast ratings and simulations in the MRP to characterize the changes in visuals.		visible, visual intrusion occurs at such distances that the change in form, color, line, and texture in contrast to adjacent undisturbed areas would be subtle. Effects would occur until the reclamation vegetation cover blends in with adjacent land areas.	
Transportation (Section 3.11.3) • Effects of increased traffic on public roads, potential for increased traffic accidents, estimated increase in average daily traffic, and increase in number of heavy-duty vehicles and heavy equipment on public roads.	Conditions would continue as they are.	A seven percent increase in traffic by personal vehicles during the approximate 40-year mine life on regional and public roadways could lead to more traffic accidents.	Same as Proposed Action.
• Change in traffic safety from increased use of railroad.	Conditions would continue as they are.	The Union Pacific railroad would run two trains per day, which would be the total use of this rail line. Traffic safety would not change due to the controls at the crossings (**Appendix B**, **Section B.15.8)**.	Same as Proposed Action.
Cultural Resources (Section 3.12.2) • Effects on historical and cultural locations and sites through identifying the number of historic properties affected, evaluation of effects on sites, and consultation with Idaho State Historic Preservation Office.	Conditions would continue as they are.	No historic properties (cultural sites eligible for the National Register of Historic Places) have been identified in the disturbed areas. There are two eligible cultural sites (prehistoric lithic scatters (10CU86 and 10CU434)) which occur 150 feet and 300 feet respectively from the disturbed areas. The project would have no direct or indirect effects on these eligible cultural sites.	Same as Proposed Action.
Tribal Treaty Rights and Interests (Section 3.13.3) • Impacts on use of the area and Tribe's ability to exercise inherent and treaty-reserved rights on	Conditions would continue as they are.	During the 40-year life of the mine, 153 acres of unoccupied BLM land would not be available for traditional tribal use and treaty rights. There is currently no public access because private lands surround the public lands requiring private owner's permission. No Traditional Cultural Properties were identified during	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
unoccupied lands by measuring the acres of traditional use areas that would be available or unavailable and the length of time tribal use would be reduced.		consultation. As noted above, two prehistoric lithic scatters (10CU86 and 10CU434), eligible for the National Register of Historic Places, were identified near the mine. Consultation on these sites is on-going.	
• Impacts on Natural Resources Important to Tribes.	Conditions would continue as they are.	Potential changes in the quality and quantity of natural resources may affect traditional hunting, fishing, and gathering areas. Refer to **Section 3.4** for water; **Section 3.5** for air; **Section 3.7** for soil; **Section 3.8** for vegetation, wetlands, and riparian areas; **Section 3.9** for wildlife; and **Section 3.10** for visual quality, for effects on natural resources important to the tribes.	Same as Proposed Action.
Social and Economic Conditions (Section 3.14.3) • Impacts on employment and tax revenue assessing the number of jobs maintained and income, property taxes, production royalties, and Idaho Mine License Tax.	Employment of approximately 185 employees and contractors would cease in approximately three years when the reserves from the Blackfoot Bridge Mine are depleted, as would their income. Employment and income would be reduced at P4 Production's phosphate processing plants. Property taxes would continue to be paid at current rates. No production royalties and no Idaho Mine License Tax would be paid. No phosphate would be mined, thus precluding the benefits of its use.	Approximately 185 people would continue to be employed in mining operations. No change would occur in the property tax paid. P4 Production would pay between $80 million and $120 million to the state and federal government in production royalties, and another $800,000 to $1.2 million in Idaho Mine License Tax to the state over the life of the mine.	Same as Proposed Action.

Component/Issue	No Action	Proposed Action	Alternative 1
- Impacts on grazing.	There would be no changes to the current grazing allocations and no reduction in AUMs, resulting in no impacts to the economic benefits of the grazing allotments.	There would be a short-term minor to moderate reduction of 78 allocated annual unit months (AUMs) for the leases proportionate to the land area affected. P4 Production holds the grazing leases and would not likely request a reallocation. Impacts on grazing would be negligible, localized, and short-term.	

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter presents the potential direct, indirect, and cumulative effects of the alternatives, and identifies irreversible and irretrievable commitments of resources and residual adverse effects. Effects are described in terms of context (referring to the location and duration) and intensity (refers to the severity of the impact).

References to context are defined as follows:

- Localized - Changes are perceived at the location of the activity but dissipate beyond the local setting.
- Regional - Changes are perceived at the county level or the regional aquifer (for groundwater).
- Short-term - Effects that would not last longer than the life of the project, including final reclamation.
- Long-term - Effects that would remain or occur following project completion.

The thresholds of change for the intensity of an impact are defined as:

- Negligible - the impact is at the lowest levels of detection.
- Minor - the impact is slight, but detectable.
- Moderate - the impact is readily apparent.
- Major - the impact is a severe or adverse impact or is of exceptional benefit.

Internal and external scoping and regulatory and policy requirements were used to identify potential impacts. All resources were considered; however, some resources are not discussed in detail because they are not in the affected area or impacts would be negligible or minor and managed through EPMs and BMPs to a level of insignificance. **Table 6** presents the rationale for resources to be either documented only in the project record, or where the analysis appears in this EIS.

Table 6. Resources Considered

Resource	Project Record Only	EIS Analysis
Air Quality		**Section 3.5**
Areas of Critical Environmental Concern or Research Natural Areas, Special Designations	Not present in affected area.	
Climate Change	The effects that action alternatives would have on climate change would be long-term and negligible and the effects climate change would have on Caldwell Canyon could be long term and moderate but are uncertain. The MRP establishes an adaptive management strategy that would be used to modify actions caused by a potential increase or decrease in water on the site, timing of precipitation, or increased evapotranspiration.	
Comprehensive Trails and Travel Management	Access is already restricted by land ownership patterns and would not be affected by the mine.	
Cultural Resources		**Section 3.12**

Resource	Project Record Only	EIS Analysis
Designated Wilderness	Not present in affected area.	
Environmental Justice	No low income or minority populations are present in the analysis area (Caribou County).	
Fish Habitat, Threatened, Endangered, and BLM Sensitive Fish	Not detected in affected area as described in the *Final Fisheries and Aquatics Baseline Technical Report* (NewFields, 2015a). Stream reaches through the project area are not connected via surface water sufficient to expect migrating fish from nearby fish bearing streams to access the project area (**Section 3.4** of this EIS). Groundwater discharged to the surface would be diluted and mixed with surface water flows at the regional discharge locations. Based on the fate and transport modeling (**Section 3.4.3** of this EIS) and EPMs, BMPs, POC, and adaptive management, the potential for measurable indirect effects on fish would be negligible to none.	
Floodplains	Not present. There are no floodplains identified by the Federal Emergency Management Agency within the application area. None of the alternatives authorize construction of structures in, modification of, or federal occupancy of floodplains. In accordance with Executive Order 11988, there would be no alteration of the floodplain's function, risk of loss of federal facilities due to flooding, or impacts to human safety from flooding. The nearest downstream designated floodplain is in the town of Blackfoot and the Blackfoot Reservoir Dam sits between the two, regulating flow to the Blackfoot River.	
Forest		**Section 3.8**
Inventoried Roadless Areas	Not present in affected area.	
Migratory Birds		**Section 3.9**
Minerals		**Section 3.3**
Native Americans, Tribal Treaty Rights and Interests		**Section 3.13**
Noise		**Section 3.6**
Paleontological Resources	As per Action PR-1.1.4 of the ARMP, protective measures have been developed to avoid impacts to paleontological resources should they be discovered.	
Prime and Unique Farmlands	Not present in affected area.	
Public Health and Safety		**Sections 3.4, 3.5**, and **3.11**
Range		**Sections 3.8** and **3.14**
Recreation	No public access is available without permission from the surrounding private landowners.	
Social and Economic Conditions		**Section 3.14**
Soil		**Section 3.7**
Solid or Hazardous Waste	Managed through regulations and EPMs (**Appendix B, Section B.14** of this EIS). Transportation of hazardous materials would occur infrequently by regulated transporters.	

Resource	Project Record Only	EIS Analysis
Threatened, Endangered, and BLM Sensitive Plants	Surveys for special status plants were completed in June and July of 2014 and 2015 according to *Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plants* (BLM, 2009). No special status plants were found during the surveys (NewFields, 2015d; NewFields, 2015f; NewFields, 2016b).	
Threatened, Endangered, and Proposed Wildlife	No listed or proposed wildlife (Canada lynx and North American wolverine) were found (NewFields, 2015e), habitat not close, negligible impacts. Canada lynx linkage zones on National Forest System lands are 12 miles away. See **Appendix F**.	
BLM Sensitive Wildlife		**Section 3.9**
Vegetation		**Section 3.8**
Visual Quality		**Section 3.10**
Water (surface and ground)		**Section 3.4**
Weeds		**Section 3.8**
Wetlands/Riparian		**Section 3.8**
Wild and Scenic Rivers	Not present in affected area.	
Wild Horses and Burros	No wild horse or burro herds are located within the BLM Pocatello Field Office boundaries.	
Wildlife		**Section 3.9**

Each resource analysis discusses direct, indirect, and cumulative effects. Direct effects are those that would occur at the same time and at or near the actions discussed in Chapter 2, with EPMs being considered. Indirect effects are caused by the actions discussed in Chapter 2, but that occur later or at a greater distance from the actions. Cumulative effects result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions within a resource's cumulative effects analysis area, regardless of what agency (federal or non-federal), organization or person undertakes such action (40 CFR 1508.7). Naturally occurring events are not considered actions, for example, a wildland fire is not an action; however, the effects of fire suppression or rehabilitation are actions that would be considered.

The cumulative effects analyses performed for each resource are conducted within the cumulative effects analysis areas defined specifically for each resource, as shown on **Figure 9** and **Figure 10**.

3.2 Past, Present, and Reasonably Foreseeable Actions

Past land management activities have occurred on BLM, National Forest, state, and private lands for a century or more and have contributed to the current conditions described in the affected environment sections in this chapter. These activities include timber management (harvesting, site preparation, planting, salvage, and thinning), weed treatment (herbicide application), prescribed burning (for wildland fuel management, habitat improvement, site preparation), fuel break construction, mechanical fuel treatment, farming and ranching (grazing), and firewood gathering. Some activities created trails, roads, railroads, fences, and power lines. More is known about more recent activities, which are shown in in **Table 7**. Past non-governmental activities have also occurred or are currently occurring. Because previous mining in the area has similar impacts as the Caldwell Canyon Project and more is known about the specific activities in the last 40 years, past actions from recent mining are addressed individually in the cumulative impacts sections for each resource.

Reasonably foreseeable actions were identified as those activities which are approved and those activities that have been proposed (such as an application submitted or included on the schedule of proposed actions) but are not yet underway. These are also shown in **Table 7.**

Table 7. Past, Present, and Reasonably Foreseeable Actions

Activity/ Project Name	Period of Activity	Description
Mining – Past and Present		
Ballard Mine	1952-1969	635 acres[1]
Bear Lake Mine	1920-1921	0.1 acres[1]
Blackfoot Bridge Mine	2013-Present	420 acres
Champ Mine and Champ Extension	1982-1985	460 acres
Conda Mine and Trail Canyon Mine	1920-1984	1,572 acres
Diamond Gulch Mine	1960	32 acres[1]
Dry Valley Mine	1992-2014	1,082 acres
Enoch Valley Mine	1990-Present	645 acres
Georgetown Canyon Mine	1958-1964	251 acres[1]
Henry Mine	1969-1989	1,074 acres[1]
Home Canyon Mine	1916-1924	0.8 acres[1]
Lanes Creek Mine	1978-1989; 2014 to Present	256 acres[1]
Mountain Fuel Mine	1966-1967, 1985-1993	781 acres[1]
North and South Maybe Canyon Mine	1951-1995	1,028 acres[1]
Rasmussen Ridge Mine[2]	1991- 2020	858 acres[1]
Rattlesnake Canyon Mine	1920-1926	0.4 acres[1]
Smoky Canyon Mine	1982-Present	3,338 acres[1]
South Rasmussen Mine	2003-2015	390 acres[1]
Waterloo Mine	1907-1920, 1945-1960	196 acres[1]
Wooley Valley Mine	1955-1989	808 acres[1]
Rasmussen Valley Mine (Federal Lease I-05975)	2017 to 2024	An open pit phosphate mine with approximately 1,559 acres of planned disturbance for mining, backfilled pits, a haul road, and ancillary facilities, on private land, State of Idaho land, and public land administered by the BLM and Forest Service. The final decision is under appeal. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=48240&dctmId=0b0003e880865e91.
Caldwell Canyon and Trail Creek Exploration Plan Environmental Assessment	In Progress	Exploration drilling to gather information about phosphate reserves on portions of two federal phosphate leases and three off lease areas. The Caldwell Canyon portion is complete. Trail Creek will resume into 2019. https://eplanning.blm.gov/epl-front-

Activity/ Project Name	Period of Activity	Description
		office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=138642.
Mining – Reasonably Foreseeable		
Ballard Lease	Implementation expected in 2019	Phosphate mining on previously disturbed Ballard Mine to recover ore and facilitate reclamation. No additional disturbed areas.
Dairy Syncline Mine (Federal Leases)	Ground disturbing activities approximately 2030-2060 when Smoky Canyon Mine depleted	Phosphate mining in open pits, beneficiation plant, tailings pond, and facilities on private land, State of Idaho land, and public land administered by the BLM and Forest Service. Approximately 2,830 acres would be disturbed. A draft EIS was published. A direct land sale from BLM to the proponent of 1,142 acres is included, as well as a Forest Service land exchange. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=44904.
East Smoky Panel Mine EIS (Federal I-26843, I-012890, and I-015259)	Ground disturbing activities approximately 2023-2036 (12 years)	Phosphate mine expansion plan and associated projects and infrastructure at the existing J.R. Simplot Company's Smoky Canyon Mine. 720 acres of new disturbance. A draft EIS was published. http://www.fs.usda.gov/project/?project=44748.
Freeman Ridge/Husky 2 Exploration Plan Environmental Assessment	On Hold	Exploration drilling of 967 holes to gather information about phosphate reserves on portions of two federal phosphate leases and three off lease areas. Overall disturbance is 168 acres. http://www.fs.usda.gov/project/?project=42793.
Husky I-North Dry Ridge Project Mine (Federal Leases I-05549, I-04, and I-008289	Future	Open-pit phosphate mine and facilities on private and National Forest System land. Details uncertain because MRP is being revised.
Other – Past and Present		
Flat Valley Road Stream Crossing Improvements on Lanes Creek and Brown Canyon Creek	2016	Caribou-Targhee National Forest lead efforts that were made possible through the partnership with the Upper Blackfoot Confluence, U.S. Fish and Wildlife Service (USFWS) and Trout Unlimited. The project focused on upgrading two undersized and problematic road stream crossings on the Forest Service Flat Valley Road (FS107). The project goals are to restore stream/riparian function and aquatic passage in Lanes Creek.
John Wood Forest Management Project EIS	Implementation expected January 2018	Forest vegetation management activities (mechanical timber harvest and pre-commercial thinning) and road work (temporary and permanent). Legal Description – Township 9 South, Range 43 East, Sections 4 and 5 and Township 8 South, Range 43 East, Sections 32and 33. Johnson and Wood canyon drainages. http://www.fs.usda.gov/project/?project=50688.
Lanes Creek Recreational Trail Improvements	2015	Improve 1.8 miles on all-terrain vehicle trail number 088 and 2.5 miles on trail number 022 by relocating and adding drainage.
Lanes Creek Restoration	2015	Trout Unlimited/UBC Upper Lane Creek Restoration occurring on about 3 miles of stream on private lands.
Phosphate Processing Plants in Soda Springs, Idaho	Past, Present, and Future	Two operating phosphate processing plants and associated facilities including railroads.

Activity/ Project Name	Period of Activity	Description
Sheep Creek Restoration	2016	Trout Unlimited/UBC Sheep Creek Restoration occurring on about 1 mile of private lands.
South Soda Sheep Allotments Environmental Assessment	Future	Livestock grazing and permit re-administration for multiple allotments on the Soda Springs Ranger District. Legal Description – Township 7 South/Township 8 South, Range 45 East, multiple sections. http://www.fs.usda.gov/project/?project=43251.
Other – Reasonably Foreseeable		
Hooper Springs Transmission Line	Construction beginning fall 2019	A 138/115-kilovolt Hooper Springs Substation, about 24 miles of double-circuit 115-kilovolt transmission line, a connection facility to connect the new line to Lower Valley Energy's transmission system, about 0.2 miles of single-circuit 138-kilovolt transmission line between the Hooper Springs Substation and PacifiCorp's existing Threemile Knoll Substation, and ancillary facilities such as access roads. The Hooper Springs transmission line would impact an additional 112 to 188 acres in the foreseeable future (Bonneville Power Administration, 2015; LVE, 2018).
Chippy Creek Bridge Replacement and Stream Restoration	2018-2019	Upgrade and upsize the Chippy stream crossing on the Caribou County Lane Creek Cutoff Road. In association with the bridge, perform 700 to 1,000 feet of channel restoration on private lands to improve stream stability, reduce threats to the new crossing, improve water quality, and improve aquatic habitat.
Diamond Creek Road Bridge Replacements	2018-2020	Forest Service, Trout Unlimited, and Caribou County to replace failing undersized bridges on Diamond Creek on the Diamond Creek Forest Service Road 51102. Bridge number 1 (Milepost 14.5) to improve public safety, channel function, stream stability, aquatic organism passage and aquatic habitat.
Tincup Creek Restoration	July 2018-September 2019	Restore Tincup Creek from Highway 34 up the Bridge Creek Road to the bridge. Two road miles or about 4 stream miles. https://www.fs.usda.gov/nfs/11558/www/nepa/103029_FSPLT3_3017788.pdf.
Toponce Habitat Restoration Project	On Hold	Treat a mountain brush community (mountain big sage, bitterbrush, snowberry) using fire to diversify the age structure and improve conditions for wildlife and reduce fuel loading. Legal Description - Township 6 South, Range 38 East, Sections 18, 19, and 29 through 32; Township 7 South, Range 38 East, Section 4 Boise Meridian. The project is on the east side of the Toponce Basin. http://www.fs.usda.gov/project/?project=43319.

Notes:

1 Disturbed Areas (acres) (permitted or actual disturbance): Acreage does not account for current reclamation status of mine areas.

2 Consists of North Rasmussen Ridge, Central Rasmussen Ridge, and South Rasmussen Ridge mines.

Figure 9. Cumulative Effects Analysis Areas for Cultural Resources, Soil, Noise, Water, Wildlife, Vegetation, Wetlands, and Riparian Areas

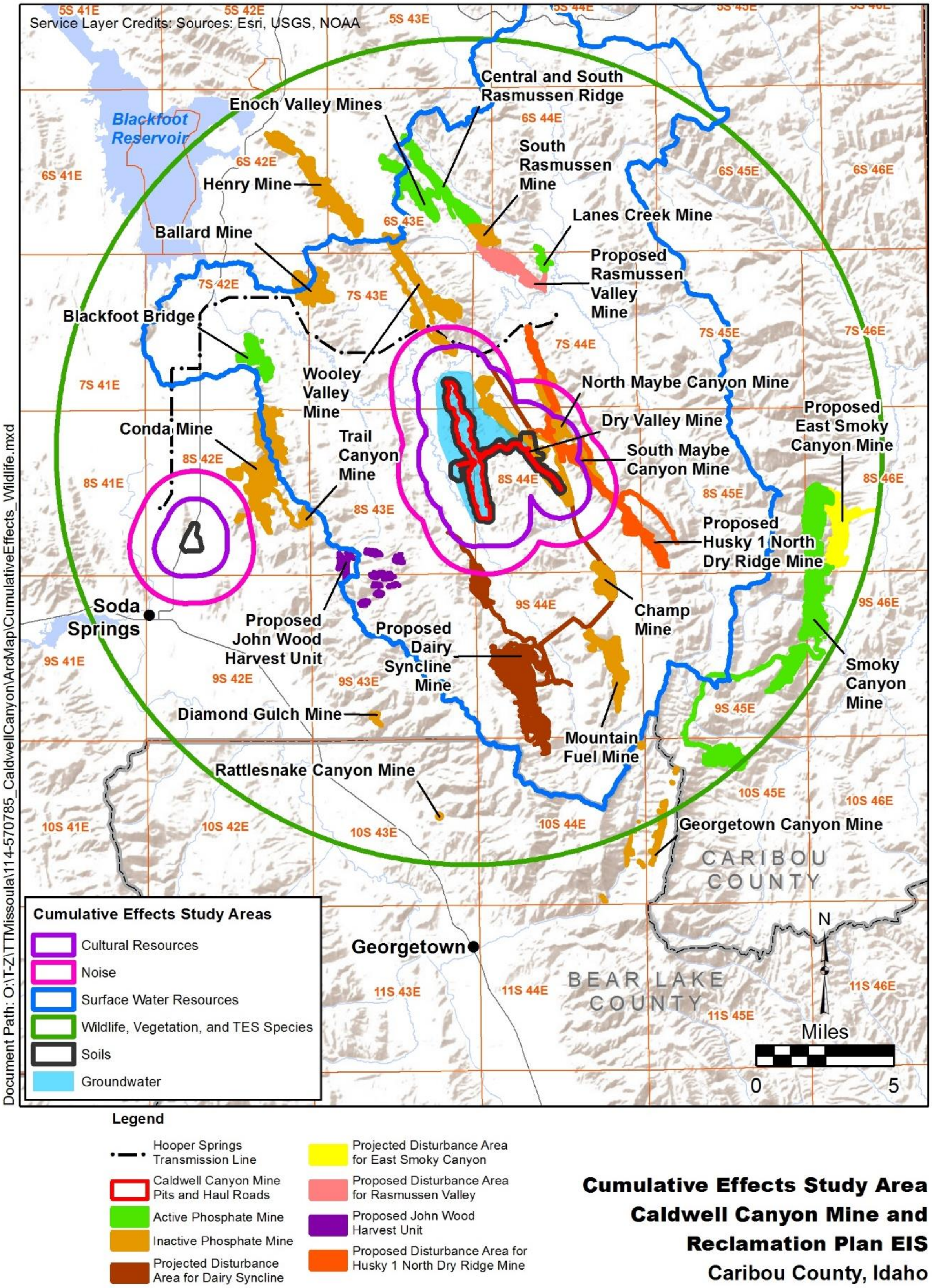
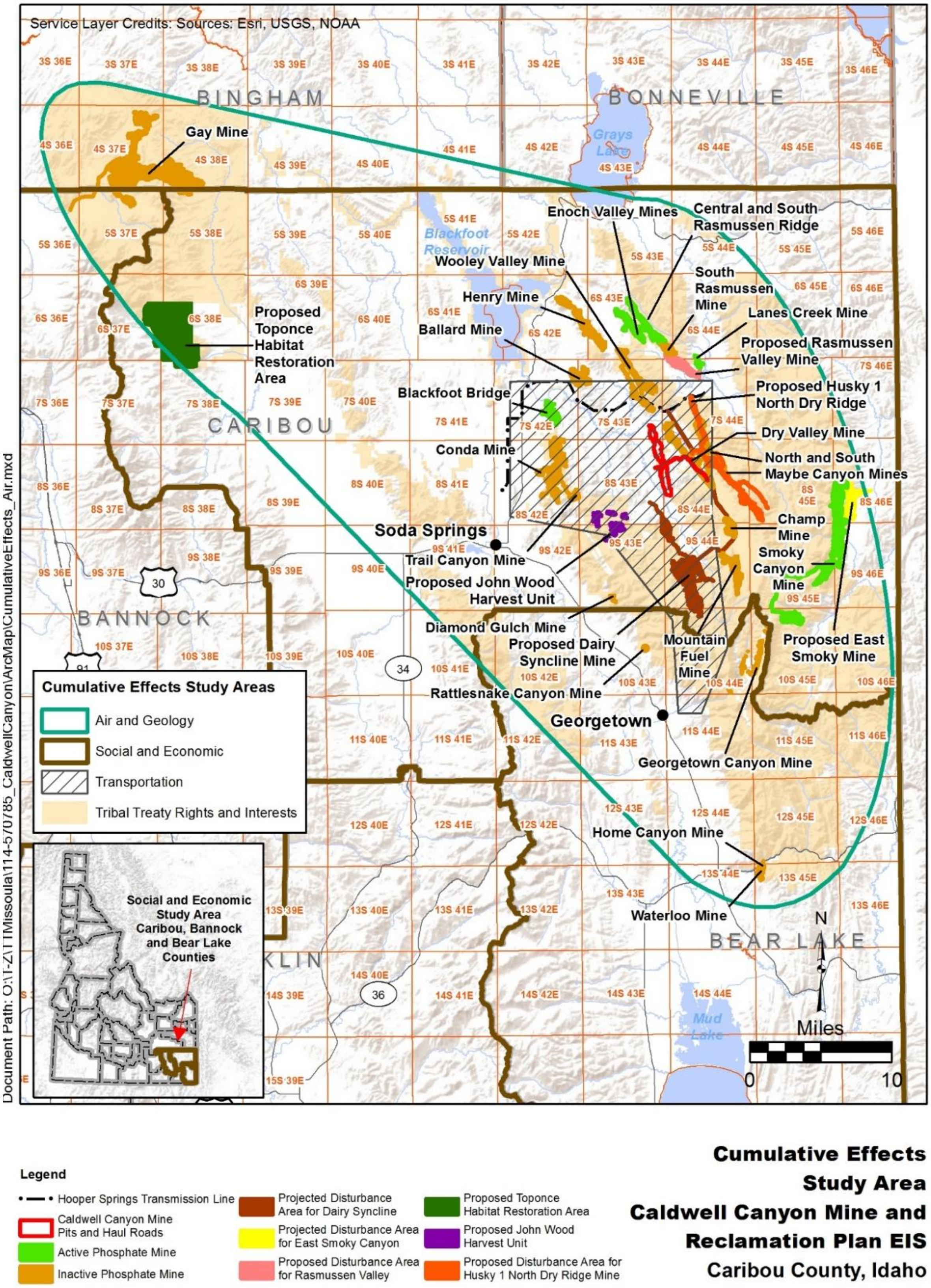


Figure 10. Cumulative Effects Analysis Areas for Air, Social and Economic Conditions, Geology, Transportation, and Tribal Treaty Rights and Interests



3.3 Geology and Minerals

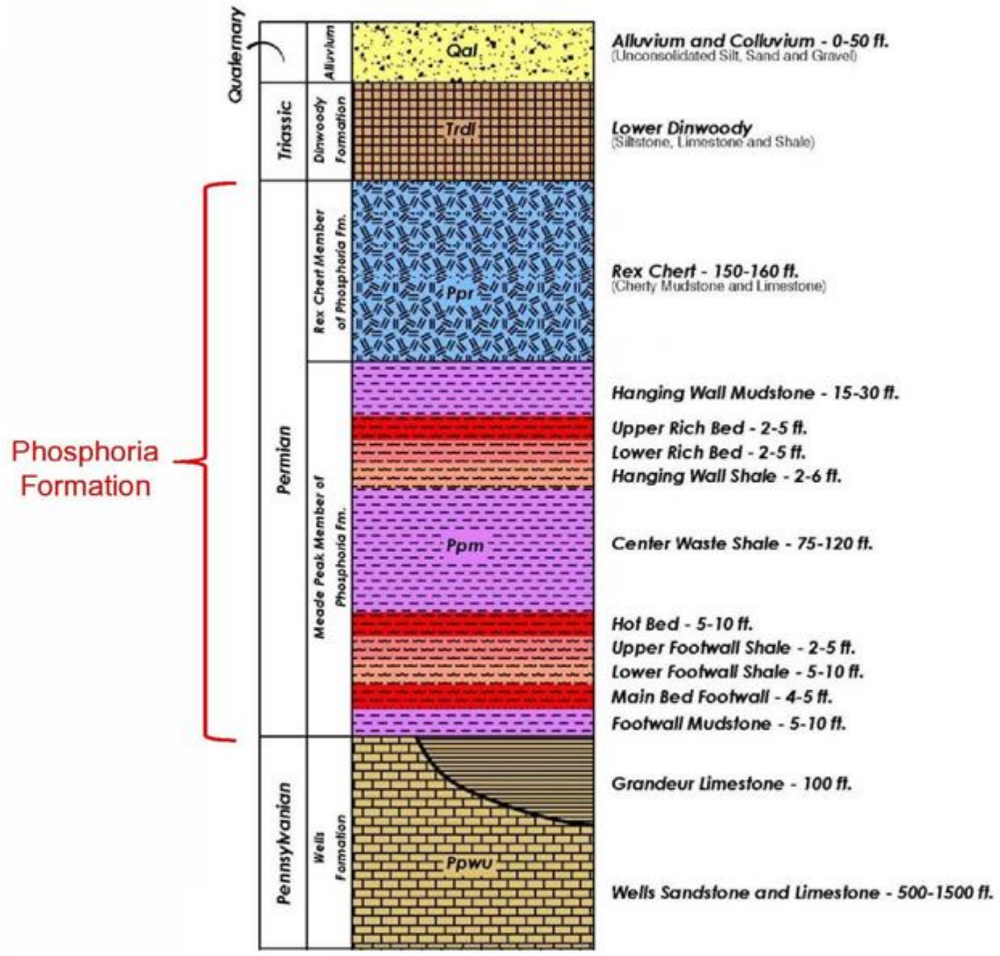
3.3.1 Analysis Area

The geology and minerals analysis area extends across the Caldwell Canyon Project, encompassing the North Pit, South Pit, Slug Creek Valley to the west, and Dry Valley to the east.

3.3.2 Affected Environment

Phosphate ore is found in the Meade Peak Phosphatic Shale (Meade Peak) Member of the Permian-age Phosphoria Formation (**Figure 11**). The Phosphoria Formation, which includes the Meade Peak Member and Rex Chert Member, is overlain by the Dinwoody Formation and Thaynes Formation and underlain by the Grandeur Limestone (Grandeur Tongue) of the Park City Formation, Wells Formation, and Monroe Canyon Limestone. The Grandeur Tongue is absent in parts of the geology and minerals analysis area where the Phosphoria Formation directly overlies the Wells Formation.

Figure 11. Generalized Stratigraphic Section Southeastern Idaho Phosphate Region



Modified from: (Opp & Wheeler, 2015)

Figure 12 is a geologic map created from a combination of published geologic mapping and site-specific information (P4 Production, 2017)**,** that shows the geology in the North and South pits and adjacent areas. **Figure 13** also provides geologic cross-sections of the North and South pits.

Figure 12. Geologic Map of the North and South Pit

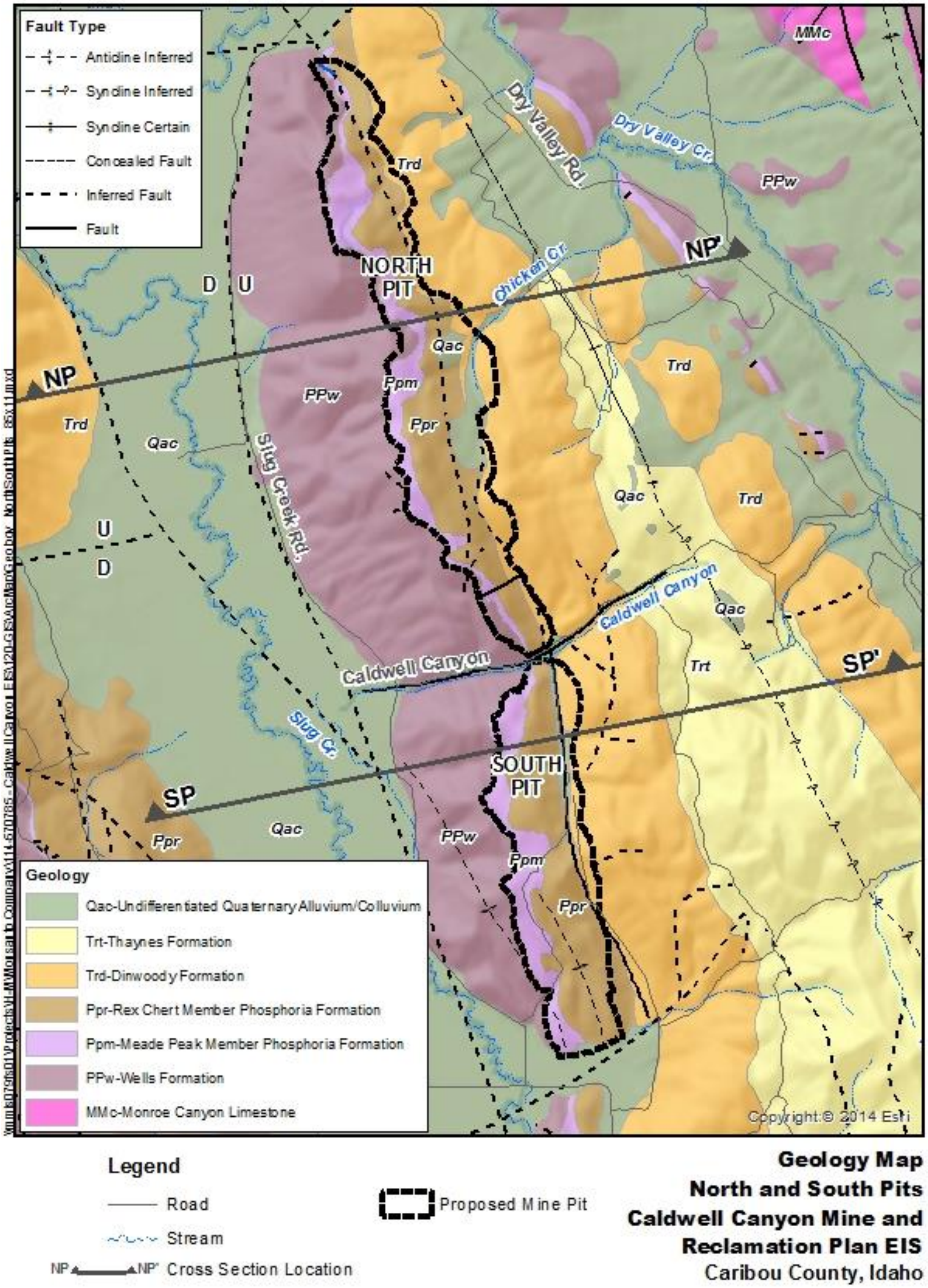
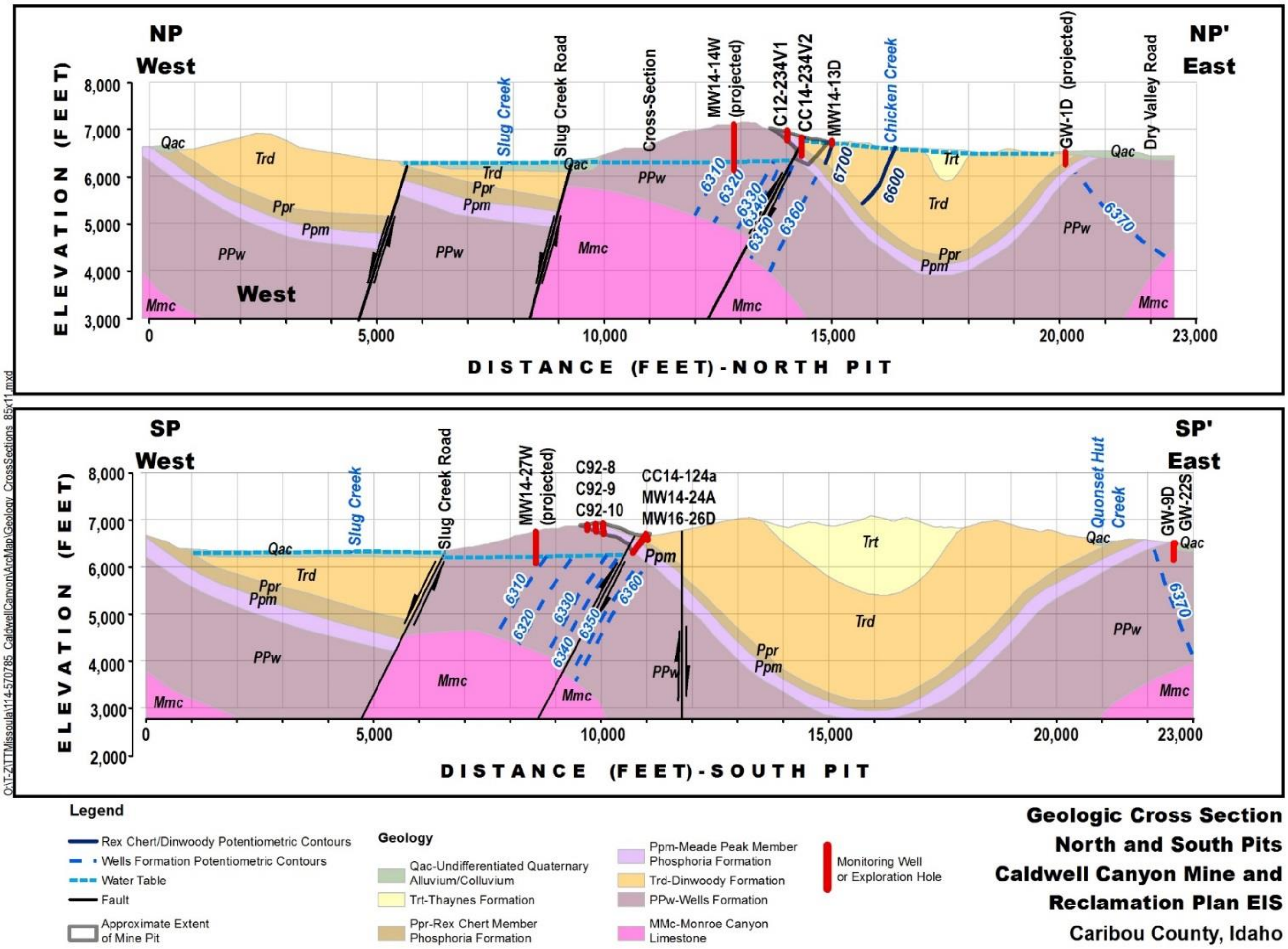


Figure 13. Geologic Cross Sections of the North and South Pits



Geochemical testing (NewFields, 2018g) has shown certain geologic units of the Phosphoria Formation to contain COPCs that may be released from the mine area via transport as PM in air and as particulates carried by compounds dissolved in water. The Meade Peak Member of the Phosphoria Formation is the primary geologic source of selenium, and certain lithologies of the Phosphoria Formation excavated would leach antimony, cadmium, manganese, and sulfate.

3.3.3 Direct and Indirect Effects

3.3.3.1 Proposed Action and Alternative 1

Mining would remove phosphate ore from the Meade Peak Member during the 40-year mine life. The Rex Chert and lower beds of the Dinwoody Formation, units of the Meade Peak Member interbedded with the ore, and the underlying Wells Formation would need to be excavated to access the ore and placed into previously mined pits. Pit walls would need to be laid back for slope stability. Beds of the Meade Peak Member that contain ore would be permanently removed from the mineral estate, resulting in an irreversible and irretrievable commitment of resources. All non-ore overburden material would be excavated then used as pit backfill, to construct closure cover over overburden or as construction materials. This would be a long-term, localized, moderate loss of geologic and mineral resources, and an irreversible and irretrievable use of minerals.

3.3.3.2 No Action Alternative

The No Action Alternative would result in no removal of phosphate containing ore. None of the lithologic units in the area would be disturbed.

3.3.4 Cumulative Effects

The cumulative effects analysis area for geology and minerals is the Southeast Idaho Phosphate District (see **Figure 10**). This is the area where similar impacts from phosphate mining have occurred.

3.3.4.1 Proposed Action and Alternative 1

Past, present, and reasonably foreseeable mining would continue to result in the permanent severance of phosphate ore. Phosphate mining has occurred since at least 1907 (**Table 7**).

3.3.4.2 No Action Alternative

Because there would be no direct or indirect effects resulting from disturbance under the No Action Alternative, there would be no cumulative effects.

3.4 Water

3.4.1 Analysis Area

The analysis area for water is based on hydrologic features such as stream channels and drainage divides, springs, seeps, wetlands, groundwater flow systems and current and future land uses and encompasses the area where ground disturbance (direct impacts) would occur (shown on **Figure 14**).

3.4.2 Affected Environment

Water Rights

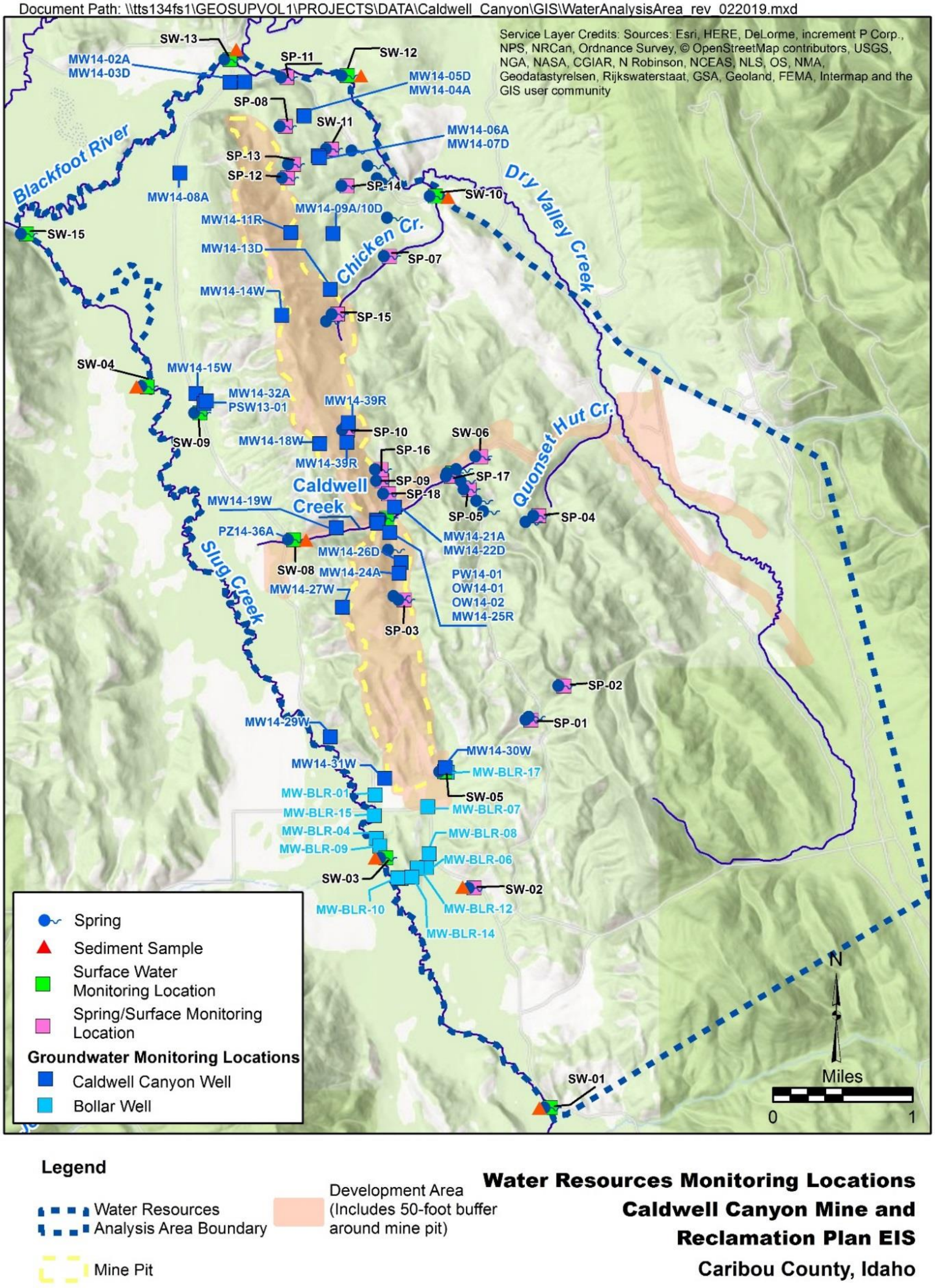
Figure 15 presents the water rights listed with Idaho Department of Water Resources. There are approximately 80 water rights for irrigation and stockwater for 17 different owners inside or within one mile of the water analysis area (NewFields, 2017a).

Flows (Quantities) of Surface Water, Groundwater, Wetlands, Springs, and Seeps

Three sub-watersheds occur in the analysis area: the Blackfoot River, Slug Creek, and Dry Valley Creek. The Blackfoot River [hydrologic unit code 17040207] is a tributary to the Upper Snake River that drains into the Columbia River. Slug Creek and Dry Valley Creek flow generally north to the Blackfoot River. Caldwell Creek and two unnamed drainages in the Slug Creek drainage area have no surface connection to Slug Creek. Knudsen Spring (SW-02 on **Figure 14**) feeds a short stream segment that flows year-round to Slug Creek. Quonset Hut Creek and Chicken Creek are tributaries of Dry Valley Creek. Eight other springs occur in the Caldwell Creek watershed, two in a Slug Creek tributary drainage and nine in the Dry Valley Creek watershed.

Flow of surface water and groundwater in and near the Caldwell Canyon project was measured (in gallons per minute (gpm) and cubic feet per second (cfs)) to aid in understanding and modeling of how the project could affect water quantity and quality. Baseline surface water monitoring was conducted in 2014 – 2016 (NewFields, 2017a; NewFields, 2017e; NewFields, 2018c). The baseline

Figure 14. Water Resources Analysis Area



reports and addenda provide detailed discussions of the data collected and interpretation of the data. Surface water and spring flow monitoring locations and parameters are shown in **Table 8** (surface water) and **Table 9** (springs). **Figure 15** shows the monitoring locations. All surface water and springs are perennial except the two unnamed tributaries to Slug Creek (ephemeral), the Caldwell Creek wetland (intermittent/ seasonal), the two springs that are unnamed tributaries of Dry Valley Creek (ephemeral), and Caldwell Creek (intermittent/ seasonal).

Table 8. Surface Water Monitoring Locations and Flow Rates (2014 – 2016)

Station No.	Type	Source	Elevation (feet amsl)	Flow Range (gpm)	Flow Range (cfs)
SW-01	SW	Slug Creek	6,389	583 – 3,725	1.3 – 8.3
SW-03	SW	Slug Creek	6,354	741 – 4,713	1.65 – 10.5
SW-04	SW	Slug Creek	6,323	22 – 2,962	0.05 – 6.6
SW-05	SW	Unnamed Tributary of Slug Creek	6,431	0	0
SW-06	SW	Caldwell Creek Wetland	6,576	0 – 15	0 – 0.033
SW-07	SW	Caldwell Creek	6,714	4 – 69	0.009 – 0.153
SW-08	SW	Caldwell Creek	6,394	18 – 368	0.041 – 0.82
SW-09	SW	Unnamed Tributary of Slug Creek	6,333	0	0
SW-10	SW	Chicken Creek	6,409	47 – 337	0.106 – 0.75
SW-12	SW	Dry Valley Creek	6,359	27 – 1,481	0.06 – 4.8
SW-13	SW	Blackfoot River	6,340	21,095 – 109,963	47 – 245
SW-14	SW	Blackfoot River	6,305	not measured	not measured
SW-15	SW	Slug Creek	6,321	not measured	not measured

Source: Table 6 (NewFields, 2017a).
not measured – Not measured due to one or more field conditions or station not established until August 2014.
amsl – above mean sea level, SW – Surface water, SP – Spring.

Measured flows were highest during the May 2016 spring run-off period. The lowest measured flows were during the August 2014 or 2015 measuring events. Additional data from 2008 through 2013 (NewFields, 2017a) indicated that spring flows from Knudsen Spring may contribute up to 2,437 gpm or 5.43 cfs to Slug Creek during wetter years.

Flow data measured by IDEQ on the Blackfoot River within and just downstream of the water analysis area, indicated a gaining reach with flow increases of 40 to 120 cfs between the Slug Creek Road bridge and the Trail Creek bridge when flows in the river were greater than approximately 300 cfs (NewFields, 2017a). The source of the flow was believed to be from both surface water and groundwater from the Slug Creek and Wooley Creek drainages. When Blackfoot River flows were approximately 120 cfs or less, flow in the same reach of the river did not change appreciably.

Flows in Slug Creek and from Knudsen Spring were measured during 2014 - 2016 (NewFields, 2017a). All but two of the monitoring events indicated surface water flow in Slug Creek near the proposed Caldwell Canyon Mine (i.e., between stations SW-01 and SW-04) consistently decreased, indicating a loss of surface flow to groundwater and/or to several irrigation diversion ditches present within the reach. Monitoring data conducted for the Dairy Syncline Mine Project also indicated a loss of flow through this reach of Slug Creek. Loss of flow along Slug Creek was greatest during the June and August monitoring, when flow loss ranged from 53 to 96 percent, likely because of irrigation withdrawals.

Figure 15. Water Rights and Monitoring Locations

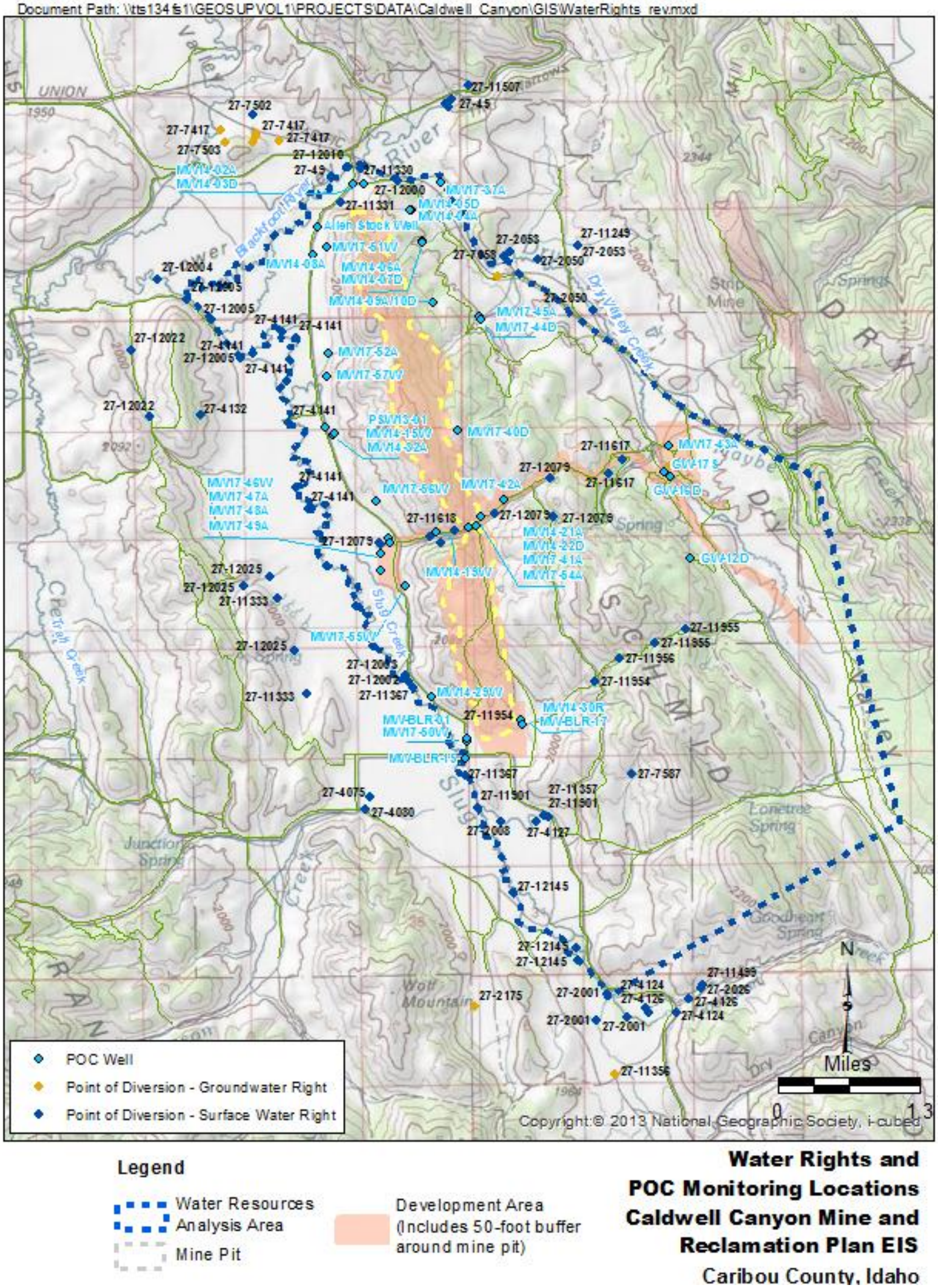


Table 9. Spring Monitoring Locations and Flow Rates (2014 – 2016)

Station No.	Type	Associated Stream	Elevation (feet amsl)	Flow Range (gpm)	Flow Range (cfs)
SW-02	SP	Knudsen Spring – Feeds Slug Creek	6,363	673 – 1,211	1.5 – 2.70
SW-11	SP	Unnamed Tributary of Dry Valley Creek	6,467	0 - 92	0 - 0.20
SP-01	SP	Unnamed Tributary of Slug Creek	6,781	0 - 40	0 – 0.089
SP-02	SP	Unnamed Tributary of Slug Creek	6,952	1 – 5.0	0.0022 – 0.011
SP-03	SP	Unnamed Tributary of Caldwell Creek	6,784	0.42 – 4.8	0.001 – 0.011
SP-04	SP/ SW	Upper Quonset Hut Creek	6,784	15 – 61.6	0.033 – 0.14
SP-05	SP/ SW	Southern Tributary to Caldwell Creek	6,744	4.8 - 60	0.011 – 0.13
SP-06	SP	Caldwell Creek	6,802	1.1 – 48.6	0.002 – 0.067
SP-07	SP	Chicken Creek	6,518	<1 - 30	<0.002 – 0.067
SP-08	SP	Unnamed Tributary to Dry Valley Creek	6,541	7 – 68.8	0.016 – 0.15
SP-09	SP	Unnamed Tributary to Caldwell Creek	6,678	0 – 37.2	0 – 0.083
SP-10	SP	Unnamed Tributary to Caldwell Creek	6,958	0 - 15	0 – 0.033
SP-11	SP	Discharge from Pipe near Dry Valley Road	6,362	3.9 – 43	0.009 – 0.095
SP-12	SP	Unnamed Tributary to Dry Valley Creek	6,637	0.5 - 3	0.0011 – 0.0067
SP-13	SP	Unnamed Tributary to Dry Valley Creek	6,591	1.4 – 26.4	0.003 – 0.059
SP-14	SP	Unnamed Tributary of Dry Valley Creek	6,498	5.0 - 10	0.011 – 0.022
SP-15	SP/ SW	Chicken Creek	6,697	6.8 - 24	0.015 – 0.053
SP-16	SP	Unnamed Tributary to Caldwell Creek	6,739	1.0 – 4.0	0.002 – 0.009
SP-17	SP	Caldwell Creek	6,704	not measured	not measured
SP-18	SP	Unnamed Tributary to Caldwell Creek	6,650	<1.0 – 37.2	<0.002 – 0.0083

Source: Appendix A, Table A1 (NewFields, 2018c)
not measured – Not measured due to one or more field conditions or station not established until August 2014.
amsl – above mean sea level, SW – Surface water, SP – Spring

Gaining flow observed along most of Caldwell Creek is probably due to springs originating from the Dinwoody Formation that supply water along multiple unnamed tributaries (NewFields, 2017a). These springs likely occur due to structural or topographic controls, or because the Meade Peak Member acts as an aquitard. Caldwell Creek surface flow sinks into the subsurface when it reaches the alluvial fan at the base of Schmid Ridge and does not reach Slug Creek to the west. Flow increases of 12 to 50 percent were observed between stations SW-07 and SW-08 (**Figure 15**).

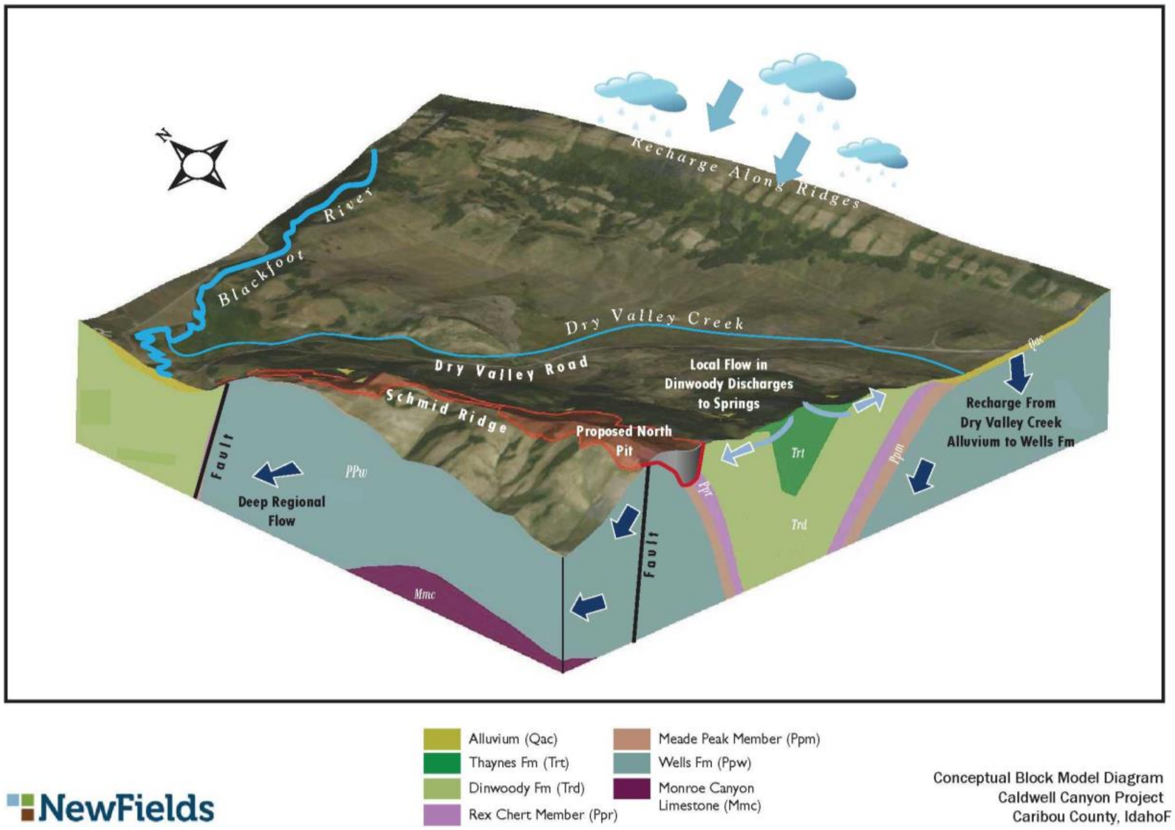
Data from a 1975 study of Dry Creek Valley were used to evaluate stream gain-loss, as a gain-loss study was not conducted during the 2014-2015 monitoring work. The 1975 study indicated that Dry Valley Creek loses flow throughout its length, except for one short reach indicating potential flow gain. Loss rates were estimated as 0.025 to 0.82 cfs per mile (NewFields, 2017a).

Groundwater

Groundwater aquifers occur primarily in the alluvium, colluvium, Thaynes Formation, Dinwoody Formation, and Wells Formation, with some occurrence in the Rex Chert and Meade Peak members of the Phosphoria Formation. Typically, the Meade Peak Member acts as an aquitard that limits interaction between the overlying local and intermediate groundwater flow systems in the alluvium, colluvium, Thaynes Formation, Dinwoody Formation, and Rex Chert Member and the deeper regional groundwater flow system in the Wells and Monroe Canyon formations.

Groundwater recharge occurs mainly along the mountain ridges, through the alluvium and colluvium, and from streamflow losses to the underlying alluvium and bedrock (**Figure 16**) (NewFields, 2017a). Local recharge to the regional groundwater system occurs through the Dry Valley Creek alluvium to the Wells Formation. Most groundwater flow through the analysis area is through the regional flow system; regional flow enters the area from the east-northeast and leaves toward the west-southwest. Alluvial aquifers occur along Blackfoot River, Slug Creek, and Dry Valley Creek, and alluvium intermittently (spatially and temporally) hosts groundwater in Caldwell Canyon and other drainages extending from Schmid Ridge to Slug Creek and Dry Valley Creek. Flow through the alluvium is generally down-valley. The alluvial aquifers sometimes discharge to surface streams but more commonly gain water from streamflow seepage. Colluvium is typically unsaturated; however, it may recharge the underlying bedrock groundwater or receive discharge from bedrock, depending on location.

Figure 16. Water Resources Conceptual Block Model



Source: (NewFields, 2017a)

Several springs discharge from the Thaynes Formation on the eastern side of the analysis area. Also, several springs discharge from the Dinwoody Formation on the east side of the proposed Caldwell Canyon Mine pits area. Except for flows from Knudsen Spring, which forms a perennial tributary to Slug Creek, and several small springs which produce perennial flow in the Caldwell Creek headwaters, flows from the springs do not create perennial streams. **Section 3.3.2** provides additional discussion of the geology of the area, and the water resources baseline technical report (NewFields, 2017a) discusses and provides photographs of the springs.

Water Quality

Surface Water Quality

Pursuant to the Federal Clean Water Act, the State of Idaho, acting through the IDEQ, regulates surface water quality for designated beneficial uses under the IDAPA 58.01.02. The State of Idaho has established and the USEPA has approved water quality standards for specific conductivity, pH, turbidity, chemicals, solids, metals, and temperature. Details on the standards and discussion of existing surface water quality are included in the water resources baseline technical report and two addenda (NewFields, 2017a; NewFields, 2017e; NewFields, 2018c). Constituents in surface water that have regularly exceeded standards include aluminum (Blackfoot River, Slug Creek, Chicken Creek, springs discharging from alluvium and the Thaynes and Dinwoody formations), selenium (Blackfoot River, Chicken Creek), manganese (Chicken Creek, Dry Valley Creek), and total dissolved solids (Caldwell Creek, Chicken Creek, Dry Valley Creek, springs discharging from the Thaynes and Dinwoody formations).

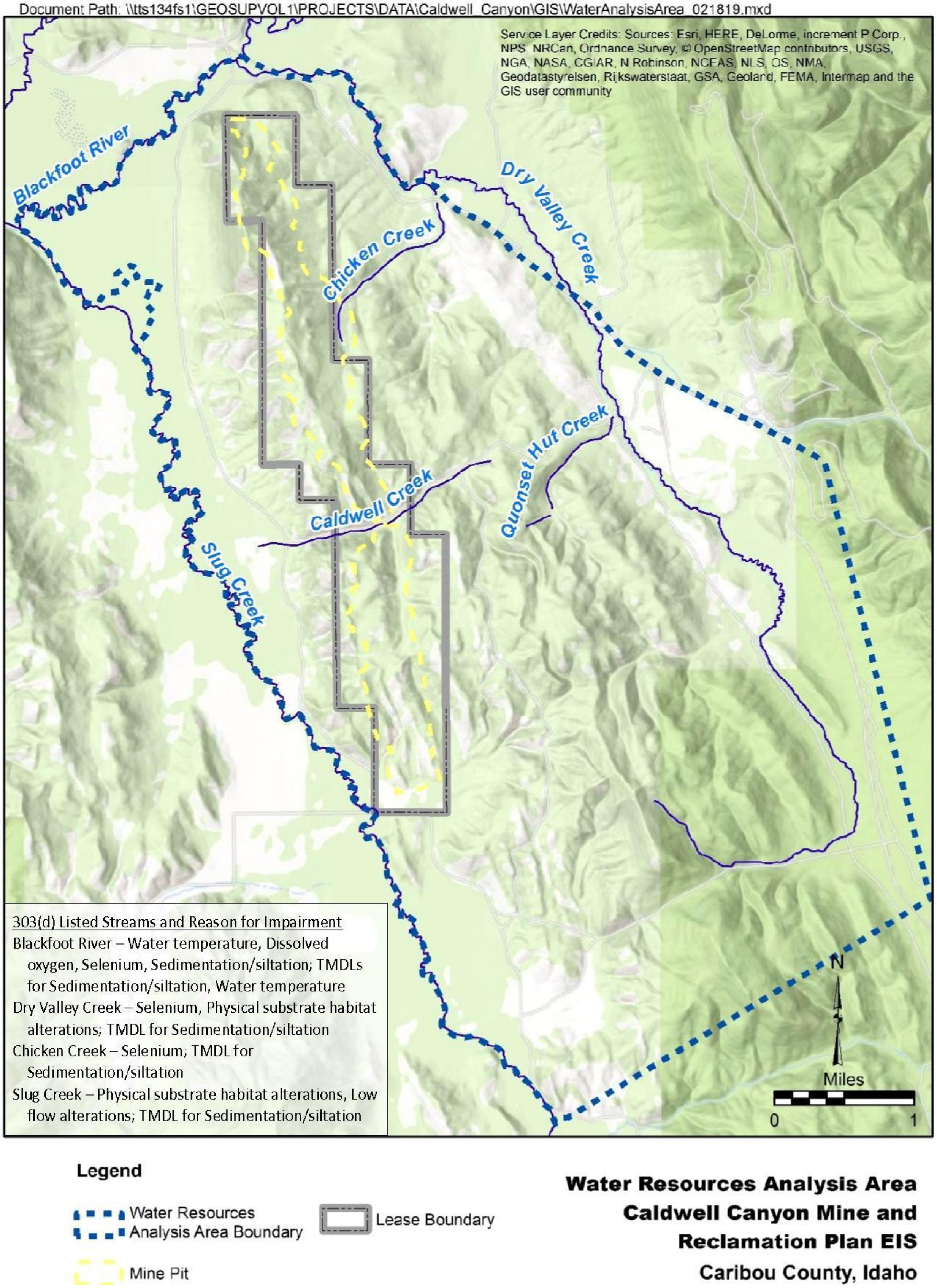
Designated beneficial uses for the Blackfoot River are cold water aquatic life, salmonid spawning, primary contact recreation, and domestic water supply. Caldwell Creek, Slug Creek, and Dry Valley Creek do not have designated beneficial uses, so cold water aquatic life and primary and secondary contact recreation are beneficial uses per IDEQ presumed use protection for unspecified water bodies. Waterbodies may be designated as impaired when beneficial uses are not being met.

Idaho's 2014 Integrated Report (IDEQ, 2017a) lists impaired waters per Section 303(d) of the Clean Water Act, shown on **Figure 17**. Waters that are listed as impaired must undergo a study to establish a Total Maximum Daily Load (TMDL) to mitigate the impairment. The following water bodies are listed under 303(d) and require a TMDL: Blackfoot River is listed as impaired for dissolved oxygen and selenium, Dry Valley Creek for selenium, and Chicken Creek for selenium. The following water bodies have TMDLs for sedimentation/siltation that have been approved by the USEPA: Blackfoot River, Slug Creek, Dry Valley Creek, and Chicken Creek. The Blackfoot River also has an approved TMDL for water temperature, which also serves as a surrogate for dissolved oxygen. Slug Creek and Dry Valley Creek are listed as impaired under Category 4C (failing to meet water quality standards from causes other than pollutants) due to physical substrate habitat alterations (changes to the stream bed, such as accumulation of fine sediment, that would degrade aquatic life habitat) and additionally for low flow alterations in Slug Creek. Neither Slug Creek nor Dry Valley Creek are listed as supporting cold water aquatic life or salmonid spawning; Slug Creek supports secondary contact recreation. The Blackfoot River is listed as not supporting cold water aquatic life. It was not assessed for domestic water supply, primary contact recreation or salmonid spawning.

Groundwater Quality

In Idaho, IDEQ oversees groundwater standards under the authority of the IDAPA 58.01.11. Groundwater in the analysis area is subject to standards under IDAPA 58.01.11.200 per its classification as a general resource. Primary standards are protective of human health, and secondary standards are to protect aesthetic quality. Should naturally occurring levels of a parameter exceed the standards, the natural background level is used for the standard. This is to prevent natural conditions being declared as an exceedance of water quality standards. **Table 10** shows monitoring locations and water quality, compared to standards, for the Wells Formation regional aquifer. One or more groundwater samples from monitoring wells showed elevated natural background concentrations. These samples exceeded primary standards for antimony, arsenic, barium, beryllium, cadmium,

Figure 17. Surface Water



Service Layer Credits: Sources: Esri, HERE, DeLorme, increment P Corp., NPS, NRCan, Ordnance Survey, © OpenStreetMap contributors, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

303(d) Listed Streams and Reason for Impairment

Blackfoot River – Water temperature, Dissolved oxygen, Selenium, Sedimentation/siltation; TMDLs for Sedimentation/siltation, Water temperature

Dry Valley Creek – Selenium, Physical substrate habitat alterations; TMDL for Sedimentation/siltation

Chicken Creek – Selenium; TMDL for Sedimentation/siltation

Slug Creek – Physical substrate habitat alterations, Low flow alterations; TMDL for Sedimentation/siltation chromium, lead and thallium, and secondary standards for aluminum, iron, manganese, zinc, total dissolved solids, and pH. The most frequent exceedances were for aluminum, iron, and manganese as total concentrations in unfiltered samples. Dissolved concentrations from filtered samples rarely exceeded groundwater standards, except for samples from wells completed in the Dinwoody Formation and the Rex Chert Member. Wells completed in the Wells Formation exceeded the secondary groundwater standard for manganese in the dissolved phase. Several wells completed in the Meade Peak Member and the Wells Formation exceeded the standard for cadmium. Note that the groundwater standards apply to total concentrations and not dissolved concentrations but evaluating dissolved phases from filtered samples provides additional information on water quality characteristics. Additional details and discussion on the quality of groundwater are provided in the water resources baseline technical report and two addenda (NewFields, 2017a; NewFields, 2017e; NewFields, 2018c). Pursuant to the state groundwater standards, IDEQ has established POC locations where monitor wells are required to be placed and monitored to ensure that mining activities meet groundwater quality standards and beneficial uses of the aquifer are protected.

Table 10. Groundwater Quality in Wells Formation Monitoring Wells

Constituent	Cadmium, total	Manganese, total	Selenium, total	Sulfate, total
Groundwater Quality Standard	0.005[a]	0.05[b]	0.05[a]	250[b]
Wells	mg/L	mg/L	mg/L	mg/L
MW14-14W	0.00004	*0.11	0.0006	12.9
MW14-15W	*0.0076	*0.43	0.0023	10.6
MW14-18W	0.00004	*0.16	0.0004	10.5
MW14-19W	0.00008	*0.08	0.0005	41.8
MW14-27W	0.00004	*0.02	0.0015	13
MW14-29W	0.00047	0.52	0.001	13.1
MW14-31W	0.0037	*0.13	0.0008	15.3

Source: (NewFields, 2017a; NewFields, 2017e; NewFields, 2018c; IDEQ, 1997).

Notes:

* indicates concentrations above the standards.

Concentrations are averages for all samples collected from each well. For calculation of averages, concentrations below the detection limits were treated as one-half of the detection limit. Groundwater Quality Standards from IDAPA 58.01.11 (IDEQ, 1997).

a indicates primary standard;

b indicates secondary standard.

3.4.2.1 Delineated Wetlands, Streams, and Jurisdictional Waters of the U.S.

Wetlands are defined as "[t]hose areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3; 40 CFR 230.3). Waters of the U.S., which are regulated by the USACE, are differentiated from all wetlands and streams based on connectivity to a traditional navigable water. Waters of the U.S. include wetlands and relatively permanent water (e.g., rivers, streams, and creeks). Wetlands were classified using the Cowardin (Cowardin, et al., 1979) and Hydrogeomorphic (HGM) classification systems (Smith, et al., 1995). Thirty-two individual wetlands were delineated (NewFields, 2015f; NewFields, 2016b), totaling 43 acres (see **Table 11** and **Figure 18**).

Figure 18. Wetlands Delineation Analysis Area

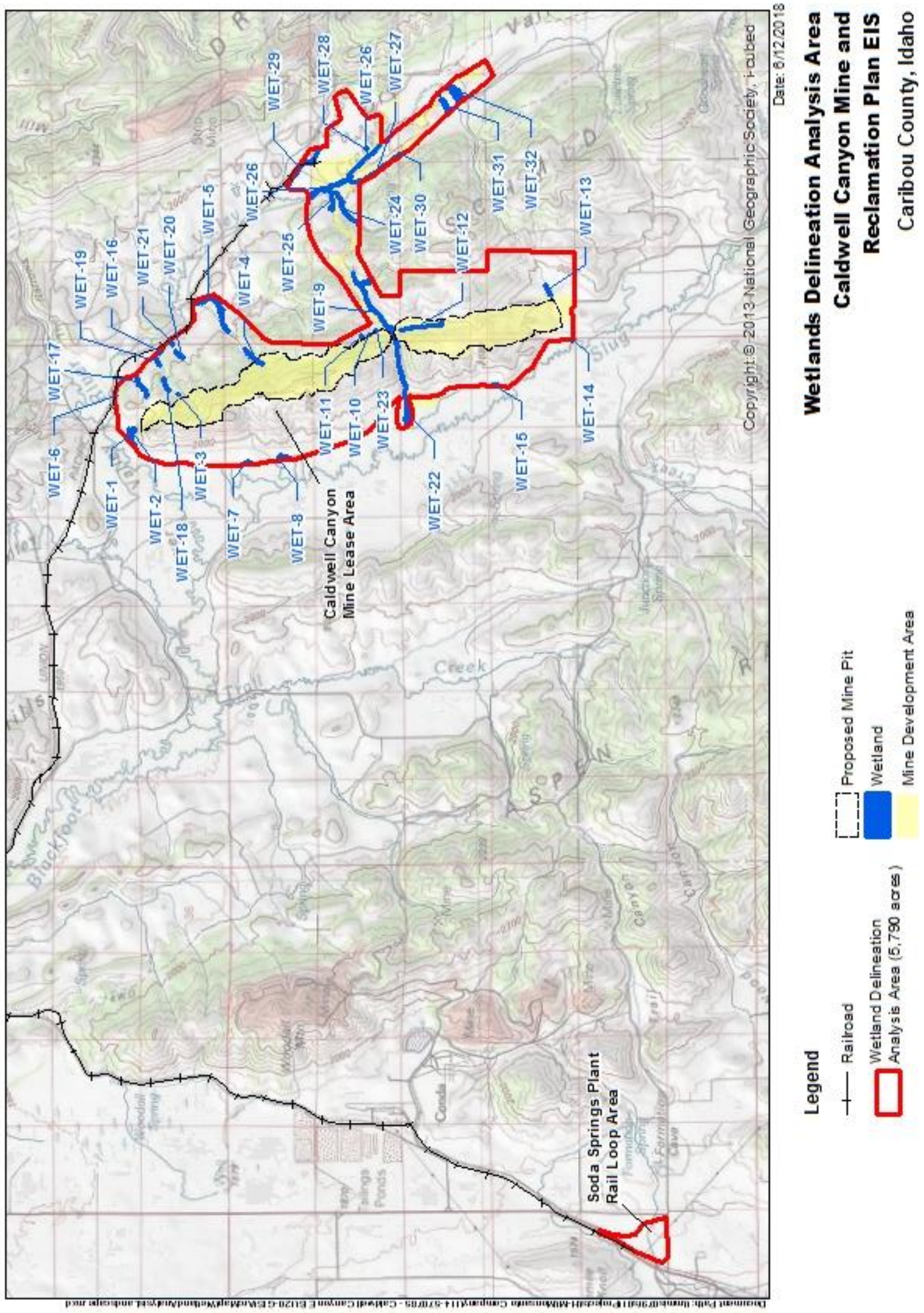


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Table 11. Delineated Wetland and Stream Acres by Wetland Type

Wetland Type (Cowardin/HGM)	Wetland Acres	Wetland Type (Cowardin/HGM)	Wetland Acres
Emergent/ Depressional	0.71	Seasonal Emergent/ Riverine	3.04
Emergent/ Riverine	10.44	Seasonal Emergent/ Slope	1.23
Emergent/ Slope	0.18	Shrub-Scrub, Emergent/ Riverine, Slope	0.53
Forested, Shrub-Scrub/ Riverine	0.22	Shrub-Scrub/ Depressional	2.29
Forested, Shrub-Scrub/ Slope	1.34	Shrub-Scrub/ Riverine	2.93
Limnetic/ Depressional	0.09	Shrub-Scrub/ Riverine, Slope	6.37
Riverine-Seasonal Emergent/ Riverine	6.4	Shrub-Scrub/ Slope	5.45
Seasonal Emergent/ Depressional	0.01	Shrub-Scrub/ Slope, Riverine	1.55

Sources: (NewFields, 2015f; NewFields, 2016b)

The proper functioning condition of five primary stream reaches was assessed following BLM methods (BLM, USFS, NRCS, 1998). The proper functioning condition methodology evaluates stream characteristics including vegetation, landform, and woody debris to assess stream functions such as energy dissipation, sediment control, bank stabilization, and providing habitat.

Primary drainages are Slug Creek, Caldwell Creek, and Dry Valley Creek. A significant nexus evaluation was completed for delineated wetlands and other waters of the U.S. The nearest traditional navigable water is the Snake River. Slug Creek and Dry Valley Creek are relatively permanent waters and are tributaries to the Snake River via the Blackfoot River. Connectivity of a wetland or relatively permanent water to Slug Creek and Dry Valley Creek would be considered connectivity to a traditional navigable water; therefore, the feature would also be presumed jurisdictional (NewFields, 2015f).

The USACE approved a jurisdictional determination and a preliminary jurisdictional determination for wetlands and other waters of the U.S. identified in the wetlands delineation analysis area [Corps File No. NWW-2014-302-I01 (October 19, 2015 and December 4, 2015)] (USACE, 2015). The approved jurisdictional determination found a select group of wetlands and streams to be isolated, including Caldwell Creek, and portions of Chicken Creek, Slug Creek tributary, and Dry Valley Creek tributary; therefore, those waters and associated wetlands are not jurisdictional. Impacts on these features would not require mitigation under the Clean Water Act. The preliminary jurisdictional determination included wetlands and streams presumed to be waters of the U.S. based on a desktop review of connectivity to relatively permanent waters.

3.4.3 Direct and Indirect Effects

Direct and indirect effects to water rights and beneficial uses can result from changes in chemical concentrations in groundwater, changes in chemical concentrations or loading to surface water, and from changes in stream flows or groundwater levels.

3.4.3.1 Analysis Methods

Geochemistry

To predict the concentration of COPCs that could be released from overburden, a geochemistry study was performed on exploration drilling samples representative of run-of-mine overburden that would be placed as backfill. The study included whole rock analysis, paste extractable metals, static leaching testing, saturated column leach testing, and unsaturated column leach testing (NewFields, 2018g) The study characterized run-of-mine overburden geochemistry and identified COPCs for planning onsite overburden storage and facility geologic construction materials. Past studies on regional phosphate mine overburden have indicated that the Meade Peak Member of the Phosphoria Formation is the primary geologic source of COPCs, and particularly selenium, so geochemical testing focused on this rock unit (NewFields, 2015b).

Testing also indicated that, along with selenium, leachate from overburden lithologies includes antimony, cadmium, manganese, and sulfate. In the tests, antimony was present at levels below the reporting limits and the Idaho water quality standard, but cadmium, manganese, selenium, and sulfate were above the Idaho groundwater quality standards. Column testing showed cadmium and selenium concentrations calculated for the run-of-mine backfill, would decrease and meet Idaho water quality standards by the second pore volume flush. Column testing also showed a decreasing trend of sulfate and manganese concentrations, but they did not appear to reach equilibrium or decrease to levels below Idaho groundwater quality standards by the fourth pore volume flush. The results from the geochemistry testing were used to determine leachate source concentrations for groundwater flow and transport modeling of surface water and groundwater.

Cover Model

A numerical cover design model was developed using the variably saturated zone flow model VADOSE/W (Geo-Slope, 2014). This software is part of the GeoStudio suite of programs and was used to determine the infiltration rate for use in the groundwater fate and transport model. Modeling was completed on two, two-dimensional cross-sections representative of the general conditions during the post-closure period (after cessation of mining, backfilling of the pits, and placement of the closure cover). The two modeled sections are an east-west oriented section through the North Pit and an east-west section through the South Pit. They are intended to evaluate the infiltration of precipitation into the closure cover, and percolation of that water through the cover and into the underlying backfill. The water table is below the pit bottom at the modeled section through the North Pit. The water table intercepts the bottom of the pit and the backfill materials in the section used to simulate the South Pit. A detailed report of the model development and simulations, and analysis of the model results has been provided in the project record (Tetra Tech, Inc., 2018b).

Groundwater Models

Results from the geochemistry and the cover infiltration model were put into a numerical groundwater fate and transport model (predictive model) to assess transport of selenium, manganese, cadmium, and sulfate leached from the pits backfill into groundwater and to predict impacts on surface water and groundwater. The model used the MODFLOW-SURFACT finite-difference code to simulate groundwater flow and solute transport and predict the response of the groundwater and related surface water features to the proposed mining and mine reclamation. A detailed report of the model development, input parameters, calibration and operation, and model sensitivity and uncertainty, has been provided in the project record (Tetra Tech, Inc., 2018a; Tetra Tech, Inc., 2018b).

COPCs would leach from the backfill materials by precipitation and run-off that infiltrates through the cover and percolates through the backfill, then into the groundwater system. The model treated the run-of-mine backfill that would be placed into the mine pits as a source of COPCs to the groundwater system and simulated the transport of the COPCs with the groundwater. The model incorporated the conservative assumption that no chemical reactions would occur during transport because the reactions most likely to occur under the existing hydrogeologic and geochemical conditions would reduce some COPCs concentrations. To focus on the impacts from mining, the model included the resulting change in groundwater concentrations from the backfill source and not the existing baseline groundwater concentration. Additionally, model predictions carry a degree of uncertainty. The uncertainties are due to the generalizations necessary to mathematically represent natural systems, variabilities in aquifer properties and hydrologic processes, and lack of information about such variability within the modeled area. Sensitivity analysis was done to better understand the uncertainties. The sensitivity analysis found that the uncertainty was within acceptable ranges.

The groundwater quality standards related to the COPCs are shown in **Table 10**. Source term concentrations were varied with time based on the number of pore volumes flushed through the backfill. The details of calculations related to solute transport, source concentration calculations, and sequencing of source concentration application were provided in the groundwater modeling report (Tetra Tech, Inc., 2018a), which is part of the project record.

A separate groundwater transport model (Random Walk model) was used to predict the effects to groundwater from placement of backfill from the Caldwell Canyon South Pit into the Dry Valley Mine D Pit (Brown and Caldwell, 2018). The Random Walk model originally used to predict groundwater quality in the Wells Formation regional aquifer west of the Dry Valley Mine C and D pits (Tetra Tech, Inc., 2007) was recalibrated and updated to represent COPCs leaching from the combined Dry Valley Mine and Caldwell Canyon Mine backfill materials in the Dry Valley Mine D Pit.

3.4.3.2 Proposed Action

Water Rights

Diversion and control of surface water run-off within the disturbed areas would reduce the volume of run-off leaving the disturbed areas during construction and mining. Following reclamation, the diversions and controls would be removed, so the effects of diversion and surface water controls on run-off from this area would be temporary. Mining would physically remove four springs in the North Pit and one spring in the South Pit. Data presented in the Final Water Resources Baseline Technical Report (NewFields, 2017a) shows median flows of 0 to 1 gpm for four of the springs and 9.7 gpm for one spring in the headwaters of Chicken Creek (**Figure 14**). Removal of the springs would result in permanent cessation of flow, representing a long-term irreversible impact. Those springs do not have water rights associated with them.

During Phase 3 (mining years 6-9) and Phase 6 (mining years 16-19), two areas of the South Pit below the water table of the regional aquifer would be kept dry by pumping water from wells outside the pits. Because dewatering water would be tested as described in **Section 2.1.5** before discharging, the water quality that supports existing beneficial uses would not be affected.

The modeled drawdown from mine dewatering is shown in **Figure 19** for each phase; negative values indicate groundwater mounding due to water introduced into the infiltration galleries. These direct effects would dissipate within a few years after dewatering ends. The model predicted that no permitted water supply wells (**Table 12**) would be measurably affected, nor would stream flows in Caldwell Creek, Dry Valley Creek, and Blackfoot River or spring flows (Tetra Tech, Inc., 2018a).

Figure 19. Predicted Drawdown Area from Mine Dewatering

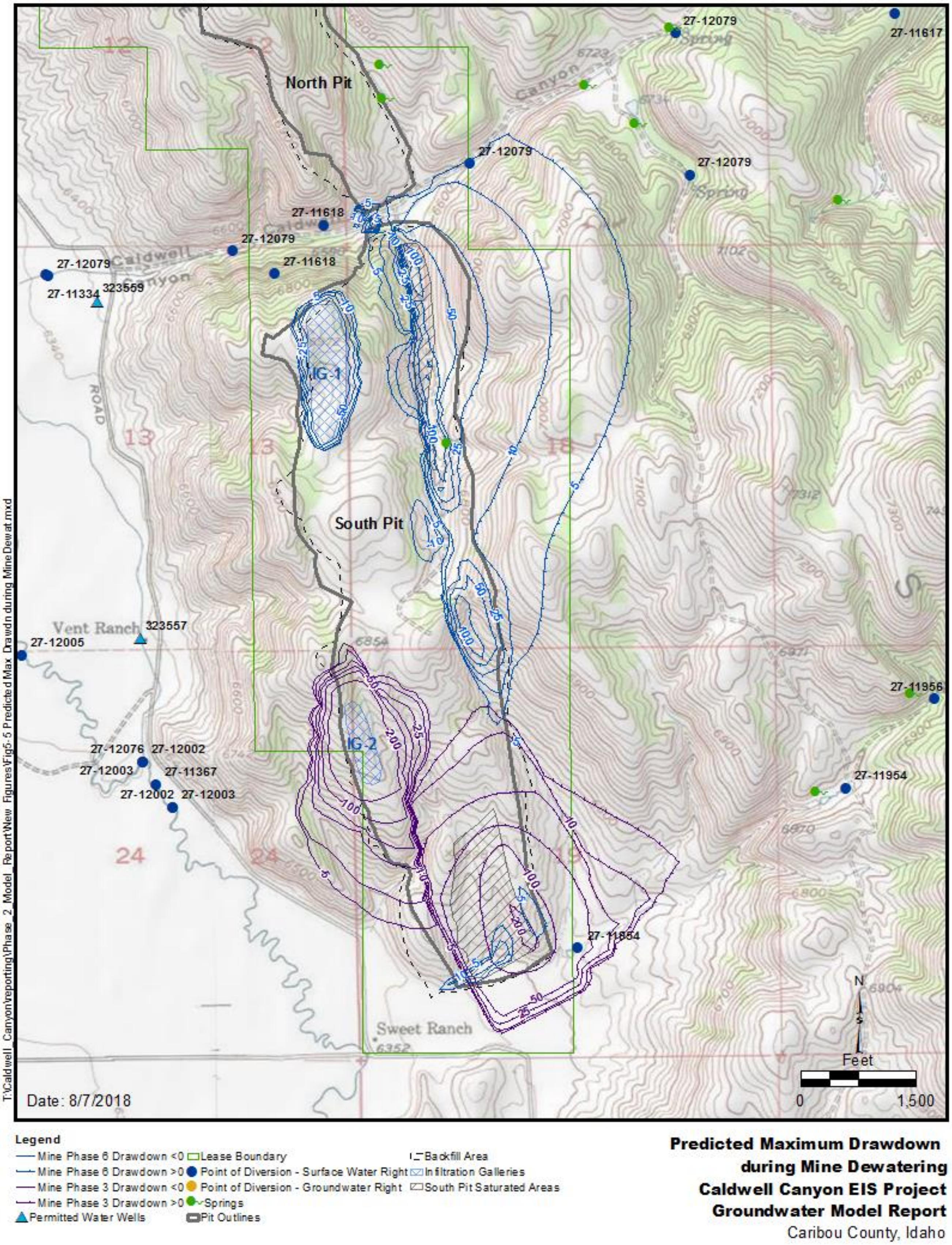


Table 12. Predicted Water-Level Changes (feet) at Permitted Water Supply Wells

Well ID	Permit ID	Hydrogeologic Unit[1]	Maximum Water Level Increase	Maximum Water Level Decrease	Ending Water Level Change
323547	706324	Wells Formation	<0.1	<0.1	<0.1
323557	706334	Alluvium/Colluvium	0.5	<0.1	+0.2
323559	706336	Alluvium/Colluvium	1.1	<0.1	+0.3
342108	770149	Alluvium/Colluvium	<0.1	<0.1	<0.1
342137	770178	Alluvium/Colluvium	0.1	<0.1	<0.1
342141	770182	Dinwoody Formation	<0.1	1.5	-1.5
342540	770591	Alluvium/Colluvium	<0.1	0.2	-0.2
343475	771552	Alluvium/Colluvium	<0.1	0.01	<0.1
383201	812499	Dinwoody Formation	<0.1	0.3	-0.3
389240	818572	Wells Formation	<0.1	<0.1	<0.1
432944	863856	Dinwoody Formation	<0.1	<0.1	<0.1

1 Estimated from driller's log descriptions, well depth and geologic maps.

After backfilling, groundwater levels in the regional aquifer beneath the north part of the South Pit would rise slightly because surface run-off from the internally-drained areas of the reclaimed mine pit would be introduced to the regional groundwater through the infiltration galleries. Mining would remove overburden, including the Meade Peak Member aquitard that helps maintain the water levels in the local/intermediate aquifers. Overburden returned to the pits as backfill would be broken up, and thus more permeable, allowing groundwater from the local aquifers to drain into the pits backfill and underlying regional aquifer, resulting in a decline of the water levels in the local or intermediate aquifers in and east of the mine pits. The decline, shown in **Figure 20**, would be permanent.

Water level declines were predicted to occur at 3 of the 12 permitted water supply (water rights) wells in the modeled area (**Figure 19** and **Figure 20**). The predicted 1.5-foot and 0.3-foot declines at wells 342141 and 383201 in the Dinwoody Formation and the predicted 0.2-foot decline at well 342540 in the alluvial aquifer, are smaller than the observed seasonal water-level fluctuations in those aquifers, based on seasonal fluctuations of 3.6 to 22 feet in the Dinwoody Formation and 2.8 to 15.5 feet in the alluvial aquifer wells (NewFields, 2017a). Therefore, impacts to water levels in these wells would not be discernable from normal seasonal fluctuations.

Surface water right diversions occur in the drawdown area (**Figure 19** and **Figure 20**). Because the diversions are in reaches of the streams which do not normally depend on groundwater to support base flow, drawdown of groundwater levels would not measurably affect flow in the streams and would not measurably affect surface water rights. The contribution to flow in Slug Creek by Knudsen Spring is not predicted to change. Knudsen Spring is fed primarily by groundwater from the Wells Formation (Ralston, et al., 1983) which would not experience water-level drawdown near Knudsen Spring. Streams with model-predicted changes in flow at points of diversion are listed in **Table 12**. Stream flows at three of the 61 points of diversion (water rights 27-11618, 27-12145 and 27-2008) along modeled stream segments were predicted to decrease more than one percent; all other changes were less than one-half of one percent. The modeled changes are likely within the variability of measured flows. These changes represent long-term minor impacts.

Figure 20. Predicted Long-Term Drawdown Area

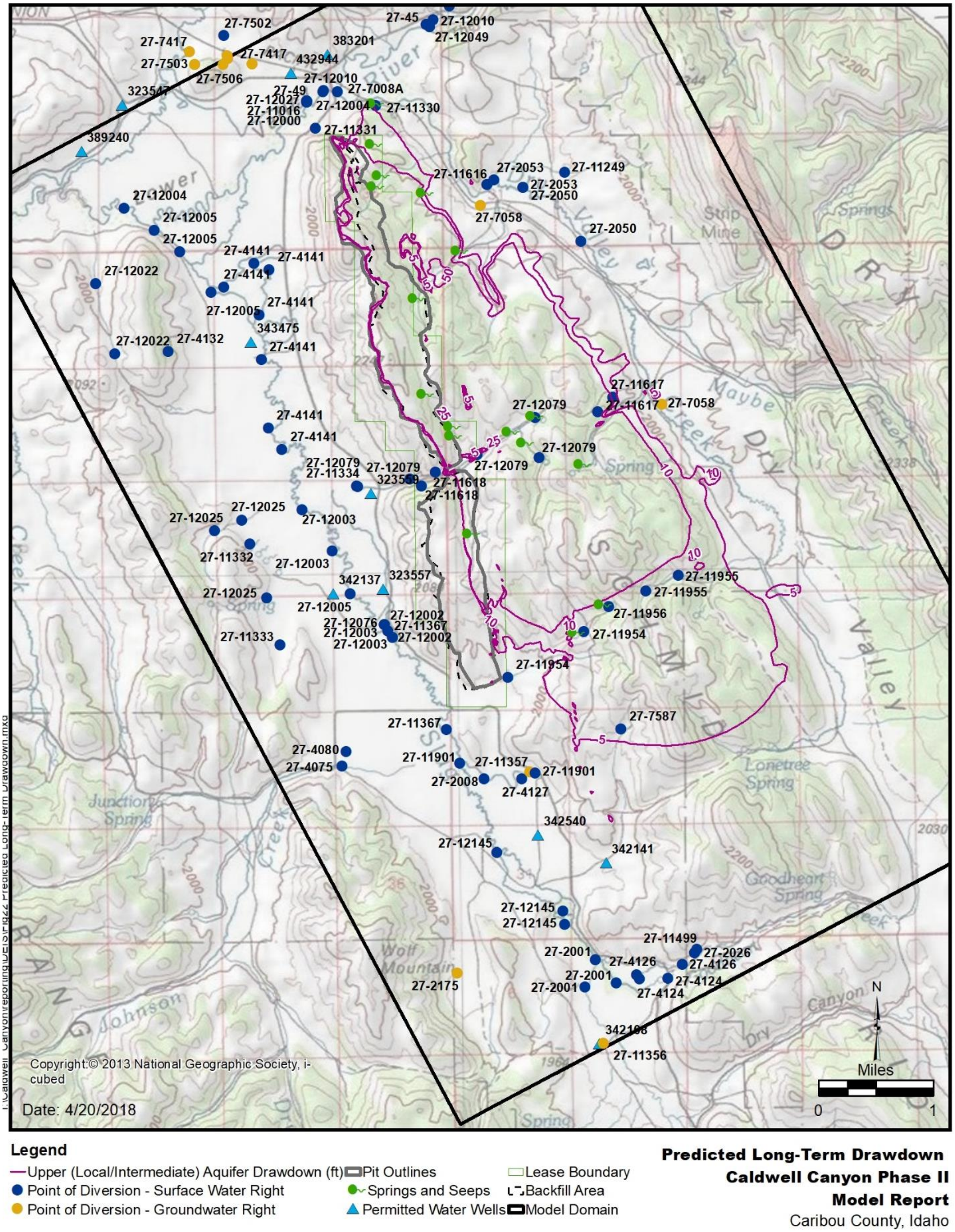


Table 13. Stream Flow Changes at Surface Water Right Points of Diversion

Water Right ID	Owner	Max Rate (cfs)	Source	Initial Modeled Flow (cfs)	Change of Flow as % of Initial Modeled Flow
27-11330	Hunsaker Ranching Inc	0.18	Spring	11	-0.1%
27-11334	Preston R Allen & Sons Partnership	0.30	Caldwell Creek	0.5	-0.3%
27-11367	Keith Bitton	0.02	Slug Creek	5.5	-0.5%
27-11367	Keith Bitton	0.02	Slug Creek	5.9	-0.4%
27-11499	USA	0.02	Goodheart Creek	1.3	-0.4%
27-11618	USA	0.02	Caldwell Creek	0.09	-1.4%
27-11901	P Thomas Blotter Family Ltd Partnership	0.02	Unnamed Stream	5.4	-0.5%
27-12002	P4 Production LLC	1.43	Slug Creek	5.8	-0.4%
27-12003	Preston R Allen & Sons Partnership	6.46	Slug Creek	5.8	-0.4%
27-12003	Preston R Allen & Sons Partnership	6.46	Slug Creek	6.2	-0.4%
27-12003	Preston R Allen & Sons Partnership	6.46	Slug Creek	6.3	-0.4%
27-12004	Preston R Allen & Sons Partnership	0.02	Blackfoot River	55.0	-0.1%
27-12005	Preston R Allen & Sons Partnership	0.02	Slug Creek	7.4	-0.2%
27-12005	Preston R Allen & Sons Partnership	0.02	Slug Creek	55.0	-0.1%
27-12079	Doris Bollar Hayden	0.02	Caldwell Creek	0.5	-0.3%
27-12145	Keith Bitton	0.02	Slug Creek	0.0	-3.0%
27-12145	Keith Bitton	0.02	Slug Creek	3.6	-0.5%
27-2001	P Thomas Blotter Family Ltd Partnership	2.10	Slug Creek	2.1	-0.2%
27-2001	P Thomas Blotter Family Ltd Partnership	2.10	Slug Creek	1.6	-0.1%
27-2008	P Thomas Blotter Family Ltd Partnership	1.10	Unnamed Stream	0.6	-1.4%
27-2026	P Thomas Blotter Family Ltd Partnership	1.28	Goodheart Creek	1.3	-0.4%
27-4126	P Thomas Blotter Family Ltd Partnership	0.02	Goodheart Creek	1.4	-0.3%
27-4141	Preston R Allen & Sons Partnership	10.57	Slug Creek	6.6	-0.3%
27-4141	Preston R Allen & Sons Partnership	10.57	Slug Creek	6.9	-0.3%
27-4141	Preston R Allen & Sons Partnership	10.57	Slug Creek	7.1	-0.3%
27-4141	Preston R Allen & Sons Partnership	10.57	Slug Creek	7.4	-0.2%

Source: (Tetra Tech, Inc., 2018a).

Flows

The groundwater model predicted an overall decrease of about 2 gpm in flow from the 25 springs in the model, and an overall decrease of stream flow leaving the model area of less than 0.1 cfs (**Figure 21**). The change in stream flow predicted, would be from a slight seepage increase from the stream to the alluvial aquifer and a slight decrease in groundwater discharge from the alluvial aquifer to the stream. **Table 14** presents the model-predicted changes in stream flows at stream gaging station locations. The predicted changes are half a percent or less of the initial modeled flows and are likely within the range of variability of measured flows. The predicted downstream changes are not large enough to cause detrimental impacts on beneficial use of water resources.

Figure 21. Predicted Changes in Stream Flow and Spring Discharge

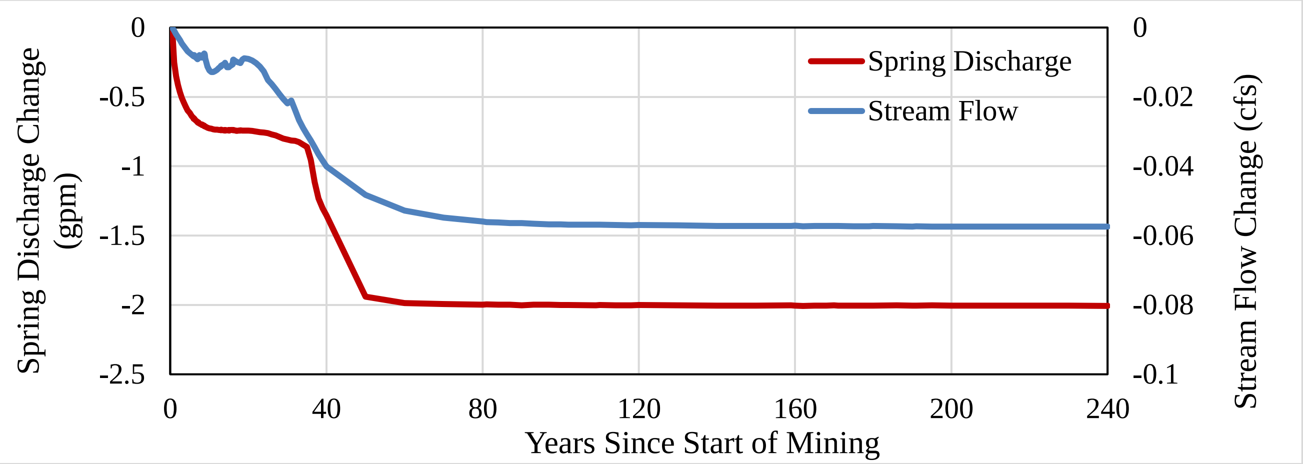


Table 14. Predicted Stream Flow Changes at Surface Water Monitoring Locations

Station	Initial Modeled Flow (cfs)	Change from Initial Modeled Flow (cfs)	Change from Initial Modeled Flow (%)
SW-03 Slug Creek approximately a 1/3 of a mile upstream of the South Pit, below the confluence with Knudsen Spring	5.5	-0.03	-0.5%
SW-04 Slug Creek west of North Pit, downstream of South Pit	7.0	-0.02	-0.3%
SW-15 Slug Creek near confluence with Blackfoot River	7.8	-0.02	-0.2%
SW-06 Caldwell Creek Seasonal South Tributary	0.6	-0.001	-0.1%
SW-07 Caldwell Creek upstream of mine	0.2	0	0%
SW-08 Caldwell Creek downstream near Slug Creek Road	0.4	-0.001	-0.3%
SW-13 Blackfoot River downstream of Dry Valley Creek at bridge	49.0	-0.01	-0.0%
SW-14 Blackfoot River below Slug Creek confluence at the North Trail Road bridge	55.0	-0.05	-0.1%

Source: (Tetra Tech, Inc., 2018a)

Water Quality

Surface Water Quality

Surface water and run-off would be managed as described in **Section 2.1.5** and monitored as described in **Appendix B**, **Section B.14.1**. Sediment, dissolved contaminants, and discharges of groundwater to springs or streams, would occur only when authorized. Accidental releases would be responded to appropriately. Construction and operations conducted in accordance with the MRP and regulatory permits, would reduce impacts on surface water to levels below regulatory limits.

The springs outside of the mine pits area would also be outside of the area in which groundwater quality would be affected by the proposed mine, so surface water quality at the springs would not be affected. Predicted plumes of groundwater containing selenium and manganese at concentrations above their respective groundwater standards, would develop west of the mine pits (Tetra Tech, Inc., 2018a); however, the plumes would be within the regional aquifer of the Wells Formation at depths ranging to 1,000 feet below the land surface and not in hydrologic connection with surface water. Consequently, the potentially affected groundwater would not affect surface water.

During active mining, airborne dust would be generated that carries an estimated annual average of 5.5 kilograms of selenium each year (NewFields, 2018d). Based on modeling, only a small portion of that dust would be deposited into the Blackfoot River, it is very unlikely that the dust would increase the selenium concentration in the river water to the acute or chronic aquatic life standards (0.02 and 0.005 mg/L, respectively) or the human health concentration for consumption of water and aquatic organisms (0.17 mg/L) established by IDEQ in IDAPA 58.01.02. Such an increase would be transient and temporary. An increase to the lowest of the standards, 0.005 mg/L, would require that all of the dust for an entire year be deposited directly into the Blackfoot River over about nine days when the stream flow was 50 cfs, the minimum mean daily flow for the period of record for U.S. Geological Survey gaging station 13063000, Blackfoot River above Reservoir near Henry, Idaho.

Designated beneficial uses for the Blackfoot River (cold water aquatic life, salmonid spawning, primary contact recreation and domestic water supply) would not be affected because selenium, other COPCs, and sediment would not be added; and the temperature and dissolved oxygen concentration would not change. The presumed beneficial uses for Slug Creek, Caldwell Creek, and Dry Valley Creek (cold water aquatic life and primary or secondary contact recreation) would not be affected, because implementation of BMPs would limit addition of COPCs and sediment load to the streams. The causes of impairment of the 303(d) listed streams or criteria subject to TMDLs would not be affected, as COPCs concentrations and sediment loads would not increase, flows would not decrease measurably, and physical disturbances to these water bodies would not occur.

Groundwater Quality

Groundwater quality would not be affected by construction of surface facilities such as roads and other mine features. Rex Chert would be used to construct the surface facilities. Saturated paste extract tests and other testing (synthetic precipitation leaching procedure, acid-base accounting, whole rock) verified that any selenium released from the Rex Chert would not exceed the groundwater standard (NewFields, 2017b). The only COPC released in test work on Rex Chert samples at concentrations above the groundwater quality standard was manganese, a secondary standard based on aesthetics. Manganese would be leached from the construction material but the substantial dilution factor from storm events and annual run-off results in the concentration reporting to receiving groundwater to diminish over the 40-year life of the mine. Precipitation managed in accordance with the MRP (**Section 2.1.5**) would result in negligible groundwater quality impacts.

Figure 22 shows the model-predicted extent of plumes above groundwater standards for each COPC (Tetra Tech, Inc., 2018a). Concentrations of selenium and manganese in groundwater were predicted to exceed the respective groundwater standards in areas beyond the POC wells. Concentrations of cadmium and sulfate above the respective groundwater standards were predicted to remain within or very close to the mine pits. The model predicted that the selenium and manganese would migrate downward from the mine pits to the regional aquifer in the Wells Formation and then be carried westward forming a plume within the regional aquifer, rather than into the shallow and intermediate groundwater system aquifers. The Wells Formation groundwater flowing beneath the proposed Caldwell Canyon Mine area, is believed to ultimately discharge to springs (Ralston, et al., 1983) along a major fault system bounding the west side of the Aspen Range about six miles west of the model area. Formation, East Soda, and Sulfur Canyon springs are potentially down-gradient, and within the flowpath of groundwater COPCs from the proposed mine area and discharge an estimated 17, 3, and 0.3 cfs, respectively (Ralston, et al., 1983), into the Bear River watershed.

The time for groundwater in the regional aquifer to travel from the mine area to the springs would be about 120 years, based on extrapolation of groundwater velocities in the Wells Formation in the model area. Attenuation of COPC concentrations by dispersion, dilution, and mixing, would likely occur along the expected tortuous flowpaths between the project and the springs. Dilution of the groundwater upon discharge to the surface and mixing with surface water flows at the regional discharge locations, would result in negligible to no effects on fish.

Figure 23 presents cross-sections illustrating the vertical extent of the selenium plumes from the pits. The cross sections are aligned approximately with the centerlines of the plumes (Tetra Tech, Inc., 2018a). The predicted migration of the manganese plumes followed a similar pattern. The plumes are predicted to remain in the middle part of the Wells Formation regional aquifer at more than 1,000 feet below the alluvial aquifer, due to the predicted limited vertical extent of groundwater flow patterns. **Table 15** lists the maximum predicted concentrations at Wells Formation monitoring wells that serve as points of compliance.

Table 15. Maximum Predicted COPC Concentrations at Wells Formation POC Monitoring Wells for Proposed Action

Well	Constituent	Cadmium	Manganese	Selenium	Sulfate
	Groundwater Quality Standard	0.005[a]	0.05[b]	0.05[a]	250[b]
MW14-15W	Background	0.00764	0.431	0.002	10.6
	Predicted Increase	0.00076	0.068	0.092	71
	Background plus Predicted Increase	0.0084	0.499	0.094	81.6
MW14-19W	Background	0.00008	0.082	0.0005	41.8
	Predicted Increase	0.00015	0.013	0.0176	13.7
	Background plus Predicted Increase	0.00023	0.095	0.0181	55.5
MW14-29W	Background	0.00047	0.522	0.001	13.1
	Predicted Increase	0	0	0.0436	0.1
	Background plus Predicted Increase	0.00047	0.522	0.0446	13.2

Source (IDEQ, 1997; Tetra Tech, Inc., 2018a)

Concentrations are in milligrams per liter (mg/L). Background concentrations are average concentration for all samples collected from each well. For calculation of averages, concentrations below the detection limits were treated as one-half of the detection limit. Predicted concentration increases are the maximum model-predicted concentration increase for each well.

a indicates primary standard;

b indicates secondary standard.

The highest selenium concentration predicted for an alluvial aquifer was approximately 0.01 mg/L (1/5 of the groundwater standard) at POC Well MW17-54A in the Caldwell Creek alluvium between the mine pits. That reach of Caldwell Creek, being a losing stream and receiving no groundwater, would not be affected by selenium in the groundwater. The highest predicted added selenium concentration in the Slug Creek alluvium at POC Well MW14-32A, was 0.00003 mg/L; below laboratory analytical detection levels.

Figure 22. Predicted Extent of COPC Plumes at 40-Year Intervals for Proposed Action

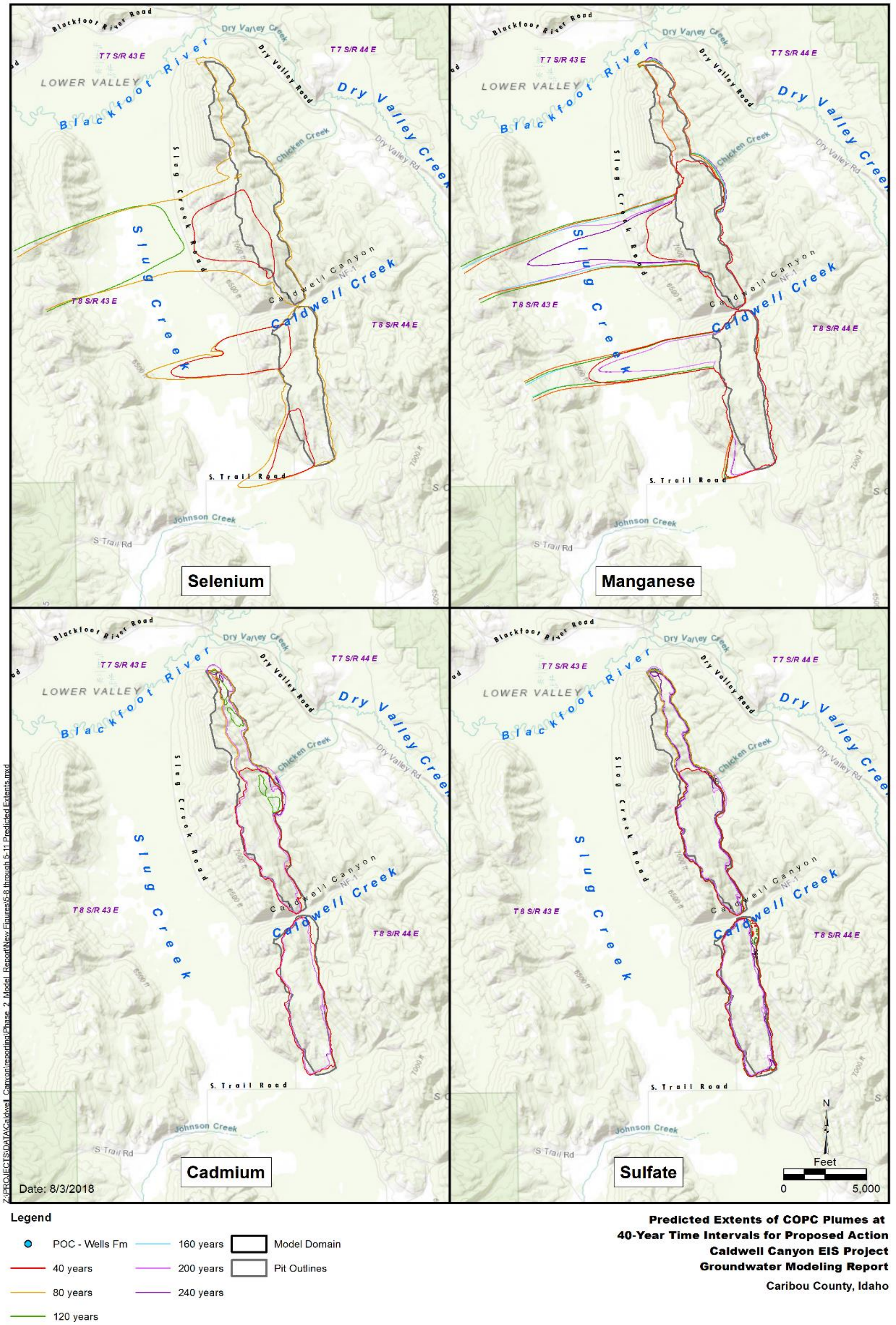
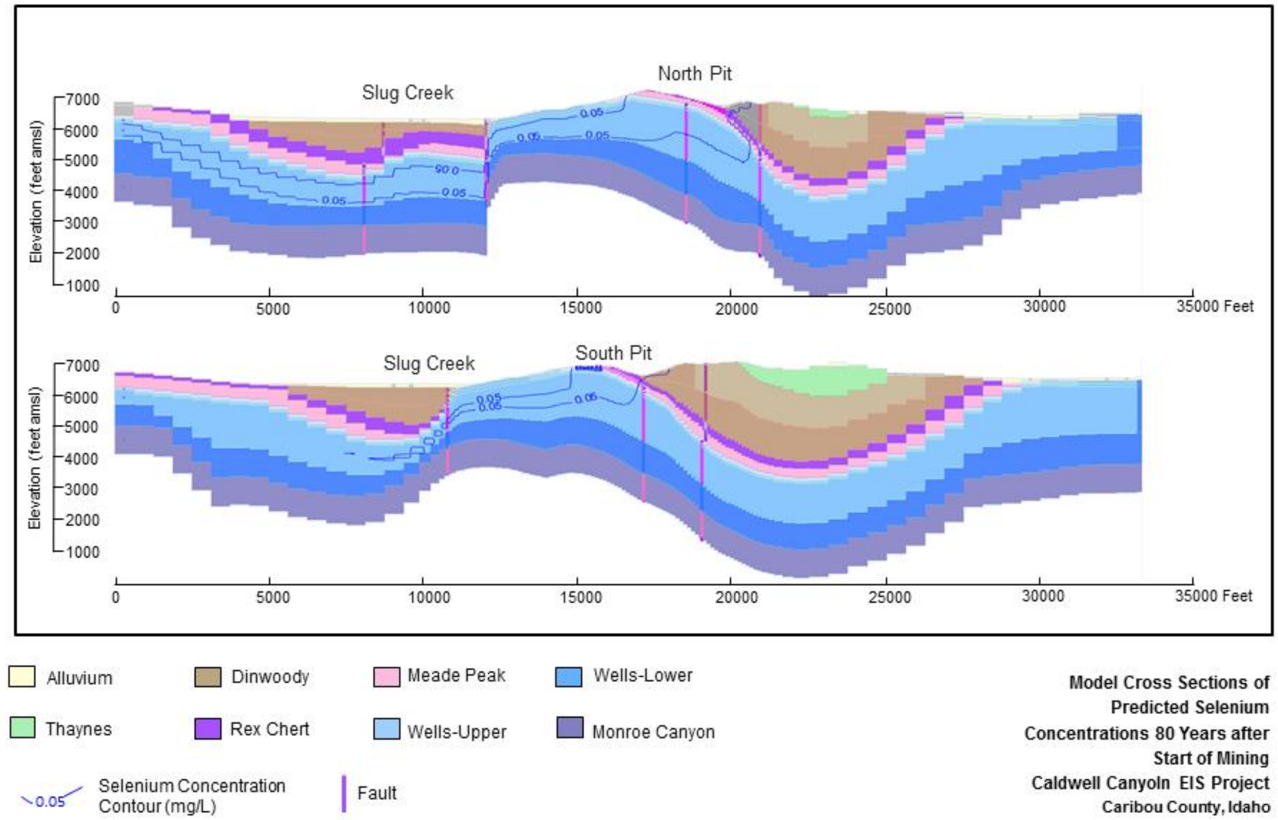


Figure 23. Cross Sections of Predicted Selenium Concentrations 80 Years after Start of Mining



At the Dry Valley Mine D Pit, concentrations of COPCs including selenium, sulfate, and manganese are predicted to remain below the groundwater standards with the addition of overburden from Caldwell Canyon Mine (Brown and Caldwell, 2018).

3.4.3.3 Alternative 1

Water Rights

The effects on water rights would be the same as the Proposed Action. Water infiltrating into the backfill cover would percolate into the natural subsurface or be discharged to existing natural channels. Therefore, the modifications to recharge through the backfill from the enhanced cover design would not change the hydraulics of the groundwater system to cause quantifiable changes in the predicted mounding, drawdown, or stream flows.

Water Quality

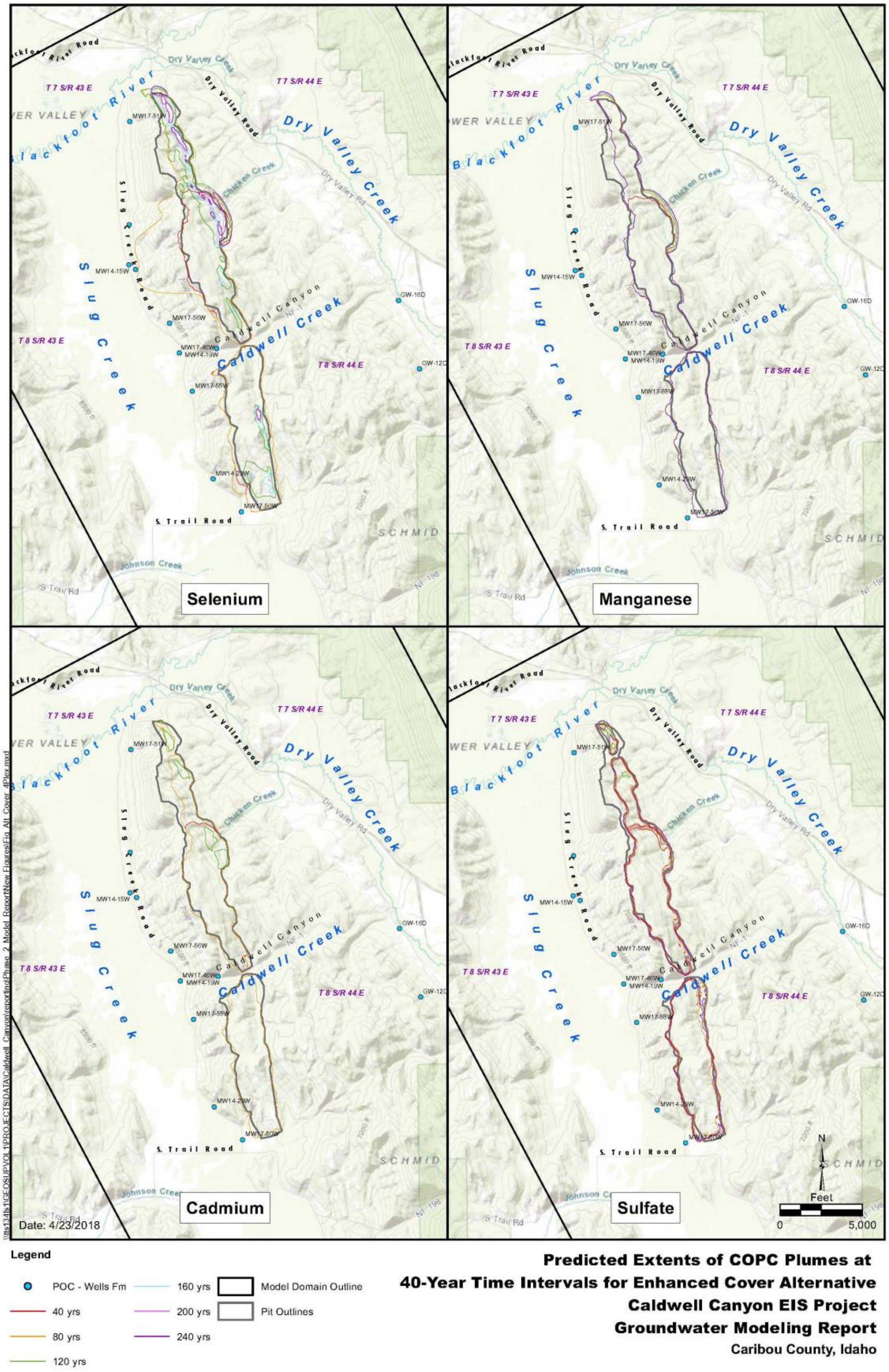
Surface Water Quality

Surface water quality is not predicted to be adversely affected by mining under the Alternative 1 scenario. Beneficial uses and 303(d) listed water bodies would not be affected.

Groundwater Quality

Implementation of Alternative 1 would reduce the mass loading of COPCs from the mine pit backfill into the groundwater system compared to the Proposed Action, resulting in much smaller predicted COPC plumes that dissipate over shorter times. **Figure 24** shows the locations of the groundwater

Figure 24. Predicted Extent of COPC Plumes at 40-Year Intervals for Alternative 1



standard concentration contours (0.05 mg/L for selenium and manganese, 0.005 mg/L for cadmium, and 250 mg/L for sulfate) at 40-year intervals after the start of mining.

Concentrations of selenium in groundwater were predicted to exceed the respective groundwater standards in areas outside the immediate vicinity of the mine pits but not beyond the POC wells. **Table 16** lists the maximum predicted concentrations at Wells Formation monitoring wells that serve as points of compliance.

Table 16. Maximum Predicted COPC Concentrations at Wells Formation POC Monitoring Wells for Alternative 1

		Cadmium	Manganese	Selenium	Sulfate
	Groundwater Quality Standard	0.005[a]	0.05[b]	0.05[a]	250[b]
MW14-15W	Background	0.00764	0.431	0.002	10.6
	Predicted Increase	0.0004	0.035	0.048	37.3
	Background plus Predicted Increase	0.00804	0.466	0.05	47.9
MW14-19W	Background	0.00008	0.082	0.0005	41.8
	Predicted Increase	0.00014	0.013	0.0175	13.6
	Background plus Predicted Increase	0.00022	0.095	0.018	55.4
MW14-29W	Background	0.00047	0.522	0.001	13.1
	Predicted Increase	0.00031	0.028	0.037	28.9
	Background plus Predicted Increase	0.00078	0.55	0.038	42

Source: (IDEQ, 1997; Tetra Tech, Inc., 2018a).

Concentrations are in milligrams per liter (mg/L). Background concentrations are average concentration for all samples collected from each well. For calculation of averages, concentrations below the detection limits were treated as one-half of the detection limit. Predicted concentration increases are maximum model-predicted concentration increase for each well.

a indicates primary standard;

b indicates secondary standard.

Concentrations of manganese, cadmium, and sulfate above the respective groundwater standards were predicted to remain within or very close to the mine pits footprints. Predicted selenium concentrations over time at POC Well MW14-15W remained below the groundwater standard throughout the simulation and in all model layers. The predicted concentrations were highest in the middle Wells Formation, approaching the groundwater standard but not exceeding it. Predicted concentrations in shallower and deeper parts of the groundwater system were much lower than in the middle Wells Formation. Predicted plume migration from the immediate vicinity of the mine pits would be limited to the middle portion of the Wells Formation, and COPC concentrations in the Slug Creek alluvial aquifer were predicted to remain well below the respective groundwater standards.

The effects on groundwater near the Dry Valley Mine D Pit would be the same as the Proposed Action.

Delineated Wetlands Streams, and Jurisdictional Waters of the U.S.

Several alternatives were evaluated to determine the least environmentally damaging practicable alternative. The evaluation is described in detail in the Section 404(b)(1) Analysis Report (NewFields, 2017g). The alternatives considered impacts to waters of the U.S. resulting from the mine pits, ore haulage, and overburden disposal. Based on the Section 404(b)(1) Analysis Report, the haul road location, ore hauling route, and only placing overburden in the existing Dry Valley

Mine D Pit, and the North and South pits (Proposed Action and subsequently Alternative 1) are the least environmentally damaging practicable alternatives.

Excavation of mine pits and construction of new roads would result in discharge of dredged or fill material into 3.18 acres of delineated wetlands and 9,920 linear feet of delineated stream channels (and associated riparian). Of those, 0.21 acre are jurisdictional wetlands and 500 linear feet are jurisdictional stream channels (within the wetlands) (USACE, 2015) in the Quonset Hut Creek and Dry Valley Creek systems and would be affected by the construction of new haul roads. Wetlands affected are shown on **Figure 25** and in **Table 17** and **Table 18** by jurisdictional status.

Table 17. Non-Jurisdictional Wetlands and Streams

Non-jurisdictional Feature	Feature and Type (Cowardin/HGM)	Disturbance Feature
Upper Chicken Creek	WET-4 and perennial stream channel within wetland	North Pit excavation
Caldwell Creek	WET-9 and perennial stream channel within wetland	Road
Caldwell Creek	WET-10 and perennial stream channel within wetland	North Pit excavation
Caldwell Creek sub-drainage	WET-12, 12a, 12b and stream channel within wetland	South Pit excavation
Slug Creek sub-drainage	WET-13	South Pit excavation
Caldwell Creek	WET-22 and perennial stream channel within wetland	WMP-1
Caldwell Creek sub-drainage	WET-23 and channel within wetland	North Pit excavation

Source: (NewFields, 2015e)

Table 18. Jurisdictional Waters of the U.S.

Jurisdictional Feature	Feature ID(s) and Type (Cowardin/HGM)	Impacted Area/length	Disturbance Feature
Quonset Hut Creek	WET-24 Shrub-Scrub/ Riverine	0.2 acre and 180 linear feet	East Caldwell Area Haul Road crossing, new culvert and fill
Dry Valley Creek and Tributary	WET-26, WET-31, WET-32 Seasonal Emergent/ Riverine	WET-26: 0.02 acre and 10 linear feet; WET-31: 0.01 acre and 150 linear feet of ephemeral drainage; WET-32: 0.41 acre and 150 linear feet intermittent drainage	East Caldwell Area Haul Road crossing, new/ modified culvert, fill placement
Stewart Creek	WET-27 Emergent/ Riverine	0.02 acre; 10 linear feet of perennial drainage	East Caldwell Area Haul Road crossing replace/improve existing culvert

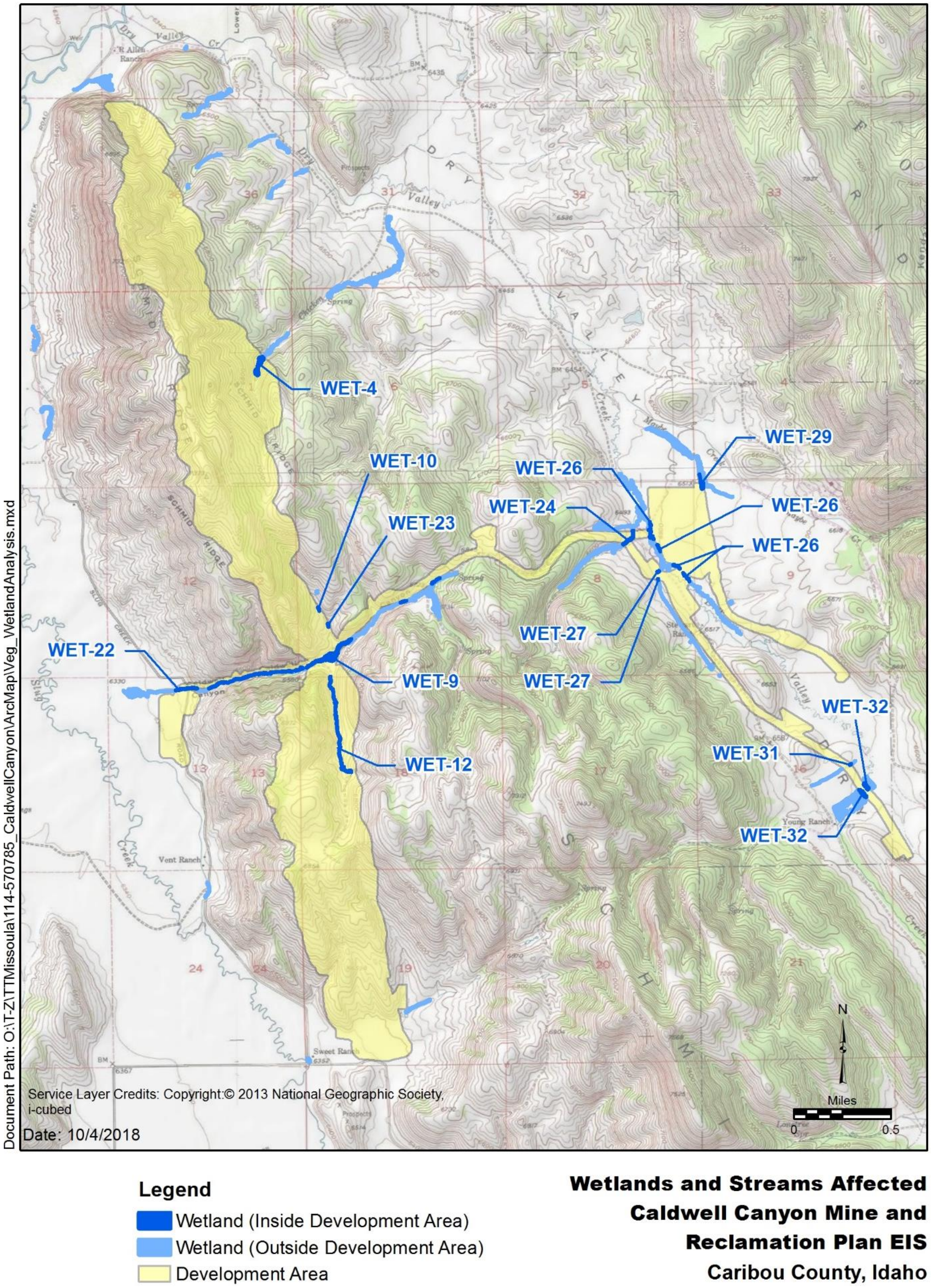
Source: (NewFields, 2015e)

Wetlands Functions and Services

The wetlands functional capacity was evaluated using methods developed by Berglund and McEldowney in 2008 and adopted by the Montana Department of Transportation (Berglund & McEldowney, 2008). Wetlands were ranked into one of the following four functional categories based on the capacity to provide physical and ecological functions:

- Category I – Wetlands of exceptional high quality, and rare to uncommon in the state or from a regulatory standpoint. Category 1 wetlands may provide primary habitat for threatened and endangered species, provide irreplaceable wetland functions, and exhibit high flood attenuation capacity.

Figure 25. Wetlands and Streams Affected



- Category II – More common than Category I wetlands, but may provide habitat for sensitive plants and animals, provide high-quality fish and wildlife habitat, and are assigned high values for many of the assessed functions and values.
- Category III – Common and less diverse than Category I and II wetlands but provide many functions and values at lower levels than Category I and II.
- Category IV – Small, isolated, less diverse, and often directly or indirectly disturbed.

Effects on the functions and services of WET-24, which scored as important for groundwater discharge/recharge, sediment removal, and wildlife habitat (NewFields, 2015f), would be negligible and short-term. A culvert installation would not prohibit stream flow. Sediment removal and wildlife habitat may be altered by removal of adjacent vegetation. Effects would be localized and negligible.

Impacts on Dry Valley Creek and adjacent wetlands would be negligible. Dry Valley Creek is a man-made stream that was relocated and restored as part of the Dry Valley Mine. The function and service scoring was conducted on the entire reach of Dry Valley Creek, which resulted in a functional Category III. If the assessment had been limited to the affected reach (ephemeral, man-made channel), the rating would likely be the lower Category IV (NewFields, 2015f). The affected area of Dry Valley Creek where the Dry Valley Haul Road would cross is ephemeral (flows in response to storm events and does not convey groundwater). It drains a relatively small area and represents a relatively low-quality segment. Its highest function and service variable scores were for sediment stabilization, production export/food chain support, and groundwater discharge/recharge. There would be no effect on functions and services from the culvert installation, as the culvert would not prohibit stream flow or alter function and service capacity.

The stream segment of Stewart Creek (WET-27) where the haul road crosses it, is a perennial-flowing, relatively straight, man-made channel from relocation and restoration due to the Dry Valley Mine. Its highest function and service variable score was for sediment stabilization (NewFields, 2015f). Installation of the culvert would have no effect on functions and services, as the culvert would not prohibit stream flow.

Impacts were evaluated as part of the least environmentally damaging practicable alternative analysis (NewFields, 2017g). Jurisdictional waters of the U.S. that are affected are Category III and Category IV, with 21 percent to 39 percent of possible functional points, except for the Quonset Hut Creek site (WET-24), which is Category II and has 66 percent of possible functional points. Effects on the functions and services of jurisdictional stream features from culvert or fill placement would be negligible, as the proposed fill activity would not prohibit stream flow or reduce the capacity of the feature to continue to provide the same level of functions and services.

The *Conceptual Mitigation Plan for Impacts to Waters of the U.S., Caldwell Canyon Mine Project* (Conceptual Mitigation Plan) (NewFields, 2017c) describes the proposed compensatory mitigation activities to offset the predicted impacts on jurisdictional wetlands and other waters of the U.S. (i.e., stream channels). A Final Compensatory Mitigation Plan would be prepared through coordination with the USACE following approval of the Conceptual Mitigation Plan (NewFields, 2017c). Effects on wetlands and other waters of the U.S would be negligible, as the functions and services provided by the impacted wetlands are relatively low and would not be diminished. Mitigation would be completed using an appropriate functional equivalency ratio to offset the 0.21 acre of wetlands and 500 linear feet of other waters of the U.S. affected.

Reclamation includes application of a seed mix for wetland/wet meadow areas (see **Appendix A**) at culvert installations and road construction. With reclamation, impacts on jurisdictional wetlands and other waters of the U.S. would be minimized. Mitigation as specified under the project-specific Section 404 permit would offset direct impacts.

3.4.3.4 No Action Alternative

The No Action Alternative would produce no change from current conditions. No direct or indirect impacts on delineated wetlands, streams, or other waters of the U.S. would occur.

3.4.4 Cumulative Effects

The cumulative effects analysis area for water resources includes the Upper Blackfoot Watershed (**Figure 9**), in which the Proposed Action would occur and where other phosphate mining projects have been developed or proposed.

Recent analysis methods and regulatory requirements have resulted in the design of the active projects showing little potential for future impacts to beneficial uses.

Water quality degradation, primarily increases of COPC concentrations in surface water and groundwater and increased erosion leading to higher sediment loads in surface water, has resulted from these activities. Open pits and overburden piles from past phosphate mining projects have allowed COPCs, most notably selenium, to enter groundwater and surface water at elevated concentrations. Selenium has been measured in the Blackfoot River, Slug Creek, Dry Valley Creek, and other Blackfoot River tributaries draining phosphate mine sites at concentrations at or above the chronic aquatic life standard of 0.005 mg/L (Mebane, et al., 2015) and in groundwater at concentrations above the groundwater standard of 0.05 mg/L at many of the past mine sites.

3.4.4.1 Proposed Action

Surface Water

The Proposed Action would result in the removal of five springs in the area to be mined. The springs, which do not drain to perennial reaches of streams, are not affected by past actions, active surface water flows or quality. There would be no or negligible cumulative impact on surface water rights or beneficial uses. Reasonably foreseeable actions are not anticipated to contribute additional effects on stream flow, water rights, or beneficial uses.

Groundwater

The selenium and manganese plumes created by the Proposed Action in the Wells Formation regional aquifer west of the mine pits would increase the size of the area affected. The plumes would not overlap spatially with the cumulative effects related to other past actions and active projects, except the Conda Mine (**Figure 9**). At least some of the Wells Formation groundwater flowing beneath the proposed Caldwell Canyon Mine is believed to ultimately discharge to Formation, East Soda, and Sulfur Canyon springs about six miles west of the model area (Ralston, et al., 1983). The groundwater plumes from Caldwell Canyon Mine could reach those springs after 120 years, based on extrapolation of predicted groundwater velocities within the groundwater model area. Attenuation of COPC concentrations from dispersion, dilution, and mixing between the Caldwell Canyon Mine and Conda Mine sites and the springs would likely occur. Additionally, commingling of plumes from the Proposed Action and the Conda Mine is very unlikely due to the shallow depth of the Conda Mine plume and the much greater depth predicted for the Proposed Action plume.

Because the long-term water table drawdown predicted from the Proposed Action would affect water levels in permitted water supply wells less than the typical seasonal fluctuations, there would be no measurable additional cumulative effects on the water level.

3.4.4.2 Alternative 1

The cumulative effects of Alternative 1 on surface water flows and quality and on groundwater levels, would be the same as those of the Proposed Action. The cumulative effects of implementing Alternative 1 on groundwater quality, would be smaller than for the Proposed Action. The Alternative 1 plumes would not extend beyond POC limits. Since the plumes will not extend past the POC limits, they are not predicted to potentially affect downgradient springs to which the Wells Formation water discharges. Other cumulative effects on groundwater would be the same as the Proposed Action.

3.4.4.3 No Action Alternative

As there would be no change from current conditions of surface or groundwater from the No Action Alternative, there would be no cumulative effects.

3.5 Air

The Caldwell Canyon Project is expected to meet the requirements of the Clean Air Act. Air emissions are regulated by IDEQ and USEPA.

3.5.1 Analysis Area

The analysis area for air quality and greenhouse gas emissions is the immediate vicinity of the Caldwell Canyon Project operations, including the truck and train hauling routes.

3.5.2 Affected Environment

Clean Air Act

Ambient air quality data (IDEQ, 2015a; IDEQ, 2015b) indicates that all criteria pollutants are below the National Ambient Air Quality Standards (NAAQS); therefore, the Caldwell Canyon Project is not in a non-attainment area. The only air pollutants of concern are PM because of three Idaho non-attainment areas (IDEQ, 2017b) and ozone because of one Wyoming non-attainment area (WDEQ, 2015). The Fort Hall non-attainment area and the Portneuf Valley maintenance area are both listed for PM less than 10 microns (PM_{10}) and are 60 miles and 47 miles west of the Caldwell Canyon Project, respectively. The Cache Valley non-attainment area is for PM less than 2.5 microns ($PM_{2.5}$), approximately 35 miles south of the Caldwell Canyon Project. This non-attainment area extends into Utah. Wyoming has an ozone non-attainment area in the Upper Green River Basin, 37 miles east of the Caldwell Canyon Project. The next closest Idaho non-attainment areas are over 200 miles west and north from the project site.

The Caldwell Canyon Project would not be considered a major source for any air pollutant, consequently, there is no need to obtain either a Prevention of Significant Deterioration or Tier 1 (Title V) Operating Permit.

The nearest Class I area (National Park, Wilderness, etc.) is Grand Teton National Park, 62 miles (100 kilometers) to the east (IDEQ, 2017b). A regional haze and visibility analysis is not required because the Caldwell Canyon Project would not be a major/stationary source of any regional haze pollutants.

Idaho Air Quality Regulations

Section 651 of the Rules for the Control of Air Pollution in Idaho (IDAPA 58.01.01) requires reasonable precautions to minimize fugitive dust (IDEQ, 2011). Fugitive dust controls are also discussed in Section 808 of the Idaho air rules.

Greenhouse Gas

Greenhouse gases are both manmade and naturally occurring pollutants that trap heat in the atmosphere. The greenhouse gas emissions considered are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases.

3.5.3 Direct and Indirect Effects

3.5.3.1 Proposed Action and Alternative 1

Emissions

Fugitive dust emissions would be produced from mining and sizing of the ore, blasting, pit backfilling, and stripping and haulage of growth media. Grading would produce nearly half the PM_{10} emissions, with material hauling and wind erosion from pit overburden producing most of the remaining emissions. These three activities account for 93 percent of calculated PM_{10} emissions. **Table 19** presents the calculated PM_{10} emissions inventory (Air Sciences, Inc., 2015). Nitrogen oxides and volatile organic compounds are the ozone precursors. No air permit to construct would be required; therefore, no air quality dispersion modeling was conducted.

Table 19. Annual Emissions Summary (tons per year)

Sources	$PM_{2.5}$	PM_{10}	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	Volatile Organic Compounds
Mining Fugitives	77	860	31	7.96	0.94	0
Processing Fugitives	0.22	1.65	0	0	0	0
Total	77	862	31	8.0	0.94	0

Source: (Air Sciences, Inc., 2015)

The three Idaho non-attainment areas would not be affected because wind predominantly flows from the westerly or southerly directions, away from the Fort Hall, Porteneuf Valley, and Cache Valley non-attainment areas. There would be no impact on the downwind ozone non-attainment area in Wyoming due to the distance from the mine and minimal to no emissions of the precursors of ozone (nitrogen oxides and volatile organic compounds) (**Table 19**).

Wind erosion of bare soil and equipment use during reclamation activities, would be the main contributing sources of PM_{10} and $PM_{2.5}$ emissions. The fugitive dust control plan would control airborne PM.

Fugitive dust emissions would be reduced with implementation of the fugitive dust control plan in the Permit to Construct, and therefore would meet IDAPA regulatory requirements. To control fugitive dust, water spray or surfactant (chemical binder), could be used on the East Caldwell Area and Dry Valley haul roads as dictated by conditions. Controlling vehicle speeds and covering storage piles, are other methods to control fugitive dust. Concurrent reclamation would limit bare ground exposure and reduce airborne PM due to wind erosion. With the implementation of the fugitive dust control plan, reclamation and closure activities would have negligible effects on air quality.

Selenium is present in the material to be mined and processed; therefore, selenium emissions as a component of fugitive dust could become airborne PM produced during the mining and processing activities are expected. Based on a geochemical characterization study (NewFields, 2017b), the selenium concentration would not be the same for each type of material mined. The run-of-mine overburden would contain the highest concentration of selenium of 21.8 mg/kg followed by 21.5 mg/kg in the phosphate ore. Overburden suitable for construction materials would have the least amount of selenium with 2.2 mg/kg. Because selenium is part of the PM emissions, selenium dispersal would be managed with implementation of the fugitive dust control plan. The effects would be minor and short-term and would meet IDEQ permitting standards.

Greenhouse Gas

The Caldwell Canyon Project greenhouse gas emissions were estimated using greenhouse gas emissions calculation formulas from the USEPA’s website (USEPA, 2017) using the anticipated 2.1 million gallons of fuel that would be consumed per year. The calculations use averages collected from historical data to produce an emission factor for each source type. Different uses and fuels result in different outputs. The results range between 18,627 metric tons of CO_2 per year if the fuel was gasoline to 21,500 metric tons of CO_2 equivalent per year if the fuel is diesel. The greenhouse gas emissions are predicted to be less than 50,000 metric tons of CO_2 equivalent per year and do not require further analysis or reporting. Effects from greenhouse gas emissions would be negligible but long-term.

The annual contribution to greenhouse gas emissions from removal of vegetation and removal, storage, and replacement of soil as the mine is developed is not accounted for in the above calculations because it is highly variable depending on site conditions. This is because vegetation and soil are CO_2 sinks, and there would be a temporary net loss to the carbon stock from this activity, at least until reclamation replaces soil and results in a cover of native grass, shrubs, and trees where appropriate. Once established, the CO_2 will again begin to be stored in the soil through plant roots and grass and leaf litter.

3.5.4 Cumulative Effects

The analysis area for cumulative effects is the Southeast Idaho Phosphate District, which includes the eastern half of Caribou County and a portion of Bear Lake County (**Figure 10**). Air quality in this regional area reflects the impacts of the concurrent activities that contribute to the overall ambient air quality.

With the exception of greenhouse gases, past actions will not contribute to air quality cumulative effects because they are transient. Present and future actions will contribute to cumulative effects when the activities are occurring. Reasonably foreseeable actions will contribute impacts in the future, if they occur while the Caldwell Canyon Project is operating until it is completely reclaimed.

3.5.4.1 Proposed Action and Alternative 1

Impacts on air quality (criteria pollutants) from past actions have dissipated. Emissions generated by the Caldwell Canyon Project would not combine with emissions from past actions to result in cumulative effects. Concurrent actions could increase concentrations of air pollutants, particularly in the short-term from smoke generated when fire is used to reduce excess wildland fuels or for habitat restoration. All major sources of emissions (such as the Soda Springs phosphate processing plants) are regulated and emissions are limited by air permits. Non-point sources, such as dust from farming or transportation emissions, are reflected in the current air quality in the analysis area. These sources are not expected to change noticeably during the life of the Caldwell Canyon Project. Emissions from the Caldwell Canyon Project would replace emissions from the Blackfoot Bridge Mine that would be ending during the same period, so an overall increase in emissions would not be detectible, but would source from a different location, the Caldwell Canyon Mine. Because the criteria pollutant emissions from the Caldwell Canyon Project do not exceed air quality permitting thresholds, the effects would be negligible.

Greenhouse gas emissions are thought to persist in the atmosphere for much longer, therefore, emissions of greenhouse gasses from past, present and reasonably foreseeable actions would combine with emissions from the Caldwell Canyon Project in the atmosphere. The greenhouse gas cumulative effects on air quality would be negligible but long-term.

3.5.4.2 No Action Alternative

Because there would be no direct or indirect impacts on air quality or greenhouse gas emissions, there would be no cumulative effects from the No Action Alternative.

3.6 Noise

3.6.1 Analysis Area

The noise analysis area extends in a two mile-radius from the Caldwell Canyon Project to account for potential noise disturbance to Greater Sage-Grouse leks within two miles of noise sources (BLM, 2019), and encompasses the mine pits, haul roads, and railway loop; and the sensitive receptors (residences and Greater Sage-Grouse leks). The 2015 Final Noise Baseline Technical Report (NewFields, 2015c) considered a one-mile radius buffer for human residences as sensitive receptors and the 2018 Caldwell Canyon Environmental Noise Assessment included the area around leks (Big Sky Acoustics, 2018) .

3.6.2 Affected Environment

Sound is typically expressed in decibels. A decibel is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals. Sound exposure is commonly measured and calculated as dBA.

Sensitive Receptors

Sensitive receptors include areas of human activity, such as residences and schools, and wildlife habitat, including the one pending Greater Sage-Grouse lek in Dry Valley. The 2015 Final Noise Baseline Technical Report (NewFields, 2015c) identified two residences within a one-mile radius of the Caldwell Canyon Project.

- Year-round residence approximately 1/4-mile north of the Caldwell Canyon Project on the north side of Dry Valley Road near the junction of Slug Creek Road.
- Year-round residence approximately 2/3-mile north of the Caldwell Canyon Project on the north side of Blackfoot River Road.

See **Section 3.9.3.1** for a discussion on Greater Sage-Grouse leks. The one lek in the analysis area (3C040) is classified as pending by the IDFG and State OSC and is on private land in Dry Valley (identified in the 2018 noise assessment as “Potential Dry Valley 2017 Lek”). At their closes point, this lek is approximately 0.3 miles from the rail line, 1.7 miles from ore loading operations, 1.5 miles from the North Pit, and 2.4 miles from the South Pit.

3.6.2.1 Noise Guidance

No federal, state, or county noise regulations pertaining to the assessment of potential noise impacts on human receptors (e.g., residences) apply to the Caldwell Canyon Project. Guidelines published by the USEPA were used for context. In addition, the Department of Energy (DOE), Office of Scientific and Technical Information (OSTI) guidelines were referenced to evaluate blasting noise levels.

U.S. Environmental Protection Agency Environmental Noise Guidelines

The USEPA does not regulate environmental noise; however, USEPA noise guidelines have been developed to protect public health, prevent hearing loss, and protect against annoyance and interference with other activities. The USEPA guidelines are summarized in **Table 20**.

Table 20. USEPA Guidelines for Noise Levels Protective of Public Health and Welfare

Location	Level
All public accessible areas with prolonged exposure	70 dBA $L_{eq(24)}$
Outdoor at residential structure and other Noise Sensitive Areas where a large amount of time is spent	55 dBA L_{dn}
Outdoor areas where limited amounts of time are spent, e.g., park areas, school yards, golf courses, etc.	55 dBA $L_{eq(24)}$
Indoor residential	45 dBA L_{dn}
Indoor non-residential	55 dBA $L_{eq(24)}$

Source: (USEPA, 1974)
L_{eq} – equivalent sound level; L_{dn} – day night sound level

For outdoor residential areas, the recommended USEPA guideline is an L_{dn} of 55 dBA, equivalent to an L_{eq} (1-hour) of 48.6 dBA, assuming continuous 24-hour operation. The USEPA sound level guidelines also suggest an L_{eq} limit of 70 dBA (24-hour) to avoid adverse effects on health and safety at publicly accessible property lines or work areas (USEPA, 1974).

Department of Energy Structure and Human Health Guidelines

The DOE OSTI guidelines state that airblast should be controlled so that it does not exceed the values specified below at any residential structure, to preclude damage and long-term human injury.

- Hz or lower (flat response) = 134 peak sound level (L_{pk})
- Hz or lower (flat response) = 133 L_{pk}
- 6 Hz or lower (flat response) = 129 L_{pk}
- C-weighted (slow response) = 105 dBC

3.6.2.2 Existing Conditions

The Caldwell Canyon Project area can be characterized as natural and rural, with livestock grazing, agriculture, and recreational use. Seasonally, noise sources from these activities are traffic and equipment, snowmobiles, all-terrain-vehicles, and gunshots during the hunting season. The nearest active phosphate mines, Blackfoot Bridge Mine (approximately 8.5 miles to the northwest), the North Rasmussen Mine (approximately 10.7 miles to the north), and the Rasmussen Valley Mine (approximately 6.5 miles to the northeast) do not contribute to ambient noise at the Caldwell Canyon Project due to distance. Other developments may contribute transportation-related noise from the Blackfoot River Road, Slug Creek Road, and Dry Valley Road.

Ambient Sound Levels

Actual ambient sound measurement data were collected (**Table 21)** in April and May 2018 at the pending lek 3C040. Periods of inclement weather were excluded from the dataset.

Table 21. Summary of Measured Ambient Sound Levels at Pending Lek 3C040

Date	Time Period	L_{eq} Sound Level Range (dBA)	L_{50} Sound Level Range (dBA)	L_{90} Sound Level Range (dBA)	Median L_{90} (dBA)
4/27 – 28/2018	1800 to 0900	16 to 43	15 to 24	15 to 19	17
	24-hour	16 to 43	15 to 28	15 to 23	17
5/6 – 7/2018	1800 to 0900	16 to 41	16 to 29	16 to 23	17
	24-hour	16 to 41	16 to 29	16 to 23	18
5/21 – 29/2018	1800 to 0900	16 to 51	15 to 35	15 to 24	16
	24-hour	16 to 51	15 to 35	15 to 24	17
All the above 2017 Measurement Dates	1800 to 0900	16 to 51	15 to 35	15 to 24	16
	24-hour	16 to 51	15 to 35	15 to 24	17

3.6.3 Direct and Indirect Effects

3.6.3.1 Proposed Action and Alternative 1

Noise would be generated during mining by heavy equipment, vehicles, and blasting. Sound levels would fluctuate, depending on the activity, equipment type and number, weather and distance, and topography between the noise source and the receptor. Though not linearly additive, the contributions of multiple sources would correspond to a higher overall sound level. Factors such as vegetation, ground absorption, and terrain may reduce the noise levels, but were not considered in this analysis. Blasting noise is evaluated separately.

Construction and Operations Noise

Initial site construction would occur in the first 18 to 24 months followed by year-round mining operations. When in use, L_{max} (maximum sound level) at 50 ranges from 81 to 93 dBA and at 1,000 feet ranges from 56 to 67 dBA.

Residences

Predicted noise levels during construction and operation were revised in February 2019 based on new information (Big Sky Acoustics, 2019). Expected sound levels during typical construction and operation would occasionally be greater than the USEPA environmental noise guideline specified for outdoor use at residential structures and other noise sensitive areas where a large amount of time is spent. Conversely, if all pieces of equipment do not operate simultaneously at maximum load, received sound levels would be lower than those predicted. Construction and operational noise impacts would be considered short-term and moderate.

Mine Development

Mine development includes construction, operations and reclamation of the South and North Pits. For the purposes of the acoustic analysis it was assumed that eighteen pieces of diesel-powered equipment were operating simultaneously. In addition, construction would occur 10 hours per day while mining and reclamation activities would occur 24 hours per day/7 days per week. Noise sources were assumed to be positioned at existing grade; however, as they proceed further into the mining pits, shielding would aid in sound attenuation. Modeling results indicated that mining during Years 37 to 40 in the northern pit, received sound levels at residential receptors north of the North Pits will experience received sound levels greater than the USEPA 55 dBA L_{dn} noise guideline.

Blasting

Blasting is a short-duration event, approximately 0.3 of a second. The typical noise generated by blasting operations is 114 dBA at 50 feet. Blasting noise was evaluated at the residential receptors along Blackfoot Road and blast noise levels are predicted to range between 75 and 99 dBC; below the DOE structure and human health guidelines. These impacts would be short term and range from moderate to major depending on the size of the detonation.

Transportation

One train (two trips per day) would operate between the Caldwell Canyon Project and the Soda Springs processing plant. Noise generated from the train operations would result in noise levels of 57 dBA at 1/4 mile at the closest residence (Big Sky Acoustics, 2019).

There will be traffic due to personnel traveling to the mine and delivery trucks. Seven days a week the dayshift will occur from 04:30 to 15:30 hours, while the nightshift will occur from 16:00 to 03:00 hours. During the dayshift it is anticipated that 105 light vehicles and 14 heavy trucks will travel along the roadway. During the nightshift it is anticipated that 55 light vehicles and 4 heavy trucks will travel along the roadway.

The noise from haul road traffic would cause instantaneous increases above ambient levels and in excess of USEPA noise guidelines, but the noise would not be constant. Like potential noise impacts produced by construction and operational activities, sound generated by traffic on haul roads would be considered short-term but repetitive and moderate.

Rail Ore Transportation

One train (two trips per day) would operate between the Caldwell Canyon Project and the Soda Springs processing plant. Ore will be loaded into a train during the day in the East Caldwell Area and transported to the Monsanto Processing Plant in Soda Springs. During the weekdays, an empty train will return at night for the next day’s operations. The expected sound exposure level of the trains would be 92 dBA at 50 feet from locomotives and 82 dBA at 50 feet from rail cars assuming the train speed is 25 mph. There will also be horn crossings at Slug Creek/Dry Valley roads west of Fox Ranch and at Panting Lane. The train horn sounds 15 seconds before each crossing at a level of 113 dBA at 50 feet.

Residential receptors along Blackfoot River Road are expected to experience received sound levels that will exceed tor USEPA noise guideline due to the train sounding its horn. That being said, the Union Pacific rail line is existing and has been used in the past; therefore, residential receptors are accustomed to some train-related noise. In addition, trains are required to sound their horns at certain crossings, which would limit possible noise mitigation options.

Leks

A detailed acoustic modeling analysis was conducted to evaluate potential noise impacts at a pending Greater Sage-Grouse lek 3C040 in Dry Valley north of the east Caldwell area. Noise levels from the East Caldwell area are expected to be less than 10 dBA at the pending lek, except when the sizer associated with ore loading operations is operating. Mining operations in the South Pit are not predicted to exceed 10 dBA at the pending lek during Years 1 through 15. However, as operations progress to the North Pit (years 16 through 40), the noise levels are predicted to be greater than 10 dBA at the pending lek when the equipment is located at or near the pit crest. As the pit is deepened, sound levels received at the pending lek will decrease due to the shielding of the intervening mine pit wall. The predicted exceedances due to activities in the East Caldwell area and initial North Pit activity could negatively affect the success of the lek or cause it to be abandoned. See **Appendix C** for the Caldwell Canyon Environmental Noise Assessment Report. See **Section 3.9.3.1** for effects on Greater Sage-Grouse.

East Caldwell Area

Construction, reclamation and operational noise impacts were analyzed for the East Caldwell Area. Activities included construction or reclamation of lower East Caldwell Haul Road and Dry Valley Pit Haul Road. Received sound levels associated with those activities are expected to range from 12 to 26 dBA at the pending Dry Valley lek. In addition, dump trucks will haul mine overburden to Dry Valley Pit during Years 1 to 3, which is predicted to result in a received sound level of 26 dBA at the pending Dry Valley lek. Hauling ore to Tipple will result in similar received sound levels.

As far as operational sound sources, ore loading operations will occur with and without a sizer. Loaders will also be required onsite for ore loading. When the sizer is operating, received sound levels are expected to be 27 dBA at the pending Dry Valley lek. When the sizer is not operating received sound levels will be reduce to 23 dBA.

Train activity will also result in noise impacts. There will typically be two trains during a 24-hour hour period and the train will sound its horn 15 seconds before its crossing. The sound of the horn at the Dry Valley/Mine Spur Railroad crossing will result in a received sound level of 16 dBA at the pending Dry Valley lek. The train pass-by itself will result in a received sound level of 17 dBA at the pending Dry Valley lek.

Traffic will also be produced due to the day and night shifts occurring at the mine. During the day shift it is assumed that 105 light vehicles and 14 heavy trucks might travel along Dry Valley Road. During the night shift it is assumed that 55 light vehicles and 4 heavy trucks might travel along Dry Valley Road. Traffic pass-by noise is expected to correspond to a received sound level of 20 dBA at the pending Dry Valley lek.

North and South Pits

Construction, reclamation and operational activities at the North and South pits and their expected noise emissions were also evaluated. For the purposes of the acoustic modeling analysis, it assumed that eighteen diesel-powered equipment were operating simultaneously. Mining and backfilling activities were also assumed to occur simultaneously, 24 hours per day and 7 days per week. To determine worst case impacts, it was first assumed that all equipment was at grade, or near the mine entrance rim.

From Years 1 to 15 activity occurs at the South Pit and received sound levels at the pending Dry Valley range from 0 to 23 dBA. As activity proceeds into the North Pit (Years 16 – 40), the noise levels are predicted to increase from a range of 4 to 32 dBA at the pending Dry Valley lek. However, the worst-case impacts were evaluated assuming equipment was located at or near the rim. Sound level impacts will be less when equipment is located down within the pit due to shielding from the mine headwall.

3.6.3.2 No Action Alternative

The No Action Alternative would produce no change from current conditions, including those of current ambient sound levels. Direct and indirect noise impacts would not occur.

3.6.4 Cumulative Effects

The cumulative effects analysis for noise considers the distance sound may travel and encompasses a two-mile buffer of the Caldwell Canyon Project **(Figure 9**). This area encompasses the same sensitive receptors considered for evaluation of direct and indirect effects. There are no active mines or other projects that would generate noise within the cumulative effects analysis area.

3.6.4.1 Proposed Action and Alternative 1

Noise generated by the Caldwell Canyon Project would combine with other noise sources in the analysis area to result in a greater amount of noise although given the distance that noise could travel, the effect would be slight on sensitive noise receptors.

3.6.4.2 No Action Alternative

There would be no direct or indirect noise impacts from the No Action Alternative, therefore, there would be no cumulative noise impacts.

3.7 Soil

3.7.1 Analysis Area

The soil analysis area is defined by where soil would be disturbed or salvaged, including the Caldwell Canyon Project proposed mine pits and other proposed surface disturbance such as ancillary facilities, haul roads, and the rail loop.

3.7.2 Affected Environment

For this discussion, the term soil refers to the existing in-place soil profile and growth media refers to salvaged earthen material, including soil and alluvium that would be used to replace soil in areas where the soil has been removed. The soil properties affected by the project consist of the services provided by the soil. Also, soil that is disturbed or replaced for reclamation can affect other resources such as surface water, revegetation, and wildlife habitat. Baseline soil surveys were conducted to evaluate soil conditions and the suitability of each soil mapping unit for use as growth media for reclamation (Catena and NewFields, 2015; Catena and NewFields, 2016). The baseline data collection included field investigation and sampling, laboratory analysis, classification, map unit development, and rating of soil for reclamation suitability.

3.7.2.1 General Soil Characteristics

The parent material for soil delineated in the baseline soil surveys (Catena and NewFields, 2015; Catena and NewFields, 2016) includes the underlying geologic material discussed in **Section 3.3**, and the overlying windblown glacial loess. Textures are coarse loams on ridge crests and fine-loamy and silty soils in lower landscape positions.

Rock outcrops, thin soil, and soil with the greatest coarse fragment content occur on ridge tops and steep south- and west-facing slopes. Soil depths in other areas vary from 20 to over 60 inches and can have coarse fragment contents that are very low near the surface but increase with depth. Approximately half of the soil mapped exhibited coarse fragment contents exceeding 35 percent in subsoil horizons (Catena and NewFields, 2015). Soil had observable structure usually consisting of granular structure in the upper soil horizons and blocky structures in subsoil.

Microbiological soil crusts were not observed during the baseline soil surveys (Catena and NewFields, 2015).

3.7.2.2 Erosion Potential

The susceptibility of soil to erosion by water is represented by the soil K-factor and erodibility by wind is represented by the Wind Erodibility Factor or “Group” (WEG). Groomer, Toponce, and Bothwell soil series are the most susceptible to water erosion (K-factor, fine fraction > 0.4), however, these fine textured soils are among the least common in the baseline soil survey area, accounting for less than 15 percent of any soil mapping unit. All other soils have low to moderate susceptibility to water erosion based on K-factor, course fragment.

When adjusted for coarse fragment content, all soil series were categorized as having moderate to no susceptibility to wind erosion.

The Ireland soil series was the only series to be disturbed that had a high susceptibility to water (K-factor, fine fraction = 0.46) and wind (WEG 3, not adjusted for coarse fragments) erosion. However, when adjusted for coarse fragment content, this soil is only moderately susceptible to water erosion (K-factor, course fragment = 0.29) and not susceptible to wind erosion (WEG 8). Approximately 95 acres of the Ireland soil series occurs in areas proposed for ground disturbance, of which 88 acres are within the mine pits boundaries.

3.7.2.3 Trace Element Concentrations

Concentrations of certain constituents in soils, if too high, can contaminate adjacent surface waters that receive eroded sediment. Plant uptake of these constituents can affect suitability of vegetation for livestock and wildlife consumption. Trace element concentrations were measured in 114 soil samples collected from within and in the vicinity of the proposed Caldwell Canyon Project mine pits (Catena and NewFields, 2015). Trace element concentrations in these soil types reflect natural background conditions and, in most cases, fall within the range documented for other soil in the U.S. and worldwide (Catena and NewFields, 2015).

In the soil sampled across the Caldwell Canyon Project, cadmium exceeded documented ranges and molybdenum exceeded documented ranges at two sample locations but did not appear to have an adverse influence on surface water quality, since there was no indication that surface water quality exceeded standards for these elements in the baseline soil surveys (Catena and NewFields, 2015; Catena and NewFields, 2016). Total selenium concentrations in soil ranged from non-detect to 34.6 mg/kg, but hot-water-extractable selenium concentrations were below analytical detection limits in all samples, indicating a low potential for plant uptake that would be deleterious for livestock or wildlife consumption.

3.7.2.4 Soil Suitability and Quantity

Potential salvage thicknesses were determined based on a two-lift strategy of soil removal for salvage that will rely on observable characteristics to differentiate the soil quality during soil stripping. The top lift salvaged (Lift-1) would consist of topsoil identified by dark brown colors and containing fewer than 35 percent coarse fragments by observation. The lower lift (Lift-2) material is subsoil; extending from the bottom of Lift-1 to either the bedrock contact or to a depth where coarse fragment content is visually greater than 50 percent. Lift-2 is typically less favorable for plant growth, but still suitable as growth media.

Soil properties for each lift were compared to criteria for plant growth material suitability (Catena and NewFields, 2015), including trace element concentrations and other agronomic parameters. The major limiting factors affecting soil salvage depth are high coarse fragment content or shallow depth to bedrock. Of the 31 map units, 20 were rated ideal or moderate for reclamation use. The rest had limitations causing them to be rated fair or poor. To obtain the required growth media volume for reclamation, fair or poor soil could be mixed with ideal or moderate soil, ameliorating unsuitable characteristics and resulting in suitable growth media performance.

The estimated range and average thicknesses of suitable Lift-1 and Lift-2 material for each map unit are reported in the baseline soil surveys reports (Catena and NewFields, 2015; Catena and NewFields, 2016). Based on the baseline soil surveys, 3.3 million cubic yards of Lift-1 and 3.4 million cubic yards of Lift-2 suitable growth media are available for salvage within the disturbance boundaries for use in reclamation.

Based on the growth media thicknesses available (**Section 3.7.3.1**) there will be an adequate volume of growth media to reclaim the mine pits and a surplus of growth media to reclaim other disturbances.

3.7.3 Direct and Indirect Effects

3.7.3.1 Proposed Action and Alternative 1

The mine operations would salvage a total of 6.7 million cubic yards of soil to obtain growth media for reclamation. Salvage would result in the degradation of soil structure, which is a key factor affecting soil-water interactions, erosion, nutrient cycling, susceptibility to compaction, and the support of plant life (Bronick & Lal, 2004). The resulting growth media would be susceptible to erosion during handling and storage and would exhibit decreased productivity upon placement in reclaimed areas. These effects would be long-term; however, soil salvage and growth media placement activities are designed to minimize the loss of functionality through concurrent reclamation, direct hauling. Erosion prevention measures would conserve growth media thickness and minimize impacts to other resources.

Concurrent reclamation of the mine pits would occur by salvaging growth media from newly disturbed areas and directly hauling and placing on the final reclamation areas without long term storage in growth media stockpiles. Growth media not directly hauled for use in reclamation would be temporarily stockpiled until needed for reclamation. Berms constructed around the base of each growth media stockpile would prevent contact between stockpiled growth media and run-on from upslope areas. Run-off from precipitation falling directly on the stockpiles would be intercepted by the berm and allowed to infiltrate or evaporate within the berm perimeter. Eroded growth media accumulating within the berm would be returned to the stockpile, as necessary. Stockpiles remaining for multiple growing seasons would be graded to 2.5H:1V and seeded to prevent erosion. These management practices, along with the use of erosion prevention measures such as placement of straw wattles, silt fences, and run-off control ditches; and seeding road cut and fill areas, would further limit growth media loss. Erosion prevention measures used, would be consistent with existing guidance for soil conservation (BLM, 2012).

Soil trace element total concentrations would be unaffected by soil handling operations. Trace element mobility would also be unaffected as the existing near-surface soil is currently subjected to the same atmospheric weathering processes as the resulting growth media placed for reclamation. The excavation would not cause a change in the oxidation state of trace element-containing minerals and subsequent increases in trace element mobility.

Aerial deposition modeling of selenium from surface sources resulting from mining operations indicates that selenium concentrations away from the mine disturbance could increase, affecting soil quality and increasing plant uptake. Dust emission modeling of these conditions indicate mining and hauling activities would cause selenium to become airborne and be deposited on soil outside of the mine disturbance area, with 50 percent of the concentration peak occurring 400 meters and 10 percent occurring 1,100 meters from the disturbance. The concentration peak would occur 175 meters away. At 400 meters, the resulting soil selenium concentration would be 0.665 mg/kg soil. The 1,100-meter distance would have a selenium concentration of 0.0956 mg/kg soil (NewFields, 2018d). These concentrations fall within those measured during the baseline soil surveys (non-detect to 34.6 mg/kg) (Catena and NewFields, 2015; Catena and NewFields, 2016).

Reclamation of disturbances of ancillary facilities and haul roads would include placing growth media stored from nearby fill slopes, berms, and stockpiles. Growth media placement would vary by facility, but specified thicknesses are generally 12 to 18 inches (P4 Production, 2017). The 21-inch average depth of undisturbed Lift-1 soil available in areas designated for ancillary facilities and haul roads exceeds the thickness and volume of growth media required to achieve reclamation design specifications and a surplus of suitable Lift-2 soil material is also available. Therefore, adequate growth media is available to reclaim facilities and haul roads. In these disturbances, 0.9 million cubic yards of soil characterized as ideal to fair are available to mix with 0.8 million cubic yards of poorly suited soil to obtain growth media for reclamation.

The MRP specifies placing 18 inches of Lift-1 growth media over 30 inches of Lift-2 material to construct the overburden backfill cover (P4 Production, 2017). Of the 1,205 acres of mine pits disturbances, 130 acres of the North Pit wall would not receive growth media or be reclaimed due to their steepness and inability to hold soil (P4 Production, 2017). Achieving the specified growth media thicknesses on areas to be reclaimed would require a total of 2.6 million cubic yards of growth media derived from Lift-1 soil and a total of 4.3 million cubic yards of growth media derived from 2.4 million cubic yards of Lift-2 soil blended with 1.9 million cubic yards of other earthen material not meeting plant growth suitability criteria.

Based on the available volume of growth media there would provide an adequate volume of Lift-2 material, 1.9 million cubic yards of earthen materials not meeting plant growth suitability criteria would be required for blending with 2.4 million cubic yards of salvaged Lift-2 material rated ideal to fair for plant growth. The MRP (P4 Production, 2017) identified the availability of 9 million cubic yards of such material, based on a material testing program completed in support of the cover design (NewFields, 2016a)`. Material not meeting plant growth criteria is classified as poorly suited for plant growth due to high coarse fragment content and inclusion of this material with Lift-2 would cause a proportionate reduction of the suitability of the bulk Lift-2 growth media. This would be sufficient for plant establishment and growth as the thickness of Lift-1 growth media (18 inches) placed on top would be one inch thicker than the average pre-disturbance thickness. While Lift-2 material may contain an undesirable volume of coarse fragments, the overall depth of soil cover over the backfill would be greater than what originally existed.

Mine operations would disturb soil on approximately 1,559 acres and would result in long-term reduction in soil functionality due to disruption of soil structure. Due to the concurrent reclamation and direct hauling, the volume and time that soil would be stored in stockpiles would be minimized. Erosion of soil stored in stockpiles, on fill slopes, and berms would be managed using BMPs as is consistent with soil conservation guidance (BLM, 2012). Initial establishment of grasses would meet reclamation objectives of soil stabilization. Overall impacts on soil would be minor and long-term.

3.7.3.2 No Action Alternative

The No Action Alternative would produce no change from current conditions. Direct and indirect effects on soil would not occur.

3.7.4 Cumulative Effects

The cumulative effects analysis area for soil is the same as the direct and indirect impacts analysis area because effects from the Caldwell Canyon Project on soil would not extend beyond the Caldwell Canyon Project. About 131 acres of the Dry Valley Mine (past or present activity) and about 5 acres of the Husky 1 North Dry Ridge Mine (reasonably foreseeable action) are in the cumulative effects analysis area (**Figure 9**).

3.7.4.1 Proposed Action and Alternative 1

The Dry Valley Mine previously disturbed 99 acres in the cumulative effects analysis area. The cumulative soil disturbance from the Caldwell Canyon Mine (1,559 acres) and Dry Valley Mine (99 acres) would be 1,658 acres. The remaining disturbed area in the Dry Valley Mine area would be reclaimed once the Caldwell Canyon Project is complete. Within the cumulative effects analysis area, 130 acres of the Caldwell Canyon Project North Pit would remain as highwall.

3.7.4.2 No Action Alternative

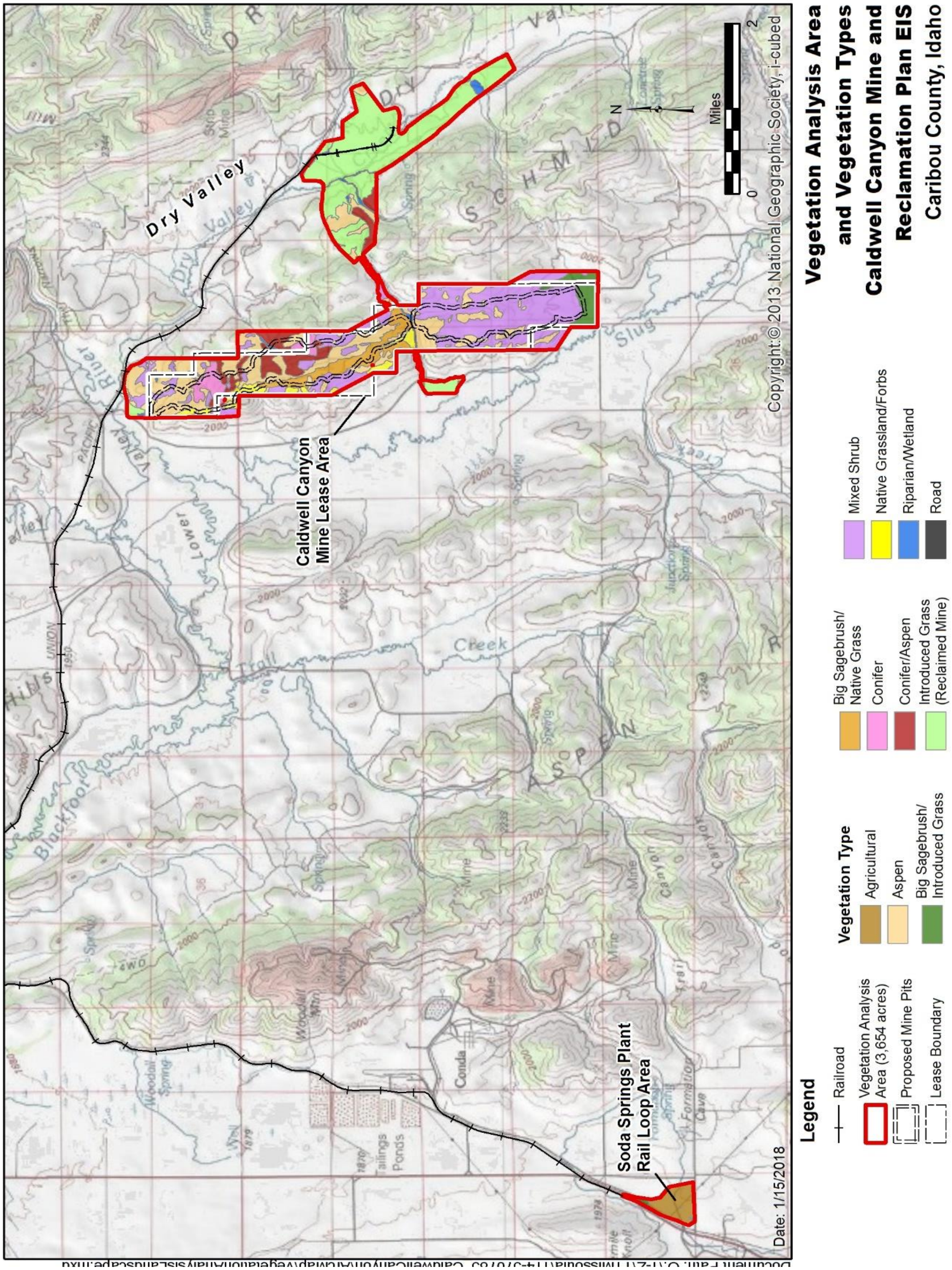
The No Action Alternative would have no direct or indirect effects on soil and therefore would have no cumulative effects.

3.8 Vegetation, Wetlands, and Riparian Areas

3.8.1 Analysis Area

The vegetation analysis area is shown on **Figure 26**. It includes the lease area, the East Caldwell Area, and the Soda Springs processing plant rail loop area. The wetlands and riparian analysis area includes the Caldwell Canyon lease area, the East Caldwell Area, the Soda Springs processing plant rail loop area, and the drainages surrounding the Caldwell Canyon Project, to allow assessment of possible connection with surface water tributaries (NewFields, 2015f). These analysis areas encompass the locations where direct and indirect effects on vegetation types, wetland habitat, and individual plants from mining and ore transportation could occur.

Figure 26. Vegetation Analysis Area and Vegetation Types



3.8.2 Affected Environment

The elevation of the vegetation analysis area is from 6,350 feet at Slug Creek to 7,370 feet above mean sea level along Schmid Ridge (NewFields, 2015d). Topography is characterized by a series of north to northwest trending mountains separated by intermountain valleys. This combination of elevation and topography supports vegetation communities typical of the region, including sagebrush and grasslands, mixed shrub, aspen, aspen-conifer, and conifer forests, with riparian areas and wetlands occurring in the primary drainages.

The species composition and canopy structure characteristics of vegetation types and special status plant habitat were determined through baseline vegetation studies. Vegetation types were documented through a combination of desktop review and field reconnaissance surveys (NewFields, 2015d). Wetlands and riparian areas were delineated according to USACE protocol and evaluated based on a functions and services (values) scoring system (NewFields, 2015f).

Vegetation types and the land cover type mapped within the vegetation analysis area are shown in **Table 22** and on **Figure 26**.

3.8.2.1 General Vegetation and Land Cover Types

The overall distribution and presence of vegetation types and the percent of each vegetation type or land cover type (i.e., road and mining disturbance) in the vegetation analysis area are shown in **Table 22**. Sixty vegetation plots were established during the field reconnaissance surveys to document species composition, and to estimate canopy cover, tree and snag density, and downed woody debris. The results of a formal wetland delineation completed according to USACE protocol is reported in **Table 11**.

Table 22. General Vegetation and Land Cover Types

Vegetation/Land Cover Type	Percent of Vegetation Analysis Area
Mixed Shrub	27.9
Introduced Grass	24.3
Aspen	22.8
Conifer/Aspen	6.4
Big Sagebrush/Native Grass	4.8
Big Sagebrush/Introduced Grass	3.6
Native Grassland/Forbs	3.3
Agricultural	2.9
Conifer	2.7
Riparian/Wetland	1.4
Road	0.1
Total	**100.0**

Source: (NewFields, 2015d).

3.8.2.2 Noxious Weeds and Invasive Plants

The Idaho State Department of Agriculture list of noxious weeds and the U.S. Department of Agriculture Natural Resources Conservation Service PLANTS database list were consulted and surveys for listed noxious weeds occurred during the vegetation field reconnaissance survey and special status plant field reconnaissance survey. The location of infestations found during the field reconnaissance surveys were recorded. General distributions of noxious weed species that are considered common, were documented in field notes. Noxious weeds recorded in the vegetation analysis area were musk thistle, houndstongue, Canada thistle, dyer’s woad, and yellow toadflax. Cheatgrass, an invasive species, was also documented (NewFields, 2015d). Noxious weeds were found in the following vegetation types.

- In the Introduced Grass vegetation type, widely distributed occurrences of houndstongue, Canada thistle, and musk thistle were found.
- In the Native Grassland/Forbs vegetation type, along the northern part of Schmid Ridge, isolated populations of dyer’s woad were found.
- In the Riparian/Wetland vegetation type, noxious weeds were widespread along riparian and wetland margins. Species commonly found included musk thistle, Canada thistle, and houndstongue.
- In the Aspen vegetation type, small populations of houndstongue were frequently observed.

Weed infestations in the Dry Valley Mine area are addressed by the leasee’s ongoing weed control program in the current Dry Valley Mine MRP.

3.8.3 Direct and Indirect Effects

3.8.3.1 Proposed Action and Alternative 1

General Vegetation and Land Cover Types

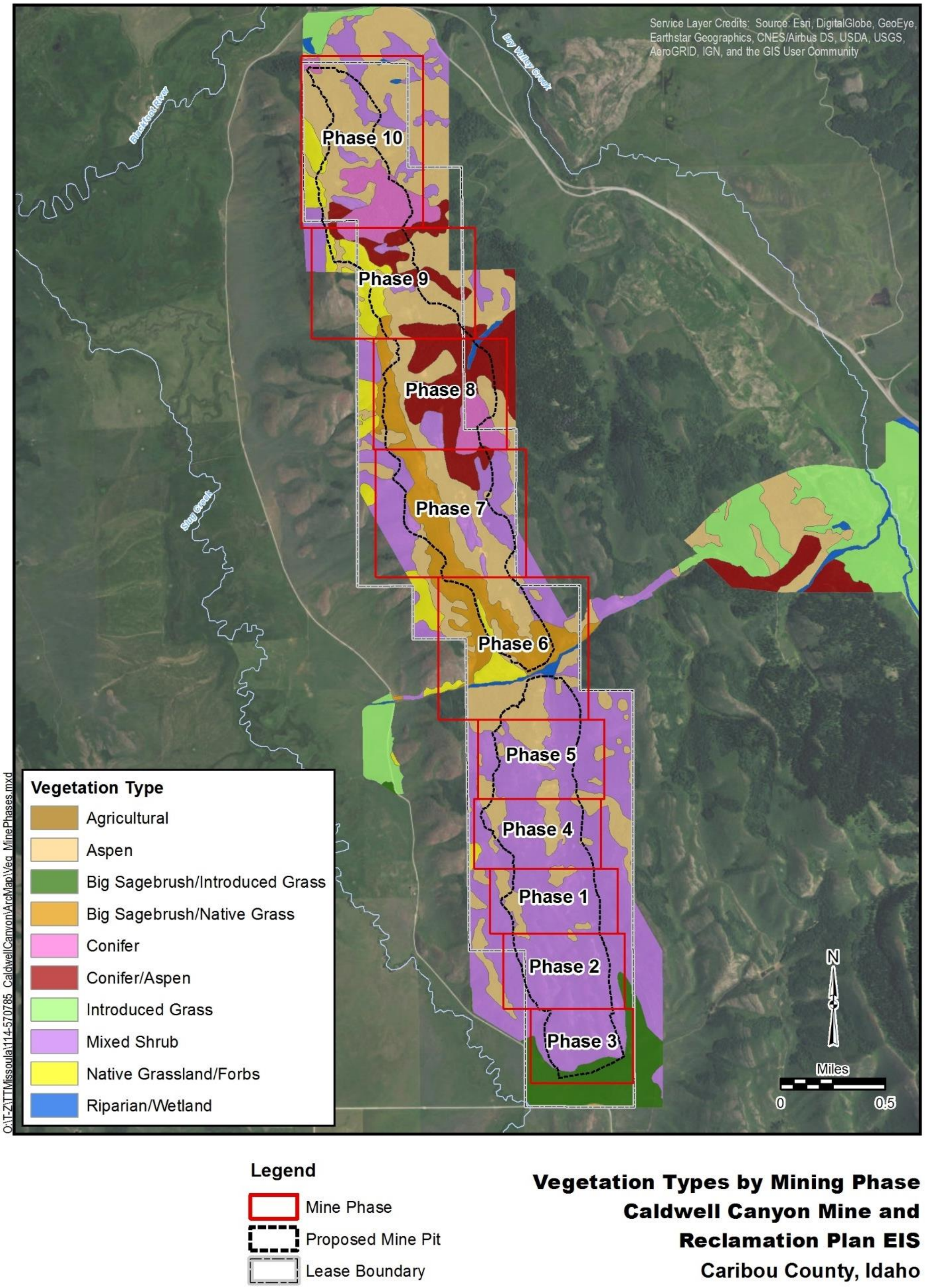
Acres of each vegetation type removed are shown in **Table 23** and **Table 24**. Vegetation would be removed in phases as construction of the mine pits progresses over an estimated 40-year mine life. **Table 23** and **Figure 27** include the timing of vegetation removal by mining phase. Phase 1 starts after the pre-mining construction phase.

Table 23. Acres of Disturbance by Vegetation Type and Phase

Habitat	Construction	Phase 1 (1 - 3 years)	Phase 2 (4-6 years)	Phase 3 (7-9 years)	Phase 4 (10-12 years)	Phase 5 (13-15 years)	Phase 6 (16-19 years)	Phase 7 (20-25 years)	Phase 8 (26-32 years)	Phase 9 (33-36 years)	Phase 10 (37-42 years)	Total
Aspen	11	14	2		24	27	52	58	44	44	75	349
Big Sagebrush/Introduced Grass	19			24								43
Big Sagebrush/Native Grass	1						52	49	20	3		125
Conifer and Conifer/Aspen	10							18	94	44	53	220
Introduced Grass	273											273
Mixed Shrub	15	73	97	62	76	72	20	45	10	6	20	495
Native Grasslands/Forbs	1						11			25	5	41
Riparian/Wetland	3						6		2			11
Road	3											3
Total	335	87	98	86	100	98	141	170	169	122	153	1,559

Rounding acres by type and phase may cause slight differences in totals.

Figure 27. Vegetation Types by Mining Phase



Disturbed areas (**Table 24**) would be reclaimed (discussed below); however, species composition and vegetation community structure would be different from pre-mine conditions. Direct impacts on vegetation would be moderate and long-term. It is unlikely that aspen communities would return following reclamation of the backfill covers, as aspen primarily reproduces by root sprouting, and grubbing and soil salvage on areas to be disturbed would remove the roots (an irretrievable loss of 339 acres of aspen). Conifer/Aspen vegetation type and Conifer vegetation type would see a long-term loss. The reclamation seed mix is chosen to contain species that meet variable site characteristics of slope and aspect. The reclaimed communities would likely return as a Native Grassland/Forbs vegetation type and/or an Introduced Grass vegetation type. Shrub species are included in the seed mixes and would be potentially transplanted if seeding is unsuccessful. Shrubs would establish at varying percent cover over the long-term depending on site-specific conditions, ultimately resulting in a Big Sagebrush/Introduced Grass, Big Sagebrush/Native Grass, or Mixed Shrub vegetation type.

Table 24. Total Acres Affected by Vegetation Type

Vegetation Type	Acres in Mine Pits[1]	Acres in Other Disturbance	Vegetation Type Acres Affected
Aspen	339	10.5	349.5
Big Sagebrush/Introduced Grass	23.8	19.1	42.9
Big Sagebrush/Native Grass	123.5	1.2	124.7
Conifer	77.5	0	77.5
Conifer/Aspen	132.2	9.9	142.1
Introduced Grass	0	272.5	272.5
Mixed Shrub	479.7	15.3	495
Native Grassland/Forbs	40.3	1.0	41.3
Riparian/Wetland[2]	7.9	3.2	11.1
Mining Disturbance – Road	0	2.5	2.5
Total	**1223.9**	**335.2**	**1559.1**

1 Total acres includes the haul road between the North and South pits and other small disturbance areas adjacent to the southern end of the South Pit. Footprint of North and South pits alone is 1,105 acres, as is indicated in the reclamation schedule (**Appendix B, Table B-8**).

2 Acres are a result of baseline mapping, which combined riparian with informally mapped wetland boundaries. Results reported below are from the formal wetland delineation, which was completed using USACE protocol.

Site disturbance would remove all plant species, some of which have been identified as having traditional and current uses by Native Americans as food, medicine, building materials, and ceremonial and spiritual purposes. The Shoshone-Bannock Tribes list of culturally significant plants (Environmental Waste Management Program, 2014) was reviewed for this analysis. The majority are commonly found throughout native plant communities of southern Idaho and are included in the reclamation seed mixes (**Appendix A**). Most culturally significant species would re-establish following reclamation. With implementation of reclamation, effects on ethnobotanical uses would be minor and long-term.

Shrubs are expected to establish root systems and gain height sufficient within approximately 10 years following successful establishment to be considered as reestablishing wildlife habitat. Aspen, Conifer, Conifer/Aspen, and Riparian/Wetland vegetation types would be permanently lost and converted to grasslands or shrubland types after reclamation. It is expected that species richness, diversity, and plant community structure would be permanently altered, particularly in the shrubland vegetation types (Big Sagebrush/Introduced Grass, Big Sagebrush/Native Grass, and Mixed Shrub), as reclamation would not return these areas to pre-mine conditions for an extended period.

Selenium uptake by plant roots and selenium in dust settling on plants are two pathways that livestock and wildlife feeding on vegetation, can potentially consume selenium at deleterious levels. Dust modelling indicated that the mining and hauling activities would cause selenium in particulates to become airborne (see **Section 3.5.3**) and settle on vegetation and soil. At 400 meters, the calculated vegetation concentration would be 1.13 mg/kg dry weight and at 1,100 meters the calculated vegetation concentration would be 0.149 mg/kg dry weight. Concentrations at both distances are below the 5 mg/kg dry weight IDEQ set as a vegetation action level (NewFields, 2018d; IDEQ, 2004). The effect of selenium uptake by vegetation would be negligible.

To prevent reclamation plant uptake of COPCs at concentrations exceeding the 5 mg/kg plant dry weight action level in the ARMP (BLM, 2012), the overburden backfill cover would be thick enough to isolate the roots of revegetated species from the selenium and other COPCs in the underlying material, species in the reclamation seed mix that accumulate selenium and plants that grow deep roots (trees) would be avoided. However, should these species naturally inhabit these sites, the most current BLM PFO guidance would be used to control them. These design measures would avoid the uptake of COPCs by plants consumed by livestock and wildlife. With reclamation, impacts on general vegetation would be negligible.

Post-closure vegetation monitoring would ensure final site compliance with the vegetation COPC concentrations established in the ARMP (BLM, 2012).

Impacts on vegetation would include vegetation removal, and changes in vegetation percent cover, species composition, and community structure following reclamation.

Noxious Weeds and Invasive Plants

The potential for the introduction or expansion of non-native plant species would increase, including noxious weeds, where vegetation is removed, and soils are disturbed. Earth-moving equipment and vehicle traffic would act as vectors to spread noxious weed seeds. Noxious and invasive species control measures would be implemented throughout the duration of all mining activities. Following phased reclamation, monitoring for invasive, noxious, and selenium accumulating species, and a treatment plan would be implemented to control these species and minimize noxious weed introduction and spread. This would be in compliance with BLM PFO guidance (BLM, 2017b) and Idaho State Department of Agriculture regulations. Reclamation would include treatments to control noxious weed infestations in disturbed areas that are identified during reclamation monitoring. Particular attention would be given to vegetation types and noxious weed populations that were identified during the baseline vegetation, wetlands, and riparian studies, such as along the margins of wetlands. This would reduce impacts on vegetation composition from noxious weed invasions. The Caldwell Canyon Project is consistent with management direction in the ARMP for the control of non-native invasive plant species, noxious weeds, and selenium accumulators (BLM, 2012).

With reclamation, impacts on general vegetation from noxious weeds and invasive plants would be negligible.

3.8.3.2 No Action

No new disturbance would occur that would cause direct or indirect effects on vegetation, wetlands, and riparian areas.

3.8.4 Cumulative Effects

The cumulative effects analysis area for vegetation includes a 15-mile radius around the disturbed areas (**Figure 9**). This area covers the habitats evaluated in the wildlife cumulative effects (**Section 3.9.4**). It encompasses approximately 452,000 acres comprised of private land, public land administered by two federal agencies (BLM and Forest Service), and state land.

Gap Analysis Program (GAP) land cover data (USGS, 2011) were used to quantify land cover types in the vegetation cumulative effects analysis area. The GAP classifications were grouped into cover types that are similar to the habitat types developed for the wildlife cumulative effects analysis area (**Table 25**). In addition to the past and present projects listed in **Table 7**, the GAP data provides insight into the past and present disturbances that have occurred within the vegetation cumulative effects analysis area. Cultivated cropland; developed; harvested forest; pasture; and quarries, mines, and gravel pits reflect the effects of human settlement and conversion of native habitat.

Table 25. Land Cover in the Vegetation and Wildlife Cumulative Effects Analysis Area

Cover Type	Acres	Percentage
Sagebrush Shrubland	153,584	34.0
Conifer Forest	115,651	25.6
Aspen Forest	59,863	13.2
Grassland	42,446	9.4
Cultivated Cropland	32,506	7.2
Wetland/Riparian	24,794	5.5
Other Shrubland	7,567	1.7
Developed	5,990	1.3
Open Water	4,402	1.0
Harvested Forest	2,728	0.6
Quarries, Mines, and Gravel Pits	1,544	0.3
Pasture	1,278	0.3
Introduced Grass	7	0.0
TOTAL	**452,359**	**100.0**

Source: (USGS, 2011)

3.8.4.1 Proposed Action and Alternative 1

Vegetation removal would combine with past and future actions and would result in a cumulative effect (**Figure 9**). Changes in vegetation from land development, agriculture, and timber harvest, based on estimates from the GAP land cover data, quantify past disturbance as approximately 44,045 acres or about 10 percent of the cumulative effects analysis area. Historical and present mining activities would result in approximately 13,700 acres of disturbance, for a total disturbance of 57,700 acres, or 13 percent of the cumulative effects analysis area (**Table 7)**.

Reasonably foreseeable mining activities, including the Caldwell Canyon Project would add approximately 6,900 acres of disturbance, increasing the amount of disturbance within the cumulative effects analysis area to about 64,600 acres (14 percent).

Other past, present, and reasonably foreseeable actions have affected or would affect vegetation as far as seral stage, density, and to a lesser degree, species composition, but have not resulted in a habitat type change, unless it was a road or other semi-permanent land use. The Hooper Springs Transmission Line disturbed 288 acres may change the vegetation type. The John Wood Forest Management Project disturbed 395 acres but did not change the vegetation type.

Reasonably foreseeable mining activities are expected to disturb an additional 5,200 acres. Reclamation of mining would restore grassland and shrubland communities, but forest types would be permanently altered on areas that have pit covers.

Treatments involving timber harvesting, prescribed burning, and fuel break construction would result in a loss of forested types. However, these treatments typically involve site preparation and seeding or planting to restore the forest type, whereas reclamation of the action alternatives does not include replacement of trees.

3.8.4.2 No Action Alternative

There would be no direct or indirect effects on vegetation, wetlands, or riparian areas, thus there would be no cumulative effects.

3.9 Wildlife

3.9.1 Analysis Area

The wildlife analysis area for all wildlife, except for Greater Sage-Grouse, includes a 1-mile buffer around the leases, mine facilities, and the East Caldwell Area, plus a 0.5-mile buffer around the rail system (29,346 acres) (**Figure 28**). The Greater Sage-Grouse analysis area is the third-order (fine scale) habitat boundary shown in Figure 10 of the Greater Sage-Grouse Habitat Assessment Technical Report (NewFields, 2018e) **(Appendix C)** and covers approximately 100,000 acres. These analysis areas encompass the locations where direct and indirect effects on habitat and individual wildlife could occur from mining and ore transportation.

3.9.2 Affected Environment

3.9.2.1 General Wildlife

Habitat types were determined using a combination of existing data, aerial photo interpretation, and vegetation field reconnaissance surveys (NewFields, 2017d). **Table 26** shows the dominant habitat types within the wildlife analysis area. Because the wildlife analysis area is larger than the vegetation analysis area and encompasses more lowland areas, the percentage of wildlife analysis area by habitat type in **Table 26** differs from the vegetation analysis area shown in **Table 22**. The wildlife analysis area has one habitat type not addressed in the vegetation section – past mining disturbance. Otherwise, the vegetation type descriptions in **Section 3.8** and **Table 22** apply to the habitat types discussed here. The past mining disturbance habitat type (**Figure 28**) includes active mining operations and reclaimed mine areas.

Figure 28. Wildlife Analysis Area

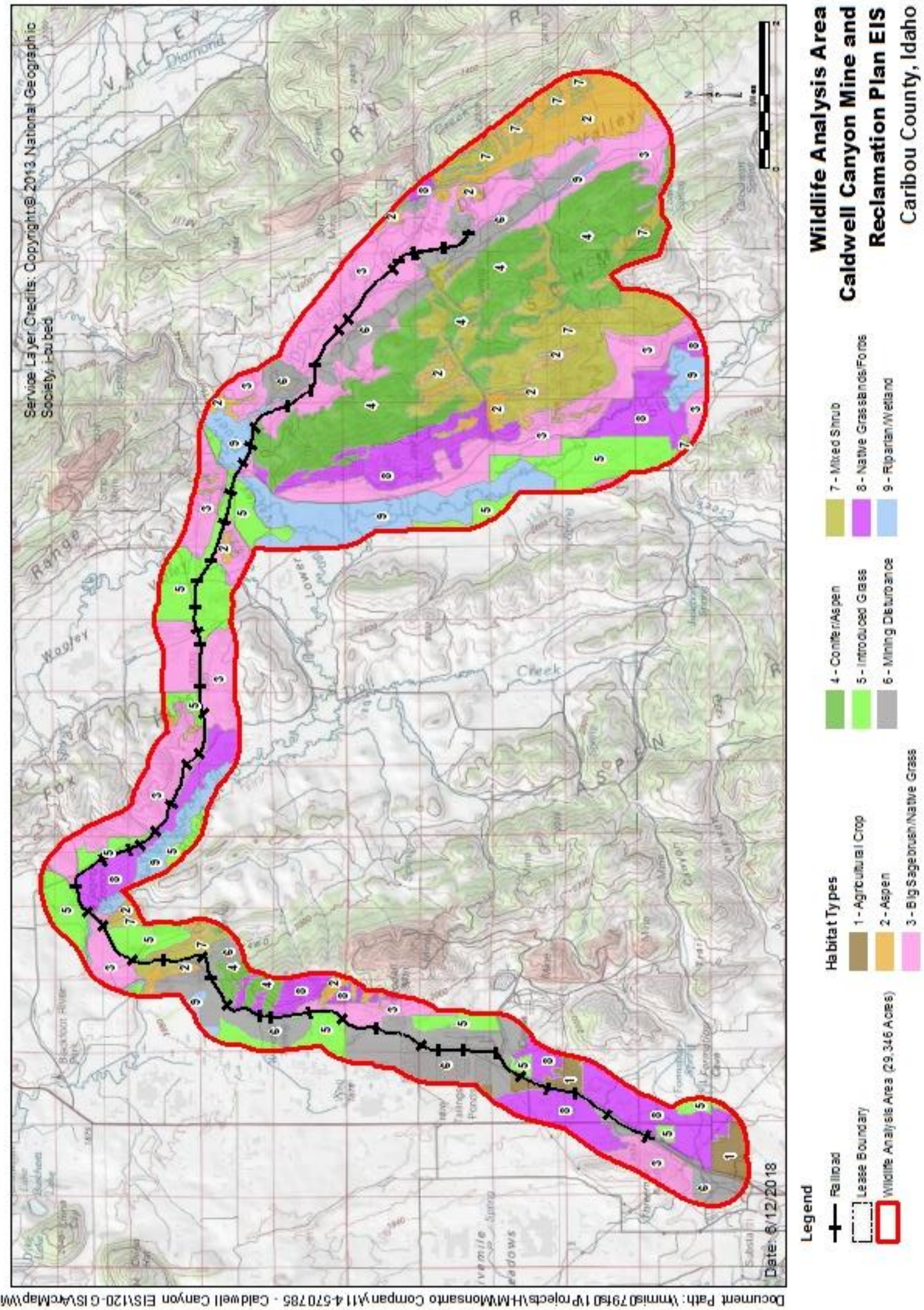


Table 26. Dominant Habitat Types in the Wildlife Analysis Area

Habitat Type	Acres (Percent) of Wildlife Analysis Area
Big Sagebrush/Native Grass[1]	7,369 (25.1)
Conifer/Aspen	4,177 (14.2)
Native Grassland/Forbs	3,752 (12.8)
Introduced Grass	3,351 (11.4)
Past Mining Disturbance	3,188 (10.9)
Mixed Shrub	3,011 (10.3)
Riparian/Wetland	2,209 (7.5)
Aspen	1,913 (6.5)
Agricultural	378 (1.3)

Source: (NewFields, 2017f)

1 The Big Sagebrush/Introduced Grass vegetation type is incorporated into the Big Sagebrush/Native Grass habitat type and the Conifer vegetation type is incorporated into the Conifer/Aspen habitat type (**Figure 28**). This was done because the resolution of available data did not allow aerial photo interpretation to distinguish these habitat types within the entire wildlife analysis area (NewFields, 2017d). However, these habitat types are distinguishable and are separated in the wildlife effects analysis.

The wildlife analysis area is rural and undeveloped, with mining, traffic (all-terrain vehicles and railroad (**Section 3.11**)), and livestock activities. Ambient noise were measured to be similar to rural residential (39 dBA) and wooded residential (51 dBA) (**Section 3.6**).

Baseline wildlife field surveys were conducted in 2014, 2015, and 2017 to determine wildlife use baseline conditions (NewFields, 2015e; NewFields, 2018e; NewFields, 2017d; NewFields, 2017f) and results are summarized in **Table 27**. The baseline reports include additional details including wildlife species’ scientific names, life history descriptions, and survey methodologies.

Table 27. Wildlife Surveys Conducted in the Wildlife Analysis Area

Survey Year	Type of Wildlife Survey
2014	Diurnal raptor nest ground survey
2014	Northern goshawk calling survey
2014	Breeding bird point count survey
2014	Bat acoustical monitoring
2014	Amphibian visual encounter and dip-netting surveys
2015	Greater Sage-Grouse and Columbian sharp-tailed grouse ground surveys
2015	Northern goshawk calling survey
2015	Flammulated owl nocturnal calling survey
2015	Diurnal raptor nest aerial and ground survey
2015	Winter carnivore track surveys
2017	Winter carnivore track surveys

Source: (NewFields, 2015e; NewFields, 2018e; NewFields, 2017d; NewFields, 2017f).

Carnivorous mammals were identified during the winter track surveys in 2015 (NewFields, 2017d) and 2017 (NewFields, 2017f), and incidentally during other baseline surveys (NewFields, 2015e). Small mammals occur in all dominant habitat types within the wildlife analysis area. All observed bats were BLM Sensitive species. See **Table 30** for more information on bats.

A Habitat Equivalency Assessment (HEA) (Tetra Tech, Inc., 2018c) quantified the wildlife services provided across habitat types. The HEA is not used to calculate or exact mitigation (BLM IM ID-

2013-040). The initial step in the HEA was to weigh the relative value of habitats and calculate a baseline service score. The relative service scores by habitat type were developed based on metrics such as cover, diversity, size, and services provided such as hiding cover, thermal cover, and structural diversity. Relatively, the Introduced Grass habitat type provides less than half the services that the Aspen habitat type does. To avoid double counting, areas of jurisdictional wetlands undergo their own habitat analysis through the USACE in **Section 3.4.3.2** and are not included in the HEA.

3.9.2.2 Big Game

BLM describes big game within the BLM PFO as elk, mule deer, white-tailed deer, moose, pronghorn antelope, black bear, and mountain lion (BLM, 2010). The wildlife analysis area is not within the typical range or distribution of pronghorn antelope (IDFG, 2004). Black bear and white-tailed deer may occur in the wildlife analysis area, but no evidence of use was found during the baseline wildlife surveys, and consequently are not analyzed. The wildlife analysis area is encompassed by IDFG's game management unit (GMU) 76. Recent unpublished big game population information for GMU 76 was provided to the BLM by IDFG's Region 5 (southeast region).

Mule Deer

According to IDFG Region 5, mule deer populations in GMU 76 have increased between 2013 and 2019. Mule deer use all dominant habitat types (**Table 26**). The mule deer analysis focuses on limited range, summer range, and winter range (Western Association of Fish and Wildlife Agencies, 2005) (**Figure 29**). Limited range is habitat that is occasionally inhabited or only contains small populations of scattered mule deer (Western Association of Fish and Wildlife Agencies, 2005). Mule deer depend on shrub habitats for forage and cover (Cox, et al., 2009) and riparian/wetland and aspen habitats for fawning and abundant nutrition (IDFG, 2017a).

IDFG Region 5 describes mule deer in GMU 76 as migratory, with thousands of deer moving out of GMU 76 primarily westerly into the Soda Hills (GMU 72) to winter. IDFG Region 5 monitoring indicates that many of these deer cross a narrow corridor along highway 34 near the proposed rail loop. Mule deer in GMU 76 also migrate south to the Bear Lake Plateau and foothills between Soda Springs and Montpelier along Highway 30.

Elk

Recent surveys by IDFG Region 5 indicate that the elk population in GMU 76 is above the management objectives outlined in Idaho's Elk Management Plan (IDFG, 2014). Because elk use all dominant habitat types in the wildlife analysis area (**Table 26**), the focus is on summer, summer crucial, and winter habitat (Rocky Mountain Elk Foundation, 2006). Most of the wildlife analysis area is summer habitat while the east side of Schmid Ridge is winter habitat (**Figure 30**). The rail loop area is not in elk habitat. IDFG Region 5 describes elk in GMU 76 as migratory and typically move west to winter in the Soda Hills (GMU 72) or south to lower elevation foothills above highways 30, 89, and 34 to winter.

Habitat-use research indicates that aspen habitat types are highly preferred by elk, especially during non-snow periods (IDFG, 2017b). Habitat types in the wildlife analysis area used for summer habitat are Aspen, Conifer/Aspen, Big Sagebrush/Native Grass, Mixed Shrub (i.e. mountain brush which has a similar function as the Mixed Shrub habitat type), and Riparian/Wetland (Beck, et al., 2013).

Figure 29. Mule Deer Habitat within the Wildlife Analysis Area

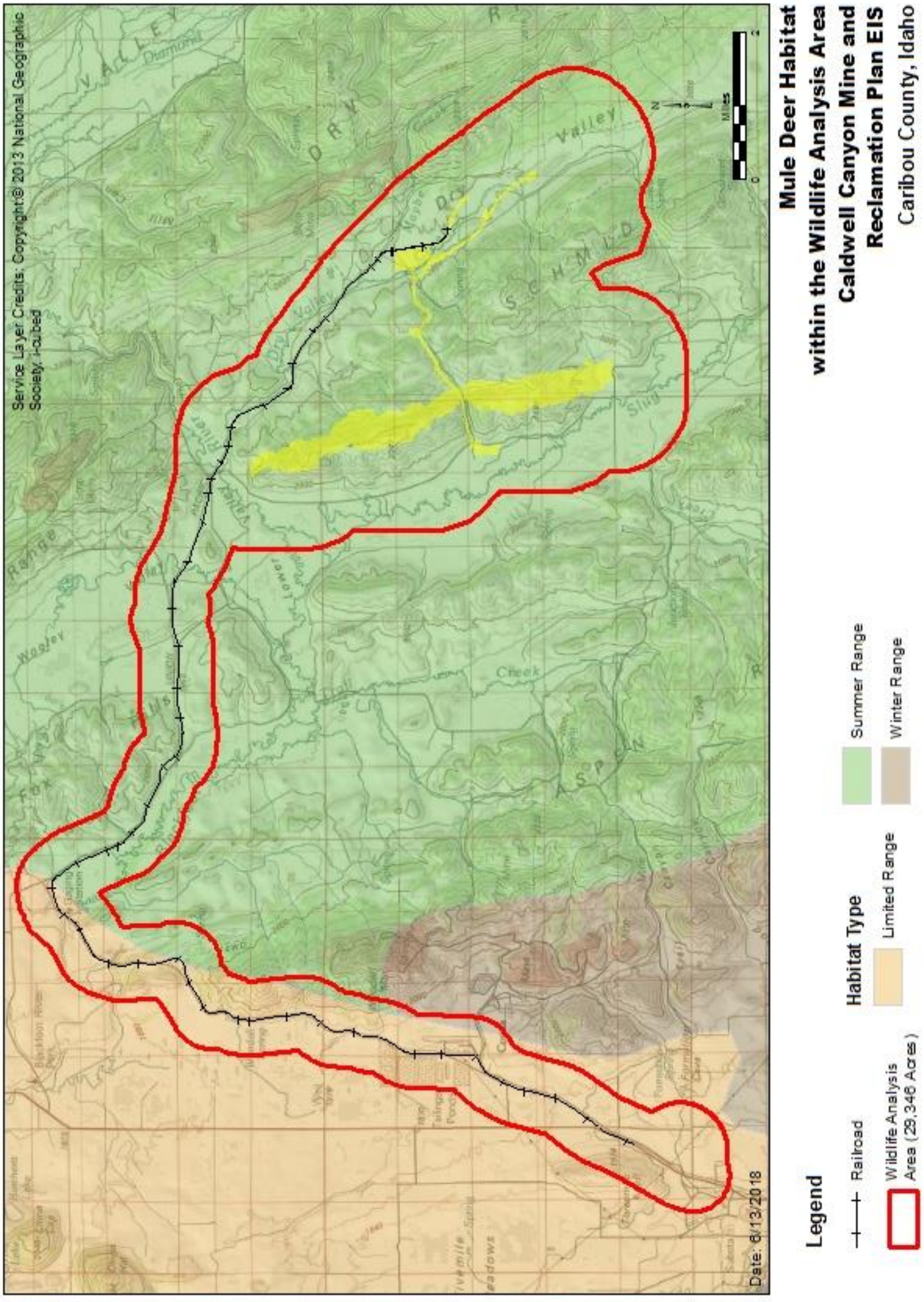
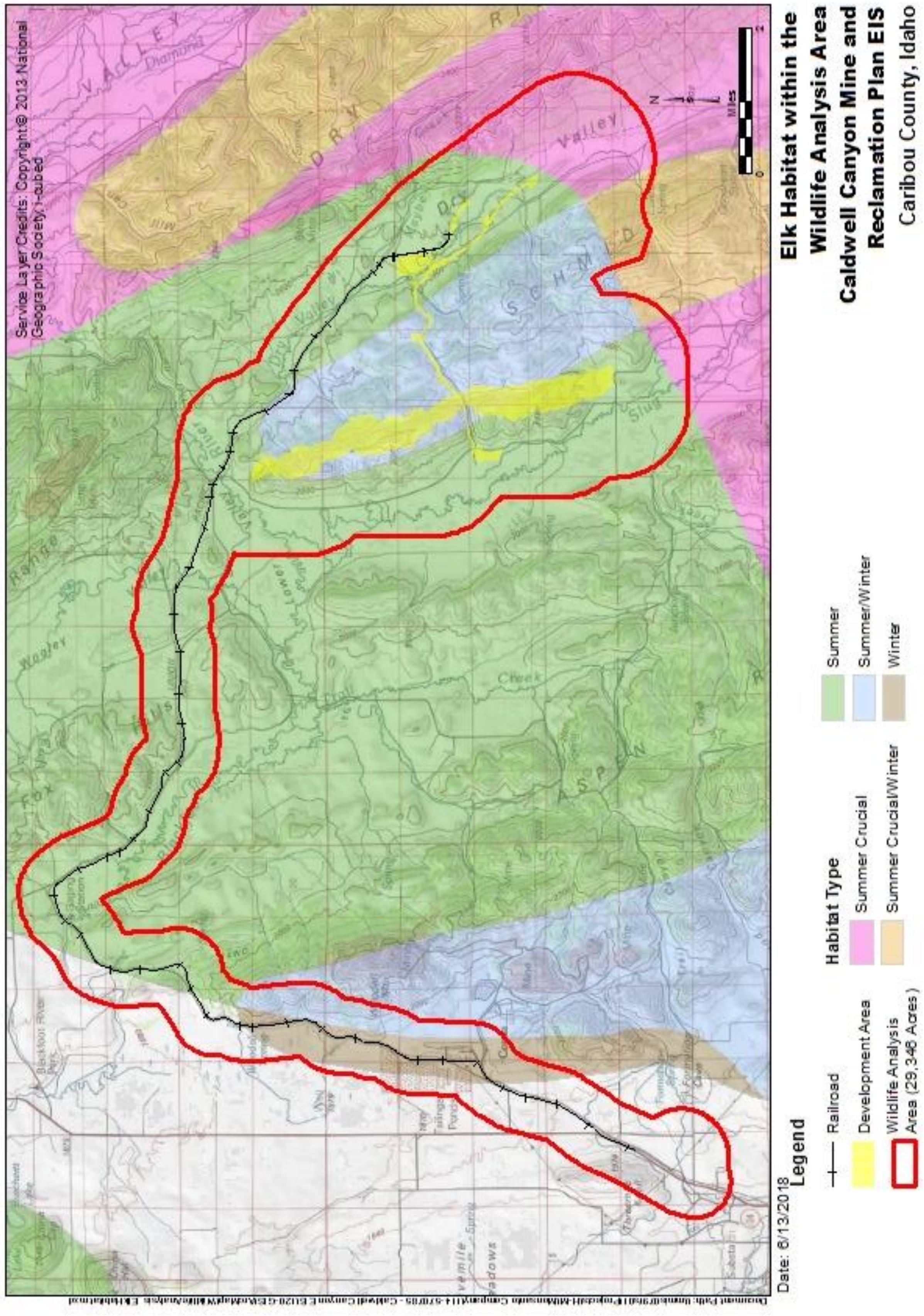


Figure 30. Elk Habitat within the Wildlife Analysis Area



The habitat types used in winter are Mixed Shrub (mountain brush), Conifer/Aspen, and Big Sagebrush/Native Grass (Beck, et al., 2013). The arrangement of cover and forage areas (i.e. forested habitat for cover adjacent to grassland habitat for foraging) is important to the functionality of elk habitat (Thomas, et al., 1988).

Moose

Moose habitat is not mapped. According to IDFG Region 5, moose populations in GMU 76 have shown a 56 percent decline from population estimates in the early 2000s. Causes for the decline are not well understood. Moose were observed (NewFields, 2015e) and use the Mixed Shrub habitat type in winter and Riparian/Wetland, Aspen, and Conifer/Aspen habitat types in the spring through fall (BLM, 2010).

3.9.2.3 Birds

The wildlife analysis area is in Bird Conservation Region 9 (Great Basin). Most of the Birds of Conservation Concern (USFWS, 2008a) are also BLM Sensitive and these species are discussed in the BLM Sensitive species section of this EIS. Only the calliope hummingbird and peregrine falcon are Birds of Conservation Concern that are not BLM Sensitive. Calliope hummingbirds were observed during the baseline wildlife surveys and are associated with the Aspen, Riparian/Wetland, and Conifer/Aspen habitat types (BLM, 2010; NewFields, 2015e; Idaho State University, 2017). Peregrine falcon were not observed during the baseline wildlife surveys (NewFields, 2017f). The nearest observation was nine miles to the east at Smoky Canyon Mine reservoirs, other were at Grays Lake, Blackfoot Reservoir, and Alexander Reservoir (IDFG, 2016a). Greater Sage-Grouse and Columbian sharp-tailed grouse are discussed in the BLM Sensitive Wildlife Section, **Section 3.9.2.5.**

More than 100 bird species were observed within the wildlife analysis area during the baseline wildlife surveys (NewFields, 2017d). No breeding bird counts were performed in the Introduced Grass or Past Mining Disturbance, or agricultural habitat types. All raptors observed during the baseline wildlife surveys are in the following discussion to consolidate all raptor nest observations.

Bald eagle, golden eagle, ferruginous hawk, flammulated owl, American kestrel, Cooper’s hawk, great horned owl, northern harrier, prairie falcon, red-tailed hawk, sharp-shinned hawk, and turkey vulture were observed nesting and/or foraging within the wildlife analysis area (NewFields, 2015e).

Raptors nesting within the wildlife analysis area during the baseline wildlife surveys included bald eagle, golden eagle, red-tailed hawk, Swainson’s hawk, great horned owl, and American kestrel. Several unoccupied nests were also observed. The red-tailed hawk is the most abundant nesting raptor species in the wildlife analysis area. The nesting substrate for all raptors was predominantly Douglas-fir or aspen trees. The occupied raptor nests and their distance to the Caldwell Canyon Project features are provided in **Table 28**. Nests that were unoccupied (unknown species) are not included in the table; however, those nests may become occupied in subsequent raptor breeding seasons and are included on **Figure 31** and are maintained in the project record.

Table 28. Occupied Raptor Nests in the Wildlife Analysis Area

Nest Number	Nesting Species	Nearest Caldwell Canyon Project Feature	Miles to Caldwell Canyon Project Feature
N02	American Kestrel	Mine Pits	0.00
N04	Red-tailed Hawk	Mine Pits/Railroad	0.44/0.16
N05	Bald Eagle	Mine Pits	0.10
N07	Golden Eagle	Caldwell Canyon Service Road	0.03
N08	Red-tailed Hawk	Mine Pits/Railroad	0.48/0.18
N13	Red-tailed Hawk	Mine Pits	0.00
N17	Red-tailed Hawk	East Caldwell Area Haul Road	0.67
N25	Red-tailed Hawk	Mine Pits	0.45
N28	Red-tailed Hawk	Mine Pits	0.11
N29	Red-tailed Hawk	Mine Pits	0.10
N34	Red-tailed Hawk	Railroad	0.14
N35	Red-tailed Hawk	Railroad	0.37
N36	Red-tailed Hawk	Railroad	0.29
N37	Red-tailed Hawk	Railroad	0.38
N38	Bald Eagle	Railroad	0.28
N39	Bald Eagle	Railroad	0.18
N40	Great Horned Owl	Railroad	0.08
N43	Red-tailed Hawk	Railroad	0.19
N44	Red-tailed Hawk	Railroad	0.14
N46	Swainson's Hawk	Mine Pits	0.30
N47	Red-tailed Hawk	Mine Pits	0.00
N56 (Alternate nest to N07)	Golden Eagle	Caldwell Canyon Service Road	0.02

3.9.2.4 Amphibians and Reptiles

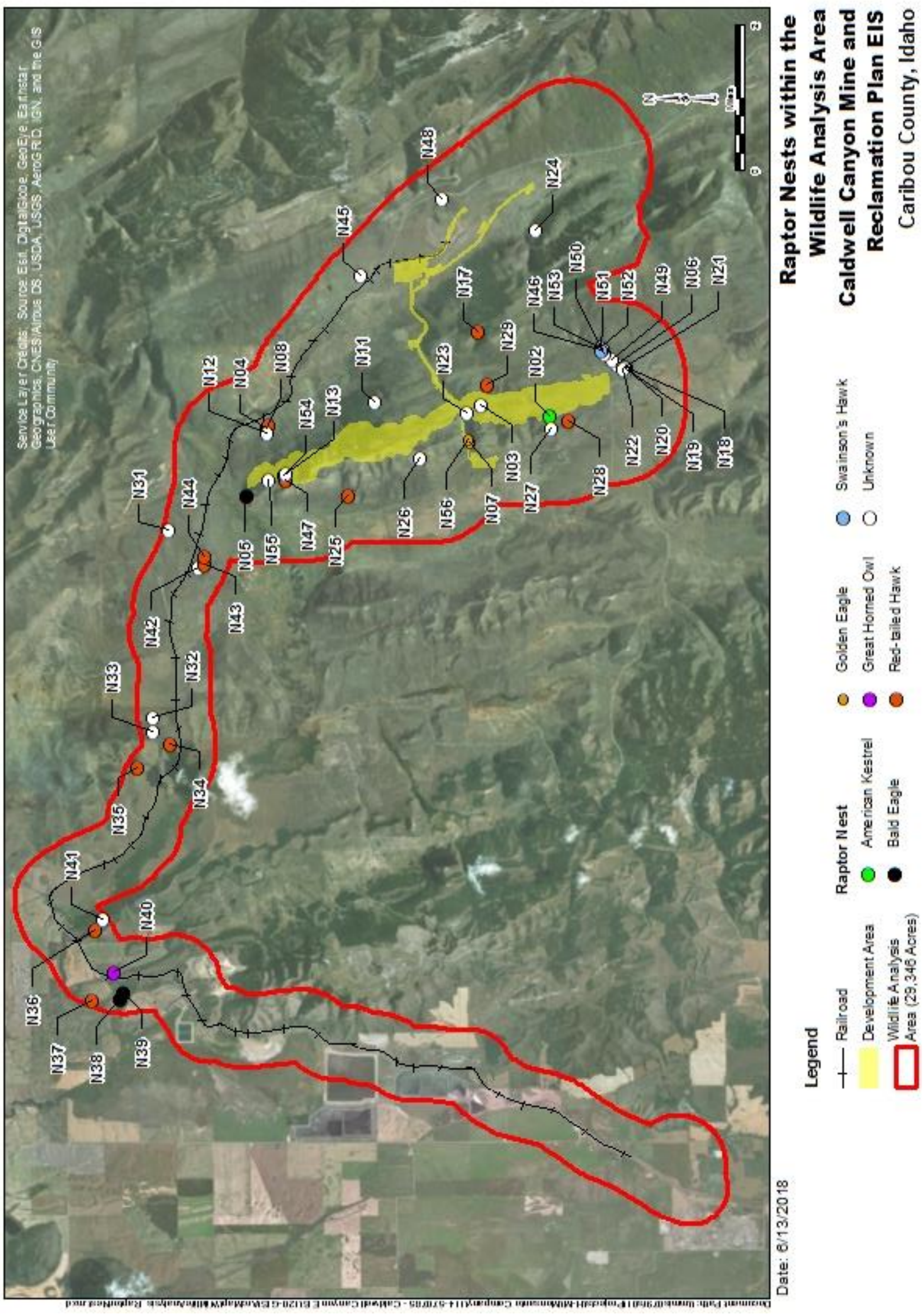
Visual encounter and dip netting surveys were performed for amphibians; however, no specific surveys were performed for reptiles (NewFields, 2015e). Amphibians and reptiles observed incidentally during all baseline wildlife surveys were recorded. Those observed that are not BLM Sensitive species are presented in **Table 29.**

Table 29. Amphibian and Reptiles Observed during the Baseline Wildlife Surveys

Species	Habitat Type Association[1]
Amphibians	
Boreal Chorus Frog	Riparian/Wetland habitat type. Observed in standing water west of Dry Valley Road, in a wetland area south of Caldwell Canyon, in two wetlands along Slug Creek Road, and in a wetland northeast of Schmid Ridge along the Blackfoot River Road (NewFields, 2015f; NewFields, 2017d).
Tiger Salamander	Riparian/Wetland habitat type. Observed in larval stage at two wetlands along Slug Creek Road and at two ponds, one in the upper drainage of Caldwell Canyon and one in the upper Chicken Creek drainage. An adult was observed in a side tributary of Caldwell Canyon (NewFields, 2015f).
Reptiles	
Garter Snake	Expected to occur in the Riparian/Wetland and Aspen habitat types. Observed basking on Slug Creek Road (NewFields, 2015f),

1 Habitat Type Association contains the habitat types (**Table 26**) that each species is likely to be found in.

Figure 31. Raptor Nests within the Wildlife Analysis Area



3.9.2.5 BLM Sensitive Wildlife

BLM Type 2 Sensitive species include BLM State Director-designated species and candidate, proposed, experimental nonessential populations under the Endangered Species Act, and species delisted from threatened or endangered status within the past five years (BLM, 2014). The baseline wildlife studies determined 39 BLM Type 2 Sensitive species could occur in the wildlife analysis area (NewFields, 2015e) including North American wolverine, which is proposed for listing (discussed in **Table 6**). **Table 30** summarizes the remaining 38 species.

Table 30. BLM Type 2 Sensitive Species with the Potential to Occur within the Wildlife Analysis Area

Name	Habitat Type Association	Observed
Mammals		
Gray Wolf	All dominant habitat types	No
Pygmy Rabbit	Mixed Shrub and Big Sagebrush/Native Grass habitat types	No
Bats		
Big Brown Bat	All dominant habitat types.	Yes
Hoary Bat	Mixed Shrub, Aspen, Riparian/Wetland, Big Sagebrush/Native Grass, and Conifer/Aspen habitat types.	Yes
Little brown Bat	All dominant habitat types.	Yes
Long-eared Myotis	Mixed shrub, Aspen, Riparian/Wetland, Big sagebrush/Native Grass, and Conifer/Aspen habitat types.	Yes
Long-legged Myotis	Aspen, Riparian/Wetland, and Conifer/Aspen habitat types.	Yes
Pallid Bat	Mixed Shrub, Riparian/Wetland, and Big Sagebrush/Native Grass habitat types.	No
Silver-haired Bat	Aspen, Riparian/Wetland and Conifer/Aspen habitat types.	Yes
Townsend’s Big-eared Bat	Mixed Shrub, Aspen, Riparian/Wetland, Big Sagebrush/Native Grass, and Conifer/Aspen habitat types.	No
Western Small-footed Myotis	Riparian/Wetland and Conifer/Aspen habitat types.	Yes
Yuma Myotis	All dominant habitat types.	Yes
Birds		
Bald Eagle*	Riparian/Wetland and Conifer/Aspen habitat types.	Yes
Black Tern	Riparian/Wetland habitat type.	No
Brewer's Sparrow*	Mixed Shrub and Big Sagebrush/Native Grass habitat types.	Yes
Burrowing Owl	Introduced Grass, Big Sagebrush/Native Grass, reclaimed portions of Past Mining Disturbance, and Native Grassland/Forbs habitat types.	No
Cassin’s Finch	Conifer/Aspen, Mixed Shrub, and Big Sagebrush/Native Grass habitat types.	Yes
Columbian Sharp-tailed Grouse	Mixed Shrub, Aspen, Introduced Grass, Riparian/Wetland, Big Sagebrush/Native Grass, reclaimed portions of Past Mining Disturbance, and Native Grassland/Forbs habitat types.	Yes
Ferruginous Hawk*	Big Sagebrush/Native Grass, Introduced Grass, and Native Grassland/Forbs habitat types.	No
Flammulated Owl*	Conifer/Aspen habitat type.	Yes
Golden Eagle*	Mixed Shrub, Introduced Grass, Big Sagebrush/Native Grass, Conifer/Aspen, and Native Grassland/Forbs habitat types.	Yes
Grasshopper Sparrow	Introduced Grass, reclaimed portions of Past Mining Disturbance, and Native	No

Name	Habitat Type Association	Observed
	Grassland/Forbs habitat types.	
Greater Sage-Grouse	Mixed Shrub, Riparian/Wetland, and Big Sagebrush/Native Grass habitat types.	Yes
Green-tailed Towhee*	Big Sagebrush/Native Grass and Mixed Shrub habitat types.	Yes
Lewis' Woodpecker*	Aspen and Conifer/Aspen habitat types.	No
Loggerhead Shrike*	Mixed Shrub and Big Sagebrush/Native Grass habitat types.	No
Long-billed Curlew*	Introduced Grass, Riparian/Wetland, reclaimed portions of Past Mining Disturbance, and Native Grassland/Forbs habitat types.	Yes
Northern Goshawk	Aspen and Conifer/Aspen habitat types.	No
Olive-sided Flycatcher	Conifer/Aspen habitat type.	No
Pinyon Jay*	Big Sagebrush/Native Grass and Conifer/Aspen habitat types.	No
Sagebrush Sparrow*	Mixed Shrub and Big Sagebrush/Native Grass habitat types.	Yes
Sage Thrasher*	Big Sagebrush/Native Grass habitat types.	Yes
Short-eared Owl	Introduced Grass, Riparian/Wetland, reclaimed portions of Past Mining Disturbance, and Native Grassland/Forbs habitat types.	No
Trumpeter Swan	Riparian/Wetland habitat type.	Yes
Virginia's Warbler*	Mixed Shrub, Aspen, Riparian/Wetland, and Big Sagebrush/Native Grass habitat types.	No
Willow Flycatcher*	Riparian/Wetland habitat type.	Yes
Amphibians		
Boreal Toad	Riparian/Wetland habitat type.	No
Northern Leopard Frog	Riparian/Wetland habitat type.	Yes

Sources: (NewFields, 2015e; NewFields, 2017d; NewFields, 2017f). (Idaho State University, 2017). (BLM, 2010)

Notes: Habitat Type Association contains the habitat types (**Table 26**) where each species is likely to be found.

* Indicates that the species is included in the list of Birds of Conservation Concern in Bird Conservation Region 9 (USFWS, 2008a).

Species which the BLM PFO ARMP specifically identified as part of the implementation of its special status species goals and objectives are discussed below.

Gray Wolf

Gray wolves are habitat generalists and wide-ranging predators capable of covering large distances, particularly dispersing individuals. Since the termination of the Tex Creek pack (IDFG, 2016b) there are no documented wolf packs in Idaho south of U.S. 26 between Idaho Falls, Idaho and Alpine, Wyoming. Gray wolf use of the wildlife analysis area would be limited to individual wolves during dispersal events.

Pygmy Rabbit

Pygmy rabbits depend upon stands of tall, dense sagebrush in conjunction with deep, friable soils, for food, cover, and burrows. In Idaho they often occupy sites where sagebrush cover and height are significantly greater than the surrounding landscape (Keinath & McGee, 2004).

Birds

Columbian Sharp-tailed Grouse

The ARMP does not consider the wildlife analysis area to have sufficient breeding and winter habitat to support Columbia sharp-tailed grouse (BLM, 2012); however, three Columbian sharp-tailed grouse leks occur in the wildlife analysis area (3CT100, 3CT100a, and 3CT103) (**Table 31**). Columbian sharp-tailed grouse are known to use the wildlife analysis area, including being observed in the Mixed Shrub habitat type in the mine pits development areas during winter carnivore track surveys and near the northern portion of the railroad system (NewFields, 2017d). A majority of hens nest within two kilometers of leks (1.24 miles) and raise broods within one kilometer (0.6 mile) of the nest (Hoffman & Thomas, 2007). Columbian sharp-tailed grouse in Idaho typically find winter habitat within 0.8 to 9.2 kilometers (0.5 to 5.7 miles) of the lek (Hoffman & Thomas, 2007). Considering that leks are present within the wildlife analysis area, it is likely that nesting, brood rearing, and winter habitat exists within the wildlife analysis area.

Table 31. Columbian Sharp-tailed Grouse Leks within Two Miles of the Wildife Analysis Area

Lek ID	Management Status	Nearest Caldwell Canyon Project Feature	Miles to Nearest Caldwell Canyon Project Feature
3CT100	New	Railroad	0.48
3CT100a	New	Railroad	0.38
3CT103	New	Mine Pits	0.00

Source: (IDFG, 2016a).

Greater Sage-Grouse

The Greater Sage-Grouse analysis area consists of 100,000 acres around the proposed mine and represents the seasonal habitat needs of the local Greater Sage-Grouse population. The Greater Sage-Grouse analysis area is within the Greater Sage-Grouse Management Zone IV (Stiver, et al., 2006), and within the East Idaho Uplands Greater Sage-Grouse population. This small isolated population east of the Snake River is separated from adjacent populations by 30 to 50 kilometers (18 to 31 miles) (Garton, et al., 2011). This population is not within a Priority Area for Conservation identified by the USFWS (USFWS, 2013).

A project-specific Greater Sage-Grouse habitat assessment (Mid, Fine and Site Scale Habitat Assessment) has been developed by P4 Production in coordination with the BLM (NewFields, 2018e) (**Appendix C**). The Habitat Assessment Mid-Scale (2nd Order) and Fine-Scale (3rd Order) assessments yielded a suitability rating of Marginal. Specifically, in Eastern Idaho, Greater Sage-Grouse populations are isolated and the distances among occupied habitat patches is high because sagebrush habitat is fragmented by wooded mountain ranges, and higher levels of anthropogenic disturbances e.g. agricultural land uses and transportation infrastructure land uses. At the Site-Scale, four of the five sites analyzed were found to be suitable as summer brood habitat, however, due to the abundance/proximity of non-habitat (timbered areas), the Site-Scale suitability is marginal.

The Greater Sage-Grouse analysis area contains 14,105 acres designated as GHMA (BLM, 2019). GHMA are generally characterized by lower quality disturbed habitat or patchy habitat of low lek connectivity (BLM, 2019). Known Phosphate Leasing Areas were not included as part of GHMA in the ARMPA; however, some of the proposed modifications are outside the Known Phosphate Leasing Areas and within GHMA (**Appendix C**). There are 17,602 acres of key habitat within the Greater Sage-Grouse analysis area. Key habitat is characterized by having approximately 10% or more sagebrush cover and may be used by Greater Sage-Grouse during some portion of the year.

IDFG identified one occupied lek and three undetermined leks in the Greater Sage-Grouse analysis area (**Table 32). ** Lek 3C028 has been active from 2012 to 2016 with very low male Greater Sage-

Grouse attendance (1 to 10 males) (BLM, 2017c). One pending lek is located in the Greater Sage-Grouse analysis area (3C040). Very low numbers of male Greater Sage-Grouse at 3C040 were observed displaying in 2018 (two different observations). As noted, lek 3C040 is designated by IDFG as pending.

Table 32. Greater Sage-Grouse Leks within the Greater Sage-Grouse Analysis Area

Lek	Management Status	Nearest Caldwell Canyon Project Feature	Miles to Nearest Caldwell Canyon Project Feature	Last Confirmed Occupancy
3C014	Undetermined	Railroad	3.43	1967
3C028	Occupied	Railroad	2.74	2017
3C035	Undetermined	Soda Springs Processing Plant Rail Loop Area	1.41	2009
3C038	Undetermined	Railroad	0.56	1965
3C040	Pending	Railroad	0.31	2018

An unoccupied lek is one that has been inactive in 5 consecutive breeding seasons or if no birds were observed during surveys in seven of the last 10 years. Unoccupied leks (3C06, 3C010, 3C011, 3C012, 3C014, and 3C029) are within the Greater Sage-Grouse analysis area. Overall, Greater Sage-Grouse leks within the Greater Sage-Grouse analysis area have exhibited declining counts between the mid-1970s and today (**Appendix C**).

Bald and Golden Eagles

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act (16 U.S.C 668-668c) and are BLM Sensitive species.

Bald eagle use, including three nest sites, was noted during the baseline wildlife surveys (NewFields, 2017d). The three bald eagle nests are in two breeding territories. Nest NO5 is in a Douglas-fir tree at the north end of the North Pit area near the intersection of Slug Creek Road and Dry Valley Road (**Figure 31**). This nest was active during the 2015 baseline wildlife surveys (NewFields, 2017d). Nests N38 and N39 are along the Blackfoot River north of the Conda Mine (**Figure 31**). In 2015, nest N39 was active while nest N38 was an inactive alternate nest; both nests are in Douglas-fir trees (NewFields, 2017d). While not adjacent to the Caldwell Canyon Project, both nests are within 0.5 mile of the Union Pacific Railroad used to transport ore to the Soda Springs processing plant.

The baseline wildlife surveys identified golden eagle use, including two nest sites within a single breeding territory (NewFields, 2017d). Nests N07 and N56 are both in Douglas-fir trees near the mouth of Caldwell Canyon (**Figure 31**); nest N07 was active in 2014 and both were inactive in 2015 (NewFields, 2017d). Both nests are within 0.03 mile (about 150 feet) of the Caldwell Canyon Service Road (**Table 28**).

Bats

Bats were identified in the wildlife analysis area (**Table 30**) by recording characteristic calls during acoustic surveys. Other bat species expected to occur but not detected during the acoustic surveys are Townsend’s big-eared bat, California myotis, and pallid bat (NewFields, 2015e).

Roosting habitat for bats likely occurs within the wildlife analysis area in the form of trees or rock outcrops and crevices. Species that typically roost in caves or abandoned mine adits (i.e., Townsend's big-eared bat) are less likely to roost in the wildlife analysis area, as no caves or abandoned mines are known to occur (NewFields, 2015e).

The site where the most calls were recorded, which indicates the highest bat activity, was in a Riparian/Wetland habitat type (beaver pond) with a large amount of open water, diverse riparian vegetation, and nearby forest and shrub communities. This site would not be disturbed. Other active sites were in the Conifer habitat type and another Riparian/Wetland habitat type (wetland/spring) (NewFields, 2015e).

Northern Leopard Frog

Two adult northern leopard frogs were observed at a wetland on the east side of Slug Creek Road, outside of the disturbed areas south of Caldwell Canyon (NewFields, 2015e).

3.9.3 Direct and Indirect Effects

3.9.3.1 Proposed Action and Alternative 1

General Effects Common to All Wildlife

Habitat types would be removed in phases as construction of the mine pits progresses (mine pits, road improvements, etc.) (**Figure 28**) over 40 years. Total acreage of each vegetation type removed and percent of total acres affected are shown by mine phase in **Table 23**. Dominant habitat types associated with these vegetation types are listed in **Table 26**.

Removal of the vegetation types in **Table 23** would affect each species associated with those habitat types (**Table 29** and **Table 30**) ranging from a temporary disturbance, to individual mortality, and a loss of an important breeding site (e.g., raptor nest or lek site). The availability of habitat to support dispersed wildlife individuals can be identified by comparing the amount of habitat disturbed by mining (**Table 23**) against the amount of habitat available in the wildlife analysis area (**Table 26**) and the cumulative effects analysis area (**Table 25**). The Greater Sage-Grouse habitat assessment (**Appendix C**) includes an analysis of existing habitat, anthropogenic disturbances (such as roads), habitat connectivity, patch size, and edge effects that are applicable to most wildlife.

Mortality or injury could result from collisions with mining equipment or vehicles and by crushing or compaction during vegetation removal and soil excavation. Mortality or injury from crushing is more likely to occur to less mobile wildlife species such as small mammals, burrowing mammals, amphibians, and reptiles. Large and intermediate-sized mammals are better able to avoid mining equipment and are less likely to experience direct mortality from mining activities. Mortality of an individual in a localized area and the effects on a population are typically negligible. Wildlife that can avoid mining equipment and the immediate work area would experience disturbances that could result in dispersal movements away from mining activities. Human-caused displacement results in unnecessary energy expenditure and potential disruptions in behavior that could ultimately impact reproductive success and survival. Dispersal into adjacent habitats may result in increased competition for resources with other individuals or different species.

Wildlife would be indirectly affected by the loss or modification of habitat types through reduced habitat functionality, such as the ability of an area to provide adequate forage and cover. Loss or modification of habitat types would also contribute to habitat fragmentation into smaller, isolated patches. For example, mining will result in the long-term fragmentation of the Aspen habitat type. The shift in habitat type from forest to grasses and shrubs would change the species composition as forest-dependent species would decline in abundance while grassland and shrub species would increase. Modification of the existing habitat types to a mining disturbance habitat type (reclaimed perennial grassland and shrubland) would reduce the diversity of habitat types in the area and ultimately reduce the diversity of wildlife that use the reclaimed area.

Disturbed earthen materials with elevated selenium and other contaminants may become airborne and deposit on vegetation and soil. The selenium and other contaminants may be taken up in vegetation growing in the soil. **Section 3.5.3.1** describes the analysis and results of dust dispersion and selenium deposition. The analysis indicated that most of the selenium would be deposited within 400 feet of the disturbed areas and calculated vegetation concentrations would peak at 2.26 mg/kg of dry weight vegetation (based on an estimated 1.13 mg/kg at 400 feet, or 50 percent of the peak concentration) (NewFields, 2018d). Concentrations in vegetation would be below the 5 mg/kg dry weight, the action level set in the Pocatello ARMP (BLM, 2012), established to protect wildlife.

Reclamation would result in a grassland habitat type in the short-term. Shrubs would also be seeded during reclamation, and potentially transplanted if seeding is unsuccessful. Shrubs would establish over the long-term. Aspen, Conifer/Aspen, and Riparian/Wetland habitat types would be lost in the long-term and converted to a grassland/shrubland habitat type after reclamation. Most of the mine would be reclaimed with placement of growth media and seeding. Approximately 130 acres of the North Pit would not receive growth media or seeding and would remain as a pit highwall.

Mine closure would greatly reduce human activity, benefitting wildlife that would be re-colonizing the areas. Reclamation monitoring would ensure that reclamation standards are met. Meeting reclamation standards would result in a reclaimed mine compatible with the larger land use objectives, including wildlife habitat.

Reclamation and closure would return a portion of the wildlife habitat functionality lost during mining. Aspen, Conifer/Aspen, and Riparian/Wetland habitat types would not recover on the backfill covers and would become grassland or shrubland habitat types. This would result in a permanent shift in the composition of wildlife species to more grassland and shrubland wildlife species.

As discussed in **Section 3.9.2.1**, habitat that would be disturbed is providing services to wildlife. The values of these current services were calculated in the HEA (Tetra Tech, Inc., 2018c). The HEA considers not only the acreage of services lost or gained, but also the timing of when those services are lost or gained. Depending on the mining phases, the acres would be disturbed at different times (see **Table 23**). To account for this, the value measured in habitat service acres is discounted over time at a three percent annual discount rate in the HEA. Initial disturbance of an area, before it is reclaimed, is considered a total habitat services loss. These losses are discounted depending on the year they occur and are disclosed as “Discounted Service Acre Years” (DSAYs). The discounting accounts for the services provided today being more valuable than services provided in the future. The HEA analysis of the acres disturbed in each phase, discounted and accounted for annually, results in a total of 3,092 DSAYs lost (pre-mining construction through total reclamation).

As mining phases progress, previously mined areas would be reclaimed, regaining some level of wildlife habitat service, long-term. The HEA calculated the gain in DSAYs from reclamation as 199 (6.4 percent of baseline) considering the timing of disturbance and reclamation and the habitat type reclaimed (grass, sage brush or mixed shrub). The main factors that affect the gain in DSAYs from reclamation include the following: 1) the 335 acres disturbed for construction are some of the last acres reclaimed, 2) the discount rate which results in a nearly undetectable gain after 50 years, and 3) the long time expected for mixed shrub to provide services. Even when reclamation is completed in a shrub or forest vegetation type, the time before the area recovers the service acres (up to 120 years) exceeds the time the HEA model will register a gain. This would result in a deficit of 2,880 DSAYs (93.1 percent of baseline). The HEA results are intended for disclosure of affects to wildlife habitat and will not be used to require onsite mitigation over and above the unnecessary or undue degradation requirement of FLPMA, or to require off-site wildlife habitat mitigation.

Big Game

Acres of big game habitat within the disturbed areas and rail loop area are presented in **Table 33**. In addition to **Table 33**, refer to **Table 24** and **Table 26** for the acres of disturbance by habitat type and the total amount of that habitat type available in the wildlife analysis area. Vegetation in big game habitat would be removed, rendering those habitats unusable by big game during active mining. However, the phased approach to mining would disperse those effects over 40 years (see **Table 23**) and reclamation would occur concurrently with active mining so the amount of unusable habitat at any one time is significantly less than the totals presented. Based on the discussion below, effects on big game would be long-term, localized, and minor.

Table 33. Acres of Big Game Seasonal Habitat within the Disturbed Area

Species	Seasonal Habitat	Acres
Mule Deer	Summer Range	1,556
Mule Deer	Limited Range	118
Mule Deer	Winter Range	0
Elk	Summer	684
Elk	Summer and Winter	884
Elk	Summer Crucial	0
Moose	Mixed Shrub	518
Moose	Riparian/Wetland	9
Moose	Aspen	361
Moose	Conifer/Aspen	141
Moose	Conifer	78

Mule Deer

Most mining disturbance would be in mule deer summer range, which is abundant in the wildlife analysis area. While winter habitat is often a limiting factor for mule deer, summer range plays a more critical role in mule deer populations (IDFG, 2017a). The loss or modification of shrubland habitat types in summer range due to the project would reduce the available forage and cover for mule deer. Riparian/Wetland and Aspen habitat types disturbed in summer range would result in a long-term loss of fawning and forage habitat.

Mule deer limited range overlaps 118 acres at the rail loop. Disturbances to limited range would have negligible effects on mule deer populations as these areas are only occasionally inhabited and/or support only small groups of scattered mule deer. However, disturbance at this specific location would affect mule deer migration as discussed below.

Habitat of the type affected by mining (**Table 24**) is available to dispersed mule deer throughout the wildlife analysis area (**Table 26**) and cumulative effects analysis area (**Table 25**). Available similar habitat outside of the disturbed areas is expected to provide sufficient forage, cover and fawning habitat for mule deer populations. Dispersal into adjacent habitats may result in individuals experiencing increased competition for resources with other individuals or different species.

After reclamation, the grassland-dominated habitat types may provide some spring and summer forage for mule deer but would lack the shrub component important to mule deer. Successful shrub establishment, especially big sagebrush species, through seeding and natural succession occurs over a longer timeframe, so the loss of the shrubland habitat component would be a long-term effect on mule deer. Riparian/Wetland and Aspen habitat types would not be fully recovered through on-site reclamation and would result in a long-term loss of fawning and forage habitat.

In addition to habitat loss or modification, mining activities at the mine pits would modify mule deer travel corridors, which would affect typical movements of populations of mule deer (Cox, et al., 2009). Mine pits and other features create a physical barrier to movement, while human presence and mining activities create a perceived barrier to movement due to behavioral avoidance of such activities. The rail loop site has been identified by IDFG Region 5 as a concentrated area of travel during winter migration and development of this site would reduce the suitability of the current movement corridor. Reduced suitability of the established corridor could affect mule deer by reducing access to preferred winter range through behavioral avoidance of the existing corridor or by shifting the corridor to where animals are more susceptible to vehicle strikes along Highway 34.

Elk

Both action alternatives would result in the loss and/or modification of 684 acres of summer habitat and 884 acres of summer/winter habitat. Mining would result in the loss or modification of elk habitat and may cause elk to travel further to find suitable habitat during sensitive times of the year, such as calving and calf-rearing and over-wintering. Elk cow/calf pairs readily abandon their traditional summer calf-rearing areas during or after mining (Kuck, et al., 1985); however, Caldwell Canyon Mine would not disturb summer crucial habitat where most cow/calf pairs are expected (**Figure 30**). Avoidance of mining activities and barriers to elk movements would be similar to those discussed for mule deer except that the rail loop is not known to be an important travel corridor for elk.

Habitat of the type affected by mining (**Table 24**) is available to dispersed elk throughout the wildlife analysis area (**Table 26**) and cumulative effects analysis area (**Table 25**) is available to dispersed elk throughout the wildlife analysis area and cumulative effects analysis area.). Available similar habitat is expected to be able to support elk populations. Dispersal into adjacent habitats may result in individuals experiencing increased competition for resources with other individuals or different species.

Similar to mule deer, reclamation would provide forage for elk by providing grassland habitats throughout the reclaimed area. Because of the long timeframe required for shrub recovery and the permanent loss of Aspen, Conifer/Aspen, and Riparian/Wetland habitat types, the reclaimed areas would have reduced functionality as summer and winter habitat because of the lack of adequate cover habitat and foraging habitat.

Moose

Disturbance to aspen, riparian/wetland, conifer/aspen, and conifer habitats (**Table 33**) would result in the long-term loss of these habitats that are used by moose in the spring, summer, and fall.

Disturbance to mixed shrub habitats would result in a long-term loss of winter habitat. Moose would likely avoid mining activities for distances ranging from 100 to 3,000 meters (328 to 9,843 feet) (EDI, Inc., 2015). Habitat loss from mining would contribute to the unknown/various factors associated with the declining moose population. Dispersal into adjacent habitats may result in individuals experiencing increased competition for resources with other individuals or different species.

The reclaimed mine site would not provide spring, summer, or fall habitat for moose because of the permanent loss of aspen, riparian/wetland, conifer/aspen, and conifer habitats. The reclaimed mine may provide some functionality as winter habitat for moose once mixed shrub habitats have been established over the long-term.

Birds

There are no threatened or endangered birds that nest near the proposed mine. Flammulated owl, bald and golden eagles, sharp-tailed grouse, and Greater Sage-Grouse are discussed under BLM Sensitive Wildlife.

The power line poses a collision risk for birds. Increased perching opportunities for raptors and ravens benefit those birds' foraging ability and having an adverse effect on upland game birds, and other ground nesting birds, due to increased predation and nest depredation. Required adherence? to Avian Power Line Interaction Committee guidelines (APLIC, 2006) reduces or eliminates the risk of electrocution for birds.

Significant population-level effects of COPCs on migratory birds were not observed during one study that encompassed the wildlife analysis area, suggesting that there are no negative effects on reproductive success of the general avian community (Ratti, et al., 2006). Therefore, since the mine is not predicted to increase COPC in surface waters, exposure to COPCs during mining and reclamation is expected to have negligible effects on migratory bird populations. The study showed that some negative effects are likely occurring to individual birds that use streams with elevated selenium levels that are immediately adjacent to mining sites; approximately 8 percent of eggs analyzed exceeded the threshold for selenium (Ratti, et al., 2006). The primary effects of selenium toxicity on birds includes embryo defects and mortality and chick and adult mortality.

While habitat loss and modification and avoidance of mining activities may affect individual birds, the abundance of similar habitat types within the rural and undeveloped wildlife analysis area would continue to support populations of birds known or expected to occur within the analysis area.

Migratory Birds

Migratory bird habitat would be lost during active mining. A permanent modification of 589 acres of Riparian/Wetland, Aspen, and Conifer/Aspen habitat types to grassland or shrubland habitat types would occur after reclamation. Riparian/Wetland, Aspen, and Conifer/Aspen habitat types have the highest bird species richness among all habitat types. The modification of these habitat types to grassland and eventually shrubland habitat types would reduce bird species richness in the disturbed areas.

Prior to undertaking activities such as ground clearing that could adversely affect nesting birds, P4 Production would develop bird and nest avoidance plans in accordance with Pocatello ARMP seasonal restrictions and other relevant requirements before these areas are disturbed. This practice would avoid impacts to migratory and other non-migratory bird populations.

Nesting habitat for grassland and shrubland birds would be reduced during mining and permanently eliminated for Riparian/Wetland, Aspen, and Conifer/Aspen habitat types. Birds returning during the breeding season would be displaced into the surrounding areas.

Based on the anticipated noise levels described in Section 3.6, migratory birds may experience masking (interference with the detection of one sound by another) of important communications between individuals (e.g., a nestling and the adult) and/or other behavioral and/or physiological effects (Dooling & Popper, 2007). Effects from noise would be short-term, localized, and minor.

Raptors

Habitat loss and modification would alter the prey base for raptors because habitat for prey species (small birds, mice, voles, ground squirrels, and rabbits) would be reduced during mining. If the raptors continue to nest in the same areas, they may expend more energy to forage in other areas. The phased approach to mining would disperse those effects over 40 years and reclamation would occur concurrently with active mining so that the amount of unusable foraging habitat at any one time is much less than the total acreage disturbed.

Breeding pairs of raptors would have to re-establish territories in other areas. Nests identified during the baseline wildlife surveys that occur within the disturbed areas include: American kestrel N02 and red-tailed hawk N13 and N47 (**Table 28** and **Figure 31**). Nest N02 would be destroyed outside of breeding season during Phase 2 and nests N13 and N47 would be destroyed during Phase 10.

Raptor nests (other than eagles) within one half mile of the disturbed areas are red-tailed hawk nests (N04, N08, N25, N28, and N29) (**Table 28** and **Figure 31**). While initial vegetation clearing within the disturbance areas would be scheduled to avoid the migratory bird nesting season, development of pits and ore extraction activities would occur during the migratory bird nesting season in subsequent years. If these red-tailed hawk nests are active during subsequent breeding seasons, they would be exposed to noise and visual disturbances that may result in decreased reproductive success. Reduced plant cover following reclamation may make colonizing prey species more visible and therefore more susceptible to predation, benefiting foraging raptors.

Amphibians and Reptiles

Amphibians and reptiles would be vulnerable to mortality or injury during mining activities from traffic and equipment. Selenium deposition on surface water from dust is expected to be less than the acute and chronic aquatic life concentrations of 0.02 and 0.005 mg/L, respectively, and less than the 0.17 mg/L total human health concentration (NewFields, 2018d). Effects on amphibians and reptiles would be short-term, localized, and negligible.

BLM Sensitive Wildlife

Gray Wolf

The primary effect on gray wolves would be disruption of their main prey, big game. The effect on gray wolves would be negligible considering the expected use of the wildlife analysis area would be limited to transient individuals.

Pygmy Rabbit

The primary effect on pygmy rabbit would be loss of potential burrowing habitat from mining and roads in Mixed Shrub and Big Sagebrush/Native Grass habitat types. Considering the low likelihood of this species occurring within the wildlife analysis area, potential effects are negligible.

Birds

Effects on BLM Sensitive birds would be the same as described for other birds above. Modification of Riparian/Wetland, Aspen, and Conifer/Aspen habitat types would permanently eliminate the use of the reclaimed area for the following BLM Sensitive birds: bald eagle, black tern, calliope hummingbird, flammulated owl, golden eagle, Lewis' woodpecker, pinyon jay, trumpeter swan, Virginia's warbler, and willow flycatcher. Removal of shrubland habitat types and the extended time required to restore those habitat types would result in a long-term loss of nesting and foraging habitat for the following shrub-dependent BLM Sensitive birds: Brewer's sparrow, green-tailed towhee, loggerhead shrike, sagebrush sparrow, and sage thrasher. Long-billed curlew and ferruginous hawk would experience short-term loss of habitat and displacement during mining activities. Cassin's finch would be moderately affected by loss or modification of the Conifer/Aspen, Mixed Shrub, and Big Sagebrush/Native Grass habitat types; grasshopper sparrow would be moderately affected by loss or modification of the grassland habitat types; and olive-sided flycatcher would be moderately affected by loss or modification of the Conifer/Aspen habitat type. These effects would be long-term until these habitat types recover and mature.

Nesting habitat for grassland species such as long-billed curlew would increase after reclamation. Nesting habitat for shrubland birds such as Brewer's sparrow, would return over the long-term.

The reclaimed mine area could be used by Columbian sharp-tailed grouse; however, important winter habitat of Mixed Shrub, Aspen, and Riparian/Wetland habitat types would recover slowly (mixed shrub) or be permanently absent (riparian/wetland and aspen) from the reclaimed area. For Greater Sage-Grouse, the reclaimed mine site would not provide habitat until shrubs become established.

The impacts from occasional ground clearing activities on bird populations would not be measurable nor affect population viability of sensitive species, including sharp-tail and Greater Sage-Grouse.

Columbian Sharp-tailed Grouse

Given the proximity of the three known leks to the mine pits and railroad (0.00 to 2.62 miles), it is likely that habitat loss and modification would reduce Columbian sharp-tailed grouse's use/occupancy of habitat.

Columbian sharp-tailed grouse lek 3CT103 is within the disturbance area of the mine pits (Phase 3), which would result in at least the temporary, and possibly permanent loss of this lek site and the nesting and brood rearing habitat likely used by birds at this lek site. Columbian sharp-tailed grouse lek 3CT100 and its satellite lek 3CT100a would be subjected to increased noise levels from use of the railroad which could disrupt typical breeding behaviors at these lek sites. **Section 3.6** discusses typical noise levels from mining equipment and ambient noise levels expected.

Columbian sharp-tailed grouse using seasonal habitat may temporarily avoid these areas during mining activities. Up to 1,349 acres of suitable habitat (mixed shrub, aspen, introduced grass, riparian/wetland, sagebrush, and native grasslands/forbs) would be removed.

The action alternatives do not modify more than ten percent of habitat within two miles of any Columbian sharp-tailed grouse leks and availability of deciduous shrubs (e.g., serviceberry, chokecherry) would be maintained within four miles of Columbian sharp-tailed grouse leks to protect winter habitat in compliance with Management Action SS-1.3.7 (BLM, 2012).

Based on the above analysis, the overall effects on Columbian sharp-tailed grouse would be short-term, localized, and negligible.

Greater Sage-Grouse

The action alternatives would result in a loss or modification to 113 acres of GHMA and 868 acres of key habitat outside of the GHMA. A Greater Sage-Grouse habitat assessment (Stiver, et al., 2015) describes the suitability of GHMA and key habitat to support Greater Sage-Grouse. Of the 113 acres of GHMA affected, 69 acres are administered by the BLM (NewFields, 2018e) and 36.1 acres of that 69 acres are considered suitable habitat. Overall effects from loss or modification of 981 acres (113 acres of GHMA (0.8% of GHMA within Greater Sage-Grouse analysis area) and 868 acres of key habitat outside of the GHMA) of largely intact/mature shrub-land habitat, within a region where Greater Sage-Grouse habitat is already patchily distributed, would be expected to be long-term and moderate.

Occupied lek 3C028 is 2.74 miles from the railroad and 4.7 miles from WMP-1. This lek is unlikely to be directly affected by mining activities given its distance from the activities. In 2016, very low numbers of displaying male Greater Sage-Grouse were observed and documented approximately 5,100 feet north of current pending lek 3C040. In 2017, very low numbers of displaying males were observed at the 3C040 pending lek location. In 2018, very low numbers of displaying males were observed 1,600 feet south of the pending lek 3C040. It is expected that the three display locations constitute one set of birds. pending lek 3C040 is 1.0 miles from the mine and 0.38 mile from the railroad and would be subjected to increased noise levels.

Ore loading operations in the East Caldwell Area are predicted to increase noise at the pending lek to greater than 10 dBA above ambient during mining operations (Big Sky Acoustics, 2018). For reference, the greater than 10 dBA increase above ambient exceeds the required design feature, best management practice, included in Appendix C of the 2019 Greater Sage-Grouse ARMPA (BLM, 2019). Noise from the mine pit is not expected to exceed 10 dBA over ambient at the pending lek during mining years 1 through 15 (Big Sky Acoustics, 2018). During mining years 16 through 40, noise from the mine pit at the pending lek are predicted to increase to greater than 10 dBA above ambient, but only when mining equipment is at or near the rim of the pit (Big Sky Acoustics, 2018).

It is possible, that the noise from mining operations could reduce lek attendance or dissuade future use of pending lek 3C040. Section **3.6** discusses typical noise levels effects. The pending lek 3C040 is on private property and outside of designated or key habitat, thus does not fall within the areas covered by the ARMPA (BLM, 2019) or the Pocatello Field Office ARMP (BLM 2012). It does not require mitigation.

The use of undetermined leks 3C014, 3C035, and 3C038 is unknown. Leks 3C014 and 3C035 are far enough away from mining activities that they would have a negligible effect on birds attending the leks; however, lek 3C038 may experience some level of visual and audible disturbance from use of the railroad.

Raptors

The effects on raptors (including bald and golden eagles) would be the same as those discussed for non-BLM Sensitive raptors in the birds section above. In general, loss of nesting and foraging habitat would have a short- or long-term effect on raptors depending on the habitat type each species is associated with and the duration for which that habitat type is affected during mining.

Nests of BLM Sensitive raptor species are within the spatial buffer of the seasonal restrictions identified in the ARMP (BLM, 2012) and would experience noise and visual disturbances that may result in reduced reproductive success[1]. One occupied bald eagle territory associated with nest N05 is within 0.10 mile of the North Pit (**Table 28** and **Figure 31**). Phase 10 mining would occur within Zone 1, the occupied nesting zone, as defined in the Greater Yellowstone Bald Eagle Management Plan (Greater Yellowstone Bald Eagle Working Group, 1996). Recommendations for the occupied nesting zone are minimal human activity in the breeding season and habitat alteration should be to maintain or enhance bald eagle habitat and should occur outside the breeding season. Mining of Phase 10 would not adhere to these recommendations if the nest is still occupied and could result in the bald eagles abandoning the nest. Nesting habitat would be permanently eliminated for riparian/wetland and forest nesting bird species such as bald eagles.

Nests N07 and N56, associated with one golden eagle territory, are within approximately 0.03 mile of the Caldwell Canyon Service Road (**Table 28** and **Figure 31**) and currently experience an unknown level of human disturbance. Mining activities are anticipated to increase the level of traffic along the service road compared to current levels, which could result in the golden eagles abandoning the nest sites.

P4 Production proposes to develop an Eagle Conservation Plan in consultation with the USFWS to mitigate the potential effects of mine development on eagle nest sites. The Eagle Conservation Plan would address take under the Bald and Golden Eagle Protection Act, including a path forward to determine if an eagle take permit would be required pursuant to the most recent revisions to regulations for eagle incidental take and take of eagle nests (81 Federal Register 91494). Overall effects on bald and golden eagles would be short-term, localized, and negligible.

Removal of vegetation would likely result in a loss of breeding and foraging habitat in flammulated owl territories. While no flammulated owl nest trees were found during the baseline wildlife surveys, the number of vocalizations suggests that one or more flammulated owl territories occurs. Owls occupying these territories would be displaced into similar habitats.

Bats

Mining activities would destroy BLM Sensitive bats roosting habitat through removal of Aspen and Conifer/Aspen habitat types. If bats are present during habitat removal, they may be injured or killed. Bat foraging habitat would be lost or modified, including the Riparian/Wetland habitat type (**Table 23**) which would result in the loss of 9.3 acres of the most productive foraging habitat available to bats. In general, mining would result in reduced foraging opportunities for bats across all habitat types. Noise and vibration from mining activities may affect bats beyond the disturbed areas and result in modified roosting and foraging behavior away from mining activities. Construction of a power line would introduce a potential collision risk to foraging bats.

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[1] The seasonal restrictions in Appendix B of the ARMP do not apply to mineral development.

Because no mine adits or caves are known within the wildlife analysis area, individual bats roosting in trees or rock crevices or foraging in the area may be affected, but this is unlikely to have population-level effects due to the lack of significant roosts or hibernacula. Loss of foraging habitat may require some individuals to modify their feeding habits and temporarily expend more energy searching for replacement habitat.

The reclaimed mine site would result in decreased foraging and roosting opportunities for bat species. The long-term loss of Conifer and Riparian/Wetland habitat types would remove the areas where the most bat activity was recorded during the baseline wildlife surveys. Grassland and shrubland habitat types expected to return within the reclaimed mine site, provide little roosting opportunities for bats.

Northern Leopard Frog

Effects on the northern leopard frog would be similar to those discussed for amphibians above. Loss of the Riparian/Wetland habitat type would likely result in mortality of northern leopard frogs.

3.9.3.2 No Action Alternative

The No Action Alternative would result in no new impacts to wildlife in the wildlife analysis area. The No Action Alternative would maintain the current status of wildlife populations.

3.9.4 Cumulative Effects

The cumulative effects analysis area for wildlife (**Figure 9**) is the same as vegetation. Past, present, and reasonably foreseeable actions disturbances and calculations of the following percentages are explained in **Section 3.8.4**. The analysis area includes suitable habitat for species within a 15-mile radius circle centered on the disturbed areas. The wildlife cumulative effects analysis area encompasses approximately 452,000 acres. An area with a 15-mile radius is large enough to encompass the home ranges of the most mobile wildlife individuals such as large predatory mammals. The home ranges of small and less mobile individuals are well within this range. **Table 25** shows the vegetation types from GAP land cover data in the analysis area.

Changes in wildlife habitat conditions from land development, agriculture, and timber harvest are estimated to have occurred on approximately 44,045 acres or about 10 percent of the cumulative effects analysis area. Mining activities presented in **Table 7** include approximately 13,700 acres of historical and present mining disturbance, resulting in a total past and present disturbance of 57,700 acres or 13 percent of the cumulative effects analysis area.

3.9.4.1 Proposed Action and Alternative 1

Reasonably foreseeable mining activities, including the Caldwell Canyon Project would add approximately 6,900 acres of disturbance, increasing the amount of disturbance within the cumulative effects analysis area to about 64,600 acres (14 percent).

Activities such as timber harvest, vegetation treatments, road closures, and habitat improvement projects likely benefit wildlife. Reclamation and closure of mines likely benefit wildlife, depending on the success of reclamation. There would be a long-term reduction of functionality due to the time it takes for reclaimed areas to provide similar functioning habitat to pre-disturbance habitat.

Negative effects on wildlife from actions in the cumulative effects analysis area include mortality of individual wildlife, loss of habitat, reduction of habitat functionality, displacement of wildlife from suitable habitat due to human activity, and habitat fragmentation resulting from these effects. The Caldwell Canyon Project would add to the cumulative negative effects on wildlife that use sagebrush, conifer, aspen, grassland, other shrub, and wetland/riparian habitat types.

3.9.4.2 No Action Alternative

There would be no direct or indirect effects on wildlife and therefore no cumulative effects.

3.10 Visual Quality

3.10.1 Analysis Area

The visual quality analysis area includes KOPs (**Figure 32**) accessed by public roads (e.g. sections of Slug Creek Road, Blackfoot River Road, South Trail Road, North Trail Road, and Dry Valley Road) (NewFields, 2018f).

3.10.2 Affected Environment

Existing Landscape Character

The landscape in the visual quality analysis area is predominantly natural and rural. No landforms unique to the region occur in the analysis area (NewFields, 2018f). The northern aspects along higher ridges are vegetated with conifer and aspen, and the foothills with sagebrush and other shrubs interspersed with aspen. Valley bottoms are a mix of sagebrush and grassland. The Caldwell Canyon Project site is visible from both Slug Creek and Dry Valley roads on the west and east sides of Schmid Ridge, respectively (NewFields, 2018f).

Summer grazing, logging, and mining provide the rural landscape character. Man-made features consist of corrals, fences, roads, and stock-watering ponds and tanks. The landscape exhibits some modification of the natural character from past mining (Dry Fork Mine, buildings, railroads, settling ponds, roads, and reclaimed mine pits and overburden piles) and mineral exploration, including drilling and trenching (NewFields, 2018f).

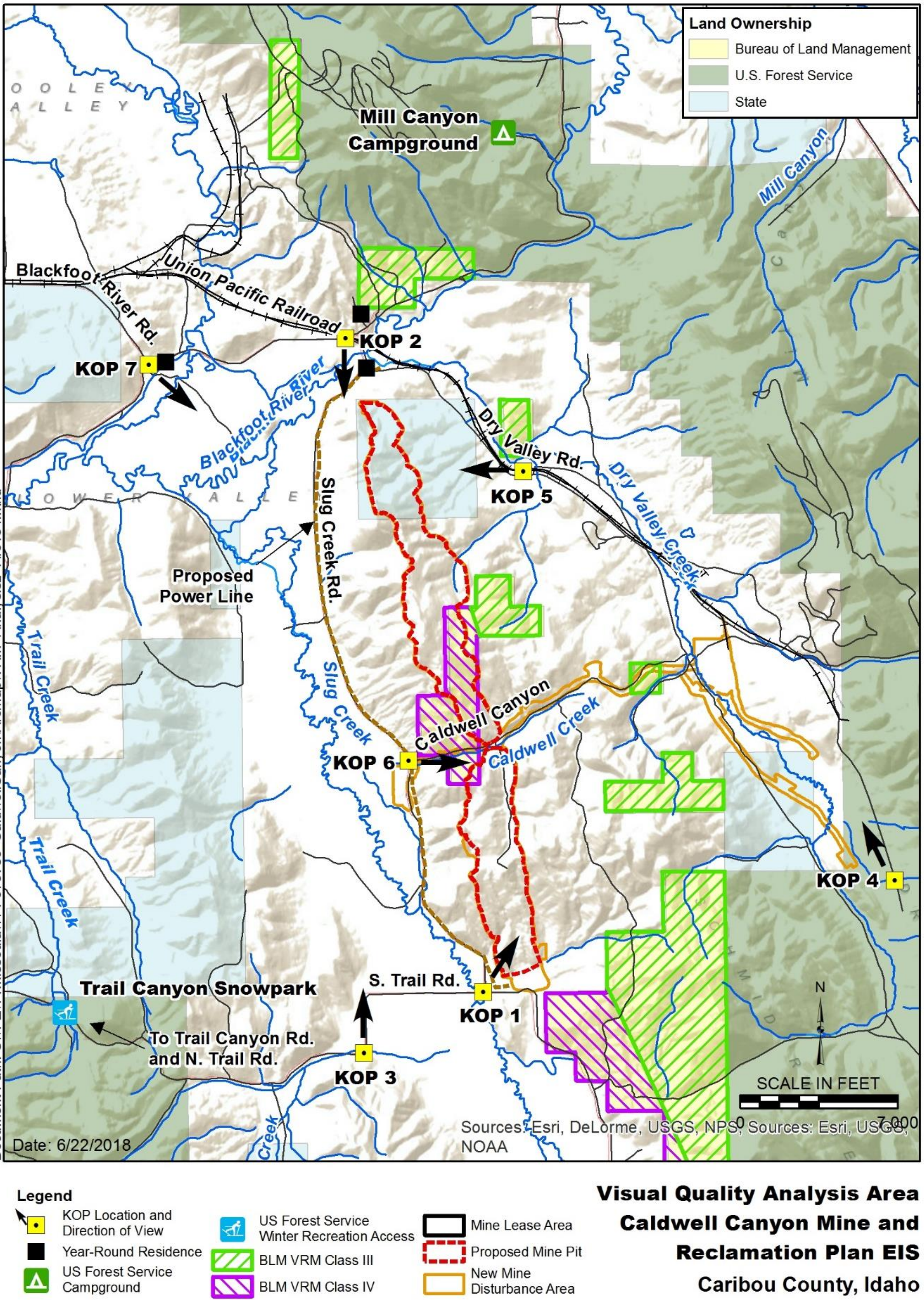
BLM Visual Resource Management System

The BLM VRM system guides management of visual quality on BLM public land. The visual quality analysis area is mostly in VRM Class IV (BLM, 1986a). A BLM parcel along the East Caldwell Area Haul Road and a small portion on lease just east of the North Pit is in VRM Class III (**Figure 32**). The VRM Class IV objective is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Such activities may dominate the landscape and be the major focus of viewer attention. The VRM Class III objective is to partially retain the existing character of the landscape. The landscape characteristic change should be moderate (BLM, 2012).

KOPs

Seven KOPs were identified to represent views of the Caldwell Canyon Project (**Figure 32**). Selected KOPs represent views of the proposed mine site and ancillary facilities from nearby residences and from main public access corridors, including the Blackfoot River Road, South Trail Road, North Trail Road, Slug Creek Road, and Dry Valley Road. KOPs were selected and approved by the BLM (Alderman, 2015). Views are described as part of the foreground and middle-ground zone, which are less than three or up to five miles away, respectively (BLM, 1986b).

Figure 32. Visual Quality Analysis Area



- KOP-1 is less than 1/4-mile southwest of the southernmost Caldwell Canyon Project boundary at the junction of South Trail Road and Slug Creek Road. This KOP faces northeast and represents views seen by motorists on the South Trail Road heading east near the junction with Slug Creek Road. The view depicts Slug Creek Road and Slug Creek in the foreground, with southern slopes of Schmid Ridge framing the middle-ground to the north and northeast. KOP-1 provides a view of the southern edge of the proposed mine site.
- KOP-2 is approximately 1/2-mile north of the northern most Caldwell Canyon Project boundary at the junction of Blackfoot River Road and Slug Creek Road. The view from KOP-2 is to the south as seen by motorists heading south on the Slug Creek Road, and views from two year-round residences. The view depicts fenced summer grazing land in the foreground and northern slopes of Schmid Ridge as the major middle-ground feature to the south-southeast. The KOP provides a view of the northern edge of the proposed mine site.
- KOP-3 is approximately 1.3 miles southwest of the project along South Trail Road. KOP-3 faces north and represents views seen by motorists traveling northward along South Trail Road toward the junction of Slug Creek Road and Trail Creek Road. Fenced summer grazing land and associated man-made features dominate the foreground, and the western slopes of Schmid Ridge from the middle-ground and beyond.
- KOP-4 is approximately three miles east of the southeastern portion of the Caldwell Canyon Project on the Dry Valley Road. The view from KOP-4 is to the northwest with existing reclamation at the Dry Valley Mine in the foreground and treed foothills east of Schmid Ridge in the middle-ground. A small area of Schmid Ridge is visible in the middle-ground beyond the foothills. Most of the proposed mine site and the existing Dry Valley facilities are screened by the lower ridges that frame the middle-ground.KOP-5 is approximately 1/2-mile east of the northern portion of the Caldwell Canyon Project on Dry Valley Road. The view from KOP-5 is
- westward from Dry Valley Road, with open grassland and a pair of electric distribution lines framing the foreground. Treed eastern slopes of Schmid Ridge, which comprise a portion of the proposed mine area, dominate the middle-ground/background.
- KOP-6 is at the western edge of the Caldwell Canyon Project at the junction of Slug Creek Road and Caldwell Canyon Service Road. The view from KOP-6 extends east along Caldwell Canyon Service Road, with Caldwell Creek and partially fenced grazing land dominating the foreground, and Caldwell Canyon Service Road extending from the foreground to the middle-view. Caldwell Canyon, Caldwell Canyon Service Road, and the partially treed ridges framing the east and west trending slopes of the canyon dominate the middle-ground.
- KOP-7 is near the junction of the North Trail Road and Blackfoot River Road less than two miles northwest of the Caldwell Canyon Project. The view from KOP-7 extends to the southeast and represents views from a year-round residence, and motorists traveling on the North Trail Road. Fenced grazing land dominates the foreground and the northwestern slopes of Schmid Ridge frame the middle-ground.

3.10.3 Direct and Indirect Effects

Visual Simulations

Computer-generated visual simulations representing full buildout mine and mine reclamation were used to determine if facilities would degrade visual resources and meet the VRM class objective (NewFields, 2018f).

Visual Contrast Rating Worksheets

Effects on visual resources are measured using a contrast rating system that rates the extent to which activities affect the visual contrast created with the existing landscape on form, line, color, and texture (BLM, 1986b).

Viewer Sensitivity

Sensitivity levels are a measure of public concern for scenic quality. Public land is assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern. Factors considered when rating sensitivity include: type of users, amount of use, public interest, adjacent land uses, and occurrence management objectives of specially designated areas (BLM, 1986a).

3.10.3.1 Proposed Action and Alternative 1

Effects on the visual landscape character would result from removal of vegetation and exposure of soil of contrasting color and texture during construction and mining, described by KOP below.

Residents and other users of the region are accustomed to viewing existing mineral resource development but could be sensitive to increased levels of development. Residents with potential views of the mine operations are likely to have a high level of concern for scenic quality and changes in landscape characteristics. Passing motorists (e.g. along Blackfoot River Road) would likely have relatively low levels of concern for changes in landscape because the Caldwell Canyon Mine site would be within view of a motorist for a relatively brief period (NewFields, 2018f).

Intervening terrain to the west, east, south, and north of the mine site limits most of the views of the mine from publicly accessible areas. Ancillary features such as WMPs, the Slug Creek Road power line, and the Dry Valley Mine facilities would be visible from publicly accessible viewpoints only in the background distance (NewFields, 2018f).

KOPs

Once reclamation of the North and South pits has matured, it would appear similar to pre-mining slopes and contours. Grading and recontouring would eliminate angular features and blend the surface with adjacent terrain where practicable. All areas except for the pit wall at the north end of the North Pit, would be revegetated and would eventually appear natural. Concurrent reclamation is expected to be revegetated (although still visible) within three years of completion of the mining in that area. Over time, as the vegetation returns, the changes would become less visible and may more closely resemble naturally occurring surfaces in the surrounding area (P4 Production, 2017).

The visual contrast created by the Caldwell Canyon Project and long-term reclamation and closure of the Caldwell Canyon Project would not exceed the visual contrast within the VRM Class IV designation on public land tracts (NewFields, 2018f). Overall, effects due to reclamation and closure would be localized, long-term, and negligible to moderate.

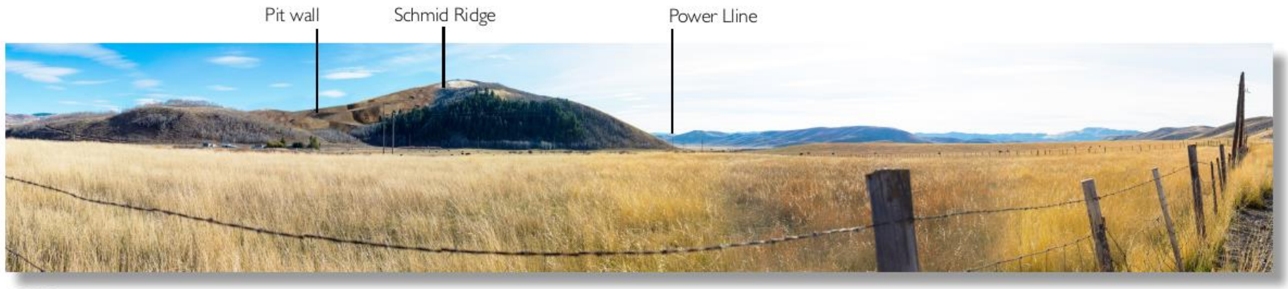
From all KOPs, the visual contrast rating evaluations indicated structures would have no effect on form, line, color, or texture.

Visual Simulation KOP- 1. Mine Development

KOP 1
Mine Development Simulation

KOP-1 – Looking northeast, the south end of the South Pit would be visible in the background during Phases 2 and 3 (years 4 through 9). The power line would be visible for the life-of-mine. The visual contrast rating evaluation showed the long-term contrast effects from changes in land would be weak on form and line and changes in vegetation would be moderate on form and line. Contrast from changes in land and vegetation would be weak on color and texture.

Visual Simulation KOP- 2. Mine Development



KOP 2
Mine Development Simulation

KOP-2 – The North Pit would be visible in the background from a limited portion of the Blackfoot River Road, Slug Creek Road, and Dry Valley Road during phases 6, 7, 8, 9, and 10 (years 16 through 40). The power line would be visible for the mine life. The visual contrast rating indicated the long-term contrast effects from changes in land and vegetation as moderate on form and line and weak on color and texture.

Visual Simulation KOP- 3. Mine Development

KOP 3
Mine Development Simulation

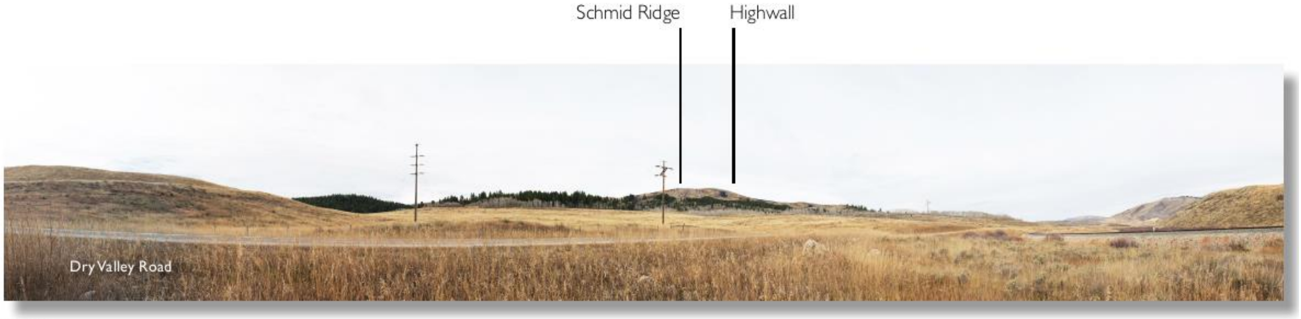
KOP-3 – Looking north, the disturbances at the southern end of the South Pit would be visible in the background distance zone during phases 2 and 3 (years 4 through 9). The power line would be barely visible. The visual contrast rating showed long-term contrast effects from changes in land would be weak on form and changes in vegetation would be moderate on form, contrast in line, color and texture would be weak from changes in land and vegetation.

Visual Simulation KOP- 4. Mine Development

KOP 4
Mine Development Simulation

KOP-4 – Looking northwest to the east side of the South Pit, topography would limit the view of the pit. The Dry Valley Mine facilities would continue to be largely screened from view by land forms in the foreground. A segment of the North Pit pit wall would be barely visible in the background during phases 6, 7, 8, 9, and 10 (years 16 through 40) and following post-mining reclamation (NewFields, 2018f). The visual contrast rating indicated weak, long-term, contrast from land and vegetation changes on form, line, color and texture. At reclamation, the steep rock pit wall in the North Pit would not receive final grading and would be permanently, but barely visible (130 acres).

Visual Simulation KOP- 5. Mine Development



KOP 5
Mine Development Simulation

KOP-5 – The North Pit would be visible, including the North Pit pit wall in the middle/background during mining in phases 6, 7, 8, 9, and 10 (years 16 through 40) and following post-mining reclamation. The visual contrast rating indicated weak, long-term, contrast effects from changes in land and vegetation on form, line, color and texture. At reclamation, the steep rock pit wall remnants in the North Pit would be permanently, but barely visible (130 acres).

Visual Simulation KOP- 6. Mine Development

KOP 6
Mine Development Simulation

KOP-6 – Widening of the existing Caldwell Canyon Service Road would create strong contrast with landforms and vegetation during the pre-mining phase until reclamation is complete (NewFields, 2018f). The visual contrast rating evaluation indicated moderate, long-term, contrast effects from changes in land and vegetation on form, line, color and texture. Reclamation of the Caldwell Canyon Service Road would reduce the road width to near original condition and visual contrast (NewFields, 2018f).

Visual Simulation KOP- 7. Mine Development

KOP 7
Mine Development Simulation

KOP-7 – A very small exposure of a portion of the North Pit would be visible in the background distance zone during phases 9 and 10 (years 33 through 40). The power line would be barely visible for the life-of-mine. The visual contrast rating evaluation indicated weak, long-term, contrast effects from changes in land and vegetation on form, line, color, and texture.

3.10.3.2 No Action Alternative

No new visual disturbances would occur. The Dry Valley Mine D Pit (although largely screened from view at KOP-4) would not be backfilled and would remain open.

3.10.4 Cumulative Effects

The cumulative effects analysis area for visual quality is the same analysis area used for direct and indirect effects, which was defined to include key viewing areas, or all travel corridors, key vista points, recreation areas, and residential areas where the Caldwell Canyon Project would be visible to the public (**Figure 32**).

3.10.4.1 Proposed Action and Alternative 1

The Dry Valley Mine is the only action within the cumulative effects analysis area for visual quality that contributes cumulative effects. The current effects that the Dry Valley Mine has on the visual quality from KOPs are considered in the affected environment and the direct and indirect effects sections above. There would be no additional cumulative effects.

3.10.4.2 No Action Alternative

Because there would be no new visual disturbances, there would be no cumulative effects.

3.11 Transportation

3.11.1 Analysis Area

The transportation analysis area (**Figure 33**) includes the Caldwell Canyon Project and surrounding publicly accessible roads that provide access to and from the Caldwell Canyon Project.

3.11.2 Affected Environment

The transportation network includes State Highway 34 and U.S. Highway 30. These highways converge in Soda Springs, Idaho for approximately six miles until the “Y” intersection where State Highway 34 continues south, and U.S. Highway 30 continues west (NewFields, 2015g).

From State Highway 34, access is via two main access routes: (1) from the north via Blackfoot River Road and (2) from the south from North Trail Road via Trail Canyon Road. Access from the north extends from State Highway 34 along Lanes Creek Road and Blackfoot River Road (distance of approximately 18 miles). Access from the south near U.S. Highway 30 extends more than 17 miles from Georgetown Canyon Road/Slug Creek Road (NewFields, 2015h). Direct access from the east is limited and consists mainly of a network of National Forest roads beyond Dry Valley Road and Diamond Creek Road which are maintained for Forest Service-related use (NewFields, 2015h).

Ground-based access to BLM public lands is available only through private land with permission. Currently, the private land owners do not allow access across their land, so no public access is available.

Caribou County maintains the paved Blackfoot River Road, Slug Creek Road, and Dry Valley Road and the gravel surfaced Slug Creek Road.

Road Use

Table 34 depicts the Idaho Department of Transportation regional average annual daily traffic (AADT) for 2013.

Table 34. Idaho Department of Transportation 2013 Regional AADT Counts

Location	AADT Counts for 2013	Location	AADT Counts for 2013
State Highway 34		**U.S. Highway 30**	
Soda Springs	1,900	Montpelier	3,700
Conda	2,100	Georgetown	2,900
Freedom	360	Soda Springs	2,900
Wayan	300	McCammon	4,300

Source: (NewFields, 2015h)

Figure 33. Transportation Analysis Area

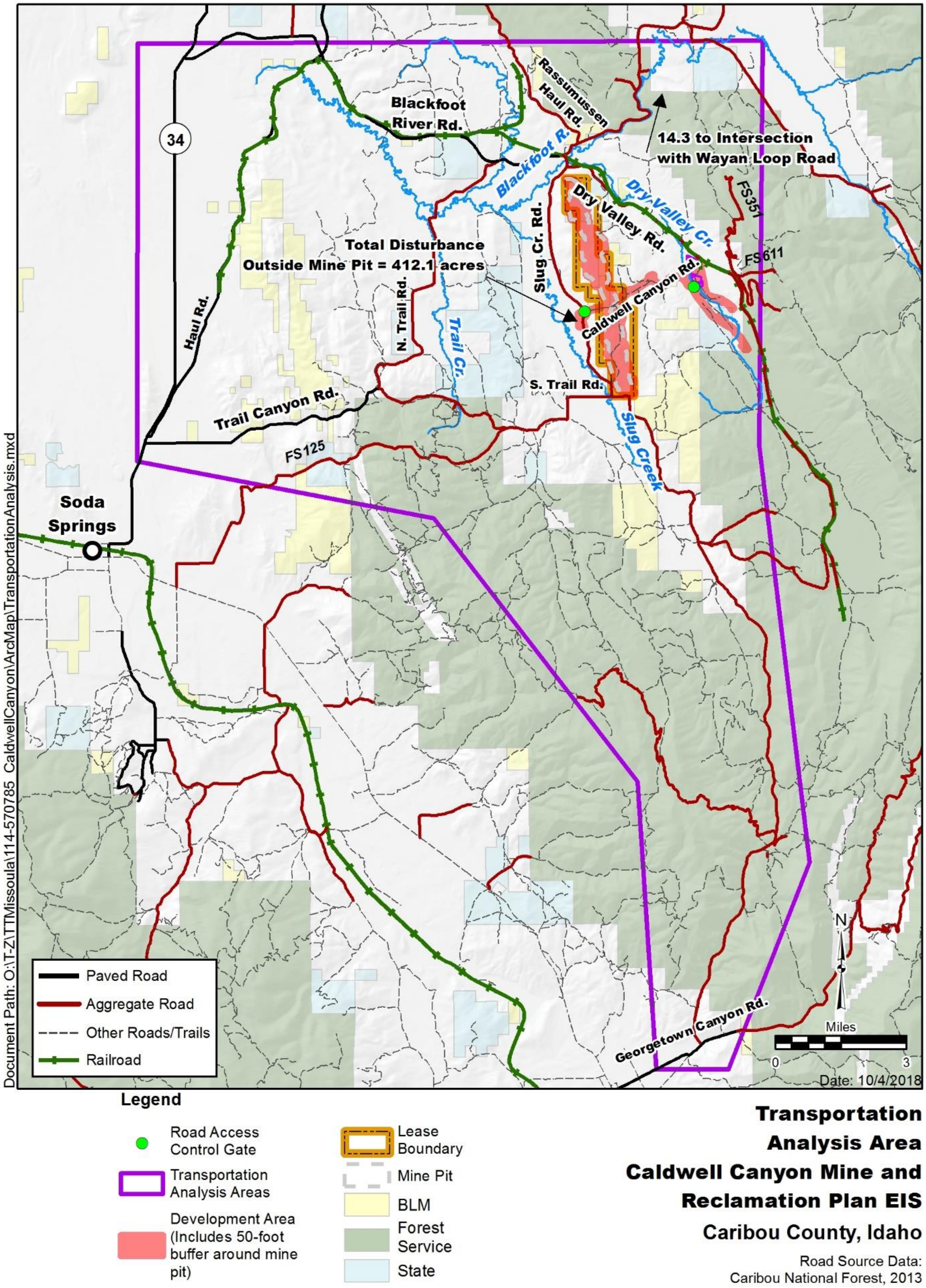


Table 35 shows the Idaho Transportation Department (ITD) data for road use from 2012 (ITD, 2014). No AADT count data was available for the Dry Valley Road.

Table 35. ITD 2012 Average Annual Daily Traffic Counts

Road Name	Total	Passenger Car	Commercial Vehicles
Trail Canyon Road (5.8-mile segment) from the junction of North Trail Road to State Highway 34	140	120	20
North Trail Road (8.9-mile segment) from the junction of Blackfoot River Road to junction of Trail Canyon Road/South Trail Road	130	100	30
South Trail Road (6.5-mile segment) from the junction of Slug Creek Road west to junction of Trail Canyon Road/North Trail Road	70	60	10
Blackfoot River Road (8.9-mile segment) from the junction of North Trail Road west to State Highway 34	30	20	10
Blackfoot River Road (17.6-mile segment) from the junction of Slug Creek Road east past the Narrows and north to the juncture of Wayan Loop Road	70	60	10
Slug Creek Road (6.3-mile segment) from the junction of Blackfoot River Road to South Trail Road	30	20	10
Georgetown Canyon Road (17.7-mile segment) from junction of South Trail Road south to Georgetown Canyon Road near U.S. Highway 30	140	140	0

Source: (ITD, 2014)

Existing traffic is likely related to dispersed recreational use of nearby publicly-managed land and local agricultural/grazing use and mining. Short-term increases in local traffic may coincide with designated hunting seasons and/or to support cattle grazing activities.

The Forest Service reports that the Trail Canyon Road, South Trail Road, and Georgetown Canyon Road (southern portion of Slug Creek Road) that connect to U.S. Highway 30 farther south, have the highest road use, particularly for access to local off-highway-vehicle trails (Trail Canyon Recreation Area) and to access big-game hunting opportunities in the fall.

Rail Transportation

Within the transportation analysis area, the Union Pacific Railroad maintains a feeder rail system that extends from State Highway 34 east towards the Dry Valley Mine (partially following the Blackfoot River Road), which provides service to mining operations in the area (NewFields, 2015g). The railroad was used for the Dry Valley Mine until August of 2011. The portion of the rail line servicing the Rasmussen Ridge mines via the Woolly Valley tipple is still in service.

3.11.3 Direct and Indirect Effects

3.11.3.1 Proposed Action and Alternative 1

This analysis assumes that of the approximately 185 employees, half of them would carpool (two people per car, 46 vehicles) and the other half (93) would drive their own vehicles (Leatherman, 2017), and they would travel primarily from Soda Springs, Idaho via State Highway 34 to the Caldwell Canyon Project via the two main access routes, each day.

Construction and mining equipment mobilized to the Caldwell Canyon Project site would occur as needed and not increase traffic substantially. This equipment is moved slowly and would not likely contribute to accidents.

Total traffic on State Highway 34 would increase by approximately 139 vehicles (7.3 percent over 2013 levels, **Table 34**). Total AADT on the Blackfoot River Road and Slug Creek Road would increase from an estimated 30 vehicles per day to 169 vehicles per day during mining operations.

A relatively small amount of equipment and passenger vehicle traffic would be added to the AADT. The number of traffic accidents may increase slightly. Overall, the Caldwell Canyon Project would have short-term and negligible to minor effects on motorists at the regional and local scales.

Following the cessation of mining activities, the Caldwell Canyon Service Road would be reclaimed to leave a 25-foot wide double-track road (including berm) that would connect with the double-track road re-established during reclamation of the East Caldwell Area Haul Road. As is the current condition, public access would only be available through private land with permission. Caldwell Canyon Project related traffic on regional and local roadways would cease; effects to motorists would no longer occur.

Rail traffic at the Dry Valley tipple would increase to two train trips per day (one round trip), from the current non-use. Rail transportation would cross county roads twice between Caldwell Canyon and Soda Springs where the crossings are regulated with warning signs, signals, and stop signs (**Appendix B**, **Section B.15.8**). The increase in rail traffic would have localized, short-term, and negligible to minor effects on motorists.

3.11.3.2 No Action Alternative

No increase in regional and local traffic would occur on roadways, therefore, no impacts on transportation.

3.11.4 Cumulative Effects

The cumulative effects analysis area for transportation is the area used for the direct and indirect impacts (**Figure 32**). Past actions have produced the affected environment that was analyzed in the direct and indirect impacts, but these actions are no longer contributing to the traffic volume, railroad, or safety concerns.

3.11.4.1 Proposed Action and Alternative 1

Projects in progress are already accounted for in the transportation affected environment. As Caldwell Canyon would not be using public roads for hauling ore, there would not be any cumulative ore hauling impacts. Additional traffic from workers and equipment traveling to the site would be added to other traffic and would increase the overall number of trips and potential for vehicle accidents.

3.11.4.2 No Action Alternative

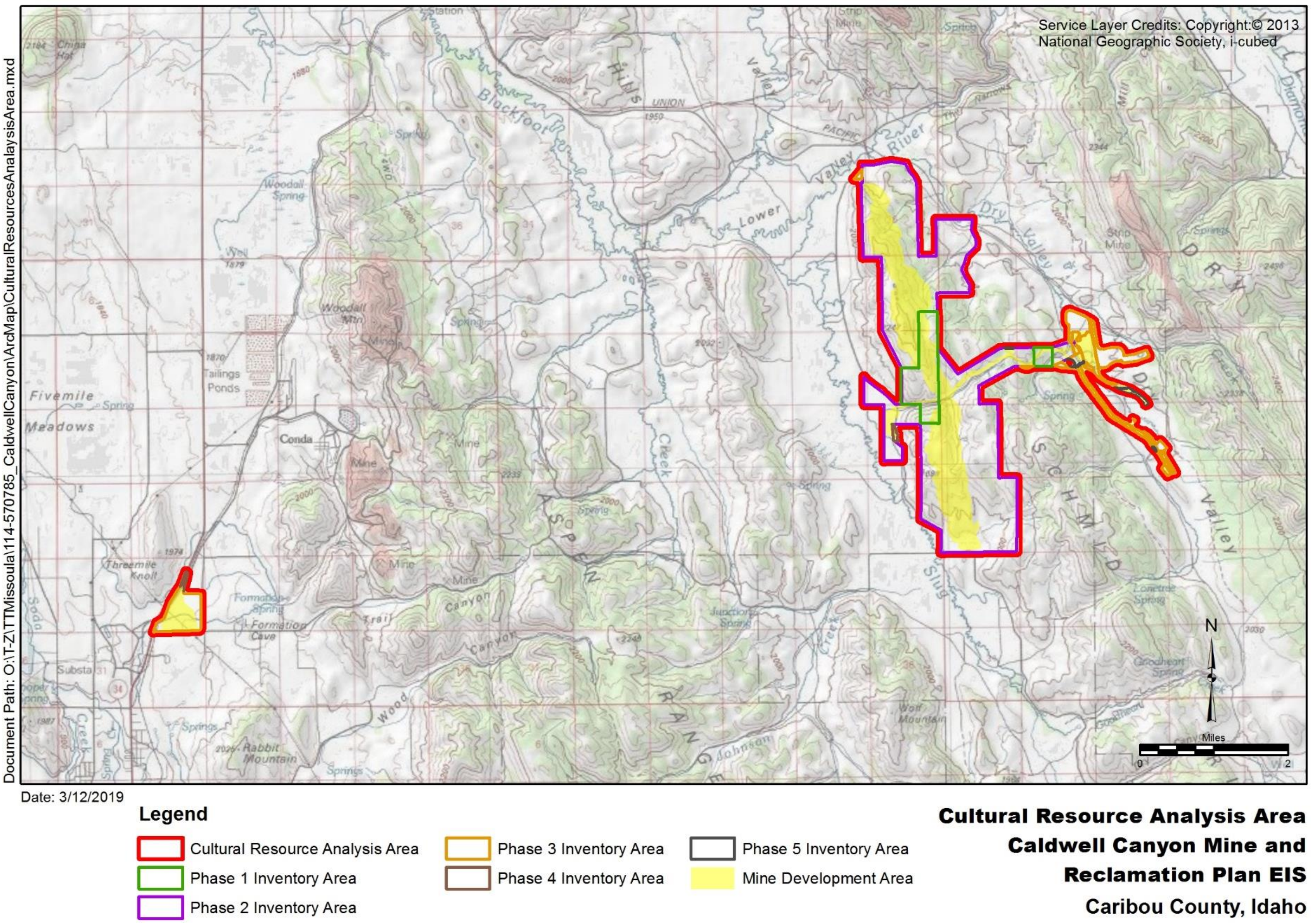
There would be no impacts on transportation, therefore, there would be no cumulative effects.

3.12 Cultural Resources

3.12.1 Analysis Area

The cultural resource analysis area totals 2,055 acres (**Figure 34**).

Figure 34. Cultural Resource Analysis Area



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Date: 3/12/2019

3.12.2 Affected Environment

Desert West Environmental conducted five class III cultural resource inventories (phases 1, 2, 3, 4, and 5) for the Caldwell Canyon Project in 2014, 2015, 2017, and 2018 (Desert West Environmental, 2014a; Desert West Environmental, 2014b; Desert West Environmental, 2016; Desert West Environmental, 2017; Desert West Environmental, 2019). In total, 2,078.5 acres were inventoried

Pre-field levels 1 and 2 research (of the cultural resource analysis area and a surrounding one-mile buffer) included Idaho State Historic Preservation Office record searches, and review of historical overviews, the National Register of Historic Places, General Land Office plat maps, and historic topographic maps. Research identified 12 archaeological sites. The Level 3 pedestrian cultural resource inventories identified an additional 15 archaeological sites. Of the 27 identified archaeological sites, 21 occur in the cultural resource analysis area (**Figure 34**). These sites were either recorded for the first time or revisited and documented.

Site 10CU457, the Anaconda Copper Mining Company Railroad (of the Union Pacific Railroad), has been determined eligible for the National Register of Historic Places listing under Criterion A as the site is associated with events that made a significant contribution to our history.

Two eligible prehistoric lithic scatters, 10CU086 and 10CU434, were identified by Desert West Environmental in 2014 outside the areas to be disturbed. These sites qualify for the National Register of Historic Places listing under Criterion D, for their ability to potentially contribute important information to prehistory.

3.12.3 Direct and Indirect Effects

3.12.3.1 Proposed Action and Alternative 1

Eleven cultural sites were identified. Of the 11 sites, 10 have been determined to be not eligible for listing on the National Register of Historic Places and do not require special protection or mitigation under the National Register of Historic Places. Site 10CU457, the Anaconda Copper Mining Company Railroad (of the Union Pacific Railroad), occurs in the rail loop area where a single-track rail bed and rails would be constructed to tie the rail loop to the existing Union Pacific Railroad. Although the existing railroad follows its historic route, this railroad is still in use and has undergone regular maintenance and safety upgrades. As such, the Union Pacific retains integrity of location, setting, and association, but integrity of feeling, design, workmanship, and materials have been compromised by modern maintenance (BLM, 2018). Approximately 200 feet of existing sub-ballast, ballast, rail ties, and rail would be modified; however, these features are out of period and do not retain integrity. Because project modifications would not alter the railroad’s historic route or established purpose, the integrity of Site 10CU457 would not be diminished.

To avoid adverse effects to the lithic scatters outside the disturbed areas, the East Caldwell Area Haul Road was rerouted to be more than 200 feet north of the significant properties, sites 10CU86 and 10CU434, effectively protecting these properties from activities. The Caldwell Canyon Project would have no adverse effect on these significant properties.

Reclamation and closure activities would also have no direct or indirect effects on historic properties identified in the cultural resource analysis area.

3.12.3.2 No Action Alternative

Under the No Action Alternative, the Caldwell Canyon Project would not be developed, and there would be no effect on known historic properties.

3.12.4 Cumulative Effects

The cumulative effects analysis area for cultural resources is an area within one mile of the proposed disturbed areas (**Figure 9**).

3.12.4.1 Proposed Action and Alternative 1

The Anaconda Copper Mining Company Railroad (10CU457) has been affected by past and present railroad maintenance activities that have compromised integrity of feeling, design, workmanship, and materials. These activities are anticipated to continue in the future but would not diminish the property's overall integrity and National Register of Historic Places eligibility. Sites 10CU086 and 10CU434 (lithic scatter), would not be affected, so there would be no cumulative effects.

3.12.4.2 No Action Alternative

As there would be no direct or indirect effects on cultural resources from the No Action Alternative, there would be no cumulative effects.

3.13 Tribal Treaty Rights and Interests

3.13.1 Analysis Area

The tribal treaty rights and interests analysis area includes 260 acres of unoccupied BLM public land within the Caldwell Canyon Project area.

3.13.2 Affected Environment

The Caldwell Canyon Project occurs within the traditional territory of the Shoshone and Bannock Tribes. The 1868 Fort Bridger Treaty (Kappler, 1904), between the Shoshone-Bannock Tribes and the U.S., reserves the Tribes' right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied Federal lands. Unoccupied land, a term common to treaties negotiated in the mid-1800s, refers to public domain land held by the U.S. that had not been fenced or claimed through a land settlement act. Today, the term applies to land remaining in the public domain for the purposes of hunting, gathering foods, grazing livestock, or trapping.

The federal government has an obligation to protect and preserve treaty rights, specifically to consider and consult on potential effects on natural resources related to the tribal treaty rights or cultural use. Shoshone-Bannock Tribes and BLM staff-to-staff consultation began in November 2014, and in a letter dated May 8, 2017, the Tribes expressed concerns regarding the Caldwell Canyon Project impacts to treaty-reserved rights, cultural resources, and natural resources including, air, water, soil, plants, wildlife, and the visual landscape.

3.13.3 Direct and Indirect Effects

3.13.3.1 Proposed Action and Alternative 1

Treaty Rights

Of the 260 acres of BLM public land within the Caldwell Canyon Project Lease Area, 153 acres would be directly affected and become temporarily occupied by the mine pit development, Caldwell

Canyon Service Road construction or area use for growth media stockpiles. For safety reasons, access and public use of the Federal land would be temporarily restricted, including use for exercising Treaty rights. There is no plan to fence off the mining area and prevent tribal access to BLM-administered public land, although access for vehicles would be restricted by gates on private property. The use of gates to restrict vehicle access does not constitute an access change, as currently, permission is needed to drive through private land to access BLM-administered public land. During the life of the mine, disturbance acres on BLM-administered public land would not be available for traditional tribal use and treaty rights since these acres would be directly affected for 42 years (includes reclamation).

After reclamation and closure, the 153 acres of previously disturbed federal land would be available to the Shoshone-Bannock Tribes by surface access across private property after obtaining permission from the private landowners to cross their land, a requirement that effectively restricts access.

Treaty rights may also be indirectly affected by the change of vegetation types from Conifer/Aspen to Native Grassland/Forbs or a Mixed Shrub vegetation type. Big game that prefer a Conifer/Aspen habitat/vegetation type may not use portions of the 153 acres of BLM-administered public land and other portions of the mine as they did before mining due to the change in vegetation. However, concurrent reclamation will ensure timely revegetation and restoration of habitat. Over time the restored lands will supply forage and services to big game and other wildlife in the manner and levels described in **Section 3.9.3.1**. Animal numbers are not expected to change drastically within the mine site, except during the approximately 6 years when sequential mining activities remove all vegetation from the active mine area until reclamation results in revegetation. Even if changed, vegetation types do affect big game numbers on the mine area. The abundance of similar big game habitat/vegetation types near the Caldwell Canyon Project should provide adequate opportunities for the Shoshone-Bannock Tribes to exercise their rights to hunt, fish, gather, and conduct other traditional uses and practices on unoccupied public lands making these short-term effects negligible.

Indirect effects to tribal treaty rights would include increased travel time to public land in the Caldwell Canyon Project vicinity because of restricted road access and increased traffic from mining. Traffic volume on the Blackfoot River Road, Slug Creek Road, Dry Valley Road, and Caldwell Canyon Service Road is expected to increase. A gate near the intersection of the Slug Creek Road and Caldwell Canyon Service Road would restrict public access to the Caldwell Canyon Project and Caldwell Canyon Service Road. These effects would be short-term and negligible as the quantity of disturbed public land is relatively low compared to nearby open public land. After mine closure, the traffic volume on roads surrounding and within the former mine area would likely return to pre-mine conditions. Impacts to natural resources and resources of cultural significance to Tribal members, including diminishing or destroying the traditional value of the land, is an effect on Tribal members' natural resource and traditional activity use under the Fort Bridger Treaty of July 3, 1868.

Cultural Resources

Consultation between the BLM and the Shoshone-Bannock Tribes did not identify any Traditional Cultural Properties that may be affected by the Caldwell Canyon Project. Two prehistoric lithic scatters (10CU86 and 10CU434) eligible for the National Register of Historic Places were identified near (but not within) the mine disturbance areas.

Natural Resources

The quality and quantity of natural resources, traditional hunting, fishing, and gathering areas may be affected. For a complete discussion on the Caldwell Canyon Project natural resources effects, refer to **Section 3.4** for water; **Section 3.5** for air; **Section 3.7** for soil; **Section 3.8** for vegetation, wetlands, and riparian areas; **Section 3.9** for wildlife; and **Section 3.10** for visual quality. Given the minor extent of the public lands that would be directly affected, these effects would be negligible.

Reclamation of roads and stockpiles would eventually result in reduced road widths (Section 2.1.6) s and a conversion to Native Grassland/Forbs vegetation or Mixed Shrub vegetation types. Natural reestablishment of the pre-disturbance Conifer/Aspen vegetation type would be long term (see **Section 3.9.3.1**).

3.13.3.2 No Action Alternative

Impacts on important natural resources or the Shoshone-Bannock Tribe’s ability to exercise inherent and treaty-reserved rights on unoccupied land, or cultural resources would not occur; therefore, there would be no impacts to tribal treaty rights and interests from the No Action Alternative.

3.13.4 Cumulative Effects

The cumulative effects analysis area for tribal treaty rights and interests is the Southeast Idaho Phosphate District (**Figure 10**). Past actions in the cumulative effects analysis area for tribal treaty rights and interests include currently active mines and previous mining that is now inactive.

3.13.4.1 Proposed Action and Alternative 1

Past mining disturbances have removed vegetation that is important to the Shoshone-Bannock Tribes, and reduced water quality through selenium and other COPC contamination, although IDEQ concluded human health is not at risk (IDEQ, 2004). Past and present activities have disturbed areas within the cumulative effects analysis area. Removal of vegetation has modified or eliminated wildlife habitat, particularly where it is not yet reclaimed, or reclamation has not matured. Reasonably foreseeable activities (including the Caldwell Canyon Project) would have similar effects on vegetation and wildlife habitat, except that reclamation for newer disturbances would likely consider emphasizing the plants that are important to the tribes and include them in reclamation plans and monitoring. Like the Caldwell Canyon Project, aspen or conifer habitat removed during mining, a small percentage of the overall disturbance, would likely never return to aspen or conifer habitat.

Current regulations regarding water quality are intended to assure that recently approved and reasonably foreseeable mining would not be permitted unless it is demonstrated that water quality standards would be met and water quality is protected. Legacy mines exhibiting unauthorized releases of COPCs are being remediated resulting in improved water quality in the cumulative effects analysis area; new mining operations would be designed to meet water beneficial uses. The proposed mine cap and final selection of plant species for reclamation would ensure that Tribal members will have access to uncontaminated water and culturally important natural resources for hunting, gathering and other protected Treaty Rights use post mining.

Consultation between the BLM and the Shoshone-Bannock Tribes is ongoing and will include discussions of ways to minimize future impacts and reduce effects from past activities.

3.13.4.2 No Action Alternative

As there would be no direct or indirect effects on the Shoshone-Bannock Tribes tribal treaty rights and interests from the No Action Alternative, there would be no cumulative effects.

3.14 Social and Economic Conditions

3.14.1 Analysis Area

The social and economic analysis area is Caribou, Bear Lake, and Bannock counties, Idaho. While a small percentage of the workforce resides in Franklin County, this county is not considered in the analysis area because the percentage is small. The impacts in these counties from the Caldwell Canyon Project on employment and tax revenue would result from extending the mining and operations for approximately 40 years.

3.14.2 Affected Environment

Employment and Income

P4 Production employs 185 people in the mining operations (Leatherman, 2017). In 2014, the Soda Springs operation's (including the processing plant) payroll and benefits was approximately $43.7 million and the average pay for P4 Production employees is $64,330 annually (P4 Production, 2017). Employees reside in Caribou County (51 percent), Bannock County (28 percent), Bear Lake County (15 percent), and Franklin County (4 percent) (Monsanto, 2018).

The U.S. Census Bureau conducts a complete census survey every ten years and projects the changes in employment, income, and earnings in the Annual Community Survey. Based on the 2010 census and the Annual Community Survey, the U.S. Census Bureau estimated the 2016 Caribou, Bear Lake, and Bannock counties employment and income levels listed in **Table 36**.

Table 36. 2016 Caribou, Bear Lake, and Bannock Counties Estimated Employment and Income

Metric	Caribou	Bear Lake	Bannock
Number employed more than 35 hours per week (full time)[1]	2,332	1,759	27,614
Number employed 15 to 34 hours per week (part time)[1]	613	644	10,459
Median Household Income[2]	$57,957	$46,863	$45,216
Average Household Earnings*[3]	$69,916	$55,003	$60,015

Source (Headwaters Economics, 2018a)

1 Labor Participation Characteristics, 2016* table.

2 Household income Distributions, 2016. The amount where half the households have more income and half have less.

3 Mean Annual Household Earnings by Source, 2017 (2016$)

* Earned through paid labor, excludes Social Security, retirement, Supplemental Security Income, and public assistance.

The "multiplier effect" is an indicator of values as goods and services move through the local or regional economy. Monsanto reports that they spend about $115 in Idaho, which has an indirect (multiplier) effects of $230 million in economic impact on the state (Monsanto, 2018).

Property Taxes

P4 Production paid property taxes to Caribou County of approximately $1.6 million in 2014 and $1.4 million in 2016 (Monsanto, 2018) and approximately $572,000 for annual licenses and permits. Payments to Idaho vendors in 2014 were approximately $73 million (P4 Production, 2017). P4

Production does not own property in Bannock or Bear Lake counties. Counties receive revenue from property taxes, fees, and permits. The Soda Springs Joint School District #150 reports the school district received $314,178 in property taxes from P4 Production in 2017. Employees and contractors who reside in Caribou, Bear Lake, and Bannock counties also pay property taxes on their properties in these counties. Secondarily, counties receive revenue from employees who pay property taxes on their real estate and personal property.

Production Royalties

Production royalties are paid each month for minerals that are removed from the leased land, based on a percent of the value of the production. P4 Production paid $3.1 million in royalties in 2016 to federal and state governments. All of the phosphate mines in Idaho together paid $10.1 million in royalties in 2016, which is down from $10.4 million paid in 2015 (ONRR, 2017). Per the Idaho Mine License Tax, phosphate mines pay tax to the State of Idaho at a rate of one percent of the value (royalty) received from mining.

The federal government returns about 50 percent of the Federal royalties collected to the state. Ten percent of this amount is earmarked for distribution to the county where the mining occurred. Production royalties paid to the State of Idaho from state phosphate leases are returned to the endowment fund or the general fund, depending on the land leased.

Grazing

Two BLM grazing allotments contain a portion of the Caldwell Canyon Lease Boundary and a portion of the requested lease modification parcels. Each has two grazing leases within the project ground disturbance area. P4 Production holds both grazing leases. One lease allows 34 Animal Unit Months (AUM) and the other, 44 AUM. Both are allocated by BLM for custodial use which means they occur on public land that is intermingled with other private land.

3.14.3 Direct and Indirect Effects

3.14.3.1 Proposed Action and Alternative 1

Employment and Income

Approximately 185 direct and contract employees would continue to work at the mine for the approximately 40-year mine life. The Soda Springs processing plant would continue to employ 585 workers for at least the duration of the mine. Miners would move from current mining operations at the Blackfoot Bridge Mine as operations cease and mining progresses at the Caldwell Canyon Mine. Minor, temporary (up to one year) increases in employment may occur as the Caldwell Canyon Mine infrastructure is developed. Unless a new mine is opened in the future, or a new source of phosphate ore is obtained, employment and income would taper off in about 42 years as reclamation and closure activities are completed.

Indirectly, an unquantified portion of the phosphate ore produced by P4 Production might be used at other phosphate processing plant(s) which would support employment at those plant(s) and subsequent income.

Impacts from the continued employment and income would be positive, regional, and moderate over the term of the 40-year mine life.

Property Taxes

P4 Production would continue to pay property taxes to Caribou County at a rate similar to the recent past ($1.4 million in 2016) for a total of approximately $59 million over the 42-year life (initiation through closure) of the Caldwell Canyon Project (not counting any changes in property value assessment or levies). Employees would retain ownership of their homes and personal property, maintaining the property taxes at approximately the current level to the counties where they reside.

At closure, property taxes would continue to be paid and would taper off as facilities are removed and the area is reclaimed. Eventually the property tax would stabilize.

Impacts from the continued payment of property taxes, would be positive, regional, and moderate over the term of the 40-year mine life.

Production Royalties

The Caldwell Canyon Project would extend the timeframes of overall ore production (production is currently from the Blackfoot Bridge Mine), but not increase the annual rate of production. Therefore, P4 Production would continue to pay royalties in approximately the same amount as the recent past (about $2 million to $3 million per year) (P4 Production, 2017). Over the 40 years of projected production, a total of from about $80 to $120 million would be paid to the state and federal government in royalties. Royalties would cease once mining concludes.

The Idaho Mine License Tax paid to the State of Idaho, based on one percent of the royalty paid to the federal government, would be $800,000 to $1.2 million per year ($32 to $48 million over life of mine).

Impacts from the continued payment of production royalties would be positive, regional and statewide, and moderate over the term of the 40-year mine life.

Grazing

For both action alternatives, short-term grazing availability on public land would be affected in phase 6, 7, and 8 by expansion of mine facilities onto grazing leases held by P4 Production. This would cause short-term minor to moderate reductions of 78 allocated AUMs for the leases proportionate to the land area affected. P4 Production would not likely request a reallocation. Impacts on grazing would be negligible, localized, and short-term.

3.14.3.2 No Action Alternative

Employment and Income

Future employment of approximately 185 people would cease when current mining operations at the Blackfoot Bridge Mine are completed starting in 2022, as would their associated income. The loss of 185 full-time and part-time employees and the percentage of the total employment in 2016 is shown in **Table 37**. Within the three-county analysis area, this amounts to less than 0.5 percent of the total employment, a long-term, moderate impact. When considering the populations of just Caribou and Bear Lake counties, where 96 percent of the mine employees reside, the 146 P4 Production employees lost would be close to 3 percent of the population. Many may leave the area, reducing employment in these counties.

Table 37. 2016 Employment and Income, Caribou, Bear Lake, and Bannock Counties

Metric	Caribou 2016	Bear Lake 2016	Bannock 2016
Number employed more at least 15 hours per week (**Table 36**)	2,945	2,403	38,163
Share of P4 Production Employees by County	51%	28%	4%
Estimated Number of P4 Production employees in mining based on percentage of total (Monsanto, 2018)	94	52	7
Percent of Total Employees by County (15 hours per week or more)	3%	1%	>1%

Sources (Headwaters Economics, 2018a; Monsanto, 2018)

Property Taxes

The majority of the property taxes P4 Production pays are for the Soda Springs processing plant. Under the No Action Alternative, for P4 Production to continue operation of the plant, phosphate ore would need to be acquired from another mine, or other external ore source. For the foreseeable future, the Soda Springs processing plant could remain operational and property taxes would continue to be paid at current rates.

Not mining the Caldwell Canyon lease would have no direct impacts on the acres of public land and no impact on the payment in lieu of taxes.

Other mining and processing plant operations in the area are fully staffed, indicating that the loss of jobs for mining would require employees to find employment outside the phosphate industry. If these employees leave the area, the property taxes paid to the counties may be reduced if the migration results in reduced property values. This would result in a long-term, moderate impact.

Production Royalties

No production royalties or Idaho Mine License Tax would be paid to the federal government or the State of Idaho. This loss would be short-term and moderate.

Grazing

There would be no changes to the current grazing allocations and no reduction in AUMs, resulting in no impacts to the economic benefits of the grazing allotments.

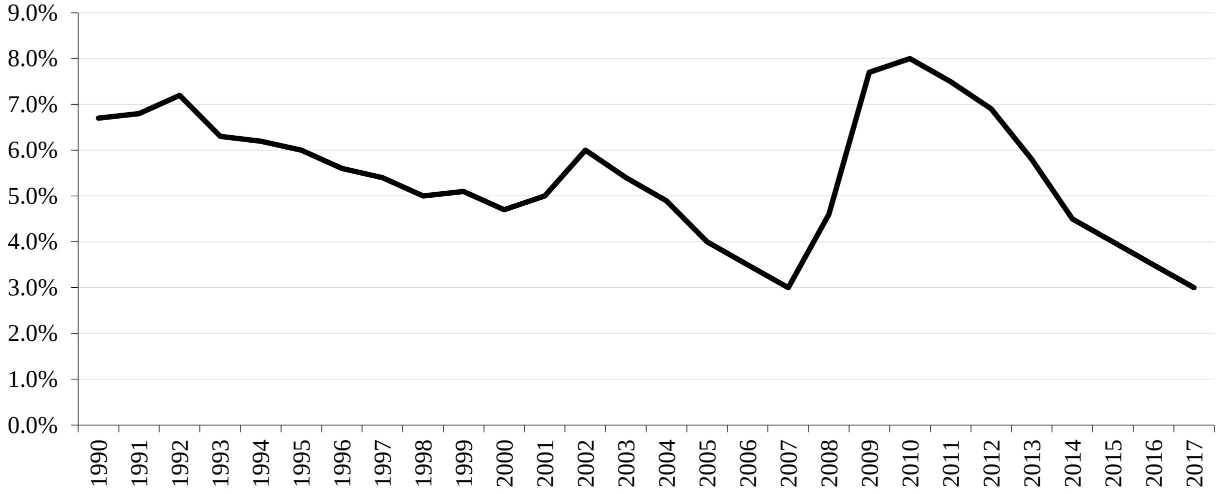
3.14.4 Cumulative Effects

The analysis area for cumulative effects on social and economic conditions is the same as the direct and indirect effects analysis area. While past action in Caribou, Bannock, and Bear Lake counties has established the current conditions, projects that are completed are not contributing cumulative effects any longer. Actions that are occurring now are contributing to the employment, income, and tax revenue in the counties.

3.14.4.1 Proposed Action and Alternative 1

The three-county region’s unemployment varies over time and is decreasing since 2011 (**Figure 35**).

Figure 35. Average Annual Unemployment Trend in Combined Caribou, Bear Lake, and Bannock Counties



Source: (Headwaters Economics, 2018b)

Present and reasonably foreseeable mining actions (if approved) are designed and scheduled to maintain the operations of the phosphate processing plants in Soda Springs and Pocatello. Therefore, the cumulative effects would be to maintain the employment and income, property taxes paid to the counties, and royalties paid by all phosphate mines in the State of Idaho, as described in the Affected Environment, **Section 3.14.2**.

3.14.4.2 No Action Alternative

Compared to the unemployment trend (**Figure 35**), the change would represent a loss of less than 0.5 percent, which is within the range of variation that the area has experienced in the last 30 years. There would be no direct and minimal indirect impacts on property taxes or royalties and there would not be any cumulative effects.

Chapter 4
Consultation and Coordination

4.1 Consultations

4.1.1 Tribal Treaty Rights and American Indian Tribal Consultation

Federal trust responsibility arises from treaties, statutes, executive orders, and the historical relations between the U.S. and American Indian Tribes. The government has a unique trust relationship with federally recognized American Indian Tribes, such as the Shoshone-Bannock Tribes.

The Fort Bridger Treaty of 1868 reserves the Shoshone-Bannock Tribes' right to hunt, fish, gather, and exercise other traditional practices and uses on unoccupied federal lands. The Shoshone-Bannock Tribes also have the right to graze tribal livestock and cut timber for tribal use on those unoccupied federal lands of the original Fort Hall Reservation that were ceded to the federal government in the agreement of February 5, 1898 (Kappler, 1904).

Federal agencies consult on potential effects to tribal rights, uses, and interests. Government-to-government consultation between the Shoshone-Bannock Tribal Council and the BLM Idaho Falls District Manager was undertaken regarding activities that could affect the exercise of tribal rights. Coordination continues with tribal staff and the government-to-government consultation process is ongoing among the agencies and the Shoshone-Bannock Tribes.

The BLM met several times with tribal staff over the years beginning on November 18, 2014 to present the Caldwell Canyon Project overview. The tribal staff expressed interest in following the Caldwell Canyon Project and requested updates on progress. Consequently, subsequent meetings have been held as discussed in **Section 4.3**. To ensure a thorough assessment of issues and potential impacts to American Indian tribal rights and interests, including reserved treaty rights, coordination with the Tribe will continue throughout the NEPA process.

As managers of unoccupied federal lands, BLM managers are responsible for managing resources that are essential for the Shoshone-Bannock Tribes to exercise their treaty rights. Concerns and objections from the Shoshone-Bannock Tribes are discussed in this EIS.

4.1.2 Public Participation

This EIS incorporated public comments and internal scoping as required in 40 CFR1501.7.

4.2 Scoping

4.2.1 Public

Public scoping was initiated with inclusion of the Caldwell Canyon Project EIS in the BLM's online NEPA Register beginning on October 13, 2016. A notice of intent to prepare an EIS was published in the Federal Register on March 22, 2017 (Federal Register, 2017). The notice of intent initiated a 30-day public scoping comment period, which closed on April 21, 2017. The BLM mailed a scoping letter to nearly 600 people and organizations on the Caldwell Canyon Project mailing list.

During the public scoping period, the BLM held a public meeting in Pocatello, Idaho on April 5, 2017 and in Soda Springs, Idaho on April 6, 2017 to provide information to the public on the Caldwell Canyon Project details and how to submit comments effectively.

The BLM received six written comment letters (emailed) and one comment form left at the public meetings. The comments were analyzed for identification of alternatives and mitigation suggestions, issues to analyze, and information to be considered in this EIS. The analysis resulted in the identification of approximately 128 comments.

Copies of the notices, public scoping meetings sign-in sheets, and results of the comment analysis are included in the Caldwell Canyon Scoping Report (Tetra Tech, Inc., 2017a).

4.2.2 Agency

BLM conducted scoping with IDEQ, IDL, IDFG, Idaho State Historic Preservation Office, USACE, USFWS, and USEPA through written correspondence during the public scoping period.

4.3 Government-to-Government Consultation

The Shoshone-Bannock Tribes have reserved treaty rights on federal public domain lands, based on the Fort Bridger Treaty of July 3, 1868. This treaty reserves the right for tribal members to hunt and fish on all unoccupied lands of the U.S.

Agencies are required by the National Historic Preservation Act and its implementing regulations (36 CFR 800) to consult with affected American Indian Tribes to identify traditional cultural properties and consider potential impacts. Likewise, Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments and Executive Order 13007 – Indian Sacred Sites, require consultation with Tribes on the effects on their tribal interests.

Consultation with the Shoshone-Bannock Tribes by the BLM included:

- A staff -to-staff meeting on November 18, 2014, where the BLM made an introductory presentation about the Caldwell Canyon Project.
- A staff-to-staff meeting on November 20, 2015, in which the BLM staff briefed three Shoshone-Bannock Tribes environmental staff on current phosphate mining projects.
- A staff-to-staff meeting on March 9, 2017 in which the BLM presented an overview of the Caldwell Canyon Project.
- The BLM received scoping comments dated May 8, 2017 from the Shoshone-Bannock Tribes with concerns about selenium contamination and impacts to cultural, natural, and visual resources, and inherent and treaty-reserved rights.
- A staff-to-staff meeting on February 7, 2018 in which the BLM briefed the Shoshone-Bannock Tribes on the draft EIS for the Caldwell Canyon Project. Tribal issues discussed included cumulative effects of mining and wildlife habitat conversion, vegetation protection in reclaimed mine areas to ensure safe cultural use, treaty rights effects, and impacts to Greater Sage-Grouse and groundwater.
- A government-to-government meeting with the Shoshone-Bannock Tribes Business Council on March 12, 2018, to present the Caldwell Canyon Project and to discuss related issues. Issues discussed included the Tribes displeasure with mining, that all the improvements in reclamation cannot prevent impacts on resources, that new mines should not be permitted until the old mines have been cleaned up, that the government has not achieved the mine reclamation promised, and that they wanted to help the BLM establish ways to reduce tribal access problems.

List of Preparers

This EIS was prepared by the BLM with the assistance of a third-party contractor selected by the BLM. The BLM also relied on the expertise of the cooperating agencies. The EIS analysis also relied on supporting surveys and studies conducted by contractors following protocols established in conjunction with BLM and cooperating agencies. **Table 38** lists the names of agency contributors, their area of responsibility, and qualifications of agency personnel involved in the preparation of this EIS. **Table 39** identifies similar information for the third-party contractor. **Table 40** provides similar information for those that produced supporting studies.

Table 38. List of Preparers, Federal, and State Agencies

Name/Agency	Area of Responsibility	Qualifications (Degree and Years of Experience)
Volk, William, BLM	BLM EIS Project Manager	B.S. Geology; 43 years.
Alderman, David, BLM	BLM EIS Project Manager (baseline and project initiation)	M.S. Planning and Environmental Science; B.A. Molecular Biology and Biochemistry; 8 years (BLM).
Myers, Barry, BLM	Geology/Hydrogeology	B.A. Geology; M.S. Hydrogeology Engineering; 17 years
Miller, Danny, BLM	Access	J.D.; 23 years
Lapp, Amy, BLM	Cultural	B.A. M.S. Anthropology; 13 years
Swan, Channing, BLM	Forestry	B.S. Forest Management; 20 years
Kraus, Karen, BLM	Vegetation, Riparian	B.S. in Biology; 3 years
Newman, Blaine, BLM	Recreation, Visual	B.S. Wildland Recreation Management; 27 years
Mavor, Shelli, BLM	Weeds	M.S. Natural Resource Stewardship (Forest Sciences), B.S. Biology, B.A. Chemistry; 4 years
Beatty, Ryan, BLM	Fish	M.S. Zoology and Physiology; B.S. Fisheries Science and Limnology; B.S. Biology; 11 years.
Berglund, Arn, BLM	Fish (baseline)	Retired BLM
Anderson, Bryce, BLM	Geology, Paleontology	B.S. Geology; 8 years
Cundick, Jeff, BLM	Technical Oversight, District Mineral Branch Supervisor	B.S. Mining Engineering, M.B.A.; 29 years.
Price, David, BLM	Wildlife (including threatened, endangered and BLM Sensitive wildlife species)	B.S. Zoology; 5 years.
Lipka, Adrienne, BLM	Range	B.S. Animal Science; 6 years
Phelan, Geoffrey, BLM	Weeds	B.S. Biology; 3 years
Crowther, Wayne, IDEQ	Project Manager and Engineering	B.S.C.E., Civil & Environmental Engineering with Geology Minor; 14 years.
Tanner, Doug, IDEQ	Program Oversight	M.S. Hazardous Waste Management; M.P.A.; B.A. Poly Science; Certified Public Manager; 23 years
Johnson, Brady, IDEQ	Water Resources	M.S., Hydrologic Sciences; B.S., Geology; 7 years.
Vanevery, Lynn, IDEQ	Surface Water Quality	B.S. Biology; M.S. Zoology; 28 years
Mende, Jim, IDFG	Wildlife Biologist	B.S. Fishery Biology; 30 years (retired)

Name/Agency	Area of Responsibility	Qualifications (Degree and Years of Experience)
Billman, Gary, IDL	IDL lead	B.S. Geology; 11 years
Brochu, Robert, USACE	USACE Regulatory Project Manager	B.S. Biology; 35 years
Chatburn, John	Administrator (OEMR)	Governor Appointee

Table 39. Third Party Contractor – Tetra Tech, Inc.

Name	Area of Responsibility	Qualifications (Degree and Years of Experience)
Cadle, Sonya	Groundwater Modeling	M.E. Geological Engineering; B.S. Geology; 17 years
Cambier, Matt	Wildlife (including Threatened and Endangered Wildlife Species and BLM Sensitive Wildlife Species)	B.S. Environmental Science; 15 years
Flood, Cameo	Project Manager, Social and Economic Conditions, Visual Quality	B.S. Forestry; 35 years
Fowler, Kevin	Technical Reviewer of Noise	B.A. Audio and Acoustics; 12 years
Harloe, Lisa	Technical Reviewer of Vegetation/Riparian Areas/Wetlands (including Threatened and Endangered Plants and BLM Sensitive Plants)	B.S. Biology (Botany emphasis) and Public Administration and Policy Analysis; 17 years
Hudson, Amy	Geochemistry/Cover Analysis	Ph.D. Geoscience (Hydrogeology and Geochemistry specialty); M.S. Environmental Science and Engineering; B.S. Geology and Environmental Science; 19 years
Matolyak, Shane	Soils	M.S. Land Rehabilitation; B.S. Biology; 15 years
Pellerin, Tricia	Noise	MESc Chemical Engineering; 12 years
Peterson, Lynn	Cultural Resources/Tribal Treaty Rights and Interests/Geographic Information System	M.S. Anthropology and Geo-Technology Certificate; 30 years
Reeves, Tim	NEPA and Quality Assurance and Quality Control Review and Grazing	M.S. Range Management; 35 Years
Reid, Jill	Transportation	B.S. Biology; 13 years
Roemer, Guy	Water (Groundwater Modeling)	M.S. Engineering; 20 years
Thompson, Keith	Water (Surface and Groundwater)	M.S. Geology; B.S. Geology; 38 years
Vering, Walt	Technical Review of Wildlife (including Threatened and Endangered Wildlife and BLM Sensitive Wildlife)	M.S. Natural Resources; B.A. Biology; 24 years
Weidner, Michele	Deputy Project Manager, Vegetation/Riparian Areas/Wetlands (including Threatened and Endangered Plants and BLM Sensitive Plants)	M.S. Vegetation Ecology; B.S. Forestry; 17 years
Woolsey, Sara	Air	B.S. Civil Engineering; 11 years

Table 40. Preparers of Supporting Studies and Analysis

Name/Company	Area of Responsibility	Qualifications (Degree and Years of Experience)
Grotbo, Terry/NewFields	Project Manager	B.S. Earth Sciences – Geology Major / Soil Minor; 40 years
Pare, Marie/NewFields	Assistant Project Manager	B.S. Geological Engineering; 16 years of experience
Rogness, Doug/NewFields	Water Resources/Wetlands/Waters of the U.S. Mitigation/Fisheries and Aquatics	M.S. Hydrology/Groundwater; B.S. Earth Sciences/Geology; 30 years
Elliott, Joe/NewFields	Wildlife/Vegetation	Ph.D. Botany; B.S. Biology and Chemistry; 43 years
Tooke, David/NewFields	Geochemistry	Ph.D. Geochemisty; M.S. Environmental Geochemistry; B.A. Chemistry; 12 years
Pfister, Laura/NewFields	Land Use, Recreation, Transportation, Greater Sage-Grouse Habitat Assessment, Visual Resources	M.S. Resource Administration and Management; B.S. Economics – Environmental Studies; 21 years
Graham, Lisa/NewFields	Air Quality	B.S. Environmental Engineering; B.A. Political Science; 11 years
Pryor, Sabrina/Air Sciences, Inc.	Air emissions inventory	B.S. Engineering Science, BA, Liberal Arts, 15 years
Back, Gary/NewFields	Wildlife/Greater Sage-Grouse Habitat Assessment	Ph.D. Wildlife Ecology; M.S. Forestry; B.S. Wildlife Management; 35 years
Clark, K. Bill/NewFields	Geology	M.S. Geology/Hydrogeology; B.S. Earth Sciences/Geology; 27 years
Peterson, Larry/NewFields	Geochemistry	M.S. Geochemistry; B.S. Chemistry; 22 years
Rocco, Nick/NewFields	Water Balance Cover Design	Ph.D. Geotechnical (Civil) Engineering; M.S. Geotechnical Engineering; B.S. Civil Engineering; 14 years
Stringer, Cam/NewFields	Water Resources – Groundwater Modeling Support	M.S. Geology/Hydrogeology; B.A. Biology and Secondary Education; 30 years
Perine, Adam/NewFields	Water Resources – Groundwater	M.S. Hydrogeology; B.S. Environmental Sciences; 20 years
Hoffman, Dan/NewFields	Water Resources – Surface Water	M.S. Geology; B.S. Resource Conservation; 10 years
Balge, Zachary/NewFields	Visual Resources	B.A. Photography; 10 years
Connolly, Sean/Big Sky Acoustics, LLC	Noise	M.S. Mechanical Engineering; B.S. Mechanical Engineering; 23 years
Stark, Judd/Catena Consulting, LLC	Soil Resources	B.S. Land Rehabilitation; 18 years
Hutmacher, Sonia/Desert West Environmental	Cultural Resources	M.A. Anthropology/Applied Archaeology; B.A. Geology/Anthropology; 20 years

List to Whom the Final EIS Notification was Sent

Letters, postcards, or email announcements were sent to the following people, organizations, and agencies with a notification that the final EIS is available for review. Tribes and those requesting final EIS hard copies received hard copies.

Agency, Organization, or Company, Last Name, First Name

A & R Excavation Corporation, Wood, Ann
ACF West, Deitrick, Cameron
AEMA, Ellsworth, Matthew
Alliance for The Wild Rockies, Garrity, Michael
American Agri-Women, Zurn, Karolyn
American Soy Bean Association, Stephens, Davie
Apple Valley Farms, Farms, Apple
Ashley Creek Properties Ltd, Archer, Elizabeth
Association Management Group, Larrocea-Phillips, Patxi
Band of Shoshoni Nation NW, Archaeologist
Bannock Development Corporation, Regetz, John
Bear Lake Grazing Company,
Bingham County Commissioners
Blackfoot River Watershed Council, Reid, Charlotte
BLM - Idaho State Office, Porter, Karen
BLM - Upper Snake Field Office, D'aversa, Mary
BLM - Washington Office (Wo-210)
BLM -Pocatello Field Office, Cundick, Jeff
BLM -Pocatello Field Office, Volk, Bill
Blue Ribbon Coalition, Foster, Ric
Board of Bear Lake County Commissioners
Board of Lincoln County Commissioners
Bonneville Power Administration
Bonneville Power Administration, Cottrell, Joe
Bridgerland Audubon Society
Brown and Caldwell, Glindeman, Todd
Bureau of Indian Affairs, Ecosystems Analysis Pn6550
Bureau of Indian Affairs Fort Hall Indian Agency, Superintendent
California Grain and Feed Association, Zanobini, Chris
Capital Press, O'Connell, John
Caribou County Assessor, Cook, Aaron
Caribou County Attorney
Caribou County Commissioners, Davids-Moore, Carol
Caribou County Commissioners, Horsley, Denise
Caribou County Commissioners, Johnson, Elaine
Caribou County Commissioners, Rasmussen, Lloyd M
Caribou County Farm Bureau, Lau, Lori Anne
Caribou County Planning Department
Caribou Industrial Coatings
Caribou Sun, Steele, Mark
Caribou-Targhee National Forest, Mickelson, Robb
Cascade Earth Sciences
Cat Equipment Company, McGarry, Kent R
Center for Biological Diversity, Conner, Hannah
Chem Lime Company - Ten Mile Project
City of Chubbuck, England, Kevin
City of Georgetown, Van Cleave, Bob
City of Grace, Barthlome, Jackie
City of Lava Hot Springs - T. Paul Davids, Mayor, Davids, III, T. Paul
City of Mccammon- Copy of Email, Karlene Hail Mayor, Hail, Karlene
City of Montpelier, Petersen, Reed
City of Pocatello, Blad, Brian
City of Pocatello, Kendell, Konni
City of Soda Springs
City of Soda Springs, Godfrey, W Lee
City of Soda Springs, Hansen, Kirk L
City of Soda Springs, Robinson, Austin
City of Soda Springs, Skinner, Alan
City of Soda Springs, Vorwaller, Tausha
Clark County Commissioners, Vodnais, Charles
Colorado State University Library, Smith, Judy
Committee for Idaho's High Desert, Hausrath, Katherine
Committee for Idaho's High Desert, Ploger, Scott
Conely Company, Garside, Larry
Corbridge Brothers Ltd
Crapo Bothers, Bothers, Crapo
Crapo Farms, Farms, Crapo
Ct Myers Farms Inc., Myers Farms, Ct
Custer County Commissioner, Smith, Steve
Custer County Commissioner Chair
Degerstrom Ventures, Nelson, Bob
Denver Federal Center
Eagle Rock Backcountry Horsemen, Peterson, Ron
Eagle Rock Timber Inc, Gokey, Rick R
Earthjustice, Evans, Lisa
East Central Idaho Dev Co
Ecological Design Inc, Tiedemann, Rob
Electric Wholesale Supply Co, Baldwin, Dale
Environmental Protection Agency, Hood, Lynne
Environmental Protection Agency Region 10, Director

Environmental Protection Agency Region 10, Connor, Tom
Environmental Protection Agency Region 10, Contreas, Peter
Environmental Protection Agency Region 10, Demaria, Eva C
Environmental Protection Agency Region 10, Eckley, Chris
Environmental Protection Agency Region 10, Maley, Tim
Environmental Protection Agency Region 10, Tomten, Dave
Environmental Protection Agency Region 3, Borsuk, Frank
Fairview Ranch Construction, Gilchrist, Richard W
Federal Aviation Administration, Stilson, Diane
Federal Emergency Management Agency, Webber, Joe
Federal Highway Administration, Division Administrator
Federal Highway Administration, Inghram, Brent
Federal Highway Administration, Johnson, Edwin
Food Producers of Idaho, Fitch, Candi
Franklin County Commissioners, Westerberg, Richard D
Franklin County Commission-Shauna Geddes, Geddes, Shauna
Fremont County Commissioners, Davis, Glenn D
Gemt (Tronox), Transue, Pat
Governor of Idaho, Otter, Cl Butch
Greater Yellowstone Coalition, Gamett, Jen
Greater Yellowstone Coalition, Michalski, Allison
Greater Yellowstone Coalition, Rinaldi, Kathy
Greater Yellowstone Coalition, Zimmer, Bob
Green Market News, Mendiola, Mark
Gurr Professional Services, Inc., Gurr, Mike
Health Dept District 7, Director
Henrys Lake Foundation
High Country RC&D Council, Hendrich, Pam
Hillyard Anderson Olsen Attorneys At Law, Anderson, Gary N
Hunzeker Fred W and Sons, Hunzeker, Dennis
IACI - Alex Labeau, Labeau, Alex
IBEW, Jones, Ned
Idaho Alfalfa & Clover Seed Growers Association, Svaty, Rayan
Idaho Association of Commerce & Industry, Hawkins, Sharon
Idaho Association of Counties, Maynard, Bob
Idaho Cattle Association, Bennett, George
Idaho Cattle Association, Williams, Karen
Idaho Conservation League, Brown, Perry
Idaho Conservation League, Foster, Tim
Idaho Conservation League, Haass, Patrick
Idaho Conservation League, Mazzotta, Dani
Idaho Conservation League, Oppenheimer, Jonathan
Idaho Conservation League, Price, Rick
Idaho Conservation League, Richardson, Mike
Idaho Conservation League, Robison, John
Idaho Conservation League, Stiener, Sharon
Idaho Department Health and Safety
Idaho Department Health and Welfare, Stevens, Kara
Idaho Department of Agriculture, Gould, Celia
Idaho Department of Commerce, Meuleman, Bobbi-Joe
Idaho Department of Environmental Quality, Abderhalden, Doug
Idaho Department of Environmental Quality, English, Margie
Idaho Department of Environmental Quality, Hull, David
Idaho Department of Environmental Quality, Johnson, Brady
Idaho Department of Environmental Quality, Mcintyre, Michael
Idaho Department of Environmental Quality, Miller, Scott
Idaho Department of Environmental Quality, Neher, Eric
Idaho Department of Environmental Quality, Olenick, Bruce
Idaho Department of Environmental Quality, Rowe, Mike
Idaho Department of Environmental Quality, Tanner, Doug
Idaho Department of Environmental Quality, Tippets, John
Idaho Department of Environmental Quality, Van Every, Lynn
Idaho Department of Fish and Game Region 5, Maeder, Tom
Idaho Department of Fish and Game Region 5, Mende, Jim
Idaho Department of Fish and Game Region 5, Pitman, Dexter
Idaho Department of Fish and Game Region 6, Saban, Bob
Idaho Department of Fish and Game Region 6, Schmidt, Steve
Idaho Department of Labor, Smyser, Melinda
Idaho Department of Lands, MINERALS PROGRAM MANAGER
Idaho Department of Lands, Billman, Gary
Idaho Department of Lands, Brown, Pat

Idaho Department of Parks and Recreation, Cook, Jeff
Idaho Department of Parks and Recreation, Just, Rick
Idaho Department of Parks and Recreation, Lucachick, Mary
Idaho Department of Parks and Recreation, Meinen, Bob
Idaho Department of Transportation, Bala, Ed
Idaho Department of Transportation, Bower, Dwight
Idaho Department of Transportation, Clark, Dennis
Idaho Department of Transportation, Greene, Dee
Idaho Department of Transportation, Lowe, Pamela
Idaho Department of Transportation, Robertson, Dan
Idaho Department of Water Resources
Idaho Department of Water Resources, Bassista, Tom
Idaho Farm Bureau Federation, Keller, Rick
Idaho Farm Bureau Federation, Lanier, Zack
Idaho Farm Bureau Federation, Lee, Delon
Idaho Gardens, Reid, Matt
Idaho Geologic Survey, Gillerman, Virginia
Idaho Governor’s Office of Energy and Mineral Resources, Mensinger, Marde
Idaho Grain Producers - S Satterlee, Satterlee, S.
Idaho Hay and Forage Association, Hale, Don
Idaho Hay and Forage Association, Ricks, Will
Idaho Honey Industry Association, Tomazin, Brody
Idaho House of Representatives, Andrus, Ken
Idaho House of Representatives, Loertscher, Thomas F
Idaho Mining Association, Davenport, Benjamin
Idaho Mining Association, Lyman, Jack
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Glossary

Acid-base accounting – testing of rock or soil material to determine the potential for acid generation or neutralization.

Aquitard - an impervious geologic layer that will not allow water to pass through it easily; retards the movement of water.

Capillary break – where a coarser grained porous media (soil or rock) underlies a finer grained porous media (soil or rock) with sufficient pore size differences to stop water movement by capillary action; coarse material providing sufficiently large pore spaces relative to overlying material to prevent water movement by capillary action.

Clonally – propagation from a single progenitor; plants such as aspen that have grown in a given location all originating vegetatively (not sexually) from a single progenitor.

Contact water – water that has come in contact with mined materials or disturbed areas exhibiting elevated levels of chemicals of concern or sediment that could be dissolved or picked up by the water.

Criteria pollutants – criteria pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. Criteria pollutants are the only air pollutants with national air quality standards that define allowable concentrations of these substances in ambient air.

Desiccation cracking – cracking in soils caused by wetting-drying cycle conditions and desiccation.

Fate and transport modeling – modeling to predict how a chemical or substance moves and is altered in the environment as in water-solute fate and transport modeling

Geomembrane – a low permeability synthetic sheet liner or barrier used in geotechnical engineering to impede or direct fluid (or gas) migration.

Geotextile/Geosynthetic/Geocomposite – permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect, or drain.

Leach testing – testing used to characterize the water quality of water drained or leached through soil, rock, or overburden (mine waste) material.

Meteoric – water derived from precipitation (rain or snow).

Overburden – Rock material that needs to be removed to retrieve the ore. These rock units can overly, interfinger with or sometimes underlie the ore deposit, and are segregated from the ore and typically backfilled into a pit or placed in a pile.

Piezometer – a device or borehole which measures the pressure or level of groundwater at a specific point.

Pore volume – the volume of water occupying the pore space in a packed column of soil.

Propagule – a portion of a plant such as a seed or sprout from which a new individual may develop.

Redox potential – chemical term describing the reduction - oxidation state and condition for chemical reactions and chemical speciation, particularly of a rock, soil or solute.

Rock check dam – a small dam or wall made of rock to reduce water velocity and erosion of sediments.

Run-of-mine – rock, ore or overburden in its natural, unprocessed state as it is after blasting. Often referring to overburden that has been excavated and managed without segregating the various rock layers or strata.

Seed inoculant – living beneficial micro - organisms that attach to roots of plants to promote fertility and plant growth.

Shear properties (shear strength) – a term used in soil mechanics to describe the strength or parallel shear stress that a soil can sustain; the shear resistance of soil is a result of friction and interlocking of particles.

Tipple – the location where ore hauled from a mine typically undergoes physical sizing, temporary storage and loading, typically into railroad cars, for transport to a processing plant.

Variably saturated zone flow model – a water infiltration and percolation flow model predicting flow and transport of water through layers of porous material of varying water contents (saturation).

Appendix A
Complete Reclamation Seed Mix

Table A-1. Species for Use in Reclamation Seed Mixes

					Seed Mix Lists and Preference[5]		
Group & Common Name *(Scientific Name)*	**PLS seeds/lb[1]**	**GRSG Habitat[2]**	**Grass Root Form[3]**	**Upland Adaptation[4]**	**Primary**	**Channel and Stabilization**	**Wetland/ Wet Meadow**
Cover/Nurse Crop							
Quickguard *(Triticum aestivum x Secale cereale)*	13,000				cover	cover	
Graminoids							
Alpine timothy *(Phleum alpinum)*	1,000,000		BG	C	3	2	2
American mannagrass *(Glyceria grandis)*	1,280,000		Rhiz				2
Baltic rush *(Juncus arcticus ssp. Littoralis)*	10,900,000		Rhiz				1
Basin wildrye *(Leymus cinereus)*	130,000	X	BG		1	2	
Beardless bluebunch wheatgrass *(Pseudoroegneria spicata ssp inermus)*	117,000	X	BG		1		
Big bluegrass *(Poa secunda ssp ampla)*	882,000	X	BG		3		
Bluebunch wheatgrass *(Pseudoregneria spicata)*	140,000	X	BG	W	2		
Bluejoint reedgrass *(Calamagrostis canadensis)*	2,270,000		Rhiz				1
Broadleaf cattail *(Typha latifolia)*	10,000,000		Rhiz				2
Canby bluegrass *(Poa secunda ssp. canbyi)*	926,000		BG		3		
Common spikerush *(Eleocharis palustris)*	620,000		Rhiz				2
Fowl mannagrass *(Glyceria striata)*	180,000		Rhiz				2
Hardstem bulrush *(Schoenoplectus acutus)*	377,000		Rhiz				1
Idaho fescue *(Festuca idahoensis)*	450,000	X	BG	C	1		
Intermediate wheatgrass *(Thinopyrum Intermedium)*	88,000		Rhiz		1	1	
Kentucky bluegrass *(Poa pratensis)*	2,177,000		Rhiz			1	
Mountain brome *(Bromus marginatus)*	64,000		BG		1		
Orchardgrass *(Dactylis glomerata)*	427,200		Rhiz		1	2	
Pubescent wheatgrass *(Thinopyrum intermedium ssp barbulatum)*	100,000		Rhiz		3	1	
Sandberg bluegrass *(Poa secunda)*	1,047,000		BG	W	2		
Sheep fescue *(Festuca ovina)*	680,000	X	BG		2		
Tall fescue *(Festuca arundinacea)*	227,000		Rhiz	W	2		

					Seed Mix Lists and Preference[5]		
Timothy *(Phleum Pratense)*	1,300,000		BG	C	2	2	2
Tufted hairgrass *(Deschampsia cespitosa)*	1,500,000		BG				1
Western wheatgrass *(Pascopyrum smithii)*	110,000		Rhiz			2	2
Forbs							
Arrowleaf balsamroot *(Balsamorhiza sagittata)*	55,000				2		
Aspen fleabane *(Erigeron speciosus)*	1,600,000				2		
Blanket flower *(Gaillardia aristata)*	132,000	X			1		
Common woolly sunflower *(Eriophyllum lanatum)*	810,000				2		
Common yarrow *(Achillea millefolium)*	2,770,000	X		W	2		
Fernleaf Biscuitroot *(Lomatium dissectum)*	45,000	X			2		
Hoary tansyaster *(Machaeranthera canescens)*	1,300,000	X		W	2		
Lewis flax *(Linum lewisii)*	170,000				2		
Littleflower penstemon *(Penstemon procerus)*	900,000			W	1		
Mule-ears *(Wyethia amplexicaulis)*	28,000				3		
Northern sweetvetch *(Hedysarum boreale)*	46,000	X		W	1		
Parsnipflower buckwheat *(Eriogonum heracleoides)*	135,700	X		W	1		
Purple coneflower *(Echinacea purpurea)*	117,000				3		
Red clover *(Trifolium pratense)*	275,000	X			1		
Rocky Mountain beeplant *(Cleome serrulata)*	65,900				2	1	
Rocky Mountain iris *(Iris missouriensis)*	21,000				3		
Rocky Mountain penstemon *(Penstemon strictus)*	592,000				1		
Sainfoin *(Onobrychis viciifolia)*	30,000				2		
Scarlet gilia *(Ipomopsis aggregata)*	357,000				2		
Scarlet globemallow *(Sphaeralcea coccinea)*	500,000	X			3		
Sticky purple geranium *(Geranium viscosissimum)*	52,000			C	1	2	
Strawberry clover *(Trifolium fragiferum)*	300,000	X				1	1
Sulphur-flower buckwheat *(Eriogonum umbellatum)*	209,000	X		W	2		
Tapertip hawksbeard *(Crepis acuminata)*	165,000	X		W	1		
Western coneflower *(Rudbeckia occidentalis)*	345,000			C	2		
Western sweetroot *(Osmorhiza occidentalis)*	29,800			C	2		

					Seed Mix Lists and Preference[5]		
Western yarrow *(Achillea millefolium var. occidentalis)*	2,770,000	X		W	1		
White clover *(Trifolium repens)*	850,000	X				1	1
White sagebrush *(Artemisia ludoviciana)*	4,500,000	X			2		
Woolypod milkvetch *(Astragalus purshii)*	120,000	X		W	2		
Yellow evening primrose *(Oenothera flava)*	700,000				2		
Sub-Shrubs							
Creeping barberry *(Mahonia repens)*	54,000				3	2	
Prairie sagewort *(Artemisia frigida)*	4,536,000	X			2		
Shrubs							
Antelope bitterbrush *(Purshia tridentata)*	15,000	X		W	1		
Chokecherry *(Prunus virginiana)*	4,800			C	3	2	2
Golden currant *(Ribes aureum)*	356,200			C	2		
Mountain big sagebrush *(Artemisia tridentata vaseyana)*	2,500,000	X			1	2	
Mountain snowberry *(Symphoricarpos oreophilus)*	54,700	X		C	1	2	
Rocky Mountain maple *(Acer glabrum)*	13,400			C	3		
Rubber rabbitbrush *(Ericameria nauseosa)*	400,000	X			2	2	
Russet buffaloberry *(Shepherdia Canadensis)*	59,215				3		
Saskatoon serviceberry *(Amelanchier alnifolia)*	25,800			C	3		2
Snowbrush ceanothus *(Ceanothus velutinus)*	124,275			C	3		
Woods' rose *(Rosa woodsii)*	45,300				3		
Yellow rabbitbrush *(Chrysothamnus viscidiflorus)*	782,000	X		W	1		

Source: MRP Table 6-4 (P4 Production, 2017)

1 Seeds per pound (lb) of pure live seed (PLS).

2 Species providing beneficial forage or cover (forbs, shrubs, or subshrubs) or cover only (bunchgrasses) for Greater Sage-Grouse (GRSG).

3 Grass root forms include rhizomatous grasses (rhiz.) or bunchgrasses (bg).

4 Adaptation for relatively warm / dry (W) or cool / moist (C) sites likely to occur in areas receiving the Primary Seed Mix.

5 Lower numbers indicate preference for inclusion in a mix during initial reclamation, where available. Higher numbers (lower preference) use is discretionary considering site conditions, availability, and historical success. Species without a preference noted would not be included in a mix. Mixes would be developed as discussed in the MRP text.

Appendix B

Proposed Action Details

B.1 Mining Equipment

Ore and overburden would be mined using haul trucks, track mounted excavators, bulldozers, and frontend loaders. Blast hole drill rigs and drill trucks would be used for drill and blast operations. Water trucks, patrols, and snowplows would be used for road maintenance. Light plants and light towers would be used for night operations. A list of select equipment to be used at the mine is given in the MRP (P4 Production, 2017).

B.2 Water Management System

The MRP, POC application, and IDEQ's POC determination provide the Water Management Plan, including the description of BMPs discussed below and shown on **Figure B-1**. "Contact-water" is precipitation, run off or run on water that has come in contact with mined materials, disturbed areas, or surface water sources that are close to mine development and could acquire dissolved constituents of concern or particulates. Non-contact water is water from unaffected areas, typically diverted away from disturbed areas and then returned to natural drainages. Contact water requires additional application of BMPs for management and control.

As specified in the POC, P4 Production has proposed a system of ditches, collection points, and pipelines that would allow multiple options to divert rain and snow non-contact water and convey it to natural drainages below disturbance areas to the extent possible.

The water management system and BMPs are designed to minimize soil erosion and sedimentation, and to protect surface water and groundwater quality in and adjacent to the project. Besides using maximum controls to divert non-contact water, the three primary functions of the designed water management system are to:

1. Manage groundwater that would inflow into the mine pits at locations where mining would advance below the water table;
2. Manage storm water and snow melt run-off; and
3. Manage rain and snowmelt water and run-on water in mine pits

The water management system includes WMPs, SCPs, RCPs, infiltration galleries (IGs), ditches, and pipelines and BMPs implemented to control or minimize erosion and storm water run-off.

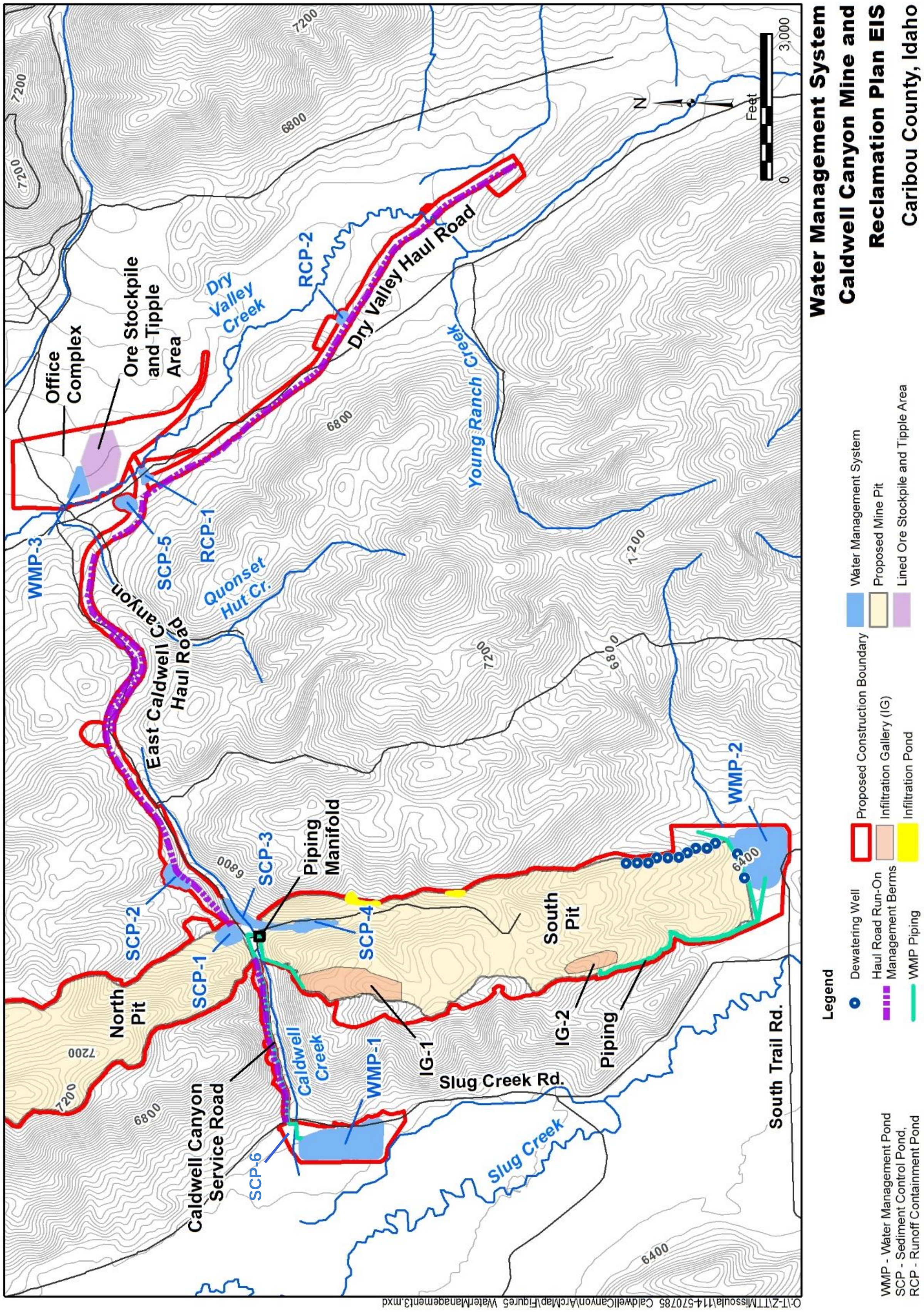
B.2.1 Groundwater Inflow Dewatering

Mining below the water table elevation would occur at two locations within the South Pit (north and south ends). Groundwater inflow into these pit areas would be controlled and managed using dewatering wells installed outside the South Pit (non-contact water) or using dewatering sumps located at the low point in the pit (contact water).

B.2.2 External Dewatering Wells

Dewatering wells adjacent to the South Pit would draw down both the alluvial aquifer and bedrock aquifer to intercept groundwater flowing to the South Pit (**Figure B-1**). Groundwater interception wells would be used to dewater the South Pit areas in years 6, 7, and 8 at the south end of the South Pit and years 14, 15, and 16 at the north end of the South Pit when mining is advanced below the water table.

Figure B-1. Water Management System



The pumping rate is expected to be between 140 and 1,200 gpm according to Table 3-1 in the POC application (P4 Production, 2016a). Dewatering is described in more detail in the MRP Section 5.1 and Section 3.2 of the POC application.

Because the water pumped from the dewatering wells is ambient groundwater quality and has not contacted overburden waste, it would be managed as non-contact water. This water would be conveyed to an IG, used for dust suppression, or commingled with collected sump water to reduce the concentration of total selenium to meet the infiltration water quality goal of 0.005 mg/L. The selenium goal is an order of magnitude less than USEPA's recommended maximum contaminant level for drinking water and equal to the Idaho surface water quality standard for aquatic life.

B.3 Pit Dewatering Sumps

Sumps installed at low points in the pits would collect run-on into the pits, direct in-pit precipitation, and potential residual groundwater that may have not been intercepted by the external dewatering wells. Water collected in the sump would be tested for use in dust suppression, allowed to infiltrate into the Wells Formation or evaporated. In circumstances where the capacity of the sump is or would be exceeded and the sump water is to be conveyed to an IG or WMP, the water would be sampled for three consecutive days and analyzed by a certified laboratory. If the water quality meets the infiltration groundwater quality goal, sump water would be conveyed to the IGs. Sump water not meeting the infiltration water quality goal would be mixed with dewatering well water to meet the goal or conveyed to a WMP where it would be further commingled with ambient quality water or evaporated.

The MRP presents an adaptive management plan to assist in managing water from mine dewatering systems (i.e. dewatering wells and pit sumps) if required. The plan prioritizes five steps for managing excess water from mine dewatering activities with the primary goal of maximizing to the greatest extent possible the volume of water discharged to the IGs. The plan is implemented based on the encountered volume and quality of collected sump water. The primary steps in the adaptive management plan are:

1. Accelerate mining schedule in saturated zones, which would reduce the amount of pumping time and therefore the volume of water to be managed;
2. Pump collected sump water and dewatering well water directly to IGs if water quality goal for selenium is met;
3. Pump collected sump water to WMPs for further management if it does not meet the infiltration goal for total selenium;
4. Employ enhanced evaporation at WMPs using mechanical means; and
5. If WMPs exceed safe storage capacity (**Table B-1**), there would be an emergency short-term discharge of collected sump water to IGs that does not meet the selenium infiltration quality goal of 0.005 mg/L, but would meet the groundwater quality standard of 0.050 mg/L by comingling with dewatering well water.

B.4 Water Management Ponds

Three WMPs are shown on **Figure B-1**. Groundwater collected in dewatering sumps would be the primary water source for WMP-1 and WMP-2. WMP-3 would collect run-off from the ore stockpile and Dry Valley tipple area.WMP-1 and WMP-2 would a) store water of uncertain water quality until sampling and water quality analysis are performed; b) evaporate water; and c) store excess mine contact water to be commingled with ambient quality water prior to infiltration, or dust control. All WMPs would be lined with a cushion geotextile, a flexible membrane liner, a geocomposite layer, a geosynthetic clay liner, and another flexible membrane liner. Ponds would be fenced to prevent wildlife and public access. All WMPs would incorporate leak detection systems installed at low points below the liner system. **Table B-1** shows the WMPs dimensions and pond capacities.

Table B-1. Water Management Ponds Dimensions and Capacity

WMP	Million Gallons[1]	Acre-Feet[1]
WMP-1 (West Caldwell Area)	51	156
WMP-2 (South of South Pit)	69	213
WMP-3 (Ore Stockpile/Tipple Area)	14	44

Source: MRP Table 5-1 (P4 Production, 2017).

1 Numbers are rounded capacity/volume is subject to change. Volumes leave two feet of freeboard.

A storm water collection system on the perimeter of the ore loading facility would capture run-off, direct precipitation, and infiltrated water from the facility captured by the underlying geomembrane to WMP-3. WMP-3 is designed to exceed the design capacity needed for a 100-year/24-hour storm event (**Table B-1**).

B.5 Infiltration Galleries

Two IGs (IG-1 and IG-2 on **Figure B-1**) and their pipelines would be used to manage dewatering well water and collected pit sump water primarily from the South Pit (**Figure B-1**). Depending on the volume of flow for infiltration, the galleries would be expanded along contour as needed to increase capacity. The IGs would be 20 feet deep and 20 feet wide at the bottom. The bottom of the IGs would be completed in the Wells Formation limestone and would be drilled and blasted to increase permeability. Excavated limestone would be used as coarse rock backfill in the IGs to promote rapid water infiltration into the Wells Formation. Each IG would be equipped with a piezometer to monitor water levels.

B.6 Storm Water

A SWPPP would be developed to meet the requirements for authorization under a Multi-Sector General Permit under the National Pollutant Discharge Elimination System program. The SWPPP will define key components, structural BMPs, and other alternative sediment control measures such as silt fencing, straw wattles, and rock check dams, which would be employed as needed to control erosion and sedimentation from disturbed areas or recently reclaimed backfill. A list of potential sediment control measures is provided in the MRP.

B.7 Run-On to Active Mine Pit

Given the limited drainage area upslope of the active individual pit panels, run-on water would be allowed to drain from undisturbed upslope areas into the open pit panels. This water would combine with precipitation and potential residual groundwater and be conveyed to the sump in the pits bottom. Collected sump water would infiltrate into the Wells Formation limestone in the pits bottom or be conveyed either to the IGs if the water quality meets an infiltration groundwater quality goal or to the WMPs.

B.8 Run-on Ditch System

Run-on control ditches and berms are planned up-slope of the East Caldwell Area and Dry Valley haul roads, the Caldwell Canyon Service Road, and SCPs to divert non-contact water around disturbed areas. Run-on control berms around growth media stockpiles would be employed at the uphill toe and perimeter of the stockpiles to divert non-contact water around the piles. Diverted water would be conveyed back into the undisturbed drainage below each facility. Typical haul road design, including a ditch and berm system, is shown on **Figure B-1**.

B.9 Run-Off

Run-Off Containment Ponds

Two RCPs would be constructed along the Dry Valley Haul Road to collect rain and snowmelt contact water from the road surface (**Figure B-1**). The RCPs would be designed for a 5-year, 24-hour storm event, using a single liner system or 2 feet of compacted clay to contain run-off. The RCPs would minimize infiltration into the backfilled and reclaimed portions of the Dry Valley Mine D Pit. Water would be used for dust control or allowed to evaporate. RCPs would be inspected to ensure that the design capacity is maintained. Excess water would be removed to appropriate water management facilities and retained sediment would be removed and placed as backfill.

Sediment Control Ponds

SCPs would collect run-off (contact water) and sediment from disturbed areas. SCPs would be designed to control run-off that would occur from a 100-year, 24-hour storm event. SCP design volumes are shown in **Table B-2. Figure B-1** shows the location of the SCPs. Run-off water would infiltrate, evaporate, or be used for dust control on the East Caldwell Area and Dry Valley haul roads. SCPs would be managed to ensure that design capacity is maintained. Excess storm water would be used for dust control or pumped to other SCPs with enough capacity.

Table B-2. Sediment Control Pond Locations and Sizes

Pond	Location / Function	Million Gallons[1]	Acre-Feet[1]
SCP-1	Collects run-off from East Caldwell Area Haul Road	0.3	0.91
SCP-2	Collects run-off from East Caldwell Area Haul Road	0.56	1.73
SCP-3	Collects run-off from East Caldwell Area Haul Road	0.59	1.8
SCP-4	Collects seasonal flows from a wetland complex and tributary drainage to Caldwell Creek and East Caldwell Area Haul Road extension to South Pit	0.79	2.43
SCP-5	Collects run-off from the East Caldwell Area Haul Road	1.5	4.6
SCP-6	Collects run-off from the staging area (Caldwell Canyon Service Road/Slug Creek)	1.2	3.6

Source: (P4 Production, 2017)

1 Pond design volumes are subject to change based on final design.

Non-contact water from upslope of SCP-1 and SCP-2 would be discharged to Caldwell Creek. Run-off (contact water) from the East Caldwell Area Haul Road would be managed with SCP-1, SCP-2, SCP-3, and SCP-5. SCP-4 would control run-off from the East Caldwell Area Haul Road in the South Pit and a wetland complex that is tributary to Caldwell Creek.

B.10 Service and Haul Roads

Mine access would be provided through new service road construction and existing road widening. The Caldwell Canyon Service Road would be widened to a running width of 25 feet to accommodate construction equipment and light vehicle access.

Haul roads would be constructed with a road running surface of 90 feet wide. Existing growth media from the Dry Valley Haul Road template along with Rex Chert from the South Pit would be placed on either side of the Dry Valley Haul Road to meet the five-foot wheel safety berm criteria. Rex Chert would also be used to provide a running surface. Interim seeding of the salvaged growth media would reduce soil loss until final reclamation is completed.

A temporary haul road (Dry Valley Haul Road) for hauling initial overburden from the South Pit, would be constructed across the currently reclaimed Dry Valley Mine D Pit backfill and haul road to the remaining open pit panel at the Dry Valley Mine D Pit. Overburden would be hauled from the South Pit to the Dry Valley Mine D Pit during the first three years. **Table B-3** shows the proposed road disturbance.

To provide a place to park equipment and temporarily store materials during initial mine infrastructure development, a staging area and stormwater management pond totaling 4 acres would be constructed on the west side of Slug Creek Road just north of the intersection of Slug Creek Road and the Caldwell Creek access road.

Snow (contact water) would be dumped in the open pits areas or SCPs to infiltrate. Special snow-hauling and handling practices would be used to avoid putting snow in sensitive areas (e.g., near wetlands).

Table B-3. Proposed Road Disturbance

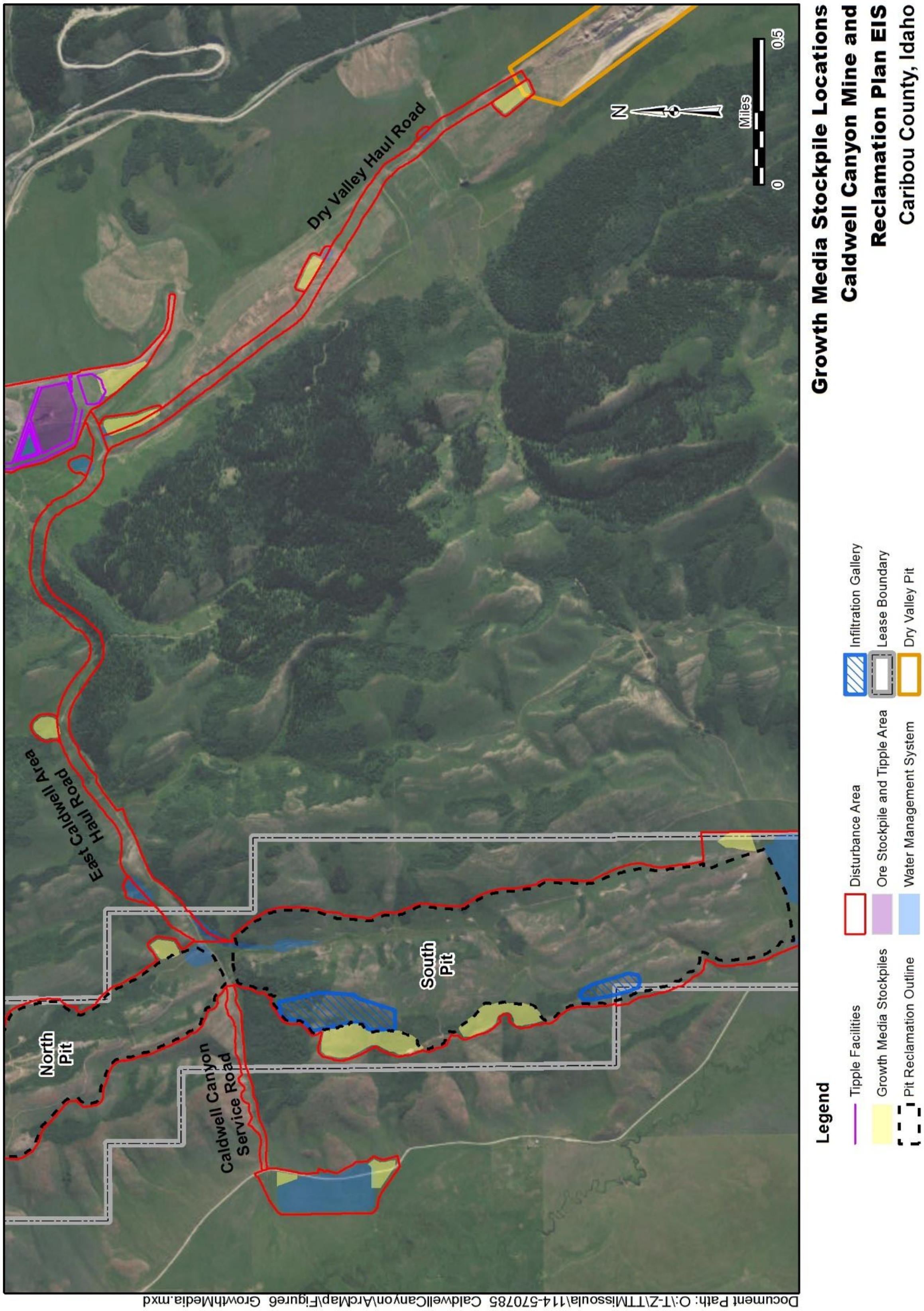
Road Name	Acres of Disturbance	Miles of New Construction	Miles of Existing Road Widening	Miles of Already Reclaimed Road
Caldwell Canyon Service Road	11.5	0	0.7	0
East Caldwell Area Haul Road	67.7	1.0	1.2	0
Dry Valley Haul Road	52.2	1.1	0	0.9

Source: (P4 Production, 2017)

B.11 Growth Media Stockpiles

Growth media would be removed (salvaged) from areas to be disturbed including pits, roads, and mine facilities. Salvaged growth media would either be stockpiled for later reclamation use or directly placed on backfill or other areas prepared to receive it. Growth media stockpiles that remain for multiple seasons would be graded to a 2.5H:1V slope and seeded. The long-term growth media stockpile locations are shown on **Figure B-2**.

Figure B-2. Growth Media Stockpile Locations



B.12 East Caldwell Area Facilities

B.12.1 Ore Stockpile and Tipple Area

The ore stockpile pad and tipple area would be constructed on the east end of the Dry Valley Haul Road near the existing Dry Valley tipple (**Figure B-2**). These areas were reclaimed after cessation of operations at the Dry Valley Mine. The existing Dry Valley tipple structure would be replaced.

The ore stockpile pad and tipple area would be constructed on a liner system designed to capture run-off water. The liner system design consists of a prepared subgrade overlain by a geosynthetic clay liner or two feet of compacted clay, flexible membrane liner, cushion geotextile, and up to four feet of Rex Chert from the South Pit, depending on the existing subgrade conditions.

B.12.2 Office/Warehouse/Shop Complex

The existing mine offices, warehouse, and maintenance shop facilities in the East Caldwell Area would be used or reconstructed. Above-ground petroleum storage tanks would be equipped with secondary containment in accordance with the Spill Prevention, Control, and Countermeasure Plan. The estimated 2.4 million gallons annual fuel consumption would require 72,000 gallons of storage.

A land farm area would be constructed near the fuel tankage area to provide a site for treatment of petroleum contaminated soil.

B.13 Dry Valley MRP Modifications

Backfilling the reclaimed Dry Valley Mine D Pit for disposal of overburden during Phase 1 of the Caldwell Canyon Mine as discussed in **Section 2.1.3**, would require a modification to the current approved Dry Valley Mine MRP. For ease of reference, the modifications required are listed here:

- Reopen the Dry Valley Haul Road shown on **Figure 3**, then reclaim. Reseed with the seed mix as described in **Appendix A**;
- Backfill and cover backfilled areas of the Dry Valley Mine D Pit shown on **Figure 3**. Reseed with the seed mix as described in **Appendix A**;
- Construction, use, and reclamation of RCPs 1 and 2, SCP-5, and WMP 3, as shown on **Figure B-1**;
- Development and subsequent reclamation of growth media stockpiles shown on **Figure B-2**;
- Removal and reconstruction of mine facilities at the East Caldwell Canyon Area shown on **Figure 5**; and
- Addition of EPMs and BMPs listed in Sections B.14 and B.15 as appropriate.

B.14 Environmental Protection Measures

P4 Production has committed to implementing EPMs and BMPs to ensure responsible mining operations and to reduce adverse environmental impacts. Key components of the EPMs are described in the MRP (P4 Production, 2017) and the BMPs included in the POC application (P4 Production, 2016a).

The BLM has reviewed the MRP, POC, and other permit applications against the requirements in the ARMP (BLM, 2012), the Idaho Standards for Rangeland Health (BLM, 1997), the ARMPA (BLM, 2019) and the BLM Special Status Species Management Manual. In addition to EPMs and BMPs specified in the MRP and POC, P4 Production has agreed to include the following additional measures in the MRP to ensure conformance.

- P4 Production would submit its Noxious Weed Treatment Plan to the BLM for review of the effectiveness of proposed treatments for weeds on BLM-administered public lands (Action VE-2.1.4). If the plan includes herbicide use, the BLM will review for conformance with current policy (Action VE-2.1.5), and its effects on special status species (VR-2.1.6).
- Straw wattles and straw bales used on BLM-administered public lands and National Forest lands would be state-certified noxious weed free (VE-2.1.11).

B.14.1 Monitoring

Draft EMP Objectives and Approach

The overall objective of this Draft EMP is to describe the monitoring program which would be in place during operations and would ensure that mining activity at the Project does not adversely impact the environment. A Quality Assurance Project Plan (QAPP) and media-specific Field Sampling Plans (FSPs) will be developed as appendices to the Final EMP as this Draft EMP is revised following the ROD. Details regarding specific monitored parameters, criteria, and sampling methodologies will be fully developed in coordination with the ROD and presented in the Final EMP.

The Draft EMP is considered a working document that would be updated as additional information for the Project becomes available. The intent of this Draft EMP is to present an understanding of what the resources that would be monitored at the Project during operations and closure.

Monitoring Programs

This Draft EMP describes proposed monitoring programs to be conducted during mining operations and reclamation that are designed to assess water resources, wildlife, vegetation, wetlands, and cover system. Quality control for the monitoring programs would be described in the project-specific QAPP included in the Final EMP. Storm water will be monitored in accordance with a site-specific Storm Water Pollution Prevention Plan (SWPPP). Air quality permit is not required for this project; therefore, air quality monitoring is not included in this EMP.

The Dry Valley Mine has its own existing EMP and SWPPP. The plan consists of the following components:

- The Dry Valley Mine (South Extension) is currently under an Idaho Department of Environmental Quality (IDEQ) Consent Order that defines an active mineral extraction area, the location of groundwater monitoring wells and the level of constituents allowed in the monitoring wells and BMPs that need to be maintained.
- During operations, storm water would be monitored as specified in a SWPPP for the Dry Valley Mine.
- A post-closure water monitoring and management plan.
- Reclamation monitoring would be performed as specified in the reclamation section of the Dry Valley Mine EMP.

The following section summarizes the primary monitoring programs that would be implemented for the Caldwell Canyon Mine portion of the Project during mining and reclamation.

Water Resources

Water resources monitoring for the proposed Caldwell Canyon Project includes both surface water and groundwater. Water resource monitoring for the Project will address the following:

- IDEQ's Point of Compliance (POC) determination for groundwater monitoring;
- On-site water resources monitoring to support the Water Management Plan; and
- Construction, operational, and post-closure surface water and groundwater monitoring.

Surface Water Monitoring Plan

During mine operations and reclamation, surface water conditions would be monitored at 17 stream or spring monitoring locations adjacent to the mine during spring and fall of each year (two events) to characterize high and base flow conditions. The actual dates of the monitoring will depend on weather and sampling location accessibility but are anticipated to occur in April-May and September-October. Surface water monitoring activities would be conducted with groundwater sampling activities to allow comparison of the data.

Proposed surface water monitoring locations are shown on **Figure 17** and described in **Table B-4**.

Table B-4. Stream and Spring Monitoring Site Locations

Station ID[1]	Type[2]	Source / Geologic Formation[3]	Easting[4]	Northing[4]	Elevation[4]	Location Description
			(IDSP feet)	(IDSP feet)	(feet msl)	
Surface Water (SW) Station on Stream or River and Spring (SP) Site						
SW-01	SW	Slug Creek	877341.75	368660.94	6389	Slug Creek, approx. 2 miles upstream (south) of Project Area
SW-02	Spring	PPw	874464.84	376979.58	6363	Knudsen Spring, approx. 0.5 mile upstream (south) of South Pit area; major discharge that flows to Slug Creek
SW-04	SW	Slug Creek	862087.24	395962.35	6323	Slug Creek, west of North Pit area, and downstream (north) of South Pit area
SW-08	SW	Caldwell Creek	867627.09	390165.87	6394	Caldwell Creek, downstream (west) of Mine Pit area near Slug Creek Road
SW-10	SW	Chicken Creek	872992.82	403170.19	6409	Chicken Creek, lower reach at Dry Valley Road and near Dry Valley Creek; east of North Pit area
SW-12	SW	Dry Valley Creek	869661.59	407730.45	6359	Dry Valley Creek, lower reach near confluence with Blackfoot River; northeast of North Pit area
SW-13	SW	Blackfoot River	865223.14	408346.80	6340	Blackfoot River, downstream of Dry Valley Creek confluence at bridge
SP-01	Spring	Trt	876614.73	383342.12	6781	Spring in upper end of unnamed drainage south of mine area in Slug Creek basin
SP-03	Spring	Trd	871807.20	387888.44	6696	Spring near upper end of wetland complex along fault; flows into SW-6

Station ID[1]	Type[2]	Source / Geologic Formation[3]	Easting[4]	Northing[4]	Elevation[4]	Location Description
			(IDSP feet)	(IDSP feet)	(feet msl)	
						tributary of Caldwell Creek
SP-04	Spring/ SW	Trt	876908.60	391072.02	6784	Spring in unnamed tributary to Dry Valley Creek east of South Pit area; monitored several hundred feet downstream of spring discharge point, so considered spring/stream site
SP-05	Spring/ SW	Trt	874266.03	392066.99	6744	Spring in southern tributary to upper Caldwell Creek; monitored several hundred feet downstream of spring discharge point, so considered spring/stream site
SP-06	Spring	Trt	874710.77	393310.50	6802	Spring at head of Caldwell Creek
SP-07	Spring	Qac	871253.84	400895.02	6518	Spring in Chicken Creek drainage east of North Pit area, extending to Dry Valley Creek
SP-08	Spring	Trd	867313.93	405814.85	6541	Spring in unnamed tributary to Dry Valley Creek east of north end of North Pit area
SP-11	Spring	Trd	867366.07	407668.72	6362	Spring discharging from pipe north of North Pit area near Dry Valley Road
SP-13	Spring	Trd	867628.03	404375.92	6591	Spring in unnamed tributary to Dry Valley Creek upstream of SW-11 east of North Pit area
SP-15	Spring/ SW	Qac	869284.67	398700.60	6697	Spring in upper Chicken Creek drainage upstream of SP-07 within North Pit area; monitored several hundred feet downstream of spring discharge point, so considered spring/stream site

Notes:

1 See **Figure 17** for surface water station locations.

2 SW = surface water; spring/SW = source is a groundwater spring, but sample location is on the surface water channel several hundred feet downstream of the spring discharge point.

3 Qac = Quaternary-age alluvium and colluvium; Trt = Triassic-age Thaynes Formation; Trd = Triassic-age Dinwoody Formation; PPw = Pennsylvanian-age Wells Formation.

4 Location and elevation values are based on recreational-grade GPS unit. IDSP = Idaho State Plane; msl = mean sea level.

The proposed surface water monitoring program will be finalized as the ROD is completed and will include the following items:

- Measurement of field parameters (see Table B-5);
- Manual measurements of stream flow; and
- Collection of water samples for laboratory analysis.

The surface water analyte list, analytical methods to be followed, and associated surface water criteria will be finalized as the ROD is completed and will include parameters listed in **Table B-5**.

Details regarding sampling methodologies and analytical testing will be fully developed in a FSP in coordination with the Final EIS and ROD and presented in the Final EMP.

Table B-5. Surface Water Quality Analyte List

Parameters	T / D [1]	Analytical Method	Laboratory Reporting Limit[2]
General Chemistry (mg/L unless otherwise noted)			
Specific Conductivity (SC) (µmhos/cm)	T	EPA 120.1	1.0
pH (std. units)	T	SM 4500H-B	0.1
Sulfate	T	EPA 300.0	1.0
Total Alkalinity	T	SM 2320B	1.0
Hardness	T	SM 2340B	0.4
Total Dissolved Solids (TDS)	D	SM 2540C	10
Total Suspended Solids (TSS)	T	SM 2540D	5
Nutrients (mg/L)			
Ammonia as N	T	EPA 350.1	0.03
Nitrate/Nitrite as N	T	EPA 353.2	0.05
Metals (mg/L)			
Aluminum	T / D	EPA 200.8	0.01
Antimony	D	EPA 200.8	0.0005
Arsenic	D	EPA 200.8	0.0005
Cadmium	D	EPA 200.8	0.00008
Chromium	D	EPA 200.8	0.005
Iron	D	EPA 200.8	0.05
Lead	D	EPA 200.8	0.0001
Manganese	D	EPA 200.8	0.0005
Selenium	T / D	EPA 200.8	0.0005
Thallium	D	EPA 200.8	0.0001
Zinc	D	EPA 200.8	0.005
Field Parameters			
pH (std. units)	Field Meter	Field Meter	0.1
Specific Conductivity (µmhos/cm)	Field Meter	Field Meter	1.0
Temperature4 (°C)	Field Meter	Field Meter	0.1
Turbidity6 (NTU)	Field Meter	Field Meter	0.1

Notes:

mg/L = milligrams per liter; mg/kg = milligrams per kilogram; µmhos/cm = micromhos per centimeter; NTU = nephelometric turbidity units; °C = degrees Celsius; mV = millivolts.

[1] T = total or total recoverable analysis; D = dissolved analysis by lab after field filtration.

[2] Laboratory reporting limits from Pace Analytical Services, Inc.

Groundwater Monitoring Plan

Groundwater would be monitored on a quarterly basis at all POC wells as required by IDEQ, with the exception of four indicator wells which can be sampled annually, per IDEQ. In general, samples would be collected in April, June, August, and October. The POC Determination (IDEQ, 2016) specifies which wells are to be monitored, the frequency of sampling, and the list of parameters to be analyzed during mining operations.

The groundwater monitoring well network for the mining and reclamation periods is provided in **Table B-6**; well locations are shown on **Figure 16.** If the monitoring well network is modified in the future, the new well locations and well construction details would be updated in the Final EMP as appropriate.

Table B-6. Point of Compliance (POC) Groundwater Monitoring Wells

Well ID	Hydrostratigraphic Unit	Well Type
MW14-02A	Alluvium	POC
MW14-03D	Dinwoody Formation	POC
MW14-04A	Alluvium	POC
MW14-05D	Dinwoody Formation	POC
MW14-06A	Alluvium	POC
MW14-07D	Dinwoody Formation	POC
MW14-08A	Alluvium	POC
MW14-09A	Alluvium	POC
MW14-10D	Dinwoody Formation	POC
MW14-15W	Wells Formation	POC
MW14-19W	Wells Formation	POC
MW14-21A	Alluvium	POC
MW14-22D	Dinwoody Formation	POC
MW14-29W	Wells Formation	POC
MW14-30R	Rex Chert	POC
MW14-32A	Alluvium	POC
MW-BLR-01	Alluvium	POC
MW-BLR-15	Alluvium	POC
MW-BLR-17	Alluvium	POC
PSW13-01	Wells Formation	POC
Allen Stock Well	Alluvium	POC
GW-12D	Wells Formation	Indicator
GW-16D	Wells Formation	Indicator
GW-17S	Alluvium	Indicator
MW17-37A	Alluvium	Indicator
MW17-40D	Dinwoody Formation	POC
MW17-41A	Alluvium	Indicator
MW17-42A	Alluvium	Indicator
MW17-43A	Alluvium	Indicator
MW17-44D	Dinwoody Formation	POC
MW17-45A	Alluvium	POC
MW17-46W	Wells Formation	POC
MW17-47A	Alluvium	POC
MW17-48A	Alluvium	POC
MW17-49A	Alluvium	POC

Well ID	Hydrostratigraphic Unit	Well Type
MW17-50W	Wells Formation	POC
MW17-51W	Wells Formation	POC
MW17-52A	Alluvium	POC
MW17-54A	Alluvium	POC
MW17-55W	Wells Formation	POC
MW17-56W	Wells Formation	POC
MW17-57W	Wells Formation	POC

The proposed groundwater monitoring program would be finalized as the ROD is completed and will include the following items:

- Measurement of field parameters (see Table B-7);
- Measurement of groundwater depth in order to calculate groundwater elevation; and
- Collection of water samples for laboratory analysis.

The groundwater analyte list, analytical methods to be followed, and associated groundwater criteria would be finalized as the ROD is completed and will include parameters listed in **Table B-7**. Details regarding sampling methodologies and analytical testing will be fully developed in a FSP in coordination with the Final EIS and ROD and presented in the Final EMP.

Table B-7. Groundwater Quality Analyte List

Parameters	Total (T)[1] / Diss. (D)[1]	Analytical Method	Laboratory Reporting Limit[2]
General Water Chemistry (mg/L unless otherwise noted)			
pH (std. units)	T	SM 4500H-B	0.1
Turbidity (NTU)	T	EPA 180.1	0.1
Chloride	T	EPA 300.0	0.2
Sulfate	D	EPA 300.0	1.0
Total Dissolved Solids (TDS)	D	SM 2540C	10
Total Suspended Solids (TSS)	T	SM 2540D	5
Nutrients (mg/L)			
Nitrate/Nitrite as N	T	EPA 300.0	0.05
Metals & Metalloids (mg/L)			
Aluminum	T / D	EPA 200.8	0.01
Antimony	T / D	EPA 200.8	0.0005
Cadmium	T / D	EPA 200.8	0.00008
Chromium, total	T / D	EPA 200.8	0.0005
Iron	T / D	EPA 200.8	0.05
Lead	T / D	EPA 200.8	0.0001
Manganese	T / D	EPA 200.8	0.0005
Nickel	T / D	EPA 200.8	0.0005
Selenium	T / D	EPA 200.8	0.0005
Thallium	T / D	EPA 200.8	0.0001
Zinc	T / D	EPA 200.8	0.005

Parameters	Total (T)[1] / Diss. (D)[1]	Analytical Method	Laboratory Reporting Limit[2]
Field Parameters			
pH (std. units)	Field Meter	Field Meter	0.1
Specific Conductivity (µmhos/cm)	Field Meter	Field Meter	1.0
Temperature (°C)	Field Meter	Field Meter	0.1
Dissolved Oxygen (mg/L)	Field Meter	Field Meter	0.1
Turbidity (NTU)	Field Meter	Field Meter	0.1
Oxidation-Reduction Potential (mV)	Field Meter	Field Meter	0.1

Notes:

mg/L = milligrams per liter; µmhos/cm = micromhos per centimeter; NTU = nephelometric turbidity units; °C = degrees Celsius; mV = millivolts.

1 Total (T) = total or total recoverable analysis; Diss. (D) = dissolved analysis by lab after field filtration. For groundwater samples, both T and D analysis will be conducted for metals during the first year, after which D may be eliminated since groundwater standards for Idaho are based on total (T) analysis.

2 Laboratory reporting limits from Pace Analytical Services, Inc.

Wildlife

Ongoing monitoring during operations would allow P4 and government agencies to assess the impacts of mining activity on protected species and its habitat and conduct activities to discourage nesting in areas to be mined prior to disturbance.

Nesting bird and eagle monitoring would be conducted for migratory birds and eagles contained in a future Eagle Incidental Take Permit (if necessary), as issued by USFWS. Avoidance plans would be developed before areas are disturbed. Nest surveys would be completed prior to tree clearing and annual surveys at WMPs to ensure no nests are being developed.

Depending on the determination of Greater Sage-Grouse lek activities, monitoring would be done in accordance with applicable monitoring requirements.

Vegetation

The main objective of vegetation assessment would be to evaluate the success of concurrent reclamation of mine disturbance throughout mining activity and ensure that the site is compatible with the surrounding landscape. Ongoing monitoring would allow P4 to determine that the site is restored to beneficial post-mining land use which meets the requirements and goals of IDL and BLM and would assist P4 in making final decisions related to reclamation activity.

Vegetation on reclaimed areas would be monitored for appropriate diversity and sustainability in accordance with revegetation goals established by the BLM and the IDL along with noxious weeds and a treatment plan to comply with Idaho regulations. To determine reclamation success, vegetation on overburden piles and backfilled pits would be sampled and analyzed to determine COPCs and confirm standards (IDEQ, 2004; BLM, 2012) concurrent with the progression of reclamation during active mining and upon final reclamation post-closure.

Wetlands/Riparian

The purpose of future wetlands monitoring would be to evaluate compensatory mitigation project sites and determine if performance standards are being met and ensure that mitigation projects are accomplishing the objectives. Details would be defined as necessary in a future Compensatory Mitigation Plan and 404 Permit for Caldwell Canyon. Wetland mitigation projects typically involve 5 years of monitoring.

A Compensatory Mitigation Plan would be prepared as required by the USACE that would be implemented according to the final rule for Compensatory Mitigation for Losses of Aquatic Resources (40 CFR 230, Subpart J). The USACE would be responsible for approving final mitigation requirements for jurisdictional wetlands and other Waters of the U.S. that would be subject to permitting for the discharge of dredged or fill material.

Fugitive Dust

Fugitive dust will be monitored in accordance with the Fugitive Dust Control Plan filed with IDEQ. The primary components of the monitoring program would include:

- Roads will be monitored to verify that dust suppressant measures and speed limitations are effective;
- Spray bars used to control dust, if needed, from crushing, screening, and conveyor transfer points will be inspected to verify that they are operational; and
- Stockpiles will be monitored to ensure that moisture control efforts and stockpile heights are minimizing fugitive dust emissions.

Self-inspection records will be maintained on-site to document dust control methods, such as application of dust suppressant on unpaved roads. A weather log will record temperature, wind speed, and precipitation.

Cultural Resources

Mining operations are currently not expected to disturb any eligible cultural resources in the Project area. Should any unidentified cultural or paleontological resource be discovered during the mining process, P4 would cease operations in the immediate area. P4 would report the discovery to BLM to quantify the nature and value of the resource and provide a timely determination of the necessary actions to prevent the loss of significant cultural or scientific values. P4 would provide annual training to mining workers to avoid and protect any historic sites discovered during mining operations. If avoidance and protection of these sites is not feasible, appropriate mitigation measures would be developed and implemented as required by applicable laws and regulations.

Cover System and Backfill Monitoring Plan

A cover system monitoring program would be developed in conjunction with IDEQ, IDL, and BLM to assess performance of the water balance cover. Monitoring results would be used to determine how the cover is protecting groundwater quality, meeting reclamation objectives for establishment of vegetation, and complying with the POC authorized by IDEQ. The cover system and backfill monitoring program would be implemented in an initial backfilled and covered pit and may include measurement of:

- Groundwater quality within and at the bottom of the backfill;
- Reduction-oxidation (Redox) conditions in the cover and backfill;
- Soil moisture in the cover materials;
- Stability of cover materials (erosional features; gullying); and

- Establishment of vegetation.

Dataloggers would be installed on soil moisture monitors to gather data over time. Groundwater samples from a backfill well would be collected on a frequency determined by IDEQ and BLM specialists and analyzed for a suite of parameters.

Details concerning all aspects of the cover/backfill monitoring program would be developed in conjunction with the agencies upon authorization of the Project. Information regarding monitoring locations, frequency, duration, and sampling/shipping protocols would be addressed.

B.15 Best Management Practices

BMPs and alternative sediment control measures would be implemented during construction, operation, and post-closure/reclamation to minimize surface water and groundwater impacts and control run-on/run-off.

BMPs that may be employed at the site include the following:

- Placement of overburden material as backfill in the North and South pits at Caldwell Canyon and at the inactive Dry Valley Mine.
- Placement of reclamation cover system for the North Pit and South Pit to effectively control and minimize percolation in the backfilled pits and reduce exposure to oxygen, and thereby limit selenium mobility within the overburden material.
- Concurrent reclamation of mine disturbance throughout the mine life to the extent practical.
- Evaluation of growth media placed on backfilled pits to confirm that suitability criteria are met.
- All mine disturbance areas being reclaimed would be assessed for slope, aspect, and erosion potential, to ensure that these areas are conducive to growth of vegetation and control of erosion and stability.
- Use of Rex Chert material to backfill saturated portions of the South Pit to reduce the concentration of COPCs released to groundwater.
- Operation of the water management system to retain and manage on-site all run-off that does not meet surface water quality criteria.
- Construction and operation of WMP-1 and WMP-2 to store water of uncertain quality until management of the water can be implemented to meet the infiltration water quality goal for the IGs.
- Construction and operation of WMP-3 in the Dry Valley tipple area to capture run-off and infiltration from the ore stockpile and tipple yard.
- Installation of a synthetic liner under the ore stockpile/tipple load out yard and run-off collection pond located in the East Caldwell Area.
- Construction of SCPs in drainages immediately adjacent to proposed disturbance areas to manage storm water run-off.
- Conveyance of water that meets the infiltration water quality goal to one of two IGs for infiltration into the underlying Wells Formation.
- Construction of two lined RCPs along the Dry Valley Haul Road to collect precipitation that contacts the road surface to limit infiltration of the water into pits backfill.

- Installation and operation of dewatering wells located external to the open pits for interception of groundwater.
- Installation and operation of pits sumps where groundwater inflow requires collection and management to ensure mining operations can continue.
- Conveyance of run-on water collected upgradient of SCP-1 and SCP-2 to Caldwell Creek.
- Run-on diversion ditches and berms for roads to direct run-off from undisturbed areas away from areas disturbed by mine activities.
- Use of Rex Chert for construction of haul roads; geochemical test results for Rex Chert indicate concentration of leachable selenium does not exceed groundwater standards. Run-off from the surface of mine components where these materials are used in construction would be collected and routed to various SCPs located throughout the project area. Run-off collected in the SCPs would be managed through evaporation and infiltration.
- When available, use of limestone for construction of roads, IG fill material, and infiltration ponds.
- Placement of perimeter berms or swales at the toe of topsoil/growth media stockpiles to capture run-off from the piles.
- Construction of shallow depressions periodically along roadways to reduce sediment in run-off flowing in roadside ditches.
- Seeding topsoil/growth media stockpiles to reduce the sediment load in run-off from the piles.
- Rock-check dams and silt fencing to reduce sediment load in run-off.
- Straw wattles to capture and retain sediment on newly constructed or reclaimed slopes.
- Berms along haul roads to direct run-off to constructed drainage containment.
- Dust suppression to control fugitive dust from haul roads.
- Good housekeeping practices and preventative maintenance.
- Routine facility inspections to assess the efficacy of storm water control practices.

Specific measures to protect groundwater and surface water during placement of backfill and construction of cover systems for the Caldwell Canyon Project would include:

- Soil/growth media placement on backfilled pits, evaluated to confirm that growth suitability criteria are met (P4 Production, 2016a).
- Assessment of all mine disturbance areas being reclaimed for slope, aspect, and erosion potential to ensure that these areas are conducive to growth of vegetation and control of potential erosion and instability. To the extent possible, all slopes would be contoured, fertilized, and seeded with the landowner approved seed mix. Reclamation would be conducted to conform and meet BLM regulations per 43 CFR 3592 and the IDLs Reclamation Plan per Title 47, Chapter 15 of the Idaho Code (P4 Production, 2017).

Spill Prevention, Control, and Countermeasure Plan

As required per 40 CFR Part 112, a Spill Prevention, Control, and Countermeasure Plan would be developed prior to construction and operations. The plan would describe spill response and reporting procedures, identify measures for prevention and control of potential spills, including BMPs and a contingency plan for the pollutants of concern, and provide information on routine monitoring requirements. The Spill Prevention, Control, and Countermeasure Plan would be incorporated into the SWPPP.

B.15.1 Pit Backfilling

A plug dumping approach for placement of backfill would be used. Overburden would be placed in lifts typically less than 10 feet thick which would result in compaction of the backfill, thus limiting water and oxygen infusion, and minimizing settling or subsidence.

B.15.2 Air Quality

Dust suppression would be conducted in accordance with a Dust Control Plan authorized by IDEQ. Dust control water would be sourced from production wells, SCPs, and RCPs and the annual use is estimated at 40 acre-feet. Dust control would include the following BMPs:

- Appropriate dust suppressants, which typically include magnesium chloride, calcium chloride, and water, would be applied on the East Caldwell Area and Dry Valley haul roads and disturbed areas when practical. Water for dust suppression would be pumped from centrally located water wells or ponds and stored.
- Hoods, containment chutes, and sprays would be installed at tipple crusher and screen areas especially at exchange points and on conveyors to control dust.
- All equipment would be regularly maintained to ensure efficient operation and compliance with the manufacture’s guidelines on emission levels.

B.15.3 Emergency Services, Fire Prevention, and Control

The Caldwell Canyon Project would be served by emergency services of Caribou County. Fire and ambulance services originate in Soda Springs, Idaho, approximately 26 road-miles from the site. Trained emergency medical personnel would be on-site. Heavy equipment and large-capacity water trucks would be on-site and available for firefighting. Fire extinguishers would be in all mobile equipment and mine personnel would be regularly trained in their use.

B.15.4 Protection of Fish, Wildlife, and Natural Resources

Engineering design, facility siting, and the overall MRP is designed to minimize disruption to fish and wildlife and their habitat. The Reclamation and Closure Plan provides for re-establishment of wildlife habitat focusing on Greater Sage-Grouse habitat and livestock grazing once mining operations have ceased. Noxious weeds would be monitored and a Noxious Weed and Treatment Plan developed to comply with BLM and Idaho control guidelines.

The perimeter of the WMPs would be fenced to prevent larger terrestrial wildlife and public access. The fence would be periodically inspected and maintained to ensure security of the ponds. Water that collects in the backfilled pits panels and WMPs would be inspected daily. IDFG and BLM would be contacted if wildlife use or mortality is observed to determine if mitigation is appropriate.

The power pole configurations would match the power needs and include BMPs to protect avian species.

Greater Sage-Grouse

Reclaimed mine areas would be revegetated with plants promoting summer brood-rearing, nesting, early brood-rearing, or winter habitat for Greater Sage-Grouse. P4 Production has volunteered a mitigation plan for Greater Sage-Grouse (P4 Production, 2018) (**Appendix C**). The mitigation plan consists of:

- Through reclamation and the varieties of species that would be accommodated to different slopes and aspects, P4 Production would create vegetation patches in a mosaic on 1,200 acres of the North and South pits to provide variety in forage and cover to meet needs of the Greater Sage-Grouse for daily late summer brood habitat (i.e., insects and forbs, cover for concealment, cover for shade on hot days, and cover from inclement weather).
- A voluntary habitat restoration research project to test several treatments to restore sagebrush, native bunchgrasses, and native forbs to land that was converted to non-native rhizomatous grass species to increase livestock forage.

B.15.5 Soil Erosion Prevention

Soil erosion and sedimentation would be limited by site-specific BMPs. The Water Management Plan and associated BMPs to be implemented during the operation phase are presented in **Section B.2**. Temporary growth media stockpiles that would remain for multiple seasons would be graded to a 2.5H:1V slope and seeded to reduce erosional soil loss.

Cut and fill areas of the East Caldwell Area and Dry Valley haul roads and the Caldwell Canyon Service Road would be seeded to stabilize exposed slopes. Straw wattles and silt fences would be used to trap sediment in run-off. Run-off control ditches would provide additional sediment containment.

During the reclamation phase, all reclaimed areas would be assessed for slope, aspect, and, erosion potential. BMPs would be implemented to include straw wattles, dozer track planting, and hydro-seeding. The final cover would be designed and graded to establish effective drainage on backfilled pits areas.

B.15.6 Subsidence Prevention

Some minor backfill settling or subsidence in pits backfills may occur, but the plug dumping approach for placement of backfill should minimize the amount and extent.

B.15.7 Hazardous Materials and Waste Management

The Caldwell Canyon Project would comply with the IDEQ Rules and the Standards for Hazardous Waste (IDAPA 58.01.05), the Clean Air Act (IDAPA 58.01.01), the Clean Water Act (IDAPA 58.01.02), the Safe Drinking Water Act (IDAPA 58.01.08), and other federal and state laws and regulations. Hazardous materials and wastes transportation would comply with federal regulations.

Surface mining operations are subject to the Mine Safety and Health Act of 1969. Site personnel would be trained in hazard recognition and spill response, in addition to standard health and safety procedures and policies.

P4 Production would evaluate the types and amounts of hazardous waste generated per month. Potentially hazardous materials include diesel fuel, gasoline, oil, lubricants, coolants, solvents, and waste oil. The amount of hazardous waste generation would determine specific waste management requirements for containment, emergency equipment, and inspections (as prescribed in IDAPA 58.01.05.004 and .005).

All hazardous materials and wastes would be stored and shipped in designated containers and labeled according to the U.S. Department of Transportation regulations for hazardous materials, and as provided in IDAPA 58.01.05.007 for the transportation of hazardous waste. Hazardous materials would be transported by regulated transporters primarily along State Highway 34 and Dry Valley Road from Soda Springs, Idaho to and from the mine facilities at the East Caldwell Area.

All liquid petroleum products, solvents, and antifreeze would be stored in aboveground storage tanks at the East Caldwell Area mine facilities. Equipment maintenance, including oil and coolant changes, would be conducted at the maintenance shop in the East Caldwell Area. Used engine oil would be stored on-site and periodically shipped off site for recycling by a licensed contractor.

B.15.8 Prevention of Hazards to Public Health and Safety

The daily ore haulage season via railway extends from May to November. The existing rail route crosses county roads from the East Caldwell Area to the Soda Springs processing plant. The intersections are regulated using pressure-actuated crossing lights.

A gate near the intersection with Slug Creek Road would restrict the public from entering the mine area or accessing the Caldwell Canyon Service Road. Secondary road crossings would be clearly labeled to ensure safe crossing. Access via the East Caldwell Area Haul Road would be controlled at the tipple/loadout site. WMP perimeter fences would prevent public safety hazards.

Prior to abandonment, exploration drill holes would be plugged to eliminate hazards.

B.15.9 Cultural Resources

P4 Production avoided cultural resources based on the cultural resources baseline surveys. If previously unidentified cultural or paleontological resources are discovered during operations, activities would cease in the immediate area of discovery. P4 Production would report the discovery to the appropriate agency to quantify the nature and value of the resource and provide a timely determination of the necessary actions to prevent the loss of significant cultural or scientific values.

B.15.10 Wetlands

Wetlands were delineated and evaluated according to Section 404(b)(1) guidelines and standard USACE protocol. Field delineations were used to locate facilities and infrastructure to minimize effects on wetlands and riparian areas. Jurisdictional waters of the U.S. are those in Quonset Hut Creek and in Dry Valley. In response to the USACE jurisdictional determination, P4 Production modified the design and location of surface disturbances to reduce the wetland acres affected. An individual permit under the Section 404 process is underway (P4 Production, 2016b).

The Caldwell Canyon Project was designed to minimize effects to wetlands, streams, and riparian areas, regardless of jurisdictional status. The Caldwell Canyon Service Road and East Caldwell Area Haul Road were designed to avoid or minimize placement of fill materials into Caldwell Creek.

B.15.11 Water

Surface water and groundwater monitoring activities would comply with specific requirements for water resources sampling, including monitoring activities required by IDEQ in the POC determination for operational and post-closure water monitoring. Additional on-site water resources sampling would support internal review of the Water Management Plan and storm water monitoring requirements specified in the site SWPPP.

Sediment control structures (culverts, berms, ponds, and ditches) would be constructed for the mine East Caldwell Area and Dry Valley haul roads to manage water. BMPs including installation of silt fences, straw bales, and seeding on disturbed areas would minimize sediment movement into surface waters.

B.16 Reclamation

Reclamation is designed to restore the site to a beneficial post-mining land use, prevent undue or unnecessary degradation of the environment, and return disturbed areas to conditions compatible with the surrounding landscape. The following is a summary of the Reclamation Plan included in Section 6.2 of the MRP (P4 Production, 2017).

Reclamation practices would meet the objectives set by 43 CFR 3592.1 and Idaho's Reclamation Plan Title 47, Chapter 15 – Idaho Code. The Reclamation Plan is intended to stabilize (protect from erosion) disturbed areas and to meet the final multiple land use goals of wildlife habitat and grazing.

B.16.1 Reclamation Schedule

P4 Production would use concurrent reclamation, to the extent practical, over the Caldwell Canyon Project mine life. **Table B-8** presents the area of disturbance for proposed mine facilities by each mining phase and the anticipated reclamation schedule. The final Reclamation Plan would revegetate all disturbed areas except for 130 acres of pit walls in the North Pit.

Table B-8. Reclamation Schedule and Acres Reclaimed

Phase	Mine Pits	Service and Haul Roads	Water Mgmt.	Ore Stockpile, Tipple Area	Growth Media Stockpiles	Mine Facilities East Caldwell Area	Rail Facilities East Caldwell Area	Total Acres[a]
Disturbed Acres[a]								
Pre-Mining	0	85	64	34	22	42	22	269
Years 1-5	210	0	0	0	0	0	0	210
Years 6-10	155	0	0	0	10	0	0	165
Years 11-15	63	0	0	0	0	0	0	63
Years 16-20	205	0	0	0	0	0	0	205
Years 21-26	138	0	0	0	0	0	0	138
Years 27-31	97	0	0	0	0	0	0	97
Years 32-35	63	0	0	0	0	0	0	63
Year 36-41	164	0	0	0	0	0	0	164
Total Disturbed								1,374
Reclaimed Acres[b]								
Years 1-5	91	0	0	0	0	0	0	91
Years 6-10	163	0	0	0	0	0	0	163
Years 11-15	64	0	0	0	0	0	0	64
Years 16-20	141	0	0	0	0	0	0	141

Phase	Mine Pits	Service and Haul Roads	Water Mgmt.	Ore Stockpile, Tipple Area	Growth Media Stockpiles	Mine Facilities East Caldwell Area	Rail Facilities East Caldwell Area	Total Acres[a]
Years 21-26	147	0	0	0	0	0	0	147
Years 26-31	100	0	0	0	0	0	0	100
Years 32-35	80	0	0	0	0	0	0	80
Year 36-41	187	85	64	34	22	42	22	456
Total Reclaimed								1,242

Source: (NewFields, 2018a).

a Rounded to the nearest acre.

b Acreage does not account for 84 acres of internal buffer areas; 103 acres of buffer areas at margin of disturbance areas; or 130 acres reclaimed as pit walls in the North Pit.

During mining, soil from areas being disturbed would be salvaged and placed into stockpiles close to the disturbed areas for future placement or placed directly onto backfill and other mine-related disturbance areas that have been prepared for growth media placement. Direct placement of growth media (placement immediately following stripping) would be preferred, to the extent practical, to preserve native seed sources and existing microbial community in the growth media. The final Grading Plan site topography and revegetation efforts of reclaimed areas as presented in the MRP are designed to blend with the adjacent land (P4 Production, 2017).

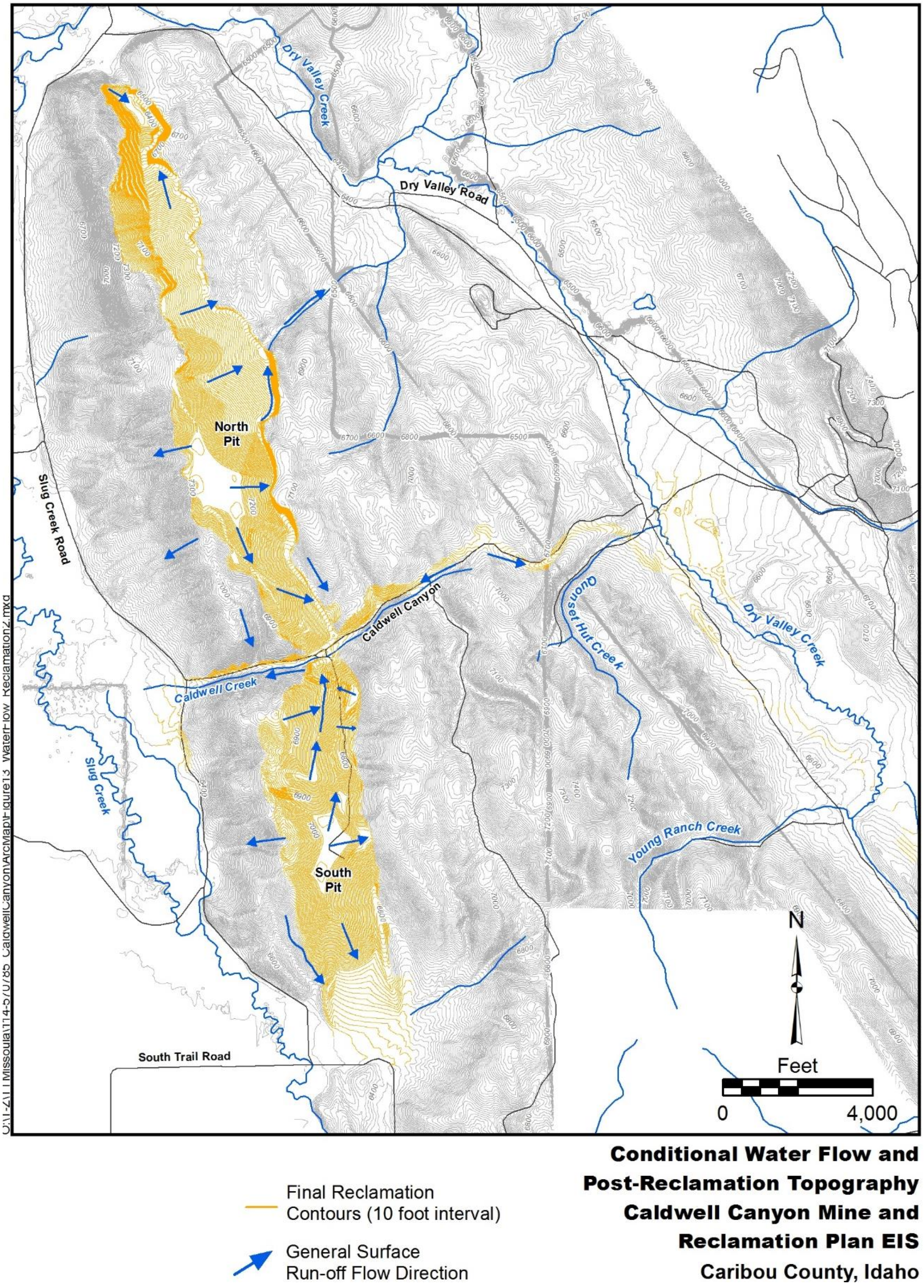
B.16.2 Contouring and Revegetation

The reclamation topography is shown on **Figure B-3**. Concurrent reclamation throughout the Caldwell Canyon Mine life is planned according to the pits sequencing and backfill schedule (**Table B-8**). Final grading would blend site topography and revegetation with adjacent undisturbed land to the extent practical.

B.16.3 Contouring and Grading

Final grading is designed to create a stable post-mining landscape, establish effective drainage to minimize erosion, and protect surface water and groundwater resources. The pits would be backfilled to resemble pre-mining slopes and contours where practicable. Grading would eliminate angular features and ensure the surface blends with the adjacent terrain following subsequent placement of capping materials and growth media. Grading in the pits areas would limit ponding of water at the surface of the covered pits. BMPs (straw wattles, dozer track planting, and hydro-seeding on steeper slopes) would be implemented to control soil erosion until vegetation is established. Steep rock pit walls remnants in the North Pit would not be graded or reclaimed.

Figure B-3. Post-Reclamation Topography



B.16.4 Growth Media Replacement

Growth media used to reclaim disturbances would include topsoil (Lift-1 material) and subsoil (Lift-2 material) that meet suitability ratings for plant growth. Additional subsoil and unconsolidated parent material that do not meet plant growth suitability ratings would be salvaged from disturbed areas and mixed with Lift-2 material to provide the volume necessary to construct a 4-foot growth media layer for the overburden cover.

Growth media material (i.e., topsoil and subsoil) for mine facilities outside of the mine pits areas would be placed at a minimum of 12 or 18 inches thick, depending on facility, then revegetated. Disturbed areas over the life of the mine would receive soil replacement before revegetation, except permanent pit walls remnants in the North Pit.

B.16.5 Revegetation

Broadcast seeding rate would typically range from 80 to 120 seeds per square foot (not including the cover crop) and would be adjusted in response to site conditions, mix composition, likelihood of natural establishment (from plant parts), and experience from recent reclamation operations. If drill seeding is employed, seeding rates would be reduced to approximately 50 percent of the broadcast rate. P4 Production has designed the pits backfill sequence and grading to create slopes that are 3H:1V or less; however, depending on the actual pits configurations and sequencing of backfill, some final slopes may be steeper. All slopes that are 3H:1V or less would be seeded with a broadcast seeder while tracking with a dozer to firm the seed bed, secure seeds, and help stabilize the surface. While not anticipated, any small areas with slopes greater than 3H:1V would be seeded with a hydro-seeder.

The first backfill would be reclaimed without adding fertilizer or mulch when backfill is placed directly following stripping. If the source materials for the initial reclamation is stockpiled material, adding mulch and/or fertilizer would be considered to augment the water holding capacity and nutrition value of the growth media, respectively. Application rates are based on soil conditions and site experience. If implemented, applications of mulch or fertilizer would occur prior to seeding.

Seed inoculants would be included in the mix or spread separately, as appropriate. Inoculants would be selected in consultation with the seed suppliers to ensure suitability for the applied mix.

If shrubs fail to establish from reclamation seeding or viable propagules in direct placed soil, shrub transplants would be employed to promote establishment of small (0.01 to 0.1-acre) shrub patches as seed sources in reclaimed areas. This method would include salvaging live shrubs (with preference for shrubs beneficial to Greater Sage-Grouse) with a backhoe or loader in advance of salvage operations and hauling those shrubs to areas prepared for revegetation. Transplant operations would select relatively small or young shrubs with limited root systems and water demands to increase the likelihood of survival, and operations would be conducted at times when soil conditions are moist. Using this method, patches of shrubs may be established on ridges and other positions optimal for seed dispersal in reclaimed areas. Additional seeding in the patches would likely be unnecessary due to the prevalence of plant propagules in the direct-hauled soil material.

Revegetation species selected considered site-specific conditions and post-closure objectives:

- Promote land uses for livestock grazing and wildlife habitat;
- Optimize store and release performance of the cover design;

- Promote development of Greater Sage-Grouse habitat; and
- Restore native plants important to Tribal cultural uses.

A detailed species list and the considerations used to develop the following tables is in **Appendix A.**

The Primary seed mix (**Table B-9**) includes upland species adapted to the most prevalent conditions in the reclaimed landscape, including the backfilled pits. Species listed are perennial and many have root systems capable of penetrating the full thickness of replaced growth media and promoting evapotranspiration and cover performance, where necessary. At the time of reclamation, the seed mix adapted to conditions would be identified.

Table B-9. Primary Seed Mix Specifications

Species Group	Number of Species	Composition	Composition Note (based on PLS)
Grasses	3 to 5	30 to 50%	60 to 80% bunchgrass, 20 to 40% rhizomatous grasses.
Forbs and Subshrubs	4 to 6	25 to 40%	At least 75% of the forbs favorable for Greater Sage-Grouse.
Shrubs	1 to 3	15 to 30%	At least 80% of the shrubs favorable for Greater Sage-Grouse.

Source MRP Table 6-3 (P4 Production, 2017).
Note: PLS = pure live seed, % = percent.

The Channel/Stabilization seed mix would rapidly stabilize areas where concentrated water flow increases erosion potential. The Channel/Stabilization seed mix would be developed according to the specifications in **Table B-10**. This seed mix would also be used for temporary reclamation and for small sites where rapid stabilization is desired (e.g., stockpiles or erosion repair).

Table B-10. Channel/Stabilization Seed Mix Specifications

Species Group	Number of Species	Composition	Composition Note (based on PLS)
Grasses	3 to 5	60 to 80%	At least 70% rhizomatous grasses.
Forbs and Subshrubs	2 to 4	20 to 40%	At least 60% of the forbs should be favorable for Greater Sage-Grouse, with preference for low-cost nitrogen fixing species.

Source: MRP Table 6-5 (P4 Production, 2017)
Note: PLS = Pure live seed, % = percent.

The Wetland and Wet Meadow seed mix (**Table B-11**) includes species adapted to seasonally flooded, wet or seasonally inundated sites. This seed mix would promote establishment of desired perennial species that control erosion and resist weed invasion.

Table B-11. Wetland and Wet Meadow Seed Mix Specifications

Species Group	Number of Species	Composition
Graminoids	3 to 5	80 to 100%
Forbs, Subshrubs, and Shrubs	0 to 2	0 to 20%

Source MRP Table 6-6 (P4 Production, 2017)
Note: PLS =pure live seed, % = percent.

Dozer tracking during and after broadcast seeding would help secure soil and control erosion on most slopes while seedlings establish. In channels, swales, and other areas of concentrated run-off flow, straw wattles or other BMPs would be installed after seeding according to standard protocol to slow run-off and retain sediment onsite.

B.16.6 Component Specific Reclamation

Mine Pit Reclamation

Water quality monitoring at historic and operating phosphate mines in the region have demonstrated that leachates released from run-of-mine overburden must be managed appropriately to avoid contamination of surface water and groundwater. Also, specific vegetation species that have relatively deep roots can uptake selenium from underlying run-of-mine overburden to the extent they become toxic to grazing livestock and wildlife. To address these issues, a Water Balance Cover system on run-of-mine overburden is proposed in the MRP. The cover is designed to limit the percolation of water into the overburden, promote run-off, and maximize evapotranspiration of precipitation, thus limiting deep percolation through the cover and reducing the amount of moisture migrating into the underlying overburden. The cover would be composed of available material on site that would limit the potential for increased permeability due to desiccation cracking. The cover would also be thick enough to isolate deep-rooted vegetation from the underlying run-of-mine overburden, thus limiting the possibility of excess selenium accumulation in the cover vegetation. The reclamation vegetation species would also be selected to benefit slope stabilization and support livestock grazing, wildlife foraging and habitat.

The cover would be constructed of two feet of Rex Chert overlain by four feet of colluvium, alluvium, and soil (primary cover material). Following placement of growth media, the final surface would be seeded for stabilization and to maximize transpiration and water removal.

The North Pit would not be completely backfilled resulting in 132 acres of steep, unreclaimed pit walls (see Section B.16.3). After final grading, an infiltration zone would be created at the remaining North Pit wall at the toe of the reclaimed backfill slope by drilling and blasting the Wells Formation bedrock to create a zone of higher permeability in the North Pit wall to promote infiltration of seasonal run-off into the Wells Formation.

Up to three acre-feet of run-off water annually may collect in a backfilled pit in the northeastern portion of the South Pit as a result of a low point. A coarse limestone rock drain would be constructed in the bottom of the low point which would drain precipitation to the Wells Formation without contacting backfill materials. Up to one acre-foot would seasonally pond at a second low point in the northeastern portion of the South Pit. A similar rock drain would be constructed at this location to infiltrate the remainder of seasonal run-off.

Water Management System Reclamation

When monitoring indicates that vegetation is fully established per BLM standards and areas are stabilized, the water management system components (WMPs, SCPs, and RCPs) would be reclaimed. Pond and ditch removal, along with final drainage pattern contouring, would be completed once the Caldwell Canyon Mine disturbance reclamation is successful.

Embankments for the RCPs and SCPs would be breached and contoured to reestablish the drainage channel (**Figure B-3**). SCPs on the East Caldwell Area Haul Road would be filled with material from the embankments and the haul road fill. WMP liners would be rolled up, staged in the center of the impoundments, and buried in-place. WMP embankments would be leveled and contoured to be slightly mounded, and covered with growth media salvaged during construction. The sites would be revegetated with a seed mix selected according to hydrologic conditions and post-closure land use.

RCPs and the Dry Valley Haul Road would be reclaimed during pit reclamation (around Year 3 of mine life). Liner material from the RCPs would be buried in pits backfill. Embankment material would be graded to fill ponds and contoured to match adjacent areas.

IG pipelines connected to WMPs near the South Pit, water diversion pipes from SCP-1 and SCP-2, and the Caldwell Canyon Service Road WMP pipes would be removed (**Figure B-3**). The East Caldwell Area Haul Road culvert in Caldwell Creek would remain. During reclamation, sub-grade ore material in the stockpiles adjacent to IG-1 would be graded to match the slope of pit backfill and covered with a Water Balance Cover.

Run-on control ditches for the haul roads, service road, and SCPs no longer needed to manage storm water, would be reshaped to blend with natural topography.

Ore Stockpile and Tipple Area

Ore stockpile removal is planned to expose the underlying Rex Chert. The site would be graded to blend with surrounding topography, re-establish drainage in the area, and cover the ore pad area with a minimum of 18 inches of growth media prior to seeding with the Primary seed mix (**Table B-9**). The tipple would be dismantled and removed from the site. WMP-3 (tipple pond) would be reclaimed as described above.

Haul Road and Service Road Reclamation

The East Caldwell Area Haul Road would be reclaimed when no longer needed for mining activities. Reclamation would include filling road cuts and contouring to near original topography as practical to blend with adjacent undisturbed areas of the haul road corridor (**Figure B-3**). Some of the higher cut slopes would likely be exposed even after filling. The haul road would be removed and the original double-track road through Caldwell Canyon would be restored. Haul road safety berms would be removed and used as backfill for the double-track road and pits. The portion of the roadbed outside of the double-track road would be ripped, scarified, reshaped to blend into the surrounding topography, covered with a minimum of 12 inches of growth media, and revegetated using the Primary seed mix (**Table B-9**).

The portion of the East Caldwell Area Haul Road that extends across Caldwell Creek would be reduced to a two-track service road providing access to the reclaimed South Pit area. The one-foot diameter culvert would remain at the crossing and be covered by two feet of fill.

The Caldwell Canyon Service Road would be reclaimed to leave a 15-foot wide double-track road (including berm) that would connect with the double-track road re-established during reclamation of the East Caldwell Area Haul Road.

Once haulage to the Dry Valley Mine D Pit is completed (Year 3 of operations), the Dry Valley Haul Road would be reclaimed by ripping compacted surfaces, grading to promote drainage commensurate with Itafos/Nutrient’s reclaimed mine area, replacing growth media, and seeding with the approved seed mix. The two culverts along the Dry Valley Haul Road and fill material overlying the culverts would be removed.

Dry Valley Mine D Pit and Dry Valley Haul Road Reclamation

Placement of a final cover/growth media on the Dry Valley Mine D Pit backfill and revegetation would be completed within 3 years of backfill placement. The final cover/growth media would be placed as described for the North and South pits and would be vegetated using the approved seed mix for the Dry Valley Mine.

Growth media would be salvaged from the bottom of the Dry Valley Mine D Pit, placed during previous reclamation activities, and stockpiled adjacent to the pit rim before pit backfill. This growth media would be combined with growth media and Rex Chert from the South Pit to construct a water balance cover similar to the South Pit cover. This material would be placed on the backfill after placement of cover material when backfilling is complete. The backfill would cover Meade Peak Member exposures and would be sloped to direct run-off to infiltrate into the Wells Formation limestone.

East Caldwell Area Rail Facilities/Office – Shop – Warehouse Complex Reclamation

Options for reclaiming the East Caldwell Area may affect land ownership and subsequently, future permit obligations including reclamation and long-term compliance with regulations. Options would be finalized prior to P4 Production’s use of the existing infrastructure for the Caldwell Canyon Project.

Power

When no longer needed, transfer stations would be removed and the sites reclaimed.

B.16.7 Reclamation Monitoring

Monitoring of vegetation in accordance with an Environmental Monitoring Plan would identify factors affecting revegetation compliance with the ARMP (BLM, 2012) and Idaho Standards for Rangeland Health (BLM, 1997). Eroded and/or ponded surfaces would be graded and reseeded. Reclamation methods would be adjusted to improve future success. Post-closure monitoring would be conducted in accordance with an agency approved Environmental Monitoring Plan for final site compliance.

Appendix C

Greater Sage-Grouse Habitat Assessment Technical Report, Volunteered Greater Sage-Grouse Mitigation Plan, and Caldwell Canyon Environmental Noise Assessment

Greater Sage-Grouse Habitat Assessment Technical Report
Caldwell Canyon Project
Caribou County, Idaho

MONSANTO

NewFields

June 2018

FINAL

GREATER SAGE-GROUSE HABITAT ASSESSMENT TECHNICAL REPORT

Caldwell Canyon Project

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June 2018

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APPENDICES

LIST OF ACRONYMS

amsl	above mean sea level
ARMPA	Approved Resource Management Plan Amendment
BLM	Bureau of Land Management (U.S. Dept. of the Interior)
CHZ	Core Habitat Zone
ECIPA	East Central Idaho Population Area
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
GHMA	General Habitat Management Area
GHZ	General Habitat Zone
GIS	Geographical Information System
GPS	Global Positioning System
GRSG	Greater Sage-Grouse
ha	hectare
HA	Habitat Assessment
HAF	Habitat Assessment Framework
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IHMA	Important Habitat Management Area
IHZ	Important Habitat Zone
KPLA	Known Phosphate Lease Area
LPI	line-point intercept
LUPA	land use plan amendments
MZ IV	Management Zone IV
NAIP	National Agriculture Imagery Program
NLCD	National Land Cover Dataset
NRCS	Natural Resources Conservation Service
P4	P4 Production, LLC
PAC	Priority Areas for Conservation
PFC	Proper Functioning Condition
PHMA	Priority Habitat Management Area
POS	Plan of Study
R1	High Restoration Potential
USFS	U.S. Forest Service
UTM	Universal Transverse Mercator
USFWS	U.S. Fish and Wildlife Service
WAFWA	Western Association of Fish and Wildlife Agencies
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION AND BACKGROUND

1.1 PROJECT DESCRIPTION

P4 Production, L.L.C. (P4), a subsidiary of Monsanto Company (Monsanto), is proposing to develop the Caldwell Canyon Project (Project), an open-pit phosphate mine, to recover phosphate from state and federal mineral leases in Caribou County, Idaho **(Figure 1)**. Surface ownership includes private land owned by P4, private land owned by other entities, public land administered by the Idaho Department of Lands (IDL), and public land administered by the U.S. Bureau of Land Management (BLM).

The Project Area is located along Schmid Ridge, within the Caribou Range, approximately 13 air miles northeast of Soda Springs, Idaho. The site is accessed via Highway 34 to Blackfoot River Road, then via Slug Creek Road to a road that extends through Caldwell Canyon. The Project Area is bounded on the north by the Blackfoot River, on the east by Dry Valley Creek, on the west by Slug Creek, and on the south by South Trail Road. Phosphate leases in the general Project Area include the following as shown on **Figure 2**:

- Federal Mineral Leases IDI-0000002, IDI-0014080, IDI-0013738 administered by BLM and proposed lease modifications; and
- State of Idaho Mineral Lease E07959 administered by IDL.

Mining at Caldwell Canyon would encompass development of two open mine pits: North Pit and South Pit. Mining operations would be conducted over an estimated 40-year period using a pit panel mining method. Mining would be initiated in the mid-point of the South Pit and proceed southward. With the exception of the initial pit panel overburden, as each subsequent pit panel is developed, overburden generated from each new panel would be used to backfill a previously mined panel. Once mining reaches the south end of the South Pit, mining would resume at the mid-point of the South Pit and proceed northward in the same pit panel method. The maximum extent of both proposed mine pits for the Caldwell Canyon Project is shown on **Figure 2**.

Given the potential for disturbance of Greater sage-grouse (*Centrocercus urophasianus*) (GRSG) habitat on BLM-administered land as part of operations, BLM directed P4 to conduct a Habitat Assessment (HA) of potential GRSG habitat within and proximal to the Project Area using the *Sage-Grouse Habitat Assessment Framework: A Multiscale Assessment Tool* (Stiver et al. 2015) (herein referred to as HAF). Descriptions depicting the boundary of the area subject to the HA are presented in *Section 2.0*. Land areas are reported in metric units (e.g., square kilometers (km^2) and/or hectares (ha)) throughout this report, consistent with the HAF documentation.

This Technical Report summarizes HA results of potential GRSG habitat within the Project Area. This Technical Report was prepared by NewFields Mining & Energy Services, LLC (NewFields). The primary authors are Gary Back, Ph.D.; Julian Colescott, M.S.; and Laura Pfister, M.S., all of NewFields. Report review was completed by other senior scientists of NewFields.

1.2 REGULATORY FRAMEWORK

1.2.1 Federal Regulatory Framework

Under the Endangered Species Act (ESA) of 1973, a species may warrant protection through listing if it is endangered or threatened throughout all or a significant portion of its range. In 2010, the U.S. Fish and Wildlife Service (USFWS) determined GRSG warranted protections under the ESA; however, the USFWS also found that listing was precluded due to other higher priority actions. Habitat loss, fragmentation, and inadequacy of existing regulatory mechanisms were identified by USFWS as factors leading to a warranted determination of the GRSG. Subsequent to this 2010 determination, USFWS entered into a court–approved settlement agreement with various non-profit organizations which set a schedule for making listing decisions on over 200 species nation-wide, including the GRSG. That schedule provided for a decision (proposed listing rule or withdrawal) on GRSG range-wide by September 2015.

To address the USFWS's 2010 statement regarding the lack of regulatory mechanisms on federally-administered land, the BLM and U.S. Forest Service (USFS) completed numerous land use plan amendments (LUPAs) throughout six western states, including Idaho. Within the Great Basin Region, the two agencies partnered to prepare four sub-regional final LUPAs and final environmental impact statements (FEISs), including the *Idaho and Southwestern Montana Greater Sage-Grouse Proposed LUPA/FEIS* (BLM 2015a) in May 2015 which addresses land within the Project Area. While the LUPA/FEIS documents were prepared jointly, each federal agency prepared its own decision document to formally approve these plans. For BLM-administered land, the Record of Decision and collective Approved Resource Management Plan Amendment (ARMPA) for the Great Basin Region was signed in September 2015 (BLM 2015b) (herein referred to as 2015 ARMPA).

Based on efforts since 2010, the USFWS stated that regulatory mechanisms adopted through federal (e.g., Idaho and Southwestern Montana Greater Sage-Grouse ARMPA and others) and state plans have substantially reduced threats (e.g., wildfire, habitat fragmentation, invasive species, conifer encroachment, etc.) in approximately 90 percent of GRSG breeding habitat through avoidance and minimization measures. Based on this assessment, the USFWS determined in September 2015 that listing the GRSG was not warranted.

1.2.2 GRSG Habitat

Each BLM ARMPA identifies GRSG habitat (across all management jurisdictions and for BLM-administered land only) by various management area categories (BLM 2015b). Specific to the Project Area, Attachment 1 of BLM's 2015 ARMPA identifies and allocates GRSG habitat for this geographic area (including those within the Project Area) into three management area categories:

- **Priority Habitat Management Area (PHMA)**. This includes areas of BLM-administered land identified as having the highest value to maintaining sustainable GRSG populations. These areas include breeding, late brood-rearing, winter concentration areas, and migration or connectivity corridors.

- **Important Habitat Management Area (IHMA)**. This includes areas of BLM-administered land identified as providing a management buffer for PHMA and which connects patches of PHMA. These areas are considered to be of moderate-to-high conservation value for habitat and/or populations, but are not as important as PHMA.
- **General Habitat Management Area (GHMA)**. This includes areas of BLM-administered land identified as needing some special management to sustain GRSG populations or areas of occupied seasonal or year-round habitat outside of PHMA or IHMA.

While the 2015 ARMPA documents habitat across all management jurisdictions (**Figure 3**) within and proximal to the Project Area, the ARMPA also states that, *"any decisions in the ARMPA apply only to BLM-administered lands, including split-estate lands within GRSG habitat management areas (the decision area). These decisions are limited to providing land use planning direction specific to conserving GRSG and its habitat*" (BLM 2015b, pp. 1-4).

The 2015 ARMPA also states that *"Areas of habitat outside of delineated habitat management areas identified during the Key habitat update process will be evaluated during site specific NEPA for project level activities and GRSG required design features (Appendix C) and buffers (Appendix B) will be included as part of project design. These areas will be further evaluated during plan evaluation and the 5-year update to the management areas, to determine whether they should be included as PHMA, IHMA, or GHMA."* (BLM 2015b, pp. 2-9). Accordingly, BLM may use findings of this HAF to inform the annual Key Habitat Map update as part of the 5-year update to management area designation.

Existing federal mineral leases and exploration licenses proximal to the Project Area were not included as part of BLM's GRSG management areas (e.g., GHMAs, PHMAs, etc.) within the 2015 ARMPA. As such, a majority of P4's Study Area was excluded as part of BLM's decision area for GRSG. Therefore, only 27.8 ha (approximately 69 acres) of BLM-administered lands within the Project Area, including BLM surface and split estate (e.g., private surface / federal mineral, Prospecting Permit IDI-037319) have been categorized by the BLM as (1) GHMA, and (2) part of BLM's decision area for GRSG management (**Figure 4**).

1.2.3 State of Idaho Regulatory Framework

Simultaneous with federal efforts to enhance regulatory mechanisms to support GRSG protections, the State of Idaho, via Executive Order 2012-02, established the "Governor's Alternative" in September 2012 as an alternative for inclusion in the National Greater Sage-grouse Land Use Planning Strategy. To complement the Governor's Alternative, the Idaho State Board of Land Commissioners completed a plan (State Land Plan) aimed at GRSG conservation on State endowment trust land (IDL 2015). The State Land Plan includes both permit stipulations and voluntary best management practices for sage-grouse on 600,000 acres across the state, which would include the required mineral lease from IDL at the Caldwell Canyon Project.

The State of Idaho, via the Governor's Alternative, adopted the designation of Sage-Grouse Management Areas with three distinct management zones: Core Habitat Zone (CHZ), Important Habitat Zone (IHZ), and General Habitat Zone (GHZ). These state-designations coincide with the BLM's designations for PHMA, IHMA, and GHMA, respectively. For consistency, BLM's designations (categories) for GRSG management areas will be referenced in this Technical Report. Therefore, 5.5 ha (approximately 14 acres) of IDL-administered land (State endowment land (Lease E07959) as depicted in **Figure 2**) within the Project Area have been categorized as (1) GHMA, and (2) part of IDL's decision area for GRSG management (**Figure 4**).

2.0 STUDY AREA

Based on the regulatory framework specified in *Section 1.2*, the HA focuses on portions of the Caldwell Canyon Project Area (Caldwell Canyon Study Area), as described below.

The Caldwell Canyon Study Area generally comprises the two proposed mine pits (North and South pits), transportation corridor along Caldwell Canyon, and immediately surrounding areas (**Figure 4**). The Study Area includes the following areas that would be impacted by the Project: 27.8 ha of BLM-administered land within the Project Area categorized by the BLM as GHMA and are part of BLM's decision area for GRSG management; and approximately 5.5 ha of IDL-administered land (State endowment trust land) within the Project Area that have been categorized as GHMA and are part of IDL's decision area for GRSG management (**Figure 4**). These five site-scale areas that total 33.3 ha include small segments of the proposed North and South pits, as well as areas of BLM-administered surface and split estate (private surface / federal mineral) within the adjacent transportation corridor along Caldwell Canyon (**Figure 4**).

The general legal description of land within the Caldwell Canyon Study Area includes portions of Section 36 in Township 7 South (T7S), Range 43 East (R43E); portions of Sections 1, 12, 13, and 24 in T8S, R43E; and portions of Sections 7, 18, and 19 in T8S, R44E. The characteristic landscape within and around the overall Project Area is predominantly natural and rural in character. Land uses that provide the rural component of the landscape character include summer grazing, logging, and mining. Man-made features related to grazing consist of corrals, fences, roads, and stock-watering ponds.

Locally, topography is characterized by a series of north to northwest trending mountain ranges separated by broad inter-montane valleys. Relief within the Caldwell Canyon Project Area is about 1,000 feet, with elevations ranging from 6,400 feet above mean sea level (amsl) along Slug Creek to about 7,400 feet amsl at the crest of Schmid Ridge. The Blackfoot Reservoir, located approximately 10 miles northwest of the Project Area, is at an elevation of about 6,100 feet amsl. The Blackfoot River forms the reservoir, and Slug Creek and Dry Valley Creek are tributaries of the river in the Project Area.

The localized landscape exhibits modification of the natural character from past mineral exploration, including drilling and trenching. Slug Creek Road and Dry Valley Road are unpaved roads that parallel Schmid Ridge in the west and east sides, respectively, of the Project Area (**Figures 2 & 4**). The ridges of the Project Area support a mixture of vegetation types. The northern and eastern aspects, along higher ridges, support conifer and aspen, in pure and mixed stands, which are interspersed with mixed shrubs. The foothills on the northern and eastern aspects consist of a mixture of aspen and mixed shrubs, which transition to grasslands and riparian/wetland in Dry Valley. Mixed shrubs are more prevalent at the southern end of the Project Area along the ridges and the foothills. The west aspect of Schmid Ridge has less aspen than the north and northeastern aspects, with sagebrush/native grass, native grasslands/forbs, and mixed shrubs from the ridge to the valley floor. The valley floor is primarily riparian/wetland associated with the Slug Creek floodplain, in addition to some areas of introduced grasses. Small riparian/wetland areas are interspersed on the landscape, associated with springs and creeks.

South of the Project Area, a major spring (referred to as Knudsen Spring; **Figure 2**) discharges forming a stream that flows year-round a short distance to Slug Creek. Perennial, intermittent, and ephemeral drainages extend west to the Slug Creek floodplain and east to Dry Valley Creek (**Figure 2**). Caldwell Creek is a 2nd-order spring- and runoff-fed stream in the Slug Creek basin with a drainage area of approximately 570 ha (2.2 square miles or 1,408 acres). Caldwell Creek flows to the west through Caldwell Canyon (**Figure 2**) and is the largest sub-basin of Slug Creek in the Study Area. Caldwell Creek appears to be perennial, but has no surface connection with Slug Creek as the flow infiltrates into alluvium and associated wetlands where the channel ends on the valley floor about 1,000 feet from Slug Creek. Due to this lack of connection with Slug Creek, the U.S. Army Corps of Engineers determined that Caldwell Creek is a non-jurisdictional Waters of the U.S.

Primary land uses in and proximal to the Study Area include agriculture, livestock grazing, and phosphate mining. Agrium's Dry Valley Mine site, which is in the closure and reclamation stage, is located approximately 1½ miles east of the Caldwell Canyon Project Area; and Simplot's proposed Dairy Syncline Mine is located in the headwaters of Slug Creek, approximately 2 miles south of the Caldwell Canyon Project Area.

3.0 METHODS

As a consequence of BLM-administered land in the Caldwell Canyon Project Area being designated as GHMA, BLM required that P4 conduct a HA for the Project using the BLM HAF process (Stiver et al. 2015). The HAF is part of the *Greater Sage-Grouse Comprehensive Strategy* published by the Western Association of Fish and Wildlife Agencies (WAFWA) in 2006 (Stiver et al. 2006) and provides a framework, including both temporal and spatial methods, for evaluating sagebrush habitats with respect to suitability for GRSG at various landscape scales. The intent of the HAF is to empower managers to make decisions regarding the implementation of project-level actions within the context of various landscape scales. For consistency, IDL has requested that the HAF also be applied to IDL-administered land in the Project Area.

Prior to conducting field surveys, a *Habitat Assessment Plan of Study (POS)* for the Caldwell Canyon Project was prepared by NewFields (2016a). The POS included a summary of the BLM's Sage-Grouse HAF (Stiver et al. 2015), a description of habitat subject to the HAF process in the Project Area, and a discussion of methods used to conduct the HA on each of four scales. The POS was reviewed and critiqued by BLM and Tetra Tech resource specialists as part of the Environmental Impact Statement (EIS) process for the Project. The POS was then revised to reflect comments and suggested revisions.

The main objective of the Caldwell Canyon Project GRSG HA is to implement the BLM HAF procedure (as described below) to determine the suitability of seasonal habitat for GRSG within the Caldwell Canyon Study Area based on the regulatory and policy framework presented in *Section 1.2*. This HA focuses on BLM-administered and IDL-administered land within the Caldwell Canyon Study Area designated as GHMA as described in *Section 2.0*.

3.1 OFFICE STUDIES

Available baseline information with direct relevance to the Caldwell Canyon was reviewed prior to conducting HA desktop review and field work. Year 2013 aerial imagery from the National Agriculture Imagery Program (NAIP) (1-meter pixel size) was examined to gain an overall impression of the extent and diversity of habitats, to familiarize biologists with topography, vegetation cover, road access, and land ownership. Details are presented in *Sections 3.2* through *3.4* below. Vegetation mapping of the Study Area was conducted by NewFields as part of the biological baseline data collection (NewFields 2015b).

3.2 BROAD-SCALE (FIRST-ORDER)

The historic and current range-wide distribution of GRSG has been established by Schroeder et al. (2004), with some adjustments and discussion by Connelly et al. (2004), Stiver et al. (2006), Wisdom et al. (2005), and Rowland et al. (2006). Consistent with the HAF (Stiver et al. 2015), broad-scale (first-order) habitat selection is based on a desktop review of the historic and present range of GRSG and identification of how the Project is within both of these ranges (**Figure 5**). No field data collection was associated with this effort.

3.3 MID-SCALE (SECOND-ORDER)

Populations and sub-populations have been geographically described by Connelly et al. (2004), and Stiver et al. (2006) identified GRSG management zones, both of which are at the second-order scale (**Figure 6**). As part of the HAF's mid-scale (second-order) habitat selection task, the population/sub-population and management zones for the Project were identified (USFWS 2013) and described based on desktop review. As part of this effort, HAF Data Form M-1 (**Appendix A**) was completed for the Project Area to document the mid-scale (second-order) sage-grouse habitat description. No field data collection was associated with this effort.

As part of the second-order assessment, Inside Idaho's (Idaho's Geospatial Data Clearinghouse) publicly available Geographic Information System (GIS) data were reviewed relative to the East Central Idaho Population Area (No. 18) (**Figure 7**). GIS data layers reviewed included:

- GRSG Management Areas (habitat) in the Proposed Plan of the Great Basin Region, Idaho-SW Montana Sub-region, Greater Sage-Grouse EIS as Priority, Important, and General Habitat; and
- 2015 Sage-Grouse Habitat Planning Map Update (IDFG).

Due to the lack of data specific to the East Central Idaho Population with respect to occupied habitats at the second-order scale, an assessment of the vegetation was conducted of habitat availability, patch size and number, patch connectivity, linkage area characteristics, and landscape matrix and edge effect. This was accomplished using the National Vegetation Classification System and the National Land Cover Dataset (NLCD) (**Figure 8**).

3.4 FINE-SCALE (THIRD-ORDER)

No field data collection was associated with this fine-scale (third-order) task; however, mapping of vegetation types, interpretation of GIS layers, and calculation of hectares of various seasonal habitats were conducted. As outlined in the HAF (Stiver et al. 2015), the following steps were used to guide the third-order level desktop assessment:

1. The extent and grain size appropriate for a habitat description of the home range area was determined (NAIP imagery) to be 30-meter pixel. NewFields then developed a vegetation map using appropriate third-order land cover types (using the National Vegetation Classification System and NLCD).
2. Due to the lack of data specific to the East Central Idaho Population with respect to occupied habitats and seasonal habitats (**Figure 8**) in the vicinity of the Caldwell Project, a fine-scale (third-order) vegetation map was created using existing aerial imagery (NLCD) and the NewFields vegetation reports (NewFields 2015b, 2016c) for a 100,000-acre area that included the Caldwell Project. This mapping effort was used to identify available seasonal habitat and non-habitat.
3. Vegetation types that are known to provide GRSG habitats were identified using the mapping product described above. These areas were identified as available habitats lacking any data regarding which areas were actually occupied (**Figure 8**).

4. The third-order assessment of the vegetation was conducted of habitat availability, patch size and number, patch connectivity, linkage area characteristics, and landscape matrix and edge effect using this vegetation map.
5. Anthropogenic features were described and mapped.
6. Vegetation connectivity characteristics between available habitats based on the vegetation mapping was conducted, which included discussions of the natural barriers and anthropogenic barriers.
7. Existing third-order habitat suitability of the home range area of interest (using HAF form F-1: Fine-Scale (Third-Order) Sage-Grouse Habitat Description – see **Appendix A**) was described and summarized based on information from Steps 2-6.

As part of the fine-scale (third-order) habitat selection task, publicly available GIS data, such as nesting and late brood rearing habitat and winter habitat as mapped by the Idaho Department of Fish and Game (IDFG) for the Idaho and Southwestern Montana Greater Sage-Grouse Final EIS (**Figure 9**), were also reviewed to ensure that they were relevant to the Project (**Figure 8**). In addition, the Caldwell Canyon Project Wildlife Baseline Technical Report and Addendum (NewFields 2015a, 2016b), as well as the Vegetation Baseline Technical Report and Addendum (NewFields 2015b, 2016c) which summarized data relative to GRSG and vegetative communities, were also reviewed. The Soil Resources Baseline Technical Report and Addendum (Catena & NewFields 2015, 2016) were also reviewed for pertinent information that could both provide additional detail for the third-order assessment, and a foundation for the fourth-order assessment.

3.5 SITE-SCALE (FOURTH-ORDER)

At the site-scale (fourth-order), availability of protective vegetation cover and food resources within seasonal habitats was described. This part of the HA involved refining the third-order seasonal habitat descriptions, where habitats defined at the third-order scale were further categorized as: Suitable, Marginal, or Unsuitable habitat based on specific measured criteria. Using measurement techniques outlined in the HAF (Stiver et al. 2015), habitat suitability worksheets and data forms were completed in the field during August 2016 for the respective seasonal habitat (**Appendix B**) and the associated summary form (**Appendix A**).

3.5.1 Fourth-Order Level Assessment Process

Generally consistent with methodology presented in the HAF (Stiver et al. 2015), the following steps were used to guide the fourth-order level assessment:

1. Seasonal use areas and associated third-order cover types of interest for fourth-order descriptions were identified, and the extent of land cover types within the Caldwell Canyon Study Area were determined. No known seasonal use areas were identified for the area. Of the eight land cover types (vegetation types) identified during the vegetation mapping baseline effort (NewFields 2015b), only three vegetation types included sagebrush: Big Sagebrush/Native Grass, Big Sagebrush/Introduced Grass, and Mixed Shrub. Other vegetation types that had potential for use by GRSG included Native Grasslands/Forbs and Riparian/Wetlands. The other vegetation types in the area consisted of trees (i.e., Aspen, Conifer/Aspen, or Conifer) or Introduced Grasses (areas where sagebrush was removed and introduced grasses were seeded for livestock grazing).

Therefore, the fourth-order assessment focused on the Big Sagebrush types that were within the GHMA in the areas that were not excluded from the BLM's decision area for the Caldwell Project as described in *Section 2.0* and displayed on **Figure 4**. As a result, the Mixed Shrub[1] was the only vegetation type of interest on these small blocks of land. Collectively, approximately 14.6 ha of the 33.3 ha in total were identified as Mixed Shrub habitat (NewFields 2015b).

2. Ecological sites for the Caldwell Canyon Study Area and the associated reference sheets have not been finalized by the Natural Resources Conservation Service (NRCS) and were not available for this Project. Therefore, existing vegetation mapping (NewFields 2015b, 2016c) was used to identify potential habitat and to allocate samples.

3. A random sampling approach was designed and sample sizes were determined for the Caldwell Canyon Study Area sites at approximately one sample per 2.4 ha of potential habitat. Because the total impact on BLM-administered lands in GMHA will only be 27.8 ha, and only one land cover type (Mixed Shrub) within the area of impact was considered available GRSG habitat (of which only 14.6 ha is present), six samples were deemed adequate. The HAF (Stiver et al. 2015) requires that a minimum of three samples be collected in each cover type; therefore, the six samples collected exceeded this minimum. Given that only one cover type (Mixed Shrub) in the impacted area was considered a seasonal habitat (i.e., late summer brood habitat), there was no reason to stratify the sampling. In addition, no detailed habitat data which could provide estimates of the mean or the variance of the various plant community metrics to be used in sample size calculation were available for the Study Area.

   Once the number of field samples was calculated, sample points were randomly selected to determine the sample locations. The purpose of randomly selecting points is to avoid sample site selection based on observer bias. The UTM grid and a random number table were used to generate X and Y coordinates, which was repeated until the specified number of samples was obtained. No more than two samples were collected in any one of the four areas sampled. This method was preferred over one that distributes sample points throughout the sample area to avoid placing points in clumps or at edges (e.g., Shiny Spatially Balanced Sampling Tool). The field data collection team then used a GPS unit to locate the sample points in the field. Some "field fitting" was necessary to ensure that the sample transects were entirely within a single vegetation type.

   Areas of vegetation that were previously mapped as being dominated by trees (i.e., Aspen, Conifer, or Mixed Aspen-Conifer), Introduced Grasses, or Native Grasslands/Forbs were examined to confirm the vegetation mapping. The two grassland types (Introduced Grasses and Native Grasslands/Forbs) were not considered GRSG habitat if adjacent to forested habitats.

4. As outlined in the POS (NewFields 2016a), NewFields collected field data for: composition and structure of habitat within the seasonal use areas using the line-point intercept method, plant heights, and tabulation of forb species richness (see *Section 3.5.2* for field method details).

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[1] Although Big Sagebrush/Native Grass was initially mapped in some of the areas sampled, the areas were small and upon field inspection, were not discernable as a separate vegetation type from the Mixed Shrub in these areas. This type did exist in the overall Project Area, but not in the areas of focus for the fourth-order assessment.

5. Similar procedures were initially planned for the IDL-administered lands. However, during the process of determining the number of sample points and the locations of the points, the existing vegetation mapping indicated that the 5.5 ha of IDL-administered lands were dominated by trees and Native Grasslands/Forbs, with only 0.25 ha of Mixed Shrub. The areas dominated by trees and Native Grasslands/Forbs were not considered late summer brood habitat, and the Mixed Shrub was not considered GRSG habitat given it was adjacent to forested habitats. As such, no suitable habitat was present in this block and no samples were taken. Photo points were established to document the area as non-habitat.

6. Field data were transferred into suitability matrix categories associated with the seasonal habitat to determine fourth-order suitability. Suitability was determined consistent with Stiver et al. (2015), whereby suitability for summer/late brood-rearing seasonal habitats depends on whether the habitat was Upland Sagebrush communities or Riparian/Wet Meadow communities in close proximity to Sagebrush communities.

7. The fourth-order habitat suitability for seasonal habitats of interest was described using HAF Form S-7 (**Appendix A**).

3.5.2 Field Methods

Based on available baseline information, potential summer late brood-rearing habitat occurs in the Caldwell Canyon Study Area. As approved in the POS (NewFields 2016a), the August 1-5, 2016 field work schedule coincided with the summer late brood-earing season, which was appropriate for the Project Area.

The field work focused on GRSG late summer brood habitat on BLM-administered land and IDL-administered land within the footprint of the proposed Caldwell Canyon mine pits and related disturbance areas. Areas dominated by trees were not assessed.

Metadata were collected for each sample as per the HAF (Stiver et al. 2015). The line-point intercept method was used to measure foliar cover of grasses, forbs, and shrubs. A laser stick with a bubble level was used rather than a pin flag. Vegetation cover was recorded on the Line-Point Intercept Data Form, and vegetation height and sagebrush shape were recorded on the Vegetation Height/Sagebrush Shape Data Form (**Appendix B**). Measurements were taken at 0.5-meter intervals to obtain 100 samples per transect. Forb availability and diversity information was collected and recorded on the Sage-Grouse Forb Diversity Data Form. Twenty-five forb plots at 2-meter intervals and a 1-meter, 180-degree arc were used to record forb species.

Photos were taken at each transect and of adjacent habitat where the adjacent habitat had potential to influence GRSG use of the area. A photo-log is included in **Appendix B.**

The data were summarized on the appropriate data summary forms, and Form S-7: Sage-Grouse Site-Scale Seasonal Habitat Site Suitability Summary Form was used to summarize the seasonal habitat suitability description (**Appendix A**).

4.0 FINDINGS

This section describes results of the HA, including office studies (first-, second- and third-order scales) and the GRSG HA field survey (fourth-order scale) conducted in August 1-4, 2016. As discussed in *Sections 3.3-3.5,* completed HA data forms for the second-, third-, and fourth-order scales are included in **Appendix A**. Additional field forms for the fourth-order scale are presented in **Appendix B**. A list of all plant species observed in the Study Area is in **Appendix C.**

4.1 FIRST-ORDER

The first-order scale is the range-wide potential pre-settlement habitat, which is the estimation of where sagebrush was likely to exist in sufficient quantity to support GRSG populations prior to settlement by European man. This area is depicted on **Figure 5** and includes portions of two Canadian provinces and 14 western states. The current distribution of GRSG is limited to one Canadian province and 11 western states (Stiver et al. 2015). The Caldwell Canyon Project is within the historic and current range of the species; however, it lies on the edge of the historic range in the transition from sagebrush valleys to forested mountains (**Figure 5**). For perspective, the pre-settlement potential distribution of sagebrush habitat encompassed over 121 million ha; disturbance associated with the Project Area would encompass approximately 607 ha.

Connelly et al. (2004) describes first-order habitat suitability with respect to availability of large expanses of sagebrush or grass/sagebrush habitat, presence of migration corridors, and juxtaposition of other habitats and land uses within these large expanses. The Caldwell Canyon Project exists in a mountain range-valley physiographic type in the Caribou Mountain Range (**Figure 1**). The mountain areas are a mixture of forests and shrub types, and the valleys are primarily riparian/wetlands and sagebrush/native grasslands, except where the native vegetation has been converted to introduced grasses or agricultural crops (e.g., hay or hops). Therefore, with respect to large expanses of sagebrush or grass/sagebrush habitat, the areas are not large or expansive, but fragmented by the forest vegetation and agricultural areas. Migration corridors have not been designated, but the valley areas historically would have had continuous areas of sagebrush vegetation to allow seasonal movements. In addition, riparian areas associated with drainages from the mountains would likely have served as seasonal corridors, especially in the spring and summer, where the riparian vegetation consisted of shrubs and grasses, rather than trees. The mixture of shrub habitats with forested habitats likely has been somewhat of a historic limiting factor for GRSG because at least 50 percent of vegetation in the mountain areas consisted of trees, as compared to a more sagebrush-dominated landscape on the Snake River Plain less than 40 miles away.

There is a gap in the historic range just east of the Caldwell Canyon Project; the Project Area is between areas of historic large expanses of sagebrush (i.e., Snake River Plain to the west and northwest) and the largely forested areas of eastern Idaho and western Wyoming to the east (**Figure 5**). The large sagebrush expanses become increasingly more fragmented by the physiographic changes with increasing distance from the Snake River Plain to the Wyoming border. The size of the sagebrush patches decrease as the size of the forested areas increase and is represented by the gap in historic distribution of potential habitat along the Idaho-Wyoming border (**Figure 5**). As is the case for most species, populations at the margins of suitable habitat (i.e., transition between two different ecosystems such as sagebrush steppe and forests) are likely to be less robust than those that exist in the heart of suitable habitat. Given the historic natural fragmentation of habitat, corridors between seasonal ranges would have been limited, especially between spring/summer habitats and winter habitat. The elevation and precipitation zone of the area result in significant winter snow accumulations that cover much of the sagebrush for extended periods of time. Consequently, it is likely that GRSG vacated these areas for most of the winter.

Therefore, with respect to the first-order scale, the Caldwell Canyon Project Area is within the range-wide potential pre-settlement habitat, but is likely to have been an area with small populations distributed based on physiographic features and available suitable habitat where movement corridors between populations and seasonal habitats existed.

4.2 SECOND-ORDER

The second-order scale is the population/sub-population level and is related to bird dispersal based on a regional perspective that focuses on having sufficient distribution and abundance of sagebrush shrubland to allow dispersal and migration movements within the population/sub-population area. The Caldwell Canyon Project is within Sage-Grouse Management Zone IV (MZ IV): Snake River Plain as determined by WAFWA (Stiver et al. 2006) (**Figure 6**). This zone supports the largest population of GRSG outside of the Wyoming Basin (Garton et al. 2011) and is one of the largest areas of connected sage-grouse habitat (Knick et al. 2011), including GRSG populations in Oregon, Idaho, Nevada, Utah, and Montana, and several of these populations have been designated as GRSG Priority Areas for Conservation (PACs) (USFWS 2013).

The second-order scale is also large relative to the Project. The Caldwell Canyon Project is approximately 607 ha in size, whereas the Sage-Grouse Management Zone IV (MZ IV): Snake River Plain (**Figure 6**) encompasses an area of approximately 316,000 km^2 or 31.6 million ha.

The East Central Idaho Population Area is located on the east side of MZ IV (**Figure 6**) within the East Idaho Uplands, including the Blackfoot River drainage upstream from Blackfoot Reservoir. The area is generally characterized by a high proportion of private and state-administered land. The Caldwell Canyon Project is within the boundary of this population (**Figure 6**). The East Central Idaho Population is not within the area designated as a GRSG PAC, indicating that the East Central Idaho Population is in a lower priority status. The PACs include areas where a high percentage of GRSG occur; approximately 75 percent of GRSG live within 25 percent of the occupied range (USFWS 2013).

Figure 7 displays the current GRSG distribution (Washington Department of Fish and Wildlife [WDFW] 2002), key GRSG habitat, areas with high restoration potential, and BLM-designated habitat management areas for the East Central Idaho Population Area. As indicated on the figure, a substantial portion of the current GRSG distribution has no designation for key habitats, or BLM-designated management areas, and the Caldwell Canyon Project Area is not within the current GRSG distribution area.

The designation of suitable habitat at the second-order is based on connected mosaics of sagebrush shrublands such that seasonal movements and dispersal of GRSG are facilitated, and anthropogenic disturbance of these mosaics and corridors are generally not widespread or are absent (Stiver et al. 2015). Using the NLCD layer to view the landscape within the East Central Idaho Population Area (**Figure 8**), an assessment was conducted of anthropogenic disturbances (i.e., area of non-habitat or unsuitable habitat inclusions) and other factors within the East Central Idaho Population Area. A summary of this assessment is presented below.

Large areas of gentle valley slopes and the valley bottoms where sagebrush was once present have been converted to agricultural crops or to non-native grasses for livestock grazing (**Figure 8)**. Sagebrush still exists in large areas, but there is also a substantial land area of sagebrush that is fragmented into widely scattered areas on steep terrain, or located in rocky patches that could not easily be converted to crops or grassland. It is likely that the lands converted to agricultural uses were part of the breeding/nesting/early brood habitat because the soils are relatively deep in these areas and would have supported a mixture of perennial grasses and sagebrush. The valleys also contain riparian vegetation that would have served as summer brood habitat. Much of this riparian habitat remains intact, or as grassland meadows adjacent to riparian vegetation.

The southern and eastern portions of the East Central Idaho Population Area are dominated by trees (**Figure 8**). As the elevation increases, annual precipitation also increases, primarily as winter snow, and the increased precipitation supports trees – aspen, conifers, and mixed aspen-conifer. These forested areas are interspersed with sagebrush and mixed shrubs depending on aspect, soil depth, and elevation. The extent of contiguous areas of sagebrush is greatly reduced in these portions of the East Central Idaho Population Area.

The result is a landscape with a patchy and fragmented complex of sagebrush and sagebrush/grasslands mixed with unsuitable habitats of non-native grasslands and various types of forest vegetation. The sagebrush areas are not well connected for dispersal or migration in much of the southern and eastern portions of the population area (**Figure 8**). The mixed shrub/grassland areas on the mountain slopes that are intermixed with the forested areas remain intact, except where mining has occurred in these higher elevation habitats. These patches of habitat provide abundant shrub cover with an understory of forbs, which is adequate late summer brood habitat. However, the proximity to trees and the size of habitat patches likely determine which habitat patches are used, and which are too fragmented or too close to trees to be used consistently by GRSG.

Using publicly available information and mapping as a foundation, Form M-1 (second-order GRSG habitat description) was completed to the extent possible **(Appendix A**). However, limited data exist for the East Central Idaho Population Area, especially for areas where leks are widely spaced and many are inactive. Consequently, data and maps of habitat availability (i.e., potential and occupied habitats), patch size and number (i.e., mean size of available habitats and number of available habitat patches), patch connectivity (i.e., mean distance to nearest available habitat), linkage areas (i.e., percentage of suitable land cover types in linkage areas), and landscape matrix and edge effect (i.e., mean percentage of positive patch edges) were not available to conduct a complete quantitative analysis of the second-order habitat description. The NLCD information was used to identify available habitat and non-habitat. The analysis is provided below.

4.2.1 Habitat Availability

Data with respect to occupied GRSG habitat were not available. However, using the NLCD, the Shrub/Scrub vegetation classification was considered as available suitable habitat (**Figure 8**). Herbaceous, Emergent Herbaceous Wetlands (includes wet meadows), and Woody Wetlands (includes riparian vegetation with willows) may also provide some habitat, but there are also aspects of these vegetation types that are not habitat. Therefore, these three types are classified as "other habitat" (**Figure 8**). Within the entire East Central Idaho Population Area (approximately 10,700 km^2 or 1.07 million ha), potential habitat (Shrub/Scrub) represents approximately 45 percent of the entire East Central Idaho Population

Area (**Figure 8**). Similarly, the area of non-habitat or unsuitable habitat, which includes categories of Open Water, Developed Areas, Barren Land, Forests, Hay/Pasture, and Cultivated Crops, accounted for approximately 40 percent of the East Central Idaho Population Area (**Figure 8**).

Because GRSG avoid areas of trees, even some sagebrush areas adjacent to trees would actually be considered non-habitat; therefore, the amount of non-habitat in the East Central Idaho Population Area is likely greater than 40 percent. The status of the "other" category with respect to providing GRSG habitat cannot be determined at this scale, but mesic areas associated with the Emergent Herbaceous Wetlands, Woody Wetlands, and Herbaceous type, would provide late summer brood habitat if adjacent to sagebrush vegetation. Assuming about half the acreage of these types is suitable GRSG habitat, then approximately 53 percent of the area consists of available habitat and 47 percent is non-habitat. Where the potential habitat is intermixed with non-habitat in small patches, the quality of the habitat would be reduced.

Figure 7 indicates that there is no identified GRSG Winter Habitat within the East Central Idaho Population Area. Lands shown as Cultivated Crops on **Figure 8** were likely the primary historic winter habitat. Cultivated Crops occupy valley floors or river plains which occur at the lower elevations and historically would have supported Big Sagebrush/Perennial Grasses that provide winter cover and forage for GRSG. With the conversion of large blocks of Sagebrush/Perennial Grasses to crops, the winter habitat was reduced in total area and became fragmented.

The conversion to Cultivated Crop also reduced the availability of GRSG Nesting and Late Brood Habitat at the north and central portions of the East Central Idaho Population Area. In addition, some development near Soda Springs represents mining activity, which also reduced the amount of Winter Habitat, as well as Nesting and Late Brood Habitat.

4.2.2 Patch Size and Number

Vegetation classifications based on NLCD data (**Figure 8)** indicate that available habitat is present and that the patch size varies considerably within the East Central Idaho Population Area. Patch size is less of an issue when different patches are all considered available habitat (i.e., nesting habitat mixed with early brood or late brood habitat); allowing GRSG to readily move through and between available habitat patches. An example of this is illustrated in **Figure 8** where the Shrub/Scrub habitat is intermixed with Herbaceous habitat (primarily in northwest portion of the East Central Idaho Population Area). In contrast, the eastern portion of the East Central Idaho Population Area is dominated by large patches of woodlands and interspersed with Shrub/Scrub. The mixture of habitat and non-habitat is less conducive to GRSG movements.

4.2.3 Patch Connectivity

No information was available with respect to occupied habitat patches; therefore, calculating the mean distance to the nearest occupied habitat patch was not possible. Based on a review of the available NLCD data (**Figure 8**), there are areas where habitat patches appear proximal to one another (northwest portion of East Central Idaho Population Area). This region consists of patches of trees and agricultural crops in a larger matrix of Shrub/Scrub, with available habitat generally adjacent to other available habitats. The patches of non-habitat are relatively small and create some barriers to movement, but are not likely to prevent GRSG from accessing seasonal habitats. The habitat patches appear distal from each other in the east and south portions of East Central Idaho Population Area. This is most apparent where the forested mountain areas separate valleys with Shrub/Scrub and where large areas of Cultivated Crops separate patches of Shrub/Scrub or reduce the size and connectivity of the suitable habitat patches. This region consists of smaller patches of available habitat in a larger matrix of trees and agricultural crops. The Caldwell Canyon Project is in the eastern portion of the East Central Idaho Population Area where the patch connectivity is reduced.

4.2.4 Linkage Area Characteristics

Available information depicting GRSG Nesting and Late Brood Habitat are based on location and distance from known leks (i.e., circles or overlapping circles of the same radius) rather than delineations of available habitats. Examination of **Figure 8** demonstrates this concept as much of the area identified in the East Central Idaho Population Area as GRSG Nesting and Late Brood Habitat (FEIS) includes large areas of agriculture (Cultivated Crops) and/or forested areas (e.g., Deciduous Forest, Evergreen Forest, and Mixed Forest). Similarly, a large portion of the area identified as Current Distribution of GRSG (WDFW 2002) consists of Cultivated Crops or forested areas. These non-habitat types could serve as potential barriers to seasonal movements; particularly forested areas which tend to include linear topographic barriers (e.g., mountains and ridges). The discussion of linkage areas is closely related to the concept of patch connectivity discussed above; the less connectivity among available habitat patches, the less likely that adequate linkage characteristics are present.

4.2.5 Landscape Matrix and Edge Effect

Without detailed information regarding occupied habitat or the seasonal habitats in the East Central Idaho Population Area, the amount of positive patch edge (i.e., edge between two occupied habitats) and negative patch edge (i.e., edge between an occupied habitat and non-habitat) cannot be quantified. An assessment was generated by examining the available habitat as mapped using the NLCD (**Figure 8**). In general, available habitat as mapped at this second-order scale appears primarily comingled with non-habitat, and the amount of non-habitat increases with elevation due to the matrix of trees and shrub habitats with increasing patch size and total area of trees, and decreasing patch size and total area of shrubs. At lower elevations, the conversion of sagebrush habitats to non-native grasslands and crops increases the amount of negative patch edge.

The amount of positive patch edge appears to be greatest east of the City of Blackfoot and northwest of the Blackfoot Reservoir (**Figure 8**). This area has some forested vegetation and some areas of Cultivated Crop, Hay/Pasture, and Herbaceous vegetation; however, this is also the area with the largest intact Shrub/Scrub area, which includes sagebrush/native grasses. The amount of positive patch edge appears to decrease to the north, east, and south of this area.

4.2.6 Anthropogenic Disturbances

As shown on **Figure 8**, the primary sources of anthropogenic disturbances within the East Central Idaho Population Area include agriculture (lands converted to crops, hay, and introduced grasses; buildings and infrastructure), mining (exploration disturbance, open pits and associated facilities, and processing facilities), towns (e.g., Soda Springs), roads (improved and unimproved), railroads, and reservoirs. Individual mining disturbances are small relative to the pixel size used for the NLCD layer and generally occur in areas of non-habitat (i.e., forested areas) or areas with other development, such as near Soda

Springs. The anthropogenic disturbance (approximately 1,400 km^2 or 140,000 ha) is estimated to represent approximately 28 percent of total non-habitat area (approximately 5,030 km^2 or 503,000 ha) or about 13 percent (approximately 1,391 km^2 or 139,100 ha) of the entire East Central Idaho Population Area (total of approximately 10,700 km^2 or 1.07 million ha).

4.2.7 Second-Order Suitability Rating

Based on the available data presented in *Sections 4.2.1-4.2.6* and assessment of GRSG habitat at the second-order scale, the habitat suitability rating is Marginal within the East Central Idaho Population Area. This rating is consistent with findings of the BLM Idaho State Office 2017 Snake River Valley HAF. Mid-scale results of this BLM Idaho State Office HAF are summarized in **Appendix D**.

As discussed above, the spectrum of habitat availability has been modified by anthropogenic disturbances that include: 1) agriculture, through the conversion of sagebrush lands to agricultural crops, hay, and introduced grasses for grazing, primarily on the west side of the East Central Idaho Population Area, but also to a lesser degree in the central and eastern portions of the population area; 2) mining, through exploration and open-pit mining and associated facilities, which occurs primarily on the east side of the East Central Idaho Population Area; 3) towns, through the permanent removal of GRSG habitat; 4) roads; 5) railroads; and 6) reservoirs. Habitat availability and quality within the East Central Idaho Population Area are also determined by existing vegetation; much of the area is forested and these areas are non-habitat for GRSG. Available habitat (mostly Shrub/Scrub) represents approximately 53 percent of the East Central Idaho Population Area, but not in large contiguous patches, especially on the south and east portions of this population area.

As shown on **Figure 8**, an analysis of habitat with respect to patch size, patch connectivity, landscape matrix and edge effect, and anthropogenic disturbance indicates that, while potential habitat still remains, the areas that once supported contiguous habitat patches providing connectivity between seasonal habitats with adequate corridors or linkages between habitats have been reduced in size and number. The available habitat that remains is typically within a matrix of non-habitat consisting of forested habitat, or lands converted for agricultural use or other anthropogenic disturbance.

4.3 THIRD-ORDER

The third-order scale is related to seasonal habitats within a population or sub-population and the ability of GRSG to move among these seasonal habitats. The Caldwell Canyon Project is located in the East Central Idaho Population Area on the east side of MZ IV (**Figure 6**). The East Central Idaho Population Area is on the edge of suitable habitat in MZ IV.

Figure 7 displays the current GRSG distribution (WDFW 2002), winter habitat, nesting and late brood habitat, key GRSG habitat, areas with high restoration potential, and BLM-designated habitat management areas for the East Central Idaho Population Area. As indicated on the figure, a substantial portion of the current GRSG distribution has no designation for key habitats, or BLM-designated management areas, and the Caldwell Canyon Project Area is not within the current GRSG distribution area. No seasonal habitats have been identified for the Project Area, and no winter habitat is identified anywhere within the East Central Idaho Population Area (**Figure 7)**. Prior to this effort, attempts at seasonal habitat mapping in proximity of the Project Area hadn't occurred.

For the third-order analysis, approximately 405 km^2 (40,500 ha) of the East Central Idaho Population Area surrounding the Caldwell Canyon Study Area, was selected for analysis (**Figure 9**). Although this third-order analysis area was not included in the current distribution of GRSG within the East Central Idaho Population Area (WDFW 2002) (**Figure 7**), at least one active lek, new observations of birds strutting that have not yet been determined to be leks (pending - identified in two different locations in 2016 and 2017, respectively), four leks of unknown status, and four inactive leks do occur in this area (**Figure 9**), indicating that GRSG have been and continue to be present in this analysis area (**Table 1**).

Little information is available on GRSG populations in the East Central Idaho Population Area beyond limited lek location and attendance data (IDFG 2016; USFWS 2013). Based on analysis of limited data available on lek location and attendance data, this population was considered to have a low probability of persistence (Garton et al. 2011). Factors that could act to reduce sage-grouse populations in this area include sagebrush treatments in breeding habitat, West Nile virus, and loss or fragmentation of winter range. Overall, this population is considered high risk (USFWS 2013).

The Caldwell Canyon Study Area is included at this third-order landscape scale, as the habitat suitability indicators include anthropogenic disturbances (i.e., proposed Caldwell Canyon Project) that can disrupt dispersal or cause mortality. The extent of these anthropogenic disturbances is a key factor in determining habitat suitability. An indication of habitat suitability at the third-order has been generated based on the designation by BLM of land within and proximal to the Project Area as GHMA. This designation is a relatively broad brush categorization of GRSG habitat in the general area, which includes suitable, marginally suitable, and non-suitable habitat.

As outlined in *Sections 3.3* and *3.4*, publicly-available GIS data were reviewed to conduct the desktop level third-order assessment; which for study purposes included a 405-km^2 (40,500-ha) area within and surrounding the Project Area. Based on available agency GIS data, no nesting and late brood rearing habitat or winter habitat was identified within this 405-km^2 area. As shown on **Figure 9**, the current (updated in 2016) approximation of GRSG habitat types shows there are two main areas of GRSG habitat in this area: approximately 72 km^2 (7,200 ha) of Key Sage-Grouse Habitat Areas, and 2.7 km^2 (270 ha) of Perennial Native and Non-native Grasslands with High Restoration Potential (denoted as R1).

Data available for the third-order level assessment included the location of nine leks (**Figure 9**) and two pending leks (status yet to be determined), as well as current status and 2017 lek counts (**Table 1**). Of the nine known leks, only five may contribute to the overall population, including one known active lek and four leks of unknown status. Two pending leks (one first observed in 2016, and the second first observed in 2017, but not yet confirmed as active leks) will require one or two more seasons of observation to determine lek status. The remaining four leks are classified as inactive. The lek count maximums are included in **Table 1**.

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Examination of the complete count data indicates that there is considerable year-to-year variability and that none of the leks have had counts of 20 or more birds since 1993 (IDFG 2017). Only four leks (Wooley Valley, Slug Creek 1, Trail Creek, and Slug Creek 2) have long-term data sets and these four leks exhibit overall declining counts between the mid-1970s and 2017 (IDFG 2017).

Count data from 2010 through 2017 (**Table 2**) indicate that the leks within the third-order area have had little activity or were not counted. Only the BLM Project Lek (3C028) was active over the last 6 years, and observations of males strutting at two locations in Dry Valley (in 2016 and 2017, respectively) indicate that another lek or leks may be forming. Additional observations of these two locations in 2018 and 2019 will be needed to determine lek status.

4.3.1 Seasonal Habitat Availability

The third-order GRSG habitat description (Form F-1) was completed to the extent possible (**Appendix A**). Seasonal habitats and occupied habitats for GRSG have not been identified/confirmed. Therefore, desktop vegetation mapping (**Figure 10**) based on photo interpretation of 2013 NAIP imagery was conducted for the third-order analysis area to identify the following 12 vegetation types: Agriculture-Native Meadow, Agriculture-Non-native Grasslands, Agriculture-Crops, Sagebrush/Perennial Grass, Mixed Shrub, Riparian, Aspen, Conifer, Aspen-Conifer Mix, Willow/Wet Meadow, Grasslands, and Mining Disturbance (i.e., barren). The Sagebrush/Perennial Grass vegetation type is considered to be potential breeding habitat (i.e., nesting and early brood habitat) and winter habitat. Mixed Shrub is considered to be breeding/summer/fall habitat, and the Riparian and Willow/Wet Meadow types are considered early and late brood habitat, respectively. The Agriculture-Native Meadow and Perennial Grasslands vegetation types are also considered as potential summer/fall; but because these areas are often large, extensive areas of grass with little or no sagebrush, only 10 percent of the acreage (representing the edge adjacent to shrub cover) was included as GRSG habitat. The total land area for each vegetation type (expressed in km^2 and ha), as well as average patch size, and minimum/maximum patch size (expressed in ha) for each vegetation type, are included in **Table 3**.

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Based on the vegetation mapping in **Figure 10**, approximately 52 percent (211 ha) of the third-order assessment area consists of non-habitat: Agriculture - Non-native Grasslands (8.7 percent), Agriculture – Crop (1.3 percent), Aspen (9.4 percent), Aspen-Conifer Mix (20.5 percent), and Mining Disturbance, Roads, etc. (5.1 percent), in addition to portions of Agriculture – Native Meadow and Perennial Grasslands (combined 7.2 percent). This non-habitat is largely due to natural vegetation that does not support GRSG (i.e., 71 percent of non-habitat), and only 29 percent of non-habitat is due to anthropogenic disturbance.

The mean, minimum, and maximum patch size for each habitat type indicate that, for most of GRSG habitats, the mean patch size is less than the median (median is the mid-point between the minimum and maximum patch size). The mean can only be less than the median when the number of small patches (i.e., patches of size less than the mean) outnumber the large patches. The smaller patches are often located adjacent to, or within larger patches of non-habitat, reducing the connectivity of seasonal habitat patches and eliminating movement corridors between seasonal habitats. The larger patches of non-habitat adjacent to habitat patches may reduce the quality of the habitat when the non-habitat patches consist of trees. All of these factors reduce the quality of available habitat and occupied habitat patches; even rendering them as non-habitat. This applies largely to the Mixed Shrub cover type, and to a lesser extent to the other GRSG habitats.

The mean patch size of habitat is 208 ha and the mean non-habitat patch size is 305 ha for the entire third-order analysis area.

Table 3: Estimate of Potential Seasonal Habitats in Third-Order Analysis Area

Vegetation Type	Potential Seasonal Habitat	Total Area (km^2 / hectare)	Mean Patch Size (hectares)	Minimum Patch Size (hectares)	Maximum Patch Size (hectares)
Agriculture – Native Meadow	Summer / Fall Habitat	12.8 / 1,283	116.6	9.7	283.5
Agriculture – Non-native Grassland	Not GRSG Habitat	35.1 / 3,507	233.8	15.8	690.1
Agriculture – Crop	Not GRSG Habitat	5.1 / 510	510.4	510.4	510.4
Sagebrush/ Perennial Grass	Breeding / Winter Habitat	112.6 / 11,263	512.0	4.4	1,857.8
Mixed Shrub	Breeding / Summer / Fall / Winter Habitat	52.8 / 5,278	164.9	1.9	2,526.6
Riparian	Breeding (Early Brood) / Summer Habitat	1.6 / 162	32.4	18.7	60.5
Willow/Wet Meadow	Late Summer Habitat	23.8 / 2,379	297.4	11.3	1369.0
Perennial Grasslands	Breeding (Early Brood) Habitat	19.6 / 1,958	130.6	9.4	533.0
Aspen	Not GRSG Habitat	37.9 / 3,794	41.7	1.2	430.9
Aspen-Conifer Mix	Not GRSG Habitat	83 / 8,300	638.4	3.4	2,789
Mining Disturbance, Roads, etc.	Not GRSG Habitat	20.7 / 2,067	103.4	2.8	424.5
Total	**Available Habitat**	**194 / 19,406**	**208**		
Total	**Non-Habitat**	**211 / 21,095**	**305**		

Note: km^2 = square kilometers; GRSG = greater sage-grouse. See Figure 10 for vegetation types.

Based on vegetation mapping conducted for the 405 km^2 (40,500 ha) third-order analysis area, approximately 169 km^2 (16,899 ha) are available or occupied breeding habitat, 79 km^2 (7,947 ha) are available or occupied summer habitat, 165 km^2 (16,541 ha) are available or occupied winter habitat[2], and approximately 211 km^2 (21,095 ha)[3] were identified as non-habitat (**Figure 10**). These estimates of available habitat or occupied habitat are high, as many of the small patches of available habitat that are adjacent to or surrounded by trees, would be unsuitable as habitat for GRSG, and therefore, not occupied. In addition, large areas of Grasslands and Native Meadow may only receive use by GRSG near the edge of the Grassland or Native Meadow where Sagebrush/Perennial Grass or Mixed Shrub is present. The interior of these habitat types may be avoided if too far from suitable escape cover.

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[2] This assumes that all sagebrush-perennial grassland is available winter habitat, regardless of the height of the sagebrush relative to winter snow accumulation. Therefore, this is an over-estimate of the available winter habitat. Some areas were identified as available breeding, summer, and winter habitat; therefore the total of the seasonal habitats is in excess of the total available habitat.

[3] This includes all acreage identified in **Table 3** as non-habitat, as well as 90 percent of the acreage of Agriculture-Native Meadow and Perennial Grasslands.

A similar analysis was conducted for the 5.5-mile buffer (truncated) around the one active lek in the third-order area (**Figure 11**). The total land area for each vegetation type (expressed in km^2 and ha), as well as average patch size, and minimum/maximum patch size (expressed in ha) for each vegetation type, are included in **Table 4**.

Review of the mean, minimum, and maximum patch size for each habitat type or non-habitat type indicates that, for most of GRSG habitats in the buffer area around the active lek, the mean patch size is less than the median (**Table 4**). This demonstrates that the area around the active lek is similar to the overall distribution of habitat/non-habitat patches for the greater third-order area as discussed above. Therefore, the reduction of habitat quality would be similar based on the patch size and distribution of habitat patches next to non-habitat patches, especially non-habitat patches consisting of trees.

The mean patch size of habitat is 210 ha and the mean non-habitat patch size is 184 ha for the truncated buffer analysis area. This compares favorably to the mean habitat and non-habitat patch size for the entire third-order analysis area.

Table 4: Estimate of Acreage of Available Seasonal Habitats in the Buffer Area of the BLM Project Lek

Vegetation Type	Potential Seasonal Habitat	Total Area (km^2 / hectare)	Mean Patch Size (hectares)	Minimum Patch Size (hectares)	Maximum Patch Size (hectares)
Agriculture – Native Meadow	Summer / Fall Habitat	6.3 / 633	90.4	9.7	283.5
Agriculture – Non-native Grassland	Not GRSG Habitat	26.7 / 2,675	191.1	10.4	604.4
Agriculture – Crop	Not GRSG Habitat	1.1 / 114	38.1	0.2	96.6
Sagebrush/ Perennial Grass	Breeding / Winter Habitats	68.9 / 6,887	491.9	30.6	1835.5
Mixed Shrub	Breeding / Summer / Fall / Winter Habitat	28.3 / 2,833	188.9	2.2	2480.6
Riparian	Late Summer Habitat	1.6 / 162	32.5	18.7	60.5
Willow/Wet Meadow	Breeding (Late Brood) Habitat	18.0 / 1,799	359.8	38.6	1369.0
Perennial Grasslands	Breeding (Early Brood) Habitat	9.9 / 994	99.4	11.1	348.1
Aspen	Not GRSG Habitat	19.1 / 1,909	26.5	0.8	161.8
Aspen-Conifer Mix	Not GRSG Habitat	34.8 / 3,484	580.7	3.4	1440.1
Mining Disturbance, Roads, etc.	Not GRSG Habitat	13.6 / 1,358	84.9	2.8	424.5
Total	**Available Habitat**	**118 / 11,844**	**210**		
Total	**Non-Habitat**	**110 / 11,004**	**184**		

Note: km^2 = square kilometer; GRSG = greater sage-grouse. See Figure 10 for vegetation types.

Based on vegetation mapping conducted for the 228 km^2 (22,948 ha) third-order buffer area associated with the BLM Project Lek analysis area, approximately 89 km^2 (8,947 ha) are available or occupied breeding habitat, 29 km^2 (2,896 ha) are available or occupied summer habitat, 69 km^2 (6,887 ha) are available or occupied winter habitat[4], and approximately 110 km^2 (11,004 ha)[5] were identified as non-habitat. These estimates of available habitat or occupied habitat are high, as many of the small patches of available habitat that are adjacent to or surrounded by trees, would be unsuitable as habitat for GRSG, and therefore, not occupied. In addition, large areas of Grasslands and Native Meadow may only receive use by GRSG near the edge of the Grassland or Native Meadow where Sagebrush/Perennial Grass or Mixed Shrub is present. The interior of these habitat types may be avoided if too far from suitable escape cover.

4.3.2 Seasonal Use Area Connectivity

Because seasonal use areas have not been identified for the third-order analysis area, the connectivity of the seasonal use areas to one another could not be calculated. However, based on the amount of available habitat and non-habitat and the distribution of these habitat/non-habitat patches within the third-order area, patches of habitat were often adjacent to large patches of non-habitat (**Figure 10**), creating barriers to connectivity of seasonal habitats and movement by GRSG between seasonal habitats.

Based on the mapping of available habitats and non-habitat for the third-order assessment (**Figure 10**), the area to edge ratio was calculated for the available habitats (**Table 5**). The available habitat was distributed in 93 patches with a total perimeter of 1,257 km; however, 36 km of the total habitat patches edge was created by the boundary of the third-order area. Therefore, the "effective" total perimeter of available habitat is 1,221 km.

Table 5: Edge Ratios for Available Habitats in the Third-Order Analysis Area

Vegetation Type	Edge : Area Ratio	Area : Edge Ratio Standardized
Ag – Native Meadow	64.2 km / 12.8 km^2	5.0 km / 1 km^2
Sagebrush/Perennial Grass	489.6 km / 112.6 km^2	4.3 km / 1 km^2
Mixed Shrub	399 km / 52.8 km^2	1.9 km / 1 km^2
Riparian	46.5 km /1.6 km^2	29.1 km / 1 km^2
Willow/Wet Meadow	114.7 / 23.8 km^2	4.8 km / 1 km^2
Perennial Grasslands	143.2 km / 19.6 km^2	7.3 km / 1 km^2

Note: km = kilometer; km^2 = square kilometer.

Of the total habitat perimeter, 819 km (67 percent) is adjacent to non-habitat (negative patch edge). The ratio of the amount of edge between patches of habitat to the amount of edge between patches of non-habitat is 402:819 km, or a standardized ratio of 1:2.04. Any ratio less than 1:1 (e.g., 1:2) would indicate a negative edge effect (more habitat edge with non-habitat) and any ratio greater than 1:1 (e.g., 1:0.5) would indicate positive edge effect. Or simply stated, the more habitat patch perimeter that is in contact with non-habitat, the greater the potential barrier to movements and the less connectivity between habitat patches.

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[4] This assumes that all sagebrush-perennial grassland is available winter habitat, regardless of the height of the sagebrush relative to winter snow accumulation. Therefore, this is an over-estimate of the available winter habitat. Some areas were identified as available breeding, summer, and winter habitat; therefore the total of the seasonal habitats is in excess of the total available habitat.

[5] This includes all acreage identified in **Table 4** as non-habitat, as well as 90 percent of the acreage of Agriculture-Native Meadow and Perennial Grasslands.

The non-habitat was distributed in 140 patches with a total "effective" perimeter of 958 km, of which 85 percent was edge between the non-habitat and habitat (negative patch edge). This information further supports the contention that the non-habitat was a substantial barrier to GRSG movements and connectivity of available habitats.

The buffer area around the active lek demonstrated similar edge effects. The total "effective" perimeter of the habitat patches was 751 km for 56 habitat patches. A total of 478 km (64 percent) of this perimeter was with non-habitat patches (negative patch edge) and 274 km (36 percent) of the perimeter was with adjoining habitat patches (positive patch edge). The ratio of the amount of edge between patches of habitat to the amount of edge between patches of non-habitat is 274:478 km, or a standardized ratio 1:1.7, representing an overall negative patch edge within the lek buffer area.

The non-habitat within the lek buffer area was distributed in 111 patches with a total "effective" perimeter of 594 km, of which 81 percent was edge between the non-habitat and habitat (negative patch edge). This in an indication that the non-habitat was a substantial barrier to GRSG movements and connectivity of available habitats in the lek buffer area.

4.3.3 Anthropogenic Disturbances

Approximately 211 km^2 of the 405-km^2 third-order analysis area (52 percent) consist of non-habitat, of which approximately 60.8 km^2 (15 percent) of the third-order analysis area was the result of anthropogenic disturbance. Conversion of natural vegetation to agricultural crops and non-native grasslands accounted for 40.1 km^2 of the 60.8 km^2 of anthropogenic disturbance; and towns, roads, railroads, mining, etc. accounted for 20.7 km^2 of the total anthropogenic disturbance. The agricultural disturbance was more likely to occur in potential GRSG habitat than the non-agricultural disturbance due to the lower elevations and gentle slopes associated with the agricultural disturbance (sites where sagebrush habitats could be converted to crops or non-native grasslands); whereas, the non-agricultural disturbance was distributed across elevations and topographic features, impacting a variety of potential GRSG habitat and non-habitat areas.

4.3.4 Third-Order Suitability Rating

Based on available data presented in *Sections 4.3.1-4.3.3* and the assessment of GRSG habitat at the third-order scale, the habitat suitability rating is Marginal.

As discussed above, approximately 52 percent of the analysis area consists of non-habitat and the non-habitat is distributed such that many of the available habitats are adjacent to non-habitat. This mixture of available habitat with non-habitat, when combined with topographic features (e.g., mountain ridges), disrupts habitat connectivity and creates barriers to movement corridors.

The area of available winter range within the analysis area is 165 km^2 (41 percent of analysis area); however, no winter range has been identified for this area, nor is it known if this available habitat is used by GRSG. A similar situation exists for breeding habitat; no breeding habitat (other than known leks) has been identified. The assumption is that if leks persist, even at low numbers, breeding is occurring, and nesting and early brood rearing activity is occurring. But the location, quality, and connectivity of these breeding habitats are unknown, although the mean patch size for breeding habitat was approximately 250 ha. The declining lek counts since 1970 and increased number of inactive leks indicate that the quality or quantity of habitat, or both, is declining.

The East Central Idaho Population Area is in the transition zone between the formerly sagebrush-dominated Snake River Plain and the forest-dominated mountains of eastern Idaho and western Wyoming. The transition zone is a mixture of sagebrush and forest (i.e., non-habitat), and this mixture is greater in the third-order area in other portions of the East Central Idaho Population Area. This mixture of habitat and non-habitat vegetation types creates marginal conditions for GRSG. The mixture of habitat and non-habitat is least at lower elevations within the third-order area and increases with elevation as the forested habitats tend to dominate the mountains (**Figure 10**). Anthropogenic disturbance, combined with this naturally occurring marginal habitat matrix of sagebrush and forests, compounds this effect.

4.4 FOURTH-ORDER

Field work conducted August 1-4, 2016 was used to complete the fourth-order assessment and included specific vegetation types assessed for habitat suitability. As discussed in *Section 3.5*, the fourth-order scale consists of the site-scale; in this case, portions of the Caldwell Canyon Study Area. The fourth-order assessment is a refinement (i.e., determination of suitable, marginally suitable, and unsuitable habitats within the Project Area) of the BLM third-order determination that defines land within the Study Area as GHMA. The HAF lists six habitat indicators to be used in assessing suitability of summer/late summer brood-rearing habitat, all of which were examined for the Study Area:

- Sagebrush cover (average percent cover for land cover type);
- Sagebrush height (average sagebrush height for land cover type);
- Availability of sagebrush cover (food site has sagebrush cover in close proximity);
- Perennial grass and forb cover (average percent cover for land cover type);
- Riparian stability (functioning condition); and
- Preferred forb availability (number and density of preferred forbs in land cover type).

As discussed in *Section 2.0*, the Caldwell Canyon Project is located on Schmid Ridge, with access via Caldwell Canyon Road. The area consists of a matrix of forest, grassland, and shrub vegetation (NewFields 2015b). The 33.3-ha Caldwell Canyon Study Area (as described in *Sections 2.0 and 3.0*) served as the focal point for the fourth-order component of the HA and included five site-scale impacted GRSG areas (**Figure 12**) consisting of four BLM-administered areas totaling approximately 27.8 ha, and one IDL-administered area totaling 5.5 ha.

The four areas on BLM-administered land (BLM-1, -2, -3, and -4; **Figure 12**) all had a Mixed Shrub vegetation type that included sagebrush[6], and this vegetation type was identified during previous field work as being potentially suitable as GRSG late summer brood habitat (NewFields 2015b). None of the other vegetation types occurring on these four BLM areas were considered to be available GRSG habitat (i.e., forested vegetation types or perennial grasslands adjacent to trees); therefore, only the Mixed Shrub vegetation type was assessed for these four areas.

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[6] BLM-4 Area was mapped as Native Grassland/Forbs (NewFields 2015b). However, upon arriving at the site, the vegetation in the Area was Mixed Shrub, but was adjacent to Native Grassland/Forbs. Therefore, the Area was established in the Mixed Shrub vegetation type.

The fifth area, on IDL-administered land (IDSL-1; **Figure 12**), contained five vegetation types: Aspen, Conifer/Aspen, Conifer, Native Grasslands/Forbs, and Mixed Shrub. The first three vegetation types are not GRSG habitat; the Native Grassland/Forbs can be GRSG if adjacent to sagebrush cover; and the Mixed Shrub is considered available GRSG habitat. Therefore, the Mixed Shrub and Native Grasslands/Forbs vegetation types were scheduled to be assessed on this area. Approximately 0.26 ha of the Mixed Shrub vegetation type occurs on the IDSL-1 Area; however, upon arriving at the site, this small area was adjacent to forested habitat, and therefore, quantitative measurements of IDSL-1 were not obtained (**Figure 13**). Similarly, the Native Grassland/Forbs type was adjacent to Aspen, Conifer/Aspen, and Conifer types and available in acreage too small to serve as habitat within this matrix of forested types.

Mixed Shrub

The Mixed Shrub vegetation type occurs on the warmer and drier slopes and aspects, from near the valley floor (>6,360 feet amsl elevation) to the top of Schmid Ridge (7,340 feet amsl). This vegetation type often borders Aspen or Conifer/Aspen, which occur on cooler, moist sites. The shrub component of the Mixed Shrub vegetation type includes varying amounts of mountain Big Sagebrush (*Artemisia tridentata spp. vaseyana*), Antelope Bitterbrush (*Purshia tridentata*), and Mountain Snowberry (*Symphoricarpos oreophilus*). Letterman's Needlegrass (*Stipa lettermanii*), Idaho Fescue (*Festuca idahoensis*), and Basin Wildrye (*Leymus cinereus*) are common native grasses. Bluebunch Wheatgrass (*Pseudoroegneria spicata*) is common only on the warmer sites (steeper, south-facing slopes). A variety of forbs occur in this vegetation type (NewFields 2015b).

Existing vegetation mapping (NewFields 2015b, 2016c) was used to identify potential habitat. Based on this, Mixed Shrub vegetation type occurs on 14.6 ha of the Caldwell Canyon Study Area; including 1.6 ha on BLM-1 Area (**Figure 14**), 2.8 ha on BLM-2 Area (**Figure 15**), 9.9 ha on BLM-3 Area (**Figure 16**), and 0.12 ha on BLM-4 Area (**Figure 15**).

Six vegetation transects were established at the four BLM Areas[7] (**Figures 14, 15,** and **16**). A line-point intercept (LPI) data summary, vegetation height/sagebrush shape data summary, and sage-grouse forb diversity summary for each of the six transects established for the Mixed Shrub vegetation type is included in **Appendix A**. Associated field data sheets completed for each of the six transects are included in **Appendix B**. Findings reported in these data forms/summaries are presented below.

Sagebrush Cover

Mean sagebrush cover of the Mixed Shrub type on the four BLM areas averaged 14.0 percent. The mean total shrub cover for the six transects was 45.3 percent. The Habitat Indicator Range for suitable sagebrush cover at late summer brood habitat is 10 to 25 percent (Stiver et al. 2015). Therefore, sagebrush cover of the Mixed Shrub at the four BLM areas is within the suitable category for late summer brood-

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[7] Transect MB-1 was moved based on *a priori* rules for relocating transects if upon arriving at the randomly selected location, the location was in a non-typical situation. For Transect MB-1, the randomly selected location was in a soil/vegetation inclusion in the vegetation mapping – a seasonally saturated area that supported mountain silver sagebrush (*Artemisia cana* ssp. *viscidula*), not Mixed Shrub. The contingency plan for these types of situations was to move 300 feet in a direction that would keep us in the vegetation type and start the transect at that location. The point was outside of the BLM-1 Area, but within the Mixed Shrub vegetation type, and the transect carried into BLM-1.
Transect MB-3 was similar – the random point was on the edge of the BLM-2 Area, but the transect was within the Mixed Shrub vegetation type. The *a priori*-selected transect bearing was north for most transects; therefore, the transect extended out of the BLM-2 Area but was within the vegetation type that was present in BLM-2.

rearing habitat. Because of the limited area of Mixed Shrub and proximity to forested habitat at the IDSL-1 Area, this Habitat Indicator was not evaluated.

Sagebrush Height

Mean sagebrush height of the Mixed Shrub type on the four BLM areas was 60.3 centimeters (cm). Mean shrub height for all shrub species for the six transects was 87.3 cm. The Habitat Indicator Range for suitable sagebrush height at late summer brood habitat is 40 to 80 cm (15-30 inches) (Stiver et al. 2015). Therefore, sagebrush height of the Mixed Shrub at the four BLM areas is within the suitable category for summer/late brood-rearing habitat. Because of the limited area of Mixed Shrub at the IDSL-1 Area and proximity of this habitat type to Conifer/Aspen, this Habitat Indicator was not evaluated.

Availability of Sagebrush Cover

Proximity of sagebrush cover is a Habitat Indicator only at foraging areas, such as riparian areas, wet meadows, or agricultural fields which have suitable food resources. No riparian areas, wet meadows, or agricultural fields were assessed at the Caldwell Canyon Study Area. However, two areas of Mixed Brush were within 50 meters of riparian areas, had these areas been assessed. There were no riparian areas, wet meadows, or agricultural fields at or near the IDSL-1 Area; therefore this Habitat Indicator was not evaluated.

Perennial Grass and Forb Cover

Mean perennial grass cover of the Mixed Shrub type on the four BLM areas was 58.3 percent and the mean perennial forb cover was 39.7 percent. The combined mean of perennial grass and perennial forb cover was 49 percent. The Habitat Indicator Range for suitable perennial grass and forb cover at late summer brood habitat is combined cover greater than 15 percent (Stiver et al. 2015). Therefore, combined cover of perennial grass and forb cover at the four BLM areas is within the suitable category for summer late brood-rearing habitat. Because of the limited area of Mixed Shrub at the IDSL-1 Area and proximity of this habitat type to Conifer/Aspen, this Habitat Indicator was not evaluated.

Riparian Stability

Assessment of riparian stability was only conducted on areas of available habitat that were scheduled to be disturbed by the Caldwell Canyon Project. There were no riparian areas, wet meadows, or agricultural fields at the BLM Areas or the IDSL-1 Area; therefore, this Habitat Indicator was not evaluated. Caldwell Creek and several springs occur in the area and provide succulent forage late in the summer and early fall and are part of the summer habitat matrix. However, Aspen and Mixed Aspen-Conifer vegetation types were adjacent to these riparian habitats (**Figure 15**), reducing the quality of this habitat for GRSG. The presence of these springs and riparian habitats do add to the overall quality of the GRSG habitat, and will remain during the mining phases and post-mining.

Preferred Forb Availability

The mean number of preferred forbs at the Mixed Shrub type on the four BLM Areas was 5.3, and the mean number of forbs (not including noxious weeds and invasive species) was 17.3. The Habitat Indicator Range for preferred forb availability at late summer brood habitat is “good abundance, diversity, and availability relative to ecological site potential” and “preferred forbs are common with appropriate numbers of species present” (Stiver et al. 2015). The ecological site descriptions for this area have not yet been determined by the NRCS; therefore, the determination of availability relative to ecological site potential and appropriate numbers of species present could not be determined. This Habitat Indicator was subjectively determined by calculating the percentage of preferred forbs at each transect relative to the total number of acceptable forbs. The habitat is considered suitable if the mean number of preferred forbs is greater than 30 percent of mean total acceptable forb species, and if the mean number of noxious weeds and invasive species is less than 5 percent of total acceptable species.

Using this modified habitat indicator, the mean number of preferred forbs at the six transects in the Mixed Shrub was 30.8 percent of the mean total acceptable forbs, and the mean number of noxious weeds and invasive species was 0.5 percent (found at only three transects). Therefore, preferred forb availability of the Mixed Shrub at the four BLM areas is considered within the suitable range for late summer brood-rearing habitat.

Native Grasslands/Forbs

No extensive area of Native Grassland/Forbs vegetation type was located on the four BLM Areas. The Native Grassland/Forbs vegetation type occurred on the IDSL-1 Area, but this area was small (2.5 ha) and adjacent to forested areas or within 76 meters (240 feet) of forested areas. The small size and proximity of predator habitat combined to make this vegetation habitat unsuitable as GRSG late summer brood habitat.

Habitat Suitability

Based on Habitat Suitability Indicators for late summer brood habitat (see Form S-4, **Appendix A**), the Mixed Shrub vegetation type of the four BLM Areas was rated as Suitable. However, this rating does not consider the proximity of forested areas or juxtaposition of Mixed Shrub within the vegetation matrix of the Caldwell Canyon Study Area. BLM-1, -2, -3, and -4 and IDSL-1 Areas all include forested habitat or are adjacent to forested habitats which would detract from the suitability of these small areas.

Observations of GRSG at the Caldwell Canyon Project Area were limited to GRSG tracks observed in the Mixed Shrub habitat at the south end of the Caldwell Canyon Project near Slug Creek (NewFields 2016b). This observation was near BLM-3 Area. No GRSG or their sign were observed during the habitat assessment, which was conducted during the late brood-rearing season in August 2016.

Native Grassland/Forbs is rated as unsuitable as GRSG habitat due to the limited extent of this vegetation type within the IDSL-1 Area and proximity to forested vegetation.

5.0 CONCLUSION

The Habitat Assessment is a tiered analysis of the landscape using four scales ranging from very large-scale (range-wide) to small-scale (site-specific) with respect to GRSG habitat. The conclusions drawn about suitability of habitat need to consider all four scales in the assessment process. A summary of the findings/suitability ratings generated via this Habitat Assessment is presented in **Table 6**.

Table 6: Habitat Suitability Summary

Second-Order Habitat Indicators	Metric Description	Current Condition
1. Habitat Availability	The amount of sagebrush habitat in the area.	Approximately 53% of the East Central Idaho Population Area (ECIPA) consists of sagebrush habitat and approximately 40% of the area is non-habitat.
2. Patch Size and Number	The average size of habitat patches and the number of patches within the area.	Varies greatly within the ECIPA, with the size of habitat patches decreasing from west to east and from north to south.
3. Patch Connectivity	The average distance from one habitat patch to the nearest similar patch within the area.	Varies greatly within the ECIPA, with patch connectivity decreasing from west to east and from north to south.
4. Linkage Area Characteristics	Percent shrub cover in relation to tree or grass/forb cover of areas between habitat patches through which sage-grouse move. Presence of anthropogenic features between patches also decreases linkage area suitability.	Varies greatly within the ECIPA, with linkage areas between habitat patches decreasing from west to east and from north to south. Anthropogenic features prevalent in the southern portion of the ECIPA.
5. Landscape Matrix and Edge Effect	The amount of edge in contact with plant communities or land uses with positive or negative influences on the habitat patch.	Varies greatly within the ECIPA, with negative patch edge increasing from west to east and from north to south.
6. Anthropogenic Disturbances	The fragmentation of contiguous sagebrush patches in the area through land use changes and infrastructure development. Measured as the number, length, or area (or area of influence) of embedded anthropogenic features per unit patch area.	Varies greatly within the ECIPA, with habitat fragmentation increasing from west to east and from north to south.
Summary: Landscape has patchy, fragmented sagebrush shrublands that are not well connected for dispersal and migration in portions of the population area. Anthropogenic disturbances that disrupt dispersal or cause mortality are present in portions of the landscape. Lek groups or subpopulations are isolated or nearly isolated. Suitability Rating: **Marginal**		
Third-Order Habitat Indicators	**Metric Description**	**Current Condition**
1. Seasonal Habitat Availability Habitat Availability	The amount of sagebrush shrubland in seasonal use areas. The amount of other forb-rich habitats in summer/fall seasonal use areas.	74.7 km^2 (18%) of the third-order area identified as key habitat; 52% of the third-order area consists of non-habitat; 41% of third-order area is available breeding habitat, 19% of the area is available summer habitat, 17% of the area is available winter habitat.
2. Season Use Area Connectivity	The extent of sagebrush connectivity between seasonal use areas.	67% of the available habitat perimeter is adjacent to non-habitat (i.e., negative patch edge); connectivity is limited due to large "linear" patches of forest between sagebrush areas.

3. Anthropogenic Disturbances	The disruption of movement between or use of seasonal use areas within a home range due to land use changes and infrastructure development. Measured as the number, length, or area of anthropogenic features within a home range area.	Anthropogenic disturbance in the third-order area is approximately 15% (20.7 km^2), consisting of Agricultural-Crops/Non-native Grasslands, Roads, Mining Disturbance, etc.
Summary: Landscape has patchy, fragmented sagebrush shrublands that are not well connected for dispersal and migration in the third-order area. Overall amount of non-habitat is greater than available habitat, negative patch edge is greater than positive patch edge, and anthropogenic disturbances account for 15% of the area. Suitability Rating: **Marginal**		

Fourth-Order Habitat Indicators – Summer/Late Brood-Rearing Habitat	Metric Description	Current Condition
1. Sagebrush Cover	Average percent cover for land cover types.	14% (Suitable)
2. Sagebrush Height	Average sagebrush height for land cover type.	60.29 cm (Suitable)
3. Availability of Sagebrush Cover	Food site has sagebrush cover in close proximity.	
4. Perennial Grass and Forb Cover	Average percent cover for land cover type.	49% (Suitable)
5. Riparian Stability	Functioning condition.	Not Available
6. Preferred Forb Availability	Number and density of preferred forbs in land cover types.	Mean preferred forb species = 7.1 (Suitable)
Summary: The overall suitability rating for 4 of the 5 areas assessed was **Suitable**. The IDSL-1 area was rated **Unsuitable** due to the limited acreage of habitat and the proximity to forested areas. BLM areas BLM-1, BLM-2, and BLM-4 areas were also in close proximity to trees and this should be taken into consideration and result in a downgrade of the overall suitability of these 3 areas as **Marginal**. BLM-3 Area was part of a sufficiently large mixed shrub patch, with scattered small patches of trees that a **Suitable** rating was appropriate.		

The first-order scale is range-wide used to document that the subject area is within the former and current range of GRSG. **Figure 5** shows that the Caldwell Canyon Project is located within the pre-settlement distribution of available habitat, albeit on the edge of available habitat and non-habitat.

Figure 6 shows that the Caldwell Canyon Project is located in Management Zone IV – Snake River Basin. As indicated on Form M-1: Mid-Scale (Second-Order) Sage-Grouse Habitat Description (**Appendix A**), approximately 47 percent of the second-order scale area (i.e., East Central Idaho Population Area) consists of non-habitat and that areas of available habitat and non-habitat occur in a matrix of patches varying in size (**Figure 8**). Fragmentation of available habitat by the patches of non-habitat results in a determination that habitat suitability at this second-order scale is **Marginal**.

At the third-order scale, data regarding occupied and non-occupied seasonal habitats was lacking, and the analysis was based on available habitat and non-habitat. While there may be patches of quality habitat, these patches are fragmented, connectivity of seasonal habitats is low due to the distribution of available habitat and non-habitat patches, and movement corridors are limited due to topographic and non-habitat features. The East Central Idaho Population Area is within the transition zone of the sagebrush-dominated Snake River Plain and the forest-dominated mountains of eastern Idaho and western Wyoming. This basin and range topography includes varying elevations and precipitation zones that create a natural mosaic of vegetation, including shrublands, grasslands, forests, and riparian areas that are mixed across the landscape. Anthropogenic disturbance of this landscape also contributes to the amount of non-habitat for GRSG and fragmentation of GRSG habitat. This landscape mosaic is apparent on **Figure 10**. Based on the analysis, the third-order suitability rating is **Marginal** as habitats representing available seasonal ranges were poorly connected or isolated, and anthropogenic features were present and contributed disruption of seasonal movements.

The fourth-order analysis is based on field studies conducted in August 2016 and focused on existing vegetation in portions of the Caldwell Canyon Study Area. Based on this analysis, five areas (BLM-1, -2, -3, -4 and IDSL-1) and the entire Caldwell Canyon Project Area are in a matrix of Aspen, Conifer, Conifer/Aspen, Big Sagebrush/Introduced Grass, Mixed Shrub, Native Grasslands/Forbs, Introduced Grass, and Riparian/Wetland vegetation types. Of these eight vegetation types, Aspen, Conifer, Conifer/Aspen, and Introduced Grass are not considered GRSG habitat. Quantitative analysis of the Mixed Shrub vegetation indicate that the vegetation rated as suitable late summer brood habitat. However, all five areas (BLM-1, -2, -3, -4 and IDSL-1) included or were adjacent to forested areas, which reduced connectivity between seasonal habitats, fragmented the suitable habitats into smaller patches, and disrupted seasonal movements. Although these patches of Mixed Shrub vegetation provide adequate forage and cover, the matrix of vegetation types in which they occurred was sub-optimal for GRSG. No evidence of GRSG use of these areas was observed during the August 2016 field work.

Consequently, although vegetation parameters of four of the five areas of interest in this assessment were suitable as GRSG summer brood habitat, the matrix of vegetation types, when considered due to the proximity of the non-habitat to the five areas, resulted in a **Marginal** fourth-order suitability rating.

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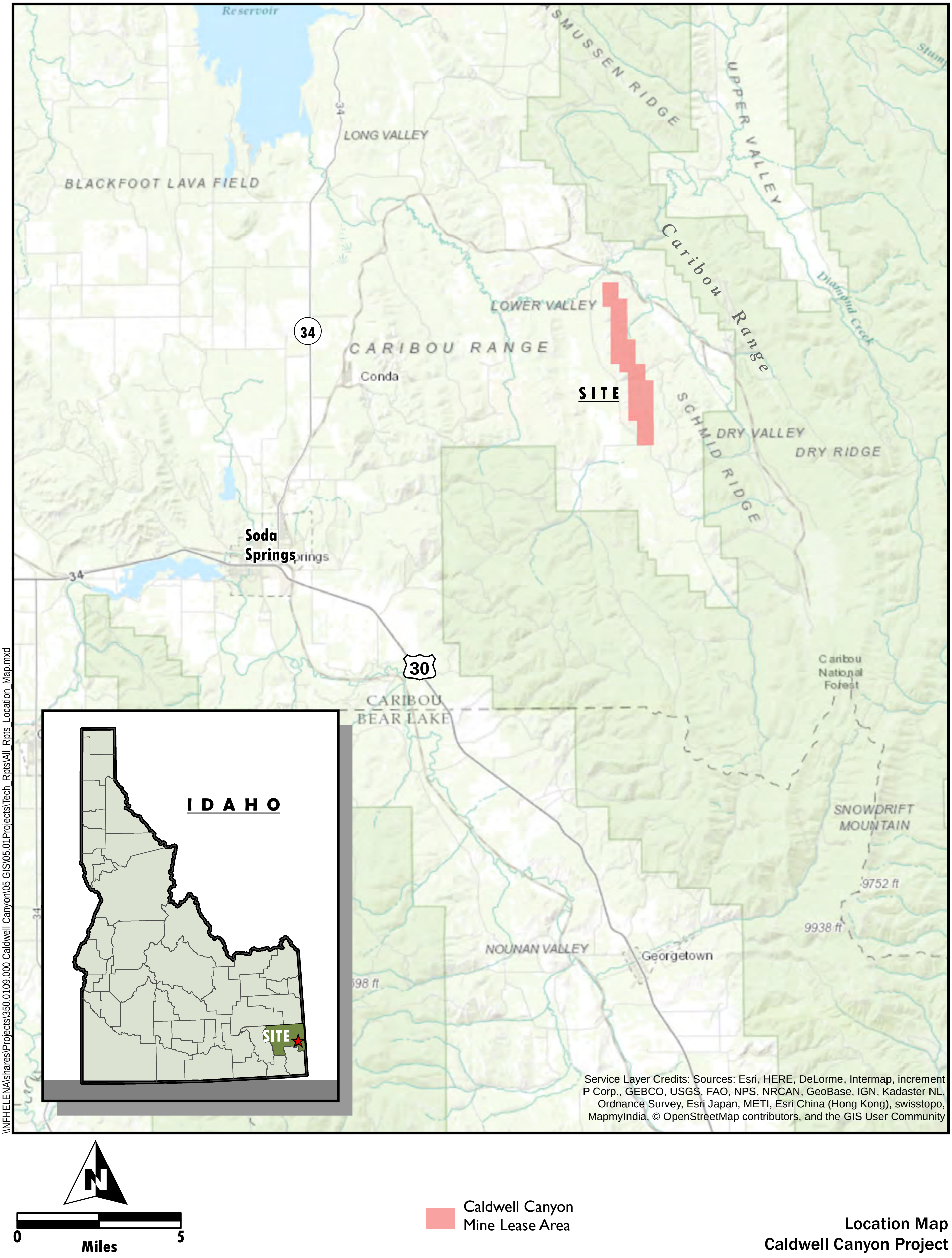
FIGURES



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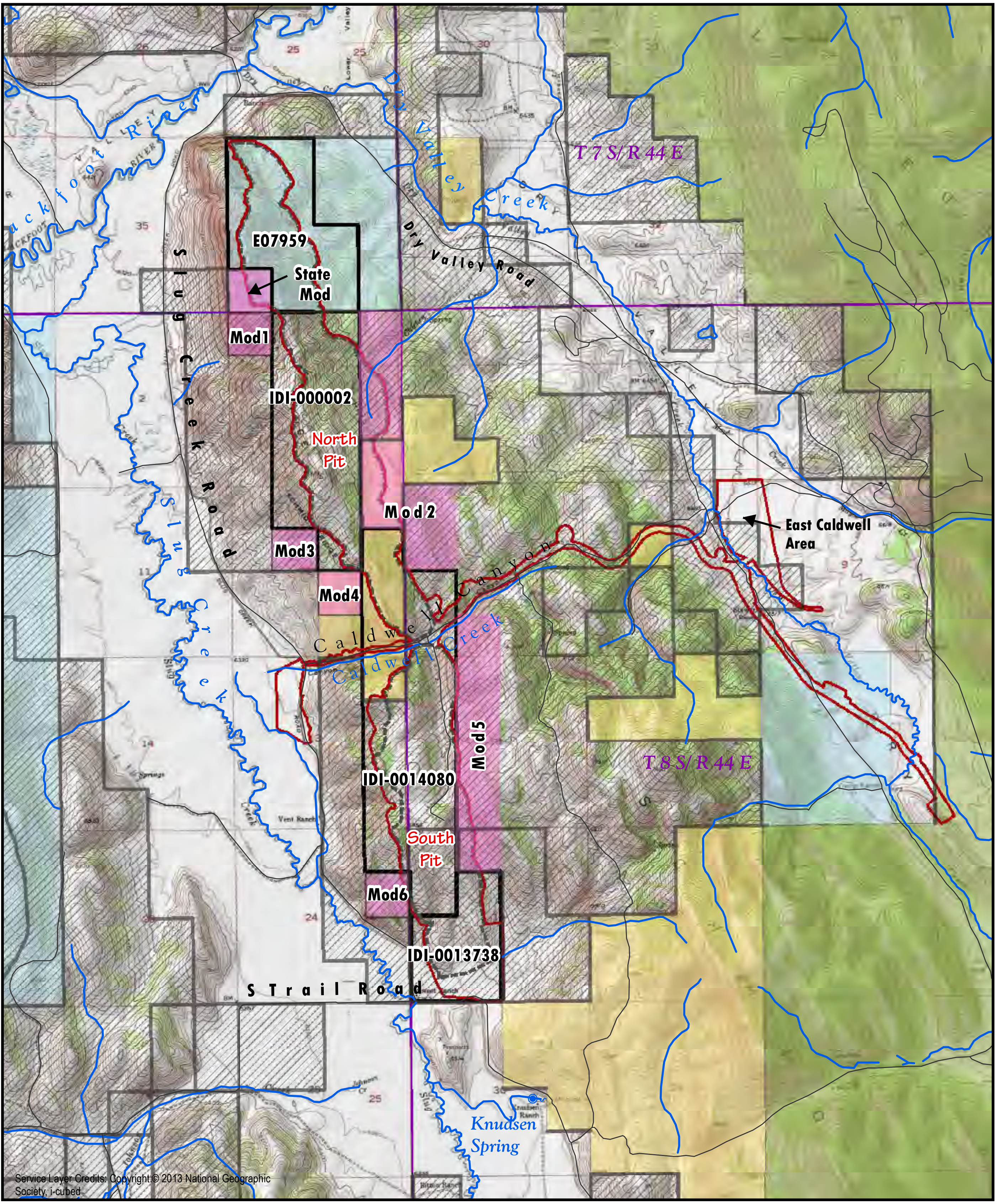
\\NFHELENA\shares\Projects\350.0109.000 Caldwell Canyon\05 GIS\05.01Projects\Tech Rpts\All Rpts Location Map.mxd

NewFields

Location Map
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 1



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N

0 Feet 5,000

NewFields

Project Area:

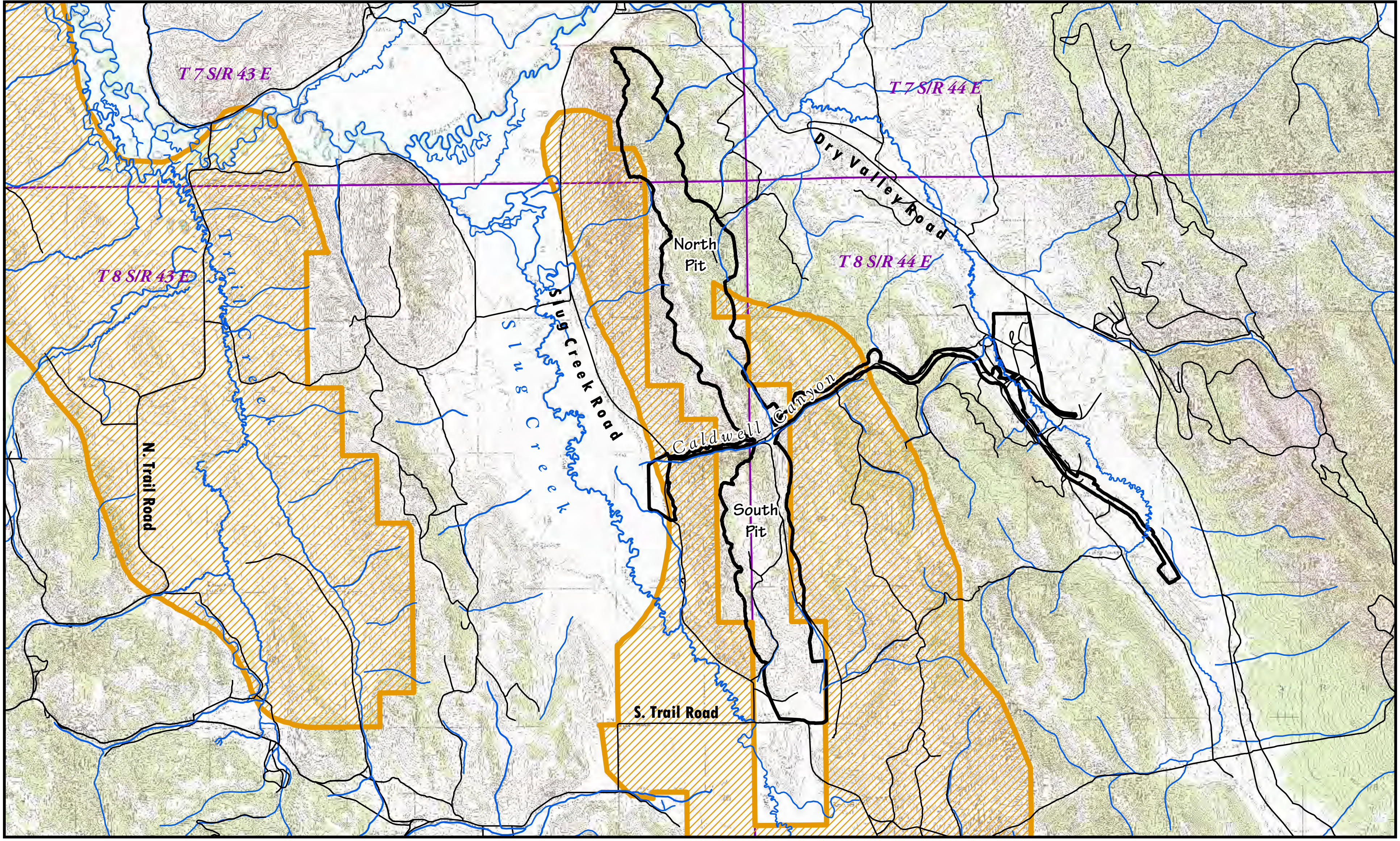
- 🟥 Project Boundary
- ⬛ Lease Boundary and Number
- ⬚ Proposed Mine Pit
- 🟪 Township/Range
- 🟪 Lease Modifications

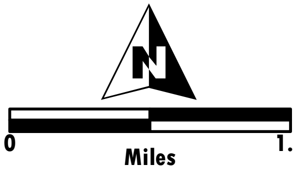
Surface Public Ownership

- 🟨 Bureau of Land Management
- 🟩 U.S. Forest Service
- 🟦 State
- ▨ Federal Mineral Estate on Non-Federal Land

Project Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 2

\\NFHELENA\shares\Projects\350.0109.000 Caldwell Canyon\05 GIS\05.01Projects\Tech_Rpts\Sage_Grouse_HAF\General_Habitat_Mgmt_Area.mxd



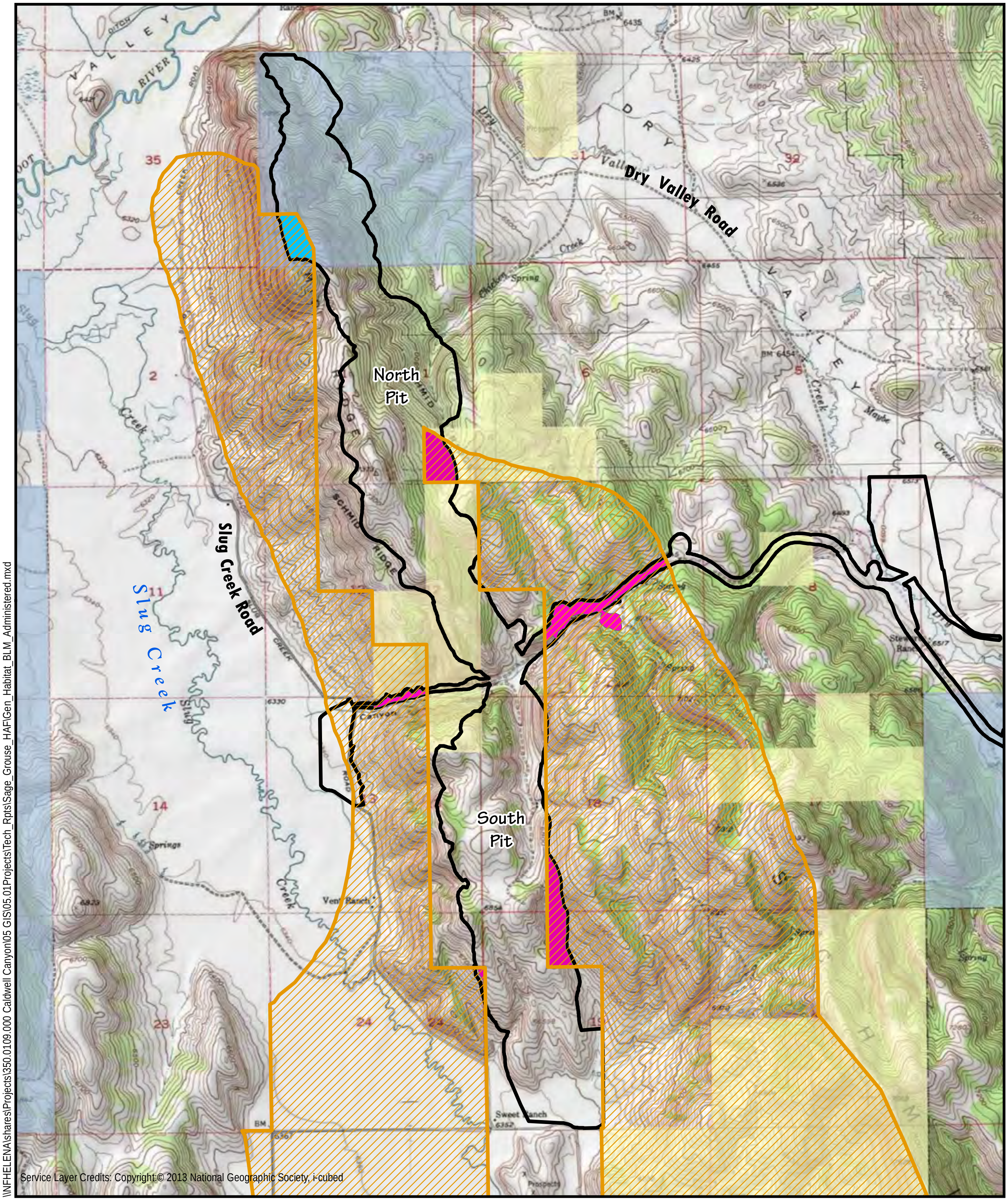


▭ Project Boundary

▨ General Habitat Management Areas (GHMA) All Jurisdictions (BLM, 2015b)

NewFields

General Habitat Management Areas
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 3



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N

0 4,000

Feet

NewFields

- ☐ Project Boundary
- 🟨 BLM Surface Ownership
- ▨ State of Idaho Surface
- ▨ General Habitat Management Area (GHMA) All Jurisdictions (BLM, 2015)
- 🟦 Impacted Sage Grouse Habitat (State Decision Area) 5.5 Hectares
- 🟪 Impacted Sage Grouse Habitat (BLM Decision Area) 27.8 Hectares

Caldwell Canyon Study Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 4

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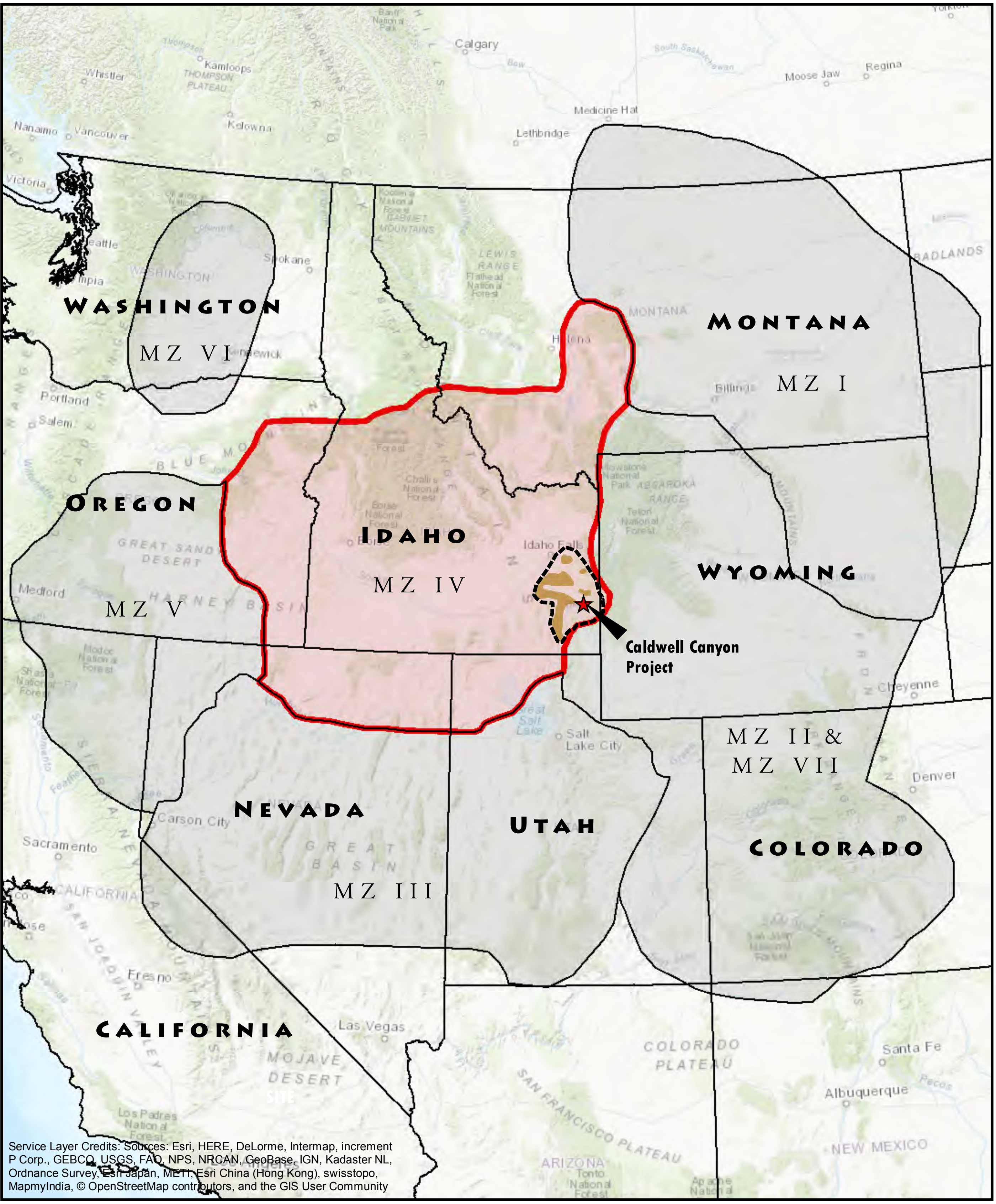
▨ Pre-settlement Distribution of Potential Habitat

**First-Order (Broad-Scale)
Pre-settlement Distribution of
Potential Habitat
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 5**

NewFields



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0 Miles 200

WAFWA Sage-Grouse Management Zones

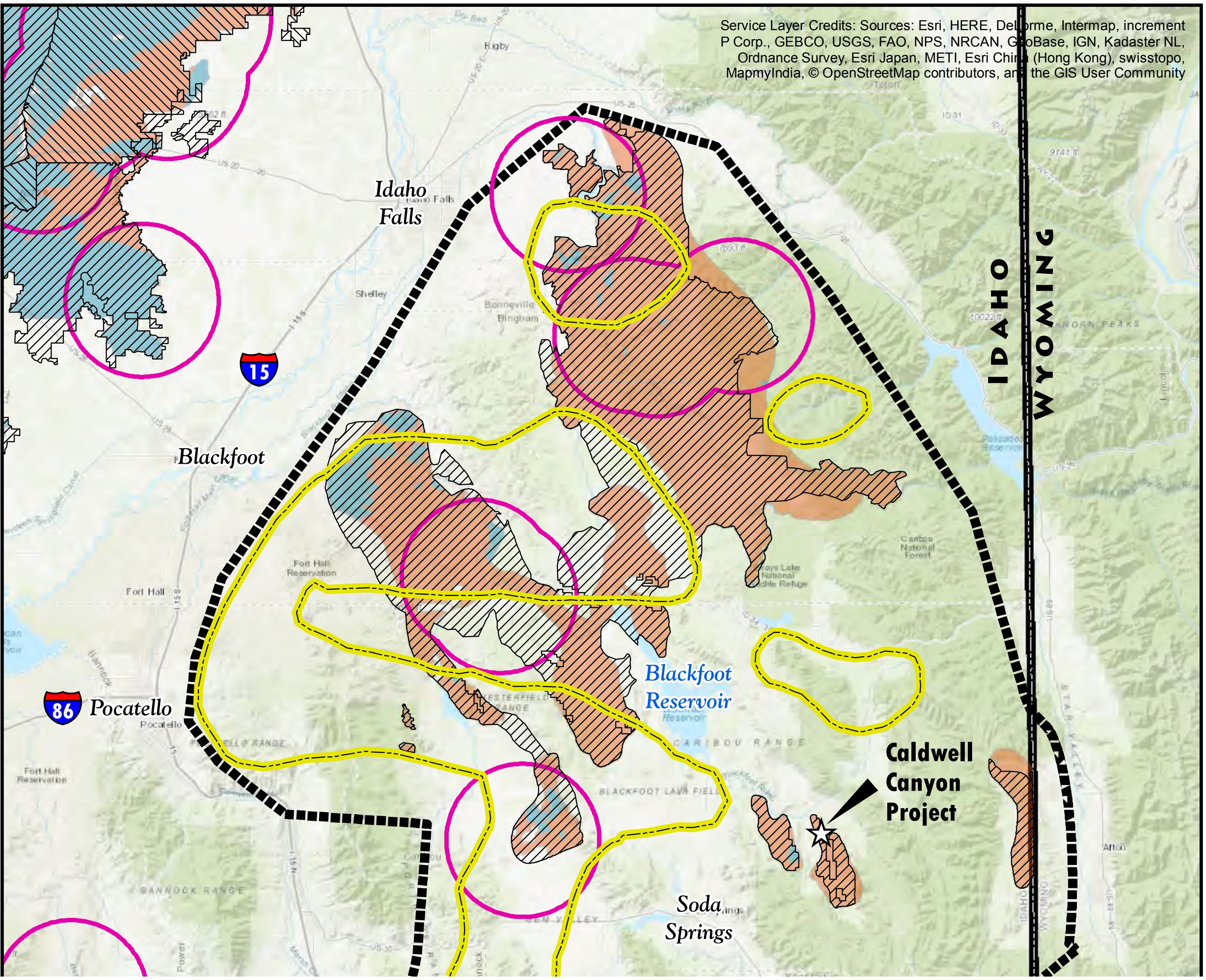
- MZ I - Great Plains
- MZ II & VII - Wyoming Basins
- MZ III - Southern Great Basin
- MZ IV - Snake River Basin
- MZ V - Northern Great Basin
- MZ VI - Columbia Basin

▭ East Central Idaho Population Area 18

■ Current Distribution of Sage Grouse

NewFields

Second-Order (Mid-Scale) WAFWA Sage-Grouse Management Zones (after Stiver et al. 2006)
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 6



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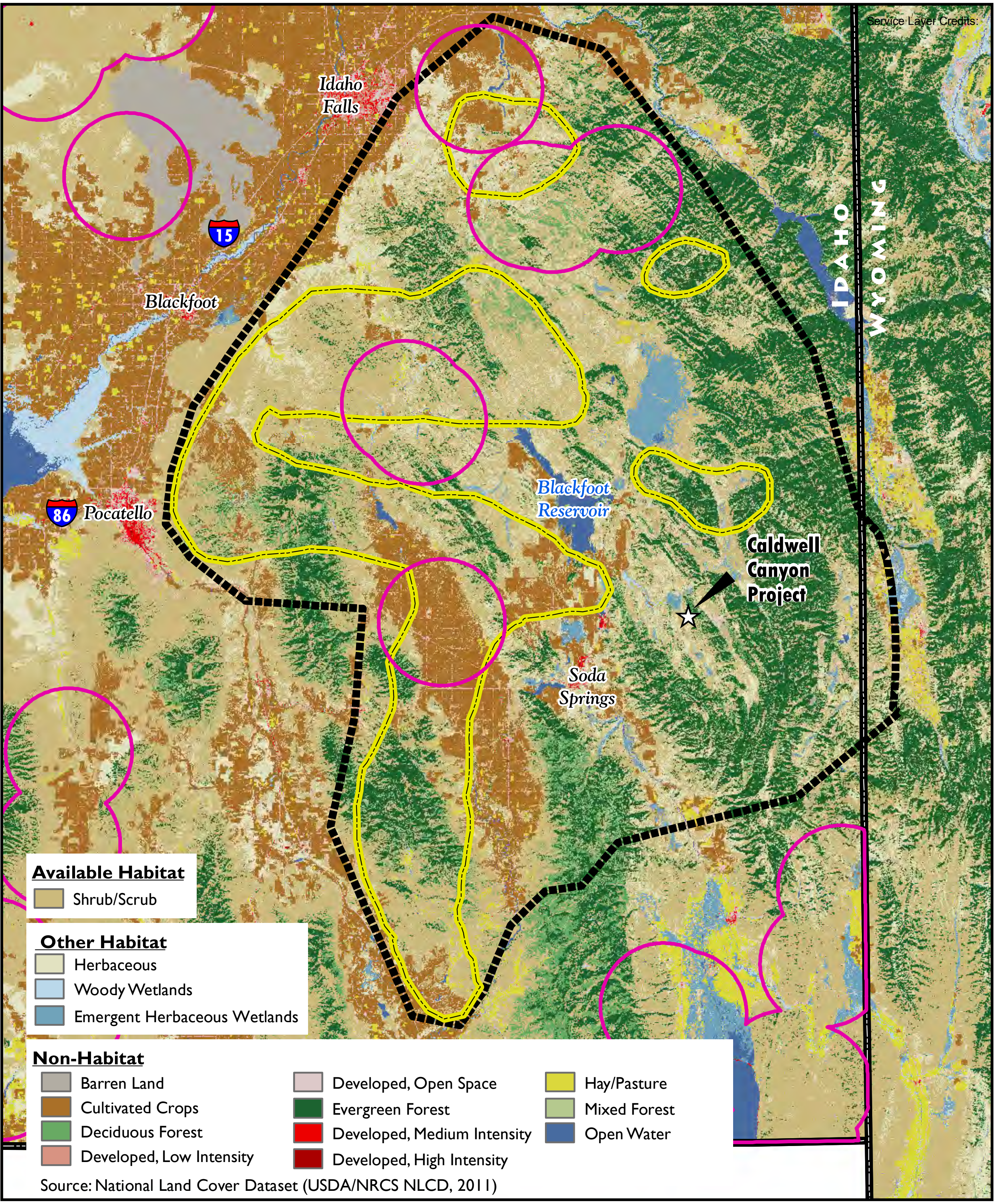
\Sage_Grouse_HAF\Area_18_Map.mxd



Source: National Land Cover Dataset (USDA/NRCS NLCD, 2011)

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NewFields

GRSG Nesting and Late Brood Habitat (FEIS)

Current Distribution of GRSG (Washington Fish & Wildlife, 2002)

East Central Idaho Population Area 18

Second-Order (Mid-Scale)
National Land Cover Dataset -
East Central Idaho
Population Area 18
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 8

Redacted

FIGURE 9

Redacted

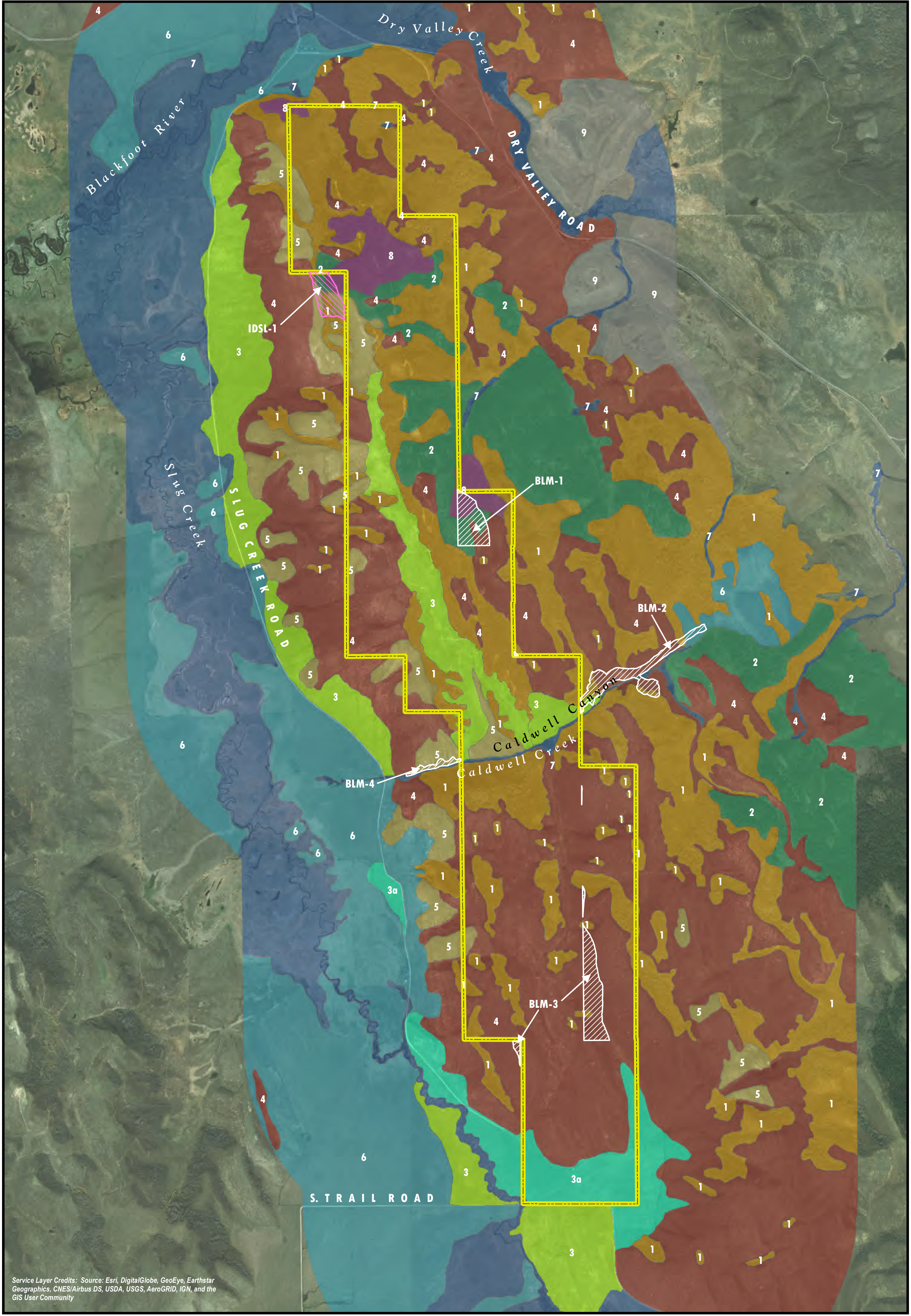
NewFields

FIGURE 10

Redacted

FIGURE 11

\\NFHELENA\shares\Projects\350.0109.000 Caldwell Canyon\05 GIS\05.01Projects\Tech_Rpts\Sage_Grouse_HAF\Veg_Fourth_Order.mxd



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0 Feet 3,000

▭ Lease Boundary

Caldwell Canyon Study Area

▨ Impacted Sage Grouse Habitat (State) 5.5 Hectares

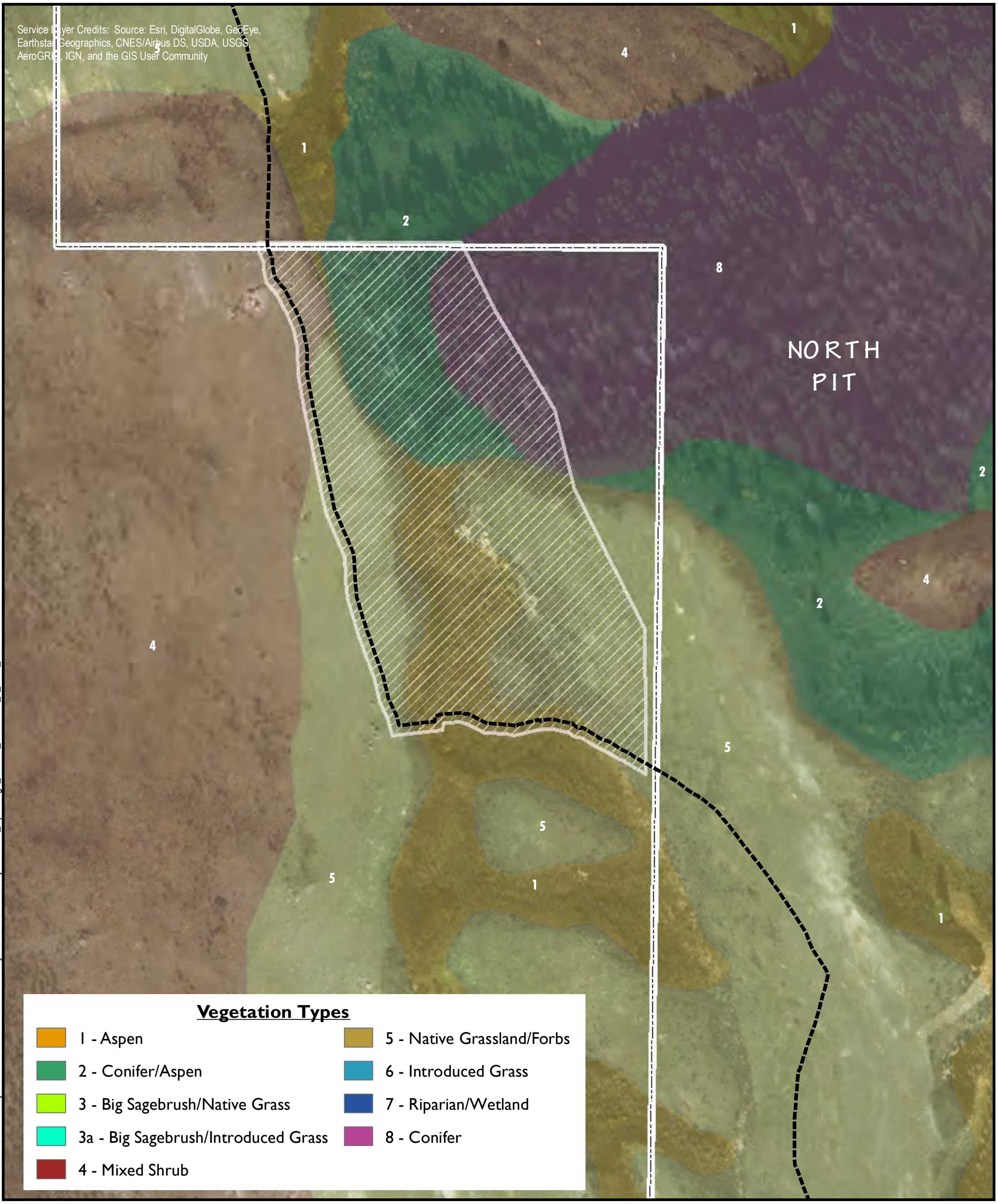
▨ Impacted Sage Grouse Habitat (BLM) 27.8 Hectares

Vegetation Types

🟧 1 - Aspen	🟫 5 - Native Grassland/Forbs
🟩 2 - Conifer/Aspen	🟦 6 - Introduced Grass
🟩 3 - Big Sagebrush/Native Grass	🟦 7 - Riparian/Wetland
🟦 3a - Big Sagebrush/Introduced Grass	🟪 8 - Conifer
🟥 4 - Mixed Shrub	⬜ 9 - Mine Reclamation

NewFields

Fourth-Order (Site-Scale)
Vegetation Types
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 12



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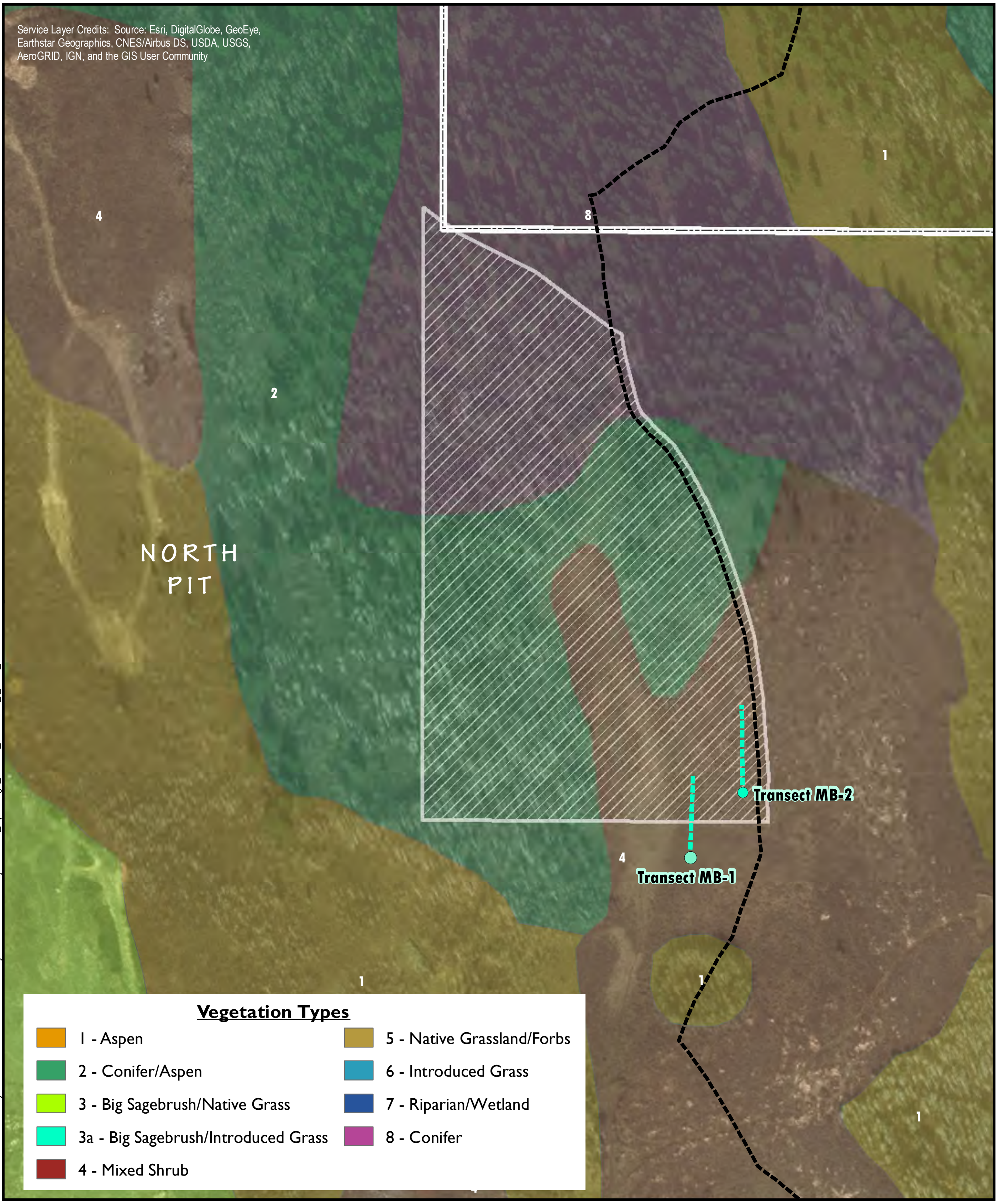
NewFields

Fourth-Order (Site-Scale) Vegetation Types - IDSL-1 Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 13



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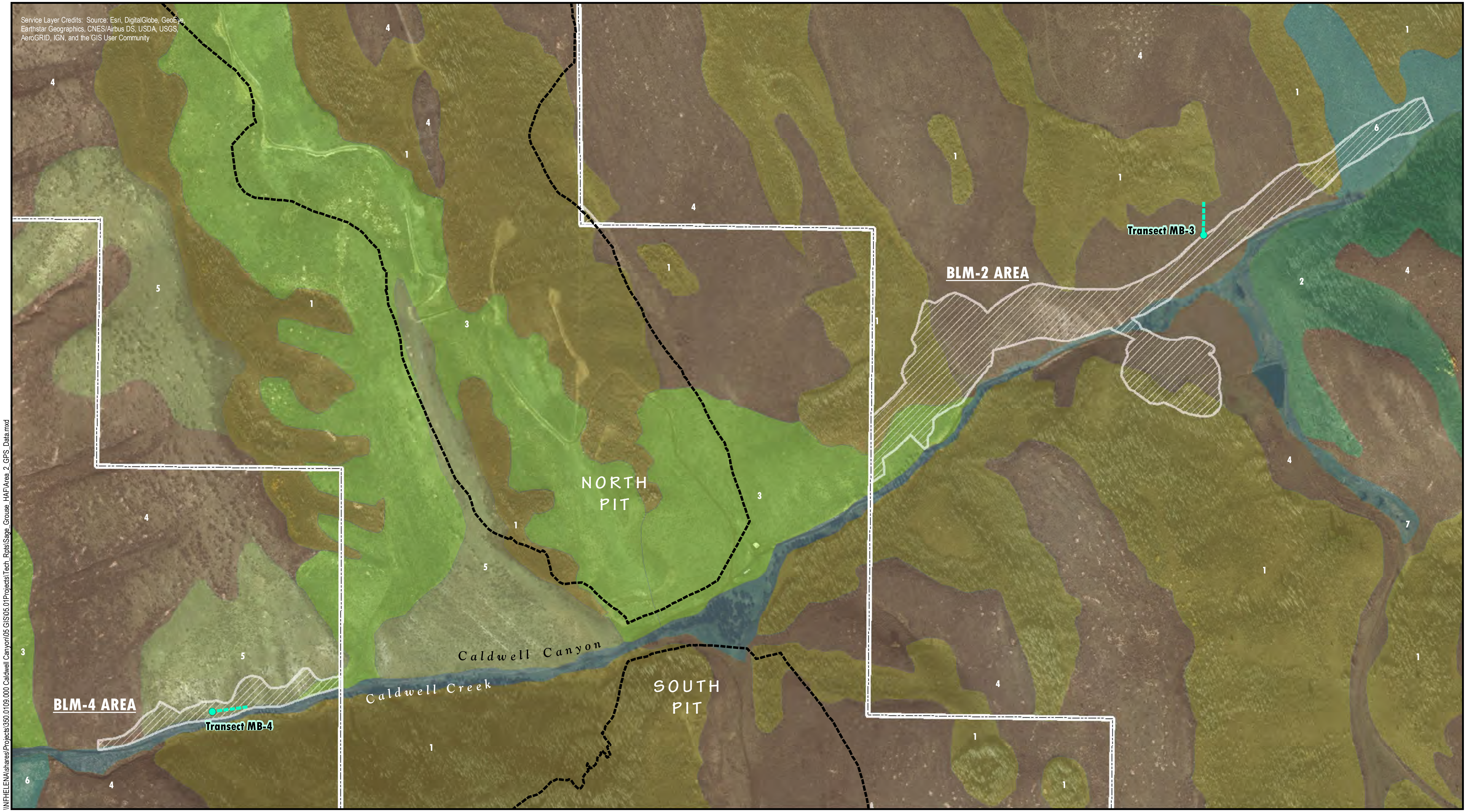
NewFields

Fourth-Order (Site-Scale)
Transect Locations and
Vegetation Types - BLM-1 Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 14



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N

0 Feet 500

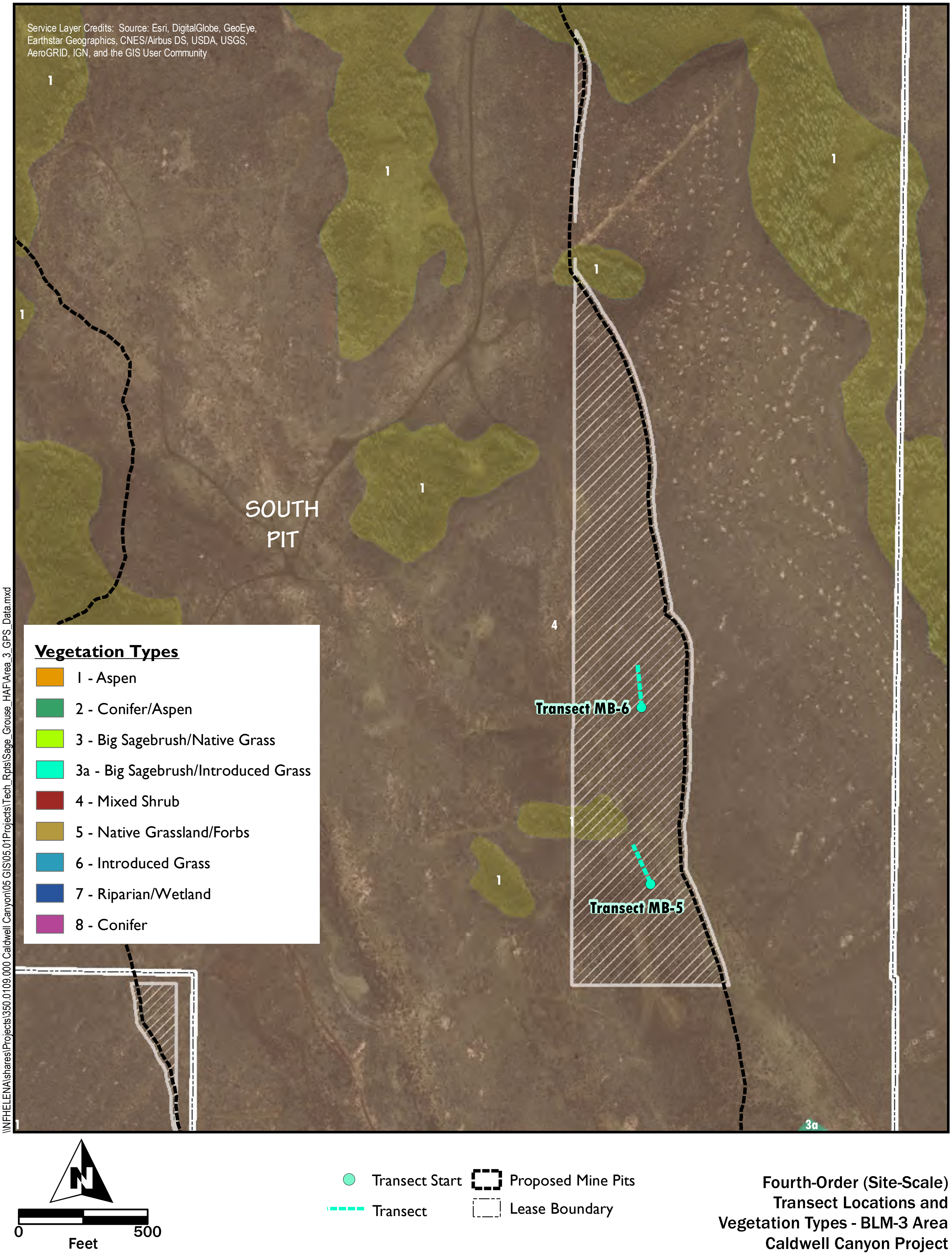
NewFields

● Transect Start
--- Transect
⬚ Proposed Mine Pits
⬚ Lease Boundary

Vegetation Types

🟧 1 - Aspen
🟩 2 - Conifer/Aspen
🟩 3 - Big Sagebrush/Native Grass
🟦 3a - Big Sagebrush/Introduced Grass
🟥 4 - Mixed Shrub
🟫 5 - Native Grassland/Forbs
🟦 6 - Introduced Grass
🟦 7 - Riparian/Wetland
🟪 8 - Conifer

**Fourth-Order (Site-Scale)
Transect Locations and
Vegetation Types - BLM-2 and BLM-4 Areas
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 15**



Fourth-Order (Site-Scale)
Transect Locations and
Vegetation Types - BLM-3 Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 16

Habitat Assessment Summary Forms

APPENDIX A

Form M-1: Mid-Scale (Second-Order) Sage-Grouse Habitat Description

Date: 10/20/16

Counties: Caribou, Bonneville, Bingham, Bear Lake, Franklin

State: Idaho

Evaluator(s): Gary Back

Populations: East Central Idaho (Pop 18)

General Location: SE Idaho

Map File Name: Sage_Grouse_HAF\Area_18_Map_NLCD.mxd

Sage-Grouse Management Zone(s): Management Zone MZ IV

Agencies: NewFields

Data Sources

Land Cover Type Data Sources: National Land Cover Dataset

Date:

Anthropogenic Features Data Sources: Same

Population Data Sources: IDFG, BLM

Data Storage Location: NewFields, Helena, MT, IDFG, BLM, Pocatello

Software and Version:

Mapping Grain (spatial resolution):

Population Area Extent (km^2):

Habitat Indicator Descriptions

1. Habitat Availability	a. Area of occupied habitat (km^2) = Unknown
	b. Area of potential habitat (km^2) = Estimated to be ~ 45% of Pop 18 Area = 4,815 km2
	c. Area of nonhabitat (km^2) (optional) = Estimated to be ~ 40% of Pop 18 Area = 4,280
	Discussion: See Section 4.2.1 of HA Report
2. Patch Size and Number	a. Mean size of occupied habitat patches (km^2) = Unknown
	b. # of occupied habitat patches = Unknown
	Discussion: See Section 4.2.2 of HA Report
3. Patch Connectivity	Mean distance to nearest occupied habitat patch (km) = Unknown
	Discussion: See Section 4.2.3 of HA Report
4. Linkage Area Characteristics	a. % suitable land cover types in linkage areas = ~45%
	b. % marginal land cover types in linkage areas = ~15%
	c. % unsuitable land cover types in linkage areas = ~40%
	Discussion: See Section 4.2.4 of the HA Report
5. Landscape Matrix and Edge Effect	a. Mean % positive patch edges = Unknown
	b. Mean % negative patch edges = Unknown
	Discussion: See Section 4.2.5 of HA Report
6. Anthropogenic Disturbances	a. Densities of linear features (km / km^2) = 1.07 km / 1 km2
	b. Densities of point features (sites / km^2) = 0.06 sites / 1 km2
	c. Area of nonhabitat or unsuitable habitat inclusions (km^2) = ~ 1,391 km2; 13% of Pop 18 Area

Mid-Scale (Second-Order) Suitability Summary

Landscape Desciption: **Check the one description below that best describes the population and subpopulation area:**	✔
Suitable: Landscapes have connected mosaics of sagebrush shrublands that allow for bird dispersal and migration movements within the population or subpopulation area. Anthropogenic disturbances that can disrupt dispersal or cause mortality are generally not widespread or are absent.	
Marginal: Landscapes have patchy, fragmented sagebrush shrublands that are not well connected for dispersal and migration in portions of the population or subpopulation area. Anthropogenic disturbances that disrupt dispersal or cause mortality are present throughout all or portions of the landscape. Some lek groups or subpopulations are isolated or nearly isolated.	✓
Unsuitable: Landscapes were former shrubland habitat now converted to predominantly grassland or woodland cover or other unsuitable land cover or use. Remaining sagebrush patches are predominantly unoccupied or have few remaining birds. Portions of the population or subpopulation area may become occupied in the foreseeable future through succession or restoration.	

Discussion:

See Section 4.2.7 of HA Report:
Based on the available data presented in Sections 4.2.1-4.2.6 and assessment of GRSG habitat at the second-order scale, the habitat suitability rating is Marginal within the East Central Idaho Population Area.

As discussed above, the spectrum of habitat availability has been modified by anthropogenic disturbances that include: 1) agriculture, through the conversion of sagebrush lands to agricultural crops, hay, and introduced grasses for grazing, primarily on the west side of the East Central Idaho Population Area, but also to a lesser degree in the central and eastern portions of the population area; 2) mining, through exploration and open-pit mining and associated facilities, which occurs primarily on the east side of the East Central Idaho Population Area; 3) towns, through the permanent removal of GRSG habitat; 4) roads; 5) railroads; and 6) reservoirs. Habitat availability and quality within the East Central Idaho Population Area are also determined by existing vegetation; much of the area is forested and these areas are non-habitat for GRSG. Available habitat (mostly Shrub/Scrub) represents approximately 53 percent of the East Central Idaho Population Area, but not in large contiguous patches, especially on the south and east portions of this population area.

As shown on Figure 8, an analysis of habitat with respect to patch size, patch connectivity, landscape matrix and edge effect, and anthropogenic disturbance indicates that, while potential habitat still remains, the areas that once supported contiguous habitat patches providing connectivity between seasonal habitats with adequate corridors or linkages between habitats have been reduced in size and number. The available habitat that remains is typically within a matrix of non-habitat consisting of forested habitat, or lands converted for agricultural use or other anthropogenic disturbance.

Form F-1: Fine-Scale (Third-Order) Sage-Grouse Habitat Description

Description Year: 2016
Counties: Caribou, Bonneville, Bear Lake, Franklin, Bingham
State: Idaho
Evaluator(s): Gary Back
Agency: NewFields
Home Range Name: Unknown
Population: East Central Idaho (Pop 18)
Lek Group Name: Unknown
General Location: SE Idaho

Data Sources

Land Cover Type Data Sources: Mapping by NewFields
Anthropogenic Features Data Sources: Mapping by NewFields
Population Data Sources: IDFG, BLM
Data Storage Location: Helena, MT; NewFields
Software and Version:
Mapping Grain:
Home Range Area Extent (km^2): 405 km2 (100,085 ac)

Habitat Indicator Descriptions

1. Seasonal Habitat Availability	a. Area of occupied breeding habitat (km^2) = Unknown
	a. Area of occupied summer habitat (km^2) = Unknown
	a. Area of occupied winter habitat (km^2) = Unknown
	b. Area of potential breeding habitat (km^2) = 170 km2 (41,757 ac)
	b. Area of potential summer habitat (km^2) = 79 km2 (19,637 ac)
	b. Area of potential winter habitat (km^2) =165 km2 (40,873 ac)
	c. Area of nonhabitat (km^2) (optional) =211 km2 (52,126 ac)
	Discussion: See Section 4.3.1 of HA Report
2. Seasonal Use Area Connectivity	Breeding to summer (km edge/km^2 of habitat) = Unknown
	Summer to winter (km edge/km^2 of habitat) = Unknown
	Winter to breeding (km edge/km^2 of habitat) = Unknown
3. Anthropogenic Disturbances	a. Densities of linear features (km/km^2) = 1.67 km / 1 km2
	b. Densities of point features (sites/km^2) = 0.07 sites / km2
	c. Area of nonhabitat or unsuitable habitat inclusions (km^2) = ~61 km2 (~15,035 ac)
	Discussion: See Section 4.3.2 and 4.3.3 of HA Report

Fine-Scale (Third-Order) Suitability Summary

✔	**Check the one description below that best describes the home range:**
	Suitable: Home ranges have connected seasonal use areas. Anthropogenic features that can disrupt seasonal movements or cause mortality are generally absent or at least not widespread.
✓	**Marginal:** Home ranges have poorly connected or disjunct seasonal use areas. Anthropogenic features that can disrupt seasonal movements or cause mortality may occur within the home range.
	Unsuitable: Home ranges have seasonal use areas with predominantly grassland, woodland, or incompatible land uses (anthropogenic features) not conducive to sage-grouse seasonal movements or habitat use. Most leks have been abandoned or have few remaining birds.

Discussion:

See Section 4.3.4 of HA Report.

Form S-4: Sage-Grouse Site-Scale Habitat Suitability Worksheet – Upland Summer/Late Brood-Rearing Habitat

Date: 8/11/16 | **County:** Caribou | **State:** ID | **Evaluator(s):** GNB, JHC

Population: East Central Idaho (Pop 18) | **Home Range Name:** Unknown

Land Cover Type: Mixed Shrub | **Ecological Site:** Unknown

Number of Transects: 6 | **Area Sampled (ha/ac):** 14.6 ha (36 ac)

List UTM Coordinates (coordinates, zone, datum) of All Transects:

See Plot Metadata Sheets for this information.

Habitat Indicator Suitability Range

Habitat Indicator	$\overline{x}$	Suitable	✔	Marginal	✔	Unsuitable	✔
Sagebrush Cover (mean)	14%	10 to 25%	✓	5 to <10% or >25%		<5%	
Sagebrush Height (mean)	60.29	40 to 80 cm	✓	20 to <40 or >80 cm		<20cm	
Perennial Grass and Forb Cover (mean)	49%	≥15 %	✓	5 to <15%		<5%	
Preferred Forb Availability (relative to site potential)		Preferred forbs are common with appropriate numbers of species present	✓	Forbs are common but only a few preferred species are present		Preferred forbs are rare	
Number of Preferred Forb Species (*n*)	7.1						

Site-Scale Suitability	Suitable	✓	Marginal		Unsuitable	

Does site potential limit suitability? ☑ Yes ☑ No ☐ Unknown

Drought Condition:
☐ Extreme Drought ☐ Severe Drought ☑ Moderate Drought ☐ Mid-Range
☐ Moderately Moist ☐ Very Moist ☐ Extremely Moist

Rationale for Overall Suitability Rating:

See Section 4.4 of HA Report

Line-Point Intercept Data Summary

Page 1 of 6

Plot: BLM-1

Transect: MB-1

Evaluator(s): JHC, GNB

Shrubs	Forbs	Grasses
Sagebrush Cover # Hits 6 % 12	**Perennial Forb Cover** # Hits 29 % 58	**Perennial Grass Cover** # Hits 33 % 66
Other Shrub Cover # Hits 14 % 28	**Annual Forb Cover** # Hits 0 % 0	**Annual Grass Cover** # Hits 0 % 0
Sagebrush Shape (n) S 2 C 1	**Total Forb Cover** # AF+PF Hits 29 % 58	**Total Grass Cover** # AG+PF Hits 33 % 66
Avg. Sagebrush Height (cm/in) 61.7 cm	**Avg. PF Height (cm/in)** 22.7 cm	**Avg. PG Height (cm/in)** 44.2 cm

Comments:

Site light to moderately grazed.
Very productive site with 40% shrub cover and 66% grass cover with a variety of forbs.
Grasses and forbs were still succulent in early Aug.

This site provided adequate shading cover, forb diversity, and forb-grass cover between shrubs that would conceal GRSG. The abundance of foliage (shrub leaves, grass, and forbs) provided habitat for insects.

No GRSG, or their sign was observed at the site.

Line-Point Intercept Data Summary

Page 2 **of** 6	**Plot:** BLM-1	**Transect:** MB-2

Evaluator(s): JHC, GNB

Shrubs	**Forbs**	**Grasses**
Sagebrush Cover *# Hits* 6 *%* 12	**Perennial Forb Cover** *# Hits* 27 *%* 54	**Perennial Grass Cover** *# Hits* 24 *%* 48
Other Shrub Cover *# Hits* 18 *%* 36	**Annual Forb Cover** *# Hits* 0 *%* 0	**Annual Grass Cover** *# Hits* 0 *%* 0
Sagebrush Shape (n) *S* 4 *C* 2	**Total Forb Cover** *# AF+PF Hits* 27 *%* 54	**Total Grass Cover** *# AG+PF Hits* 24 *%* 48
Avg. Sagebrush Height (cm/in) 51.2 cm	**Avg. PF Height (cm/in)** 21.9 cm	**Avg. PG Height (cm/in)** 37.3 cm

Comments:

Site light to moderately grazed.
Very productive site with 48% shrub cover and 48% grass cover with a variety of forbs.
Grasses and forbs were still succulent in early Aug.

This site provided adequate shading cover, forb diversity, and forb-grass cover between shrubs that would conceal GRSG. The abundance of foliage (shrub leaves, grass, and forbs) provided habitat for insects.

No GRSG, or their sign was observed at the site.

Line-Point Intercept Data Summary

Page 3 **of** 6

Plot: BLM-2

Transect: MB-3

Evaluator(s): JHC, GNB

Shrubs	**Forbs**	**Grasses**
Sagebrush Cover *# Hits* 5 *%* 10	**Perennial Forb Cover** *# Hits* 16 *%* 32	**Perennial Grass Cover** *# Hits* 28 *%* 56
Other Shrub Cover *# Hits* 9 *%* 18	**Annual Forb Cover** *# Hits* 0 *%* 0	**Annual Grass Cover** *# Hits* 0 *%* 0
Sagebrush Shape (n) *S* 5 *C* 0	**Total Forb Cover** *# AF+PF Hits* 16 *%* 32	**Total Grass Cover** *# AG+PF Hits* 28 *%* 56
Avg. Sagebrush Height (cm/in) 61.0 cm	**Avg. PF Height (cm/in)** 20.2 cm	**Avg. PG Height (cm/in)** 29.5 cm

Comments:

Site light to moderately grazed.
Very productive site with 28% shrub cover and 56% grass cover with a variety of forbs.
Grasses and forbs were still succulent in early Aug.

This site provided adequate shading cover, forb diversity, and forb-grass cover between shrubs that would conceal GRSG. The abundance of foliage (shrub leaves, grass, and forbs) provided habitat for insects.

No GRSG, or their sign was observed at the site.

Line-Point Intercept Data Summary

Page 4 **of** 6

Plot: BLM-2

Transect: MB-4

Evaluator(s): JHC, GNB

Shrubs	Forbs	Grasses
Sagebrush Cover *# Hits* 6 *%* 12	**Perennial Forb Cover** *# Hits* 7 *%* 14	**Perennial Grass Cover** *# Hits* 25 *%* 50
Other Shrub Cover *# Hits* 15 *%* 30	**Annual Forb Cover** *# Hits* 0 *%* 0	**Annual Grass Cover** *# Hits* 0 *%* 0
Sagebrush Shape (n) *S* 6 *C* 0	**Total Forb Cover** *# AF+PF Hits* 7 *%* 14	**Total Grass Cover** *# AG+PF Hits* 25 *%* 50
Avg. Sagebrush Height (cm/in) 72.2 cm	**Avg. PF Height (cm/in)** 30.0 cm	**Avg. PG Height (cm/in)** 41.5 cm

Comments:

Site light to moderately grazed.
Very productive site with 42% shrub cover and 50% grass cover with a variety of forbs.
Grasses and forbs were still succulent in early Aug.

This site provided adequate shading cover, forb diversity, and forb-grass cover between shrubs that would conceal GRSG. The abundance of foliage (shrub leaves, grass, and forbs) provided habitat for insects.

No GRSG, or their sign was observed at the site.

Line-Point Intercept Data Summary

Page 5 **of** 6	**Plot:** BLM-4	**Transect:** MB-5
Evaluator(s): JHC, GNB		
Shrubs	**Forbs**	**Grasses**
Sagebrush Cover *# Hits* 4 *%* 8	**Perennial Forb Cover** *# Hits* 18 *%* 36	**Perennial Grass Cover** *# Hits* 41 *%* 82
Other Shrub Cover *# Hits* 25 *%* 50	**Annual Forb Cover** *# Hits* 0 *%* 0	**Annual Grass Cover** *# Hits* 0 *%* 0
Sagebrush Shape (n) *S* 1 *C* 3	**Total Forb Cover** *# AF+PF Hits* 18 *%* 36	**Total Grass Cover** *# AG+PF Hits* 41 *%* 82
Avg. Sagebrush Height (cm/in) 23.8 cm	**Avg. PF Height (cm/in)** 31.7 cm	**Avg. PG Height (cm/in)** 31.5 cm

Comments:

Site was on a south-facing aspect, but at the bottom of the slope - an area of soil accumulation and the productivity of the site was very high.

Sagebrush plants were all young plants, so mean height was low. The other shrubs had a mean height of 89.9 cm. Other taller sagebrush plants were in the area sampled, but did not fall on the transect.

Site light to moderately grazed.
Very productive site with 58% shrub cover and 82% grass cover with a variety of forbs.
Grasses and forbs were still succulent in early Aug.

This site provided adequate shading cover, forb diversity, and forb-grass cover between shrubs that would conceal GRSG. The abundance of foliage (shrub leaves, grass, and forbs) provided habitat for insects.

No GRSG, or their sign was observed at the site. Site was less than 50 m to riparian zone.

Line-Point Intercept Data Summary

Page 6 **of** 6	**Plot:** BLM-4	**Transect:** MB-6
Evaluator(s): JHC, GNB		
Shrubs	**Forbs**	**Grasses**
Sagebrush Cover *# Hits* 14 *%* 28	**Perennial Forb Cover** *# Hits* 22 *%* 44	**Perennial Grass Cover** *# Hits* 24 *%* 48
Other Shrub Cover *# Hits* 14 *%* 28	**Annual Forb Cover** *# Hits* 0 *%* 0	**Annual Grass Cover** *# Hits* 0 *%* 0
Sagebrush Shape (n) *S* 11 *C* 1	**Total Forb Cover** *# AF+PF Hits* 22 *%* 44	**Total Grass Cover** *# AG+PF Hits* 24 *%* 48
Avg. Sagebrush Height (cm/in) 70.1 cm	**Avg. PF Height (cm/in)** 27.9 cm	**Avg. PG Height (cm/in)** 35.6 cm

Comments:

Site was on a south-facing aspect, but at the bottom of the slope - an area of soil accumulation and the productivity of the site was very high.

Site light to moderately grazed.
Very productive site with 56% shrub cover and 48% grass cover with a variety of forbs.
Grasses and forbs were still succulent in early Aug.

This site provided adequate shading cover, forb diversity, and forb-grass cover between shrubs that would conceal GRSG. The abundance of foliage (shrub leaves, grass, and forbs) provided habitat for insects.

No GRSG, or their sign was observed at the site. Site was less than 50 m to riparian zone.

Sage-Grouse Forb Diversity Summary Form

Date: 8/20/16	**County:** Caribou	**State:** ID	**Evaluator(s):** JHC, GNB

Population: East Central Idaho (Pop 18

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unknown

Associated Leks:

Transect #: MB-1

Area (ha/ac) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Late Summer Brood

UTM:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Transect Data Summary (see directions)

Preferred Forb Species	Noxious Weeds	Invasive Annual Forbs	Other Forbs
Total Species (#): 5	Total Species (#): 0	Total Species (#): 0	Total Species (#): 11
List major species: ACMI2 TRDU TAOF ERIOG SP ERIGE1 SP	List major species:	List major species:	List major species: GEVI2 POGR9 SENE9 SP PEGA3

Comments (describe the diversity, availability, and relative abundance of preferred forbs in relation to site potential):

16 Total Forb species; no Noxious or Invasive species.
High diversity of forbs as only those that were succulent in late summer were recorded; spring forbs had already desiccated and withered.
Forbs were common in the understory.
Preferred forbs were about what would be expected at this time of the year.

Sage-Grouse Forb Diversity Summary Form

Date: 8/20/16	**County:** Caribou	**State:** ID	**Evaluator(s):** JHC, GNB

Population: East Central Idaho (Pop 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unknown

Associated Leks:

Transect #: MB-2

Area (ha/ac) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Late Summer Brood

UTM:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Transect Data Summary (see directions)

Preferred Forb Species	Noxious Weeds	Invasive Annual Forbs	Other Forbs
Total Species (#): 6	Total Species (#): 0	Total Species (#): 0	Total Species (#): 13
List major species: TRDU ACMI2 ERIOG 1 sp EROIG 2 sp ERIGE2 sp COLLO sp	List major species:	List major species:	List major species: GEVI2 LILE3 PEGA SENE sp AGUR CAEX6

Comments (describe the diversity, availability, and relative abundance of preferred forbs in relation to site potential):

19 total forb species with no Noxious or Invasive species.
High diversity of forbs as only those that were succulent in late summer were recorded; spring forbs had already desiccated and withered.
Forbs were common in the understory.
Preferred forbs were about what would be expected at this time of the year.

Sage-Grouse Forb Diversity Summary Form

Date: 8/20/16	**County:** Caribou	**State:** ID	**Evaluator(s):** JHC, GNB

Population: East Central Idaho (Pop 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unknown

Associated Leks:

Transect #: MB-3

Area (ha/ac) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Late Summer Brood

UTM:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Transect Data Summary (see directions)

Preferred Forb Species	Noxious Weeds	Invasive Annual Forbs	Other Forbs
Total Species (#): 5	Total Species (#): 1	Total Species (#): 0	Total Species (#): 8
List major species: ERIOG sp ACMI2 TAOF TRDU LIRU4	List major species: CIAR4	List major species:	List major species: CAEX6 GEVI2 PF4 COCA5

Comments (describe the diversity, availability, and relative abundance of preferred forbs in relation to site potential):

14 total forb species with 1 Noxious and no Invasive species.
High diversity of forbs as only those that were succulent in late summer were recorded; spring forbs had already desiccated and withered.
Forbs were common in the understory.
Preferred forbs were about what would be expected at this time of the year.

Sage-Grouse Forb Diversity Summary Form

Date: 8/20/16	**County:** Caribou	**State:** ID	**Evaluator(s):** JHC, GNB

Population: East Central Idaho (Pop 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unknown

Associated Leks:

Transect #: MB-4

Area (ha/ac) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Late Summer Brood

UTM:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Transect Data Summary (see directions)

Preferred Forb Species	Noxious Weeds	Invasive Annual Forbs	Other Forbs
Total Species (#): 5	Total Species (#): 0	Total Species (#): 0	Total Species (#): 9
List major species: CRAC2 LIRU4 ERIGE2 SP ERIOG sp LEDE	List major species:	List major species:	List major species: VETH CYOF TRBU5 GEVI2 SOLID sp

Comments (describe the diversity, availability, and relative abundance of preferred forbs in relation to site potential):

14 total forb species with no Noxious or Invasive species.
High diversity of forbs as only those that were succulent in late summer were recorded; spring forbs had already desiccated and withered.
Forbs were common in the understory.
Preferred forbs were about what would be expected at this time of the year.

Sage-Grouse Forb Diversity Summary Form

Date: 8/20/16	**County:** Caribou	**State:** ID	**Evaluator(s):** JHC, GNB

Population: East Central Idaho (Pop 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unknown

Associated Leks:

Transect #: MB-5

Area (ha/ac) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Late Summer Brood

UTM:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Transect Data Summary (see directions)

Preferred Forb Species	Noxious Weeds	Invasive Annual Forbs	Other Forbs
Total Species (#): 6	Total Species (#): 1	Total Species (#): 0	Total Species (#): 16
List major species: ERIOG ACMI2 ERIOG2 TRDU TAOF LIRU	List major species: CIAR4	List major species:	List major species: POAR7 GEVI2 PF3 AGUR SENEC ANNE LILE

Comments (describe the diversity, availability, and relative abundance of preferred forbs in relation to site potential):

23 total forb species with 1 Noxious and no Invasive species.
High diversity of forbs as only those that were succulent in late summer were recorded; spring forbs had already desiccated and withered.
Forbs were common in the understory.
Preferred forbs were about what would be expected at this time of the year.

Sage-Grouse Forb Diversity Summary Form

Date: 8/20/16	**County:** Caribou	**State:** ID	**Evaluator(s):** JHC, GNB

Population: East Central Idaho (Pop 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unknown

Associated Leks:

Transect #: MB-6

Area (ha/ac) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Late Summer Brood

UTM:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Transect Data Summary (see directions)

Preferred Forb Species	Noxious Weeds	Invasive Annual Forbs	Other Forbs
Total Species (#): 5	Total Species (#): 1	Total Species (#): 0	Total Species (#): 15
List major species:	List major species:	List major species:	List major species:
LIRU4 ERIGE2 ACMI2 ERIOG TRDU	CIAR4		SEER GEVI2 AGUR ANNE CAEX6 LUPIN LOFO SOLID

Comments (describe the diversity, availability, and relative abundance of preferred forbs in relation to site potential):

21 total forb species with 1 Noxious and no Invasive species.
High diversity of forbs as only those that were succulent in late summer were recorded; spring forbs had already desiccated and withered.
Forbs were common in the understory.
Preferred forbs were about what would be expected at this time of the year.

Plot Metadata Form

Site: Caldwell Canyon Project

Ownership: BLM-administered

Establishment Date: 8/1/16

Plot ID: BLM-1

Visit Date: 8/1/16, 8/2/16

Evaluator(s): JHC, GNB

GPS Coordinate System: UTM

Datum : NAD 83

Zone (if applicable): 12

Elevation: ☑m ☐ft 2148

Transect	Azimuth	Length ☑m ☐ft		Latitude/Northing	Longitude/Easting	Slope (%)
MB-1	N	50	Start	4748393	960668	<5%, West-facing
			Start			Aspect (˚)
MB-2	N	50	Start	4748439	960700	<15%, SW-facing

Directions to the Plot:

See figure

Population: East Central Idaho (POP 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unavailable

Associated Leks: No known active leks w/in 2 miles

Area (ha/ac) or Distance (km/mi) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Potential Late Summer Brood

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Comments:

Site is on BLM-administered land outside the existing lease.
High elevation, 12"+ precip zone.
Light to moderate grazing as of 8/1/16
Site is located in GMHA-designated zone.
Proximity to forest habitats reduces the potential of this site as late summer brood habitat.

Plot Photos:

Photo	Description
3169	Transect Start - MB-1
3170	Conifer adjacent to Mixed Shrub -North
3171	Mixed Conifer/Aspen adjacent to Mixed Shrub (West)
3172	Aspen patch adjacent to Mixed Shrub - South
3173	Transect Start - MB-2

Plot Metadata Form

Site: Caldwell Canyon Project

Ownership: BLM-adminstered

Establishment Date: 8/2/16

Plot ID: BLM-2

Visit Date: 8/2/16

Evaluator(s): JHC, GNB

GPS Coordinate System: UTM

Datum : NAD 83

Zone (if applicable): 12

Elevation: ☐m ☐ft

Transect	Azimuth	Length ☑m ☐ft		Latitude/Northing	Longitude/Easting	Slope (%)
MB-3	N	50	Start	4747682	961973	<5%, S-facing
			Start			Aspect (˚)
			Start			

Directions to the Plot:

See Figure

Population: East Central Idaho (POP 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unavailable

Associated Leks: No active leks w/in 2 miles

Area (ha/ac) or Distance (km/mi) Sampled:

Site Info.: ☑ Arid Site ☐ Mesic Site

Seasonal Habitat:

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Comments:

Site is on BLM-administered land outside the existing lease.
High elevation, 12"+ precip zone.
Light to moderate grazing as of 8/1/16
Site is located in GMHA-designated zone.

Plot Photos:

Photo	Description
3178	Transect Start - MB-3

Plot Metadata Form

Site: Caldwell Canyon Project

Ownership: BLM-administered

Establishment Date: 8/3/16

Plot ID: BLM-3

Visit Date: 8/3/16

Evaluator(s): JHC, GNB

GPS Coordinate System: UTM

Datum : NAD 83

Zone (if applicable): 12

Elevation: ☐m ☐ft

Transect	Azimuth	Length ☑m ☐ft		Latitude/Northing	Longitude/Easting	Slope (%)
MB-5	NW	50	Start	4744968	961700	25%, E-facing
			Start			Aspect (˚)
MB-6	N	50	Start	4745176	961674	25%, W-facing

Directions to the Plot:

See Figure

Population: East Central Idaho (POP 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unavailable

Associated Leks: No known active leks w/in 2 miles

Area (ha/ac) or Distance (km/mi) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Potential late summer brood

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Comments:

Site is on BLM-administered land outside the existing lease.
High elevation, 12"+ precip zone.
Light to moderate grazing as of 8/1/16
Site is located in GMHA-designated zone.

Plot Photos:

Photo	Description
3183	Transect Start - MB-5
3184	Transect Start - MB-6

Plot Metadata Form

Site: Caldwell Canyon Project

Ownership: BLM-administered

Establishment Date: 8/2/16

Plot ID: BLM-4

Visit Date: 8/2/16

Evaluator(s): JHC, GNB

GPS Coordinate System: UTM

Datum : NAD83

Zone (if applicable): 12

Elevation: ☐m ☐ft

Transect	Azimuth	Length ☑m ☐ft		Latitude/Northing	Longitude/Easting	Slope (%)
MB-4	NW	50	Start	4746777	960390	30%, S-Facing
			Start			**Aspect (˚)**
			Start			

Directions to the Plot:

See Figure

Population: East Central Idaho (POP 18)

Home Range Name: Unknown

Land Cover Type: Mixed Shrub

Ecological Site: Unavailable

Associated Leks: No known active leks w/in 2 miles

Area (ha/ac) or Distance (km/mi) Sampled:

Site Info.: ☐ Arid Site ☑ Mesic Site

Seasonal Habitat: Potential Late Summer Brood

PFC Status (riparian areas only): ☐ PFC ☐ FAR ☐ NF ☐ Unknown

Comments:

Site is in Caldwell Canyon adjacent to Caldwell Creek. Bottom of south-facing slope.

Plot Photos:

Photo	Description
3182	Transect Start - MB-4

Field Data Forms

APPENDIX B

DATE: 8-1-16

LOCATION: CALDW

CANY. N

FACILITY: NORTH

PIT

TRANSECT NO. MB-1

PLOT NO.

PHOTO NO. 1

GLOBAL CHANGE: SYOC TO SYOR
ALL PAGES

Line-Point Intercept Data Form

Page 1 of 4 Date: 8-1-16 Plot ID: MB-1 BLM-1 Transect: MB-1

Evaluator(s): JHC GNB

Azimuth: N Intercept (Point) Spacing: ☐cm ☑in Height: ☑cm ☐in

Pt.	Top Layer	Lower Layers			Soil Surface	Pt.	Top Layer	Lower Layers			Soil Surface
		Code 1	Code 2	Code 3				Code 1	Code 2	Code 3	
1	TAOF	—	—	—	S	26	—	—	—	—	EL
2	—	—	—	—	EL	27	ARTRV	POPR	—	—	EL
3	CAREX	ERIGERON	—	—	S	28	POPR	AGST	—	—	EL
4	CAREX	CAREX	—	—	EL	29	SYOR	PF1	—	—	EL
5	—	—	—	—	D	30	SYOR	AGUR	—	—	EL
6	ERHE	—	—	—	D	31	AGTR	COLI	—	—	EL
7	—	—	—	—	D	32	SYOR	AGTR	—	—	EL
8	ARCA	STLE	ACMI	—	D	33	AGUR	POPR	—	—	EL
9	PF1	—	—	—	D	34	GEVI	—	—	—	S
10	POPR	—	—	—	EL	35	CAREX	GEVI	SENECIO	—	EL
11	POPR	—	—	—	D	36	ARCA	FEPR	COLI	—	EL
12	SYOR	BRIN	GEVI	—	EL	37	CAREX	ACMI	—	—	EL
13	CAREX	AGUR	—	—	EL	38	—	—	—	—	S
14	SYOR	BRIN	POPR	—	EL	39	CAREX	—	—	—	S
15	POPR	—	—	—	EL	40	—	—	—	—	S
16	GEVI	POPR	—	—	EL	41	AGTR	—	—	—	EL
17	SYOR	ARCA	POPR	—	EL	42	ARTRV	POPR	BRIN	—	EL
18	AF1	POPR	—	—	EL	43	SYOR	POPR	—	—	EL
19	ARCA	TRDU	POPR	—	EL	44	SYOR	GEVI	—	—	S
20	COLI	—	—	—	EL	45	PF6	CAREX	—	—	EL
21	POPR	POGR	—	—	EL	46	SYGR	BRIN	SENECIO	—	EL
22	—	—	—	—	EL	47	SYOR	AGTR	SENECIO	—	EL
23	POGR	POPR	—	—	EL	48	SYOR	PF1	POPR	—	EL
24	SYOR	GEVI	POPR	—	EL	49	POPR	ACMI	—	—	EL
25	ARCA	POPR	—	—	EL	50	SYOR	GEVI	—	—	EL

% foliar cover = 43 top layer pts (1st col) x 2 = 86 %

% bare ground = 2 pts (w/NONE over S) x 2 = 4 %

Top layer codes: Species code, common name, or NONE (no cover).

Lower layers codes: Species code, common name, L (herbaceous litter), WL (woody litter, >5 mm (~1/4 in) diameter), VL (vagrant lichen).

NOTE: SITE MODERATELY GRAZED

Unknown Species Codes:

- *AF#* = annual forb
- *PF#* = perennial forb
- *AG#* = annual grass
- *PG#* = perennial grass
- *SH#* = shrub
- *TR#* = tree

Soil Surface (do not use litter):

- G = gravel (≤5 mm or ~1/4 in)
- R = rock (>5 mm or ~1/4 in)
- BR = bedrock
- EL = embedded litter
- D = duff
- M = moss
- LC = visible lichen crust on soil
- S = soil

PF1 = SAGE VIOLET
PF2 =

Vegetation Height/Sagebrush Shape Data Form

Page 2 of 4 | Date: 8/1/16 | Plot ID: MB-1 BLM-1 | Transect: MB-1

Evaluator(s): JHC, GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
1	-			-		TAOF	6.2
3	-			CAREX	13.4	ERIGERON	3.8
4	-			CAREX	9.1		
6	-			-		ERHE	11.4
8	ARCA	55	S	STLE	40.9	ACMI	10.4
9	-		-	-		PF 1	14.0
10	-			POPR	19.5	-	
11	-			POPR	30.1	-	
12	SYOR	135.0	-	BRIN	70.0	GEVI	36.0
13	CAREX	22.6	-	-		AGUR	65.0
14	SYOR	120.0	-	BRIN	76.0	-	
15	-		-	POPR	42.0	-	
16	-		-	POPR	31.0	GEVI	28.0
17	SYOR	120.0		POPR	7.0		
18	-			POPR	32.5	AF 1	29.0
19	ARCA	40.2		POPR	39.0	TRDU	47.0
20	-			-		COLI	20.0
21	-			POPR	48.0	POGR	18.0
23	-			POPR	47.0	POGR	25.0
24	SYOR	115.0		POPR	25.0	GEVI	28.0
25	ARCA	55.0		POPR	15.0	-	
27	ARTRV	60.0	C	POPR	91.0	-	
28	-			POPR	75.0	-	
29	SYOR	147		-		PF 1	40
30	SYOR	147		-		AGOR	64
31	-			AGTR	72.0	COLI	12.0
32	SYOR	147		AGTR	78.0	-	
33	-			POPR	22.0	AGUR	12.0
34	-			-		GEVI	7.0
35	-			CAREX	24.0	GEVI	14.0
36	ARCA	90	-	CAREX	53.0	COLI	11.0

Average sagebrush height =

Average grass height = See page 3 of 4

Average forb height =

Vegetation Height/Sagebrush Shape Data Form

Page 3 of 4 | Date: 8/1/16 | Plot ID: MB-1 BLM-1 | Transect: MB-1

Evaluator(s): JHC, GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
37	-			CAREX	26.0	ACMI	6.0
39	-			CAREX	5.0	-	
41	-			AGTR	26.0	-	
42	ARTRV	70	S	POPR	74.0	-	
43	SYOR	132		POPR	28.0	-	
44	SYOR	132		-		GEVI	24
45	- -			CAREX	32	PENSTEMON PF8	38
46	SYOR	138		BRIN	83	SENECIO	14
47	SYOR	134		AGTR	42	SENECIO	24
48	SYOR	134		POPR	27	PF1	28
49	—			POPR	104	ACMI	7.0
50	SYOR	138		-		GEVI	17.0

Average sagebrush height = 61.7 cm sage only; 106.99 cm all shrubs

Average grass height = 44.17 cm

Average forb height = 22.75 cm

CONYZA CANADENSIS

4 OF 4

Sage-Grouse Forb Diversity Data Form

Date: 8/1/16 **County:** CARIBOU **State:** ID **Evaluator(s):** JHC, GNB

Population: **Home Range Name:**

Land Cover Type: MOUNTAIN BRUSH **Ecological Site:**

Associated Leks: **Seasonal Habitat:** LATE SUMMER BROODING

Transect #: MB-1 **Site Info. (circle one):** [✓ Arid Site] Mesic Site

Forb Diversity (see directions)

Type	Species	Forb Plot Number																								T
		0	6'	12'	18'	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	GEVI	X	X	X	X	X	X	X	X			X	X	X	X	X	X		X		X	X	X	X	X	X	21
	EREOG	X		X																							2
	POGE	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	23
	SENECIO	X			X	X		X	X		X	X		X	X	X	X		X	X	X		X	X		X	17
	ERIGERON	X			X											X								X		X	5
	ACMI	X			X	X		X	X				X	X	X		X			X							10
	PEGA	X	X	X	X	X	X		X	X	X				X	X	X		X	X	X	X		X	X		18
	TRDU		X		X					X	X										X			X	X		7
	AQUI SP		X																X				X				3
	AGUR				X	X	X	X	X	X	X	X	X		X	X			X				X		X	X	15
	PFI				X		X			X	X	X		X				X									7
	TAOF									X																	1
	LILE												X							X	X						3
	CAEX														X		X					X					3
	PENSTEMON																	X									1
	DEOC																					X	X				2

Type: P= preferred, N=noxious, I= invasive, O=other. **Note:** The forb type can be determined later in the office or via automated approaches.

DATE: 8-2-16

LOCATION: CALD CANYON

FACILITY: ____________

____

TRANSECT NO. MB-2

PLOT NO. ______

PHOTO NO. 5

Line-Point Intercept Data Form

Page 1 of 4 | Date: 8/2/16 | Plot ID: MB-2 BKM.1 | Transect: MB-2

Evaluator(s): SHC, GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Pt.	Top Layer	Lower Layers			Soil Surface	Pt.	Top Layer	Lower Layers			Soil Surface
		Code 1	Code 2	Code 3				Code 1	Code 2	Code 3	
1	—	—	—	—	EL	26	SYOR	ACMI	—	—	D
2	—	—	—	—	S	27	SENECIO	ACMI	—	—	EL
3	SENECIO	—	—	—	EL	28	SYOR	SENECIO	—	—	EL
4	ARTRV	—	—	—	D	29	SYOR	BRCA	—	—	EL
5	SENECIO	—	—	—	D	30	ARCA	SENECIO	—	—	S
6	GEVI	ACMI	—	—	D	31	ARTRV	—	—	—	D
7	SYOR	POPR	—	—	EL	32	BRCA	—	—	—	EL
8	CAREX	SENECIO	—	—	D	33	SYOR	—	—	—	EL
9	SYOR	CAREX	—	—	S	34	GEVI	BRCA	—	—	S
10	SYOR	ROAC	—	—	EL	35	ERIOGONUM	BRCA	—	—	EL
11	POPR	—	—	—	EL	36	SENECIO	—	—	—	EL
12	SYOR	SENECIO	—	—	EL	37	FEID	—	—	—	D
13	BRCA	GEVI	—	—	EL	38	BRCA	—	—	—	D
14	SYOR	AGST	GEVI	—	EL	39	—	—	—	—	EL
15	SYOR	AGST	GEVI	ACMI	EL	40	BRCA	GEVI	—	—	EL
16	AGST	GEVI	ACMI	—	D	41	FEID	—	—	—	EL
17	—	—	—	—	EL	42	FEID	—	—	—	EL
18	SYOR	POPR	—	—	EL	43	ERIGERON	—	—	—	EL
19	GEVI	—	—	—	EL	44	EREOG	—	—	—	EL
20	SYOR	POPR	GEVI	—	EL	45	STLE	ARTRV	—	—	EL
21	SYOR	GEVI	BRCA	—	S	46	SYOR	STLE	—	—	EL
22	ARTRV	—	—	—	EL	47	SYOR	COCA	—	—	EL
23	ARTRV	SENECIO	POPR	—	EL	48	SYOR	SENECIO	—	—	D
24	SENECIO	—	—	—	EL	49	POPR	SYOR	—	—	D
25	—	—	—	—	EL	50	AGUR	SYOR	—	—	EL

% foliar cover = 45 top layer pts (1st col) x 2 = 90 %

% bare ground = 1 pts (w/NONE over 5) x 2 = 2 %

Top layer codes: Species code, common name, or NONE (no cover).

Lower layers codes: Species code, common name, L (herbaceous litter), WL (woody litter, >5 mm (~1/4 in) diameter), VL (vagrant lichen).

Unknown Species Codes:

AF# = annual forb
PF# = perennial forb
AG# = annual grass
PG# = perennial grass
SH# = shrub
TR# = tree

Soil Surface (do not use litter):

G = gravel (≤5 mm or ~1/4 in)
R = rock (>5 mm or ~1/4 in)
BR = bedrock
EL = embedded litter
D = duff
M = moss
LC = visible lichen crust on soil
S = soil

Vegetation Height/Sagebrush Shape Data Form

Page 2 **of** 4 | **Date:** 8/2/16 | **Plot ID:** MB-2 BLM-1 | **Transect:** MB-2

Evaluator(s): JHC, GNB

Azimuth: NORTH | **Intercept (Point) Spacing:** ☐cm ☒in | **Height:** ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
3	—			—		SENECIO	4
4	ARTRV	75	C	—		—	
5	—			—		SENECIO	11
6	—			—		GEVI	17
7	SYOR	112		POPR	19		
8	—			CAREX	24	SENECIO	9
9	SYOR	121		CAREX	13	—	
10	SYOR	121		—		—	
11	—			POPR	31	—	
12	SYOR	152		—		SENECIO	9
13	—			BRCA	43	GEVI	26
14	SYOR	152		AGST	34	GEVI	29
15	SYOR	152		AGST	24	GEVI	22
16	—			AGST	56	GEVI	27
18	SYOR	123		POPR	57	—	
19	—			—		GEVI	22
20	SYOR	123		POPR	31	GEVI	23
21	SYOR	123		BRCA	21	GEVI	27
22	ARTRV	53	S	—		—	
23	ARTRV	53	S	POPR	15	SENECIO	17
24	—			—		SENECIO	6
26	SYOR	61		—		ACMI	6
27	—			—		SENECIO	6
28	SYOR	68		—		SENECIO	13
29	SYOR	68		BRCA	54	—	
30	ARCA	32	S	—		SENECIO	6
31	ARTRV	48	C	—		—	
32	—			BRCA	67	—	
33	SYOR	77		—		—	
34	—			BRCA	41	GEVI	29
35	—			BRCA	11	ERIOGONUM	47

Average sagebrush height =

Average grass height = See page 3 of 4

Average forb height =

Vegetation Height/Sagebrush Shape Data Form

Page 3 of 4	Date: 8/2/16	Plot ID: MB-2 BLM-1	Transect: MB-2
Evaluator(s): JHC, GNB			
Azimuth: N	Intercept (Point) Spacing: ☐cm ☒in		Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
36	—			—		SENECIO	8
37	—			FEID	23	—	
38	—			BRCA	16	—	
40	—			BRCA	102	GEVI	12
41	—			FEID	17	—	
42	—			FEID	17	—	
43	—			—		ERIGERON	22
44	—			—		ERIOC	14
45	ARTRV	46	S	STLE	54	—	
46	SYOR	154		STLE	84	—	
47	SYOR	154		—		COCA	73
48	SYOR	154		—		SENECIO	37
49	SYOR	154		POPR	36	—	
50	SYOR	154		—		AGUR	68

Average sagebrush height = sagebrush = 51.17 cm; all shrubs = 105.42 cm

Average grass height = 37.25 cm

Average forb height = 21.85 cm

4 of 4

Sage-Grouse Forb Diversity Data Form

Date: 8/2/16
County: CARIBOU
State: ID
Evaluator(s): JHC, GNB
Population:
Home Range Name:
Land Cover Type: MB
Ecological Site:
Associated Leks:
Seasonal Habitat: LATE SUMMER BROOD
Transect #: MB-Z
Site Info. (circle one): [✓ Arid Site] Mesic Site

Forb Diversity (see directions)

Type	Species	Forb Plot Number																									
		0	6'	12'	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	T
	ERIGERON	X		X	X		X		X																		5
	AQUI SP	X	X		X																						3
	LILE	X	X			X			X		X	X				X			X			X		X	X		11
	TRDU	X	X										X						X	X	X					X	7
	GEVI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	25
	PEGA	X	X	X			X	X	X	X	X	X	X			X	X	X	X		X						15
	ACMI	X	X	X	X	X	X	X	X						X									X	X		11
	SENECIO	X	X	X		X	X	X			X	X					X		X					X			11
	LUPINUS		X																								1
	ERIOG		X	X												X											3
	DRAR				X	X																					2
	TRDU					X		X			X		X	X	X		X	X	X						X		10
	AGUR					X			X	X	X	X	X				X	X	X	X		X	X			X	13
	ERIOG					X		X	X	X	X	X		X	X		X		X					X	X		12
	CHEX					X	X	X	X	X		X	X	X	X	X	X						X	X			13
	TRANSB						X																				1
	COLL SP						X																				1
	COCA								X	X																	2
	POOR																										0
	PF3												X	X	X	X				X	X			X		X	8
	PF4													X	X		X	X	X	X		X	X		X	X	10

Type: P= preferred, N=noxious, I= invasive, O=other. **Note:** The forb type can be determined later in the office or via automated approaches.

DATE: 8-2-16

1245

LOCATION: CALD CANYON

FACILITY: BLM-2

TRANSECT NO.

PLOT NO. BLM-2

PHOTO NO. 8

COORDS: E 470826 N 4732276 BLM-2

Line-Point Intercept Data Form

Page 1 of 4 | Date: 8/2/16 | Plot ID: MB-2 BLM-2 | Transect: T-1

Evaluator(s): JHC / GNB

Azimuth: N

Intercept (Point) Spacing: ☐cm ☒in

Height: ☒cm ☐in

Pt.	Top Layer	Lower Layers			Soil Surface	Pt.	Top Layer	Lower Layers			Soil Surface
		Code 1	Code 2	Code 3				Code 1	Code 2	Code 3	
1	GEVI	POPR	—	—	D	26	SYOR	POPR	—	—	D
2	SYOR	ARTRV	GEVI	—	EL	27	POPR	—	—	—	D
3	ARTRV	POPR	POGR	—	D	28	TRDU	POPR	—	—	D
4	SYOR	ACMI	—	—	S	29	CAEX	EREOG	—	—	D
5	SYOR	POPR	—	—	EL	30	GEVI	POPR	—	—	D
6	TAOF	—	—	—	D	31	—	—	—	—	D
7	POPR	—	—	—	EL	32	COCA	—	—	—	S
8	POPR	—	—	—	S	33	—	—	—	—	D
9	PF3	—	~	—	EL	34	POPR	—	—	—	EL
10	POPR	—	—	—	S	35	ARTRV	—	—	—	D
11	EREOG	—	—	—	EL	36	SYOR	POPR	—	—	D
12	POPR	EREOG	TAOF	—	S	37	SYOR	POPR	—	—	D
13	ARTRV	—	—	—	EL	38	ARTRV	POPR	—	—	EL
14	—	—	—	—	EL	39	—	—	—	—	D
15	AGSM	—	—	—	D	40	—	—	—	—	EL
16	AGSM	—	—	—	D	41	POPR	—	—	—	EL
17	ROAC	—	—	—	EL	42	POPR	—	—	—	EL
18	—	—	—	—	S	43	POPR	—	—	—	D
19	POPR	—	—	—	D	44	ACMI	POPR	—	—	D
20	AGSM	STLE	—	—	D	45	SYOR	—	—	—	EL
21	ARTRV	LEKI	—	—	D	46	POPR	—	—	—	EL
22	—	—	—	—	EL	47	TRDU	COCA	—	—	D
23	GEVI	LEKI			D	48	—	—	—	—	S
24	GEVI	—	—	—	EL	49	—	—	—	—	EL
25	SYOR	POPR	—	—	D	50	POPR	—	—	—	S

% foliar cover = 41 top layer pts (1st col) x 2 = 82 %

% bare ground = 2 pts (w/NONE over S) x 2 = 4 %

Top layer codes: Species code, common name, or NONE (no cover).

Lower layers codes: Species code, common name, L (herbaceous litter), WL (woody litter, >5 mm (~1/4 in) diameter), VL (vagrant lichen).

Unknown Species Codes:

AF# = annual forb
PF# = perennial forb
AG# = annual grass
PG# = perennial grass
SH# = shrub
TR# = tree

Soil Surface (do not use litter):

G = gravel (≤5 mm or ~1/4 in)
R = rock (>5 mm or ~1/4 in)
BR = bedrock
EL = embedded litter
D = duff
M = moss
LC = visible lichen crust on soil
S = soil

BLM 2

Vegetation Height/Sagebrush Shape Data Form

Page 2 of 4 | Date: 8/2/16 | Plot ID: MB-2 BLM-2 | Transect: 1

Evaluator(s): JHC / GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
1	—			POPR	78	GEVI	31
2	SYOR	110		—		GEVI	45
3	ARTRV	65	S	POPR	33	POGR	10
4	SYOR	94				ACMI	23
5	SYOR	98		POPR	26	—	
6	—			—		TAOF	10
7	—			POPR	15	—	
8	—			POPR	18	—	
9	—			—		PF3	4
10	—			POPR	10	—	
11	—			—		ERIOG	3
12	—			POPR	32	TAOF	5
13	ARTRV	56	S	—		—	
14	—			—		—	
15	—			AGSM	20	—	
16	—			AGSM	21	—	
17	ROAC	16		—		—	
18	—			—		—	
19	—			POPR	19	—	
20	—			AGSM	62	—	
21	ARTRV	44	S	LEKI	73	—	
22	—			—		—	
23	—			LEKI	62	GEVI	19
24	—			—		GEVI	25
25	SYOR	82		POPR	29	—	
26	SYOR	34		POPR	26	—	
27	—			POPR	29	—	
28	—			POPR	18	TRDO	47
29	—			—		CAEX	18
30				POPR	19	GEVI	24
31	—			—		—	

Average sagebrush height =

Average grass height = See page 3 of 4

Average forb height =

BLM 2

Vegetation Height/Sagebrush Shape Data Form

Page 3 of 4 | Date: 6/2/16 | Plot ID: MB-2 BLM-2 | Transect: T-1

Evaluator(s): JHC / GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☑cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
32	—			—		COCA	22
33	—			—		—	
34	—			POPR	18	—	
35	ARTRV	55	S	—		—	
36	SYOR	128		POPR	24	—	
37	SYOR	128		POPR	56	—	
38	ARTRV	45·	S	POPR	27	—	
39	—			—		—	
40	—			—		—	
41	—			POPR	18	—	
42	—			POPR	14	—	
43	—			POPR	17	—	
44	—			POPR	32	ACMI	16
45	SYOR	58	—	—		—	
46	—			POPR	21	—	
47	—			—		TRDU	21
48	—			—		—	
49	—			—		—	
50	—			POPR	8	—	

Average sagebrush height = sage only = 61 cm; all shrubs = 75.5 cm

Average grass height = 29.46 cm

Average forb height = 20.19 cm

4 of 4 BLM 2

Sage-Grouse Forb Diversity Data Form

Date: 8/2/16 County: CARIBOU State: ID	Evaluator(s): JHC / GNB
Population:	Home Range Name:
Land Cover Type:	Ecological Site:
Associated Leks:	Seasonal Habitat: LATE SUMMER BROOD
Transect #: MB-2 T-1	Site Info. (circle one): [✓ Arid Site] Mesic Site

Forb Diversity (see directions)

Type	Species	Forb Plot Number																									T
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	130	136	142	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	T
	POGR	X	X																								2
	ERFOG	X	X		.	X	X	X	X	X	X	X						X	X							X	12
	CAEX	X									X				X	X	X	X	X	X			X		X	X	11
	GEVI	X	X	X				X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X		19
	ACMI	X	X	X		X	X	X	X	X	X			X	X	X	X								X		14
	TAOF		X	X	X	X	X	X	X		X	X		X								X	X	X	X	X	15
	PF4		X	X	X	X	X		X				X							X					X		9
	PF3			X		X						X			X		X	X		X	X	X					9
	TRDU				X		X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X		X	18
	CYOF				X	X	X				X											X		X	X	X	8
	LIRU					X							X														2
	COCA											X	X	X	X	X	X	X									7
	PF5												X														1
	CIAR																							X	X	X	3

Type: P= preferred, N=noxious, I= invasive, O=other. Note: The forb type can be determined later in the office or via automated approaches.

DATE: 8-2-16

LOCATION: CALD.

1545

CANYON

FACILITY: BLM-3

TRANSECT NO. MB-4

PLOT NO.

PHOTO NO. 9

WPT009

Line-Point Intercept Data Form

Page of 4 | Date: 8/2/16 | Plot ID: BLM-3 | Transect: MB-4

Evaluator(s): JHC / GNB

Azimuth: E | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Pt.	Top Layer	Lower Layers			Soil Surface	Pt.	Top Layer	Lower Layers			Soil Surface
		Code 1	Code 2	Code 3				Code 1	Code 2	Code 3	
1	ARTRV	—	—	—	D	26	BRJA	—	—	—	D
2	—	—	—	—	R	27	LECI	—	—	—	R
3	—	—	—	—	R	28	LECI	—	—	—	D
4	FEID	—	—	—	D	29	LECI	—	—	—	D
5	PUTR	—	—	—	D	30	STLE	—	—	—	D
6	LIRU	FEID	—	—	EL	31	—	—	—	—	R
7	STLE	—	—	—	R	32	—	—	—	—	EL
8	STLE	—	—	—	EL	33	—	—	—	—	R
9	ERVI	—	—	—	D	34	POPR	—	—	—	D
10	STLE	—	—	—	R	35	POPR	—	—	—	D
11	STLE	—	—	—	R	36	PUTR	—	—	—	EL
12	ERBOG	—	—	—	EL	37	PUTR	—	—	—	R
13	ARTRV	—	—	—	EL	38	—	—	—	—	R
14	ARTRV	—	—	—	D	39	SYOR	STLE	—	—	D
15	SYOR	POPR	—	—	EL	40	LIRU	STCO	—	—	EL
16	STLE	—	—	—	R	41	STLE	—	—	—	D
17	LIRU	—	—	—	D	42	ARTRV	STLE	—	—	D
18	PUTR	SYOR	—	—	EL	43	—	—	—	—	D
19	—	—	—	—	R	44	SYOR	LIRU	—	—	D
20	LECI	—	—	—	D	45	PUTR	—	—	—	D
21	LECI	—	—	—	D	46	STLE	—	—	—	EL
22	CYOF	LECI	—	—	D	47	—	—	—	—	R
23	—	—	—	—	D	48	—	—	—	—	D
24	STLE	—	—	—	D	49	ARTRV	—	—	—	EL
25	COCA	—	—	—	D	50	ARTRV	LECI	—	—	D

% foliar cover = 39 top layer pts (1st col) x 2 = 78 %

% bare ground = 0 pts (w/NONE over S) x 2 = 0 %

Top layer codes: Species code, common name, or NONE (no cover).

Lower layers codes: Species code, common name, L (herbaceous litter), WL (woody litter, >5 mm (~1/4 in) diameter), VI (vagrant lichen).

Unknown Species Codes:

AF#	=	annual forb
PF#	=	perennial forb
AG#	=	annual grass
PG#	=	perennial grass
SH#	=	shrub
TR#	=	tree

Soil Surface (do not use litter):

G	=	gravel (≤5 mm or ~1/4 in)
R	=	rock (>5 mm or ~1/4 in)
BR	=	bedrock
EL	=	embedded litter
D	=	duff
M	=	moss
LC	=	visible lichen crust on soil
S	=	soil

Vegetation Height/Sagebrush Shape Data Form

Page 2 of 4 | Date: 8/2/16 | Plot ID: BLM-3 | Transect: MB-4

Evaluator(s): JHC / GNB

Azimuth: E | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
1	ARTRV	71	5	—	—	—	—
2	—			—		—	
3	—			—		—	
4	—			FEID	16	—	
5	PUTR	73		—		—	
6	—			FEID	20	LIRU	20
7	—			STLE	31	—	
8	—			STLE	27	—	
9	ERVI	47		—		—	
10	—			STLE	18	—	
11	—			STLE	42	—	
12	—			—		ERFOG	17
13	ARTRV	74	5	—		—	
14	ARTRV	74	5	—		—	
15	SYOR	62		POPR	54	—	
16	—			STLE	18	—	
17	—			—		LIRU	33
18	PUTR	98		—		—	
19	—			—		—	
20	—			LECI	103	—	
21	—			LECI	82	—	
22	—			LECI	76	CYOF	39
23	—			—		—	
24	—			STLE	38	—	
25	—			—		COCA	43
26	—			BRJA	26	—	
27	—			LECI	42	—	
28	—			LECI	65	—	
29	—			LECI	62	—	
30	—			STLE	24	—	
31	—			—		—	

Average sagebrush height =

Average grass height = See page 3 of 4

Average forb height =

Vegetation Height/Sagebrush Shape Data Form

Page 3 of 4 Date: 8/2/16 Plot ID: 3CM 3 Transect: MB-4

Evaluator(s): JHC / GNB

Azimuth: E Intercept (Point) Spacing: ☐cm ☒in Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
32	—			—		—	
33	—			—		—	
34	—			POPR	12	—	
35	—			POPR	30	—	
36	PUTR	92		—		—	
37	PUTR	92		—		—	
38	—			—		—	
39	SYOR	45		STLE	31	—	
40	—			STCO	37	LIRU	40
41	—			STLE	30	—	
42	ARTRV	60	5	STLE	35	—	
43	—			—		—	
44	SYOR	53		—		LIRU	18
45	PUTR	53		—		—	
46	—			STLE	36	—	
47	—			—		—	
48	—			—		—	
49	ARTRV	82	5	—		—	
50	ARTRV	72	5	LAECI	83	—	

Average sagebrush height = sage only = 72.17 cm; all shrubs = 69.87 cm

Average grass height = 41.52 cm

Average forb height = 30.0 cm

Sage-Grouse Forb Diversity Data Form

Date: 6/2/16
County: CARIBOU
State: ID
Evaluator(s): JHC / GNB
Population:
Home Range Name:
Land Cover Type:
Ecological Site:
Associated Leks:
Seasonal Habitat: LATE SUMMER BROOD
Transect #: BLM 3 MB-4
Site Info. (circle one): [✓ Arid Site] Mesic Site

Forb Diversity (see directions)

Type	Species	Forb Plot Number																									
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	T
	CRAC	X	X																								2
	LIRU		X	X	X	X	X	X				X	X	X	X	X	X	X				X	X	X	X	X	18
	VETH			X					X		X		X														4
	ERIGERON				X	X							X									X		X	X	X	7
	ERROG					X							X								X				X		4
	TRANS B							X	X															X			3
	CYOF								X	X																	2
	COCA								X	X							X	X									4
	LEDE									X	X			X		X					X	X					6
	PF 7										X	X			X		X	X	X		X						7
	GEVI											X									X		X	X		X	5
	PF 8															X	X								X	X	4
	SOL SP													X							X	X	X	X	X	X	7
	PF 1																									X	1

Type: P= preferred, N=noxious, I= invasive, O=other. **Note:** The forb type can be determined later in the office or via automated approaches.

DATE: 8-3-16

LOCATION: CALD CANYON 0755

FACILITY: BLM-4

TRANSECT NO.

PLOT NO. MB-5

PHOTO NO. 10

WPT 010

Line-Point Intercept Data Form

Page 1 **of** 4 **Date:** 8/3/16 **Plot ID:** BLM - 4 **Transect:** MB-5

Evaluator(s): JHC / GNB

Azimuth: N **Intercept (Point) Spacing:** ☐cm ☒in **Height:** ☒cm ☐in

Pt.	Top Layer	Lower Layers			Soil Surface
		Code 1	Code 2	Code 3	
1	SYOR	POPR	–	–	D
2	POPR	GEVI	–	–	EL
3	PRVI	POPR	–	–	EL
4	DAIN	PF3	–	–	S
5	SYOR	POPR	–	–	EL
6	SYOR	POPR	–	–	EL
7	ERFOG	POPR	–	–	EL
8	POPR	POOR	–	–	EL
9	SYOR	GEVI	CAREX	–	EL
10	CAREX	POOR	–	–	D
11	POPR	PF3	–	–	EL
12	PF3	CAREX	–	–	EL
13	SYOR	POPR	CAREX	–	EL
14	POPR	GEVI	PF3	–	EL
15	SYOR	CAREX	PF3		EL
16	AGUR	POPR	–	–	EL
17	POPR	ROAC	–	–	EL
18	POGR	SYOR	POPR	–	EL
19	POPR	ARCA	–	–	EL
20	SYOR	POPR	–	–	EL
21	POPR	–	–	–	EL
22	ARCA	–	–	–	EL
23	POPR	–	–	–	S
24	POPR	–	–	–	EL
25	ARCA	–	–	–	EL
26	SYOR	STLE	–	–	EL
27	POPR	–	–	–	EL
28	STLE	–	–	–	EL
29	SYOR	POPR	–	–	EL
30	SYOR	POPR	–	–	EL
31	SYOR	POPR	–	–	EL
32	TRDU	SYOR	POPR	–	EL
33	SYOR	POPR	–	–	EL
34	POPR	–	–	–	EL
35	–	–	–	–	EL
36	POPR	–	–	–	EL
37	–	–	–	–	EL
38	SYOR	POPR	–	–	EL
39	SYOR	LICA	POPR	–	EL
40	SYOR	GEVI	POPR	–	S
41	SYOR	POPR	–	–	EL
42	SYOR	STLE	–	–	EL
43	SYOR	GEVI	–	–	EL
44	SYOR	POPR	–	–	D
45	SYOR	POOR	–	–	EL
46	ROAC	–	–	–	EL
47	POPR	–	–	–	D
48	–	–	–	–	EL
49	POPR	PF4	–	–	EL
50	ARCA	–	–	–	EL

% foliar cover = 47 **top layer pts (1st col) x 2 =** 94 **%**

% bare ground = 0 **pts (w/NONE over S) x 2 =** 0 **%**

Top layer codes: Species code, common name, or NONE (no cover).

Lower layers codes: Species code, common name, L (herbaceous litter), WL (woody litter, >5 mm (~1/4 in) diameter), VL (vagrant lichen).

Unknown Species Codes:

AF# = annual forb
PF# = perennial forb
AG# = annual grass
PG# = perennial grass
SH# = shrub
TR# = tree

Soil Surface (do not use litter):

G = gravel (≤5 mm or ~1/4 in)
R = rock (>5 mm or ~1/4 in)
BR = bedrock
EL = embedded litter
D = duff
M = moss
LC = visible lichen crust on soil
S = soil

Vegetation Height/Sagebrush Shape Data Form

Page 2 of 4 | Date: 8/3/16 | Plot ID: BLM-4 | Transect: MB-5

Evaluator(s): JHC / GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
1	SYOR	66		POPR	25	–	
2	–			POPR	28	GEVI	24
3	PRVI	73		POPR	22	–	
4	–			DAIN	22	PF3	7
5	SYOR	96		POPR	8	–	
6	SYOR	96		POPR	24	–	
7	–			POPR	10	ERROG	14
8	–			POPR	23	POOR	8
9	SYOR	76		CAREX	31	GEVI	65
10	–			CAREX	33	POOR	13
11	–			POPR	20	PF3	12
12	–			CAREX	15	PF3	17
13	SYOR	132		POPR	50	–	
14	–			POPR	44	GEVI	42
15	SYOR	132		CAREX	33	PF3	19
16	–			POPR	25	AGUR	25
17	POAC	13		POPR	24	–	
18	SYOR	48		POPR	34	POCR	65
19	ARCA	14	C	POPR	35	–	
20	SYOR	98		POPR	36	–	
21	–			POPR	27	–	
22	ARCA	17	C	–		–	
23	–			POPR	12	–	
24	–			POPR	30	–	
25	ARCA	19	C	–		–	
26	SYOR	137		STLE	34		
27	–			POPR	27	–	
28	–			STLE	36	–	
29	SYOR	124		POPR	33	–	
30	SYOR	124		POPR	56	–	
31	SYOR	124		POPR	52	–	

Average sagebrush height =

Average grass height = see page 3 of 4

Average forb height =

Vegetation Height/Sagebrush Shape Data Form

Page 3 of 4
Date: 8/3/16
Plot ID: BLM-4
Transect: MB-5
Evaluator(s): SHC / GNB
Azimuth: N
Intercept (Point) Spacing: ☐cm ☒in
Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
32	SYOR	112		POPR	42	TRDU	88
33	SYOR	112		POPR	37	—	
34	—			POPR	34	—	
35	—			—		—	
36	—			POPR	22	—	
37	—			—		—	
38	SYOR	131		POPR	32	—	
39	SYOR	131		POPR	38	LICE	61
40	SYOR	131		POPR	37	GEVI	45
41	SYOR	97		POPR	54	-	
42	SYOR	118		STLE	32	-	
43	SYOR	118		—		GEVI	28
44	SYOR	99		POPR	54	—	
45	SYOR	70		—		POOR	25
46	ROAC	13		—		—	
47	—			POPR	24	—	
48	—		—	—		—	
49	—			POPR	30	PF 4	12
50	ARCA	45	S	—		—	

Average sagebrush height = sage only = 23.75 cm; all shrubs = 89.86 cm

Average grass height = 31.49 cm

Average forb height = 31.67 cm

Sage-Grouse Forb Diversity Data Form

Date: 8/3/16 **County:** CARIBOU **State:** ID **Evaluator(s):** JHC / GNB

Population: **Home Range Name:**

Land Cover Type: MIXED BRUSH **Ecological Site:**

Associated Leks: **Seasonal Habitat:** LATE SUMMER BROOD

Transect #: MB-5 **Site Info. (circle one):** [✓ Arid Site] Mesic Site

Forb Diversity (see directions)

Type	Species	Forb Plot Number																									T
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	EREOG	X	X				X	X	X	X	X		X				X		X		X	X	X	X	X	X	16
	POOR	X	X	X	X	X			X	X	X	X	X	X	X	X				X		X		X	X	X	18
	ACMI	X					X								X	X				X					X	X	7
	GEVI	X	X	X	X	X		X				X			X	X	X		X		X	X	X			X	15
	PF-3	X	X	X	X													X			X	X	X	X		X	10
	AGUR	X	X		X	X	X	X		X	X				X	X	X		X	X		X	X		X		16
	POGR	X					X	X	X											X	X	X					7
	SENECIO		X														X		X						X	X	5
	ANNE		X															X		X							3
	CYOF		X																								1
	PF4			X	X	X								X	X					X							6
	ASTER						X			X	X			X	X			X									6
	EPMI							X						X											X	X	4
	PEGA							X			X							X	X	X	X	X		X			8
	LILE							X							X	X	X										4
	CAEX								X	X	X			X				X									5
	TRDU										X		X	X		X		X	X	X							7
	SMST											X															1
	LIRU												X	X													2
	CIAR													X													1
	TAOF														X												1
	PF9																		X								1
	LUPINUS																					X	X				2

Type: P= preferred, N=noxious, I= invasive, O=other. **Note:** The forb type can be determined later in the office or via automated approaches.

DATE: 8-3-16

LOCATION: CALD CANYON

FACILITY: BLM-4

____

TRANSECT NO. MB-6

PLOT NO. ______

PHOTO NO. 11

wpT 11

Line-Point Intercept Data Form

Page 1 of 4 | Date: 8/3/16 | Plot ID: BLM 4 | Transect: MB-6

Evaluator(s): JHC / GNB

Azimuth: N | Intercept (Point) Spacing: ☐cm ☒in | Height: ☒cm ☐in

Pt.	Top Layer	Lower Layers			Soil Surface	Pt.	Top Layer	Lower Layers			Soil Surface
		Code 1	Code 2	Code 3				Code 1	Code 2	Code 3	
1	ARTRV	SEER	POPR	—	D	26	SYOR	PUTR	GEVI	—	S
2	ARTRV	—	—	—	EL	27	ARTRV	AGUR	POPR	—	D
3	SYOR	SENECIO	POPR	—	EL	28	SEER	—	—	—	D
4	GEVI	—	—	—	D	29	SYOR	—	—	—	S
5	SEER	—	—	—	D	30	AGUR	ARTRV	—	—	S
6	SENECIO	—	—	—	D	31	AGUR	—	—	—	D
7	ARTRV	SEER	POPR	—	D	32	—	—	—	—	D
8	ARTRV	—	—	—	D	33	—	—	—	—	S
9	SEER	—	—	—	S	34	SYOR	POPR	—	—	EL
10	POPR	SEER	ARTRI	—	S	35	SENECIO	—	—	—	S
11	ARTRI	POPR	LUPINUS	—	S	36	—	—	—	—	D
12	SYOR	POPR	—	—	D	37	PF4	—	—	—	S
13	LUPINUS	POPR	—	—	EL	38	SYOR	PUTR	POPR	—	D
14	POOR	POPR	—	—	S	39	SYOR	ARTRI	—	—	D
15	GEVI	POPR	—	—	EL	40	PUTR	SYOR	ARTRI	—	S
16	ARTRV	—	—	—	EL	41	ARTRI	PUTR	—	—	D
17	SYOR	POPR	—	—	EL	42	PUTR	POPR	—	—	EL
18	ARTRI	POPR	—	—	EL	43	POPR	—	—	—	EL
19	POPR	—	—	—	EL	44	POPR	GEVI	—	—	D
20	—	—	—	—	EL	45	SEER	—	—	—	D
21	SYOR	GEVI	—	—	EL	46	—	—	—	—	S
22	SYOR	AGUR	POPR	—	S	47	SYOR	POPR	—	—	S
23	SYOR	—	—	—	EL	48	ARTRI	SYOR	—	—	D
24	PUTR	POPR	—	—	D	49	POPR	—	—	—	D
25	PUTR	POPR	—	—	D	50	POPR	—	—	—	S

% foliar cover = 45 top layer pts (1st col) x 2 = 90 %

% bare ground = 2 pts (w/NONE over S) x 2 = 4 %

Top layer codes: Species code, common name, or NONE (no cover).

Lower layers codes: Species code, common name, L (herbaceous litter), WL (woody litter, >5 mm (~1/4 in) diameter), VL (vagrant lichen).

Unknown Species Codes:

AF# = annual forb
PF# = perennial forb
AG# = annual grass
PG# = perennial grass
SH# = shrub
TR# = tree

Soil Surface (do not use litter):

G = gravel (≤5 mm or ~1/4 in)
R = rock (>5 mm or ~1/4 in)
BR = bedrock
EL = embedded litter
D = duff
M = moss
LC = visible lichen crust on soil
S = soil

Vegetation Height/Sagebrush Shape Data Form

Page 2 of 4 Date: 8/3/16 Plot ID: BLM - 4 Transect: MB-6

Evaluator(s): JHC / GNB

Azimuth: N Intercept (Point) Spacing: ☐cm ☒in Height: ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
1	ARTRV	121	S	POPR	26	SEER	41
2	ARTRV	121	S	–	-	–	
3	SYOR	64		POPR	16	SENECIO	22
4	–			–		GEVI	26
5	–			–		SEER	21
6	–			–		SENECIO	24
7	ARTRV	72	C	POPR	25	SEER	46
8	ARTRV	72	S	–		–	
9	–			–		SEER	16
10	ARTRI	38	S	POPR	27	–	
11	ARTRI	48	S	POPR	31	LUPINUS	16
12	SYOR	79		POPR	27	–	
13	–			POPR	14	LUPINUS	14
14	–			POPR	34	POOR	19
15	–			POPR	18	GEVI	10
16	ARTRV	46	S	–		–	
17	SYOR	86		POPR	32	–	
18	ARTRI	25	S	POPR	15	–	
19	–			POPR	28	–	
20	–			–		–	
21	SYOR	133		–		GEVI	31
22	SYOR	133		POPR	28	AGUR	71
23	SYOR	133		–		–	
24	PUTR	77		POPR	23	–	
25	PUTR	77		POPR	30	–	
26	SYOR	94		–		GEVI	30
27	ARTRV	80	S	POPR	28	AGUR	52
28	–			–		SEER	33
29	SYOR	82		–		–	
30	ARTRV	100	S	–		AGUR	63
31	–			–		AGUR	52

Average sagebrush height =

Average grass height = see page 3 of 4

Average forb height =

Vegetation Height/Sagebrush Shape Data Form

Page 3 **of** 4 **Date:** 8/3/16 **Plot ID:** BLM-4 **Transect:** MB-6

Evaluator(s): JHC / GNB

Azimuth: N **Intercept (Point) Spacing:** ☐cm ☒in **Height:** ☒cm ☐in

Point	Species	Woody Height	Sagebrush Shape	Species	Grass Height	Species	Forb Height
32	—		—	—		—	
33	—			—		—	
34	SYOR	64		POPR	28	—	
35	—			—		SENECIO	34
36	—			—		—	
37	—			—		PF 4	21
38	SYOR	84		POPR	27	—	
39	SYOR	84		—		—	
40	PUTR	81		—		—	
41	ARTRI	65	S	—		—	
42	PUTR	67		POPR	42	—	
43	—			POPR	46	—	
44	—			POPR	33	GEVI	48
45	—			—		SEER	49
46	—			—		—	
47	SYOR	48		POPR	34	—	
48	ARTRI	53	S	—		—	
49	—			POPR	30	—	
50	—			POPR	27	—	

Average sagebrush height = sage only = 70.08 cm; all shrub = 79.54 cm

Average grass height = 27.88 cm

Average forb height = 33.59 cm

Sage-Grouse Forb Diversity Data Form

Date: 8/3/16 **County:** CARIBOU **State:** ID **Evaluator(s):** JHC / GNB

Population:

Home Range Name:

Land Cover Type: MIXED BRUSH

Ecological Site:

Associated Leks:

Seasonal Habitat: LATE SUMMER BROOD

Transect #: MB 6

Site Info. (circle one): [✓ Arid Site] Mesic Site

Forb Diversity (see directions)

Type	Species	Forb Plot Number																									
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	T
	SEER	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X			X	X		X	X	20
	GEVI	X	X	X	X	X		X	X	X	X	X	X		X						X					X	14
	AGUR	X		X		X	X		X	X	X	X		X	X		X						X	X	X	X	15
	LIRU	X																									1
	CAEX	X			X																						2
	ERIGERON	X	X	X		X						X	X	X			X						X		X	X	11
	SENECIO		X																								1
	POOR		X			X	X	X	X							X											6
	VICIA		X	X	X	X	X																				5
	LUPINE			X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	19
	PF3			X	X						X											X					4
	ACMI				X									X										X			3
	FRFOG				X	X		X	X	X				X		X	X	X		X		X					11
	CIAR					X									X				X			X	X	X	X		7
	PF4						X								X	X	X	X	X	X	X					X	9
	ANNE							X																			1
	POGR											X	X	X			X						X	X			6
	LOFO													X													1
	PF8													X									X			X	3
	TRDU															X					X	X					3
	SOLSP																	X		X	X						3

Type: P= preferred, N=noxious, I= invasive, O=other. **Note:** The forb type can be determined later in the office or via automated approaches.

APPENDIX B – FIELD FORMS
PHOTO LOG

The photos correspond to the photo numbers as entered into the Plot Metadata forms

Photo 3169: Start point for Transect MB-1, Plot BLM-1

Photo 3170: Conifer Type adjacent to Mixed Shrub at Plot BLM-1

Photo 3171: Mixed Conifer-Aspen adjacent to Mixed Shrub at Plot BLM-1

Photo 3172: Aspen Patch adjacent to Mixed Shrub at Plot BLM-1

Photo 3173: Start point for Transect MB-2, Plot BLM-1

Photo 3178: Start point for Transect MB-3, Plot BLM-2

Photo 3182: Start point for Transect MB-4, Plot BLM-4

Photo 3183: Start point for Transect MB-5, Plot BLM-3

Photo 3184: Start point for Transect MB-6, Plot BLM-3

List of Plant Species

APPENDIX C

Appendix C – Plant List

Code	PLANTS database code	Scientific Binomial (following Lesica et. al. 2012)	Common Name
SHRUBS			
AMAL	AMAL2	*Amelanchier alnifolia*	Saskatoon serviceberry
ARCA	ARCA13	*Artemisia cana*	Silver sagebrush
ARTRV	ARTRV	*Artemisia tridentata ssp. vaseyana*	Mountain big sagebrush
ARTRI	ARTR4	*Artemisia tripartita*	Threetip sagebrush
ERVI	ERVIA	*Ericameria vicidiflora*	Yellow rabbitbrush
PUTR	PUTR2	*Purshia tridentata*	Antelope bitterbrush
PRVI	PRVI	*Prunus virginiana*	Chokecherry
ROAC	ROAC	*Rosa acicularis*	Prickly rose
ROWO	ROWO	*Rosa woodsii*	Woods' rose
SYOR	SYOR2	*Symphoricarpos oreophilus*	Mountain snowberry
SUBSHRUBS			
ARLU	ARLU	*Artemesia ludoviciana*	White sagebrush
BEVU	BEVU	*Berberis vulgaris*	Common barberry
GRAMINOIDS			
AGSM	AGSM	*Agropyron smithii*	Western wheatgrass
AGIN	AGIN2	*Agropyron intermedium*	Intermediate wheatgrass
AGSP	AGSPA	*Agropyron spicatum*	Bluebunch wheatgrass
AGST	AGST2	*Agrostis stolonifera*	Creeping bentgrass
BRAN	BRAN	*Bromus anomolus*	Nodding brome
BRCA	BRCA5	*Bromus carinatus*	Mountain brome
BRIM	BRIM2	*Bromus inermis*	Smooth brome
BRJA	BRJA	*Bromus japonicus*	Japanese brome
BRTE	BRTE	*Bromus tectorum*	Cheatgrass
CAREX	CAREX	*Carex sp.*	Sedge
DAIN	DAIN	*Danthonia intermedia*	Timber oatgrass
LECI	LECI4	*Leymus cinereus*	Basin wildrye
FEID	FEID	*Festuca idahoensis*	Idaho fescue
FEOC	FEOC	*Festuca occidentalis*	Western fescue
FEPR	FEPR	*Festuca pratense*	Meadow fescue
KOMA	KOMA	*Koeleria macrantha*	Prairie Junegrass
LEKI	LEKI2	*Leucopoa kingii*	Spike fescue
PHPR	PHPR3	*Phleum pratense*	Timothy
POBU	POBU	*Poa bulbosa*	Bulbous bluegrass
POPR	POPR	*Poa pratensis*	Kentucky bluegrass
STCO	STCO4	*Stipa comata*	Needle-and-thread

Code	PLANTS database code	Scientific Binomial (following Lesica et. al. 2012)	Common Name
STLE	STLE4	*Stipa lettermanii*	Letterman's needlegrass
FORBS			
ACMI	ACMI2	*Achillea millefolium*	Common yarrow
AGUR	AGUR	*Agastache urticifolia*	Nettleleaf giant hyssop
ANNE	ANNE	*Antennaria neglecta*	Pussytoes
AQUI sp.	AQUIL	*Aquilegia sp.*	Columbine
CAEX	CAEX6	*Castilleja exilis*	Lessor Indian paintbrush
CIAR	CIAR4	*Cirsium arvense*	Canada thistle
COCA	COCA5	*Conyza canadensis*	Canadian horseweed
COLI	COLI2	*Collomia linearis*	Narrow-leaf collomia
COLL sp.	COLLO	*Collomia sp*	Trumpet
CRAC	CRAC2	*Crepis acuminata*	Hawksbeard
CYOF	CYOF	*Cynoglossum officinale*	Gypsyflower
DESO	DESO2	*Descurainia sophia*	Herb sophia
DRAR	DRAR8	*Drymocallls arguta*	Tall cinquefoil
EPMI	EPMI	*Epilobium minutum*	Chaparral willowherb
ERIGERON	ERIGE2	*Erigeron sp.*	Fleabane
ERIOG	ERIOG	*Eriogonum sp.*	Buckwheat
GEVI	GEVI2	*Geranium viscosissimum*	Sticky purple geranium
IPAG	IPAG	*Ipomopsis aggregata*	Scarlet gilia
LEDE	LEDE	*Lepidium densiflorum*	Common pepperweed
LILE	LILE3	*Linum lewisii*	Lewis flax
LIRU	LIRU4	*Lithospermum ruderale*	Western stoneseed
LOFO	LOFO	*Lomatium foeniculaceum*	Desert biscuitroot
LUPINUS	LUPIN	*Lupinus sp.*	Lupine
PEGA	PEGA3	*Perideridia gairdneri*	Gardner's yampah
PENSTEMON (PF-8)	PENST	*Penstemon sp.*	Penstemon
POAR	POAR7	*Potentilla arguta*	Tall cinquefoil
POGR	POGR9	*Potentilla gracilis*	Slender cinquefoil
POPE	POPE8	*Potentilla pensylvanica*	Pennsylvania cinquefoil
SENECIO	SENEC	*Senecio sp.*	Ragwort
SEER	SEER2	*Senecio eremphilus*	Groiundsel/ Desert ragwort
STEL sp.	STELL	*Stellaria sp.*	Starwort
SMST	SMST	*Smilacina stellata*	False solomon's seal
SOL sp.	SOLID	*Solidago sp.*	Goldenrod
TAOF	TAOF	*Taraxacum officinale*	Common dandelion
TRANSB	TRBU5	*Transberingia sp*	Strictwort
TRDU	TRDU	*Tragopogon dubius*	Yellow salsify

Code	PLANTS database code	Scientific Binomial (following Lesica et. al. 2012)	Common Name
VETH	VETH	*Verbascum thapsus*	Common mullein
VICIA	VICIA	*Vicia sp.*	Vetch

UNKNOWN PLANTS

Code on Data Forms	Observed Characteristic
PF-1	Single violet-shaped leaf
PF-2	Not used on data forms
PF-3	*Senecio* leaf look-alike. Single leaf, no flower
PF-4	Erigeron leaf look-alike. Single leaf, no flower
PF-5	Very thin leaf, no flowers; *Conyza* (?)
PF-6	Woolly leaves, no flowers
PF-7	Dark green serrate leaf, no flowers; aster family (?)
PF-8	*Penstemon* leaves? No flowers
PF-9	Yellow knapweed-like (*Centaurea*) flower
SS-1	Winterfat-like (*Krascheninnikovia*) plant. No flowers.

BLM Idaho State Office
Snake River Valley
HAF Mid-Scale Results

APPENDIX D

APPENDIX D

BLM Idaho State Ofice
Snake River Valley Habitat Assessment Framework
Mid-Scale Results

Mid-scale Sage-Grouse Habitat Descriptions

Total Size of Midscale: 73,605 km2

Indicator	Measurement	Result	Notes	Suitability-ID
Habitat Availability (M1)	Occupied habitat (km2)	**22,389**	this is existing (EVT) or potenitally (BPS) suitable landcover that is occupied	Marginal- Only 30% of the midscale area contains sutiable existing and potential habitat within occupied areas. Although the 'unoccupied' areas have ~40% of exisitng suitable habitat, the birds do not appear to be using these areas. The Western side of area contains suitable contiguos habitat; however, the eastern side is fragmented.
	Potential habitat (km2)	**35,037**	this is existing (EVT) or potenitally (BPS) suitable landcover that is not occupied	
	Nonhabitat (km2)	**16,081**	everything else; occupied or not occupied	
	Notes: About 30% of the midscale area is Occupied Habitat; 48% is Potenital Habitat; 22% is non-habitat. See Tab "M1" for details. EVT and BPS were classified according to the state-specific sagebrush monitoring class (see tab "Landfire reclass").			
Patch Size and Number (M2)	Mean size of occupied habitat patches (km2)	**818**	Wide range from 17 to 17,498 km2.	Marginal- patches on Eastern side and S NV are small . Thre is a wide range of patch sizes. Some of the larger patches on the western side would be even larger but are bisected by Hwy 93 that birds do move across.
	Number of occupied habitat patches	**24**		
	Notes: Three patches run over the east border but were clipped to the mid-scale, so the patch size statistic may be low (smaller than what is really available on the landscape). There are three unoccupied patches; small in size (151, 167, and 170 km2) relative to mean. About 23% of total midscale area is in occupied patches. See Tab "M2" for details.			
Patch Connectivty (M3)	Mean distance to nearest occupied patch (km)	**6.5**	Does not include distance between unoccupied patches or patches >54km apart	Suitable-The largest patches are well connected and the mean distance of 6.5 km is well within seasonal movement distances in the literature.
	Discussion: Most occupied patches are directly adjacent or very close to another occupied patches; overall high connectivity among occupied patches. The unoccupied patches in the eastern portion of the midscale are small and isolated. See Tab "M3" for details.			
Linakage Area Characteristics (M4)	% suitable landcover types in linkage areas	**40%**		Marginal- moving towards suitable based on knoweldge of restoration efforts within Murphy Complex area. If birds werer to disperse to some of the small isolated pathces, movement would be challenging with mix of marginal and unsuitable linkagae areas.
	% marginal landscover types in linkage areas	**37%**		
	% unsuitable land cover types in linkage areas	**23%**		
	Discussion: Remember that "suitability" for this metric is relative to suitability for movement for sage-grouse. See Tab "M4" for details. See tabe "Linkage reclass" to see how Landfire was reclassified for this metric.			
Landscape Matrix and Edge Effect (M5)	Mean % positive patch edges	**69%**		Suitable- ~70% of edge is within positive veg types thus patches are not threatened by invasives.
	Mean % neutral patch edges	**8%**		
	Mean % negative patch edges	**23%**		
	Discussion: Remember that this metric is based on reclassifying landcover according to its potenital effect on suitable habitat patches (positive, negative or neutral). See Tab "M5" for details. See tabe "Edge Effect reclass" to see how Landfire was reclassified for this metric.			
Anthropogenic Disturbances (M6)	Densities of linear features (km/km2) in patches	**0.35**		Suitable- Within patches, there is a very low density of anthropogenic distrubances.
	Densities of point features (sites/km2) in patches	**0.02**		
	Area of nonhabitat or unsuitable habitat inclusions (km2) in patches	**6.92**		
	Discussion: Based on NOC disturbance data set. See Tab "M6" for details.			

APPENDIX D

BLM Idaho State Ofice
Snake River Valley Habitat Assessment Framework
Mid-Scale Results

Mid-Scale (Second-Order) Suitability Rating

Suitable: Landscapes have connected mosaics of sagebrush shrublands that allow for bird dispersal and migration movements within the population or subpopulation area. Anthropogenic disturbances that can disrupt dispersal or cause mortality are generally not widespread or are absent.

Marginal: Landscapes have patchy, fragmented sagebrush shrublands that are not well connected for dispersal and migration in portions of the population or subpopulation area. Anthropogenic disturbances that disrupt dispersal or cause mortality are present throughout all or portions of the landscape. Some lek groups or subpopulations are isolated or nearly isolated.

Unsuitable: Landscapes were former shrubland habitat now converted to predominantly grassland or woodland cover or other unsuitable land cover or use. Remaining sagebrush patches are predominantly unoccupied or have few remaining birds. Portions of the population or subpopulation area may become occupied in the foreseeable future through succession or restoration.

Rating/ Discussion: (enter rating and rational here) The Nevada, Utah, Idaho ID team rated this midscale area as marginal. The team recognized that the western half of the area is well-connected and contains substantial areas of high-quality contiguous habitat that facilitate dispersal, but habitat conditions in the eastern half (particularly in Idaho) reduce the overall suitability of this landscape substantially. Additioanlly, overall, the midscale area has ~60% ration of existing sagebrush to potential- meaning over half of the sagebrush that could exist on the ground has been lost. In eastern Idaho, sage-grouse populations are isolated and the distances among occupied patches is high because sagebrush habitat is fragmented by wooded mountain ranges and higher levels of anthropogenic disturbances in the valleys. Also, sage-grouse populations in Nevada along the southern margin of the midscale area appear to be somewhat isolated from larger occupied areas, and would have to move considerable distances through a mixture of marginal and unsuitable habitat to disperse. Overall, although movement distances between patches for the entire midscale are suitable, the isolation of sage-grouse in eastern Idaho and low levels of occupied habitat reduced the rating of this midscale. One potential caveat, is that there is a poor understanding of occupancy in eastern Idaho because these areas are rarely surveyed/inventoried and few (if any) telemetry data is available. Future sage-grouse research in this area could provide a much better understanding of movements and habitat use patterns in this landscape, which would ensure a more robust understanding of dispersal capabilities.

Greater Sage-Grouse Mitigation Plan Caldwell Canyon Project Caribou County, Idaho

P4 Production, LLC MONSANTO

NewFields

June 2018

GREATER SAGE GROUSE MITIGATION PLAN

CALDWELL CANYON PROJECT

P4 Production, L.L.C.
PO Box 816
Soda Springs, Idaho 83276

JUNE 2018

1.0 INTRODUCTION

P4 Production, L.L.C. (P4), a subsidiary of Monsanto Company (Monsanto), is proposing to develop the Caldwell Canyon Project (Project), an open-pit phosphate mine, to recover phosphate from state and federal mineral leases in Caribou County, Idaho **(Figure 1**). Surface ownership includes private land owned by P4, private land owned by other entities; public land administered by the Idaho Department of Lands (IDL), and public land administered by the U.S. Bureau of Land Management (BLM).

P4 developed this Greater Sage Grouse (GRSG) Mitigation Plan (Plan) to address potential loss of GRSG habitat associated with the proposed Project. The Plan provides for two components that represent commitment by P4 to create sufficient mitigation to offset projected habitat loss and a third component that represents a voluntary off-site research project which seeks to recover land that has been converted to grazing back to GRSG habitat.

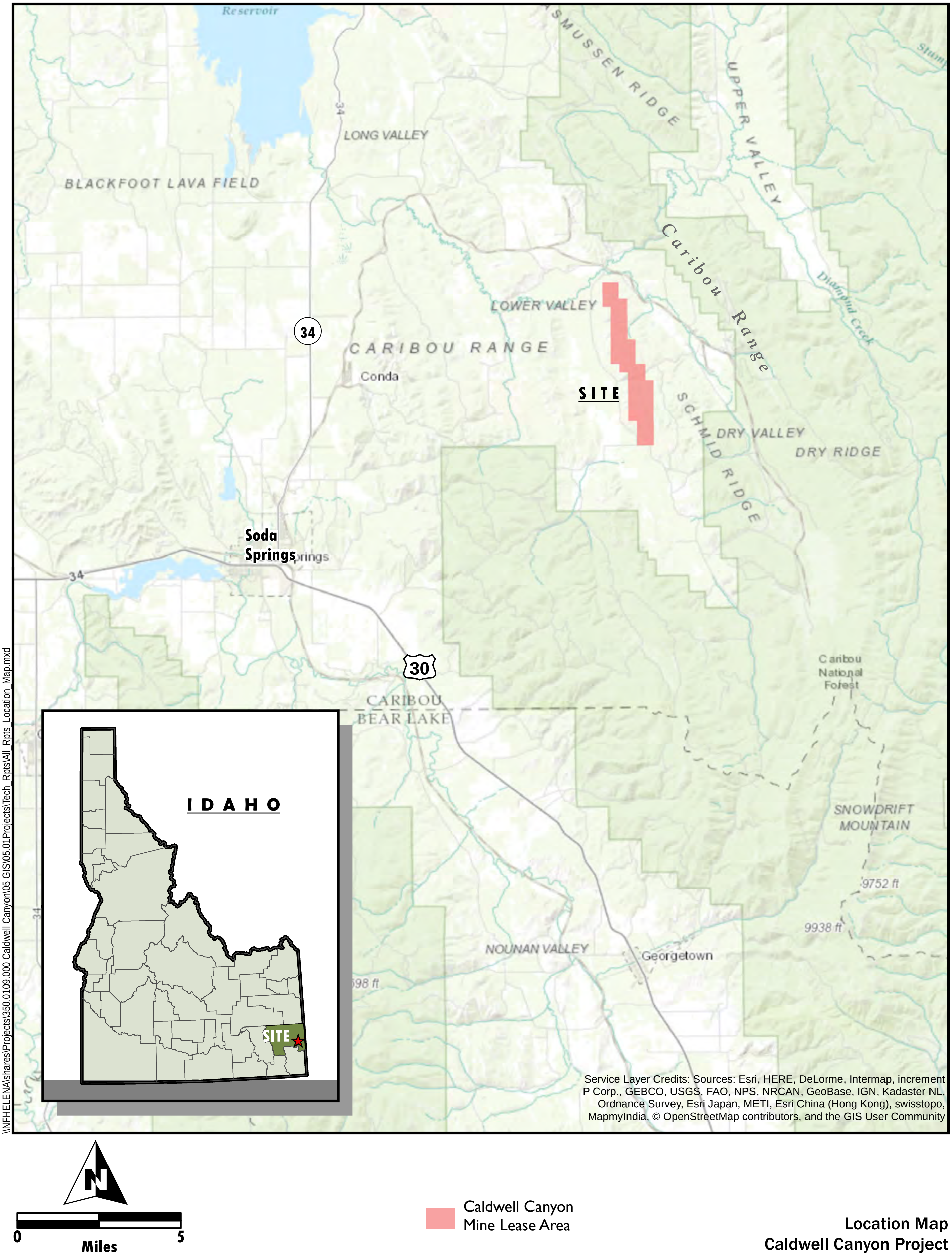
1.1 CALDWELL CANYON PROJECT DESCRIPTION

1.1.1 Description of the Project Facilities and Phases; Leases

The Project Area is located along Schmid Ridge, within the Caribou Range, approximately 13 air miles northeast of Soda Springs, Idaho. The site is accessed via Highway 34 to Blackfoot River Road, then via Slug Creek Road to a road that extends through Caldwell Canyon. The Project Area is bounded on the north by the Blackfoot River, on the east by Dry Valley Creek, on the west by Slug Creek, and on the south by South Trail Road. Phosphate leases, permits and licenses in the general Project Area include the following as shown on **Figure 2**:

- Federal Mineral Leases IDI-0000002, IDI-0014080, and IDI-0013738 administered by BLM; and
- State of Idaho Mineral Lease E07959 administered by IDL.

Mining at Caldwell Canyon would encompass development of two open mine pits: North Pit and South Pit. Mining operations would be conducted over an estimated 40-year period using a pit panel mining and backfill method. Mining would be initiated in the mid-point of the South Pit and proceed southward. With the exception of the initial pit panel overburden, as each subsequent pit panel is developed, overburden generated from each new panel would be used to backfill a previously mined panel. Once mining reaches the south end of the South Pit, mining would resume at the mid-point of the South Pit and proceed northward in the same pit panel method. The maximum extent of both proposed mine pits for the Caldwell Canyon Project is shown on **Figure 2**.

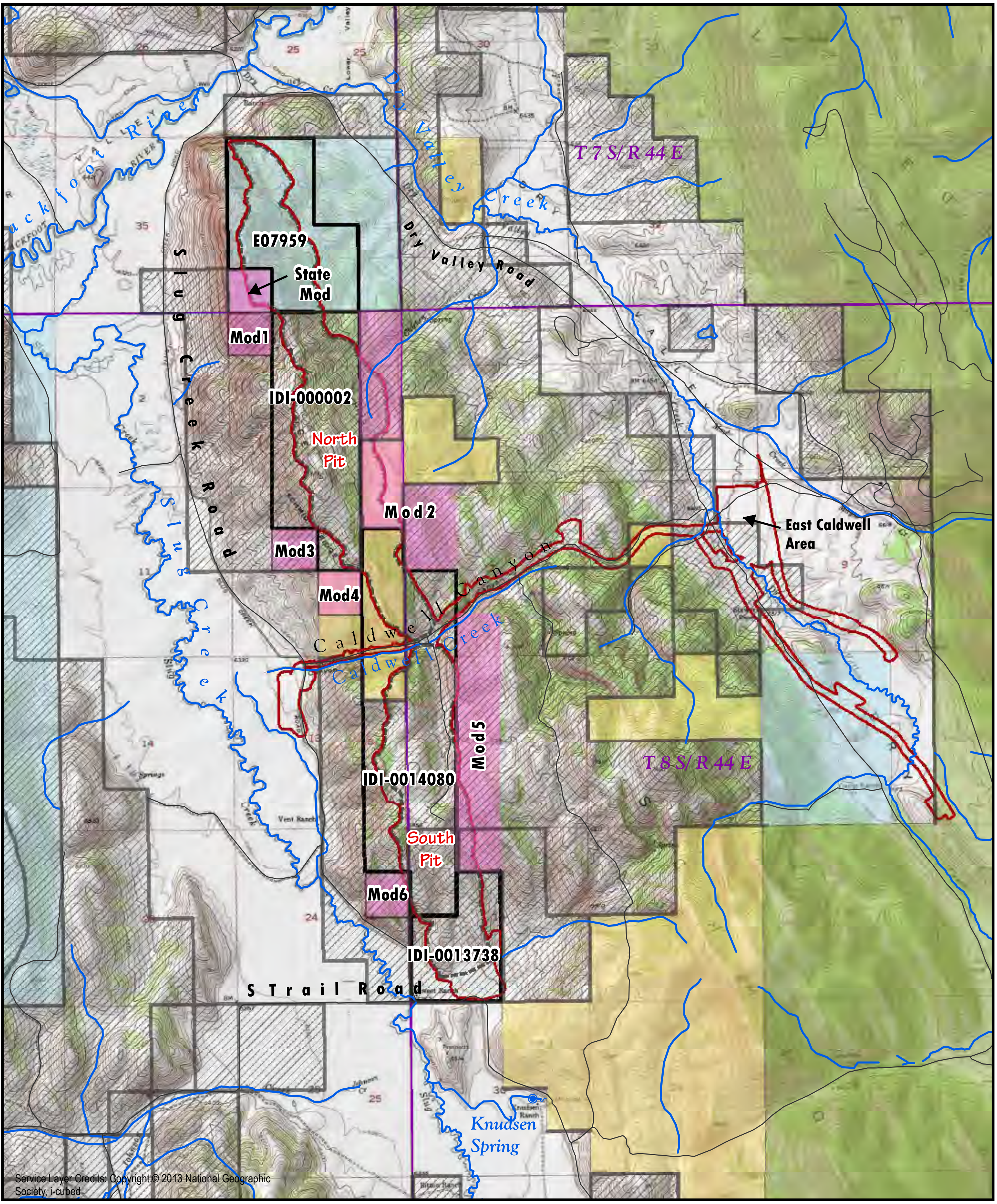


Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

\NFHELENA\shares\Projects\350.0109.000 Caldwell Canyon\05 GIS\05.01Projects\Tech Rpts\All Rpts Location Map.mxd

NewFields

Location Map
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 1



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Project Area:

- ☐ Lease Boundary and Number
- ☐ Project Boundary
- ⬚ Proposed Mine Pit
- ☐ Township/Range
- ☐ Lease Modifications

Surface Public Ownership

- ☐ Bureau of Land Management
- ☐ U.S. Forest Service
- ☐ State
- ▨ Federal Mineral Estate on Non-Federal Land

NewFields

Project Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 2

1.1.2 Description of the Reclamation

Reclamation of land disturbed by mining activities is an integral part of the Caldwell Canyon Mine Plan (P4 2017). Reclamation is designed to restore the site to a beneficial post-mining land use, prevent undue or unnecessary degradation of the environment, and reclaim disturbed areas to conditions compatible with surrounding landscape.

P4 would implement reclamation practices to meet objectives as set by BLM's 43 CFR 3592.1 and IDL's Reclamation Plan Title 47, Chapter 15 – Idaho Code. The reclamation plan is intended to confirm that the site is safe (erosion protection) and to meet the final multiple land use goals of wildlife habitat, recreation, and grazing.

The phased approach to the pit development allows P4 to perform concurrent reclamation of mine disturbance throughout the mine life to the extent practical. P4 would salvage and place growth media (soil and other suitable earthen material) in stockpiles located in proximity to disturbed areas for future placement or directly onto finished backfilled mine panels and other mine-related disturbance areas that have been prepared for topsoil placement. Final grading would ensure that the site topography of the reclaimed areas and revegetation efforts would blend with the adjacent undisturbed land to the extent practical.

The proposed topography includes slopes and aspects that would be stabilized by vegetation establishment except that some pit wall remnants would not be revegetated. All slopes except permanent pit wall remnants would be contoured, covered with plant growth media, and seeded with a seed mix compatible with reclamation objectives. Reclaimed areas are expected to achieve vegetative cover exceeding both federal and state requirements and capable of supporting the post-mining land uses.

Disturbance associated with mining operations, including pits, ponds, roads, and other support facilities, would encompass an area of approximately 1,568 acres over the life of the Project. This is inclusive of an overall 50-ft buffer around the perimeter of the entire proposed Project boundary. Anticipated actual disturbance associated with mine development is approximately 1,350 acres. During final reclamation, P4 would revegetate approximately 1,219 acres. Approximately 131 acres consisting of pit highwalls in the North Pit would not receive growth media or be seeded.

Growth media stripped during clearing of mine disturbance areas would be recovered and stockpiled for future reclamation use including construction of the primary component of the water balance cover. Salvaged material associated with the mine pit would include a combination of topsoil (A-horizon), subsoil (B-horizon), and deeper suitable parent materials (C-horizon) and unconsolidated deposits.

While majority of the reclaimed area would have relatively uniform soil thickness, as prescribed by the pit backfill cover design, the final topography would affect soil moisture and erodibility warranting implementation of diverse mixes. Outside the pit, soil conditions of reclaimed access roads, ponds, and other support facilities may be more variable and would possibly include areas of poor drainage. To capitalize on the topo-edaphic variability and promote diversity, P4 would select species from three mix lists[1] to create mixes adapted to site conditions.

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[1] As per the Mine and Reclamation Plan – Caldwell Canyon Project (P4 Production, L.L.C. 2017.)

Developing mixes from the listed species would accomplish post-closure objectives appropriate to the respective application sites without the need to identify a mix specific to each objective. Species listed are perennial and many have root systems capable of penetrating the full thickness of replaced growth media and promoting evapotranspiration and cover performance, where necessary. Many of the forb and shrub species provide forage and/or cover for greater sage-grouse and bunchgrasses would provide additional cover. While they provide less utility for sage grouse, rhizomatous species would help stabilize slopes, particularly in areas susceptible to water erosion. All grasses and palatable forbs would provide utility for livestock grazing and utility for a variety of wildlife species.

If shrubs fail to establish from reclamation seeding or viable propagules in direct placed soil, shrub transplants or shrub tublings would be employed to promote establishment of small (0.01 to 0.1ac) shrub patches as seed sources in reclaimed areas. Transplanting would include salvaging live shrubs (with preference for shrubs beneficial to greater sage-grouse) with a backhoe or loader in advance of salvage operations and hauling those shrubs to areas prepared for revegetation. Transplant operations would select relatively small or young shrubs with limited root systems and water demands to increase the likelihood of survival and operations would be conducted at times when soil conditions are moist. Using this method, patches of shrubs may be established on ridges and other positions optimal for seed dispersal in reclaimed areas. Additional seeding in the patches would likely be unnecessary due to the prevalence of plant propagules in the direct-hauled soil material. Tublings would be sourced from a commercial supplier and would be planted in similar patches as described for transplantings.

Details of the reclamation are provided in the Reclamation Section of the Caldwell Mine and Reclamation Plan (P4 2017). The vegetation component of the reclamation plan was developed to meet the objectives of the cover design and to provide suitable habitat for GRSG.

1.1.3 Description of Potential Impacts to GRSG

Potential impacts to GRSG are based on loss of GRSG habitat. GRSG habitat was identified in the *Idaho and Southwestern Montana Greater Sage-Grouse Proposed Land Use Plan Amendment/Final Environmental Impact Statement* (BLM 2015a). For BLM-administered land, the Record of Decision and collective Approved Resource Management Plan Amendment (ARMPA) for the Great Basin Region was signed in September 2015 (BLM 2015b) (herein referred to as 2015 ARMPA)[2].

Each BLM ARMPA identifies GRSG habitat (across all management jurisdictions and for BLM-administered land only) by various management area categories (BLM 2015b). Attachment 1 of BLM's 2015 ARMPA identifies and allocates GRSG habitat into three management area categories:

- **Priority Habitat Management Area (PHMA).** This classification includes areas of BLM-administered land identified as having the highest value to maintaining sustainable GRSG populations. These areas include breeding, late brood-rearing, winter concentration areas, and migration or connectivity corridors.

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[2] These foundational documents are all subject to change based on the May 4, 2018 notice of availability of Draft RMP amendments/DEIS for the Pocatello RMP regarding GRSG.

- **Important Habitat Management Area (IHMA)**. This classification includes areas of BLM-administered land identified as providing a management buffer for PHMA and which connects patches of PHMA. These areas are considered to be of moderate-to-high conservation value for habitat and/or populations, but are not as important as PHMA.

- **General Habitat Management Area (GHMA)**. This classification includes areas of BLM-administered land identified as needing some special management to sustain GRSG populations or areas of occupied seasonal or year-round habitat outside of PHMA or IHMA. The Project Area includes GHMA classified areas only.

While the 2015 ARMPA documents habitat across all management jurisdictions within and proximal to the Project Area (**Figure 3**), the ARMPA also states that, *"any decisions in the ARMPA apply only to BLM-administered lands, including split-estate lands within GRSG habitat management areas (the decision area). These decisions are limited to providing land use planning direction specific to conserving GRSG and its habitat*" (BLM 2015b, pp. 1-4).

Existing federal mineral leases and exploration licenses proximal to the Project Area were not included as part of BLM's GRSG management areas (e.g., GHMAs, PHMAs, etc.) within the 2015 ARMPA. As such, a majority of P4's Caldwell Canyon Project area was excluded as part of BLM's decision area for GRSG; therefore, 27.8 ha (approximately 69 acres) of BLM-administered land within the Project Area, including BLM surface and split estate (e.g., private surface / federal mineral, Prospecting Permit IDI-037319), have been categorized by BLM as: (1) GHMA, and (2) part of BLM's decision area for GRSG management (**Figure 4**).

The characteristic landscape within and around the overall Project Area is predominantly natural and rural. Land uses that provide the rural component of the landscape character include summer grazing, logging, and mining. Man-made features related to grazing consist of corrals, fences, roads, and stock-watering ponds.

Locally, topography is characterized by a series of north to northwest trending mountain ranges separated by broad inter-montane valleys. Relief within the Caldwell Canyon Project Area is approximately 1,000 feet, with elevations ranging from 6400 feet above mean sea level (amsl) along Slug Creek to about 7400 feet amsl at the crest of Schmid Ridge.

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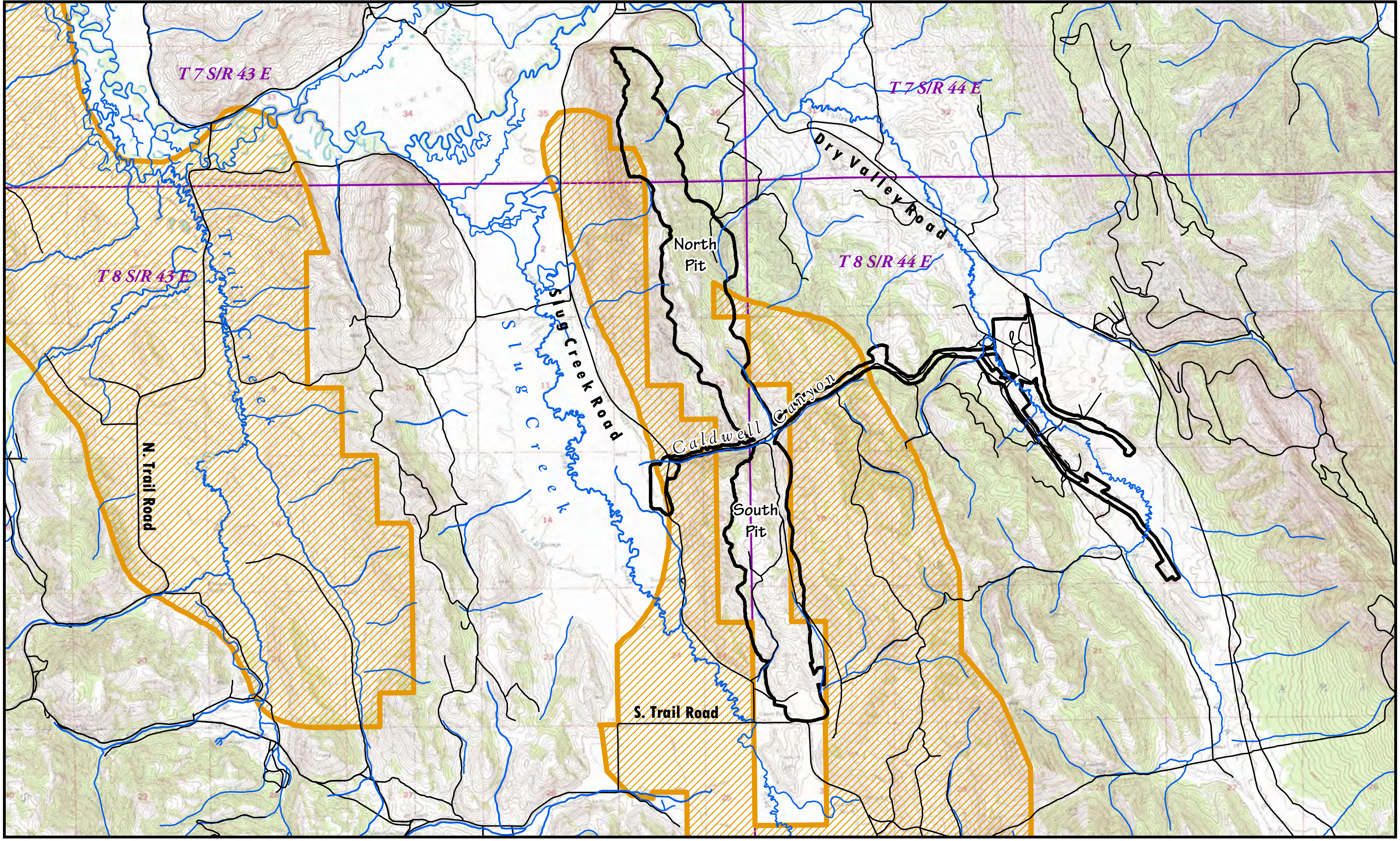

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NewFields

▭ Project Boundary

▨ General Habitat Management Areas (GHMA) All Jurisdictions (BLM, 2015b)

General Habitat Management Areas
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 3

The localized landscape exhibits modification of the natural character from past mineral exploration, including drilling and trenching. Slug Creek Road and Dry Valley Road are unpaved roads that parallel Schmid Ridge on the west and east sides, respectively, of the Project Area (**Figures 2** and **4**). Ridges in the Project Area support a mixture of vegetation types. The northern and eastern aspects, along higher ridges, support conifer and aspen, in pure and mixed stands, which are interspersed with mixed shrubs. The foothills on the northern and eastern aspects consist of a mixture of aspen and mixed shrubs, which transition to grasslands and riparian/wetland in Dry Valley. Mixed shrubs are more prevalent at the southern end of the Project Area along the ridges and the foothills. The west aspect of Schmid Ridge exhibits less aspen than the north and northeastern aspects, with mixed shrubs, native grasslands/forbs, and sagebrush/native grass from the ridge to the valley floor. The valley floor is primarily riparian/wetland associated with the Slug Creek floodplain and areas of introduced grasses. Small riparian/wetland areas are interspersed on the landscape, associated with springs and creeks.

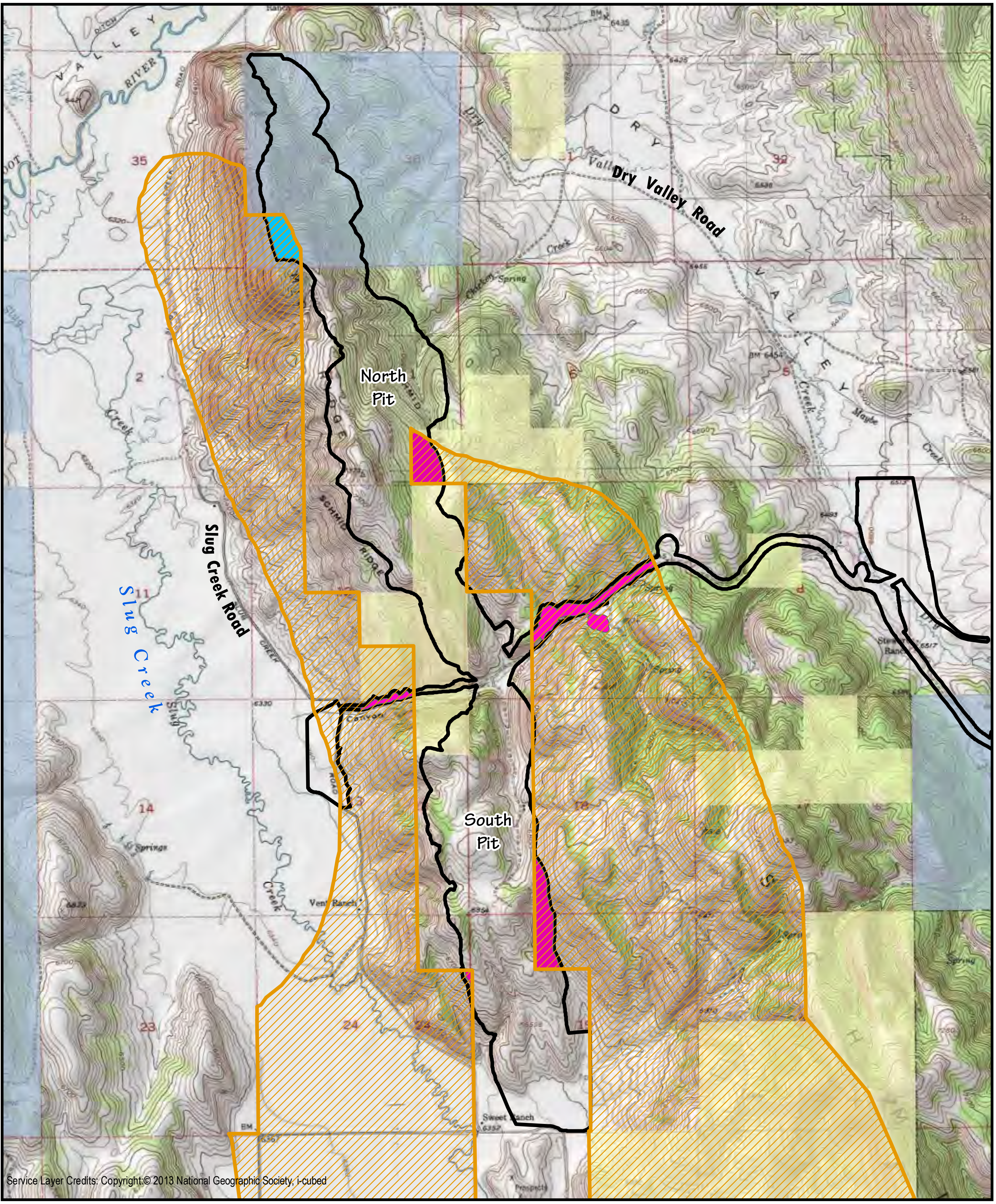
Perennial, intermittent, and ephemeral drainages extend west to the Slug Creek floodplain and east to Dry Valley Creek (**Figure 2**). Caldwell Creek is a 2nd-order spring- and runoff-fed stream in the Slug Creek basin with a drainage area of approximately 570 ha (2.2 square miles or 1,408 acres). Caldwell Creek flows to the west through Caldwell Canyon (**Figure 2**) and is the largest sub-basin of Slug Creek in the Study Area. Caldwell Creek appears to be perennial, but has no surface connection with Slug Creek as the flow infiltrates into alluvium and associated wetlands where the channel ends on the valley floor about 1,000 feet from Slug Creek. Due to this lack of connection with Slug Creek, the U.S. Army Corps of Engineers determined that Caldwell Creek is a non-jurisdictional Waters of the U.S.

Primary land uses in and proximal to the Study Area include agriculture, livestock grazing, and phosphate mining. Agrium's Dry Valley Mine site, which is in the closure and reclamation stage, is located approximately 1½ miles east of the Caldwell Canyon Project Area; and Simplot's proposed Dairy Syncline Mine is located in the headwaters of Slug Creek, approximately 2 miles south of the Caldwell Canyon Project Area.

As a consequence of BLM-administered land in the Caldwell Canyon Project Area being designated as GHMA, BLM required that P4 conduct a Habitat Assessment (HA) for the Project using the BLM Habitat Assessment Framework (HAF) process (Stiver et al. 2015). The HAF is part of the *Greater Sage-Grouse Comprehensive Strategy* published by the Western Association of Fish and Wildlife Agencies (WAFWA) in 2006 (Stiver et al. 2006) and provides a framework, including both temporal and spatial methods, for evaluating sagebrush habitats with respect to suitability for GRSG at various landscape scales. The intent of the HAF is to empower managers to make decisions regarding implementation of project-level actions within the context of various landscape scales.

The HA was conducted on the 27.8 ha (approximately 69 acres) of BLM-administered land within the Project Area which occurred across four general areas as depicted on **Figure 4**. The HAF lists six habitat indicators to be used in assessing suitability of summer/late summer brood-rearing habitat, all of which were examined for the Study Area:

- Sagebrush cover (average percent cover for land cover type);
- Sagebrush height (average sagebrush height for land cover type);
- Availability of sagebrush cover (food site has sagebrush cover in close proximity);
- Perennial grass and forb cover (average percent cover for land cover type);
- Riparian stability (functioning condition); and
- Preferred forb availability (number and density of preferred forbs in land cover type).



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NewFields

□ Project Boundary

🟨 BLM Surface Ownership

🟦 State of Idaho Surface

▨ General Habitat Management Area (GHMA) All Jurisdictions (BLM, 2015b)

🟦 Impacted Sage Grouse Habitat (State Decision Area) 5.5 Hectares

🟪 Impacted Sage Grouse Habitat (BLM Decision Area) 27.8 Hectares

Caldwell Canyon Study Area
Caldwell Canyon Project
Caribou County, Idaho
FIGURE 4

The 27.8 ha of BLM-administered land all exhibit a Mixed Shrub vegetation type that includes sagebrush. This vegetation type was identified during previous field work as being potentially suitable as GRSG late summer brood habitat (NewFields 2015b). None of the other vegetation types occurring on these four BLM areas were considered to be available GRSG habitat (i.e., forested vegetation types or perennial grasslands adjacent to trees). Existing vegetation mapping (NewFields 2015b, 2016c) was used to identify potential habitat. Based on this mapping, Mixed Shrub vegetation type occurred on 14.6 ha (36.1 acres) of the Caldwell Canyon Study Area.

Based on Habitat Suitability Indicators for late summer brood habitat, the Mixed Shrub vegetation type of the four BLM Areas was rated as Suitable; however, this rating does not consider the proximity of forested areas or juxtaposition of Mixed Shrub within the vegetation matrix of the Caldwell Canyon Study Area. BLM-1, -2, -3, and -4 Areas all include forested habitat or were adjacent to forested habitats which would detract from the suitability of these small areas. When considering the context of the shrub and forest matrix, the habitat suitability was rated as Marginal (NewFields 2018).

The Marginal habitat rating is consistent with habitat that occurs in a transition zone between major habitat types. The Caldwell Canyon area is in the transition zone between the shrub steppe and forested areas of eastern Idaho and western Wyoming; the former being the heart of GRSG habitat in Idaho and the latter is not GRSG habitat. The transition zone between these two ecosystems is a mixture of both, which results in a mixture of habitat and non-habitat. GRSG populations in these areas of mixed habitat/non-habitat are not as robust as the populations in prime habitat, and the habitat in these transitions zones is not considered prime habitat due to the detrimental aspects of the non-habitat. Consequently, the area of GRSG habitat subject to impact analysis and subsequent mitigation was limited to 14.6 ha (36.1 acres) of marginal habitat.

1.2 BLM SAGE-GROUSE POLICY

BLM's current policy with respect to project planning in GRSG habitat is to avoid impacts in all mapped GRSG habitat when possible, minimize impacts that cannot be avoided, and compensate for unavoidable impacts (referred to as the "mitigation hierarchy") (BLM 2015b)

Avoidance of impacts is generally done by recognizing where potential impacts could occur following collection of baseline data and then designing the Mine and Reclamation Plan (MRP) to avoid the potential impacts. This can be done by relocating project facilities to avoid certain habitats or operating certain aspects of the operation at a time of day or season of the year to avoid impacting a resource.

When a habitat cannot be avoided or the resource is located in areas such that time of day or seasonal operation restrictions cannot be implemented, then modifying the operation to reduce the impact to a minimal level is the next option. This may entail designing a facility to the smallest disturbance footprint within the habitat, installing noise-reduction devices, or modifying the lighting plan to illuminate only the area necessary to operate.

While the "avoid and minimize" policy may work for some aspects of an operation, the location of the pit is determined by the location of the ore. Impacts from the pit development to the existing habitat cannot be avoided, and generally the pit footprint is the minimal disturbance footprint due to the need to design cost-effective mining by having the least amount of overburden or waste rock / overburden excavated and handled during the mining process.

In addition, there may be conflicting impacts to different resources. For example, avoidance of impacts to a wetland or riparian area may take precedence over impacting upland sagebrush areas. Both vegetation types can be considered GRSG habitat, but riparian and wetland areas are generally in limited availability, more difficult to mitigate, and can create long-term issues if disturbed. Consequently, in some situations, the "least impactful" project design may still cause impacts and require compensation when avoidance and minimization cannot be fully realized.

Impacts that remain after applying the avoidance and minimization measures will be addressed by compensatory mitigation projects to provide a net conservation gain to the species. "Any compensatory mitigation will be durable, timely and in addition to that which would have resulted without the compensatory mitigation" (BLM 2015, Appendix F).

"Compensatory mitigation consists of compensating for residual project impacts that are not avoided or minimized by providing substitute resources or habitats, often at a different location than the project area. For sage-grouse, this would include, among other things, protecting and restoring sagebrush habitats to offset habitat losses and other effects of infrastructure projects" (Idaho Mitigation Framework, 2010)[3].

1.2.1 BLM Policy for Existing Leases

As indicated in Section 1.1.3, above, the 2015 ARMPA excluded existing federal mineral leases and exploration licenses from the BLM's GRSG management areas (e.g., GHMAs, PHMAs, etc.). This policy resulted in the exclusion of P4's mine lease area as part of BLM's decision area for GRSG.

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[3] On May 4, 2018, the Idaho Greater Sage Grouse Draft RMP Amendment (RMPA) and Environmental Impact Statement (DEIS) (BLM 2018) was released for public comment. BLM's proposed policy has the stated goal of better aligning with the Idaho Governor's conservation plan and supporting conservation outcomes for GRSG. The agency's preferred alternative, the Management Alignment Alternative was derived through coordination with the State and cooperating agencies to align with the State conservation plan and to support conservation outcomes for GRSG.

Specifically, the Management Alignment Alternative aligns the 2015 ARMPA (BLM 2015b) with the Governor's Plan by strategically removing or altering the specific points of contention while preserving those parts that were already in alignment with the substance of the Governor's Plan. Of note, the Management Alignment Alternative proposes a change to compensatory mitigation by modifying the "net conservation gain" standard to that of "no net loss" to the species. Moreover, compensatory mitigation would not be required in GHMA, but rather focuses on mitigation within PHMA and IHMA. For projects in GHMA, proponents would be required to mitigate impacts by avoiding and minimizing them to the extent practicable.

The final decisions regarding formal BLM policy change has yet to be determined as of this writing. As BLM stated in the Draft RMPA/EIS, "*Identification of the preferred alternative does not indicate any commitments on the part of the BLM with regard to a final decision. In developing the Proposed RMPA/Final EIS, which is the next phase of the planning process the decision maker may select various management actions from each of the alternatives analyzed in the Draft RMP A/Draft EIS for the purpose of creating a management strategy that best meets the needs of the resources and values in this area under the BLM multiple use and sustained yield mandate.*"

1.2.2 Avoid, Minimize, Compensate – Policy and how Policy is applied at Caldwell Project

GRSG were considered early on in the planning and design of the Caldwell Canyon Project. Examples of the avoidance of impacts include elimination of three ore haulage options (truck haulage option 1C-2, truck haulage alternative 1D, and hybrid truck/conveyor haulage option) due to the proximity of these haulage routes to existing leks (one active and one inactive lek) (P4 2016). The preferred haul route is to use an existing rail line, a portion of which is currently active and a portion that was active for several years but has been inactive for the last 6 years.

The placement and design for the haul road from the Caldwell Canyon Pit to Dry Valley was also done to avoid the wetland/riparian area associated with Caldwell Creek. A portion of this area is potentially part of the summer brood habitat (although much of the area is dominated by aspen and/or willow), and the proposed haul road design avoids direct impacts and minimizes indirect impacts to this creek and wetland/riparian habitat.

The proposed mine development would result in backfilling of the majority of the pit areas thereby restoring the ground surface to near pre-mining topography. P4's reclamation plan for the mine area focuses on use of selected species in a seed mix and plantings that would establish GRSG habitat.

Unavoidable impacts to the 14.6 ha (36.1 acres) of GRSG habitat are the focus of this Mitigation Plan.

1.2.3 Net Conservation Gain

The current ARMPA (BLM 2015b) requires a net conservation gain with respect to mitigation for GRSG in all identified GRSG habitat; meaning, the mitigation must provide more benefit to GRSG than the equivalent detriment to GRSG as a consequence of implementation of the MRP[4].

1.2.4 Temporal Component of Mitigation and Legal Assurance

Appendix F of the ARMPA (BLM 2015b) also includes a temporal component to mitigation which requires that the mitigation be conducted in a timely manner to offset the potential effects to reduce the time lag between the realization of effects and the achievement of compensatory mitigation goals and objectives. In addition, there must be some legal assurance that the mitigation, once completed, will continue into perpetuity for the benefit of GRSG.[5]

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[4] The preferred Management Alignment Alternative within the Draft RMPA (BLM 2018) by contrast focuses on mitigation within PHMA and IHMA that provides no net loss to the species including accounting for any uncertainty associated with the effectiveness of such mitigation which would be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions. In GHMA, proponents would be required to avoid and minimize impacts to the extent practicable. Compensatory mitigation is not required in GHMA.

[5] The Mitigation Management Alignment Alternative described in the Draft RMPA/EIS (BLM 2018) does not include a specific focus on timing or duration as part of mitigation planning.

2.0 MITIGATION PLAN TO "BENEFIT THE BIRD"

The sections that follow constitute the mitigation proposed by P4 to offset potential effects to GRSG habitat which may occur with the implementation of the Caldwell Canyon Project.[6]

2.1 CONTRIBUTION TO OFF-SITE PROJECTS – COMPENSATORY MITIGATION

The current Idaho Mitigation Framework (Sage-Grouse Mitigation Subcommittee of the Idaho Sage-Grouse State Advisory Committee, 2010) (included as Part II of Appendix F of the ARMPA, BLM 2015b) describes the general outline for a GRSG compensatory mitigation program in Idaho which includes an "in-lieu fee" approach to compensatory mitigation through which the project proponent can pay funds into an account managed by the compensatory mitigation program for performance of mitigation actions that provide measurable benefits for GRSG and habitats in Idaho. The funds are distributed by the program administrator to the appropriate government agency, foundation, or other organization for performance of mitigation actions. Compensatory mitigation transfers responsibility for delivering mitigation from the proponent to the program administrator, once the proponent has provided the necessary funds to the in-lieu fee program.[7]

Regardless of this potential change in BLM policy direction, P4 would continue to offer mitigation to offset potential effects that would be created by the Caldwell Canyon Project to GRSG through the loss of 14.6 ha (36.1 acres) of marginal late summer brood GRSG habitat in GHMA. The funds would be used for the restoration, creation, enhancement, and/or preservation of affected resources such as on-the-ground actions to improve and/or protect habitats in PHMA.

P4 proposes to offset these impacts at a 1:1 ratio by contributing funds in the amount equivalent to the cost of reclaiming the 14.6 ha (36.1 acres) (based on P4's recent reclamation costs of $1,500 per acre[8] and compensatory mitigation program administration fees of 15 percent [Sage-Grouse Mitigation Subcommittee of the Idaho Sage-Grouse State Advisory Committee, 2010]). The total contribution being offered is $62,273.

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[6] This mitigation package would continue to be offered even in the event the BLM GRSG policy changes consistent with that proposed in the Draft RMPA/EIS (BLM 2018); which would negate the requirement for formal compensatory mitigation for projects in GHMA.

[7] As discussed above, at the request of the State of Idaho, the Management Alignment Alternative described in the Draft RMPA/EIS (BLM 2018) proposes a change to compensatory mitigation by modifying the net conservation gain standard that the BLM incorporated into its plans in 2015 to that of no net loss to the species. Moreover, compensatory mitigation would not be required in GHMA, and a primary goal of the Governor's Greater Sage-Grouse plan is to push development out of PHMA and IHMA into GHMA or outside of habitat (BLM 2018, Page 4-16).

[8] Personal communication from Joe Via, Mine Environmental/Reclamation Specialist, P4 Production, L.L.C.

2.2 PHASED RECLAMATION FOCUSED ON GRSG HABITAT

As discussed above, the reclamation of the Caldwell Canyon Mine will include phased reclamation of the pit over a 41-year period, with the initial reclamation phase occurring within five years of the project startup. The temporal component of this phased reclamation will allow for a variety of age classes/density classes of sagebrush habitat to be established, which will create a mosaic of habitat conditions at the site over the life of the Project. The vegetation patches in this mosaic will create habitats that provide variety in forage and cover to meet needs of GRSG for daily late summer brood habitat (i.e., insects and forbs, cover for concealment, cover for shade on hot days, cover from inclement weather). Reclamation of the Project site is required as part of the authorization and/or permit for the Project. The focus of the reclamation plan is to create GRSG summer brood habitat on portions of 1,200 acres of the North and South backfilled mine pits, as compared to the 14.6 ha (36.1 acres) impacted by the Project. In some cases, trees located in undisturbed areas adjacent to reclaimed pits can provide roosts for raptors that would diminish use by GRSG. The reclamation plan also addresses post-closure land uses for general wildlife (i.e., elk calving / mule deer) and livestock grazing.

2.3 VOLUNTARY RESEARCH PROJECT/HABITAT REHABILITATION

Based on discussions between Monsanto and former BLM Director Neil Kornze, Monsanto has initiated a habitat restoration research project at its Fox Hills Ranch property, a few miles from the Caldwell Canyon Project. The focus of this research project is to test several treatments to restore sagebrush, native bunchgrasses, and native forbs to land that was converted to non-native rhizomatous grass species to increase livestock forage. Land converted to non-native livestock forage at the Fox Hills Ranch is generally level to gentle terrain where equipment could be used. These areas of gentle terrain likely provided nesting, early brood habitat, winter habitat, and movement corridors between seasonal GRSG habitats. These land parcels are located in valley bottoms, often adjacent to stream floodplains/riparian areas which are important late summer brood habitat. Conversion of the sagebrush-native grass/forb habitat to non-native grasses created barriers to movements between the remaining breeding/winter habitat and late summer brood habitat. The research project will determine cost-effective techniques for rehabilitating these areas to productive GRSG habitat. The research is funded by Monsanto and will be conducted by Utah State University.

The study plots will result in approximately 320 acres of sagebrush-native grass/forb habitat that will connect summer brood habitat with late summer brood habitat and provide nesting and winter habitat in an area where these habitats are in limited availability.

The research project would also benefit GRSG by creating habitat and a connectivity or movement corridor between two GRSG seasonal habitats which would not only ensure no net loss to GRSG habitat per BLM's proposed policy direction (BLM 2018) but would ultimately provide a net conservation gain for GRSG consistent with current BLM policy (BLM 2015b).

2.4 NET CONSERVATION GAIN

At this time, the GRSG project to which P4 contributed-funds will be applied has not be identified; therefore, the following discussion assumes that the project will be in PHMA and will restore, create, enhance, and/or preserve habitat of high quality. The proposed compensatory mitigation consisting of the in-lieu fee contribution to the Idaho compensatory mitigation program at a 1:1 ratio of marginal habitat in GHMA to priority habitat in PHMA provides a net conservation gain (per BLM 2015b) due to the increased quality of the habitat restored, created, enhanced, and/or preserved in PHMA at the discretion of the program administrator.

In addition, over the 40-year life-of-mine, portions of 1,200 acres of summer/late summer brood habitat will be created through reclamation of the Caldwell Canyon Mine. This area will remain in the context of a mixture of shrubs and forested area, which would continue to make this marginal habitat, but it would be sufficiently large to allow GRSG to use this habitat and remain at distance to trees that are located on undisturbed areas adjacent to the mine pits. While this habitat creation may not meet the timeliness criteria for compensatory mitigation, and there are no legal assurances that the area will be maintained as summer / late summer brood habitat, the habitat will be created with public land portions of the reclaimed land remaining under BLM management. The value of this restored habitat would represent a long-term net conservation gain.

Similarly, the research project and habitat restoration associated with the research project does not meet the timeliness criteria for compensatory mitigation and P4 does not anticipate entering into a conservation easement at this time to ensure that restored habitat remains as GRSG habitat; however, information gained from this research project will facilitate restoration of additional GRSG habitat on private and public land where this method and technology can be implemented to restore connectivity in fragmented habitats and GRSG seasonal habitats. The 320 acres of habitat restored as a result of this project should also be included in the net-conservation gain calculation.

3.0 SUMMARY

As detailed in **Table 1**, the net conservation benefit is realized by the restoration/preservation of high quality habitat and the loss of marginal habitat at a 1:1 ratio; a net conservation benefit of higher quality habitat with assurance of long-term management. In addition, the reclaimed area will result in 485 ha (1,200 acres) of marginal habitat created at the Caldwell Mine site. The technology transfer as a result of the study funded by Monsanto and the 320 acres of restored habitat will also benefit GRSG.

Table 1: Net Conservation Benefit Summary

Acres of Habitat Impacted	14.6 ha	36.1 acres
Quality of Habitat Impacted	Marginal; GHMA	
Acres of Compensatory Mitigation	14.6 ha	36.1 acres
Quality of Habitat Preserved/Restored	High; PHMA	
Acres of Habitat Created by Reclamation	485 ha; Marginal; GHMA	1,200 acres

4.0 REFERENCES

BLM (US Department of Interior, Bureau of Land Management), 2015a. Idaho and Southwestern Montana Greater Sage-Grouse Proposed Land Use Plan Amendment/Final Environmental Impact Statement. June 2015

_____, **2015b**. Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment. Attachment I from the USDI 2015 Record of Decision and Approved Resource Management Plan Amendments for the Great Basin Region, Including the Greater Sage-Grouse Sub-Regions of Idaho and Southwestern Montana, Nevada, and Northeastern California, Oregon, and Utah. September 2015.

_____, **2018**. Idaho Greater Sage-Grouse Draft Resource Management Plan Amendment and Environmental Impact Statement. May 2018

NewFields Mining & Energy Services, L.L.C. (NewFields), 2015. Wildlife Baseline Technical Report, Caldwell Canyon Project. Prepared for P4 Production L.L.C., Soda Springs, Idaho. June 2016.

______, **2015.** Vegetation Baseline Technical Report, Caldwell Canyon Project. Prepared for P4 Production L.L.C., Soda Springs, Idaho. March 2016.

______, **2018.** Final Greater Sage-Grouse Habitat Assessment Technical Report, Caldwell Canyon Project. Prepared for P4 Production L.L.C., Soda Springs, Idaho. February 2018

P4 Production, L.L.C. (P4), 2017. Mine and Reclamation Plan – Caldwell Canyon Project. Revised March 2017.

Sage-Grouse Mitigation Subcommittee of the Idaho Sage-Grouse State Advisory Committee, 2010. Framework for Mitigation of Impacts From Infrastructure Projects on Sage-Grouse And Their Habitats. December 6, 2010. (*Appendix F, Idaho and Southwestern Montana ARMPA*).

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Stiver, S.J., E.T. Rinkes, D.E. Naugle, P.D. Makela, D.A. Nance, and J.W. Karl, eds, 2015. Sage-Grouse Habitat Assessment Framework: A Multiscale Assessment Tool. Technical Reference 6710-1. Bureau of Land Management and Western Association of Fish and Wildlife Agencies, Denver, Colorado.

Big Sky Acoustics
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Tel: (406) 457-0407 • Fax: (406) 442-1296
www.bigskyacoustics.com

September 7, 2018

Mr. Chris Leatherman
Bayer U.S. – Crop Science
P4 Production, LLC
PO Box 816
Soda Springs, Idaho 83276

Re: **Caldwell Canyon Project**
Environmental Noise Assessment
BSA Project #17127

Dear Chris:

Big Sky Acoustics (BSA) has completed the Environmental Noise Assessment for the Caldwell Canyon Project. This report summarizes the field measurements, the existing ambient noise levels and the estimated Project noise levels at the potential Dry Valley *2016* and *2017* leks. Comments received on the draft report were incorporated into this final version.

If you have any questions or comments, please do not hesitate to call (406) 457-0407 or email me at sean@bigskyacoustics.com.

Sincerely,

Sean Connolly

Sean Connolly
BIG SKY ACOUSTICS

CALDWELL CANYON PROJECT
ENVIRONMENTAL NOISE ASSESSMENT

P4 Production, LLC
PO Box 816
Soda Springs, Idaho 83276

Completed by:

Big Sky Acoustics

September 7, 2018

TABLE OF CONTENTS

1.0 INTRODUCTION

P4 Production, LLC, a subsidiary of Bayer U.S. is proposing an open pit phosphate mine and associated facilities at Caldwell Canyon in Caribou County, northeast of Soda Springs, Idaho (**Figure 1**) (attached). The Caldwell Canyon Project is located along Schmid Ridge, and accessed via Highway 34 to Blackfoot River Road then Dry Valley Road. An existing rail line parallels the roads and would be used to transport ore from the East Caldwell Area (i.e., Agrium's inactive Dry Valley Mine site) to Monsanto's Soda Springs processing plant.

The Project would develop the North and South pits, using a pit panel mining method, over an estimated 40-year period. Haul roads would be constructed from the mine east through Caldwell Canyon to the ore stockpile, and to the Agrium inactive Dry Valley Mine pit for initial overburden backfilling for the first few year of mine operations (**Figure 1**). The primary pit mine equipment would be diesel-powered heavy-equipment trucks, track-mounted excavators, bulldozers and front-end loaders. Drill and prill trucks would also be used for drill and blast operations. Haul trucks would transport the ore to the East Caldwell Area, where the associated conveyor, hoppers, feeders, screening, sizing and tipple (rail loading) equipment would be located (P4 Production 2017).

Two potential greater sage-grouse leks (*2016* and *2017*) were identified by BLM in Dry Valley northwest of the East Caldwell Area, and east of the existing Dry Valley Road and Union Pacific rail line (**Figure 1**). Big Sky Acoustics (BSA) was contracted to complete an environmental noise assessment to determine the estimated Project noise at the potential leks. This report details the methodology, noise level measurements, existing ambient noise levels, and estimated equipment noise levels at the potential Dry Valley *2016* and *2017* leks.

2.0 NOISE TERMINOLOGY

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration. Response to noise on wildlife is a function of many variables, including characteristics and duration of the noise; habitat, season, previous noise exposure, etc. Different species have different levels of noise tolerance, habituation, and displacement.

Noise levels are quantified using units of decibels (dB). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz [Hz]). Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography blocks the line of sight between the source and receptor.

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain time period. The L_{eq} metric is useful because it uses a single number, similar to an average, to describe the constantly fluctuating instantaneous noise levels at a receptor location.

The 90th percentile-exceeded noise level, L_{90}, is typically considered the ambient noise level. The L_{90} is a single number that represents the noise level exceeded during 90 percent of a measurement period. Therefore, it is also an indication of the residual noise level, and among the lowest noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as bird chirps, backup alarms, vehicle pass-bys, a single blast, etc. If a continuous noise is audible at a measurement location, such as an engine, typically it is that noise that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment.

The 50th percentile-exceeded noise level, L_{50}, is a metric that represents the single noise level exceeded during 50 percent of a measurement period. The L_{50} is the median noise level during a period of time. Therefore, if the L_{50} during a 1-hour period is 60 dBA, half of the constantly-fluctuating, instantaneous noise levels are greater than 60 dBA, and half are less than 60 dBA. Noises with a duration of less than 30 minutes during a 1-hour period will have little influence on the L_{50} metric for that hour, no matter how loud the noise is.

The L_{max} metric denotes the maximum instantaneous sound level recorded during a measurement period. The quantitative measure of the noise exposure for single noise events is the Sound Exposure Level (SEL). The exposure represents the total amount of sound energy during a train pass-by (FTA 2006).

3.0 GREATER SAGE-GROUSE NOISE REVIEW

In December 2011, the U.S. Department of Interior invited 11 western states (including Idaho), impacted by a potential Endangered Species Act (ESA) listing of the greater sage-grouse, to develop state-specific conservation plans to conserve the species and its habitat while maintaining predictable levels of land use. Executive Order 2015-04 adopted Idaho’s Sage-grouse Management Plan creating three Habitat Zones (Core (CHZ), Important (IHZ) and General (GHZ)), as well as population objectives, conservation areas, and lek buffers, to enable development that maintains populations, habitats and essential migration routes (State of Idaho 2015).

In September 2015, the Bureau of Land Management (BLM) Idaho office prepared the *Approved Resource Management Plan Amendment* (ARMPA) that limits:

> *“No repeated or sustained behavioral disturbance, e.g., visual, noise over 10 dBA* (L_{50}) *at lek, etc., to lekking birds from 6:00 pm to 9:00 am within 2 miles of leks during lekking season”* (March 1 – May 15). [both parentheses inferred]

The Idaho State Board of Land Commissioners (ISBLC) updated the *Greater Sage-Grouse Conservation Plan* in October 2017. Regarding mining or infrastructure development on state endowment lands:

> *"Limit noise levels from discretionary activities within Core and Important Habitat Zones to not less than 10 decibels above ambient sound levels (typically 20-24 dBA) at occupied leks from 2 hours before sunset to 2 hours after sunrise during breeding season. Ambient noise levels will be determined by measurements taken at the perimeter of an occupied lek at sunrise."*

Note: The potential Dry Valley *2016* and *2017* leks are not located in Core or Important Habitat Zones.

4.0 EXISTING NOISE ENVIRONMENT

Existing man-made noise sources within 3 miles of the Project include intermittent traffic on paved and gravel roads, mining, intermittent train activity, rural residential activities, recreational vehicles and aircraft flyovers. Natural sound sources include wind, precipitation wildlife, birds, insects, livestock (seasonal) and water flowing in area creeks.

As shown of **Figure 1**, the potential Dry Valley *2016* and *2017* leks are generally located east of Dry Valley Road and the Union Pacific rail line, northeast of the North and South pits, and northwest of the East Caldwell Area. **Table 4-1** list the distances to the potential leks from the primary Project noise source areas.

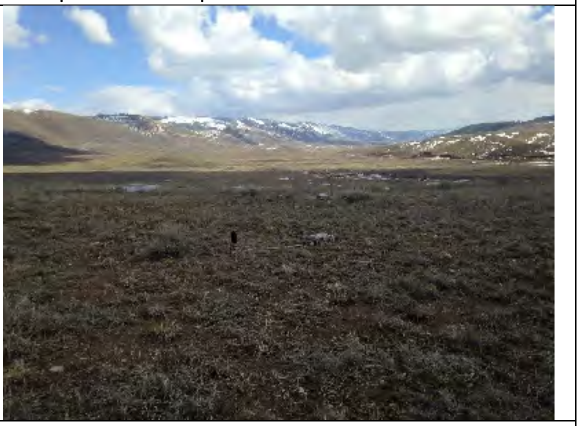
Table 4-1: Potential Dry Valley Lek Distances from Project Noise Sources

Location of Noise Source (Figure 1)	Potential Dry Valley *2016* Lek	Potential Dry Valley *2017* Lek
East Caldwell Area		
Closest point to Union Pacific rail line:	0.48 mi (2,560 ft)	0.31 mi (1,650 ft)
Closest point to Dry Valley Road:	0.49 mi (2,590 ft)	0.32 mi (1,690 ft)
Dry Valley Road/Mine Spur railroad crossing:	2.34 mi (12,330 ft)	1.37 mi (7,210 ft)
Ore Loading operations (sizer and tipple):	2.71 mi (14,330 ft)	1.74 mi (9,787 ft)
Caldwell Canyon Mine Area		
Closest point to North Pit:	1.13 mi (5,970 ft)	1.54 mi (8,130 ft)
Closest point to South Pit:	2.86 mi (15,080 ft)	2.46 mi (12,970 ft)

4.1 Noise Level Measurements

In April and May 2018, BSA completed baseline ambient noise level measurements to quantify the existing noise levels at the BLM-identified potential *2016* and *2017* leks. BSA used Larson Davis Model 831 Type I Sound Level Meters with preamplifiers, and 0.5-inch diameter microphones for the measurements, and data was field-stored on thumb-drives. The meters were calibrated prior to and after the measurement periods using a Larson Davis CAL200 Acoustical Calibrator. The sound level meters were set to "fast" response with a windscreen over the microphones, camouflaged, and set at approximately 1-foot above the ground surface. A meteorological station was also camouflaged and placed near the *2017* meter to provide continuous temperature, humidity, wind speed and direction during the measurements. The meters were located at the perimeters of the leks, locked and unattended during the 7-day periods. **Table 4-2** documents the measurement locations and field equipment. *Note that no greater sage-grouse, or evidence of greater sage-grouse (e.g., feathers, droppings, etc.) were observed by BSA at the measurement locations.*

Table 4-2: Potential Dry Valley *2016* and *2017* Lek Measurement Locations

	
Potential *2017* Lek – May 2, 2018, looking southwest at Dry Valley Road and Schmid Ridge. Coordinates: 42.76941, -111.34306	**Potential *2017* Lek – May 9, 2018**, looking east at the sound level meter camouflaged case and microphone at lek perimeter.
	
Potential *2017* Lek – May 21, 2018, looking east at the weather station. Coordinates: 42.76944, -111.34375	**Potential *2016* Lek – April 23, 2018**, looking southwest at Dry Valley Road and the East Caldwell Area. Coordinates: 42.77644, -111.35939

The measurements were conducted according to the American National Standards Institute (ANSI) Standard S12.18-1994 (R2009), *Procedures for Outdoor Measurement of Sound Pressure Level*. Noise measurements recorded the 1/3 octave band frequency spectra (31.5 to 8000 Hz) of measured ambient noise levels (L_{10}, L_{50}, L_{90}, L_{eq}, and L_{max} metrics) to determine the influence of individual noise sources, such as aircraft, vehicles, distant trains and mining equipment, insects, wind, wildlife, birds, precipitation, etc., on the measured levels at the potential *2016* and *2017* leks. The noise levels were measured in 1-second and 1-hour increments, and unweighted, A-weighted and C-weighted data were collected. The sound level meters recorded audio clips during high noise events and for 30-seconds on the hour, which were reviewed by BSA to identify noise sources.

BSA’s field measurements followed the recommended protocol in *Review of Sound Level Measurements in Wyoming Relative to Greater Sage-grouse and Recommended Protocol for Future Measurements* (Ambrose and MacDonald 2015) with the following exception:

BSA’s Procedure	Recommended Protocol	Rationale for Deviation
Record high-level (including adjacent) audio events, and once every hour	Continuous digital recordings	Recording high-level events verifies individual noise sources without filling the meter memory too quickly. This procedure does not require daily download of the data and does not disturb the lek or birds during the 7-day measurement periods.

4.2 Data Results

BSA set up the field equipment at both the *2016* and *2017* potential leks on April 23rd to measure for a 7-day period from April 23-30, 2018. The data was field-stored on thumb-drives and unfortunately the devices were corrupted, which primarily affected the data storage at the *2017* potential lek location. Therefore, the sound level meter and weather station were re-set at the potential *2017* lek on May 1-8, 2018, and again on May 21-29, 2018 with a new thumb-drive once the storage problem was verified. The stored data was downloaded, plotted graphically and the L_{max} and hourly noise level recordings were reviewed by BSA for all the dates (complete and partial 7-day periods) with data. The L_{max}, L_{eq}, L_{50} and L_{90} data results are presented graphically with identified noise sources for the potential *2016* and *2017* leks in **Appendices A and B**, respectively, and the weather data is included in **Appendix C**.

The collected data is summarized in **Table 4-3** on the following page. BSA excluded periods of inclement weather, including high wind, rain and thunder events, from the summarized data sets (**Appendix C**). From all the measurement dates and times, the existing median L_{90} ambient sound levels at the potential Dry Valley *2016* and *2017* leks were L_{90} 19 dBA and L_{90} 17 dBA, respectively. For comparison to the ARMPA and ISBLC timing restrictions (**Section 3.0**), the measured L_{90} ambient noise levels between 1800 and 0900 hours were L_{90} 19 dBA at the potential *2016* lek, and L_{90} 16 dBA at the potential *2017* lek, and these values were used for BSA’s analysis (**Section 5**). These noise levels are typical for sparsely populated, rural locations that are predominantly natural (Harris 1998).

Table 4-3: Summary of Measured Ambient Noise Levels

Dates	Time (hours)	L_{eq} (range) (dBA)	L_{50} (range) (dBA)	L_{90} (range) (dBA)	Median L_{90} (dBA)	Identified Noise Sources
Potential *2016* Lek						
4/23–30/2018	1800 to 0900	17 to 55	16 to 31	16 to 26	19	Appendix A, Figures A-1 through A-7
	24-hour	17 to 55	16 to 37	16 to 26	19	
Potential *2017* Lek						
4/27–28/2018	1800 to 0900	16 to 43	15 to 24	15 to 19	17	Appendix B, Figures B-1 and B-2
	24-hour	16 to 43	15 to 28	15 to 23	17	
5/6–7/2018	1800 to 0900	16 to 41	16 to 29	16 to 23	17	Appendix B, Figures B-3 and B-4
	24-hour	16 to 41	16 to 29	16 to 23	18	
5/21–29/2018	1800 to 0900	16 to 51	15 to 35	15 to 24	16	Appendix B, Figures B-5 through B-13
	24-hour	16 to 51	15 to 35	15 to 24	17	
All the above *2017* measurement dates	**1800 to 0900**	**16 to 51**	**15 to 35**	**15 to 24**	**16**	Appendix B, Figures B-1 through B-13
	24-hour	**16 to 51**	**15 to 35**	**15 to 24**	**17**	

Note: Periods of inclement weather, including high wind, rain and thunder events were excluded from the summarized data sets.

Appendix A includes the potential Dry Valley *2016* lek noise level measurement data collected on April 23-30, 2018. (Note that no data was collected on April 27, 2018 due to the corrupted thumb-drive.) As shown on **Appendix A**, **Figures A-1 through A-7**, the primary natural noise sources recorded were songbirds, frogs, geese, rain, wind, coyotes, crickets, other insects, wind and rain. *Note that no greater sage-grouse (i.e., breeding, strutting or otherwise) were recorded by the microphone at the 2016 potential lek.* Primary man-made noise sources recorded were commercial jets, propeller planes, diesel engines and industrial “drones”, “hums” and “rumbles” (possibly from the mine located north of the *2016* lek), as well as locomotives and train horns.

Appendix B includes the potential Dry Valley *2017* lek noise level measurement data collected on April 27-28, May 6-7 and May 21-29, 2018. As shown on **Appendix B**, **Figures B-1 through B-13**, the primary natural noise sources recorded were songbirds, crows, frogs, flies, coyotes, crickets, rodents, rain, thunder and wind. *Note that no greater sage-grouse (i.e., breeding, strutting or otherwise) were recorded by the microphone at the 2017 potential lek.* Primary man-made noise sources recorded were commercial jets, propeller planes, trucks, diesel engines and industrial “rumbles” (possibly from the mine located north of the *2017* lek), as well as ATVs and vehicle pass-bys on Dry Valley Road.

5.0 NOISE LEVEL PREDICTIONS

BSA predicted the Project construction, reclamation and operation noise levels using the Cadna-A Version 2017 noise prediction software from DataKustik. Cadna-A uses algorithms from the International Organization for Standardization Standard 9613-2, *Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation* (ISO 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers. Aerial photograph, topographic, google earth elevations of the Agrium reclaimed tailings and mine plan data were input into the model.

Calculations per ISO 9613-2 conservatively assume that atmospheric conditions are favorable for noise propagation, but atmospheric conditions can vary dramatically at large distances between a noise source and a receptor. Therefore, the estimated noise levels should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris 1998). Favorable atmospheric conditions for noise propagation mean that a light wind is blowing from a source to a receptor and a well-developed temperature inversion is in place, which is typical for the time between 2 hours after sunset until 2 hours after sunrise.

5.1 Noise Data Assumptions

The assumptions used for the noise calculations for the Project construction, reclamation and operation activities are summarized in **Table 5-1** on the next page. The noise predictions are based on the conservative assumption that the listed equipment and operations per area/phase and time of day/night are operating simultaneously.

Table 5-1: Summary of Noise Data Assumptions

Noise Source	Data Assumptions
East Caldwell Area	
Construction or Reclamation of lower East Caldwell and Dry Valley Pit Haul Roads	• 2 pieces of diesel-powered equipment operating simultaneously • L_{max} 85 dBA at 50 feet • Construction during daytime/daylight hours only
Hauling Mine Overburden to Dry Valley Pit (Years 1-3)	• CAT 777D dump truck or 100-ton Komatsu haul truck – L_{max} 90 dBA at 50 feet • Average speed, 20 mph • 16 roundtrips per hour (32 pass-bys) • Hauling 24 hours/day, 7 days/week
Hauling Ore to Tipple	• CAT 777D dump truck or 100-ton Komatsu haul truck – L_{max} 90 dBA at 50 feet • Average speed, 20 mph • 14 roundtrips per hour (28 pass-bys) • Hauling 24 hours/day, 7 days/week (intermittent)
Ore Loading Operations	• Tipple (and associated equipment) – L_{eq} 76 dBA at 65 feet • Sizer (and associated equipment) – L_{eq} 76 dBA at 115 feet • 2 CAT D10 class loaders – L_{max} 85 dBA at 50 feet • Rail yard and coupling – SEL 118 dBA at 50 ft (20 train movements per hour) • Intermittent 5 days/week (Monday – Friday)
Ore Transport Train Pass-by	• 6 locomotives per train – SEL 92 dBA at 50 feet each • 130 rail cars per train – SEL 82 dBA at 50 feet each • Train speed – 25 mph • Crossings at Dry Valley Road/mine spur and Slug Creek Road • Train horn sounds 15 seconds before crossing – SEL 113 dBA at 50 feet • 2 trains per 24 hours (0030 and 1530 hours), 5 days/week (Monday – Friday)
Project Traffic Pass-bys on Dry Valley Road	• Dayshift from 0430 to 1530 hours, Nightshift from 1600 to 0300 hours, 7 days/week • Dayshift: # of light vehicles per day=105, # of heavy trucks per day=14 (maximum hour: 1500-1600, 30 light vehicles and 2 heavy trucks) • Nightshift: # of light vehicles per night=55, # of heavy trucks per night=4 (maximum hour: 0300-0400 14 light vehicles and 0 heavy trucks)
Caldwell Canyon Mine Rim	
Construction, Operations or Reclamation of South or North Pits (Years 1-40)	• 18 pieces of diesel-powered equipment operating simultaneously (2 shovels, 4 D10 dozers, 10 Cat 777D trucks, 1 motor grader and 1 water truck mining & dumping in waste pit) – L_{max} 85 dBA at 50 feet • Mining and backfilling occurring simultaneously • 24 hours/day, 7 days/week • Noise sources at existing grade to simulate worst-case conditions (i.e. start of pit or end of reclamation). Proceeding down into pits = minus 5 dBA if line-of-sight is blocked to potential leks and minus 20 dBA when at bottom of pits.

Sources: FTA 2006, Monsanto 2018a, 2018b, P4 Productions 2017

5.2 East Caldwell Area

A comparison between Project L_{50} noise levels and estimated existing ambient L_{90} noise levels can help determine noise impacts to greater sage-grouse that live, forage or breed in the area (Ambrose 2015, Patricelli 2013). As shown in **Table 4-1**, the potential *2016* and *2017* Dry Valley leks are located 0.48 to 2.71 miles and 0.31 to 1.74 miles, respectively, from the East Caldwell Area noise sources (**Figure 1**).

Table 5-2 summarizes the predicted construction, reclamation and operation L_{50} median noise levels for equipment operating in the East Caldwell Area, for comparison to the Idaho guidelines discussed in **Section 3.0** (BLM 2015, ISBLC 2017). The noise level calculations are based on the data assumptions listed in **Table 5-1** and modeled using the Cadna-A noise modeling software discussed in **Section 5.0**. Noise levels were predicted for the loudest noise sources per phase.

As shown in **Table 5-2**, on the next page, the increase in noise levels are predicted to be less than 10 dBA for most of the noise sources in the East Caldwell Area, except when the sizer associated with the ore loading operations is operating (**Table 5-1**). The sizer is predicted to increase +11 dBA above the ambient noise level at the *2017* potential lek during lekking hours (1800 to 0900 hours).

Table 5-2: Dry Valley Environmental Noise Level Predictions East Caldwell Area

Noise Source	Closest Distance and Direction to Potential Lek	Estimated Existing Noise Level 1800 to 0900 hrs (L_{90} dBA)	Cadna-A Predicted Project Noise Level (L_{50} dBA)	Project L_{50} vs. Estimated Existing L_{90}	Greater than +10 L_{50} dBA Guideline (Section 3.0)
Potential Dry Valley *2016* Lek					
Construction or Reclamation of lower East Caldwell Haul Road	2.31 mi N	19	16 to 23	-3 to +4	No
Construction or Reclamation of Dry Valley Pit Haul Road	2.82 mi NW	19	13 to 23	-6 to +4	No
Hauling Mine Overburden to Dry Valley Pit (Years 1-3)	2.31 mi NW	19	23	+4	No
Hauling Ore to Tipple	2.31 mi N	19	20	+1	No
Ore Loading Operations – with sizer	2.71 mi NW	19	24	+5	No
Ore Loading Operations – without sizer	2.71 mi NW	19	21	+2	No
Horn at Dry Valley Road/Mine Spur Railroad Crossing	2.34 mi NW	19	19	0	No
Ore Transport Train Pass-by	0.48 mi E	19	20	+1	No
Project Traffic Pass-bys on Dry Valley Road	0.49 mi E	19	21	+2	No
Potential Dry Valley *2017* Lek					
Construction or Reclamation of lower East Caldwell Haul Road	1.49 mi N	16	14 to 26	-2 to +10	No
Construction or Reclamation of Dry Valley Pit Haul Road	1.93 mi NW	16	12 to 26	-4 to +10	No
Hauling Mine Overburden to Dry Valley Pit (Years 1-3)	1.49 mi NW	16	26	+10	No
Hauling Ore to Tipple	1.49 mi N	16	17	+1	No
Ore Loading Operations – with sizer	1.74 mi NW	16	27	+11	Yes
Ore Loading Operations – without sizer	1.74 mi NW	16	23	+7	No
Horn at Dry Valley Road/Mine Spur Railroad Crossing	1.37 mi NW	16	16	0	No
Ore Transport Train Pass-by	0.31 mi E	16	17	+1	No
Project Traffic Pass-bys on Dry Valley Road	0.32 mi E	16	20	+4	No

Note: As shown on **Table 4-3**, the ambient noise levels are 19 dBA at the potential *2016* lek and 16 dBA at the potential *2017* lek measured during 1800 to 0900 hours.

Because the sizer is loud and may operate continuously during the daytime hours and intermittent during the nighttime hours, it has a significant influence on the L_{50} noise levels at the potential leks. An example of the influence of the sizer is shown on **Figures 5-1 and 5-2**. Each figure shows how the noise level changes over time during a 1-hour period.

Figure 5-1 represents the noise of a train as it passes by the potential *2017* lek without the sizer operating, returning unloaded to the East Caldwell Area (**Table 5-1**). As shown, the maximum noise level during the pass-by is L_{max} 51 dBA, but the L_{50} is 17 dBA (without the sizer operating), which is barely over the existing ambient noise level of L_{90} 16 dBA (**Table 5-2**).

Figure 5-1: Noise Level vs. Time for Train Pass-By without the Sizer Operating

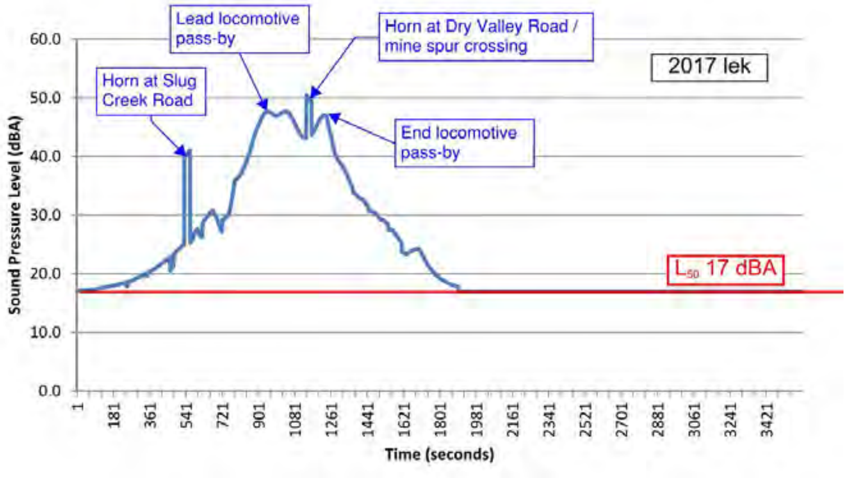
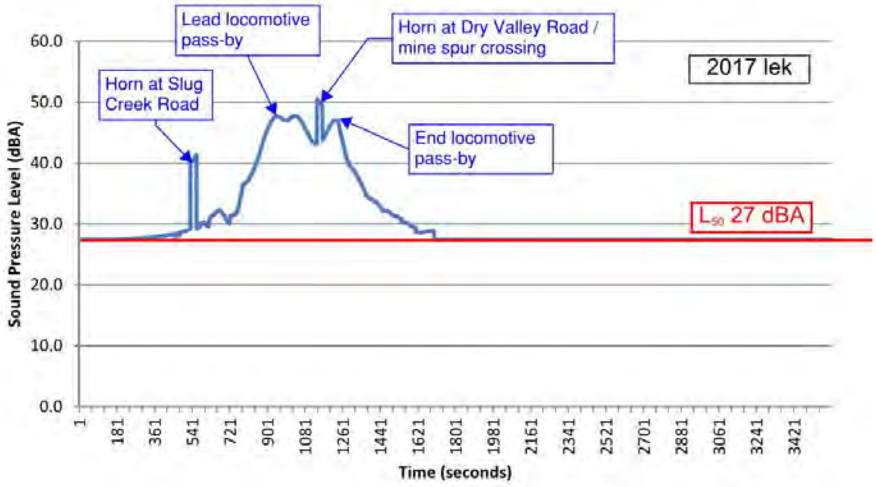


Figure 5-2 represents the noise of a train as it passes by the potential *2017* lek when the sizer is operating, leaving the East Caldwell Area loaded to the Monsanto's Processing Plant in Soda Springs. As shown, the maximum noise level during the pass-by remains the same L_{max} 51 dBA, but the L_{50} would be 27 dBA due to the continuous operation of the sizer, since it is constant during the entire 1-hour period.

Figure 5-2: Noise Level vs. Time for Train Pass-By with the Sizer Operating



5.3 Caldwell Canyon Mine – North and South Pit Rims

As shown in **Table 4-1**, the potential *2016* and *2017* Dry Valley leks are located 1.13 miles and 1.54 miles east, respectively to the closest point to the North Pit rim, and 2.86 miles and 2.46 miles northeast, respectively to the closest point to the South Pit rim (**Figure 1**).

Table 5-3 summarizes the predicted construction, reclamation and operation L_{50} median noise levels for the mine equipment for comparison to the Idaho guidelines discussed in **Section 3.0** (BLM 2015, ISBLC 2017). The noise level calculations are based on the data assumptions listed in **Table 5-1** and modeled using the Cadna-A noise modeling software discussed in **Section 5.0**. Noise Levels were predicted for the loudest equipment per phase, when the mine equipment is operating on or near the North or South pit rims (i.e., not blocked by the headwall).

Table 5-3: Dry Valley Environmental Noise Level Predictions
Caldwell Canyon Mine Rim

Noise Source (Figure 1)	Estimated Existing Noise Level 1800 to 0900 hrs (L_{90} dBA)	Cadna-A Predicted Project Noise Level (L_{50} dBA)[1]	Project L_{50} vs. Estimated Existing L_{90}[1]	Greater than +10 L_{50} dBA Guideline (Section 3.0)
Potential Dry Valley *2016* Lek				
South Pit – Years 1-3	19	0 to 20	-19 to +1	No
South Pit – Years 4-6	19	0 to 19	-19 to +0	No
South Pit – Years 7-9	19	0 to 18	-19 to -1	No
South Pit – Years 10-12	19	0 to 20	-19 to 0	No
South Pit – Years 13-15	19	3 to 23	-16 to +4	No
South and North Pits – Years 16-19	19	6 to 26	-15 to +7	No
North Pit – Years 20-24	19	11 to 31	-8 to +12	Yes[2]
North Pit – Years 26-31	19	15 to 35	-4 to +16	Yes[2]
North Pit – Years 33-36	19	16 to 36	-3 to +17	Yes[2]
North Pit – Years 37-40	19	18 to 38	-1 to +19	Yes[2]
Potential Dry Valley *2017* Lek				
South Pit – Years 1-3	16	1 to 21	-15 to +6	No
South Pit – Years 4-6	16	0 to 20	-16 to +4	No
South Pit – Years 7-9	16	0 to 19	-16 to +3	No
South Pit – Years 10-12	16	3 to 23	-13 to +7	No
South Pit – Years 13-15	16	3 to 23	-12 to +8	No
South and North Pits – Years 16-19	16	4 to 24	-9 to +11	Yes[2]
North Pit – Years 20-24	16	7 to 27	-7 to +13	Yes[2]
North Pit – Years 26-31	16	9 to 29	-3 to +17	Yes[2]
North Pit – Years 33-36	16	13 to 33	-3 to +17	Yes[2]
North Pit – Years 37-40	16	12 to 32	-4 to +16	Yes[2]

Notes:

[1] Range represents equipment at bottom of pits to worst-case if equipment at existing grade (at start of pit or end of reclamation).

[2] Predicted to exceed +10 dBA only when equipment is at existing grade (i.e., top of pit).

The predicted noise levels shown in **Table 5-3** represent the predicted noise levels when the equipment is operating at or near the existing grade (i.e., top of pit). This would occur at the start of mining in a certain area, and when reclamation and backfilling in an area is nearly complete (**Figure 1**).

The results indicate that mining operations in the South Pit are not predicted to exceed a 10 dBA increase at the potential leks during Years 1-15. As the operations move into the North Pit (Years 16-40), the noise levels are predicted to increase to greater than 10 dBA at both potential leks when the equipment is at or near the rim. However, when most of the mining equipment and operations are located down and within the pit, the noise levels are predicted to be less than the existing ambient noise levels as the barrier effect of the headwall is more pronounced.

Reasonable best management practices could be implemented to reduce the Project noise levels, and BSA could evaluate noise mitigation measures. However, even if best management practices are implemented, some Project noise sources will still be audible at the potential leks.

6.0 REFERENCES

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Patricelli, G.L., J.L. Blickley, and S.L. Hooper. 2013. *Recommended management strategies to limit anthropogenic noise impacts on greater sage-grouse in Wyoming.* Human - Wildlife Interactions; Logan Vol. 7, Iss. 2, (Fall 2013): 230-249.

P4 Production, LLC. 2017. Mine and Reclamation Plan, Caldwell Canyon Project.

State of Idaho. 2015. Executive Order No. 2015-04, Adopting Idaho's Sage-Grouse Management Plan.

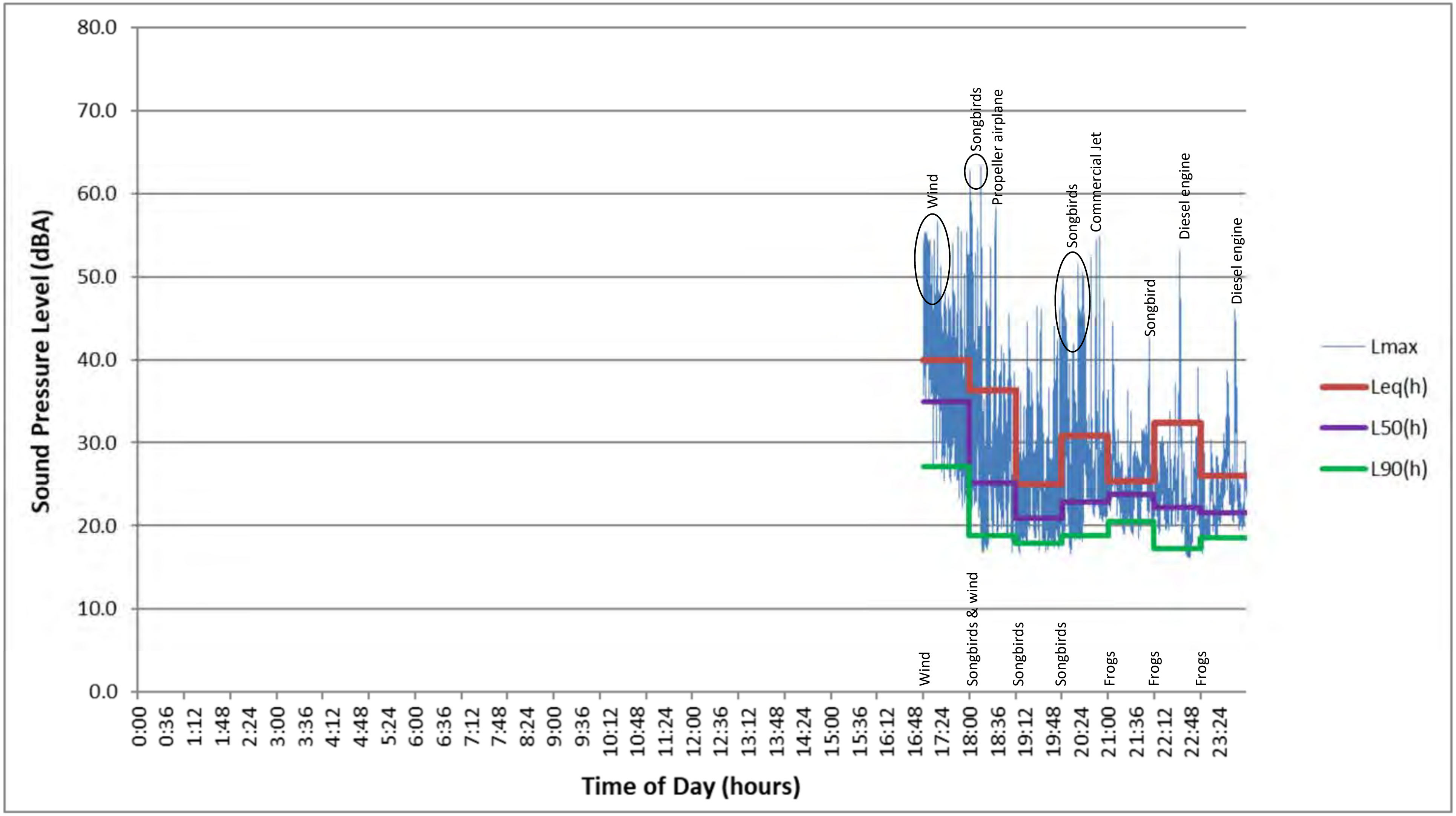
7.0 STANDARD OF CARE

To complete this report, BSA has endeavored to perform its services consistent with the professional skill and care ordinarily provided by acoustical consultants practicing in similar markets and under similar project conditions. BSA is fully experienced and properly qualified to perform acoustical consulting services. However, acoustical consulting services as offered and engaged in by BSA does not include "engineering" or "practice of engineering" or the "practice or offer to practice engineering" as these phrases are defined under Montana law.

BSA makes no warranty, either expressed or implied, as to the professional services it has rendered to complete this report. For the completion of this report, BSA has used data provided by Bayer U.S. (Monsanto) and Newfields in performing its services and is entitled to rely upon the accuracy and completeness thereof. Therefore, if the information and assumptions used to create this report change, then the noise analysis and the recommended noise control measures will need to be reevaluated.

Appendix A

Potential *2016* Dry Valley Lek Noise Level Measurement Data



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: April 23-30, 2018.

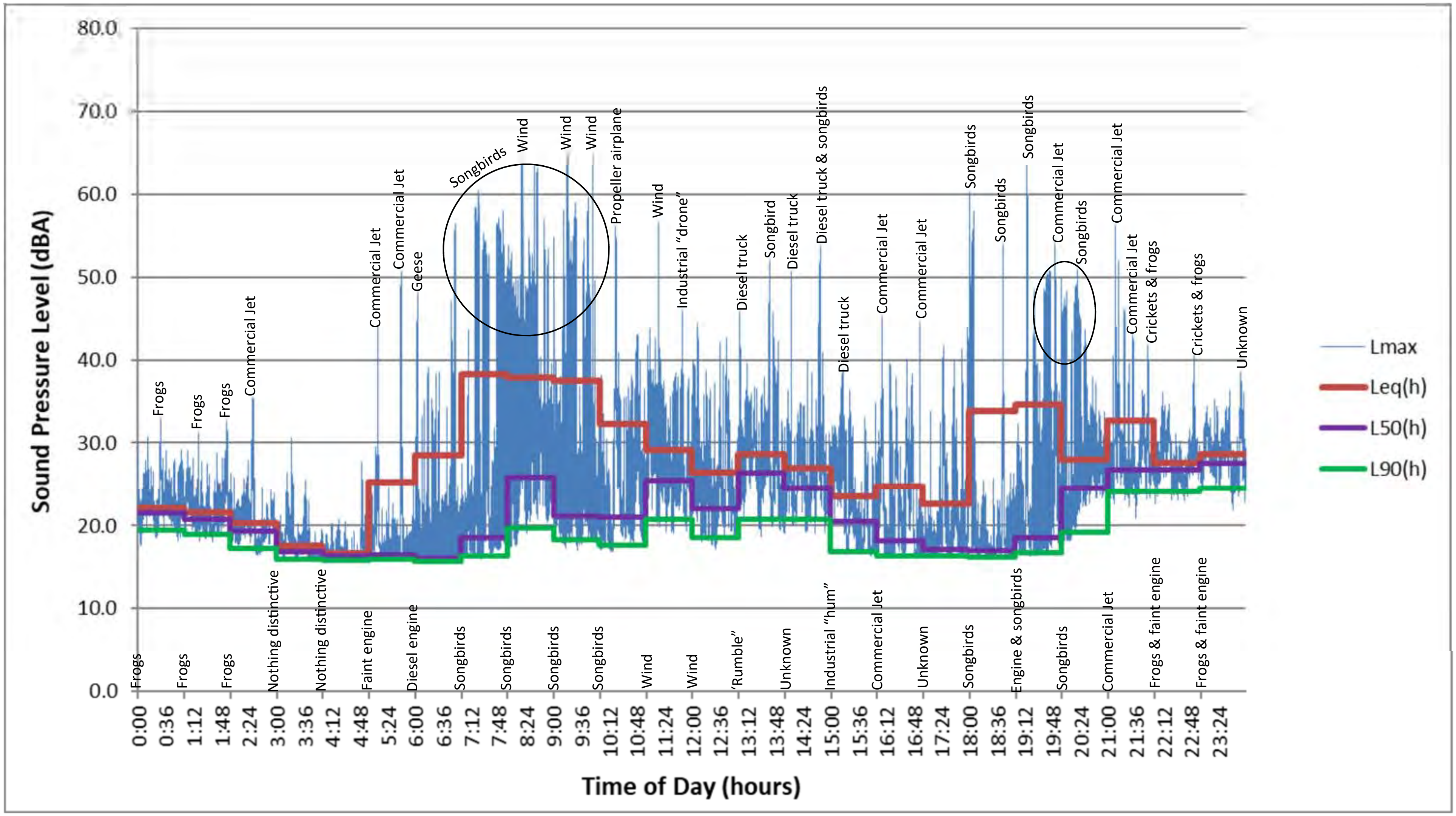
Big Sky Acoustics

FIGURE A-1

Potential *2016* Lek

Ambient Noise Measurement: April 23, 2018

Caldwell Canyon Project

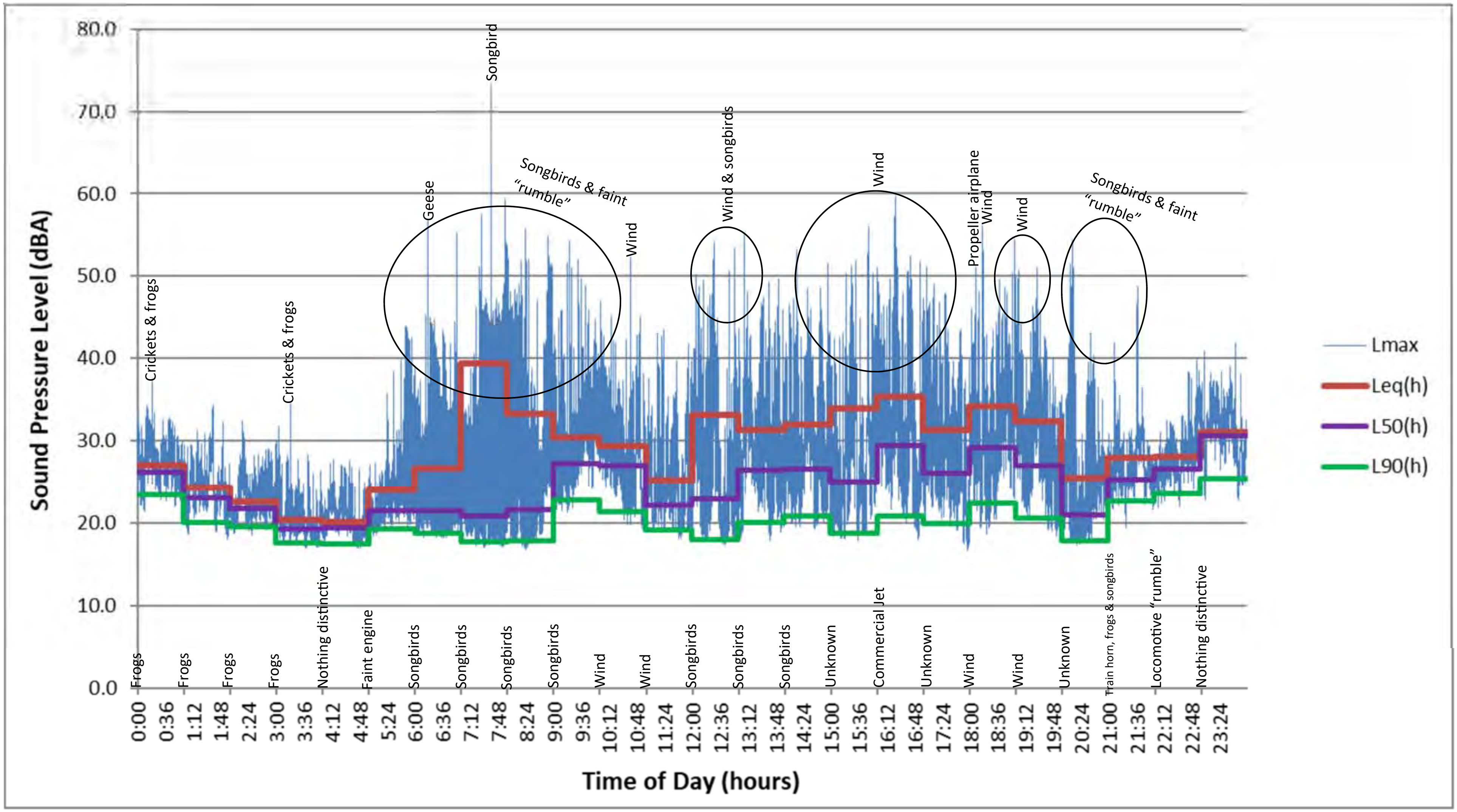


Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: April 23-30, 2018.

Big Sky Acoustics

FIGURE A-2

Potential *2016* Lek
Ambient Noise Measurement: April 24, 2018
Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: April 23-30, 2018.

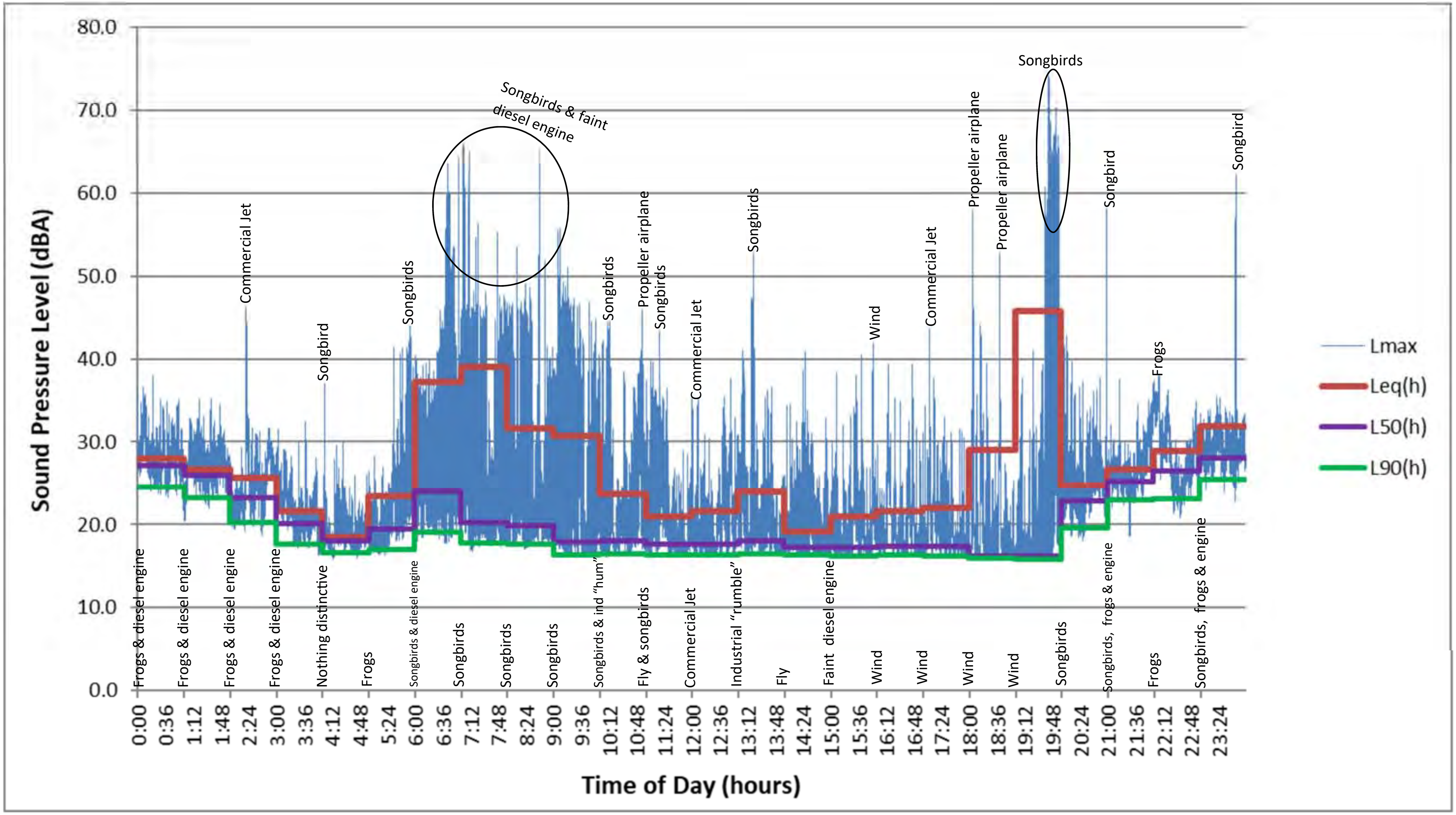
Big Sky Acoustics

FIGURE A-3

Potential *2016* Lek

Ambient Noise Measurement: April 25, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. No data was recorded on the following day (April 27th) due to a corrupted thumb drive. Measurement period: April 23-30, 2018.

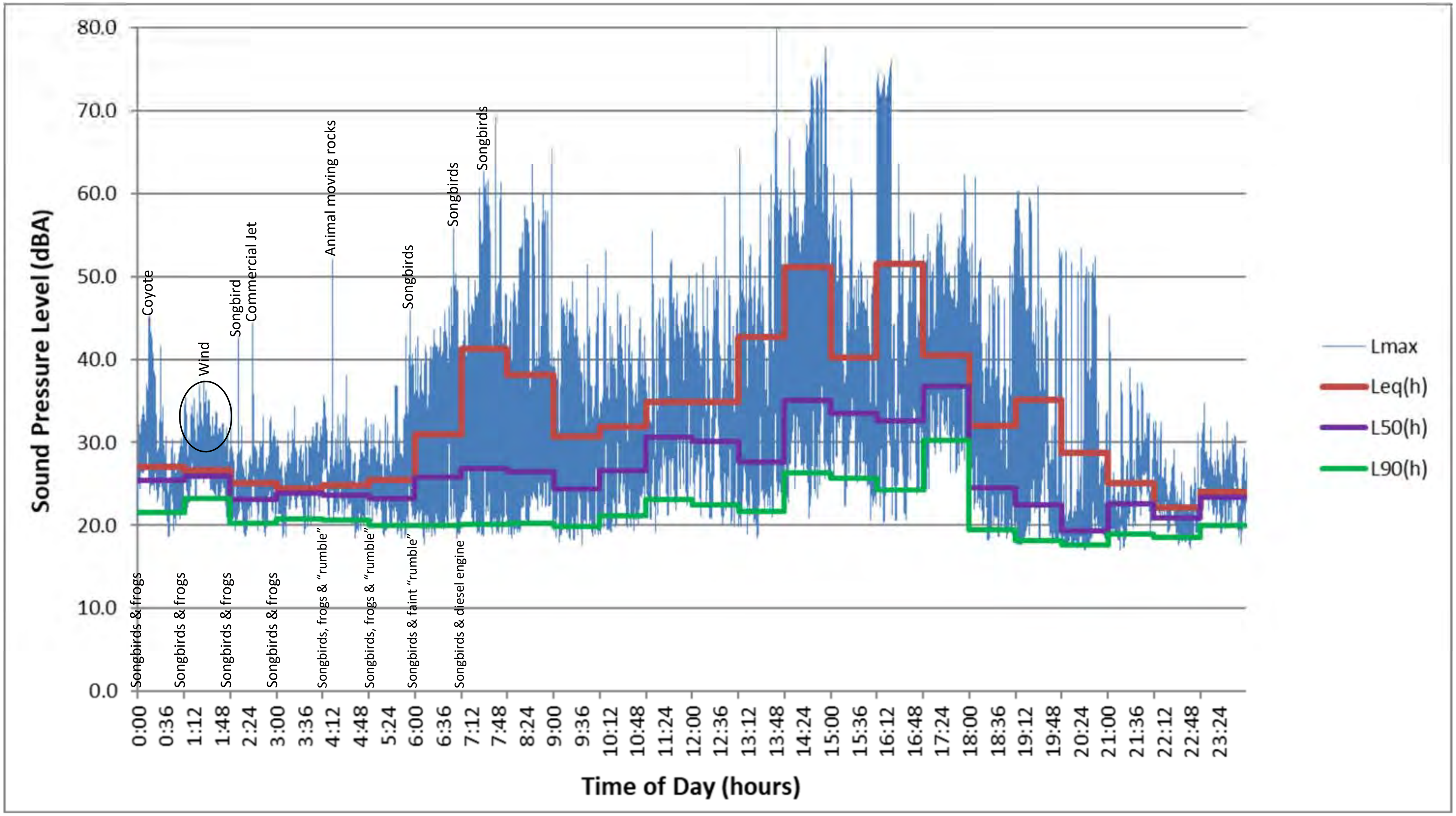
Big Sky Acoustics

FIGURE A-4

Potential *2016* Lek

Ambient Noise Measurement: April 26, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. From 0733 to 2359 the SLM recorded data but audio files could not be reviewed due to a corrupted thumb drive. Measurement period: April 23-30, 2018.

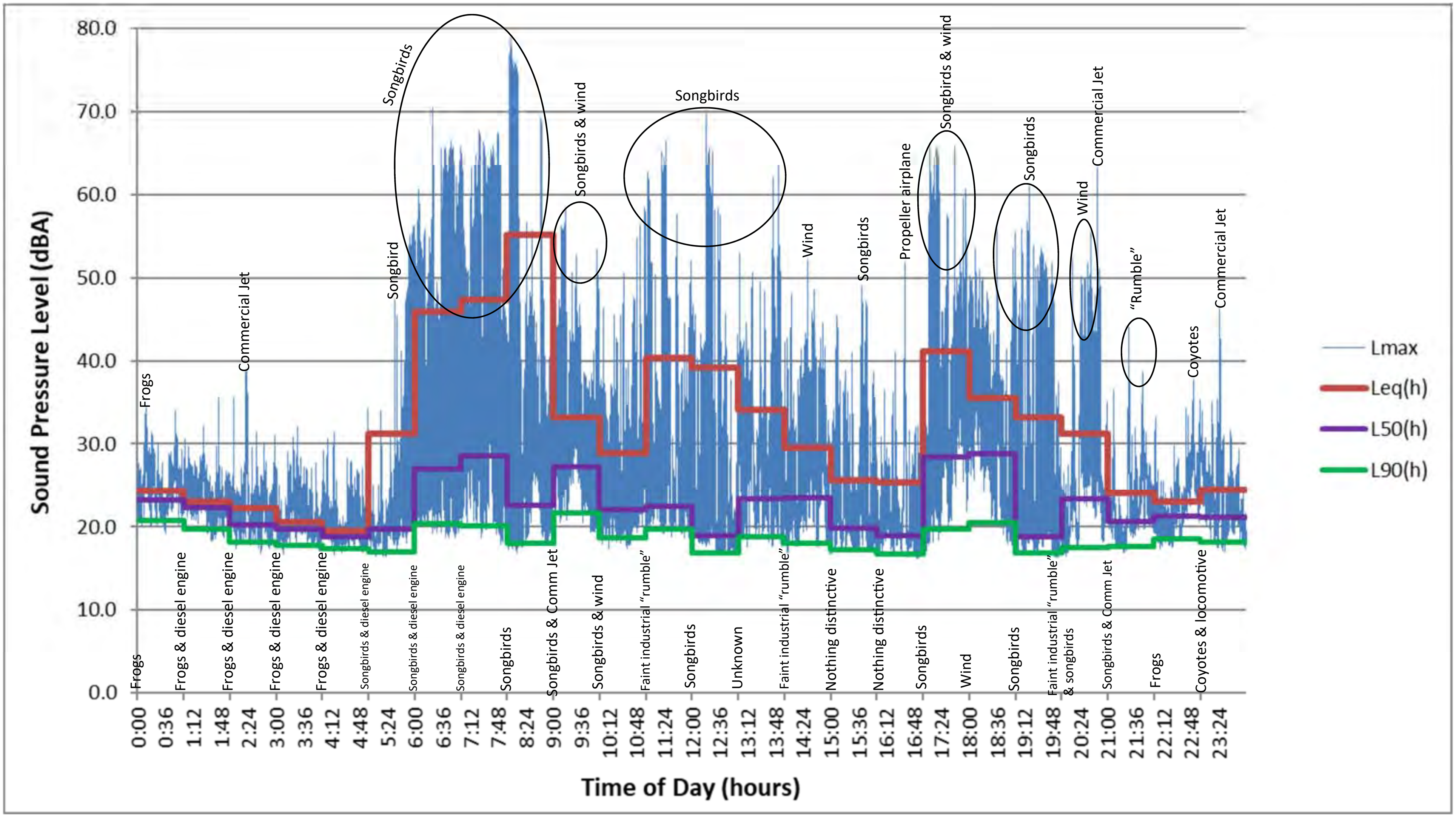
Big Sky Acoustics

FIGURE A-5

Potential *2016* Lek

Ambient Noise Measurement: April 28, 2018

Caldwell Canyon Project

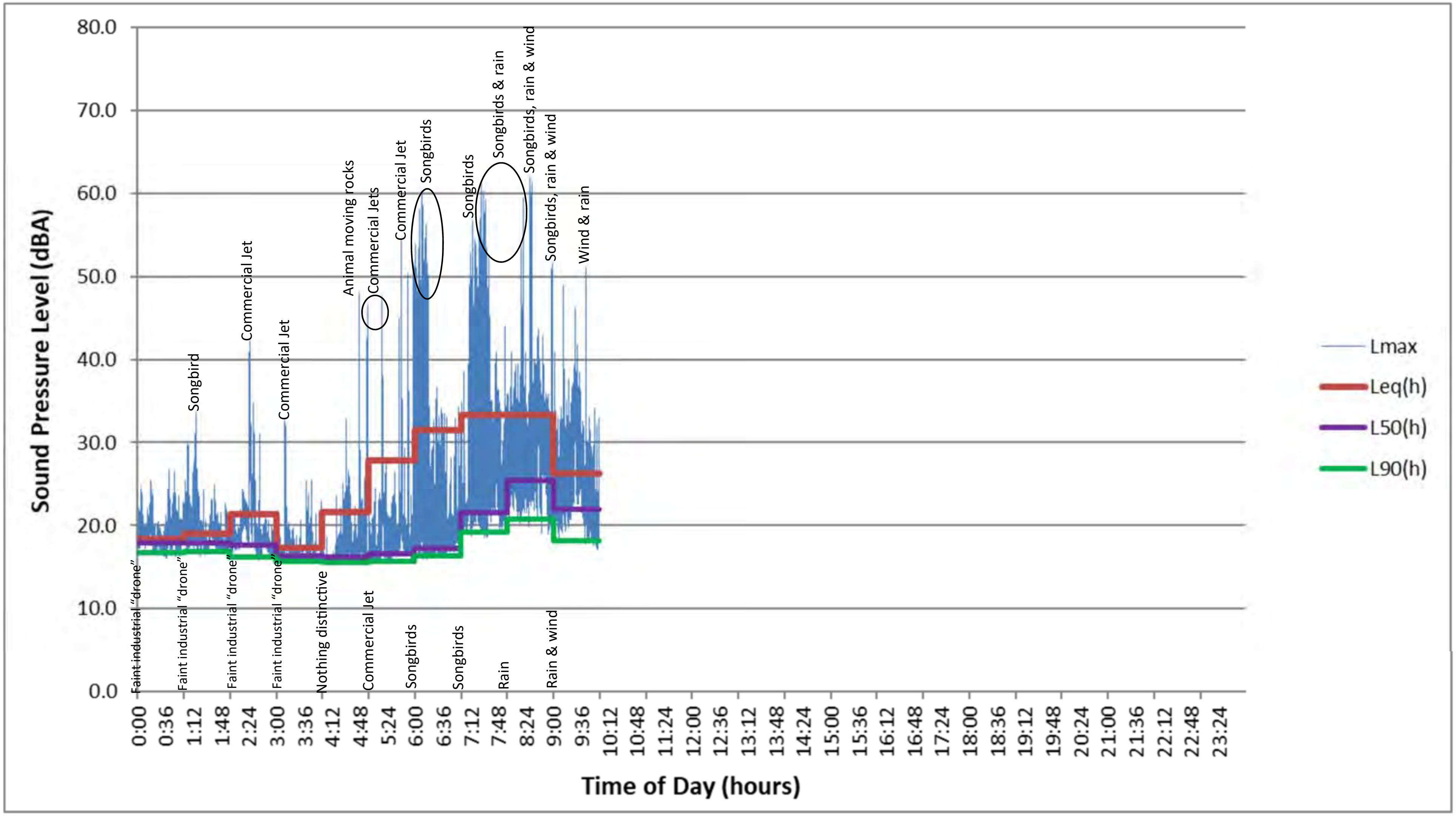


Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: April 23-30, 2018.

Big Sky Acoustics

FIGURE A-6

Potential *2016* Lek
Ambient Noise Measurement: April 29, 2018
Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: April 23-30, 2018.

Big Sky Acoustics

FIGURE A-7

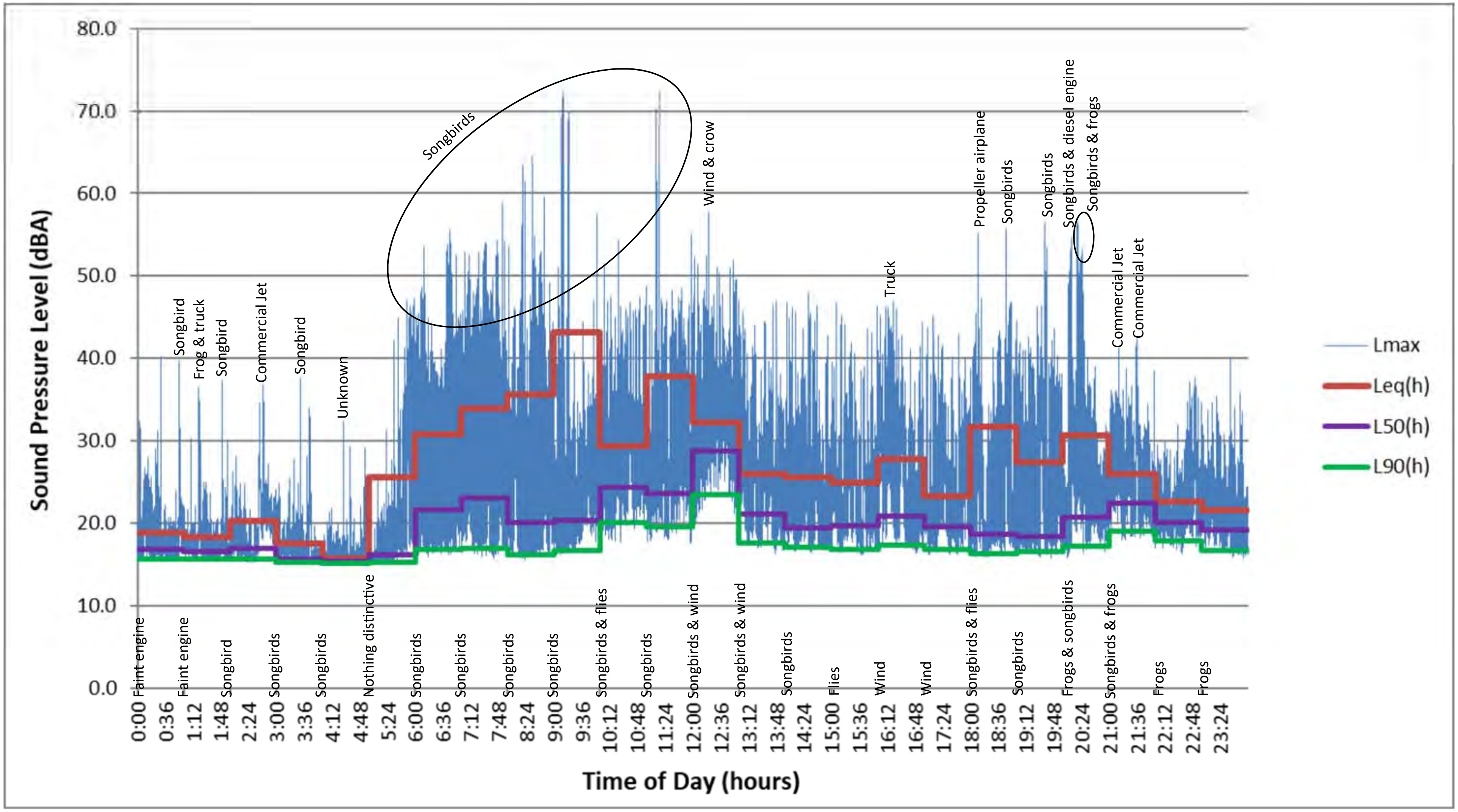
Potential *2016* Lek

Ambient Noise Measurement: April 30, 2018

Caldwell Canyon Project

Appendix B

Potential *2017* Dry Valley Lek Noise Level Measurement Data



Notes:

- Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph.
- For the measurement period April 23-30, the sound level meter only recorded data on April 27-28 due to a corrupted thumb drive.

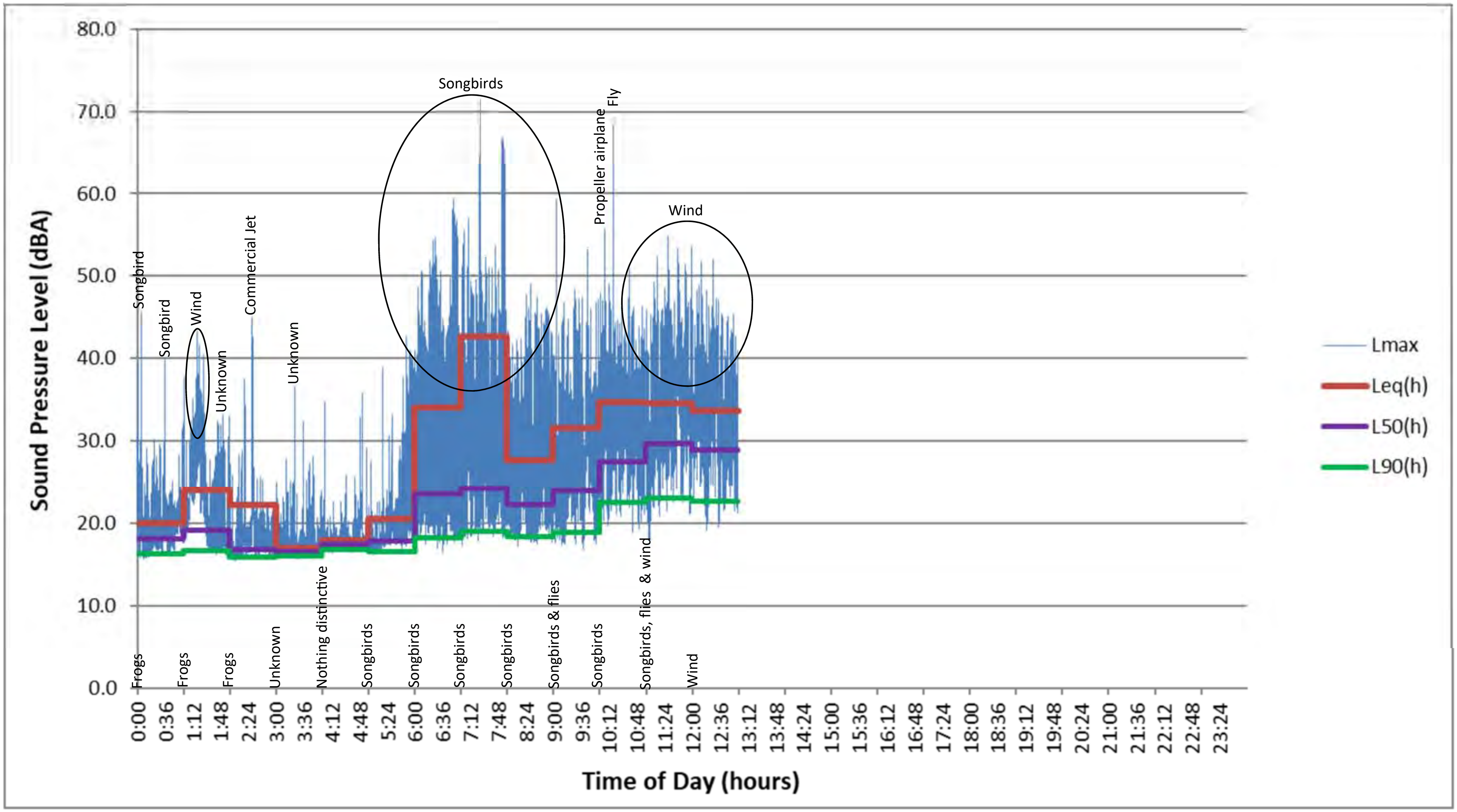
Big Sky Acoustics

FIGURE B-1

Potential *2017* Lek

Ambient Noise Measurement: April 27, 2018

Caldwell Canyon Project



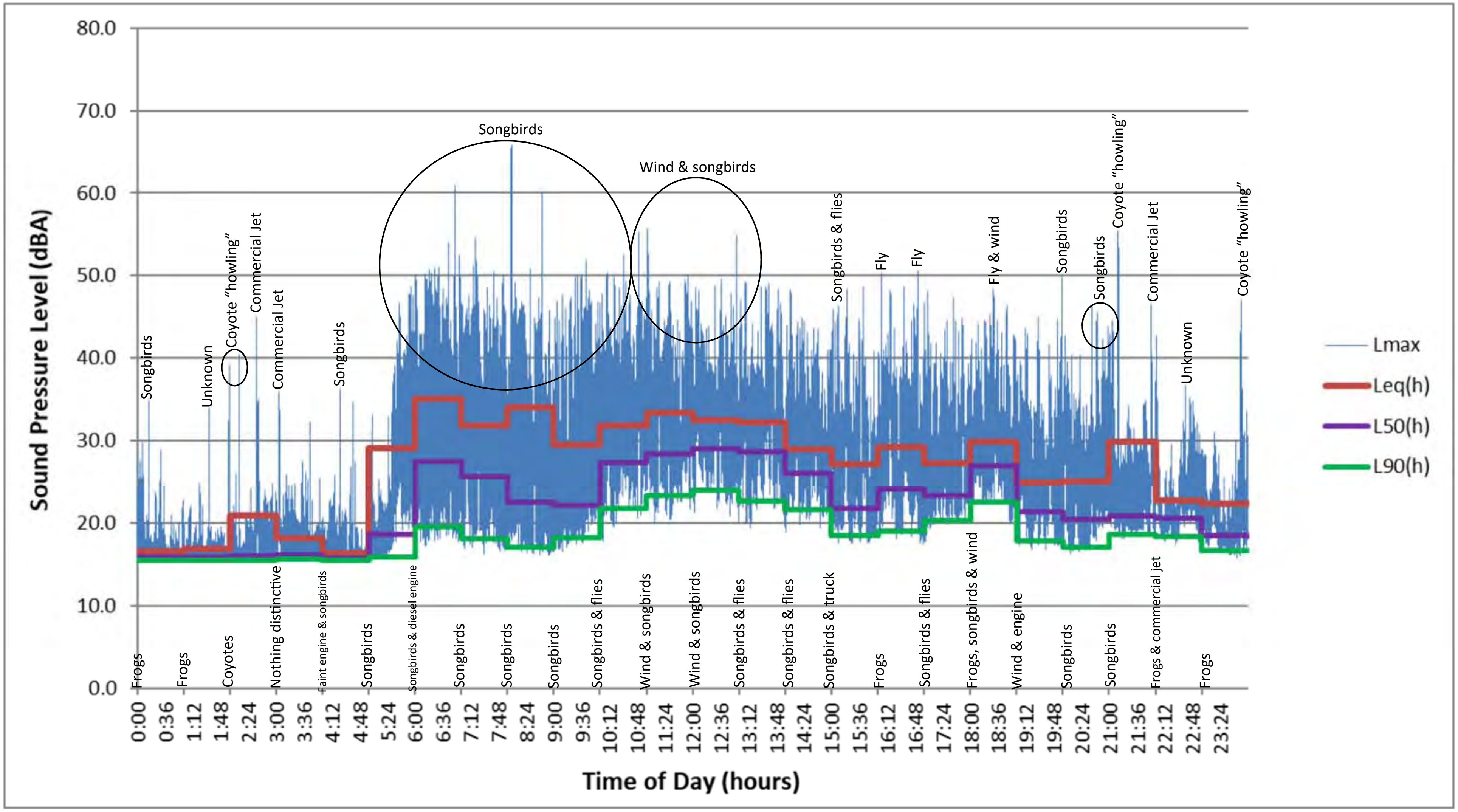
Notes:

- Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph.
- For the measurement period April 23-30, the sound level meter only recorded data on April 27-28 due to a corrupted thumb drive.

Big Sky Acoustics

FIGURE B-2

Potential *2017* Lek
Ambient Noise Measurement: April 28, 2018
Caldwell Canyon Project



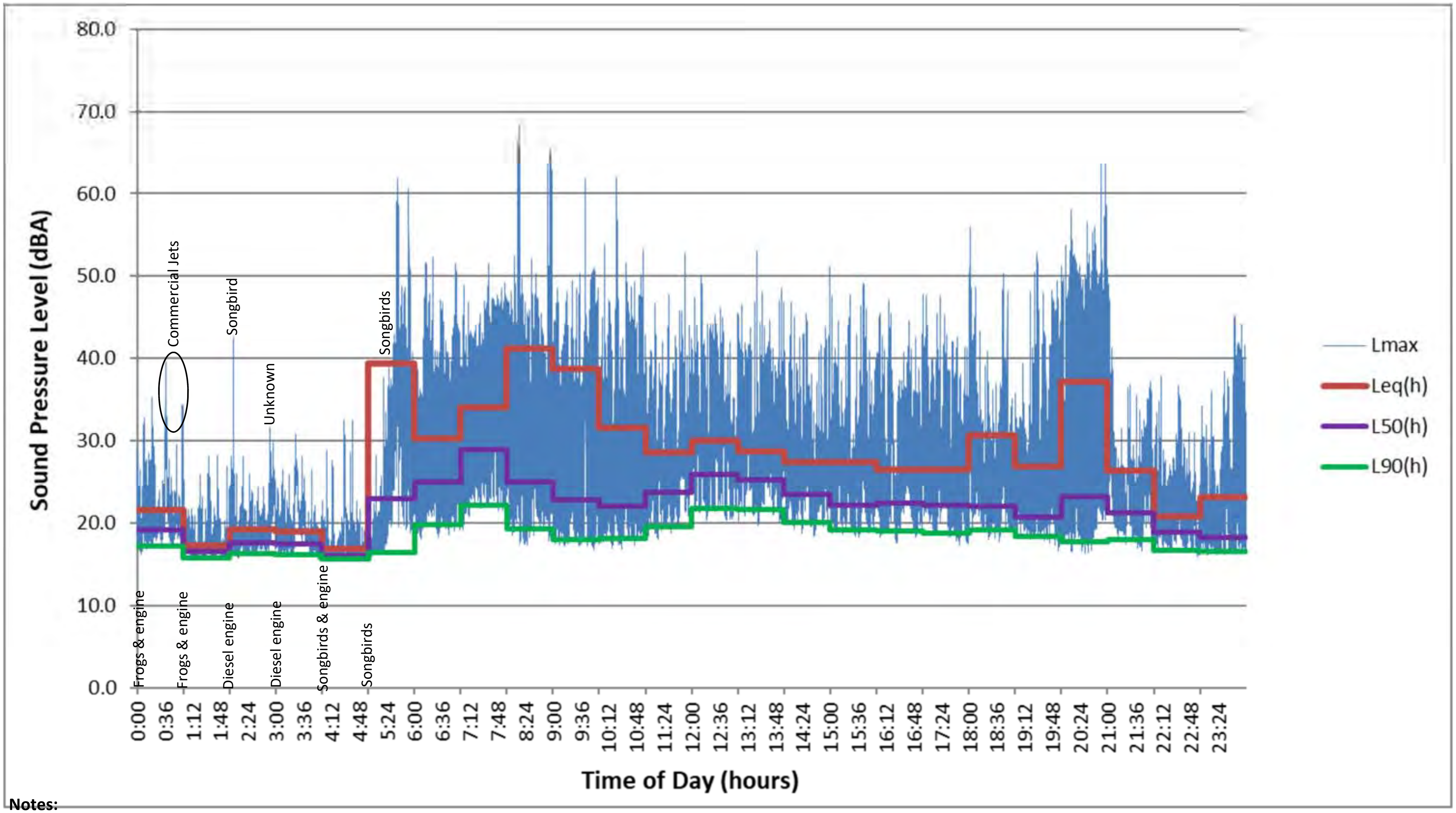
Notes:

- Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph.
- For the measurement period May 1-8, the sound level meter only recorded data on May 6-7 due to a corrupted thumb drive.

Big Sky Acoustics

FIGURE B-3

Potential *2017* Lek
Ambient Noise Measurement: May 6, 2018
Caldwell Canyon Project



Notes:

- Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph.
- For the measurement period May 1-8, the sound level meter only recorded data on May 6-7. From 0537 to 2359 on May 7th, the SLM recorded data but audio files could not be reviewed due to a corrupted thumb drive.

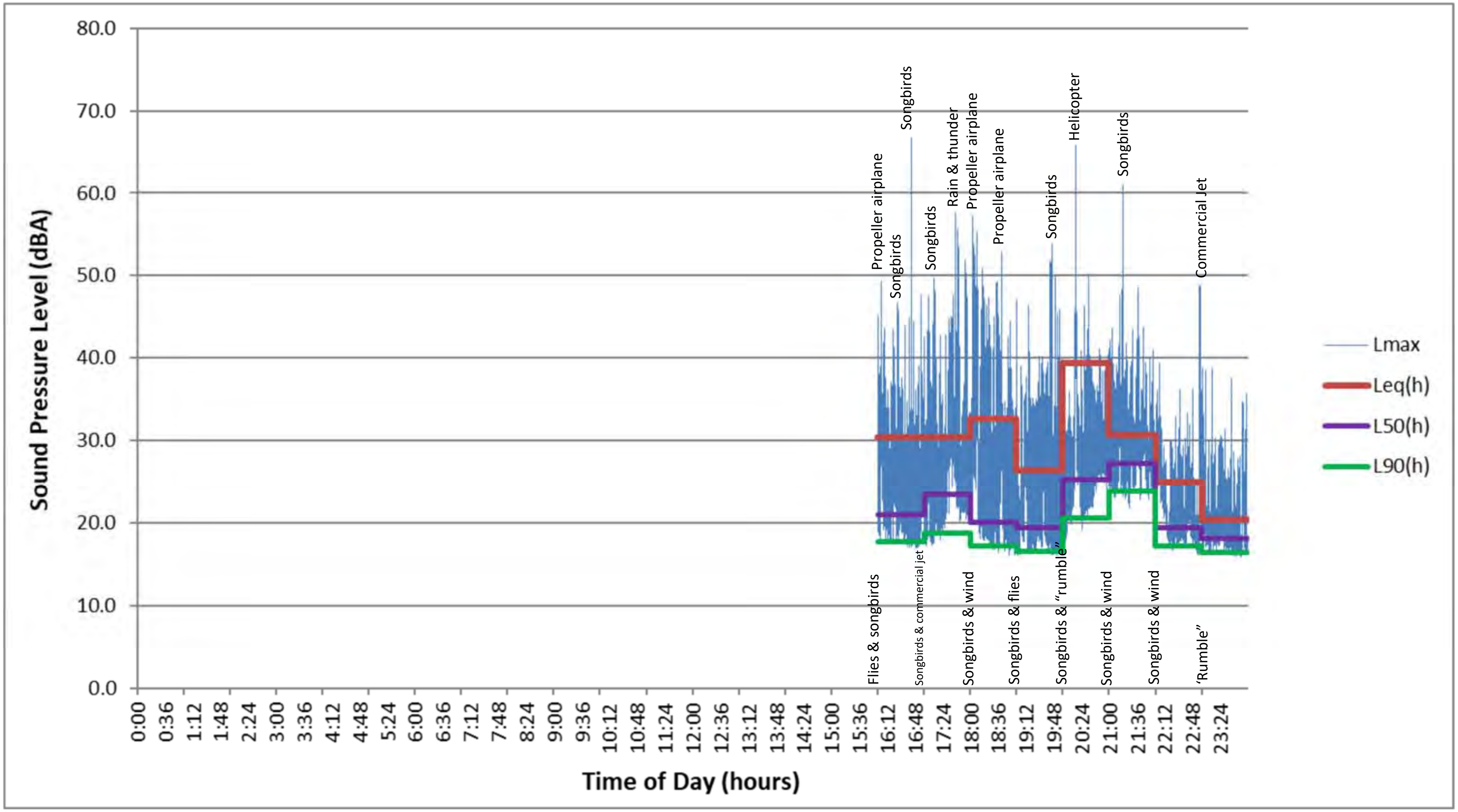
Big Sky Acoustics

FIGURE B-4

Potential *2017* Lek

Ambient Noise Measurement: May 7, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

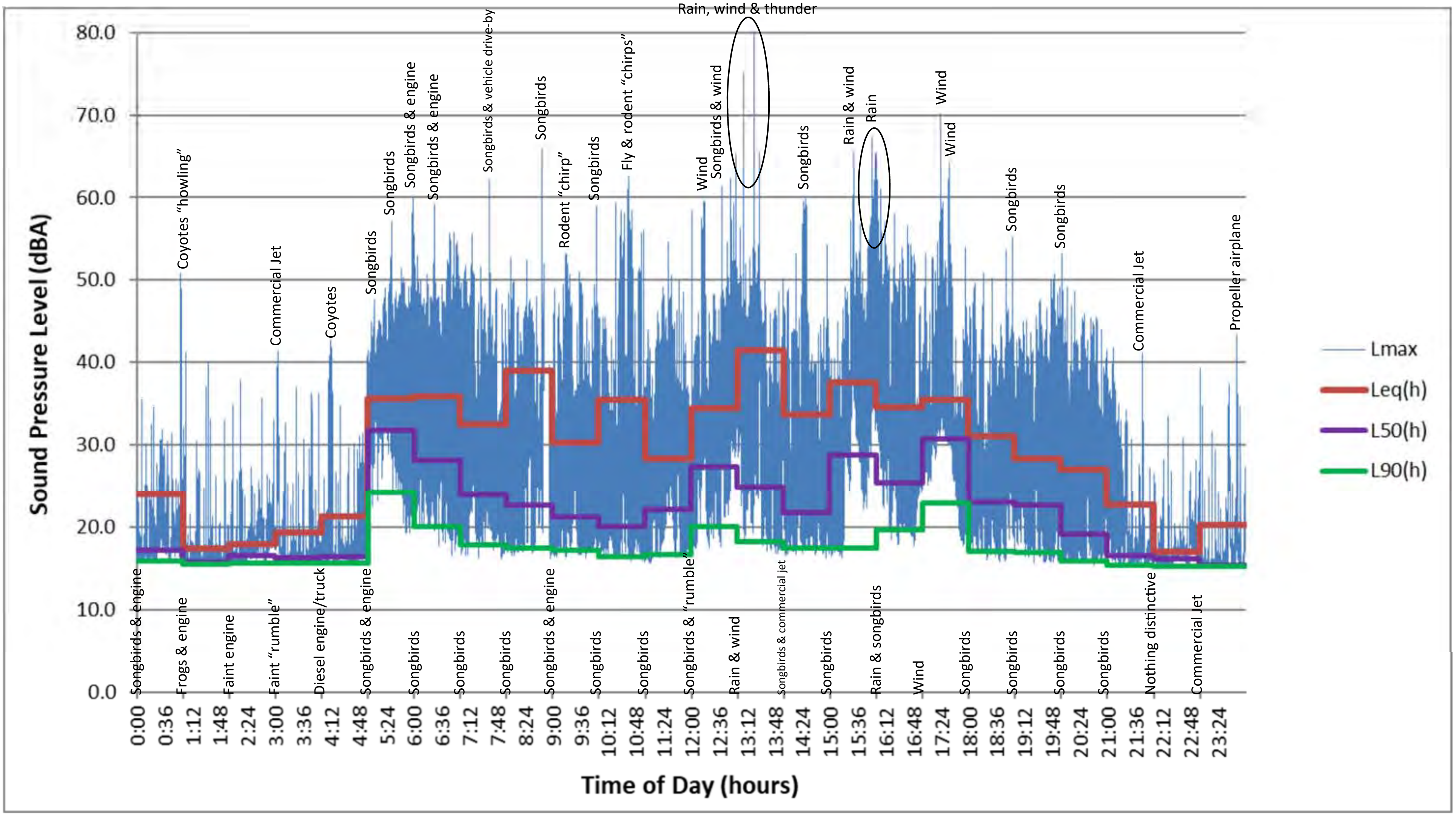
Big Sky Acoustics

FIGURE B-5

Potential *2017* Lek

Ambient Noise Measurement: May 21, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

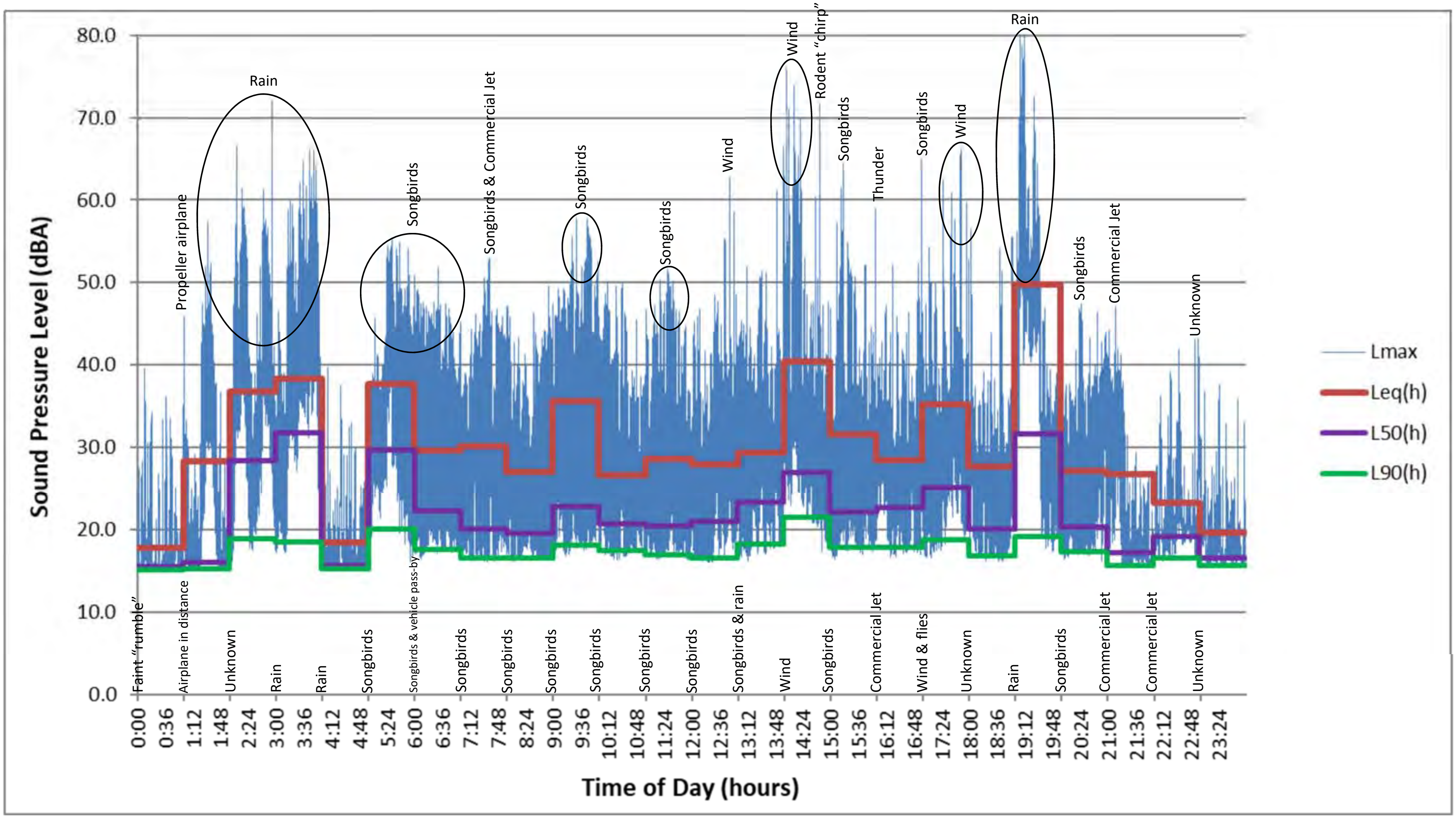
Big Sky Acoustics

FIGURE B-6

Potential *2017* Lek

Ambient Noise Measurement: May 22, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

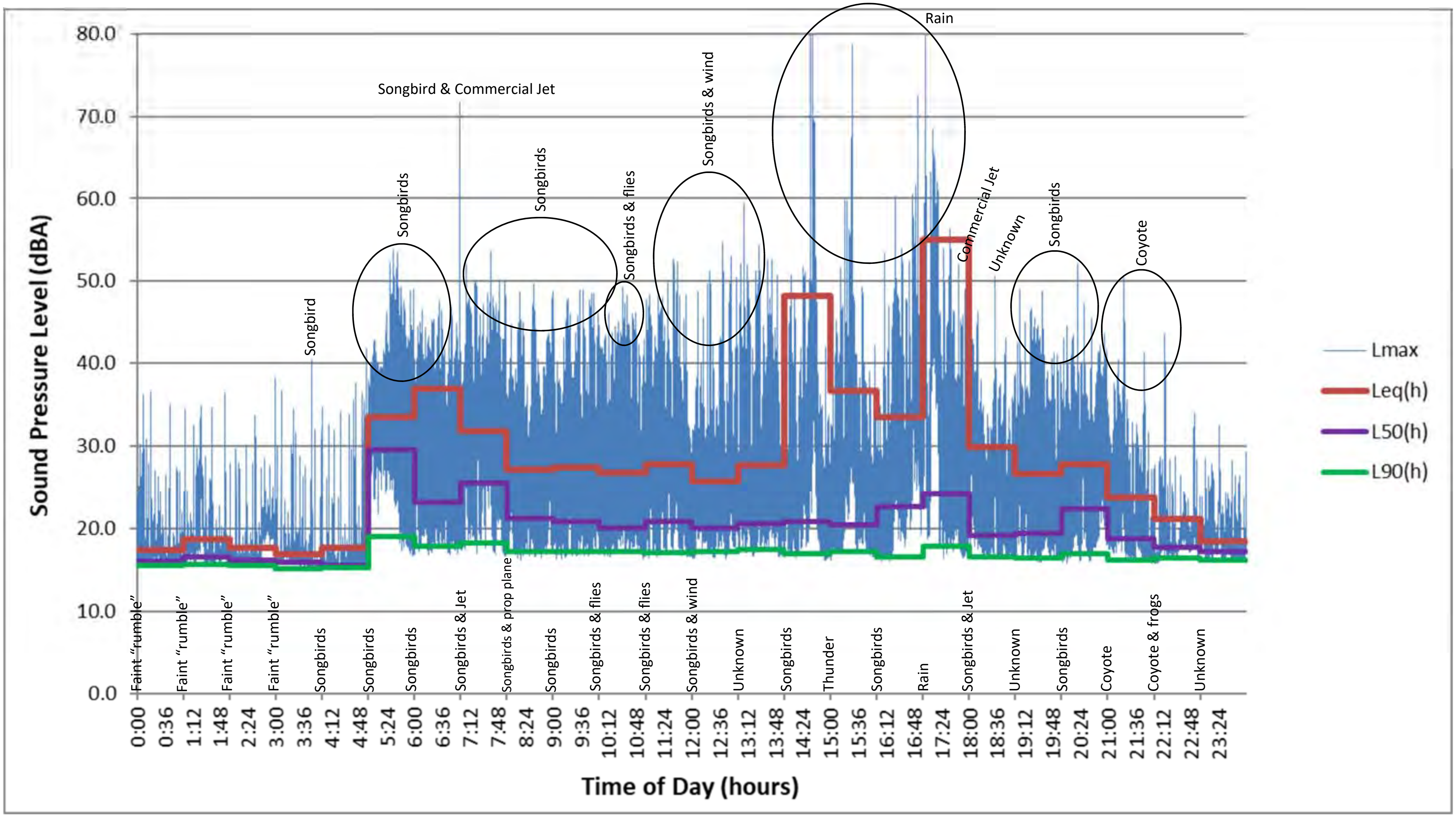
Big Sky Acoustics

FIGURE B-7

Potential *2017* Lek

Ambient Noise Measurement: May 23, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

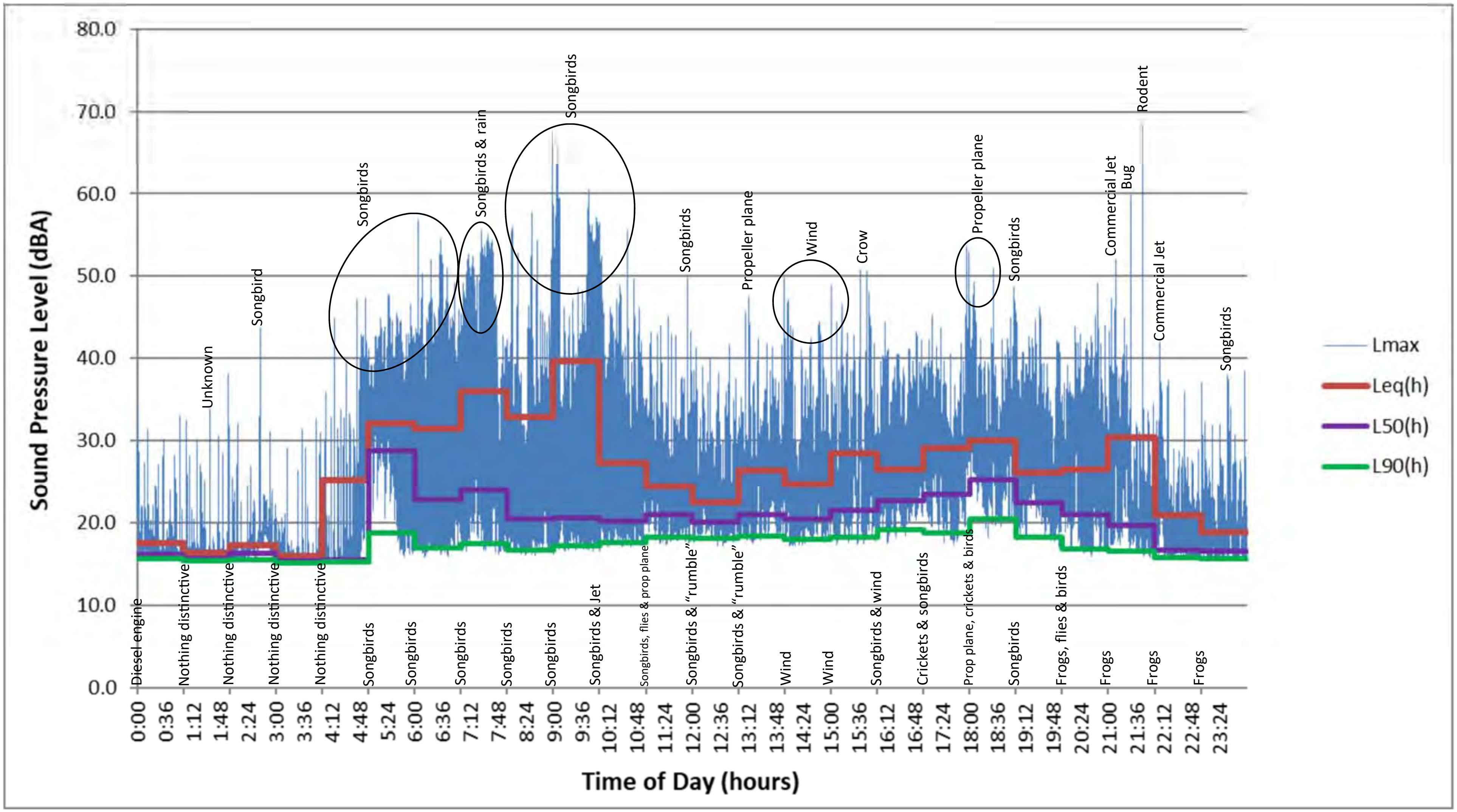
Big Sky Acoustics

FIGURE B-8

Potential *2017* Lek

Ambient Noise Measurement: May 24, 2018

Caldwell Canyon Project

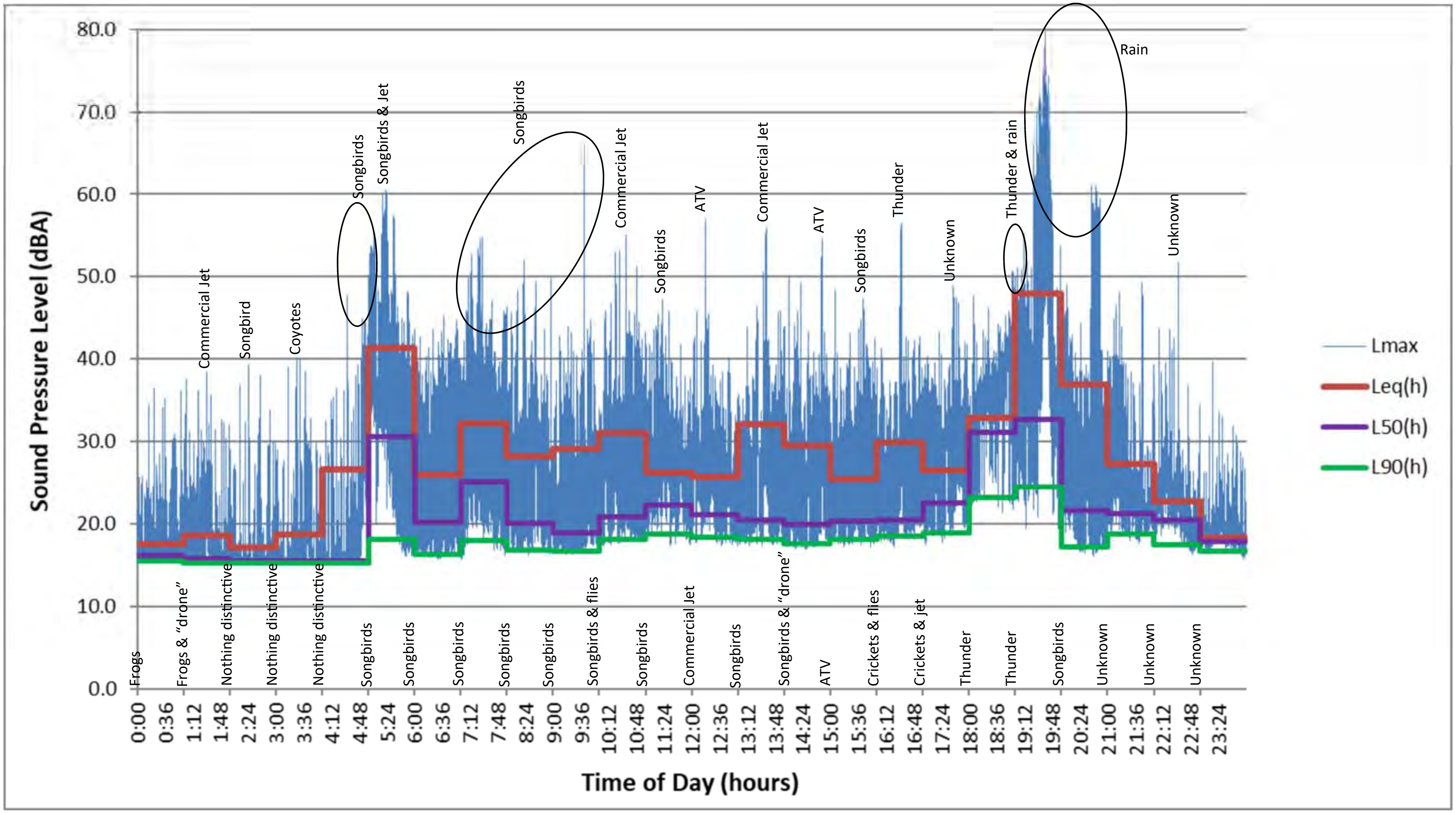


Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

Big Sky Acoustics

FIGURE B-9

Potential *2017* Lek
Ambient Noise Measurement: May 25, 2018
Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

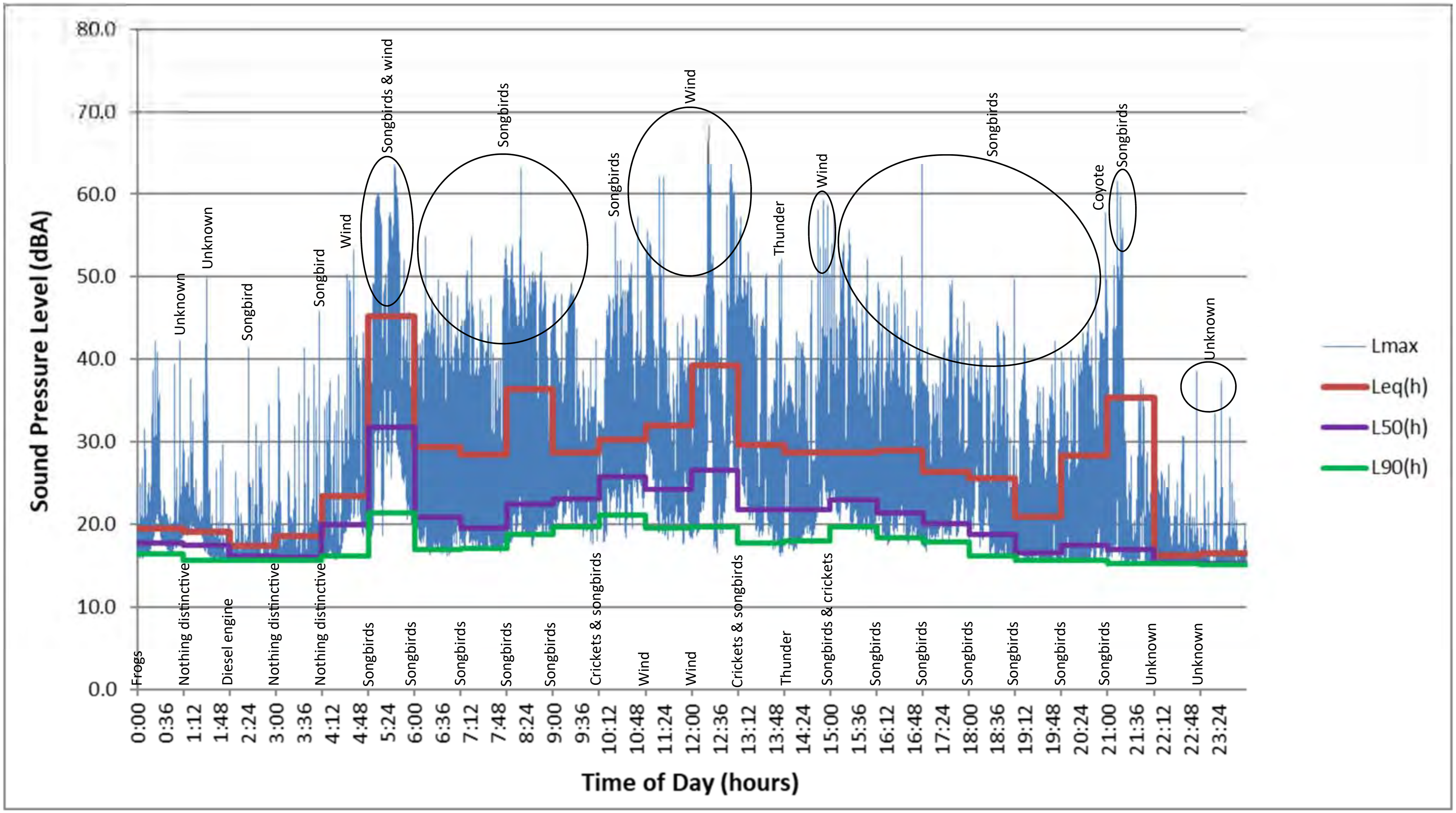
Big Sky Acoustics

FIGURE B-10

Potential *2017* Lek

Ambient Noise Measurement: May 26, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

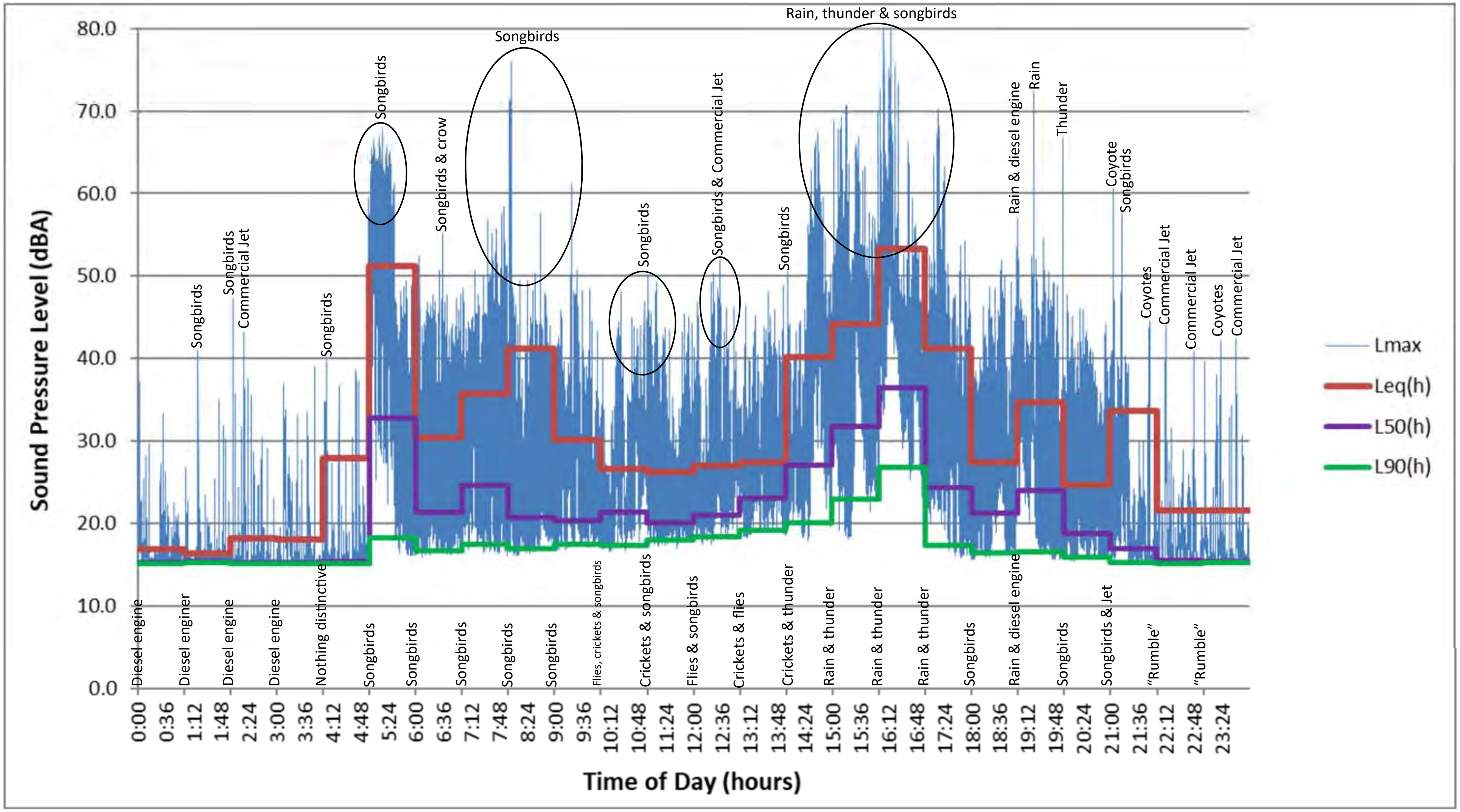
Big Sky Acoustics

FIGURE B-11

Potential *2017* Lek

Ambient Noise Measurement: May 27, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

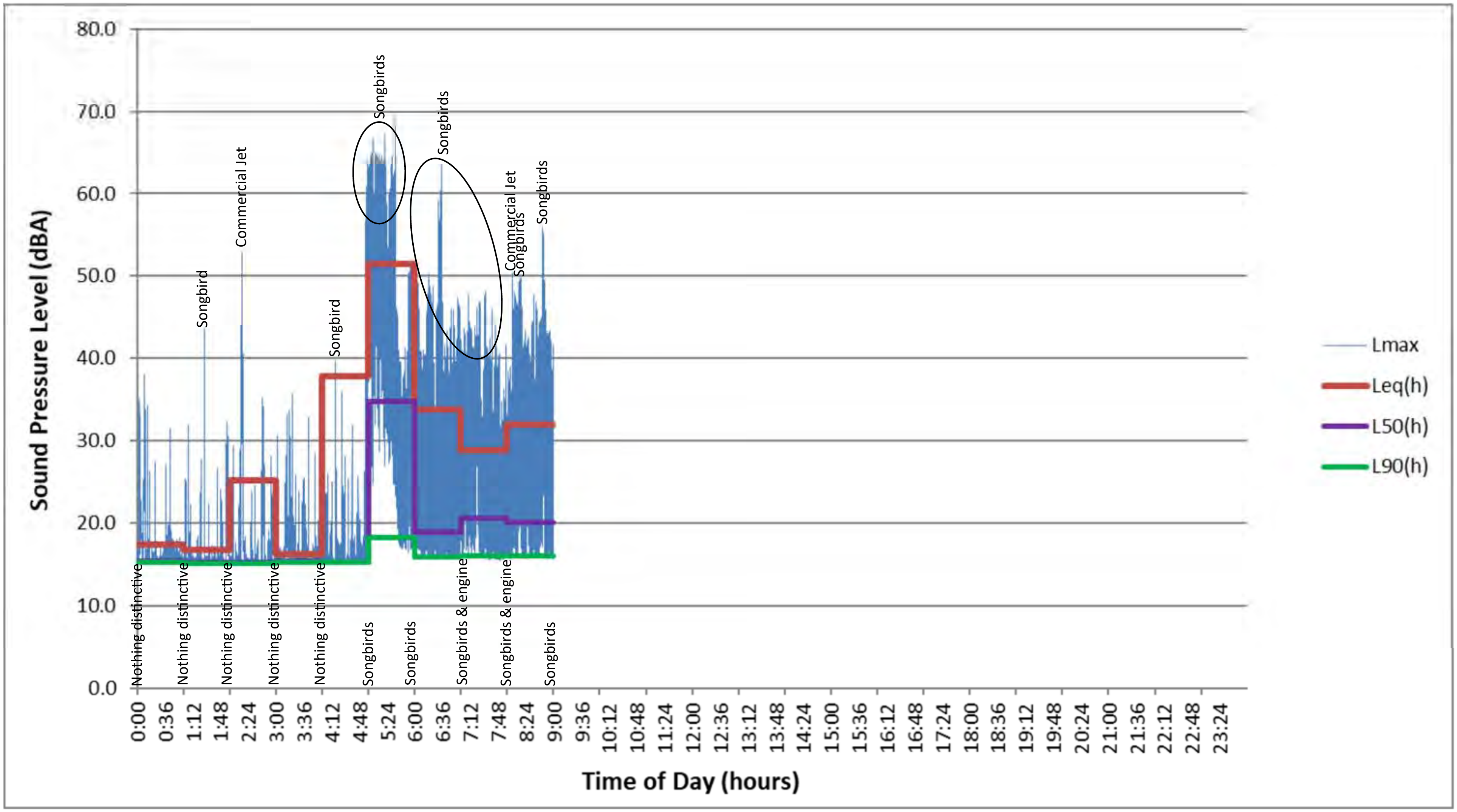
Big Sky Acoustics

FIGURE B-12

Potential *2017* Lek

Ambient Noise Measurement: May 28, 2018

Caldwell Canyon Project



Note: Audio files were reviewed for the L_{max} peak noise levels and the hourly recorded data. Identified noise sources are indicated on the above graph. Measurement period: May 21-29, 2018.

Big Sky Acoustics

FIGURE B-13

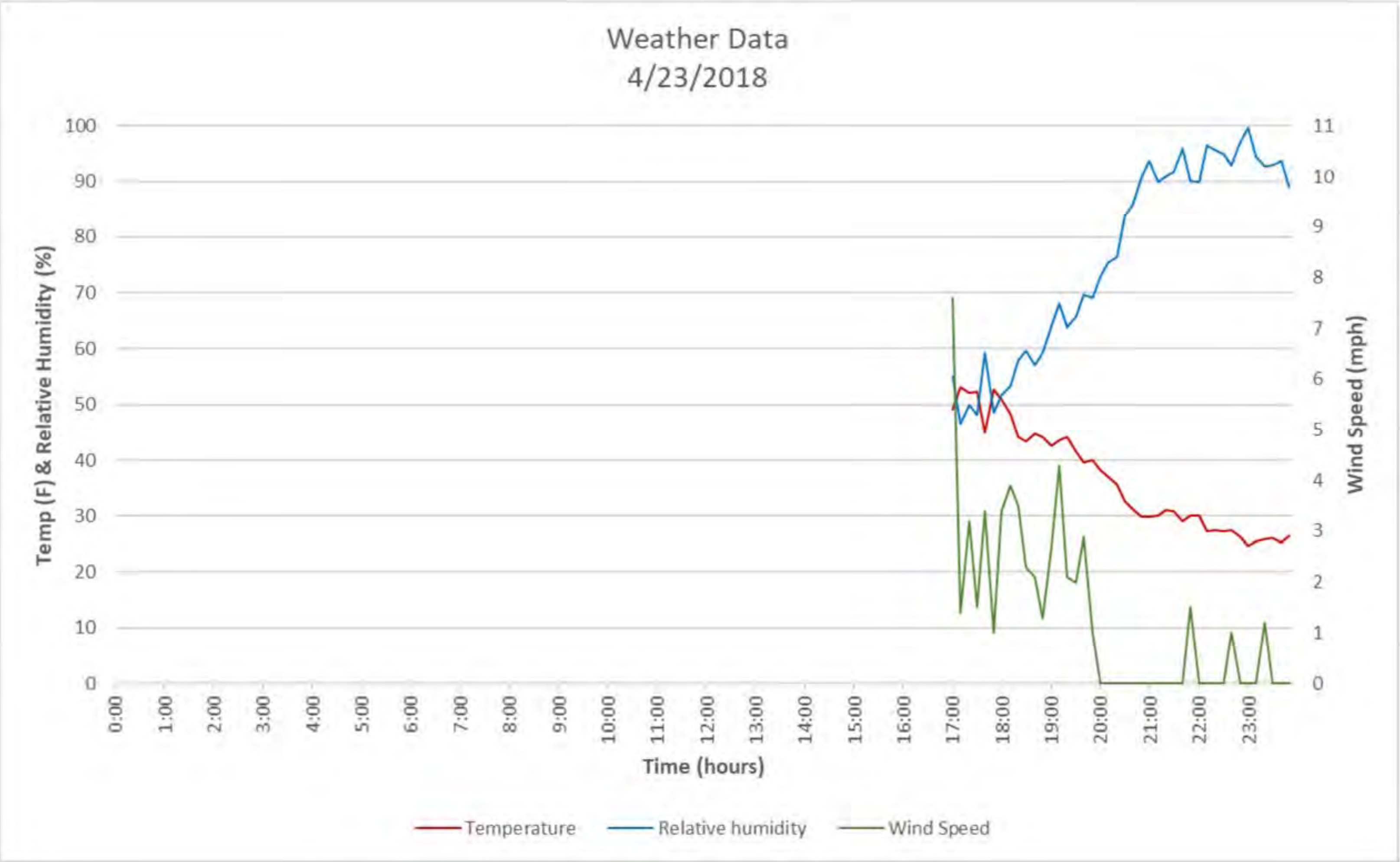
Potential *2017* Lek

Ambient Noise Measurement: May 29, 2018

Caldwell Canyon Project

Appendix C

Weather Data



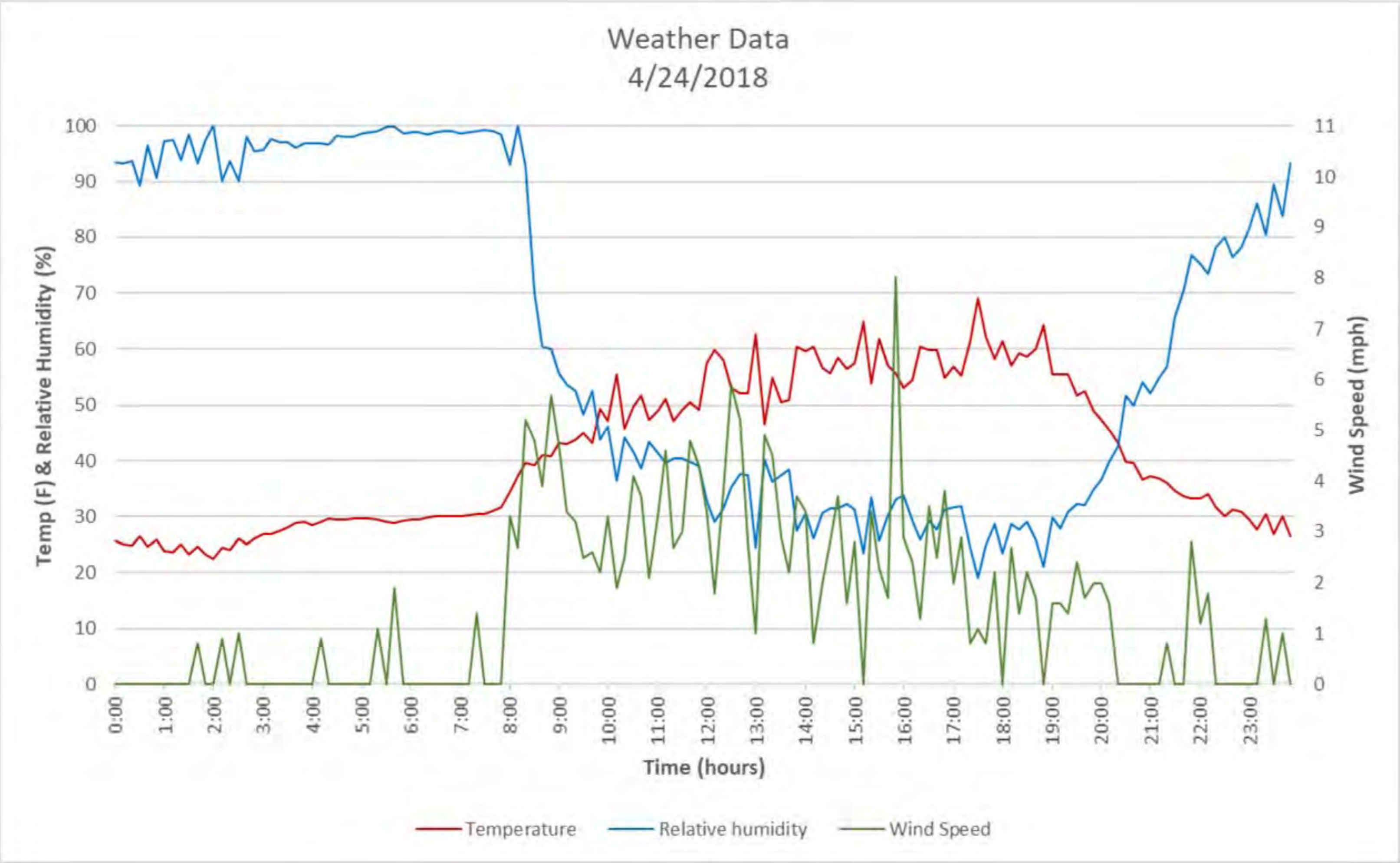
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-1

Weather Data: April 23, 2018
Caldwell Canyon Project



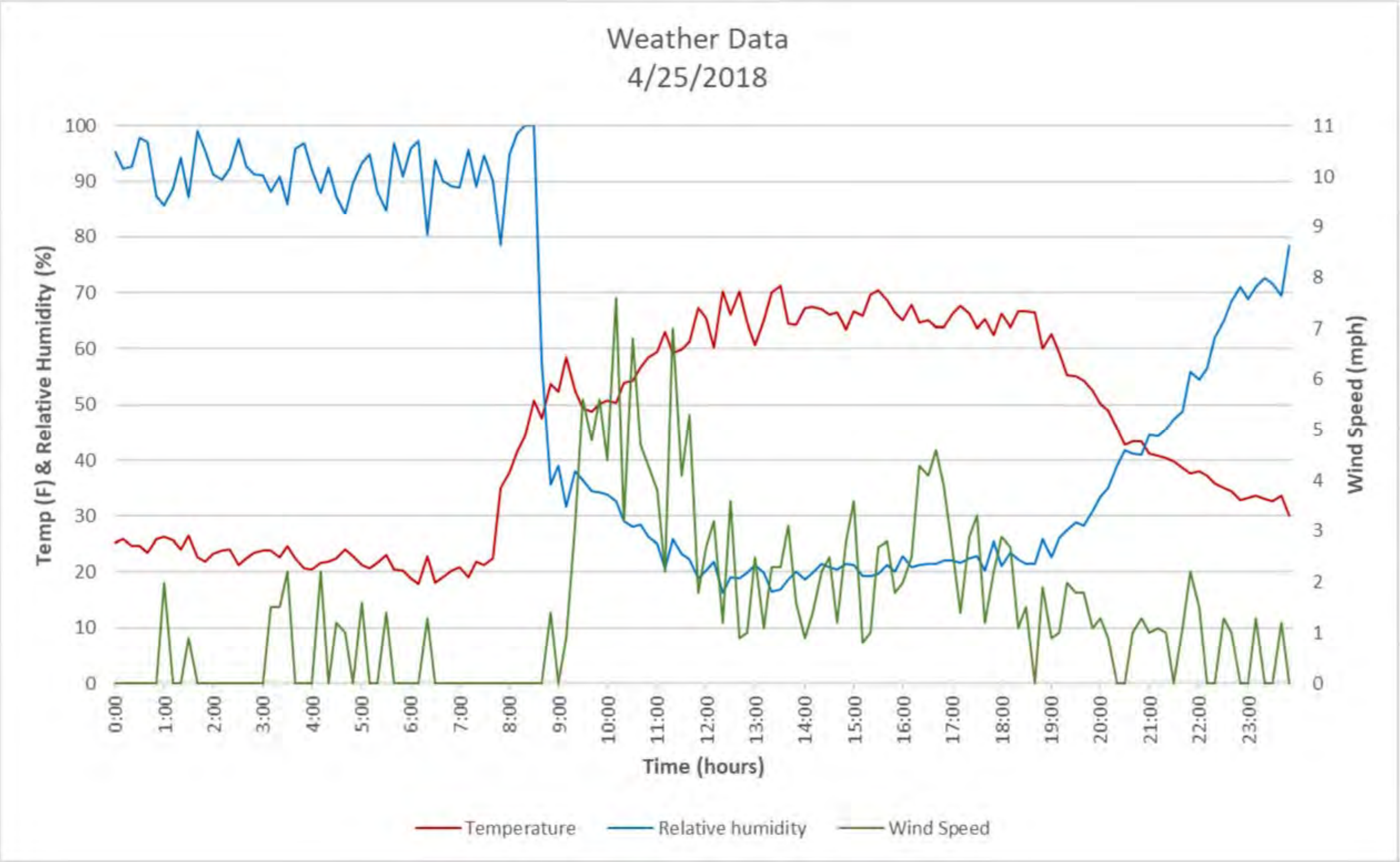
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-2

Weather Data: April 24, 2018
Caldwell Canyon Project



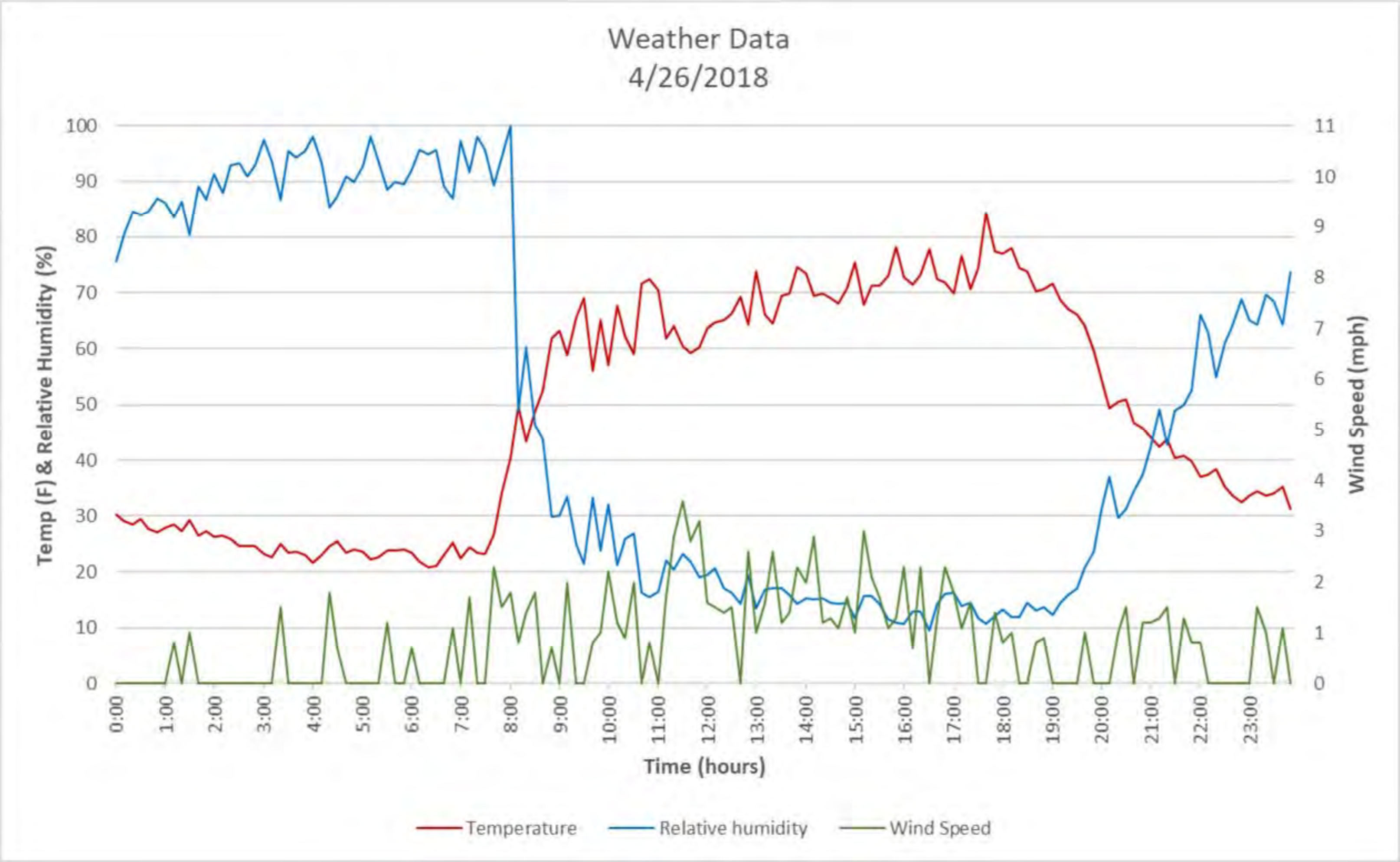
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-3

Weather Data: April 25, 2018
Caldwell Canyon Project



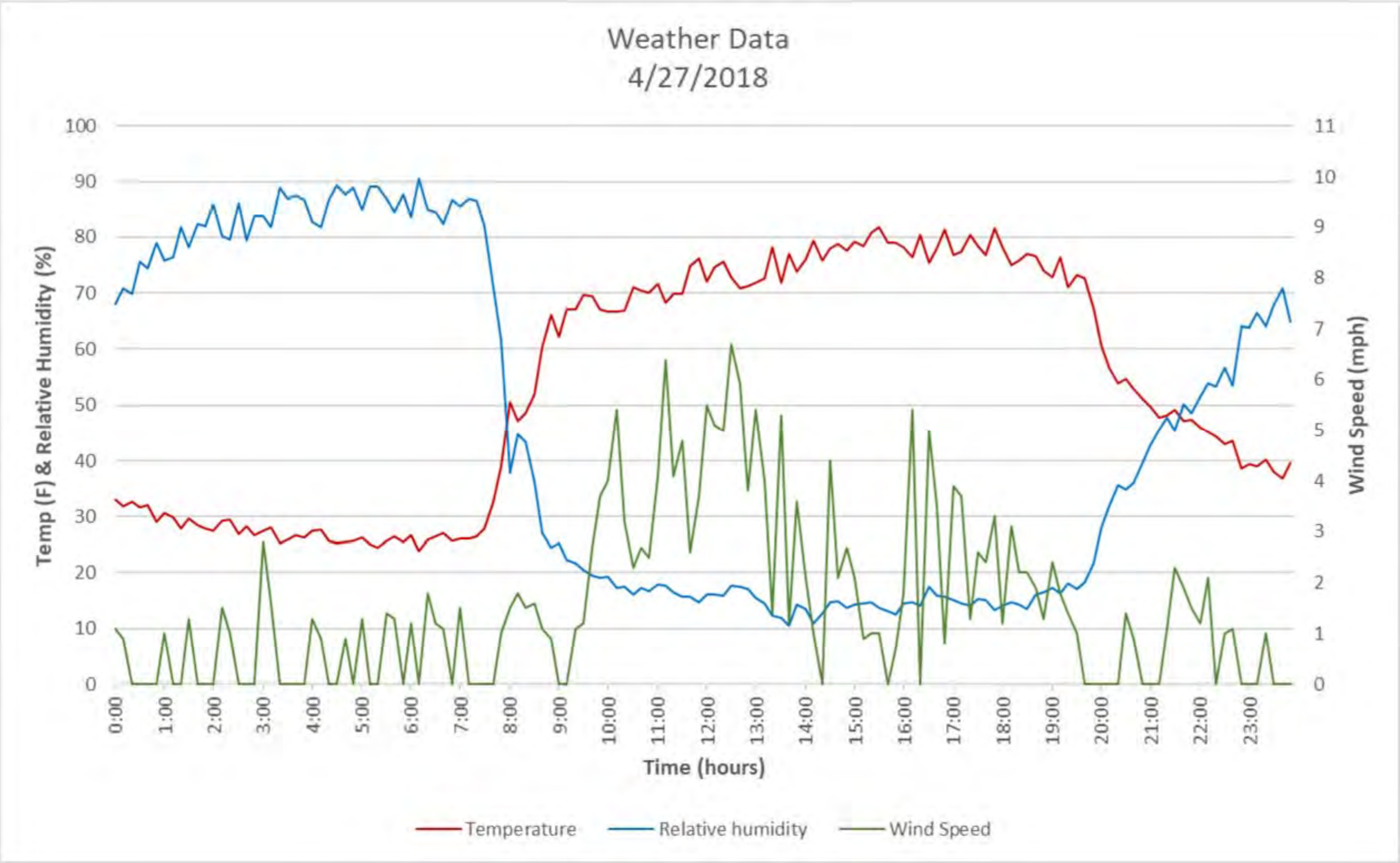
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-4

Weather Data: April 26, 2018
Caldwell Canyon Project



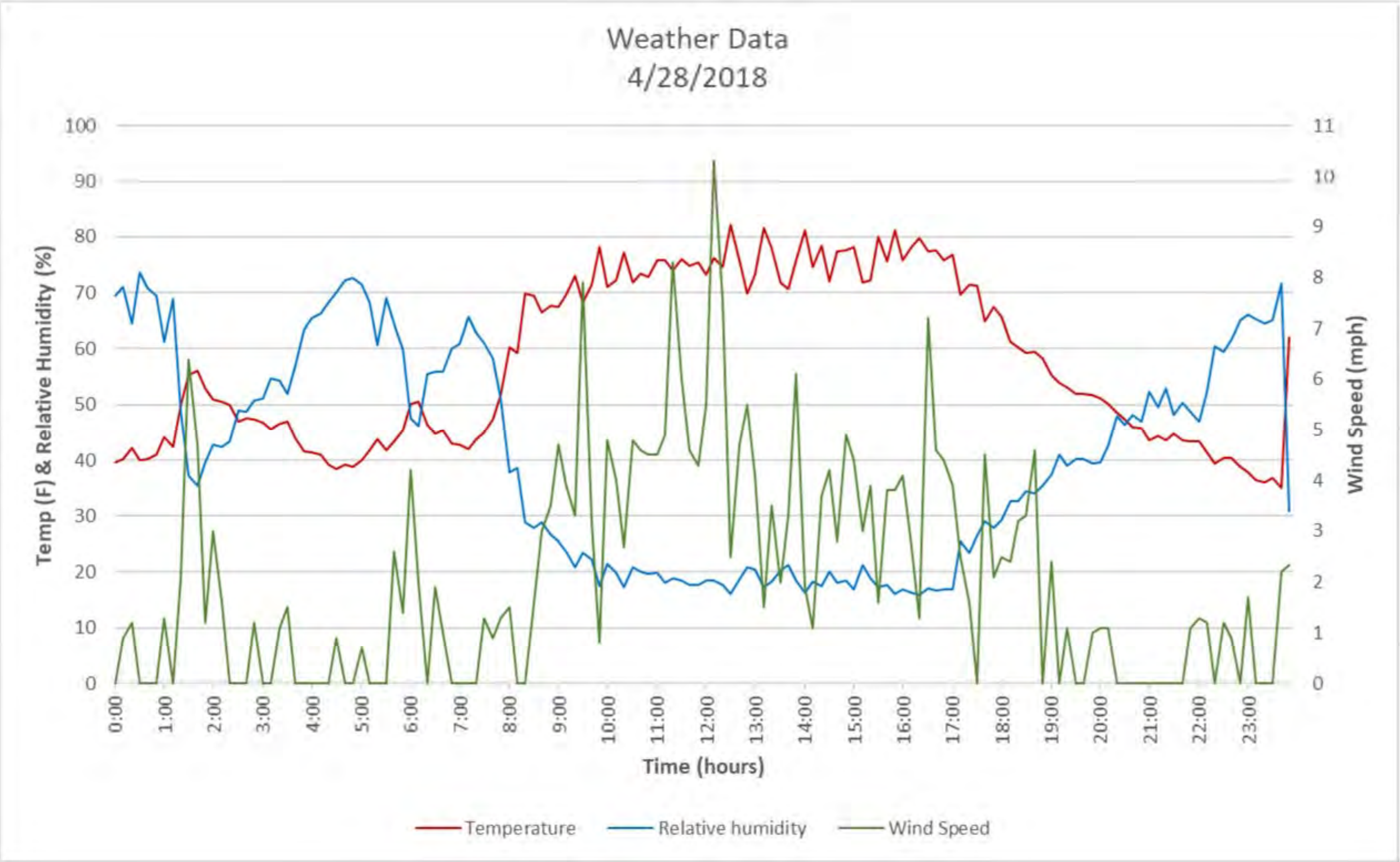
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-5

Weather Data: April 27, 2018
Caldwell Canyon Project

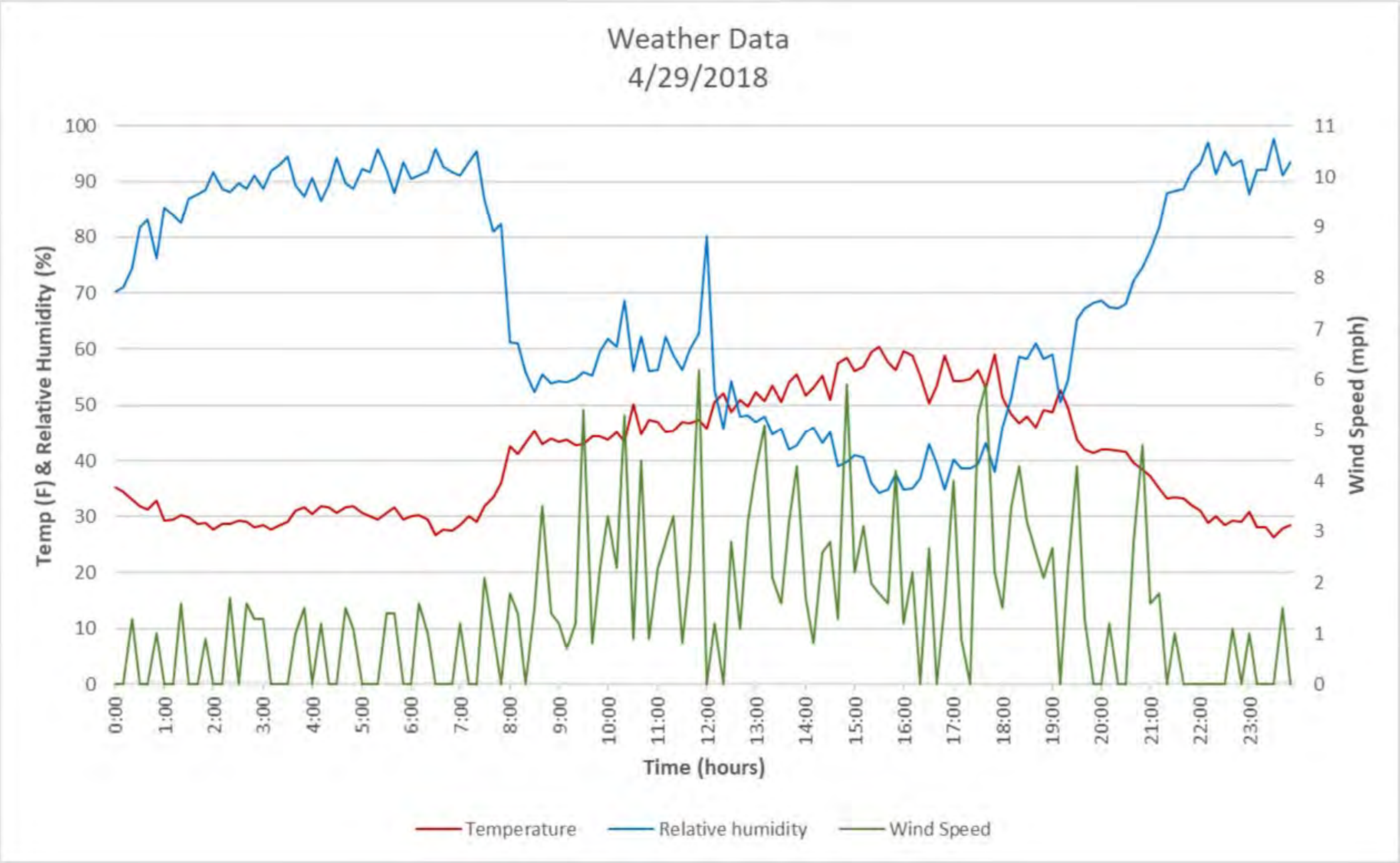


Notes:

- Weather data recorded every 10 minutes.

FIGURE C-6

Weather Data: April 28, 2018
Caldwell Canyon Project



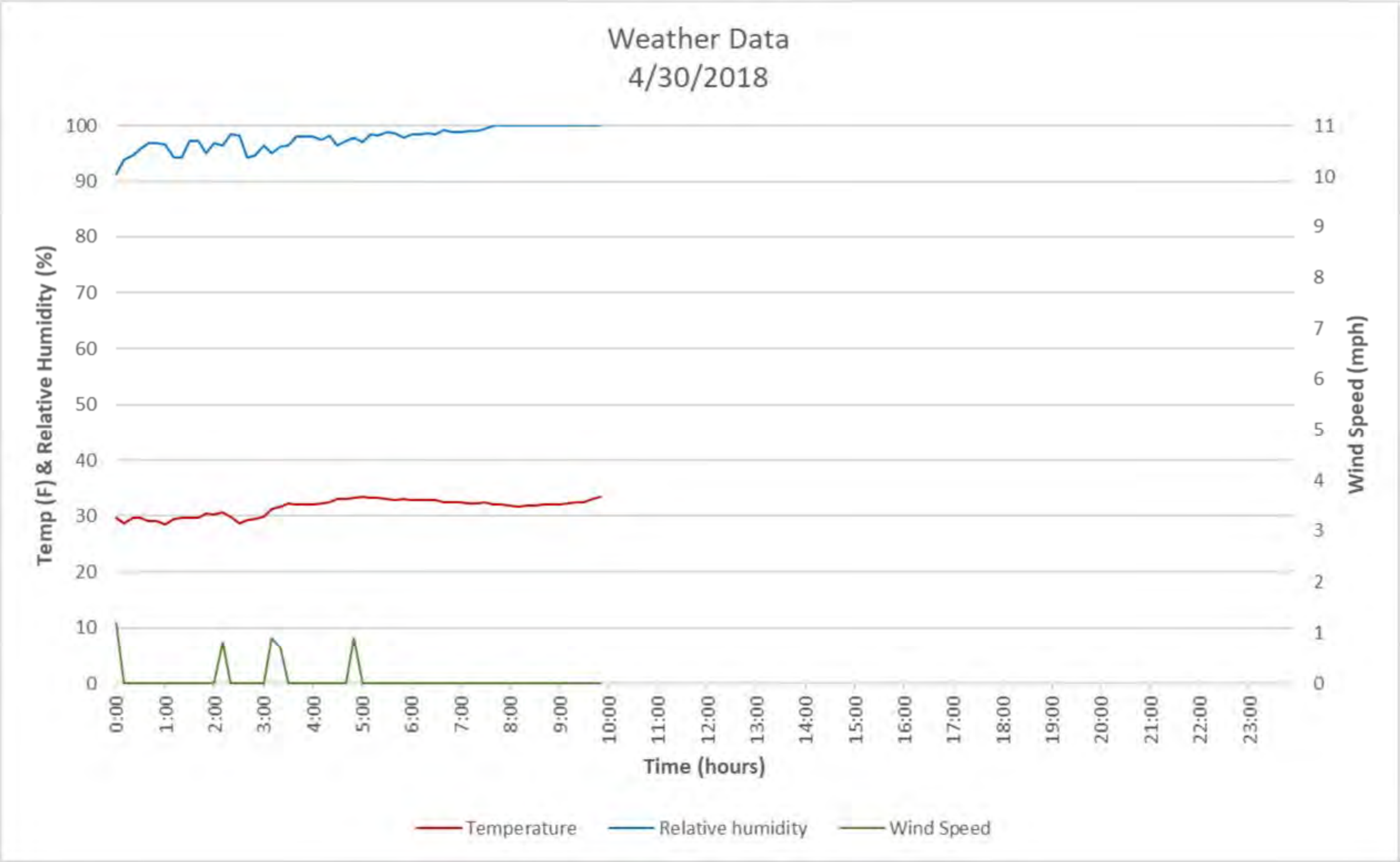
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-7

Weather Data: April 29, 2018
Caldwell Canyon Project



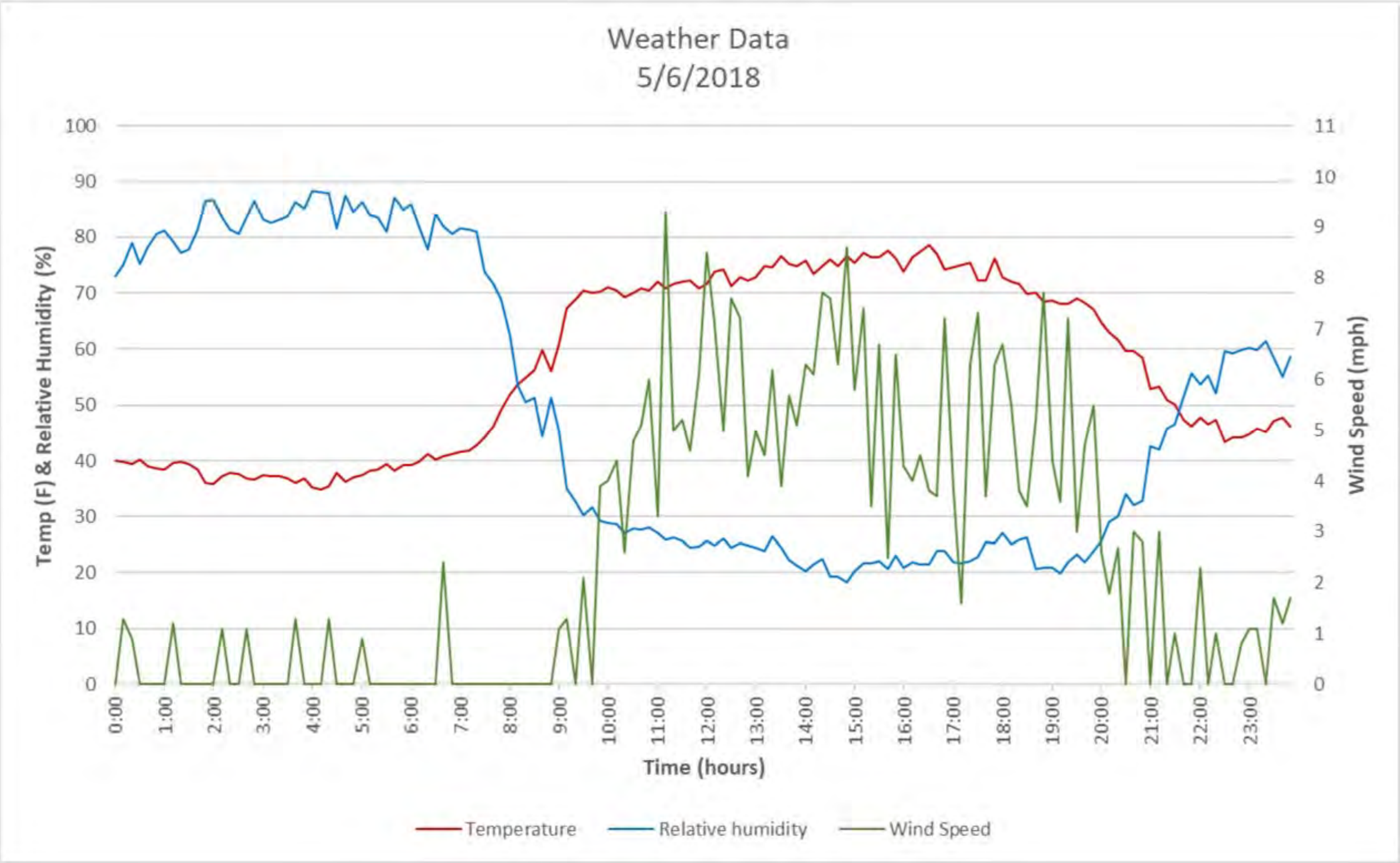
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-8

Weather Data: April 30, 2018
Caldwell Canyon Project



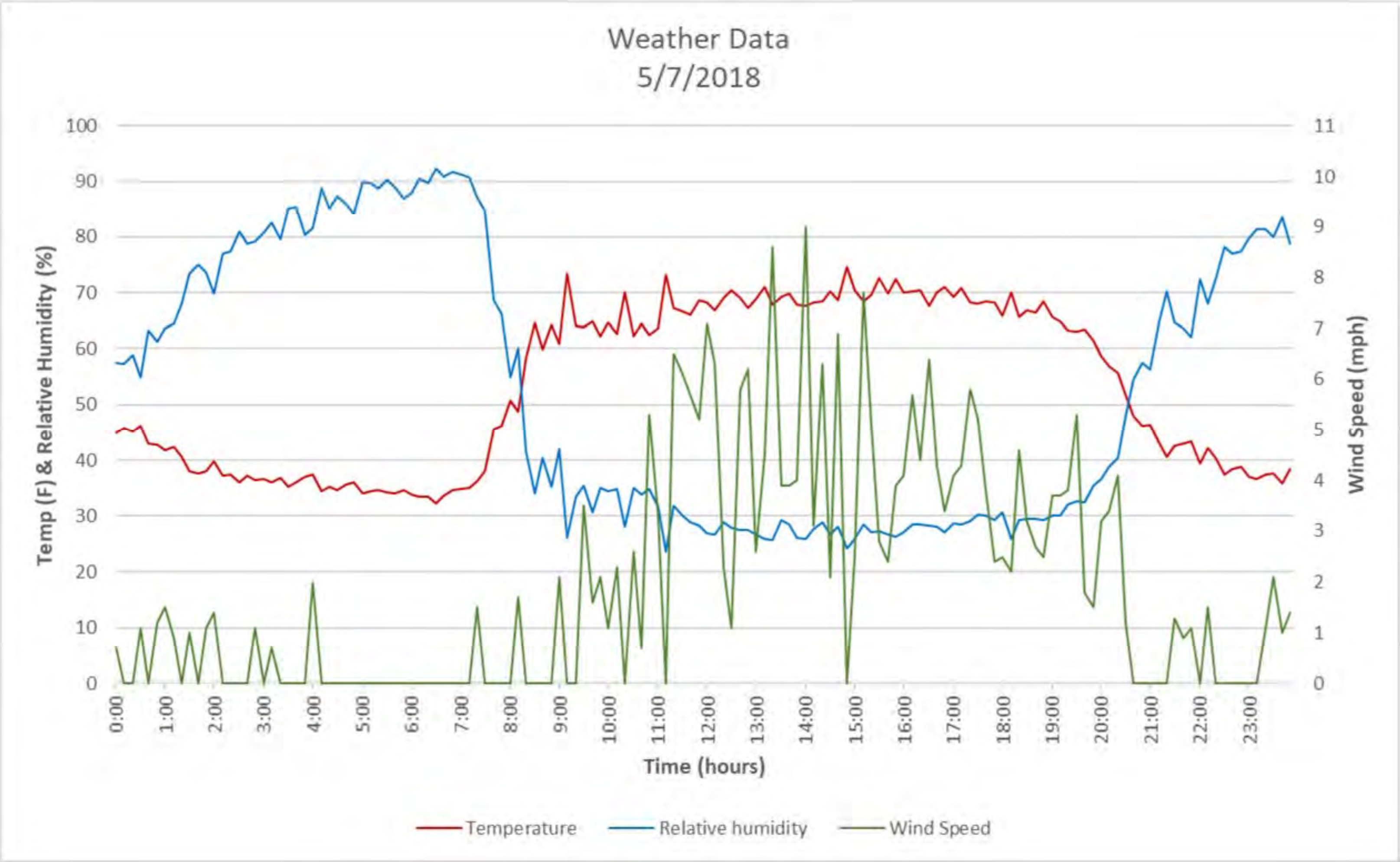
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-9

Weather Data: May 6, 2018
Caldwell Canyon Project



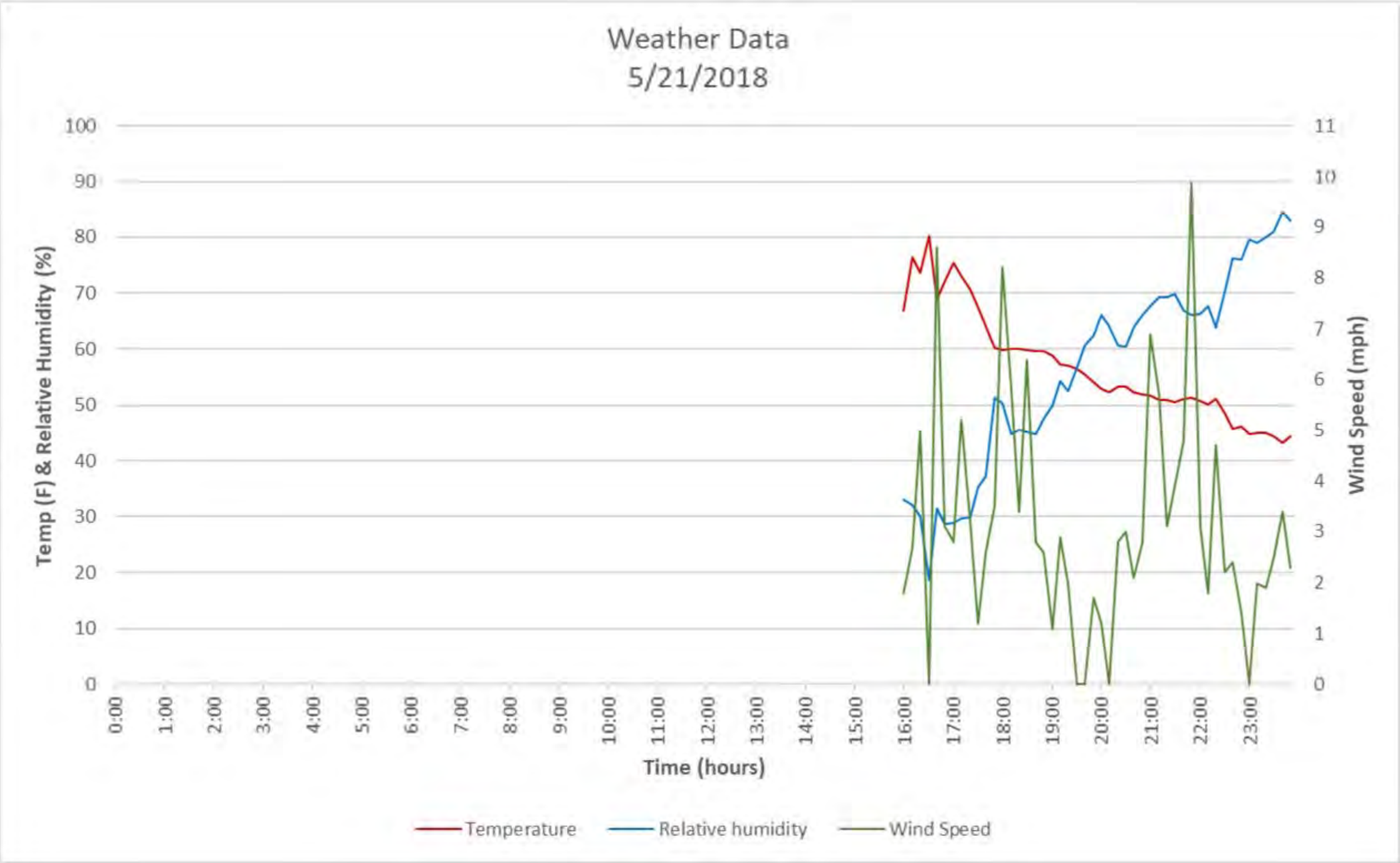
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-10

Weather Data: May 7, 2018
Caldwell Canyon Project



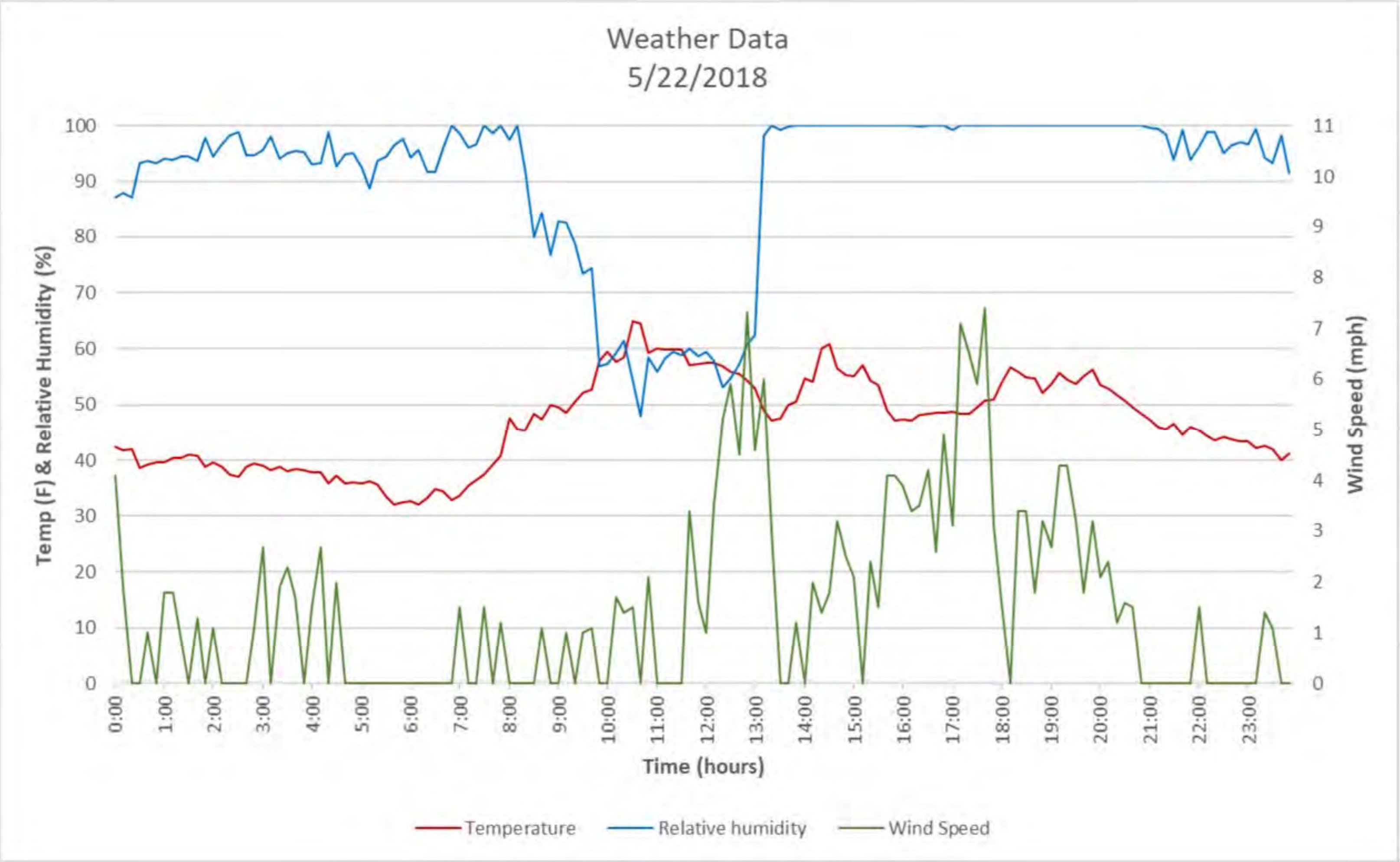
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-11

Weather Data: May 21, 2018
Caldwell Canyon Project



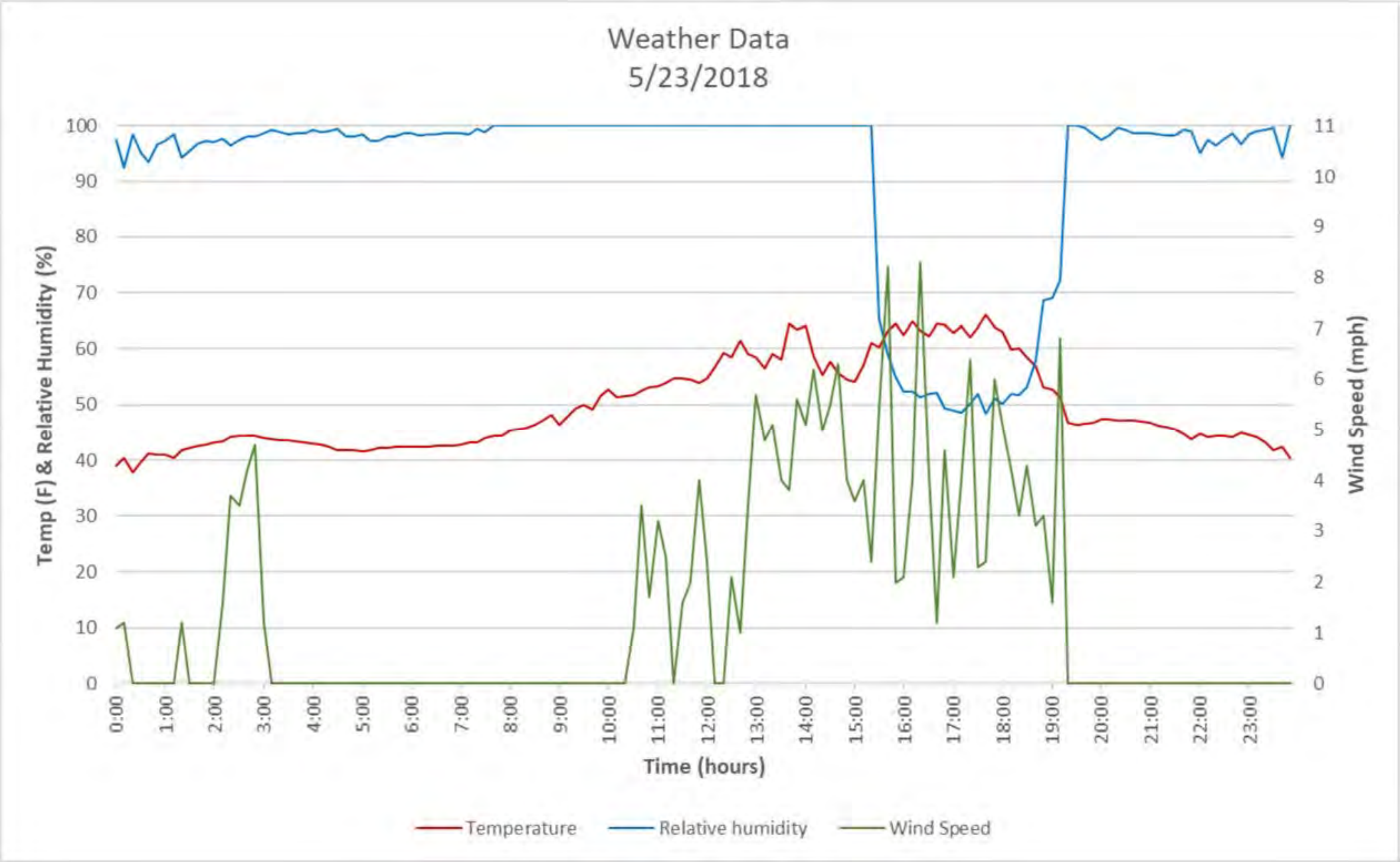
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-12

Weather Data: May 22, 2018
Caldwell Canyon Project

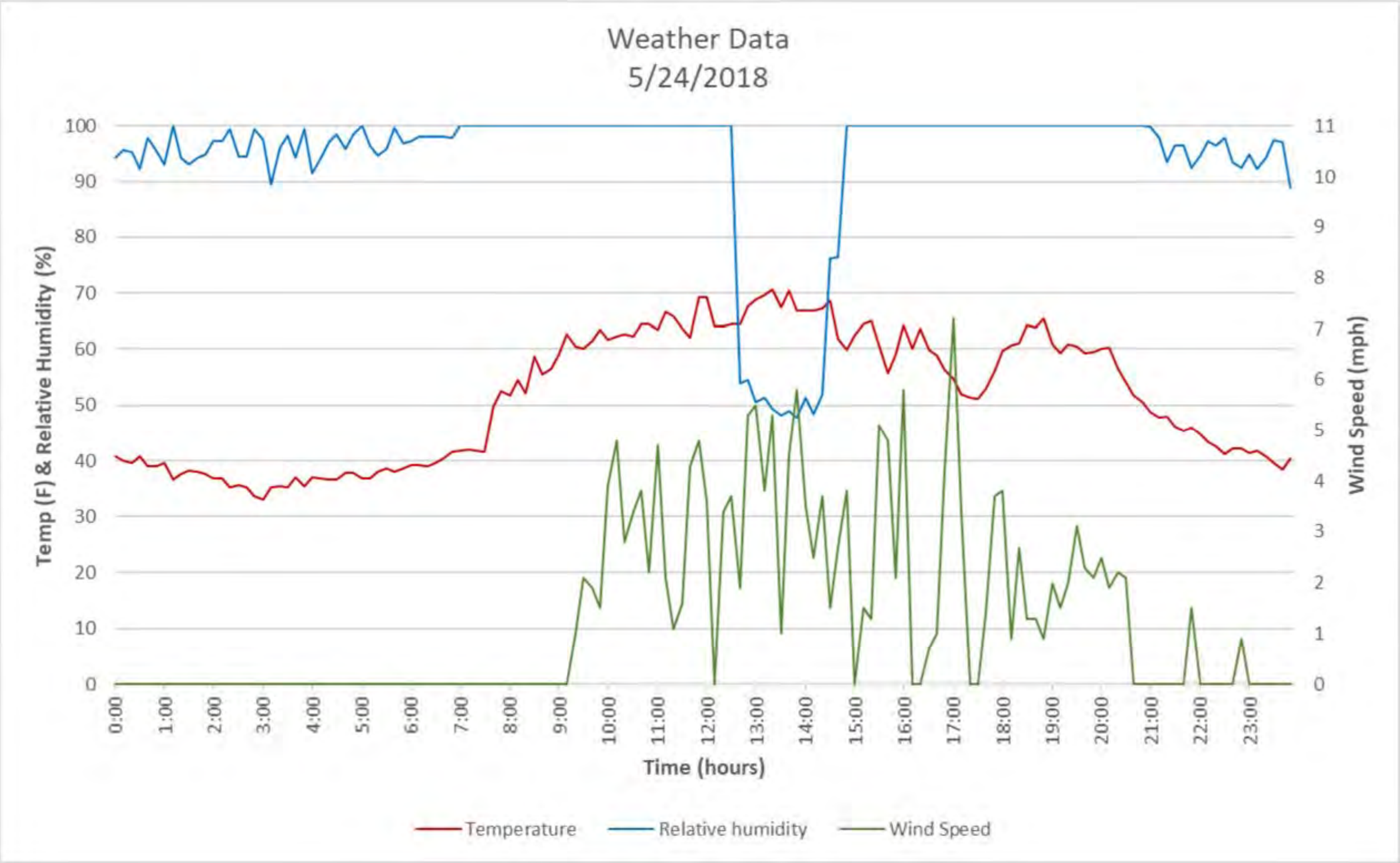


Notes:

- Weather data recorded every 10 minutes.

FIGURE C-13

Weather Data: May 23, 2018
Caldwell Canyon Project



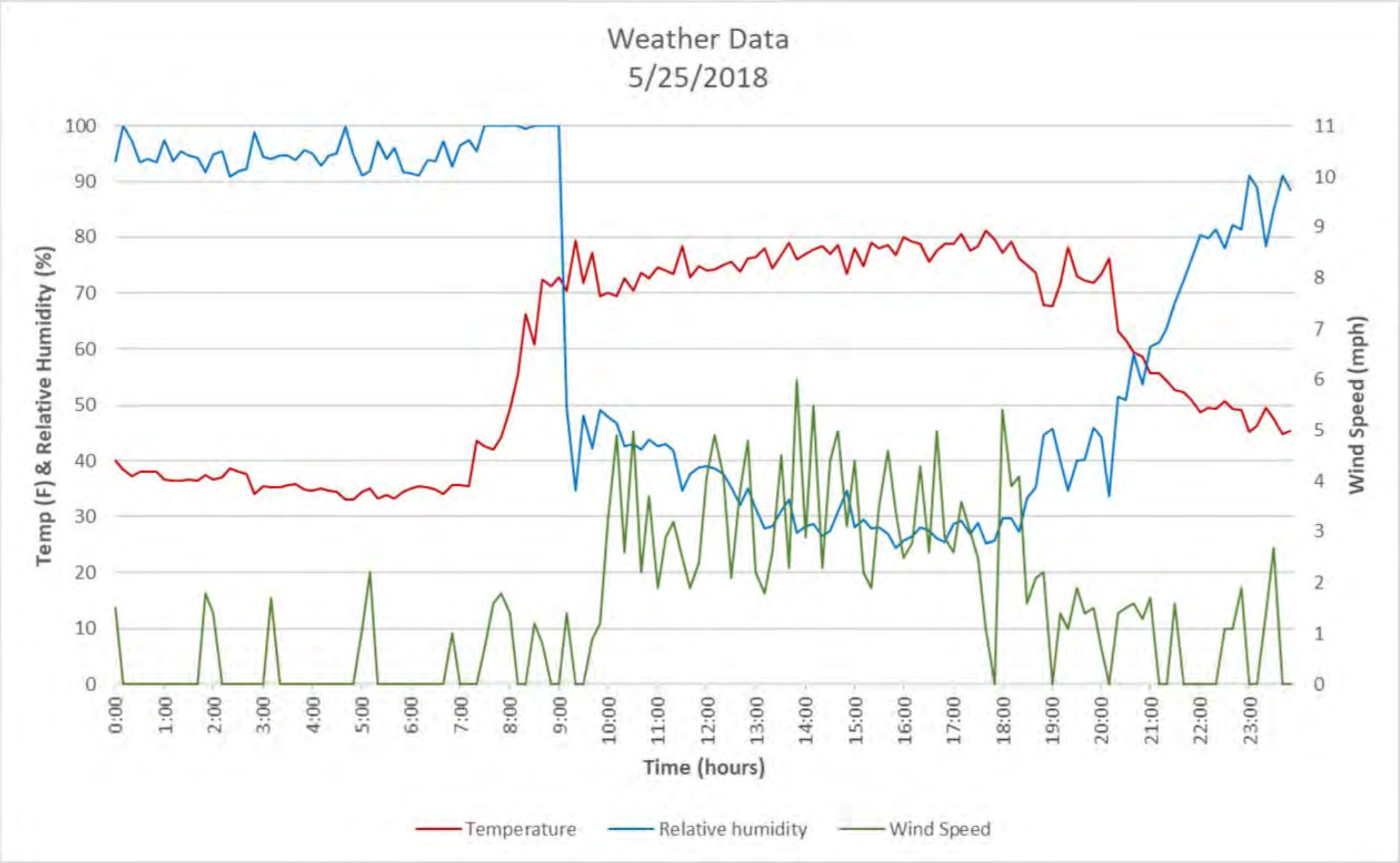
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-14

Weather Data: May 24, 2018
Caldwell Canyon Project



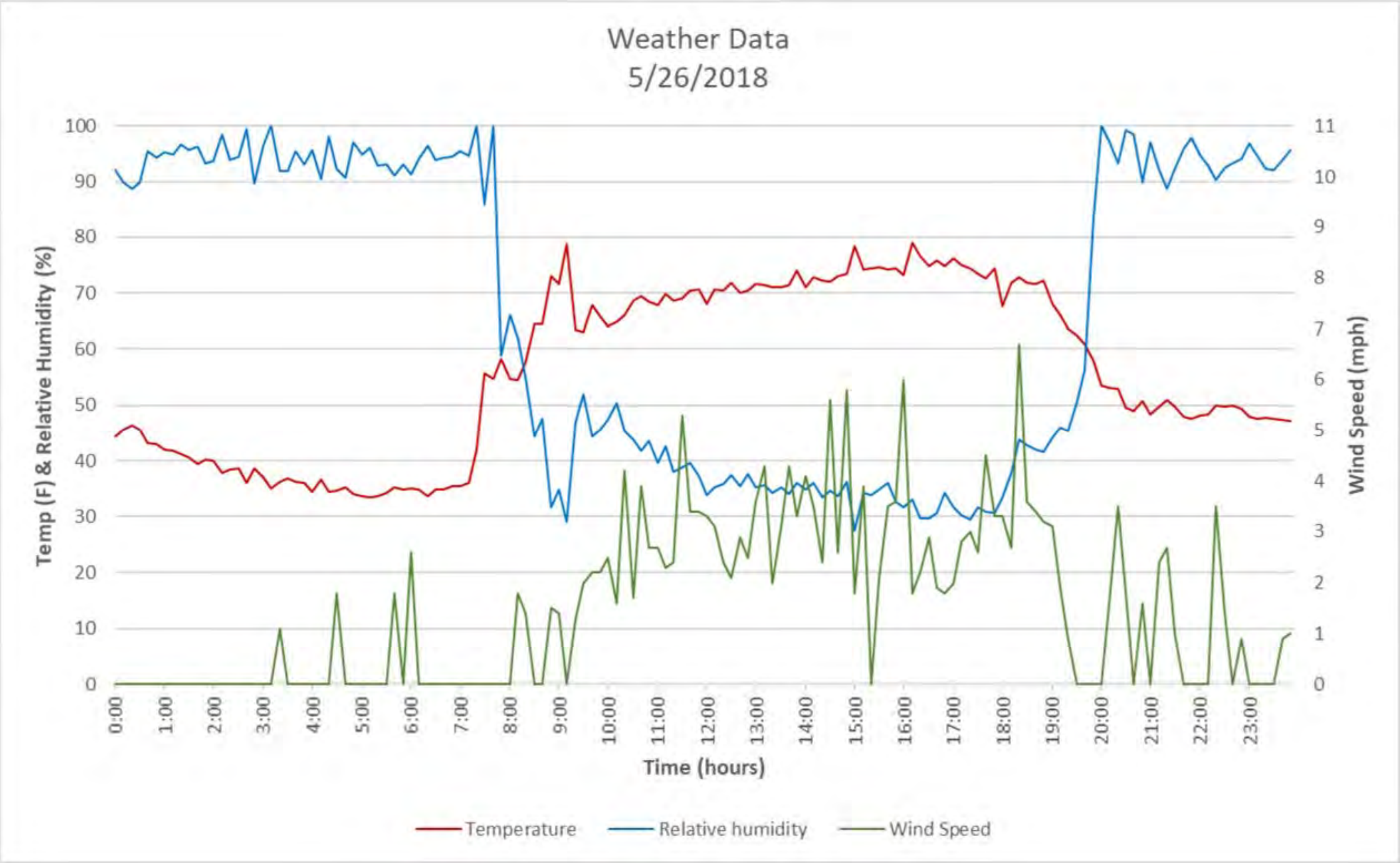
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-15

Weather Data: May 25, 2018
Caldwell Canyon Project



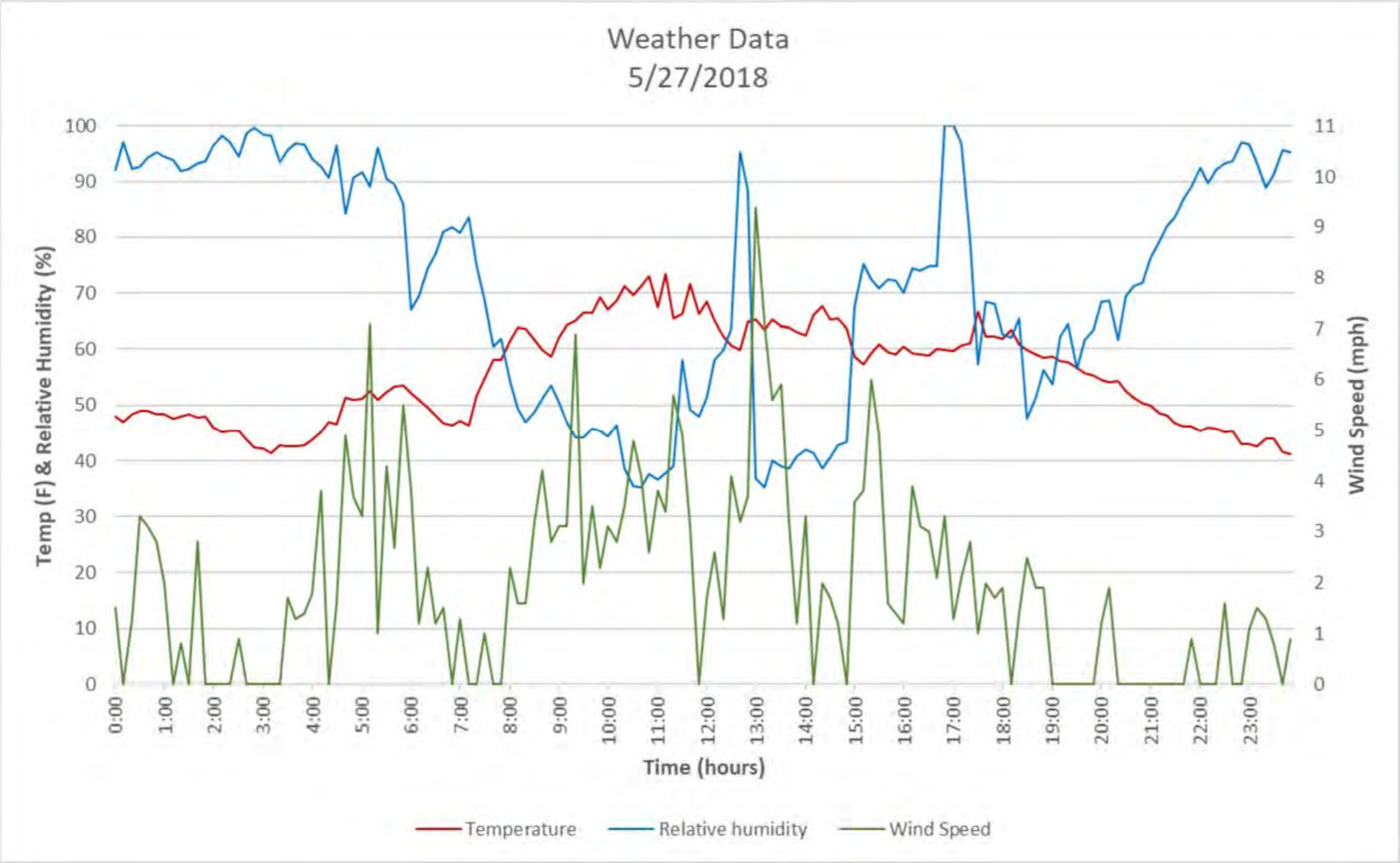
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-16

Weather Data: May 26, 2018
Caldwell Canyon Project

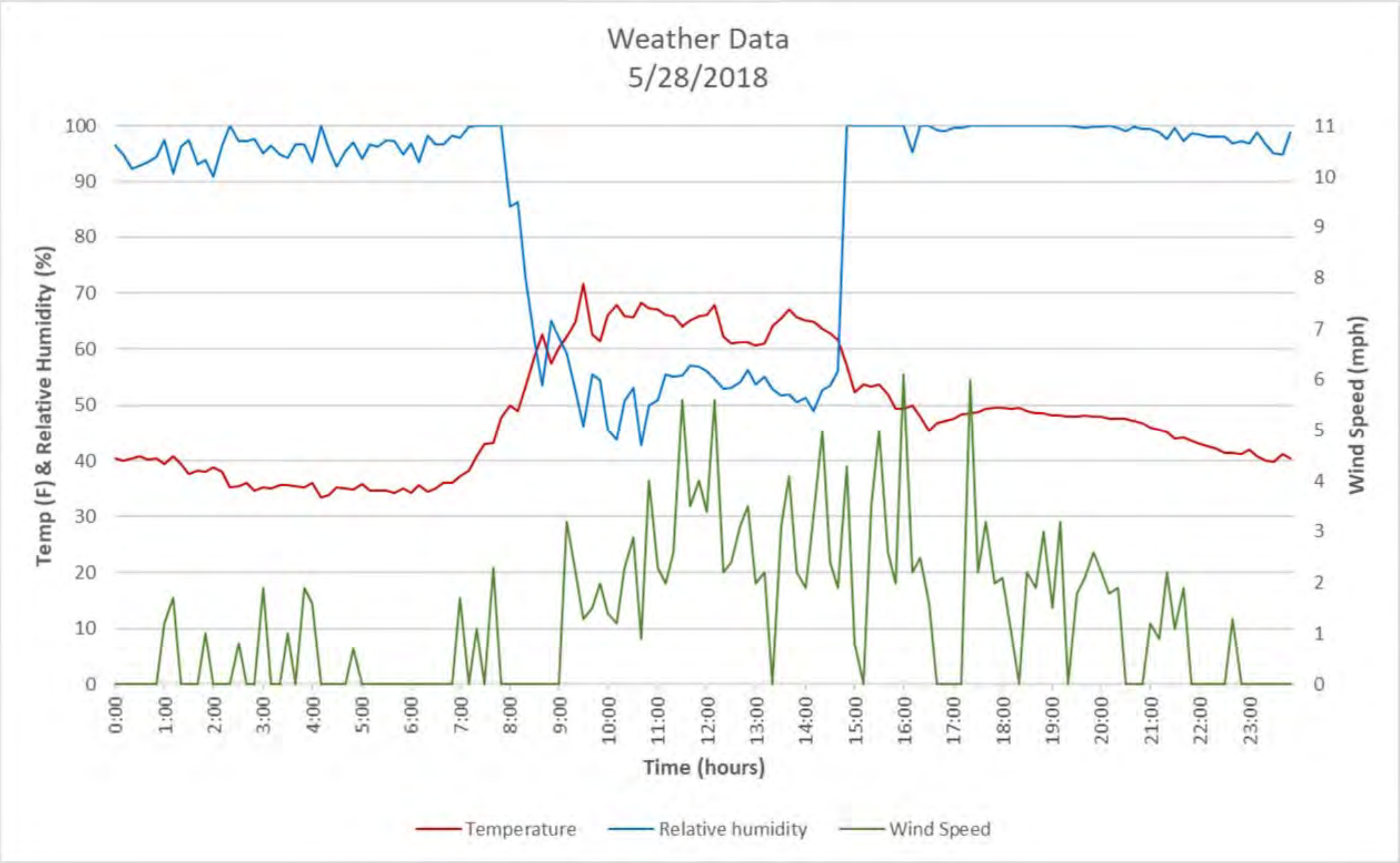


Notes:

- Weather data recorded every 10 minutes.

FIGURE C-17

Weather Data: May 27, 2018
Caldwell Canyon Project



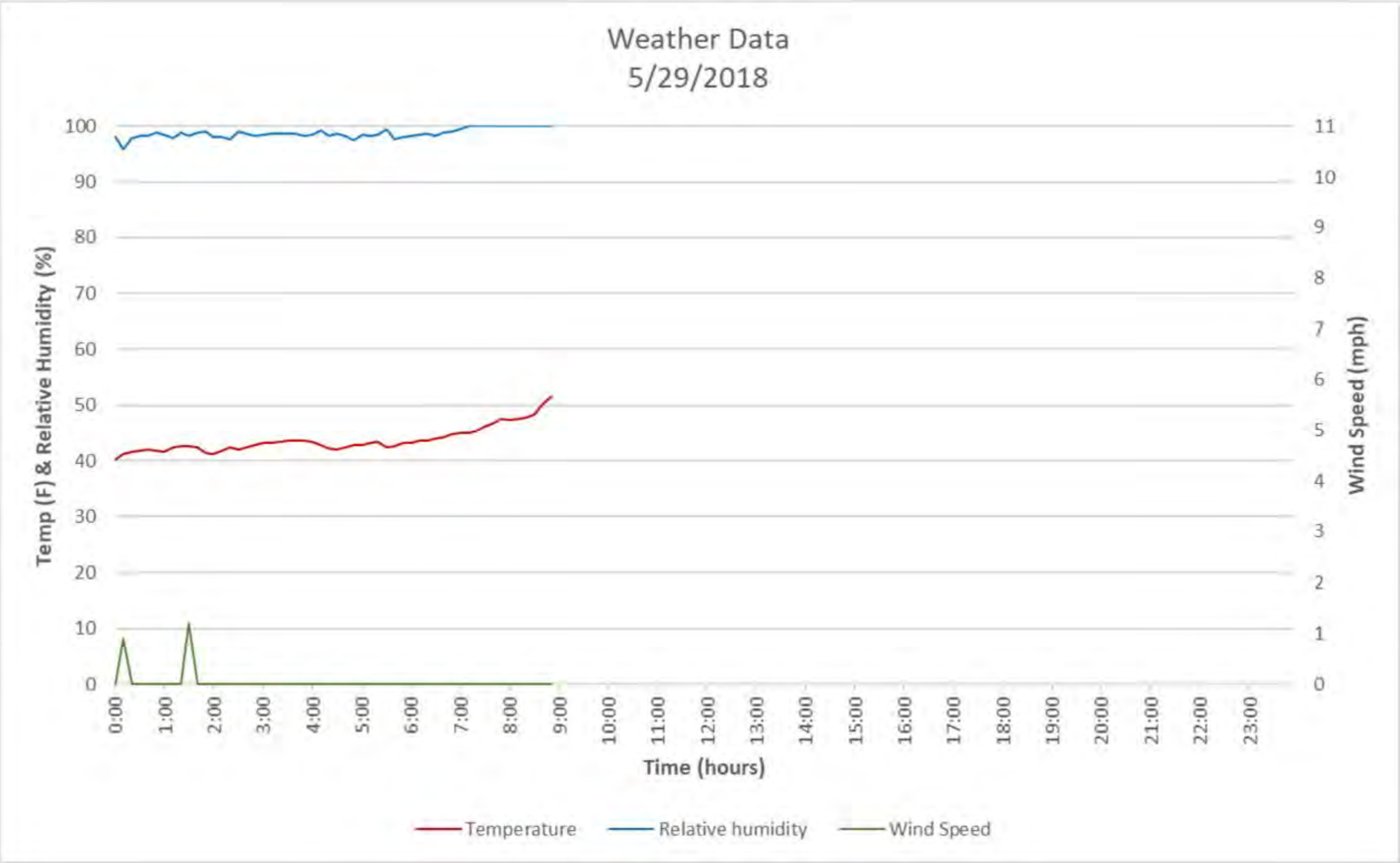
Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-18

Weather Data: May 28, 2018
Caldwell Canyon Project



Notes:

- Weather data recorded every 10 minutes.

Big Sky Acoustics

FIGURE C-19

Weather Data: May 29, 2018
Caldwell Canyon Project

Appendix D
Selenium Occurrence, Fate and Transport, and Mitigation

D.1 Introduction

Southeast Idaho is one of the world's major phosphate producing regions, and phosphate mining has been an important industry in the area since the early 20th century. Mining has resulted in overburden (waste) storage piles and backfill at more than two dozen closed mines. Past studies in Caribou and adjacent counties – including voluntary mining company investigations, area-wide investigations, mine-specific studies, and other investigations and studies since the 1990s – have identified overburden as a source of selenium and other contaminants that may pose a risk to human health and/or the environment. Selenium is an essential micronutrient for animals and plants, but when ingested in excess can be toxic, especially to certain livestock and wildlife. The phosphate mining area has recorded animal deaths due to selenium poisoning on and around the phosphate mines since 1985.

Rain and snowmelt infiltrating and percolating through overburden storage piles can dissolve selenium and other contaminants, transporting the contaminants to the surface through seeps, vegetation uptake or the commingling of contaminated water with surface water and groundwater. Exposure of livestock, wildlife, and aquatic life to toxic levels of selenium from phosphate mining is typically through three pathways 1) ingestion of vegetation grown directly on overburden, 2) ingestion of water that has contacted overburden or 3) bioaccumulation in fish via ingesting aquatic life living in water that has acquired selenium from overburden.

To address selenium and contaminant exposure, mining and reclamation methods have been developed that manage the overburden to ensure contaminants do not exceed safe levels in vegetation, water or aquatic environments. These methods include placing overburden as pit backfill to eliminate the surface seeps that could contain contaminants and placing engineered covers over overburden. These covers are thick enough to isolate plants and their roots from the overburden and designed to reduce the infiltration and deep percolation of meteoric water and snowmelt, thus reducing the selenium and contaminant loading to groundwater and connected surface water. Particular attention is paid to ensuring that the resulting groundwater quality meets surface water standards where it connects to sensitive surface streams and rivers.

The following discussion provides a more in-depth explanation of the source of selenium in southeast Idaho phosphate mines, how it is released from the overburden and transported into the environment, and how that information is applied to design mitigation strategies.

D.2 General Geologic Setting

The geologic units in the southeast Idaho phosphate district range from Paleozoic to recent in age. The geologic units include Quaternary-age alluvium, colluvium, and Triassic to Pennsylvanian-age shale, chert, siltstone, limestone, and dolomite. The stratigraphic section for the area includes a thick sequence of carbonate and clastic sedimentary rocks which are typical components of mined overburden. The geologic units in order from youngest to oldest, include:

- Alluvium/colluvium
- Dinwoody Formation
- Phosphoria Formation
- Rex Chert

- Meade Peak Phosphatic Shale Member
- Grandeur Tongue Dolomite of the Park City Formation
- Wells Formation

D.3 Phosphoria Formation

The Phosphoria Formation is comprised of sediments derived from two sources (Perkins and Foster, 2004), which results in mineralogical variability:

- Pelagic deposits including residual organic matter, calcite and dolomite, biogenic silica (SiO_2) (opal-A, now quartz), phosphate (PO_4^{3-}) (now carbonate fluorapatite [CFA]), and trace elements commonly present as sulfides; and
- Terrigenous deposits of siliciclastic components, inferred as aeolion in origin, dominated by potassium-feldspar (orthoclase, microcline), plagioclase with minor phosphates, carbonates, and oxides (Grauch et al., 2004).

The terrigenous material is anticipated to have lower potential for environmental impact than pelagic material, due to the presence of organic matter and sulfides within the marine sediments. Weathering also contributes to variation in mineralogy and geochemistry resulting in vertical geochemical variations. Knudson and Gunter (2004) noted the following trends with increased weathering:

- Disappearance of dolomite, calcite, and sulfides (pyrite, sphalerite); and
- Increase in phosphorus pentoxide (P_2O_5) and the ratio of P_2O_5/CFA.

Given the depositional environment and impact of weathering; and based on information from projects in the southeast Idaho phosphate district, several COPCs that can be released to the environment occur within the geologic materials. Perkins and Foster (2004) summarized the nature of the host phase of these COPCs (**Table D-1**). Understanding the nature of the host phase for COPCs is important in developing source terms for impact analysis. Selenium, for example, is released preferentially through the dissolution of sulfides compared with the weathering of organic matter. Total organic carbon appears to be an important indicator of COPC release.

Table D-1. Summary of Trace Element Affinities in Rocks of the Phosphoria Formation

Element	Unweathered/ Minimally Weathered	Weathered
Selenium	**Sulfides** Organic matter Selenides Oxyhydroxides Elemental Selenium	**Oxides** Organic matter Elemental Selenium
Cadmium, Copper, Zinc	**Sulfides** Organic Matter	**Oxides** Recalcitrant Organic Matter Copper: occluded Sulfides
Nickel	**Organic Matter** Sulfides Oxides	**Oxides** Organic matter Occluded Sulfides
Molybdenum	**Oxides and/or Apatite**	**Oxides and/or Apatite**

Element	Unweathered/ Minimally Weathered	Weathered
	Organic matter Sulfides Soluble or loosely sorbed	Occluded Sulfides or Organic Matter
Uranium	**Apatite** Occluded organic matter Soluble or loosely sorbed	**Apatite** Occluded organic matter Soluble or loosely sorbed
Chromium	**Refractory Phases (Chromium-oxide/hydroxide, Iron-silicates, Chromium-silicates)** Acid-soluble oxides	**Refractory Phases (Chromium-oxide/hydroxide, Iron-silicates, Chromium-silicates)** Acid-soluble oxides
Vanadium	**Sulfides** **Refractory Phases (Titanium-oxide, Vanadium-oxide)** Oxides and/or Apatite	**Oxides and/or Apatite** **Refractory Phases** Occluded Sulfides

Source: Perkins and Foster, 2004

Notes: Bold components indicate predominate host phase.

D.4 Meade Peak Member of the Phosphoria Formation

The Meade Peak Phosphatic Shale Member of the Phosphoria Formation is identified as the primary geologic residence of selenium. Cadmium, nickel, and zinc (among other elements) are also present in the Meade Peak Member at concentrations above average crustal abundance and can be mobile in seepage from overburden. The Rex Chert Member of the Phosphoria Formation may also release selenium and other constituents into the environment under certain conditions. Clean chert beds generally have low selenium and metal content and are commonly used as construction material and road base at mine sites in and near the project area. Shale interbeds and the transitional zone above the Meade Peak Member may have selenium content with reported values of up to 138 parts per million.

The Meade Peak Member is composed of fragments dominated by silicate minerals including monocrystalline quartz, potassium feldspar, and plagioclase, with subordinate amounts of detrital phosphate, carbonate, and oxide minerals. Matrix minerals are a combination of detrital and authigenic clays including illite, chlorite, and kaolinite. Carbonate fluorapatite is the primary phosphate mineral in both ore and overburden. Carbonate fluorapatite is similar to common fluorapatite with extensive substitution of carbonate (CO_3^{2-}) and minor substitution of sulfate (SO_4^{2-}) for phosphate (PO_4^{3-}) in the crystal matrix of carbonate fluorapatite.

Minor minerals include fine-grained pyrite (FeS_2) which is widely distributed in the Meade Peak Member. Euhedral to subhedral pyrite has been observed in bedding-parallel structures associated with clay. Vaesite (NiS_2) is also common in solid-solution with pyrite. Trace amounts of sphalerite (ZnS) are distributed throughout the Meade Peak Member. Sphalerite may be coarse or fine-grained and generally occurs as inclusions in carbonate fluorapatite or disseminated in the matrix. It is commonly associated with sulvanite (Cu_3VS_4), a copper vanadium sulfide mineral. Cadmium sulfide (CdS) also occurs as an alteration product of sphalerite.

D.5 Distribution of Elements

Pyrite and sphalerite are the primary mineralogic residences of selenium, cadmium, copper, and zinc in un-weathered rocks of the Meade Peak Member. Nickel and vanadium are associated with sulfide mineralogy to a large extent, as well. Fine-grained framboidal to subhedral pyrite is the principal host of selenium. A small fraction of selenium in the Meade Peak Member is also present in elemental form. In weathered rocks, selenite (Se^{4+}) dominates over reduced forms and is associated with oxyhydroxides. It is assumed that selenite is derived from the oxidation of primary sulfide minerals (Perkins and Foster, 2004). Sphalerite and organic matter are the primary hosts of cadmium and zinc in un-weathered rocks. Strong sorption to oxyhydroxides dominates cadmium and zinc occurrence in weathered rocks. Organic matter and oxyhydroxides contain the majority of selenium, cadmium, copper, zinc, nickel, and vanadium that occur in the Meade Peak Member outside of the sulfide mineral reservoir.

D.6 Selenium Fate and Transport

While there are several COPCs of interest, selenium is of key interest for overburden management, due to its ability to be highly reactive under certain geochemical conditions (Presser et al., 2004; Hamilton et al., 2004; Mackowiak et al., 2004; and Herring, 2004). Reduced forms of selenium, such as selenide (Se^{2-}) and elemental selenium (Se^0), are relatively insoluble in water and have low environmental mobility (Seed et al., 2000); however, exposure to the atmosphere, can oxidize Se^{2-} and Se^0 into mobile forms such as selenium (IV) (Se^{4+}) and selenium (VI) (Se^{6+}).

In oxygenated water, Se^{4+} occurs as selenite (SeO_3^{2-}) and biselenite ($HSeO_3^-$), while Se^{6+} is present as selenate (SeO_4^{2-}) (Hem, 1989 and Masscheleyn et al., 1990). Selenite and selenate are highly soluble under alkaline conditions, can be transported in surface and groundwater, and can bioaccumulate in plants and organisms. Geochemical controls that reduce or limit the solubility of selenium in water include sorption to mineral surfaces including oxyhydroxides of iron, manganese, and aluminum (Hayes et al., 1987; Balistrieri and Chao, 1990; and Rajan, 1979). Clay and carbonate minerals also provide effective sorption surfaces for selenium (Bar-Yosef and Meek, 1987; Cowan et al., 1990). Redox potential and pH both affect selenium solubility and sorption reactions. In general, selenate is less strongly sorbed to mineral surfaces than is selenite, and sorption reactions for selenium are least efficient under oxidizing conditions at circum-neutral pH (Elrashidi et al., 1987).

Redox reaction rates for selenium can be rapid (Pickering et al., 1995), with the aqueous species SeO_3^{2-} and SeO_4^{2-} being readily reduced to insoluble Se^0 (Hem, 1989). Likewise, Se^0 and Se^{2-} are easily oxidized to forms that are mobile in the environment (Pickering et al., 1995). Microbial processes strongly affect the redox state of selenium. Selenate in solution (SeO_4^{2-}) is reduced to Se^0 and precipitated by anaerobic bacteria in a wide range of sediments (Stolz et al., 2002). Oxidizing bacteria may also mobilize selenium in favorable environments at rates that are three to four orders of magnitude less than the reductive part of the cycle (Stolz et al., 2002).

Selenium bioaccumulates in plants, and although it is an essential nutrient for the maintenance of health in mammals, it is toxic at high concentrations. Plant species of the genus *Astragalus* and *Grindelia* (curlycap gumweed) are particularly notable for bioaccumulating selenium, with some plants having been found to contain several thousand milligrams of selenium per kilogram of dried plant material (Fessler et al., 2003; Hem, 1989). Organo-selenium compounds such as selenomethionine are common in the environment but have not been identified in unweathered rocks of the Phosphoria Formation. Organo-selenium compounds are formed in plant tissue and become present in soil and water by the decay of seleniferous vegetation.

The distribution of selenium within the Phosphoria Formation and implications for environmental fate and transport is summarized from Perkins and Foster (2004):

- The largest fraction of selenium in unweathered/minimally weathered samples are associated with sulfides;
- The majority of non-sulfide selenium is associated with organic matter and oxyhydroxides;
- Se^0 is present in minor amounts;
- Se^{6+} associated with oxyhydroxides is the dominant form of selenium in weathered samples, implying oxidation of primary sulfide and organic selenium host phases;
- High total organic carbon and scarcity of sulfides in weathered samples indicate sulfide minerals are preferentially lost relative to organic matter during weathering;
- Selenium and other trace elements are hosted in a number of phases that have variable oxidation rates and a wide range of particle sizes; and
- Release of these elements to the environment will be a variable and long-term process.

D.7 Summary of Conclusions

Two mechanisms control selenium releases from phosphate mine overburden. The primary release is controlled by water-soluble selenium that is present in the material at the time of placement. The secondary release is from weathering of sulfide mineral (pyrite) and organic material in shale. Oxidative weathering of sulfide minerals and organic material is sluggish, and releases by this mechanism are small compared to releases of water-soluble selenium (Whetstone Associates, 2011).

The primary approach to mitigation of the potential effects of selenium from overburden on the environment, is the placement of overburden as backfill into the mined out open pits to reduce the opportunity that the selenium will reach land surface and capping the material with a cover system designed to limit the dissolution of selenium by infiltration of meteoric water. This will limit the amount of water that can contact the water-soluble forms of selenium, reducing the potential for flushing of COPC from the overburden. A combination of variably saturated modeling and groundwater fate and transport modeling evaluated the release of selenium and other COPCs from the backfilled pits. The evaluation was used to develop a closure design.

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Appendix E
Comments on the Draft EIS and Responses

Draft EIS Comment Period

The BLM made the draft EIS available for public review on November 30, 2018. The EPA published the notice of availability in the Federal Register that day (Federal Register, 2018a) and the BLM published a notice of availability in the Federal Register (Federal Register, 2018b). BLM placed a legal notice in the Idaho State Journal on December 4 announcing the availability. By November 23, 2018 approximately 600 postcards announcing the draft EIS and information on how to access the electronic document or request a hard copy were mailed. Postcards were sent to people on the mailing list and those who commented during scoping. The draft EIS was made available via the BLM's ePlanning website.

To establish standing and ensure that substantive comments have a response in this appendix, comments had to be submitted by January 14, 2019, but comments submitted after this date would be reviewed and responded to where possible. Approximately 700[2] were received or postmarked by this date. Due to the lapse in funding for some federal agencies that began December 28, 2018 (including BLM and EPA), the EPA submitted their comments on February 13, 2019.

Comments were submitted to a database, text of the comment captured, and an analysis of content completed to identify substantive comments. Substantive comments were determined by considering the CEQ NEPA implementing regulations direction on responding to comments on the draft EIS according to 40 CFR 1503.4:

(1) Modify alternatives including the proposed action.

(2) Develop and evaluate alternatives not previously given serious consideration by the agency.

(3) Supplement, improve, or modify its analyses.

(4) Make factual corrections.

(5) Explain why the comments do not war-rant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.

Comments and Responses

The substantive comments identified were grouped into categories based on their content and sorted. Subject matter experts then drafted responses based on the CEQ direction. When several comments and responses were similar, the comments were summarized into one comment, and a single response provided.

The comment categories and responses are organized to follow the organization of the EIS. Comments about the content of Chapter 1 are first, followed by those on the content of Chapter 2, etc. Chapter 3 comments are organized in the same way as Chapter 3 resource sections.

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[2] Some of the comments received via mail did not have postmarks but came in a bundle where the date could be reasonably estimated from the postmarks on the rest of the bundle. Where there was doubt about a comment with no postmark because some in the bundle had dates after January 14 and some before, it was assumed the comment was postmarked by January 14.

The comment number indicated is the individual comment number in the comment database. Each comment has its own number, regardless of the letter it was submitted in.

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Comment Period

No.	Commentor	Comment	Response
376, 377 and 378	Western Watersheds Project and the Center for Biological Diversity	The public comment period should be re-opened because it did not meet the requirements of the National Environmental Policy Act (NEPA) and NEPA's implementing regulations. Also, BLM was to make staff available to meet with the public and answer questions and request information. Agencies were available for only 16 of the 45 day-comment period due to the government shutdown and weekends.	The comment period did comply with the NEPA implementing regulations. See the introduction to this appendix for details. The BLM made themselves available starting on January 28, 2019, when the furlough ended. BLM contacted Western Watersheds Project on February 1, 2019, making BLM staff available through February 15 to provide information while waiting for EPA to comment. Western Watersheds Project submitted comments within the 45-day comment period, thus gaining standing and additional comment by February 15, which were considered.

Purpose and Need

No.	Commentor	Comment	Final Response
136, 379	Yellowstone to Uintas and Kiesha's Preserve, Western Watersheds Project, and the Center for Biological Diversity	The Purpose and Need should also ensure no further selenium pollution to surface waters, ground waters, soils and vegetation and to rectify past damages such as the loss and habitat modification of streams and springs, fragmentation of Greater Sage-Grouse habitat and the Corridor. This Purpose and Need does not recognize BLM's obligations to conserve natural resources in accordance with the Endangered Species Act, Federal Land Policy and Management Act of 1976 (FLPMA), and the Mineral Leasing Act of 1920.	BLM's obligation to administer regulations under the agency's jurisdiction are the basis for the statement in Section 1.3 that …"The purpose of the Caldwell Canyon Project is for the BLM to evaluate and respond to the MRP..." The evaluation identified in the statement addresses BLM's authority under 43 CFR 3590, FLPMA, and the Mineral Leasing Act of 1920. The analysis was conducted to determine if the project will meet the requirements of the state and federal laws and regulations that protect the environment. These laws and regulations are addressed in the EIS and will also be addressed in the ROD.
380	Western Watersheds Project and the Center for Biological Diversity	The Purpose and Need should include that P4 Production/ seeks to process elemental phosphorus to sell and make Roundup herbicide.	The purpose and need for the project (Section 1.3) is the BLM's purpose and need, not P4 Production's. The statements included acknowledges P4's right to recover phosphate ore from the leases. The production of elemental phosphorous and Roundup is outside the scope of the EIS.

Proposed Action

No.	Commentor	Comment	Final Response
138	Yellowstone to Uintas and Kiesha's Preserve	The Reclamation Bond described in the DEIS (p16) is only for reclamation. When does it expire?	The reclamation bond described in Section 2.1.13 is to assure that the obligations in the approved MRP and ROD are met. The reclamation bond is released upon fulfillment of all the lease, approved mine reclamation plan, and ROD requirements, which includes reclamation. Reclamation includes meeting required environmental laws and regulations. The bond is released after the lessee has met all of its obligations under the lease.
518	Micaela Erickson	Is this lease amount public knowledge?	The amount paid for the lease purchase and in future royalties is confidential information and not available for publication in the EIS. Lease acquisition costs are determined on a competitive basis and royalties are based on a regulated process described in Section 3.13.4. The amounts paid to the United States to acquire the subject phosphate leases is public information and will be available from the Idaho State Office after the leases are made. Projected royalty amounts are disclosed in section 3.14.3.1
890	EPA	We recommend that this [water management] information be clarified in the FEIS. Additionally, we are unclear about the performance of the infiltration galleries and anticipated volumes of water.	The EIS has been updated to clarify this information. New information appears in the Mining section of the Executive Summary on page S-2. No mine contact water will be discharged to surface waters.
367	Idaho Conservation League and Greater Yellowstone Coalition	Develop a detailed reclamation plan.	Section B.16 of Appendix B of the DEIS provides a detailed reclamation plan associated with the Proposed Action. The reclamation plan is adequate for the NEPA analysis and is complete and in compliance with 43 CFR 3592.

Alternatives

No.	Commentor	Comment	Final Response
334	Yellowstone to Uintas and Kiesha's Preserve	Provide a map and analysis of the Corridor [Wasatch Cache NF corridor map-2000] addressing habitat fragmentation and the presence of core, corridor, Lynx Analysis Units (including the LAUs proposed, but	Upon review of the map submitted with the comment, the "Corridor" is well outside the scope of the analysis for the Caldwell Canyon project.

No.	Commentor	Comment	Final Response
		omitted from the 2003 CNF RFP and an analysis of their condition then and current conditions), Roadless Areas, Wilderness Areas, NRAs, areas closed to livestock grazing, security areas, and Goshawk home ranges. Then provide an alternative that proposes road closures to attain a scientifically defensible density per square mile, grazing allotment closures, fence removals, and setting noise limits on vehicles.	
362 and 363	Idaho Conservation League and Greater Yellowstone Coalition	It is unclear what the underlying problem that is solved by the enhanced geomembrane cover. How were the locations for the cover enhancement selected? for the cover enhancement selected? Could material segregation address the excessive plume generation? Will the application of the geomembrane sufficiently inhibit infiltration or move concentrated water flows to the edges of the membrane areas resulting in increased flows through the backfill and accentuated leaching in those areas? The EPM's section (2.2.2) discusses a piped drainage collection system for water collecting under the cover. Does this consider the membrane as part of the cover? What type of monitoring system will be used to assess infiltration rates or capture and test groundwater at the bottom of the backfill? If selenium concentrations exceed predicted levels and pose a contamination problem off site, what type of water capture and treat systems would be utilized? …evaluate the need for a refined material segregation plan for pit backfill. It is very important to use non seleniferous material in backfill areas that could be exposed to oxidation from water transfer along the geomembrane and concentrated flow paths. Well-established protocols for sorting seleniferous/non-seleniferous material and regular monitoring that material is being properly sorted are vital components to	Material segregation was considered by P4 Production as part of their preparation of the Proposed Action. The Proposed Action does include segregation of materials below the water table and to construct chimney drains. Under Alternative 1, further segregation of materials was not considered necessary to manage COPCs in surface water and groundwater, as demonstrated by the fate and transport modeling. Predictive modeling for the EIS has determined where geomembrane is needed to ensure the mine meets the applicable groundwater quality standards and maintains compliance at the IDEQ Points of Compliance. The membrane coverage area was evaluated during development of Alternative 1 (Section 2.2.1) and is described in more detail in the conceptual design for the geosynthetic cover (NewFields, 2018b) document referenced in Section 2.2.1. The reclaimed surface topography in concert with the cover drainage pipes would direct flow to the chimney drain structures that avoids percolation into overburden avoiding COPC leaching, as described in the Mine and Reclamation Plan.

No.	Commentor	Comment	Final Response
		managing COPCs. This again may mirror the design of the chimney drains. The SDEIS should evaluate the potential and need for larger membrane coverage or contouring the backfill and liner supporting layers to provide flow paths to chimney drain structures. The SDEIS should address drainage pipe construction sequencing with regard to membrane placement.	
384	Western Watersheds Project and the Center for Biological Diversity	43 C.F.R. § 3510.15 (g), requires that "[l]easing the lands will conserve natural resources and will provide for economical and efficient recovery as part of a mining unit[.]" Therefore, BLM must assess whether natural resources will be conserved if it modifies the lease. Under NEPA, BLM's conservation assessment requires comparison of alternatives, but the DEIS does not include a no-lease-modification alternative.	Enlargement of an existing lease by modification to allow for economic and efficient recovery of the entire ore body serves to conserve the phosphate mineral deposit. An alternative that does not approve lease modifications has been added to Section 2.4.8 but is not considered in detail.
385	Western Watersheds Project and the Center for Biological Diversity	The DEIS additionally does not include an alternative that maximizes wildlife protection and natural resources conservation. The latter is of concern in large part because of the project's proposed reliance on voluntary, rather than mandatory, measures to protect Greater Sage-Grouse.	The DEIS describes the No Action Alternative; which would maximize wildlife protection and natural resources conservation. P4 Production has committed to the Greater Sage-Grouse mitigation plan in Appendix C, which will become a condition of approval.
895	EPA	We recommend that the FEIS discuss the various cover performance modeling results [from the MRP] (i.e., infiltrations rates, leachate/groundwater concentrations of contaminants of potential concern). The discussion should include the basis for designing the geosynthetic cover on only selected portions of the waste rock. In addition, we request clarification about the ID#1 reduced percolation rate identified in the Mine Plan. If this alternative cover is more protective of groundwater, we suggest including it as an alternative carried forward for analysis in the FEIS or providing the basis for eliminating it from the analysis.	See Section 2.2.1 and the referenced materials.

Environmental Protection Measures and Mitigation

No.	Commentor	Comment	Response
141	Yellowstone to Uintas and Kiesha's Preserve	The reliance on BMPs is a flawed approach that assumes they work.	The environmental protection measures listed in Section 2.1.11 and Appendix B are commonly used and readily monitored. BMPs have been determined or are predicted to be effective.
144	Yellowstone to Uintas and Kiesha's Preserve	Irrigation diversions are described as contributing to stream flow losses in addition to losses to groundwater. (DEIS p50). There was no analysis for each stream or spring of the amounts withdrawn by diversions. Slug Creek and Dry Valley Creek appear to be connected to the Blackfoot River. A hard look should tabulate for each stream the amount diverted. An important aspect of this is whether the private property owners who have these water rights are also owners of the mineral rights for Caldwell or Dry Valley mines. An appropriate measure to restore stream flows to support fish would be the acquisition of water rights from these diversions.	Diversion of surface flow is not a component of the Proposed Action or any alternative. Surface water rights locations are shown on **Figure 15**. Water rights owner names, permitted diversion rates, modeled stream flows at the diversion locations, and predicted changes in flows at those locations are listed in **Table 13**. The Final Water Resources Baseline Technical Report (NewFields, 2017a), which is available for review as part of the project record, provides additional information regarding water rights in Section 9.2 and Appendices J1 through J4. Effects to stream flow as a consequence of irrigation practices in the Project area represent an existing condition.
148	Yellowstone to Uintas and Kiesha's Preserve	Consideration should be given to removing livestock from Fox Creek Ranch to provide habitat for fish, reptiles and amphibians, birds, Greater Sage-Grouse and also for increasing water storage and offsetting riparian and wetland impacts from the proposed mine.	BLM cannot require offsite mitigation and must not require compensatory mitigation from public land users per Instruction Memorandum 2019-018) except where the law specifically requires. BLM will consider voluntary proposals for compensatory mitigation. P4 has fenced the off-site, Fox Hills Ranch livestock from major portions of the Blackfoot River within the boundaries of the ranch to reduce impacts to the Blackfoot River.
156	Yellowstone to Uintas and Kiesha's Preserve	Climate change mitigation could include cessation of livestock grazing which would allow carbon to be stored in plants and soil, while rebuilding soils. This would also allow streams and riparian areas to recover, reducing soil loss and stream sedimentation.	See previous response with respect to BLM's ability to mitigation. This includes mitigation for climate change. Pocatello ARMP allows grazing. On federal allotments, grazing is conducted in a manner so as to minimize soil loss and stream sedimentation. Concurrent reclamation of mine pit panels would reduce the

No.	Commentor	Comment	Response
			time when mine areas would be disturbed and un-reclaimed. Livestock grazing of reclaimed areas on Federal land would not occur until sufficient vegetation has been established to support grazing.
159 and 177	Yellowstone to Uintas/ Kiesha's Preserve	Mining companies should offset some of their [illegal roads] impacts by mapping illegal trails and roads and using their equipment and staff to assist in closing these in this CEA and Corridor.	It is unclear as to what the commenter refers to as illegal roads. There is currently no legal public access to the mine area without permission across private land. **Table 6** as the limited amounts of public land are surrounded by private land. The BLM does not consider the existing access roads and trails "illegal and unnecessary roads". BLM does not have the authority to require the mining companies to implement this type of inventory or action outside of the project area. See the response to Comment 148 regarding offsite mitigation.
366	Idaho Conservation League and Greater Yellowstone Coalition	Describe the trees that will need to be controlled, what measures (herbicide, hand pulling, removal and replanting elsewhere, etc.) will be used, the effects of such actions (such as herbicide use), the frequency of such actions, the long-term cost (since tree establishment will need to be precluded in perpetuity), and the effects and costs if trees do become reestablished and compromise cover effectiveness.	See Section 3.8.3.1 page 114.
369	Idaho Conservation League and Greater Yellowstone Coalition	Create a detailed habitat mitigation plan working with IDFG to specifically incorporate applicable guidance for Greater Sage-Grouse and other impacted species.	Onsite mitigation is addressed by the proposed reclamation seed mix and cover design for restoration of habitat. While BLM does not have the authority to require offsite mitigation, a voluntary compensatory Greater Sage-Grouse plan has been submitted by P4 Production would be a condition of approval in the ROD.
371	Idaho Conservation League and Greater Yellowstone Coalition	Reassess mitigation measures for all the affected wetlands and waters.	The Project was designed to avoid jurisdictional and non-jurisdictional waters (see Section 2.4.4). P4 Production is currently working with the USACE on the 404 permit for impacts on jurisdictional waters.
394	Western	Research cannot be counted as mitigation for damage	BLM is not interpreting the proposed research as mitigation;

No.	Commentor	Comment	Response
	Watersheds Project and the Center for Biological Diversity	and loss of Greater Sage-Grouse habitat and leks.	however, the results are expected to lead to more effective mitigation in the future.
395	Western Watersheds Project and the Center for Biological Diversity	Mitigation cannot be considered a net conservation gain unless that is made a mandatory Condition of Approval.	Section 3.9.2 has been updated to refer to the BLM's revised decision on the Greater Sage-Grouse approved resource management plan amendment (BLM, 2019), which removed the requirement for mitigation to result in a net conservation gain for Greater Sage-Grouse habitat. Offsite mitigation volunteered by P4 Production would be a condition of approval in the ROD. At that point, the volunteered mitigation would become required.
873	Idaho Office of Energy and Mineral Resources	Page 19, section 2.2.1 identifies procedure for implementing capillary break if the backfill provides a "firm, no-yielding surface". However, directions or alternatives should be provided if the surface does not meet those expectations.	Backfill procedures and contouring would be carried out to result in surfaces that are firm and non-yielding. Surfaces that are not firm and non-yielding would be corrected prior to placing the capillary break cover component
913	Shoshone-Bannock Tribes	Fund a complete and comprehensive Ethnographic study for Tribal cultural heritage of the Caldwell Canyon Mine area. Monitor the biological impacts from COPCs released into the environment.	The Tribes have requested ethnographic studies for other EISs prepared by BLM. BLM has worked with the phosphate industry to make resources available for an ethnographic study as requested previously by the Tribe. BLM has requested direction and assistance from the Tribes to necessary in undertaking a study and look forward to working with the Tribe to access Tribal Elder oral histories. Meanwhile, BLM will continue to communicate with the Tribal staff and Fort Hall Business Council as done in the past to locate and protect culturally important resources. The MRP has been designed to eliminate or reduce COPC releases due to mining to below levels of concern to biological receptors. The EIS analysis has confirmed that prediction. An area-wide study indicated that COPCs from phosphate mining were not affecting wildlife (see Section 3.9.3).

Monitoring

No.	Commentor	Comment	Response
892 and 368	EPA Idaho Conservation League and Greater Yellowstone Coalition	The Adaptive Management Plan should include specific details regarding media being monitored, location/frequency, responsible party, threshold of criteria/performance standard, and corrective action. Develop a comprehensive wildlife monitoring plan. The existing proposal for monitoring migratory birds, eagles, Greater Sage-Grouse, and nests must be expanded to include the many species of wildlife that rely on the project area for survival. Wildlife monitoring and evaluation should include assessments of individuals, populations, communities, and ecosystems.	A detailed Environmental Monitoring Plan (draft version outlined in Section B.14.1) will be submitted by P4 Production prior to disturbance of the areas requiring monitoring. The mine is designed and would be permitted to be in compliance with all rules and regulations. Although the need for corrective actions is not expected, if it is required during mine operation, it will be based on monitoring results from the Environmental Monitoring Plan. BLM has no authority to require monitoring of wildlife species where standards are not defined. The project is designed, and procedures are in place, to be in accordance with the Migratory Bird Treaty Act and the Pocatello ARMP which includes migratory birds, special status and sensitive species and raptors.
139, 365	Yellowstone to Uintas and Kiesha's Preserve and Idaho Conservation League and Greater Yellowstone Coalition	What tools or resources are available to correct ongoing pollution and habitat loss extending past the mine life of approximately 40 years. Establish monitoring wells in western slope locations to monitor depth and COPC concentrations. Describe in detail the adaptive management actions should selenium (or other COPCs) reach critical levels, the thresholds for management actions, likelihood of success of adaptive management, costs, and long-term costs.	See Section 2.1.13 page 20. IDEQ established an array of Point of Compliance wells that P4 will install at locations down gradient from the Caldwell Canyon Mine. Some of the wells have already been installed. The well arrays include both shallow and deep aquifer systems to monitor quality of groundwater in compliance with Idaho's Ground Water Rule. Management of site water with respect to COPCs is described in Section B.2 of Appendix B of the DEIS. See also the response to Comment 892. See the Idaho Groundwater Rule and approved POC.

Alternatives

No.	Commentor	Comment	Response
142 and 360	Yellowstone to Uintas and Kiesha's Preserve Idaho Conservation League and Greater	An alternative should have been provided that does not include any mining below the water table and providing geosynthetic membrane in any areas subject to percolation and contamination of groundwater, particularly the Wells Aquifer.	Economic ore extends below the water table at the north end of the North Pit and in the South Pit. The proximity of the North Pit to and the potential impacts to the Blackfoot River caused P4 Production to avoid mining below the water table in this area.

	Yellowstone Coalition	Alternative 1 is not truly an alternative, however, a comparison to not mining below the water table could provide some meaningful justification for the FEIS.	The area of economic ore below the water table in the South Pit did not have the same concerns as the North Pit area. Here, under Alternative 1 (geomembrane cover), and by selective waste rock handling, the groundwater that would be affected was predicted to not exceed groundwater standards for COPCs at the Points of Compliance. The Water Management Plan would adequately address potential water quality issues while allowing for recovery of 2.5 million tons of phosphate ore, not mining below the water table in the South Pit would have substantially similar effects to the proposed action and was not analyzed in detail. Alternative 1, the geo-synthetic membrane, is not a substitute for not mining below the water table. The geo-synthetic membrane is used to reduce the rate of percolation of meteoric water through the backfill, thus reducing the concentration of COPCs in the groundwater sufficiently to maintain the groundwater in accordance with the groundwater quality standards and the POC determination.
171	Yellowstone to Uintas and Kiesha's Preserve	Public disclosure of the costs and benefits of each of these options [mining or not mining below the water table] should be provided and compared to the total expected tonnage and revenue over the life of the mine.	Mining or not mining below the water table was evaluated based on potential environmental impacts and the need for maximum ore recovery as required by 43 CFR 3594.1. Rationale for mining or not mining certain areas is provided in Sections 2.4.1.1, 2.4.1.2, and 2.4.2.
361	Idaho Conservation League and Greater Yellowstone Coalition	The DEIS assumes that some alternatives would be too costly, too similar in design to the action alternative or that the effects would be so similar to the analyzed alternative so as not to warrant their full development. It is difficult to conclude that there would not be any practical difference from these modifications. Look at an alternative cover that can allow tree, legume and aster establishment and still minimize selenium uptake or cover integrity.	The BLM considers that the analysis in the EIS is adequate to justify eliminating these alternatives from detailed analysis. The use of diverse shallow rooted species and non-selenium accumulator species in the seed mix will minimize the risk of uptake of COPCs in vegetation, while meeting the post mining multiple use requirements in the ARMP (BLM 2012).
382	Western Watersheds Project	Include a comprehensive alternatives comparison chart.	The summary comparison of alternatives in the Executive Summary and the end of Chapter 2 has been converted to a

	and the Center for Biological Diversity		table (**Table 5**).
383	Western Watersheds Project and the Center for Biological Diversity	Analyze an alternative that does not modify the lease or the additional minerals removal.	An alternative that would eliminate the lease modifications has been added as Section 2.4.8. The alternative was not studied in detail for the reasons stated in the added section.

Need for a Supplemental Draft EIS

No.	Commentor	Comment	Response
914	Idaho Conservation League and Greater Yellowstone Coalition	Prepare a Supplemental Draft Environmental Impact Statement to review additional alternatives, provide a thorough review and assessment of the proposed project, provide an additional analysis of these issues, and allow for an additional public comment period.	No new substantive issues that warranted consideration of other alternatives were presented. A supplemental draft EIS will not be prepared. See comment responses that address specific issues related to the request for a Supplemental Draft EIS.

Geology and minerals

No.	Commentor	Comment	Response
912	Shoshone-Bannock Tribes - Ansley	…phosphate ore would be permanently removed (an irreversible and irretrievable commitment of resources).	These direct and indirect impacts were disclosed in Section 3.3.3.1.
143	Yellowstone to Uintas and Kiesha's Preserve	What are the effects of removal of the large amounts of material on the faults and stresses in these faults? A quick web search indicates that mining can reactivate existing faults.	Mining would gradually (one or two truckloads at a time) reduce the overburden surcharge on faults to depths of 200 to 860 feet. Any adjustment of earth stresses would be gradually relieved as the surcharge is removed, not via an earthquake. The surcharge would be reasserted as the pits are backfilled. The gradual nature of the change in surcharge, it is not predicted to result in increased earthquake activity. No direct influence on earthquakes is predicted since the mining activity is well above earthquake depths. No excess fluid pressures would be generated that might lubricate existing faults. No increases in earthquake activity have been observed that were attributable to mine activity in the region (Tetra Tech, Inc., 2017a).

Water

No.	Commentor	Comment	Response
359 and 155	Idaho Conservation League and Greater Yellowstone Coalition and Kiesha's Preserve	Evaluate the potential and extent of groundwater fluctuation generally and from additional variations due to climate variation and change. Infiltration and leaching of mine materials could change with changing precipitation regimes and changing groundwater flows.	Groundwater modeling used to predict potential movement of meteoric water through the cap/cover of the backfilled pits was calibrated to the baseline groundwater information including water table elevation (see Section 3.4.3.2). The model also used a 100-year climate record as the basis for recharge to the backfilled pit areas. Climate variation was accounted for by using the 100-year record in the modeling (Tetra Tech, Inc., 2018a). Groundwater fluctuations are compared to predicted groundwater level changes in Section 3.4.3.2. Several precipitation scenarios were accounted for in the cover and groundwater modeling. Description and discussion are presented in (Tetra Tech, Inc., 2018a; Tetra Tech, Inc., 2018b) summarized in Section 3.4.3.1 in the draft and final EIS.
137 and 164	Yellowstone to Uintas and Kiesha's Preserve	How is it that Smoky Canyon became a Superfund Site and how can the public be assured that Caldwell Canyon will not suffer the same or similar outcome, leaving the public burdened with cleanup, restoration and loss of public resources for many generations? What were pre-mining conditions of habitat and water quality (surface and groundwater) compared to now?	The releases of COPCs at Smoky Canyon and other phosphate mines in the region have been determined to be the result of historic mining practices and are being address through the CERCLA regulatory framework. The mechanism of release of these contaminants have been investigated and addressed by new mining practices and regulatory processes. The BLM, DEQ, and phosphate mining companies have learned much about the causes and mechanisms of the releases of COPCs that have occurred due to historic phosphate mining. An example would be that some historic external overburden piles were found to release selenium when located on alluvial, Meade Peak or Dinwoody formations (see Appendix D in the DEIS, Section D.1 on page D-1 and Section D.7 on page D-5). This is the main reason that P4 Production has proposed placing their overburden back into the mined-out pits and covering them to manage the infiltration and release of selenium into surface

No.	Commentor	Comment	Response
			water and groundwater. Additionally, the DEQ implements the Idaho Groundwater Quality Rule IDAPA 58.01.11.401 to monitor and ensure that groundwater quality is met. Predictions of effects to water resources were made based on environmental data from the project area. The water resources studies and modeling, including uncertainties, are discussed in Section 3.4 and documents referred to in that section that are available as part of the project record. Modeling shows the predicted effects which BLM and DEQ used to evaluate whether the alternatives would meet laws and regulation. Impacts on water quality from previous activities is accounted for in the current baseline characterization of the existing environment.
140, 145, 163, 880, and 882,	EPA and Yellowstone to Uintas and Kiesha's Preserve and	The historical condition of Dry Valley Creek is not discussed relative to the Dry Valley Mine activity. Was it moved to accommodate the haul road? Other reason for channelization? There should be an analysis of why the habitat is impaired with corrective measures to restore that habitat. What are the existing conditions of these streams or whether elevated conditions are due to natural background or from anthropogenic activities (i.e., mining). Summarize data from the existing mine, which can be used as reference site for water quality predictions at the proposed mine. Provide information about the background of the site and existing conditions.	The EIS in Section 3.4.2 provides the baseline conditions as they occur now. The project analysis was not conducted to reanalyze impacts from previous activities. More detail on the existing conditions including, Dry Valley Creek and Slug Creek, is in the Final Water Resources Baseline Technical Report (NewFields, 2017a) and two addenda (NewFields, 2017e; NewFields, 2017c; NewFields, 2017c) which describe the existing conditions at the Dry Valley Mine. Section 2.5.2.6 describes relocation and restoration of Dry Valley Creek at the Dry Valley Mine site. Any modification to Dry Valley Creek was made in accordance with approved permits and authorizations issued by IDL, BLM, and the Forest Service. The Dry Valley Mine is currently in a reclamation phase implementing an authorized mine closure plan. State of Idaho surface water quality standards are applicable to the reclamation of the creek.
147	Yellowstone to Uintas and Kiesha's Preserve	Slug Creek and Dry Valley Creek as noted above are also listed as habitat impaired. (DEIS p53). What are the causes of these conditions? Appropriate mitigation could include removing livestock from the streams.	The 2014 Integrated Report (IDEQ, 2017a) lists habitat impairment due to sedimentation/siltation, physical substrate habitat alterations, and selenium. The proposed Caldwell Canyon mining activities were designed to not add to the

No.	Commentor	Comment	Response
			impairment (see Section 3.4.3.3). Mitigation is not warranted. Removing livestock from the streams is outside the scope of this evaluation.
166	Yellowstone to Uintas and Kiesha's Preserve	The EIS should account for the value of lost springs.	The EIS accounts for the value of these springs. The springs physically removed by mining are not associated with any permitted water rights and are in areas to be reclaimed after mining. The impacts were disclosed in Section 3.4.3.2 of the draft and final EIS.
364	Idaho Conservation League and Greater Yellowstone Coalition	What is the possibility of reduced flow increasing concentration levels of selenium (and other COPCs) and elevating those in the water table to near surface conditions? Could concentration develop to a harmful level in the root zone or in surface springs?	The referenced major fault system, discussed in the EIS (Section 3.4.3.2), restricts groundwater flow to the west and conducts it upward to the regional springs, as described by Ralston, et al., 1983. There is no indication that mining will change the existing fault system or groundwater flow system. Substantial changes in the groundwater flow rate or hydrologic role of the fault system are not predicted to occur. Consequently, it is very unlikely that the proposed action or alternative would cause reduced flow across that fault system that would result in increased concentrations of COPCs in the water table to near surface conditions.
386	Western Watersheds Project and the Center for Biological Diversity	Processing of ore from the Caldwell Canyon mine at Bayer's Soda Springs phosphorus manufacturing facility may exacerbate the issues the EPA identified in its Five-Year Review. One location of potential concern is Hooper Spring, where signs in a public park invite the public to drink from the spring.	The issues identified in the EPA 2018 Five-Year Review result from historic COPC sources at P4 Production's Soda Springs elemental phosphorus plant. The Caldwell Canyon Project would not contribute or reduce these impacts from the processing plant from current or anticipated future operations. The Soda Springs plant permit and compliance status would not change based on a decision regarding the Caldwell Canyon Project and would remain the same under the No Action alternative as it would under the action alternatives. These concerns are already being addressed by the CERCLA regulatory framework.

No.	Commentor	Comment	Response
878 and 879	EPA	Discuss the existing EPA-approved State of Idaho water quality standards as well as the state adopted selenium criterion submitted to the EPA for review under the Clean Water Act. In 2016, the EPA updated its nationally recommended chronic aquatic life criterion for selenium. If the EPA approves the state adopted criterion before the EIS is finalized, the FEIS should analyze the effects of the project to the approved criterion.	No increase in any COPCs in surface water as a result of the Caldwell Canyon Project are anticipated (see Section 3.4.3). The EIS uses the current approved criteria and the BLM recognizes that the standard may be lowered. Contributions of selenium to surface waters from fugitive dust originating from overburden was modeled. Based on this model, it is unlikely selenium in dust would increase surface water selenium concentrations to a level of acute or chronic standards (either current or proposed). Additional information has been included in Section 3.4.3 about maximum concentrations. ($1.23x10^{-4}$ mg/L or 0.000123 mg/L) potentially resulting from selenium in fugitive dust.
881	EPA	A figure defining the surface waters within the project area was not provided. While there are topographical figures on groundwater monitoring (Figure 14), the streams are difficult to decipher. Pertinent information regarding applicable water quality standards, current surface water conditions, and a figure identifying surface waters should be included.	**Figure 17** (Surface Water) has been added to remove some of the clutter on **Figure 14**. See Section 3.4.2 where the streams and the reason for their listing is discussed.
883	EPA	The DEIS is not clear regarding the models used and details regarding input parameters. Include the name of the models used and either include the details on model input parameters or include a citation to the document where those details are provided.	See the discussion of cover model and groundwater models in Section 3.4.3.1. Input parameters where added to the list of information included in the model reports (Tetra Tech, Inc., 2018a; Tetra Tech, Inc., 2018b; Brown and Caldwell, 2018)
884	EPA	Clarify how modeling [MODFLOW vs Random Walk] was applied at Caldwell Canyon and Dry Valley to achieve comparable results (i.e., utilizing the same model). If a consistent approach to modeling the effects of mine activities at the two locations was not used, the FEIS should explain and support this decision as well.	The Random Walk modeling of Dry Valley (Brown and Caldwell, 2018) is appropriate and consistent with the geohydrology at Dry Valley and the past 15 plus years of monitoring results where impacts are known. The more complex Caldwell Canyon model was appropriate for determining long term impacts of Caldwell Canyon Mine. The areas with groundwater quality impacts predicted by the two models do not overlap; therefore, it did not warrant combining the models. The results from the Dry Valley

No.	Commentor	Comment	Response
			model were incorporated into the Caldwell Canyon model results.
887	EPA	To focus on the impacts of mining, the modeling considered the resulting changes in groundwater concentrations from the backfill source and not the existing baseline groundwater concentrations. It is unclear whether the predicted groundwater concentrations were limited to the mine contribution or if the modeling considered the sum of the mine contribution and background concentrations. We recommend that the predicted impacts to groundwater quality include both the mine contribution and current/background concentrations of potential contaminants of concern to accurately predict the effects. We also recommend that the analysis in the FEIS clearly state how effects to groundwater were analyzed.	Additional information has been added to the EIS (See Sections 3.4.2 and 3.4.3) regarding the additive results of the baseline groundwater quality and predicted COPC groundwater plume at POC locations where groundwater quality is known.
888 and 889	EPA	The DEIS does not discuss the effects of the reduced flow to downstream waters (Blackfoot River, Slug Creek, Caldwell Creek, and Chicken Creek); however, we recommend that the FEIS disclose the potential effects to downstream surface waters from eliminating these springs. Details such as location, frequency and a summary of data from the groundwater well monitoring network need to be included in the EIS. How was this data was used in predicted effects to groundwater quality?	A new table (**Table 10**) has been added with information on groundwater quality in monitoring wells. This information is contained in the baseline water reports (NewFields, 2017a; NewFields, 2017e; NewFields, 2018c). Baseline information was used to calibrate the groundwater models. See the discussion of flows in Section 3.4.3.2 and **Table 14** (was Table 13 in draft EIS). See the Groundwater Quality section of 3.4.3.2 which includes details such as location, frequency and a summary of data from groundwater well monitoring.
891	EPA	The infiltration galleries are expected to receive 140 to 1,200 gallons per minute through the re-injection to groundwater. The DEIS does not provide a summary of predictions to groundwater flow or quality or disclose whether infiltrated water could influence the Blackfoot River. We recommend that the FEIS provide additional	The effects to groundwater from the infiltration galleries was included in the groundwater fate and transport model. The predictive model determined there would be no influence on the Blackfoot River. See section 3.4.3.2. See pages 63-64 and the modeling report Tetra Tech 2018a. Infiltration galleries were included in the groundwater model

No.	Commentor	Comment	Response
		details regarding the performance of the infiltration galleries under various volumes of water anticipated, a summary of modeled simulations, and any potential effects to nearby surface water.	(see the model report (Tetra Tech 2018a)).
893 and 894	EPA	Acid-base accounting study should be included. Explain why standard humidity cell tests were not completed as part of the geochemical program because the risk of acid rock drainage is considered relatively low (i.e., 5% of materials are acid generating), along with a citation indicating why the acid rock drainage risk is considered low. Disclose that acid generation and enhanced metals leaching is likely to occur in about 5% of the materials mined and influence of acid rock drainage on the release rates used for modeling; whether acid generating material would be identifiable during, the mining process and be treated/contained separately from the other materials; and whether the fact that humidity cell testing was not conducted as part of the geochemical testing program associated with this DEIS, and metal and selenium leaching from these materials under low pH conditions was not included in the water quality modeling, would impact the predictions of the water quality estimates.	As identified in acid-base testing of waste rock from other southeast Idaho phosphate mines acid-base reaction does not constitute a substantial effect on the release of selenium or other COPCs at Caldwell Canyon, as documented by the low reactivity of acid-base accounting tests performed (NewFields, 2018g). Normal mining practice would result in the mixing of the 5% of the materials that exhibit acid generation potential with other overburden materials, thus neutralizing and negating the leaching effects of any acid-base reaction. The negligible acid generating potential of the overburden indicated humidity cell testing was not necessary, as disclosed in the Geochemistry Baseline Study Plan (NewFields, 2015b).
896 and 897	EPA	The DEIS states that it is very unlikely that dust would increase the selenium concentration in the Blackfoot River (currently listed as impaired for selenium under CWA 303(d)). However, the basis for this conclusion is unclear. Was it based on modeling or another analysis? The mass of dust generated from mine operations was estimated on an average annual basis and considered the effects on the Blackfoot River. Utilizing an annual estimate could underestimate the effects of dust (i.e.,	Wind speed was a representative average of long-term conditions (NewFields, 2018d). The Gaussian Plume Model used for the analysis uses particle mass and wind speed to determine particle transport. It is an equation and not a full air dispersion model that would use full meteorological data sets and terrain data applicable to the site. It is considered adequate for modeling particulate transport at a mine such as Caldwell Canyon. The wind speed used in the model is calculated as an average

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		deposition of selenium on surface water). During winter and spring, dust may be significantly lower due to snow/precipitation; whereas, dust during the summer and early fall may be much higher. Also, this would coincide with lower flows in the Blackfoot River and the mass input per volume of water would result in the highest concentrations during summer. The analysis of the impacts of dust should include a seasonal time-step in addition to the annual average.	of over ten years of NOAA data from two stations on either side of the Project. Because the model does not consider precipitation, temperature, wind direction, or relative humidity, it does not consider the reduced dispersion that would occur if dust was reduced by precipitation or winter time conditions. Fugitive dust will be managed through a fugitive dust control plan which would be part of the IDEQ Air Quality Permit to Construct (See Section B. 15. 2).
898	EPA	The dust transportation technical report discusses the total mass of PM_{10} emissions being based on annual 'above grade' sources. Regarding surface water, the concentration was calculated by dividing the total mass of selenium emitted above grade (milligrams) into the total volume of water (liters) passing the United States Geological Survey 13063000 (Blackfoot River AB Reservoir NR Henry ID) gaging station on the Blackfoot River. Because the discussion is focused on above grade sources, we are unclear if the mine pit (below grade) was included in the evaluation.	The below grade air emissions occurring within the pit will experience a phenomenon known as “pit-trapping” where atmospheric transport of fugitive dust out of the mine is unlikely (NewFields, 2018d). The above grade and below grade sources were calculated in the emissions inventory and included in the Gaussian plume model.
885 and 886	EPA	The DEIS states that, "sensitivity analysis of the groundwater model found that the uncertainty did not affect the model reliability." This statement is confusing, and we could not determine the relationship between sensitivity, uncertainty, and reliability. Define "reliability" and how the sensitivity analysis was used to identify reliability	The word “reliability” had been removed and the purpose of the sensitivity analysis was clarified in Section 3.4.3.1.

Air

No.	Commentor	Comment	Response
149	Yellowstone to Uintas and Kiesha's Preserve	Particulate matter (PM) emissions are determined after application of fugitive dust controls such as watering. However, how effective are these? What if they are not	See Section 3.5.2. Section 651 of the Idaho Rules for the Control of Air Pollution (IDAPA 58.01.01) requiring reasonable precautions to minimize fugitive dust (IDEQ,

No.	Commentor	Comment	Response
		applied constantly during operation? Upset conditions? As discussed above, BMPs are mostly for appearance sake and we have no monitoring plan provided here to collect air quality data for PM or other pollutants in order to evaluate these. What about the tipple and crusher? Localized plumes of PM? The DEIS should have provided a model and map depicting concentration areas in order to satisfy the Hard Look aspect of NEPA. ...Modeling should be conducted showing the PM emissions with and without BMPs to give the public information it needs to show the supposed effectiveness of these BMPs and what the emission are if they are not effective.	2011). Best management practices (Section B.18) are effective in controlling fugitive dust. The fugitive dust control plan would provide multi-faceted mitigation measures. Constant wet suppression of unpaved roads is not necessary to achieve a moisture content high enough to control fugitive emissions and upset conditions would be managed promptly. Dust emissions would be managed in accordance with a Fugitive Dust Management Plan filed with IDEQ as part of P4 Production's Permit to Construct. Monitoring of dust emissions will be a component of the Permit to Construct in conjunction with IDEQ.
151	Yellowstone to Uintas and Kiesha's Preserve	What time period was used for the aerial deposition modeling of selenium from surface sources? Was this a life of mine time period and the soil concentration the cumulative deposition, or was it annual? When soil concentrations were determined, was the surface deposition averaged over a certain depth? If so, this could average the effect downward. Were emissions reduced by factoring in BMPs? In addition, what were the PM10 and PM2.5 modeled airborne concentrations? These could be compared to human and wildlife effects levels and combined with regional and localized topographic effects.	Air dispersion modeling was not performed (see Section 3.5.3.1). Section 1.0 of the fugitive dust emissions technical evaluation (NewFields, 2018d) states that the dust mass generated from the mine operations was estimated on an average annual basis. The emissions inventory accounts for dust controls per Section 2.0 of the Dust Memo. The selenium dust model, a simplified Gaussian plume model, a fate and transport model rather than an air dispersion model. The Gaussian model was used to determine a reasonable dust transport distance but was not used to determine ambient air concentrations or deposition rates. Selenium concentrations were analyzed on an annual basis at a soil depth of one centimeter. Assuming deeper penetration would be less conservative, resulting in a lower selenium concentration. Particulate deposition throughout the mine life would not accumulate in one specific area, as the pit panel mining method entails progressive movement as each panel is mined and backfilled. Less than 10% of overall emissions will be generated from fixed locations, including: haulage between

No.	Commentor	Comment	Response
			the operational panel to the Dry Valley tipple area, ore processing, stockpiling and loading. Long-term cumulative deposition is not expected given that each panel would be backfilled and reclaimed once it is depleted. Particulate generated by the development of the next panel in the mining sequence would be the predominant dust source to affect the reclaimed area and the active mining panel; thus, selenium concentrations would not be cumulative over the life of the mine. Control efficiencies resulting from BMPs were applied to material hauling emission calculations.
152	Yellowstone to Uintas and Kiesha's Preserve	Since Caldwell Canyon Mine is along a ridge, NAAQS modeling could be a valuable tool to inform the public and further improve BMP compliance or mitigation. Ongoing air monitoring at stations based on the models could be used for validation and should be done.	The Gaussian model is considered adequate by the EPA to determine dispersion selenium in dust. A Permit to Construct from the IDEQ will include a fugitive dust plan (IDAPA 58.01.01) requiring the control of emissions to a level that would be within regulatory requirements. Monitoring would ensure requirements are met (see Section 3.5.3.1). An air quality monitoring program will be developed as part of the IDEQ Permit to Construct.
153	Yellowstone to Uintas and Kiesha's Preserve	Air Quality Index map and health consequences from particulates and ozone needs to be incorporated into the analysis.	Given the low level of emissions predicted, air quality and water quality standards that are developed by the state and approved by the Environmental Protection Agencies in accordance with the Clean Air Act and Clean Water Act are protective of human health. The project would meet both the air quality standards, and water quality standards, and therefore human health would be protected. AQI is available online http://airquality.deq.idaho.gov/.
154, and 157	Yellowstone to Uintas and Kiesha's Preserve	What is the loss of carbon stored in vegetation and soils from implementation? What are the GHG contributions from P4 Production livestock grazing? Numerous publications document that livestock are a major source of greenhouse gases, including loss of soil carbon storage. What are the losses of carbon storage from that activity? What about other livestock owners who are	Vegetation loss is short-term (see Section 3.8.3.1) and will be reestablished throughout the life of mine. Analysis of carbon sequestration and the impacts from P4 Production's livestock grazing are outside the scope of the analysis. 1. We acknowledge that one of the great values that forests provide to the public is their role as a carbon sink. 2. We acknowledge that the 1,559 acres of disturbance would

No.	Commentor	Comment	Response
		also participating in revenue from the Caldwell Canyon and other mines? What steps are P4 Production going to take to counter their GHG emissions. • Assess vulnerability of species and ecosystems to climate change • Restore resilience • Promote carbon sequestration • Connect habitats, restore important corridors for fish and wildlife, decrease fragmentation and remove impediments to species migration.	reduce carbon sequestration by a small amount; also noting the Caribou Targhee National Forest has over 2 million acres of undisturbed land and the BLM over 600,000 acres that would continue to provide carbon sequestration. 3. The proposed disturbance is unavoidable but is minimized. 4. There is not a published or required carbon sequestration threshold or standard that needs to be met by the project. 5. Disturbance does not change by alternative. An in-depth analysis would not further inform our decisions. 6. We anticipate that over the long-term, selected areas of disturbance outside of the backfill cover could be reforested by natural succession. Information has been added to the Greenhouse Gas discussion in Section 3.5.3 and **Table 5** to acknowledge this effect. While a full accounting cannot be made due to uncertainties and variations, EPA's annual Inventory of U.S. Greenhouse Gas Emissions and Sinks (https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf) was used to assess the likely consequence of forest/soil removal.

Noise

No.	Commentor	Comment	Response
161	Yellowstone to Uintas and Kiesha's Preserve	The Caldwell Canyon DEIS should place buffers out to the EPA limit of background levels and map these from all haul roads, rail lines, and the mine footprint in order to show the impact zone from noise and its effects on wildlife and residences. Roads and trails, including illegally created and used trails must be mapped and sound contours plotted showing the distance and aerial effects on wildlife security areas and "quiet" users. How much of the CEA are protected from these sound levels?	Noise studies looked at the distance from noise generation to determine effects on receptors. No buffer is needed. See response to Comment 159.

No.	Commentor	Comment	Response
832, 901, and 902	P4 Production and Western Watersheds Project and the Center for Biological Diversity	Submitted with the comment letter is a noise report titled, Caldwell Canyon Project: Environmental Noise Assessment (Big Sky Acoustics, September 7, 2018). The report includes predictive levels of noise associated with construction, development, mining, and closure activities of the Project. Information in Section 3.6 of the DEIS will need to be revised to reflect predicted noise values based on noise propagation as described in the noise report. BLM should not use 39 dBA to define ambient in the Caldwell Canyon project area. The DEIS should instead discuss the sound levels found by the study conducted for the project. If for some reason the ambient sound levels that were recorded in the project area's sound study cannot be used, we suggest looking at research regarding sound levels in rural Wyoming. Disclose the baseline sound levels that it recorded, but instead relies on a 1978 Environmental Protection Agency (EPA) study for expected ambient sound level at the project area. However, that is too high.	The predictive levels from the Caldwell Canyon Project: Environmental Noise Assessment (Big Sky Acoustics, September 7, 2018) have been added. The noise assessment used slightly different assumptions than the draft EIS noise assessment used and used a model to predict effects which the draft EIS did not. The noise study has been included in Appendix C along with the Greater Sage-Grouse Habitat Assessment Framework and the Greater Sage-Grouse Mitigation Plan.

Soil

No.	Commentor	Comment	Response
150	Yellowstone to Uintas and Kiesha's Preserve	No map of locations of data collection was provided. Reported selenium concentrations [in soil] ranged from below detection to 34.6 mg/kg. (DEIS p82). No information on depth of sampling was reported. If surface contamination exists, then the depth of sample can average that number down to a lower and seemingly less significant level. Nor was there a diagram of the frequency of occurrence of selenium or other metals showing the maximum, median, minimum.	The sampling protocol used for the soil survey is in the Soil Resources baseline reports (Catena and NewFields, 2015; Catena and NewFields, 2016). The EIS reports total selenium concentrations. These concentrations are not predicted to cause vegetation to have excess selenium. Selenium in natural soil is the residual non-soluble component left behind from thousands of years of weathering and leaching by meteoric water and is bound relatively tightly to the soil, making it unavailable in the most part to plants. Since the selenium in the soil is naturally occurring on site and is not bio-available or predicted to be released into the environment

No.	Commentor	Comment	Response
			by mining activity, BLM is not requiring reduction of natural selenium levels.

Wildlife

No.	Commentor	Comment	Response
135, 180, and 332	Yellowstone to Uintas and Kiesha's Preserve	Impacts on wildlife or Corridor integrity are disclaimed by setting up a straw man then using that as a basis for its conclusions of negligible or minimal impact. This straw man is essentially restated as saying that even though habitat will be destroyed, degraded and animals killed, there is habitat elsewhere and populations will remain unharmed. But, the DEIS does nothing to quantify this other habitat and its capability and suitability to function as a corridor or to support populations of fish and wildlife, or for that matter, what the population trends might be. No buffer for noise and human activity was applied to determine remaining security cover in the Analysis Area or CEA for big game. While migratory birds are described as being affected by noise, no science on noise and human activity levels affecting them was analyzed and no definition of habitat affected by increased noise levels was provided. How is it determined that these populations are "local"?	The EIS discloses the impacts (including habitat modification and disturbance from noise and activities) on the wildlife habitat and wildlife that would be affected. The cumulative impacts (Section 3.9.4) analyzed impacts at the broader scale. Discussion is added to the General Effects to All Wildlife that directs the reader to the appropriate tables to compare the amount of habitat disturbed by mining, the acres of habitat available in the wildlife analysis area, and the acres of habitat available in the cumulative effects analysis area. Comparison of the amounts of habitat available to those disturbed supports the EIS discussion that habitat is available to support dispersed wildlife. The effects of disrupting the wildlife are analyzed in the EIS. Security is not a limiting factor. This analysis recognizes that while there are no movement or migration corridors officially designated by IDFG or Federal entities, the size of the mine will require some ungulates to modify their typical daily or seasonal movements. It is not necessary to describe the multiple varying responses to noise that may occur. For instance, behavioral avoidance of mining activities discussed for mule deer encompasses all visible and audible disturbances that would affect mule deer. The term “local” has been removed from the wildlife discussion.
146	Yellowstone to Uintas and Kiesha's Preserve	It seems the stream degradation is related to Dry Valley Mine (aside from any additional insults from livestock access). If so, this is another case where past degradation is used as a reason to avoid dealing with the	The existing Dry Valley Mine and Reclamation Plan provides for restoring segments of Dry Valley Creek which were affected by authorized mining operations and to restore habitat previously supported by Dry Valley Creek. With few

No.	Commentor	Comment	Response
		habitat issue. The HEA doesn't appear to take this into account.	exceptions, these restoration activities have already occurred, eliminating or greatly reducing effects that the mine may have on Dry Valley Creek. The Dry Valley Mine and Reclamation Plan will be modified to account for impacts from Caldwell Canyon Project (see Section 2.1.10) along with bonding for reclamation of areas disturbed by mining activities. The HEA does not address wetlands and water. Wetlands and water are regulated by the USACE. They will make decisions for a permit under Section 404 of the Clean Water Act.
158	Yellowstone to Uintas and Kiesha's Preserve	Address conservation of habitats and reduction of non-climate stressors such as the habitat degradation from livestock grazing, including soil loss, stream dewatering, plant communities shifting to increasers or weeds to help fish and wildlife adapt in accordance with the National Fish, Wildlife and Plants Climate Adaptation Strategy.	Addressing livestock grazing with respect to habitat conservation is outside the scope of this mine plan analysis. Grazing on BLM public lands will be in accordance with the PFO ARMP (BLM 2012). There is no guidance or policy that requires BLM NEPA to be in accordance with the National Fish, Wildlife and Plants Climate Adaptation Strategy.
160	Yellowstone to Uintas and Kiesha's Preserve	Road densities and effects on wildlife must be analyzed. An integrated analysis of the effects of roads, human use and habitat fragmentation on lynx and other species that incorporates this information as well as addressing other species of wildlife must be completed.	The project is not in lynx habitat. Road density will only be minimally affected (increased) over the short term as a consequence of the Proposed Action. Most roads will then be reclaimed and eliminated or reduced in width. Road use increase has been assessed in the DEIS, including its effects on wildlife.
165	Yellowstone to Uintas and Kiesha's Preserve	There was no monitoring of wildlife use of these areas. Simple use of trail cams during a baseline study would have documented the species using these.	Baseline surveys (NewFields, 2017a; NewFields, 2017d; NewFields, 2017f) were done to an approved protocol developed in conjunction with BLM and IDFG biologists and reported per the protocol. See **Table 27. Wildlife Surveys Conducted in the Wildlife Analysis Area** in the EIS, Section 3.9.2.1.
167	Yellowstone to Uintas and Kiesha's Preserve	It is assumed the major streams such as Dry Valley Creek and Slug Creek have no fish. What was the history and conditions in these streams? Did they harbor fish in the past? If so, why not now? There was	Slug Creek does not currently support a fish population (see **Table 6**) which represents the baseline condition from surveys (NewFields, 2015a). Dry Valley Creek likewise does not support a fishery. As stated in Section 3.4.3.2, sediment

No.	Commentor	Comment	Response
		no analysis of the effect of sediment on reproduction in fish, particularly Yellowstone cutthroat trout in spite of the DEIS noting impairment of habitat and sedimentation.	loads would not increase in those streams as a result of the Proposed Action.
170	Yellowstone to Uintas and Kiesha's Preserve	There is no evaluation of the value of the public and private lands to present and future generations for their inherent benefits of water supply, fish and wildlife and recreation. There is no accounting for this other than the modeled Habitat Equivalency Assessment (HEA) which apparently only accounts for the mine footprint itself, not the effects across the region, nor the wide-ranging effects of noise and human activity.	Other values are addressed in a non-monetary fashion and the effects considered.
178	Yellowstone to Uintas and Kiesha's Preserve	Was a baseline generated for the Dry Valley Mine? If so, what monitoring of wildlife during and following mining was performed? What were the results? If an HEA was implemented, what are the outcomes based on monitoring?... What was the effect of the Dry Valley Mine on raptor nests in its Analysis Area?	Current conditions at the Dry Valley Mine site are represented in the affected environment and are summarized from the baseline information related to wildlife, vegetation, soil, water resources, and cultural resources. See the Affected Environment sections for these resources in the EIS for references to baseline studies.
833, 834, and 840	P4 Production	IDFG's most recent lek status data (2018) supports that only one pending lek remains in the vicinity of the Project. The FEIS should be revised to reflect this most recent data. Section 3.6.3.1 – re-evaluate the impact of noise given the newly submitted noise report (Big Sky Acoustics 2018), in particular, re-assess the potential for exceedance of the RDF 2, 10 dBA guideline at the lek using the 2018 noise report data.	Pending lek information and its regulatory and policy framework has been added to the EIS, Noise information has been updated to incorporate the new noise study.
387	Western Watersheds Project and the Center for Biological	How much of the project area has been searched for leks and how frequently, how much is known about grouse population trends in the area over time. Discuss the effect on Greater Sage-Grouse population in the area	IDFG, Forest Service, and BLM biologists conduct annual lek surveys of potential Greater Sage-Grouse habitat, however, capacity is limited due to funding, personnel and timing constraints. Leks (mostly historic) and potential

No.	Commentor	Comment	Response
	Diversity	in those leks that are lost in the context of whether the local grouse population trends are increasing, decreasing, stable, or unknown. Discuss how BLM will ensure that the Greater Sage-Grouse habitat and leks lost to this project will not result in Greater Sage-Grouse population decreases.	habitat in proximity to the project area, where most deleterious impacts are expected, were surveyed. The Habitat Assessment Technical Report (Appendix C) and EIS Section 3.9.2.5, describe the trend of Greater Sage-Grouse populations in the East Idaho Upland sub-population The project will follow applicable resource management plans and policies to avoid decreases in Greater Sage-Grouse populations within the authorities of plans and policies.
388	Western Watersheds Project and the Center for Biological Diversity	There are five acres of U.S. Forest Service land that will be crossed by a haul road, is designated Greater Sage-Grouse habitat, undesignated habitat, or near a lek. Discuss the Forest Service Greater Sage-Grouse plans.	The 7 acres referenced, encompassing a backfilled and an open pit at the Dry Valley Extension Mine, is not designated as a Priority Habitat Management Area, General Habitat Management Area, Important Habitat Management Area nor within a key habitat, and therefore the Standards and Guidelines in the 2015 Greater Sage-Grouse ROD are not applicable. The 2003 Forest Plan standards and guidelines are applicable; however, no impacts on Greater Sage-Grouse or their habitat is expected, (no impacts to active leks, the pit is not nesting habitat, etc.) because the area is already disturbed and the backfilling of the pits would improve habitat conditions on those 7 acres. Therefore, the project is in compliance with Greater Sage-Grouse standards and guidelines in the 2003 Forest Plan.
389	Western Watersheds Project and the Center for Biological Diversity	concerned about the potential for project noise to result in lek loss.	Additional information has been added to the EIS (Section 3.9.3) discussing the impact of noise on pending lek 3C040 that could result in reduction in the viability of the pending lek, or abandonment/relocation to an area with less disturbance.
172 and 335	Yellowstone to Uintas and Kiesha's Preserve	The analysis takes into account only the phases one at a time for the direct disturbance and apparently does not account for the loss in function of the adjacent habitat while mining proceeds in adjacent areas over 40+ years. A more effective analysis would have calculated a noise	See **Table 23** and **Table 24** where all acres are accounted for. Noise effects are analyzed in Section 3.9.3, disturbance is short-term. Indirect effects to habitat beyond direct disturbance areas was

No.	Commentor	Comment	Response
		and activity buffer to a suitable level for wildlife as well as residences and included that area in the calculation for values lost and mitigation needed. It should also have evaluated all Greater Sage-Grouse leks and their noise disturbance within the appropriate buffer of 5.5 miles as NewFields' Greater Sage-Grouse Habitat Assessment, Figure 11 depicts, not just lek 3C028. The affected environment for noise impacts to wildlife and residences should be much greater than 3200 feet. How much of the CEA is protected from these sound levels?	not quantified in the DEIS. The DEIS discusses dispersal of individuals into adjacent (i.e., not directly affected) habitat creating competition for resources and the effects of noise on wildlife beyond the area of direct disturbance. The BLM determined that the analysis area for Greater Sage-Grouse would be the same as the third-order assessment area described in the Greater Sage-Grouse Habitat Assessment Technical Report (Appendix C). The leks listed in **Table 32**, together with the unoccupied leks discussed on page 112 corresponds to the leks presented in Table 1 of the Greater Sage-Grouse Habitat Assessment (Appendix C of the EIS). Section 3.6.1, states, "The noise analysis area extends in a two mile-radius from the Caldwell Canyon Project to account for potential noise disturbance to Greater Sage-Grouse leks within two miles of noise sources (BLM, 2015a) and encompasses the mine pits, haul roads, railway spur and tipple; and the sensitive receptors (two residences and the one pending Greater Sage-Grouse lek). Assessment of noise associated with the Proposed Action addressed the closest sensitive receptors.
174, 175, 176	Yellowstone to Uintas and Kiesha's Preserve	The DEIS does not analyze connectivity between southeast Idaho, Wyoming and Bear Lake Plateau Greater Sage-Grouse populations or their status. The National Technical Team Report[3] provides analysis and recommendations that should be included in the analysis for this project. Map all the known leks and presenting the population data and trends for each lek, not just lek 3C028. It should include anthropogenic impacts out an acceptable buffer of at least 4 miles to be consistent with the	Refer to Appendix C for connectivity. The Pocatello Approved Resource Management Plan (BLM, 2015) as amended by the Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) for the Great Basin Region (BLM, 2019) identifies measures to protect and restore Greater Sage-Grouse habitat. To accommodate any changes in the ARMP as amended, prior to issuance of a ROD, the proponent has committed to a Greater Sage-Grouse Mitigation Plan that would be in conformance with that

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[3] Report available online here https://eplanning.blm.gov/epl-front-office/projects/lup/9153/39961/41912/WySG_Tech-Team-Report-Conservation-Measure_2011.pdf.

No.	Commentor	Comment	Response
		National Technical Team Report. A similar analysis needs to be done for sharp-tailed grouse. These leks and their associated populations are at risk and could be lost. Declining trends in population compared to the dates of active mining nearest each of the leks should be determined. Road densities and proximity to leks, grazing and the other factors known to degrade Greater Sage-Grouse habitats should be analyzed for the entire mining district.	version of the ARMPA in force when the Caldwell Canyon Mine ROD is issued. BLM will base their final conformance determination in the ROD on whichever version of the ARMPA is in effect at the time of the decision A Greater Sage-Grouse habitat assessment was performed per the 2015 ARMPA and effects to leks were addressed at a distance greater than recommended for NEPA analysis as directed in the 2015 ARMPA Appendix B, Buffers. Leks relevant to the project are discussed in the EIS (see Sections 3.9.2 and 3.9.3). For lek attendance trends, see Table 2 of the Greater Sage-Grouse Habitat Assessment (Appendix C of the EIS). BLM agrees there is a long-term declining trend in leks and variation from year to year. The analysis of the effects of past mining, roads, grazing is outside the scope of the Caldwell Canyon EIS. Sharp-tailed grouse are analyzed to the level required for NEPA.
831, 835 and 837	P4 Production	The FEIS should conform to the ARMPA and not apply lek buffers to "pending" leks. The ARMPA states lek buffers only apply to active or occupied leks, as determined by IDFG. P. 5, Sec. 1.7, paragraph 4 - The DEIS states that management of the pending lek, which is on private land, falls under the BLM Special Status Species Management Manual (Manual 6840). However, the DEIS does not recognize that Manual 6840 clarifies that those management requirements apply "only in the absence of conservation strategies" on BLM-administered land. The FEIS should clarify that (1) Manual 6840 is inapplicable to the pending lek on private land, (2) Greater Sage-Grouse related constraints on BLM-administered public land are exclusively in the	The EIS has been revised, see section 1.7 and 3.9.3.

No.	Commentor	Comment	Response
		ARMPA, and (3) the Manual is not a NEPA document compelling consideration of habitat management on private land. The Manual has been fully supplanted by the existing conservation strategy found in the ARMPA and will continue to be supplanted by the ARMPA or the ARMPA as amended by subsequent land use planning initiatives over the life of the Project. P. 77, Sec. 3.6.1. … the pending lek location is on private land and not subject to the Special Status Species Management Manual. The FEIS should correct this error.	
842	P4 Production	P.105, Sec. 3.9.2.5, formatting typo; "undefined lek" is new term, not defined in ARMPA or 2018 PRMP, define or revise in FEIS	The term used in the EIS that most closely reflects this is "Undetermined Lek". This term is defined in the IDFG GIS lek data. Please refer to IDFG lek data or BLM Idaho Instruction Memorandum No ID-2017-018 Disclosure and Use of Greater Sage-Grouse and Columbian Sharp-Tailed Grouse Lek Data in Documents. A lek with a management status of "Undetermined" is any lek that has not been surveyed or documented as active in the last 5 years or has had insufficient survey information to designate the lek as unoccupied.
899 and 903	Western Watersheds Project and the Center for Biological Diversity	The DEIS states, "Two pending Greater Sage-Grouse leks could experience noise that would affect the success of the leks or cause it to be abandoned entirely. However, there are a total of five Greater Sage-Grouse leks that may be at risk of loss or reduced reproductive success, not just two: 3C014 (undetermined), 3C035 (undetermined), 3C038 (undetermined), 3C089(pending), 3C040 (pending). The DEIS dismisses potential noise impacts to all but lek 3C040 and possibly lek 3C0389 by saying they are too far away to be affected. See DEIS at 79-80 and 113. However, the amount of noise-related risk is difficult to assess from	Text has been added to the EIS discussing a September 2018 noise study performed by Big Sky Acoustics. This study focused on the pending lek which is closest to the Project. Pending lek 3C089 is considered to be the same birds that displayed at pending lek 3C040 and has therefore been combined with 3C040.

No.	Commentor	Comment	Response
		the DEIS because it is only specific about the distance from 3C040 to various mine features, stating that the others are further away and won't be as affected without discussing actual distances or the grouse research upon which BLM is basing these assertions. We are also concerned that the DEIS's estimates of noise from the mine's construction, operation, and reclamation are all well over what the research shows results in lek loss. Noise should be limited to 25 dBA in occupied Greater Sage-Grouse breeding, nesting, brood-rearing, and wintering habitats.	
179	Yellowstone to Uintas and Kiesha's Preserve	The DEIS notes six sharp-tailed grouse leks occur, then says three leks.	The EIS has been corrected to state that there are three known Columbian sharp-tailed grouse leks.
333	Yellowstone to Uintas and Kiesha's Preserve	What buffers apply to raptors? Raptor eggs in the Analysis Area were reported to have eggs with selenium exceeding toxicity levels in 8% of eggs. (DEIS p111). What are the potential sources of the selenium in the eggs? We have seen no analysis of soil, vegetation or water selenium levels around the Dry Canyon mine pre- and post-closure to inform these risks	Increased selenium levels in streams or bioaccumulation into reclamation vegetation is not predicted. The mine would not add to instances of selenium bioaccumulation already occurring that may have led to impacts in raptor eggs. Also see response to Comment 163 regarding presentation of water quality data.
336	Yellowstone to Uintas and Kiesha's Preserve	Past timber harvest activities, roads, mining and related activities (ohv use, including closed roads and trails illegally used) must be analyzed in the context of the importance of habitat connectivity. Road density is not analyzed in the Caldwell Canyon DEIS and should be analyzed at various levels up to the CEA and Corridor [Wasatch Cache NF corridor map-2000].	See response to Comment 174. The cumulative impacts analysis does account for modifications in habitat from these past and ongoing activities.
337, 338, and 398	Yellowstone to Uintas and Kiesha's Preserve and Western	Wolverine are not analyzed in the Caldwell Canyon Mine DEIS. As for lynx, there was no analysis of movement corridor(s) or their potential habitat, barriers, and fragmentation.	**Table 6** in the FEIS identifies wolverine and lynx analysis as being contained in the Project Record. A Biological Assessment was prepared for wolverine and lynx. The USFWS concurred with the determinations.

No.	Commentor	Comment	Response
	Watersheds Project and the Center for Biological Diversity	Provide a more detailed mapping, capability and suitability analysis for wolverine and lynx habitat integrating the above information on the Corridor and current conditions (security cover, snow cover, elevation, mines, roads, timber projects and other fragmenting or habitat degrading activities) for wolverine. This project may require Endangered Species Act consultation, which does not appear to have taken place.	USFWS determined the information in the biological assessment was adequate for compliance with the Endangered Species Act. **Table 6** describes the nature of the lynx and wolverine use (NewFields, 2015e) .
392 and 393	Western Watersheds Project and the Center for Biological Diversity	The DEIS should include GHMA acreage disturbance figures in its disturbance summaries (it currently does not) so that BLM and the public can easily compare how much designated Greater Sage-Grouse habitat the project would fragment, damage, or destroy to Bayer/P4's proposed acreage of Greater Sage-Grouse habitat mitigation. The EIS should describe how BLM verified this, including which Greater Sage-Grouse experts the agency used for the verification and who they work for.	Section 3.9.3.1 of the EIS provides the number of acres of GHMA that would be affected by the Proposed Action. The suitability designation of GHMA is described in the Habitat Assessment Technical Report (Appendix C) using the Habitat Suitability Indicators developed for the Greater Sage-Grouse Habitat Assessment Framework (Stiver et al. 2015) and Table 2-2 of the 2015 GRSG ARMPA. The Habitat Assessment Technical Report was prepared by NewFields (the primary authors are Gary Back, Ph.D.; Julian Colescott, M.S.; and Laura Pfister, M.S) and reviewed by the Pocatello BLM and the Idaho State BLM Office.
399	Western Watersheds Project and the Center for Biological Diversity	Little brown bat has been observed in the project's wildlife assessment area. Little brown bat is listed in the 2016 USFWS Listing Workplan and is currently awaiting USFWS status review.	Little brown bat is discussed as a sensitive species. Although it was on the 2016 work-plan, the bat is not a priority for listing, nor does it currently have an ESA status; therefore, there is no regulatory need to discuss/informally consult with USFWS or address it in a biological assessment.
513	City of Soda Springs - Austin Robinson	Mule deer are adaptive, as well as elk in their calving ranges. Lonn Kucic's research in Dry Valley, for the Idaho Dept. of Fish and Game, shows how adaptive they are. While they may be disturbed, they will return or move over the ridge and then come back.	The EIS recognizes the mobility of these large game animals in Section 3.9.3.1.
847	P4 Production	P. 110; Sec. 3.9.3.1; Birds; 3rd paragraph P4 Production may decide to conduct ground-clearing activities during	Prior to undertaking activities such as ground clearing that could adversely affect nesting birds, P4 Production would

No.	Commentor	Comment	Response
		the nesting season and is not constrained by the MBTA from doing so. The FEIS and ROD should comport with M-Op. No. 37050.	develop bird and nest avoidance plans in accordance with Pocatello ARMP seasonal restrictions and other relevant requirements before these areas are disturbed. This practice would avoid impacts to migratory and other non-migratory bird populations. Implementing mitigation measures described in Section 3.9.3.1, the Greater Sage-Grouse mitigation plan, and other environmental protection measures would reduce impacts.
848	P4 Production	Habitat Equivalency Assessment ("HEA") The HEA should, at most, be used to quantify baseline conditions consistent with BLM's NEPA Handbook H-1790-1, Section 6.6.2, and the No Action alternative. It should not, however, be used to calculate the "value" of current "habitat services" as suggested by the DEIS Secs. 3.9.2.1 and 3.9.3.1. These sections should make clear, just as IM ID-2013-040 did, that the HEA is not to be used to calculate or exact mitigation.1 Rather, "BLM will follow established policy and guidelines related to mitigation."	The DEIS follows current policy and is not requiring mitigation. HEA is a way to calculate habitat services for comparison within the project vegetation types and disclose how the action alternatives (including reclamation and revegetation) could affect habitat on the site. It is not appropriate to compare projects with differing vegetation types or different approaches for utilizing possible service metrics. Section 3.9.2.1 of the DEIS stated that "The HEA is not used to calculate or exact mitigation (BLM IM ID-2013-040)".
849	P4 Production	The FEIS should delete the confusing discussion of HEAs and their conversion to "discounted service acre years" ("DSAYS") in Sec. 3.9.3.1. The calculation of a habitat "deficit" that could lead a reader to assume that such deficit is unnecessary or undue. Consistent with IM-2018-093, ft. 3. the Project will necessarily and duly impair BLM-administered land. BLM is under a regulatory mandate to require mining operations to maximize recovery of the mineral deposit consistent with protection of the environment. 43 C.F.R. § 3594.1	No change has been made to the EIS.
850	P4 Production	Early establishment of grasses and legumes included in the reclamation seed mix would reestablish livestock grazing within a short period of time after backfill, capping, and growth media placement, thereby meeting	The HEA is already normalized to the existing baseline condition, weighted toward wildlife. The HEA is intended to establish impacts on wildlife and wildlife habitat and is not designed to disclose the effects of the mine on livestock

No.	Commentor	Comment	Response
		a portion of the postclosure land use substantially sooner than recognized in the HEA assessment. While the proposed reclamation plan recognizes the need to establish habitat that supports wildlife use, it also is expressly designed to establish forage to support livestock grazing on both public and private land within the project area. While the HEA analysis assigns an accounting mechanism for reclamation of disturbed land to meet a semi-quantified wildlife habitat goal, no accounting is made to recognize the goal for restored and sustainable livestock grazing use (which is also consistent with BLM's multiple use mandate).	grazing.
851	P4 Production	The discussion of HEA analysis results would also benefit from a declarative statement that while a calculated number of DSAYs have resulted from the analysis, other analyses contained in the DEIS indicate that the "effects on wildlife would be short-term, localized, and negligible." For example, throughout Section 3.9.3, several statements are made as to potential impacts to various wildlife species as being moderate, localized, short-term, minor, or negligible and that the proposed reclamation plan would serve to reduce impacts to wildlife and eventually establish habitat that would be used by various species displaced by the Project. A statement that indicates "No additional mitigation measures beyond those described for reclamation of the Caldwell Canyon Project site have been identified" would provide a meaningful conclusion to the HEA discussion.	Text added to Section 3.9.2.1 to state that use of the HEA is not to calculate or exact mitigation.
852	P4 Production	it is also unclear how applying results of the HEA assessment to private land (which is 75 percent of the proposed disturbance area for the Caldwell Canyon Project) can be considered as long-term habitat loss when control of activity on the private land does not fall	The HEA addresses the impacts of disturbance regardless of ownership. The BLM policy is to conserve private lands and natural resources within a mineral lease in a manner similar to what would be required on BLM managed land, unless the land owner wants something different consistent with the

No.	Commentor	Comment	Response
		within BLM's purview. Since private land holdings would be subject to future decisions of the landowner, incorporating private land in the calculation for wildlife habitat loss would indicate that management of the land to meet an undefined habitat goal would extend BLM authority regarding wildlife to private land decisions.	requirements of the mineral lease and related State and Federal reclamation requirements. Impacts on private land as a result of the mine must be disclosed in the EIS. If a private landowner has a different use of their land than current practice, the EIS will take that into account in the effects analysis.
872	Idaho Office of Energy and Mineral Resources	Page 15, section 2.1.9 and Figure 6 reference the development of a 118-acre rail loop for unloading ore on a private land site across the highway east of the Monsanto plant in Soda Springs. The area to be developed for the rail loop and the proposed development of the Selenium Treatment Demonstration Unit is seasonally used by migrating mule deer in route to their winter range area in the Soda Hills. Deer mortality due to vehicle strikes regularly occurs at this location during deer migration. A high priority should be placed on developing long-term plans and infrastructure to direct migrating deer to safe crossings in the Final EIS.	Information regarding the seasonal use of this area by mule deer has been added to the EIS. Train movement within the proposed rail loop would not likely exceed 5 mph; sufficient time for deer to avoid rail traffic. Pg. 109 of the DEIS addresses the rail loop and mule deer habitat and the effects to movement corridors. The general Effects Common to All Wildlife on page 107 of the DEIS addresses the potential for vehicle collisions with wildlife BLM has no authority on private land where the rail loop would occur to require mitigation that would direct migrating deer.
874	Idaho Office of Energy and Mineral Resources	Table 20 on page 91 shows that 349.5 acres of aspen habitat will be directly lost from mining activities from this project. Aspen is one of the highest value habitats for wildlife and its loss has reduced habitat quality and availability. In addition to other values, reclamation and mitigation should include aspen habitat enhancement and restoration.	Habitat reclamation in the mine pit areas is focused on establishment of GRSG brood-rearing, nesting, or winter habitat. BLM has no authority to require habitat enhancement or full restoration. Aspen is not within the reclamation planting plan and is not expected to re-establish on backfill cover.
875	Idaho Office of Energy and Mineral Resources	Page 97, section 3 9.2.2 claims that "Mule deer populations are low," citing a 2010 BLM document. More recent data is available for deer and the stability of the local moose population and the BLM is encouraged to contact the Idaho Department of Fish and Game regional staff for current information.	The EIS has been updated with the most recent IDFG survey results as provided by Zach Lockyer, IDFG regional wildlife manager for the Southeast Region.
876	Idaho Office of	Page B-3, section B.4 and page B-13, section B.15.4	See Section B1.5.4 for more detail on the fencing and

No.	Commentor	Comment	Response
	Energy and Mineral Resources	states "Ponds would be fenced to prevent wildlife and public access". This section does not include any information on how the ponds will be managed and monitored to prevent migratory bird take. An expanded discussion is recommended regarding which physical barriers or hazing will be incorporated into pond management to reduce and prevent bird contact with elevated Selenium level waters.	monitoring.
905	Shoshone-Bannock Tribes	The Caldwell Canyon Mine Habitat Equivalency Analysis is insufficient in determining the full value of lost natural resources and services, with particular evaluation omitted for the Native American perspective toward natural resources.	See BLM Instruction Memorandum No. ID-2013-040 for the guidance on how BLM should use the HEA in its NEPA analysis. Particularly, the IM states, "While the HEA could be used to evaluate impacts to various natural resource areas, the BLM Idaho has decided to use it only to evaluate current and future impacts, whether direct or indirect, to vegetative and wildlife habitat areas." The HEA cannot evaluate vegetation and habitat beyond quantifiable metrics such as tree DBH or shrub canopy cover.
908	Shoshone-Bannock Tribes	Negative impacts on wildlife in particular from mining activities at the Caldwell Canyon Mine will affect wildlife populations in a large surrounding area.	The EIS, Sections 3.9.3 and 3.9.4 discloses the direct, indirect, and cumulative impacts from past, present and reasonably foreseeable actions on wildlife.

Tribal Rights

No.	Commentor	Comment	Response
341 and 909	Shoshone-Bannock Tribes - Ansley	Impacts to natural resources and resources of cultural significance to Tribal members, including diminishing or destroying the traditional value of the land, are a diminishment of Fort Bridger Treaty Rights as given on July 3, 1868 and are an environmental justice issue that remains unaddressed in this document. The Tribes have consistently objected to mining projects because of the adverse impacts that mining has on the Tribes' cultural practices and treaty fishing, hunting, and gathering rights. Unfortunately, the DEIS	The BLM recognizes the Federal Government's treaty right obligations. See Section 3.13.2. Please also see Section 4.1.1. Please see the response to Comment 729.

No.	Commentor	Comment	Response
		fails to address the United States government's trust responsibilities to protect the important Tribal interested threatened by this proposed project.	
907	Shoshone-Bannock Tribes - Ansley	The Tribes expect that discovery of any archaeological findings during the entire life of the project will be reported and protected until notification of the Tribes cultural resource officers is completed.	See section B.15.9. "If previously unidentified cultural or paleontological resources are discovered during operations, activities would cease in the immediate area of discovery. P4 Production would report the discovery to the appropriate agency to quantify the nature and value of the resource and provide a timely determination of the necessary actions to prevent the loss of significant cultural or scientific values." The Tribes would be notified of any archaeological findings as appropriate.
911	Shoshone-Bannock Tribes - Ansley	The Tribes disagree that consultation to date has not identified culturally unique resource in this study area, including any sacred sites.	Tribes will need to provide BLM with information on their culturally unique sacred sites. Cultural surveys were conducted, and culturally significant areas identified were avoided.

Social and Economic Conditions

No.	Commentor	Comment	Response
169	Yellowstone to Uintas and Kiesha's Preserve	A more thorough analysis would place these figures [employment and revenue] in the context of the four Counties total revenues from all sources, State revenue from all sources and P4 Productions annual revenue from mining and processing.	The three-county area is the appropriate level for this impact analysis (see Section 3.14.1).
170 and 173	Yellowstone to Uintas and Kiesha's Preserve	There is no evaluation of the value of the public and private lands to present and future generations for their inherent benefits of water supply, fish and wildlife and recreation. ...There is no accounting for this other than the modeled Habitat Equivalency Assessment (HEA) which apparently only accounts for the mine footprint itself, not the effects across the region, nor the wide-ranging effects of noise and human activity. The loss of these ecosystem services has many	This mining proposal meets the development and natural resource management direction and mandates of the BLM PFO ARMP. The accounting for allowing mining impacts to natural resources and recreation has already been made in that planning process, which represents the approach to meeting Federal Land Policy and Management Act mandates of management principles of multiple use and sustained yield for resources including water supply, fish and wildlife and recreation. Other values are addressed in a non-monetary

No.	Commentor	Comment	Response
		attributes over the long term such as behest values, intrinsic values and Loomis provides means of determining market values for these services. What are the losses? What about the Native American values that are compromised? The economic analysis must go much further to meet the NEPA's hard look standard and justify to the public the legacy of Superfund sites and lost ecosystem services from an industry that is a minor contributor to the local and regional economy in Idaho and represents only 15% of the national phosphate rock industry, the vast majority occurring in the Southeast US.	fashion and the effects considered. See response to Comment 391.
407	Midas Gold - Laurel Sayer	It is possible that a public reader of this statement may negatively interpret the use of the term "short-term" with respect to the Caldwell Canyon Mine beneficial economic impacts. It is important to context this statement with some reference to the nature of the substantial number of years of development of the natural resources contemplated by the Caldwell Canyon Mine.	The definition of the time-frame "short-term" to include the 40-year mine life was added again in Section 3.14.3.1. The text in the socio-economics section that discusses the duration of economic benefits has been revised to simply state that the benefit will last for 40 years, the mine life, thus avoiding the use of the term "short-term."
462	Soda Springs Joint School District	The consequences of such action [No Action] would be reduced property tax revenues, unemployment and probable out-migration of families from the Soda Springs area. This would put pressure on enrollment in the district. It would probably result in reduction in school district employment, and could force consolidation of classes, reduce extra-curricular activities and could necessitate an additional levy to make up for the lost revenue. This would shift the burden of supporting education to the remaining citizens of the county. It would be difficult for citizens to support such a levy.	Additional information has been added to Section 3.14 related to the indirect multiplier effect of all the alternatives. Please also see the response to Comment 509.
508	City of Soda	The city's property taxes for 2017 were $805,746. I	The EIS, in Section 3.14.2, recognizes the importance of the

No.	Commentor	Comment	Response
	Springs - Austin Robinson	estimate the portion which is attributed to the property taxes paid by P4 employees, employees of direct contractors and the contracting businesses themselves is in excess of 25% of the total taxes paid to Soda Springs. This estimate may be low because wages and salaries paid by P4 and its subcontractors are generally higher than average.	property taxes P4 Production's operations and employees pay.
511	City of Soda Springs - Austin Robinson	Information obtained from Esther Eke, the regional economist for the Idaho Department of Labor. That data shows that P4 and its contractors employ nearly 795 people in or near Soda Springs, including Eastern Idaho and Western Wyoming. This provides a total annual payroll of $53,000,000 at P4 and total spending of $73,800,000. In addition, Miss Eke's research indicates that P4's state wide presence generates a total of 2,038 jobs and total earnings of $128,640,000. These sorts of economic benefits simply cannot be ignored.	Comment noted.
637 and 638	Denise Horsley Caribou County Commissioners	P4, LLC, owns 64 separate parcels of property in Caribou County. Some of these properties include 1) the mined properties, 2) the manufacturing facility located just north of Soda Springs, 3) buffer zones around the plant, and 4) ranches located in the vicinity of its current mining operation, as well as a ranch purchased near the Blackfoot River Bridge Mine. In 2017, P4 or its subsidiaries paid nearly $1.1 million in property taxes. Of that amount, 68% was paid for county services, 29% was paid to the school district, the balance was paid for other local services. Mineral lease royalties from mining operations in Caribou County were paid by the Bureau of Land Management to the state of Idaho, which in turn paid a portion of that to Caribou County. In the fiscal year for October 2017, $387,473.87was paid to Caribou County.	The property taxes and royalties paid by P4 Production were provided in the DEIS in Section 3.14.2 along with the impacts of the No Action Alternative (Section 3.14.3.2).

No.	Commentor	Comment	Response
		P4's total taxable value represents 18% of the total county valuation. The total county valuation for 2017 was $844,513,510. The assessed valuation for P4 was $111,369,537.	
509, 510, 639, 642, 705, and 462	City of Soda Springs - Austin Robinson City of Soda Springs - Austin Robinson Denise Horsley Caribou County Commissioners	The BLM suggests 185 job losses from the shutdown of the Blackfoot Bridge mine. This assumes that there would be an alternate source of phosphate ore and the manufacturing plant would not be affected because P4 could obtain phosphate ore from some other source and its plant could continue to produce elemental phosphorous. No one on behalf of the City of Soda Springs is aware of an alternative source of ore and the City does not believe that such an assumption is reasonable. If there is no alternate reliable source of ore and the Caldwell Canyon Mine is not approved, 795 people in the Soda Springs area would become unemployed as well as significant indirect economic consequences from job losses. These losses can only be described as catastrophic for a city which counts 25% of its households as employees of the P4 facility or other direct contractors. Needless to say, this would have a devastating effect on the city's property tax revenues and would make it impossible for the city to function anywhere near its current level. With respect to the economic consequences of the No Action Alternative, the DEIS does not emphasis enough the consequences of mine closure on property tax values, loss of funding for county and school services along with the general economic decline that would result in the loss of nearly 800 jobs. Further, the complications of relocating and re-training that size of work force is beyond anything that Caribou County	The analysis in Section 3.14.3.2 does assume that the no action would mean the leases would not be mined and the loss of mineral royalty and jobs is disclosed. The EIS recognizes that mine and support employees may leave the area, which could adversely affect property tax revenue. The cost of job retraining is beyond the scope of the analysis as it is highly speculative, however, the EIS does recognize that employees may need to relocate. It is not expected that the property taxes paid to the county by P4 Production would be lost if P4 Production did not mine Caldwell Canyon. It is assumed in the EIS that P4 Production's Soda Springs plant would continue to operate albeit using a different ore source if Caldwell Canyon was not approved. Utilizing phosphate ore from different mines to feed a plant is not an uncommon occurrence in the southeastern Idaho phosphate district.

No.	Commentor	Comment	Response
		could do and would require extensive services from a Work Force Training school like Idaho State University to retrain those employees—most of whom would have to leave the area even if they were retrained. Mr. Salazar, the Director of Workforce Training is confident that ISU's College of Technology could re-train the work force. But the costs of re-training are significant, running from approximately $6000 to more than $30,000 for tuition, books, and supplies. This does not cover the cost of food, shelter, and transportation during the re-training period. Nor does it assure employment."	
640	Denise Horsley Caribou County Commissioners	The other area that is not emphasized enough is the fact that this proposed mine development anticipates a 40-year life for the mine and the phosphate plant. If approved, this results in significant long-term stability for P4 and P4 in its mining operations and the consequent long-term benefits to the regional area.	The EIS (Section 3.14.3.1) does specify the mine life and the revenue impacts that 40-year mine life has on the area. The definition of the time-frame “short-term” to include the 40-year mine life was added again in section. The cost and time required for additional mine operation approvals is beyond the scope of this EIS analysis because it is highly speculative and dependent on the proposed activities, locations, and agencies involved.
754	Soda Springs Joint School District	In 2017, P4 paid $314,178.03 in property taxes to School District #150.	This information has been added to Section 3.14.2.
877	Idaho Office of Energy and Mineral Resources	Page 48, Section 3.4.2 references water rights for irrigation and stockwater. Since there are springs to be removed from state and private lands on the north pit, providing livestock water to replace those springs should be a high priority. The state has grazing allotments on the section that will be affected by the removal of this water.	P4 Production will have water rights for any water they affect. The state will be responsible for managing the effects of spring removal on the grazing allotment on their land and on private land.

Public Safety

No.	Commentor	Comment	Response
162	Yellowstone to	What are the human health effects of dust plus that from	Fugitive dust will be controlled in accordance with a Fugitive

No.	Commentor	Comment	Response
	Uintas and Kiesha's Preserve	the mining aside from the visible deterioration of the naturalness of the Forest, RWA, IRA, CEA, Corridor?	Dust Management Plan as part of their IDEQ, Air Quality Permit to Construct, which will specify BMPs and monitoring (ATSDR 2003 - Toxic Substances Portal - Selenium). No human health effects have been identified as dust will be controlled under the approved plan.
168	Yellowstone to Uintas and Kiesha's Preserve	Surface water impacts by sediment and metals could be mitigated in part by restoring stream flows, retiring grazing permits through buyouts, removing diversions for livestock water and removing livestock on private land to restore stream banks and riparian areas as well as improve upland habitat. An analysis of the location of these diversions, the net effect on spring and stream flows, riparian and wetland areas should be done.	See Section 3.4.3.2 and 3.4.3.3. No sediment or metals would enter surface water as a result of the project. Per Sections 2.5.1, B.4, B.9, and B.14, sediment associated with run-off from disturbance areas will be controlled. No diversion of stream flow is proposed as part of the Caldwell Canyon Project.
381	Western Watersheds Project and the Center for Biological Diversity	Caldwell Canyon mine would supply ore to Bayer's Soda Springs, Idaho phosphorus processing plant is important to BLM's NEPA analysis because: the Soda Springs, Idaho facility is an active Superfund site that continues to pollute groundwater, and, due to its relationship with the Caldwell Canyon proposal, the indirect and cumulative environmental impacts of this plant must be considered in the Caldwell Canyon DEIS.	The superfund activities at P4's Soda Springs plant address historic releases that are no longer being added to by current operations. The current operations are regulated under a regulatory framework for operating facilities such as the Resource Conservation and Recovery A and Toxic Substances CA (toxic substances control act). The Soda Springs ore processing plant permit and compliance status would not change if the Caldwell Canyon Project were approved. The additional ore processed at the plant is an indirect effect but is outside the scope of the analysis for the Caldwell Canyon mine. The effects from the processing plant would continue regardless of the project or the no action alternative, therefore the effects are not an indirect effect of the proposed action. The processing plant is outside the cumulative effects analysis area for groundwater and the effects are not cumulative.
729, 906, and 910	Shoshone Bannock Tribes	EIS needs to identify, address, and assess the risks from the naturally occurring radionuclide component of phosphate ore and associated waste rock from an ecological and human health perspective.	The human health issue and effect on workers is out of scope of the NEPA analysis because it is an industrial health and hygiene issue that is regulated separately by U.S. Department of Labor, Mine Safety and Health Administration and State

No.	Commentor	Comment	Response
			agencies. However, the following provides perspective for this issue. P4 Production conducted whole rock elemental analyses on 223 samples distributed evenly throughout the project area (NewFields, 2018g; Tetra Tech, Inc., 2017b). Values for uranium in the Rex Chert overburden and Rex Dolomite overburden showed lower uranium concentrations (and therefore uranium daughter products) than average global values. Elevated radiation exposure above global averages would not occur during handling the Rex Chert overburden or in the sizing and loading of ore. Similarly, the overburden that remains onsite as backfill in the reclaimed pits would not pose and environmental or ecological risk. As discussed in Section 3.5.3.1 of the FEIS, fugitive dust emissions would be reduced with implementation of the fugitive dust control plan required by IDEQ. Based on the elemental analyses of overburden, residual radiation after reclamation with overburden and soil and ecological risk would be low. Ore body samples (which would be removed and transported to the processing plant) were greater than the crustal average in 3 of 29 samples for uranium in the upper ore body and 26 of 29 samples in the lower ore body, indicating elevated concentrations. The Soda Springs ore processing plant permit and compliance status would not change based on a decision regarding the Caldwell Canyon Project. Radiation exposure that could potentially occur from the processing of ore at this facility is not within the scope of the EIS for Caldwell Canyon Project. A human health risk assessment conducted for Smoky Canyon evaluated the radiological risk (Baseline Human Health Risk Assessment Formation, 2015) determined that uranium and decay products from the Smoky Canyon Mine

No.	Commentor	Comment	Response
			did not pose a cancer risk above the regulatory cancer risk thresholds for scenarios evaluated, including to Native American receptors exposed to soil, surface water, game, tea and other produce. The largest whole rock concentrations of uranium were found in the lower ore body with an average uranium concentration of 98.0 milligram per kilogram (mg/kg); the maximum recorded sample was 139 mg/kg. Under Title 10, Part 40 of the Code of Federal Regulations (10 CFR Part 40.4) the Nuclear Regulatory Commission (NRC) does not require the licensing of source material or the licensing to transport source material until the total concentration of uranium and/or thorium exceeds 500 mg/kg which is far greater than the whole rock analysis of ore and overburden. Because the human risk assessment did not pose a cancer risk above the regulatory cancer risk thresholds for scenarios evaluated, including to Native American receptors exposed to soil, surface water, game, tea and other produce, it is not expected to have the same effect on the ecological system (plants and wildlife).

Cumulative Impacts

No.	Commentor	Comment	Response
390 and 390	Western Watersheds Project and the Center for Biological Diversity	The Central Rasmussen Ridge Mine, North Maybe Canyon Mine, and South Maybe Canyon Mines are listed by the EPA as active Superfund sites but are not identified in the DEIS's Figure 9. Name each of these 10 Superfund sites within the cumulative affects area and discuss why they have been named as Superfund sites, their current remediation status, their most recent EPA Five-Year Reviews, whether they are improving, and whether they are getting worse. The EIS must also discuss the current impacts to habitat, wildlife, water quality, and human communities of 10 active Superfund	**Figure 9** has been modified to demarcate these mines separately. See the footnote on **Figure 10**. None of the mines listed in this comment are on the National Priority List. Rasmussen Ridge is not under a superfund action. Analysis of other mine sites is out of scope for the Caldwell Canyon project analysis except where they have been included in the cumulative impacts area. Superfund actions at the mines deals with historic mining activities that are no longer taking place or being contributed to. Impacts on habitat, wildlife, water quality and human

No.	Commentor	Comment	Response
		sites concentrated within a relatively small cumulative affects area, as well as how the Caldwell Canyon mine will add to them.	communities from past mining are disclosed in the impact analysis. Caldwell Canyon would not contribute additional cumulative effects to any superfund status.

Appendix B

No.	Commentor	Comment	Response
844 and 845	P4 Production	P. B-9, Sec. B.14, last bullet - The DEIS says P4 Production will minimize effects on pending leks consistent with BLM Special Status Species Management Manual. This is incorrect. See above regarding applicability of Manual 6840 and revise. P. B-14, Sec. B 15,4. The FEIS should clarify that the Idaho Mitigation Framework has not yet been finalized.	Text removed from EIS.
846	P4 Production	P. B-14; Sec. B.15.4; last bullet This explanation should be expanded and included in the introductory discussion of Sage-Grouse.	Information in this bullet was added to the introduction and removed from the list of actions in the mitigation plan.

Appendix F
Biological Assessment for Threatened, Endangered, and Proposed Species

Final Biological Assessment for Federally Listed Endangered, Threatened, Proposed and Candidate Species for the Proposed Caldwell Canyon Mineral Action

April 29, 2019

PRESENTED TO

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Summary Table of Effects

Wildlife Species[1]	Federal Status	Determination
Canada Lynx (*Lynx canadensis*)	Threatened	May Affect, But is Not Likely to Adversely Affect
North American Wolverine (*Gulo gulo luscus*)	Proposed Threatened	Not Likely to Jeopardize the Continued Existence of the Species

Notes:

1 Per information contained in the current U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (USFWS, 2018a) for Caribou County, the Canada lynx and North American wolverine are the only federally listed species with potential to occur in the county and therefore be affected.

Prepared by:

Hilary Heist

April 29, 2019

Lisa Harloe and Hilary Heist, Biologists

Date

Reviewed by:

Matt Cambier

April 29, 2019

Matt Cambier, Wildlife Biologist

Date

Agency Representative:

April 29, 2019

David Price, BLM Wildlife Biologist

Date

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ARMP	Approved Resource Management Plan
BA	Biological Assessment
BLM	Bureau of Land Management
BMPs	best management practices
CEA	cumulative effects area
CFR	Code of Federal Regulations
EIS	environmental impact statement
EPMs	environmental protection measures
ESA	Endangered Species Act
FW	fish and wildlife
FR	Federal Register
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
MRP	mine and reclamation plan
POC	Point of Compliance
SS	special status species
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

1.1 BACKGROUND

The proposed 'action', as defined by the Endangered Species Act of 1973 (ESA), as amended, will hereafter be referred to as the 'Activity'. The Activity discussed in the BA is Alternative 1 (the preferred alternative) from the Caldwell Canyon Final EIS. A complete description of the Activity, including the design features, timing, and best management practices, is described in the Caldwell Canyon Final EIS.

Under the Endangered Species Act of 1973 (ESA), as amended, the BLM is required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of federally listed species or result in adverse modification or destruction of critical habitat for such species (regulations pertaining to the implementation of this responsibility are located in 50 Code of Federal Regulations [CFR] Part 402). This BA was prepared to determine what effects, if any, implementation of the Activity might have on federally listed endangered, threatened, proposed, or candidate species or critical habitat. The species included in this BA are Canada lynx (*Lynx canadensis*) and North American wolverine (*Gulo gulo luscus*). An internet search of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation website indicated these mammals could be affected by activities based on a search of Caribou County (USFWS, 2018a). This BA was prepared in accordance with requirements under Section 7 of the ESA (6 USC 1536 (c)) and with BLM guidance.

BLM conducted scoping with USFWS through written correspondence during the EIS public scoping period. Additionally, the USFWS was provided the opportunity to review and comment on the baseline survey reports.

1.2 LOCATION AND DESCRIPTION

The mine would be located on Schmid Ridge, approximately 13 air miles northeast of Soda Springs, Idaho (**Figure 1**) in Caribou County on federal phosphate leases and State of Idaho leases in portions of Township 7 South, Range 43 East Section 36; Township 8 South, Range 43 East, Sections 1, 12, 13, and 24; and Township 8 South, Range 44 East, Sections 7, 18, 19; Boise Meridian.. The leases issued under the Mineral Leasing Act of 1920 and Idaho Code § 47-708 grant exclusive rights to mine and otherwise dispose of the federal and state phosphate deposit. Operations would occur on the Federal Mineral Leases IDI-0000002, IDI-0014080, IDI-0013738, and State of Idaho Mineral Lease E07959 (**Figure 2**). P4 Production is also requesting modifications to the phosphate lease boundaries for the mine pits.

1.3 ACTION AREA

The Action Area includes all areas that may be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR §402.02). The Action Area identified includes a 0.5 mile to one mile buffer around all new disturbance areas, including a one mile buffer around the leases, mine facilities and the East Caldwell Area, and a 0.5-mile buffer around the rail system (For a total of 29,348 acres) (**Figure 3)**. This Action Area encompass the locations where direct and indirect effects on habitat and individual wildlife could occur from mining and ore transportation from the Activity (described in **Section 1.4**).

The Action Area is in a phosphate-producing region of Idaho and four active mines and several mines reclaimed or under remediation occur within approximately 10 miles of the Action Area. A noise study was performed in the Action Area and measured A-weighted equivalent ambient sound levels that ranged from 16 to 51 dBA (Big Sky Acoustics, 2018). **Table 1** shows the dominant habitat types within the Action Area, which ranges in elevation from 5,990 feet at the rail loop near Soda Springs to 7,568 feet at Schmid Ridge in the proposed mine pit.

The Action Area is between the Caribou National Forest and Highway 34 near Soda Springs. Ownership within the Action Area is mostly private with some BLM, USFS, and State of Idaho lands. The general setting is rural and undeveloped, with mining, traffic (passenger vehicles, all-terrain vehicles, and railroad), and livestock grazing.

Figure 1. Activity Location, Ownership, and Lease Boundary

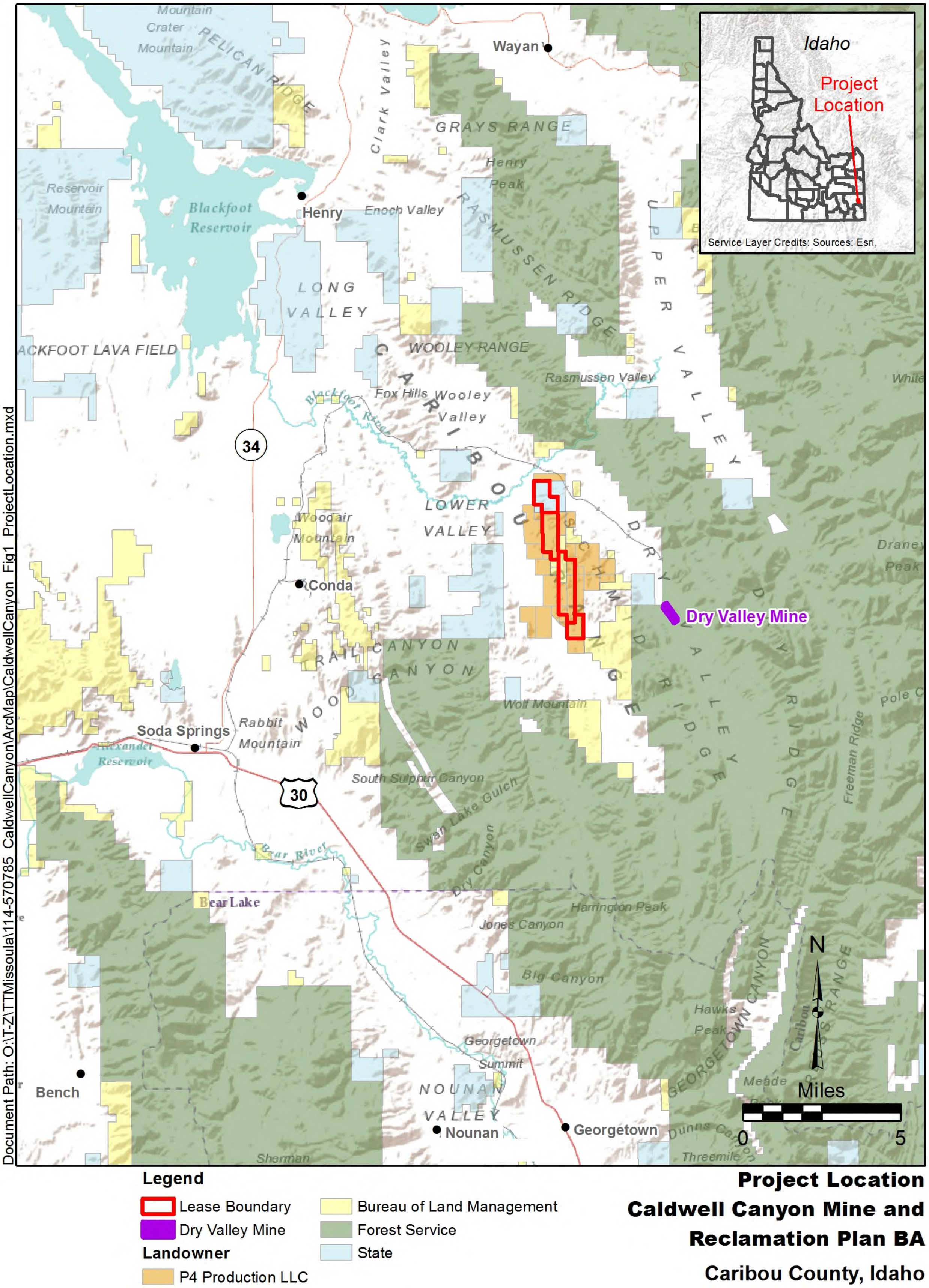
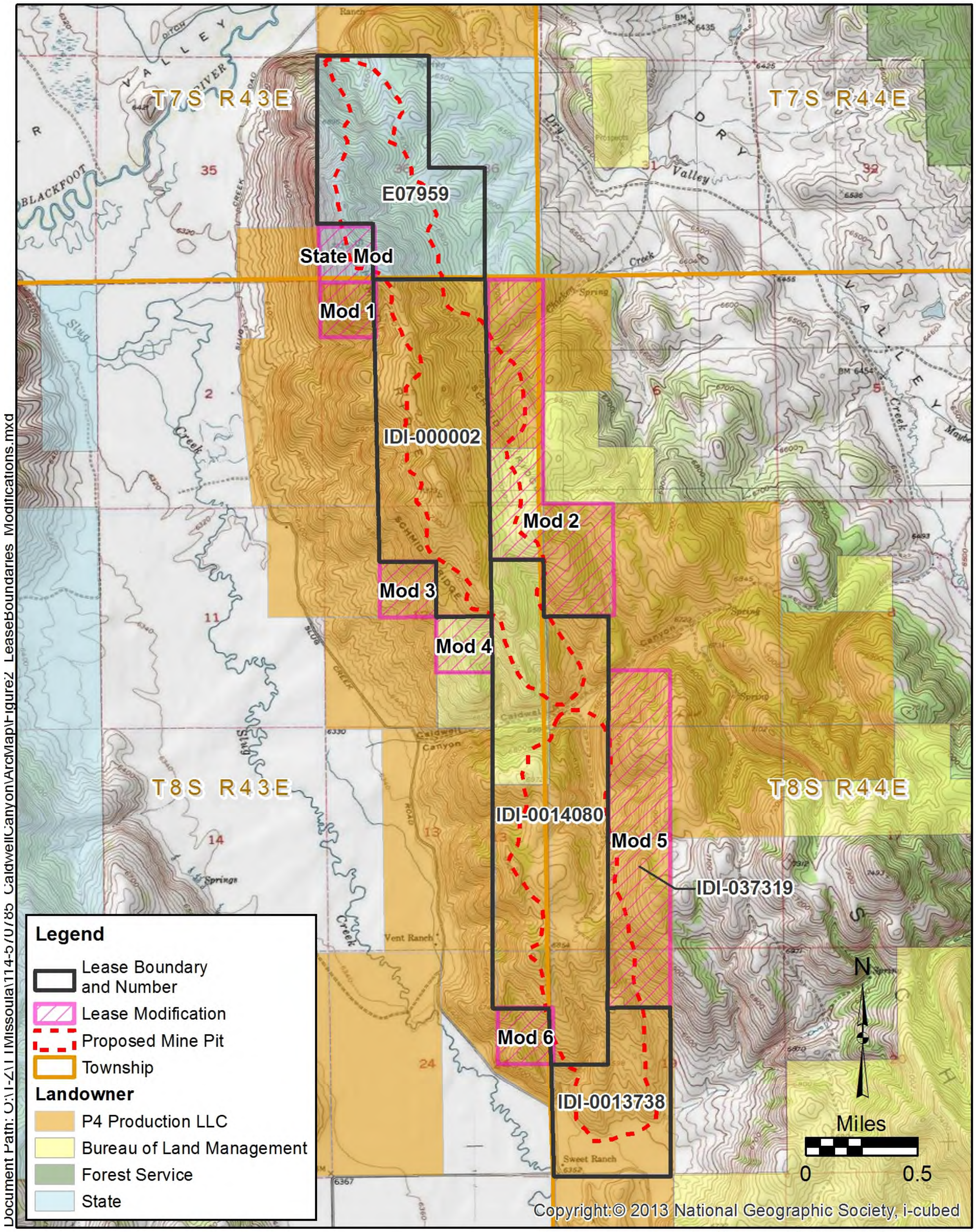


Figure 2. Lease Boundaries and Modifications



Lease Boundaries and Modifications
Caldwell Canyon Mine and
Reclamation Plan BA
Caribou County, Idaho

Past land management activities have occurred on BLM, National Forest, state, and private lands for a century or more and have contributed to the current conditions in and adjacent to the Action Area. These activities include phosphate mining, timber management (harvesting, site preparation, planting, salvage, and thinning), weed treatment (herbicide application), prescribed burning (for wildland fuel management, habitat improvement, site preparation), fuel break construction, mechanical fuel treatment, farming and ranching (grazing), and firewood gathering. Some activities created trails, roads, railroads, fences, and power lines. Past, present, and reasonably foreseeable mining and other activities are shown in **Table 2. Figure 4** displays the location of the Action Area amid the location of mining activities listed in **Table 2**.

Table 1. Habitat Types in the Action Area

Habitat Type	Acres (Percent) of Action Area
Big Sagebrush/Native Grass[1]	7,369 (25.1)
Conifer/Aspen	4,177 (14.2)
Native Grassland/Forbs	3,752 (12.8)
Introduced Grass	3,351 (11.4)
Mining Disturbance[2]	3,188 (10.9)
Mixed Shrub	3,011 (10.3)
Riparian/Wetland	2,209 (7.5)
Aspen	1,913 (6.5)
Agricultural	378 (1.3)

Source: (NewFields, 2017f)

1 Big sagebrush/introduced grass is incorporated into the big sagebrush/native grass habitat type and conifer is incorporated into the conifer/aspen habitat type. This was done because the resolution of available data did not allow aerial photo interpretation to distinguish these habitat types within the entire Action Area (NewFields, 2017d).

2 Mining disturbance includes currently disturbed and reclaimed mine areas associated with the Dry Valley Mine.

Table 2. Past, Present, and Reasonably Foreseeable Activities

Activity/ Project Name	Period of Activity	Description
Mining – Past and Present		
Ballard Mine	1952-1969	635 acres[1]
Bear Lake Mine	1920-1921	0.1 acres[1]
Blackfoot Bridge Mine	2013-Present	420 acres
Champ Mine and Champ Extension	1982-1985	460 acres
Conda Mine and Trail Canyon Mine	1920-1984	1,572 acres
Diamond Gulch Mine	1960	32 acres[1]
Dry Valley Mine	1992-2014	1,082 acres
Enoch Valley Mine	1990-Present	645 acres
Georgetown Canyon Mine	1958-1964	251 acres[1]

Activity/ Project Name	Period of Activity	Description
Henry Mine	1969-1989	1,074 acres[1]
Home Canyon Mine	1916-1924	0.8 acres[1]
Lanes Creek Mine	1978-1989; 2014 to Present	256 acres[1]
Mountain Fuel Mine	1966-1967, 1985-1993	781 acres[1]
North and South Maybe Canyon Mine	1951-1995	1,028 acres[1]
Rasmussen Ridge Mine[2]	1991- Present	858 acres[1]
Rattlesnake Canyon Mine	1920-1926	0.4 acres[1]
Smoky Canyon Mine	1982-Present	3,338 acres[1]
South Rasmussen Mine	2003-2015	390 acres[1]
Waterloo Mine	1907-1920, 1945-1960	196 acres[1]
Wooley Valley Mine	1955-1989	808 acres[1]
Rasmussen Valley Mine (Federal Lease I-05975)	2017 to 2024	An open pit phosphate mine with approximately 1,559 acres of planned disturbance for mining, backfilled pits, a haul road, and ancillary facilities, on private land, State of Idaho land, and public land administered by the BLM and Forest Service. The final decision is under appeal. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=48240&dctmId=0b0003e880865e91.
Caldwell Canyon and Trail Creek Exploration Plan Environmental Assessment	In Progress	Exploration drilling to gather information about phosphate reserves on portions of two federal phosphate leases and three off lease areas. The Caldwell Canyon portion is complete. Trail Creek will resume into 2019. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=138642.
Mining – Reasonably Foreseeable		
Ballard Lease	Implementation expected in 2019	Phosphate mining on previously disturbed Ballard Mine to recover ore and facilitate reclamation. No additional disturbed areas.
Dairy Syncline Mine (Federal Leases)	Ground disturbing activities approximately 2030-2060 when Smoky	Phosphate mining in open pits, beneficiation plant, tailings pond, and facilities on private land, State of Idaho land, and public land administered by the BLM and Forest Service. Approximately 2,830 acres would be disturbed. A draft EIS was published. A direct land sale from BLM to the proponent of 1,142 acres is included, as well as a Forest Service land exchange. https://eplanning.blm.gov/epl-front-

Activity/ Project Name	Period of Activity	Description
	Canyon Mine depleted	office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=44904.
East Smoky Panel Mine EIS (Federal I-26843, I-012890, and I-015259)	Ground disturbing activities approximately 2023-2036	Phosphate mine expansion plan and associated projects and infrastructure at the existing J.R. Simplot Company's Smoky Canyon Mine. 720 acres of new disturbance. A draft EIS was published. http://www.fs.usda.gov/project/?project=44748.
Freeman Ridge/Husky 2 Exploration Plan Environmental Assessment	On Hold	Exploration drilling of 967 holes to gather information about phosphate reserves on portions of two federal phosphate leases and three off lease areas. Overall disturbance is 168 acres. http://www.fs.usda.gov/project/?project=42793.
Husky I-North Dry Ridge Project Mine (Federal Leases I-05549, I-04, and I-008289	Future	Open-pit phosphate mine and facilities on private and National Forest System land. Details uncertain because proposed MRP is being revised.
Other – Past and Present		
Flat Valley Road Stream Crossing Improvements on Lanes Creek and Brown Canyon Creek	2016	Caribou-Targhee National Forest lead efforts that were made possible through the partnership with the Upper Blackfoot Confluence, U.S. Fish and Wildlife Service (USFWS) and Trout Unlimited. The project focused on upgrading two undersized and problematic road stream crossings on the Forest Service Flat Valley Road (FS107). The project goals are to restore stream/riparian function and aquatic passage in Lanes Creek.
John Wood Forest Management Project EIS	Implementation expected January 2018	Forest vegetation management activities (mechanical timber harvest and pre-commercial thinning) and road work (temporary and permanent). Legal Description – Township 9 South, Range 43 East, Sections 4 and 5 and Township 8 South, Range 43 East, Sections 32and 33. Johnson and Wood canyon drainages. http://www.fs.usda.gov/project/?project=50688.
Lanes Creek Recreational Trail Improvements	2015	Improve 1.8 miles on all-terrain vehicle trail number 088 and 2.5 miles on trail number 022 by relocating and adding drainage.
Lanes Creek Restoration	2015	Trout Unlimited/UBC Upper Lane Creek Restoration occurring on about 3 miles of stream on private lands.
Phosphate Processing Plants in Soda Springs, Idaho	Past, Present, and Future	Two operating phosphate processing plants and associated facilities including railroads.
Sheep Creek Restoration	2016	Trout Unlimited/UBC Sheep Creek Restoration occurring on about 1 mile of private lands.
South Soda Sheep Allotments Environmental Assessment	Future	Livestock grazing and permit re-administration for multiple allotments on the Soda Springs Ranger District. Legal Description – Township 7 South/Township 8 South, Range 45 East, multiple sections. http://www.fs.usda.gov/project/?project=43251.

Activity/ Project Name	Period of Activity	Description
Other – Reasonably Foreseeable		
Hooper Springs Transmission Line	Construction beginning fall 2019	A 138/115-kilovolt Hooper Springs Substation, about 24 miles of double-circuit 115-kilovolt transmission line, a connection facility to connect the new line to Lower Valley Energy's transmission system, about 0.2 miles of single-circuit 138-kilovolt transmission line between the Hooper Springs Substation and PacifiCorp's existing Threemile Knoll Substation, and ancillary facilities such as access roads. The Hooper Springs transmission line would impact an additional 112 to 188 acres in the foreseeable future (Bonneville Power Administration, 2015; LVE, 2018).
Chippy Creek Bridge Replacement and Stream Restoration	2018-2019	Upgrade and upsize the Chippy stream crossing on the Caribou County Lane Creek Cutoff Road. In association with the bridge, perform 700 to 1,000 feet of channel restoration on private lands to improve stream stability, reduce threats to the new crossing, improve water quality, and improve aquatic habitat.
Diamond Creek Road Bridge Replacements	2018-2020	Forest Service, Trout Unlimited, and Caribou County to replace failing undersized bridges on Diamond Creek on the Diamond Creek Forest Service Road 51102. Bridge number 1 (Milepost 14.5) to improve public safety, channel function, stream stability, aquatic organism passage and aquatic habitat.
Tincup Creek Restoration	July 2018-September 2019	Restore Tincup Creek from Highway 34 up the Bridge Creek Road to the bridge. Two road miles or about 4 stream miles. https://www.fs.usda.gov/nfs/11558/www/nepa/103029_FSPLT3_3017788.pdf.
Toponce Habitat Restoration Project	On Hold	Treat a mountain brush community (mountain big sage, bitterbrush, snowberry) using fire to diversify the age structure and improve conditions for wildlife and reduce fuel loading. Legal Description - Township 6 South, Range 38 East, Sections 18, 19, and 29 through 32; Township 7 South, Range 38 East, Section 4, Boise Meridian. The project is on the east side of the Toponce Basin. http://www.fs.usda.gov/project/?project=43319.

Notes:

1 Disturbed Areas (acres) (permitted or actual disturbance): Acreage does not account for current reclamation status of mine areas.

2 Consists of North Rasmussen Ridge, Central Rasmussen Ridge, and South Rasmussen Ridge mines.

Figure 3. Action Area and Habitat Types

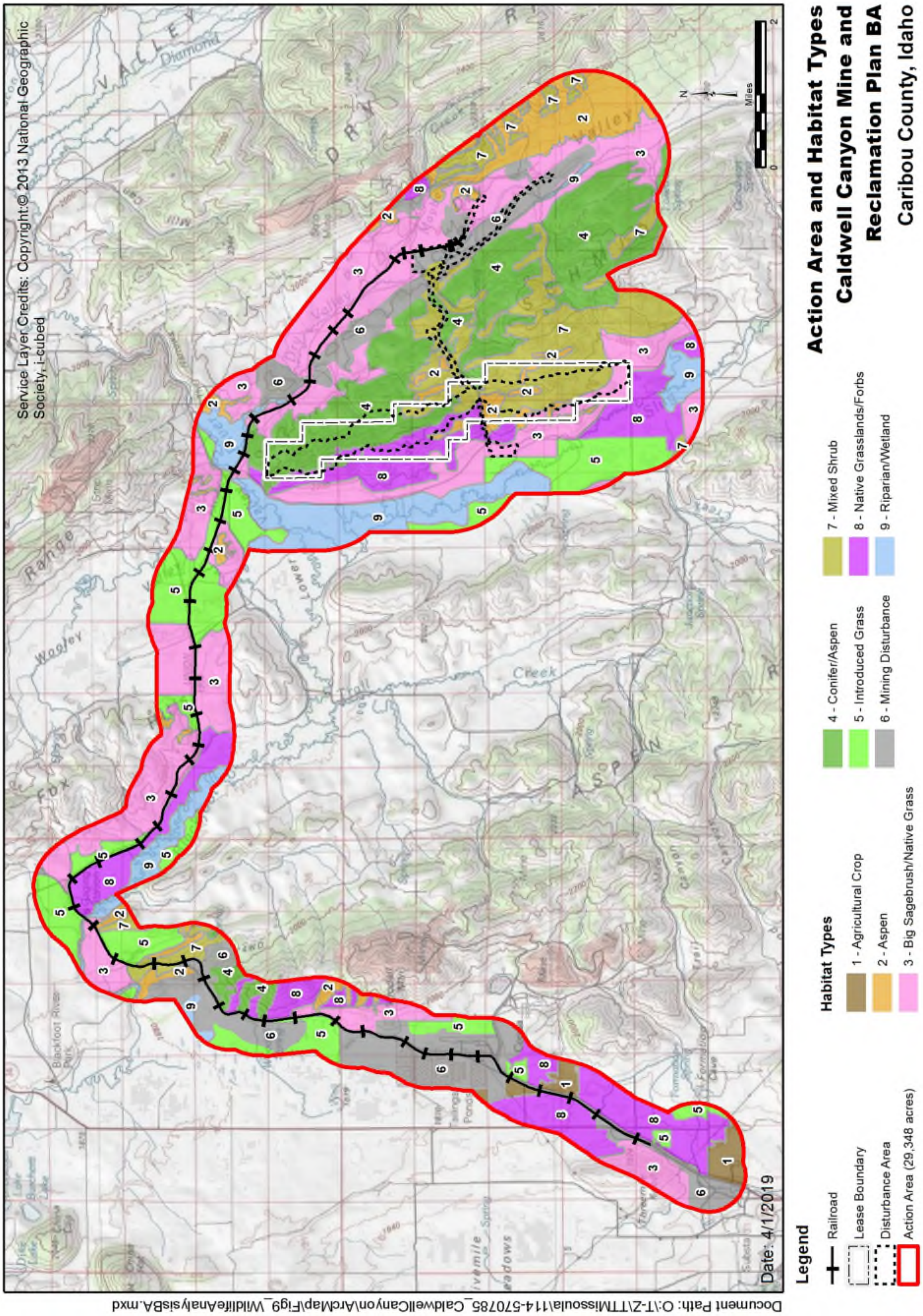
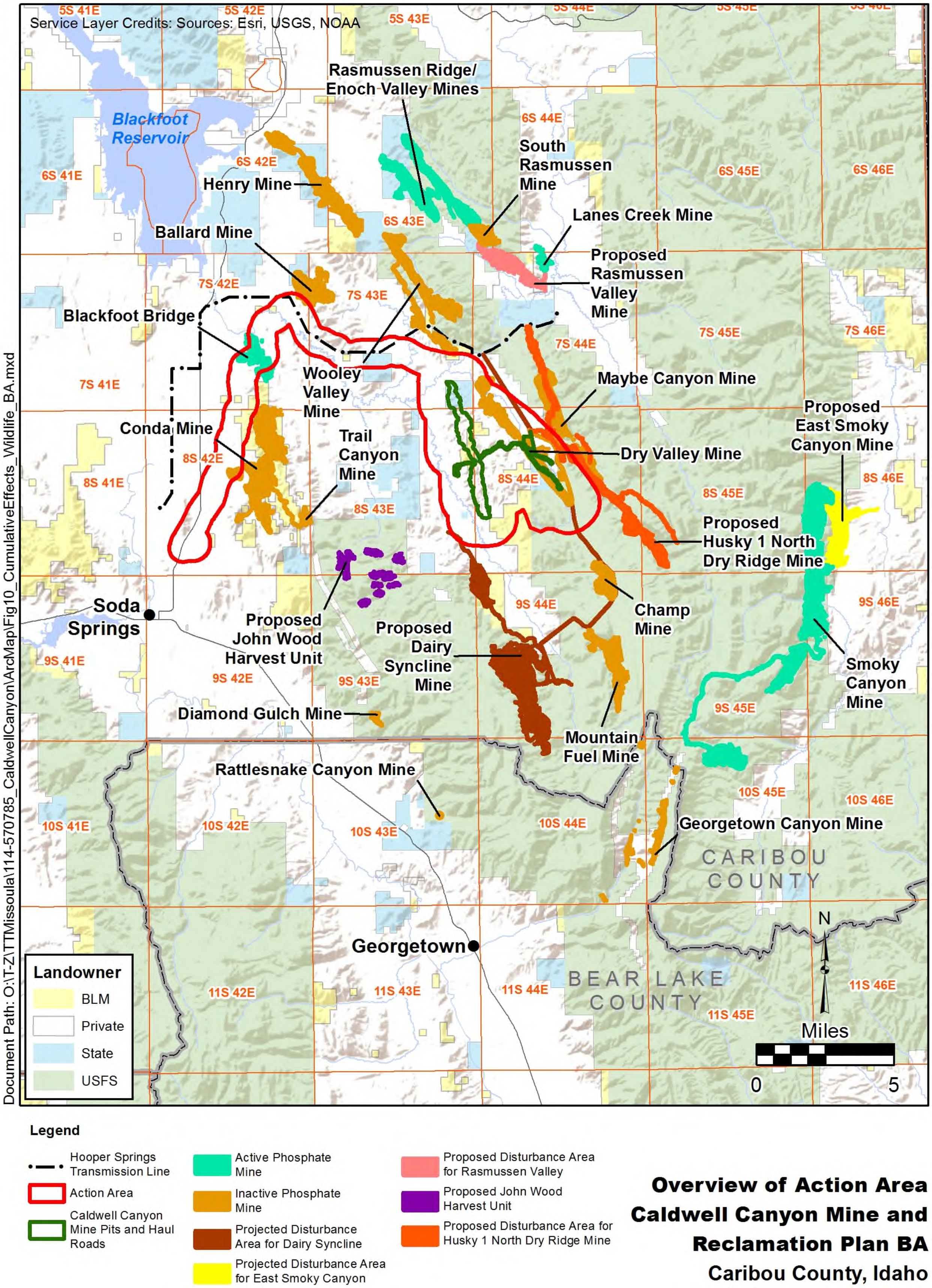


Figure 4. Overview of the Action Area



1.4 ACTIVITY

The Activity includes P4 Production constructing and operating two open mine pits (North and south pits), and associated haul and access roads, a power line, water management features, monitoring wells, shop and office facilities, associated environmental protection measures (EPMs), and reclamation. The BLM would modify (enlarge) two existing leases to accommodate maximum ore recovery. P4 Production would backfill mined out pits with overburden, including a mined-out pit at the Dry Valley Mine. The BLM would modify the existing Dry Valley Mine MRP to accommodate the placement of the backfill. P4 Production is expected to require 42 years to construct, mine and reclaim the mine.

1.4.1 Lease Modifications

Portions of the North and South pits extend beyond the current lease boundaries (**Figure 2**). To accommodate the portions of the pit outside the existing lease and maximize recovery of the phosphate resources, the Activity includes expansion of two of the leases encompassing the pits in accordance with Title 43 CFR 3516.3.

1.4.2 Disturbance Summary

The Activity would include a total of 1,559 acres of new disturbance. Of those, 153 are BLM public land surface acres, 7 are National Forest System land, 230 are state endowment land, and 1,169 are private. These acres include a 50-foot buffer (140 acres) around the planned disturbance areas to accommodate variations in pit slope, berms, run-on control ditches, pipelines, monitoring wells, and service roads. Approximate new disturbance acres are provided in **Table 3**. Disturbance listed in **Table 3** does not include 99 acres of re-disturbance of previously disturbed areas at the existing Dry Valley D Pit, rail facilities, and office complex.

Table 3. Proposed New Mine Surface Disturbance[1]

Mine Component	BLM Acres1	National Forest Acres	State Acres	Private Acres	Total Acres
North and South Mine Pits	137		205	864	1,206
Caldwell Canyon Service Road, East Caldwell Area Haul Road, and Dry Valley Haul Road[1]	16	5	22	42	85
Water Management System[1]	0	0	3	61	64
Growth Media Stockpiles[1]	0	2	0	20	22
Ore Stockpile and Tipple Area[1]	0	0	0	98	98
Internal Buffer Areas	0	0	0	84	84
Total	153	7	230	1,169	1,559

Source: Caldwell Canyon MRP Table 4-1. (P4 Production, 2017).

Notes: Rounding may cause numbers to total differently than the table.

[1] Does not include re-disturbance of reclaimed land in the East Caldwell Area; Dry Valley Pit backfill areas.

Infrastructure construction would include salvaging growth media. Once infrastructure is constructed, mining operations would begin, including salvaging growth media, overburden excavation, ore recovery, and progressive backfill and reclamation. Vegetation removal and growth media salvage would precede all mining activity.

1.4.3 Ore Removal and Backfill

Ore removal and backfill would occur year-round over about 40 years, 4 to 5 days per week in 2 10-hour shifts. Ore production from would begin in about 2023 and may fluctuate over time, depending on the needs of the Soda Springs processing plant and market conditions, thus increasing or decreasing the mine life.

P4 Production will mine the pits sequentially in segments. Mining would start in the mid-point of the South Pit and proceed southward. Mining would then proceed northward in the South Pit and advance into the North Pit as shown in **Figure 5.** The North Pit would be mined in sequence from south to north. Sequence of the pit panel development and backfill are depicted in multiple figures Appendix C of the MRP (P4 Production, 2017). The phases and production years are:

Phase 1	Years 1-3
Phase 2	Years 4-6
Phase 3	Years 7-9
Phase 4	Years 10-12
Phase 5	Years 13-15
Phase 6	Years 16-19
Phase 7	Years 20-25
Phase 8	Years 26-32
Phase 9	Years 33-36
Phase 10	Years 37-40

The South Pit would be developed during years 6 through 8 on the south end, and years 14 through 16 at the north end including mining below the water table. The North Pit would be mined in sequence from south to north.

In the first two to three years of mining, five to six million cubic yards of overburden from the South Pit would be placed as backfill in the existing Dry Valley Mine D pit (adding backfill to the partially filled the pit) This existing pit is located within the Action Area in the southeastern most portion of Dry Valley off of the Dry Valley haul road (**Figure 5**).

Once haulage of this initial overburden is completed, overburden from the Caldwell Canyon mine would be placed as backfill in mined-out portions of the South and North pits as mining progresses. See **Section 1.4.1.6** East Caldwell Area Facilities and Ore Haulage, for additional details on ore haulage.

Backfill would be shaped to have slopes no greater than three horizontal to one vertical (3H:1V) in preparation for cover placement and final reclamation. P4 Production would salvage growth media from newly disturbed areas and either place it on areas ready for final reclamation or in growth media stockpiles for later use in reclamation.

1.4.4 Water Management System

As specified in the Point of Compliance (POC), a Water Management Plan includes a system of ditches, collection points, and pipelines that would allow multiple options to manage rain and snow melt “contact water” and “non-contact water”. The Water Management Plan is shown on **Figure 7**. “Contact-water”, surface run off or run on water that has come in contact with mined materials, disturbed areas, or surface water sources that are close to mine development and could acquire dissolved constituents of concern or particulates will be intercepted to prevent from entering natural drainages and unaffected surface waters. Contact water will be evaporated or infiltrated into the ground through specially designed infiltration galleries.

“Non-contact water,” water from unaffected areas that has a low potential to pick up constituents of concern, will typically be diverted away from disturbed areas and then returned to natural drainages.

Contact and convey it to natural drainages below disturbance areas to the extent possible.

Non-contact water from dewatering wells will be evaporated or infiltrated using the infiltration galleries.

The water management system and BMPs are designed to minimize soil erosion and sedimentation, and to protect surface water and groundwater quality. Besides using maximum controls to divert non-contact water, the three primary functions of the designed water management system are to:

1. Manage groundwater that would inflow into the mine pits at locations where mining would advance below the water table;
2. Manage storm water and snow melt run-off; and
3. Manage rain and snowmelt water and run-on water in mine pits

The water management system includes ponds, infiltration galleries, ditches, and pipelines and BMPs implemented to control or minimize erosion and storm water run-off.

Figure 5. Phased Mine Pit Development

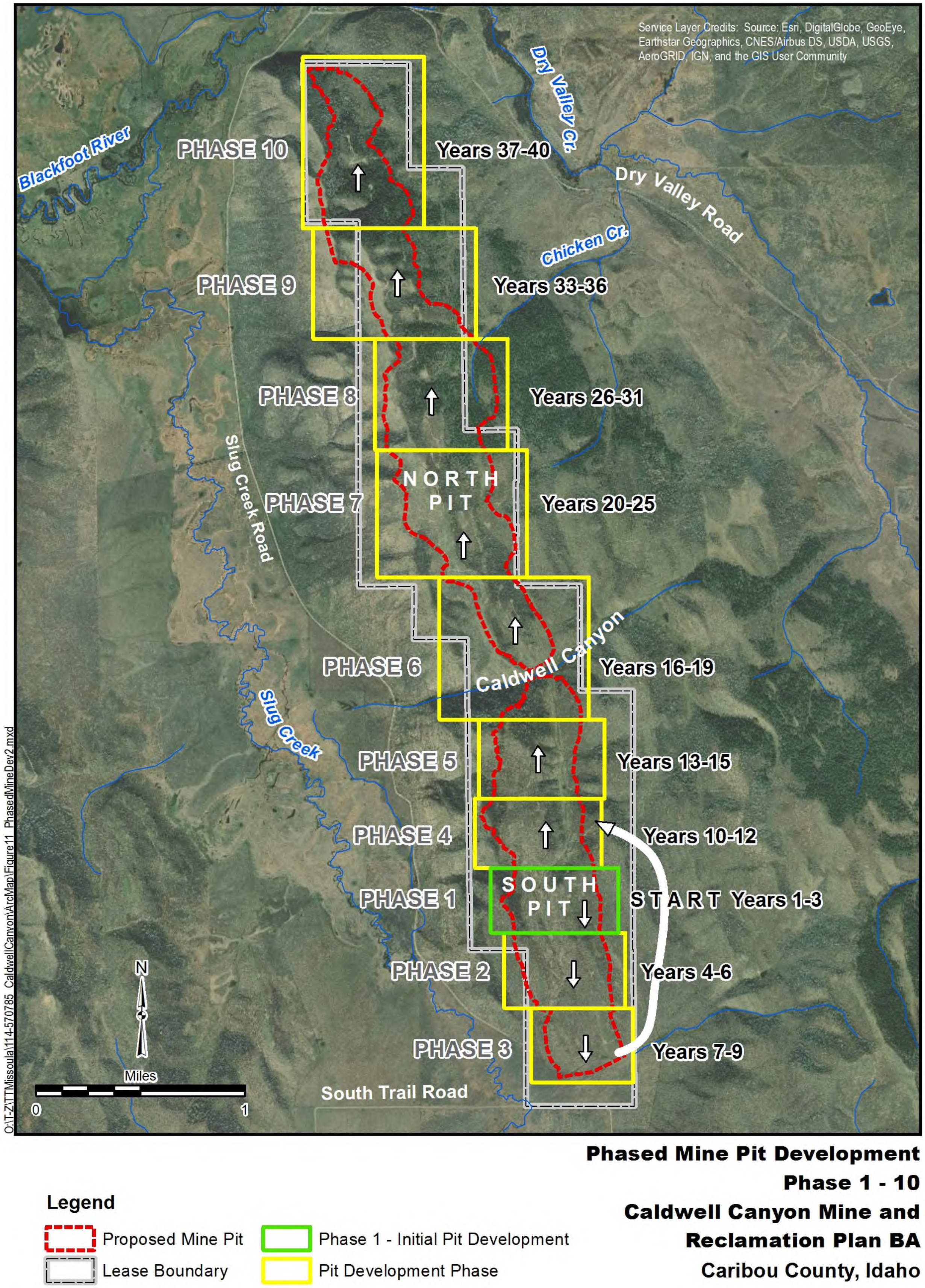
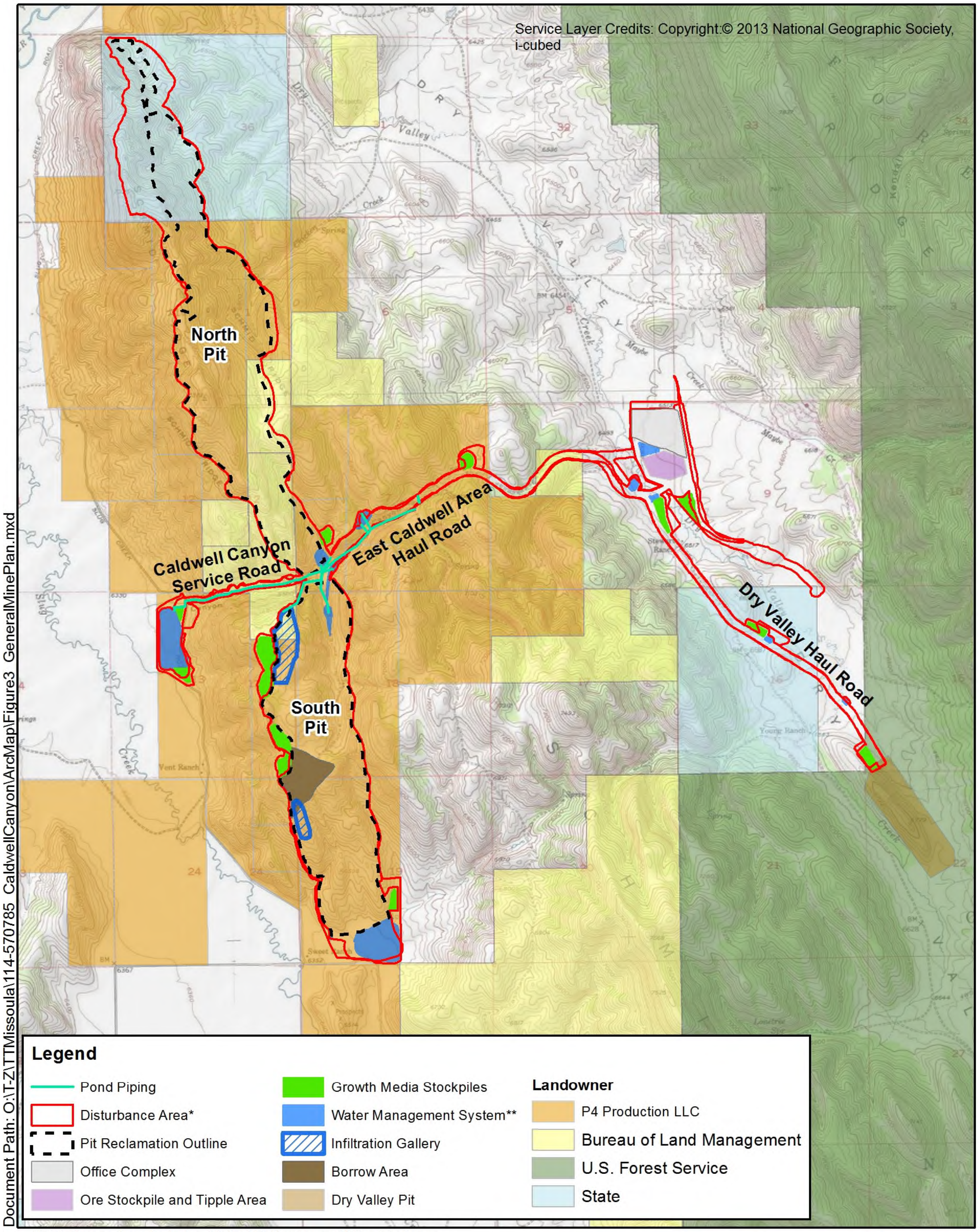


Figure 6. General Mine Plan

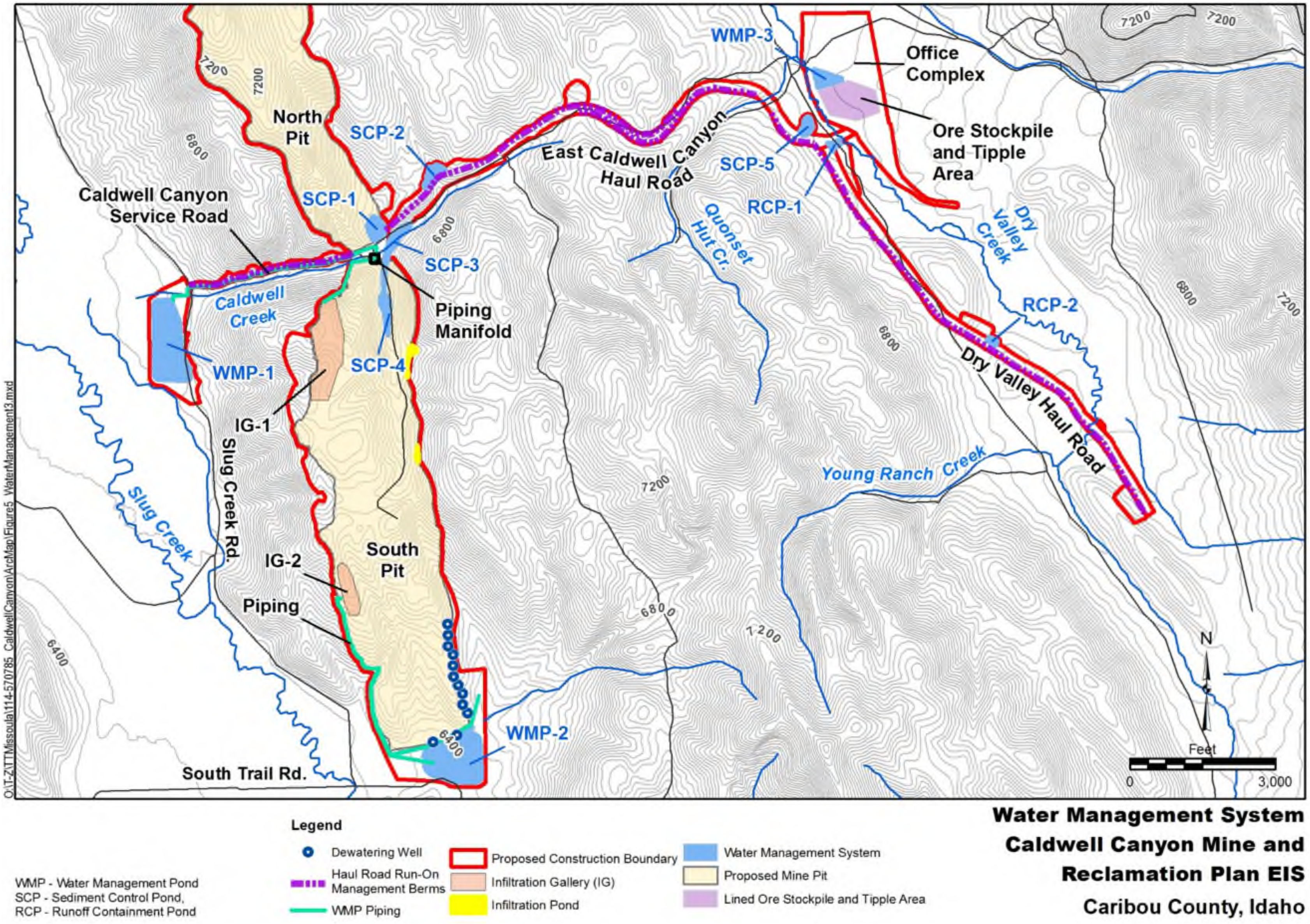


*Disturbance Area Includes 50-foot Buffer Around Mine Features
**Water Management System Includes WMPs/SCPs/RCPs/Ditches

Miles
0 0.8
N

General Mine Plan
Caldwell Canyon Mine and
Reclamation Plan BA
Caribou County, Idaho

Figure 7. Water Management System



1.4.5 Geosynthetic Membrane Enhanced Backfill Cover

P4 Production developed the Geosynthetic Membrane Enhanced Backfill Cover design to address long-term groundwater quality issues. P4 Production will install the geosynthetic membrane in three areas (**Figure 8**) designed as follows:

- The geosynthetic membrane would be a double-sided textured, low-density polyethylene membrane placed on the backfill in areas of the North and South pits shown on **Figure 8.**
- The 60 mil (about 0.06-inch thick) membrane barrier would intercept infiltrating water and convey the water horizontally to the perimeter of the pit, preventing it from percolating through the backfill and leaching constituents of concern. For stability, a 0.5-foot bedding layer could be placed below portions of the membrane.
- The cover would drain through a perforated pipe collection system installed above the membrane.
- A capillary break layer of 2 feet (to retain water in the growth media layer) would be placed on top of the membrane. In areas where the bedding layer is placed under the membrane, the capillary break layer would be 1.5 feet thick; and
- P4 Production would place four feet of fine-grained growth media over the capillary break layer to support vegetation and retain water.

1.4.6 Service and Haul Roads

P4 Production would provide mine access through a new service road and existing road widening for the first 12 to 18 months. Access roads would only be open to mine personnel. P4 Production would construct a new haul road between Caldwell Canyon Mine and Dry Valley Mine D pit in the East Caldwell Area. Haul roads would be constructed with a road running surface width of 90 feet. P4 Production would widen the Caldwell Canyon Service Road that intersects with Slug Creek Road to a running width of 25 feet to accommodate construction equipment and light vehicle access.

1.4.7 East Caldwell Area Facilities and Ore Haulage

Infrastructure at the inactive Dry Valley Mine and new facility construction that would be in the already disturbed East Caldwell Area are shown on **Figure 9.** The ore stockpile pad, tipple, rail loadout, and water management facilities would be in the same general areas used during the previous Dry Valley Mine operations, with no reconstruction needed. The new stock pile would be in the previously disturbed stock pile area. The site would also provide equipment and material staging areas. The existing mine offices, warehouse, and maintenance shop facilities in the East Caldwell Area would be used or reconstructed. Above-ground petroleum storage tanks would be equipped with secondary containment in accordance with the Spill Prevention, Control, and Countermeasure Plan. The estimated 2.4 million gallons annual fuel consumption would require 72,000 gallons of storage. A land farm area would be constructed near the fuel tankage area to provide a site for treatment of petroleum contaminated soil.

Ore would be transported by haul trucks from the Caldwell Canyon pits to ore stockpiles at the East Caldwell Area adjacent to a rail loading tipple. The ore would then be sized using a crusher, loaded onto rail cars and shipped 22 miles to the Soda Springs processing plant (**Figure 10**)**.** One train per day would deliver ore to the Soda Springs processing plant, and one empty train would return to the East Caldwell Area each day. Union Pacific would deliver empty rail cars to the East Caldwell Area rail yard for ore loading, then transport loaded rail cars to the Soda Springs processing plant. Ore haulage would occur seasonally from May to November.

1.4.8 Power

A 46-kilovolt electrical power line would be constructed along Slug Creek Road linking into existing power lines at the north end of Schmid Ridge. Power to the mining area (primarily to power water pumping equipment) would be provided by Rocky Mountain Power (**Figure 11**). The new power line would be built on private property and not cross federal or state land. The power line and ancillary power facilities would be constructed within a 40-foot wide right-of-way, about 6 miles long and in accordance with Rocky Mountain Power's design and specifications. When no longer needed, transfer stations would be removed and the sites reclaimed.

Figure 8. Geosynthetic Membrane Cover Locations

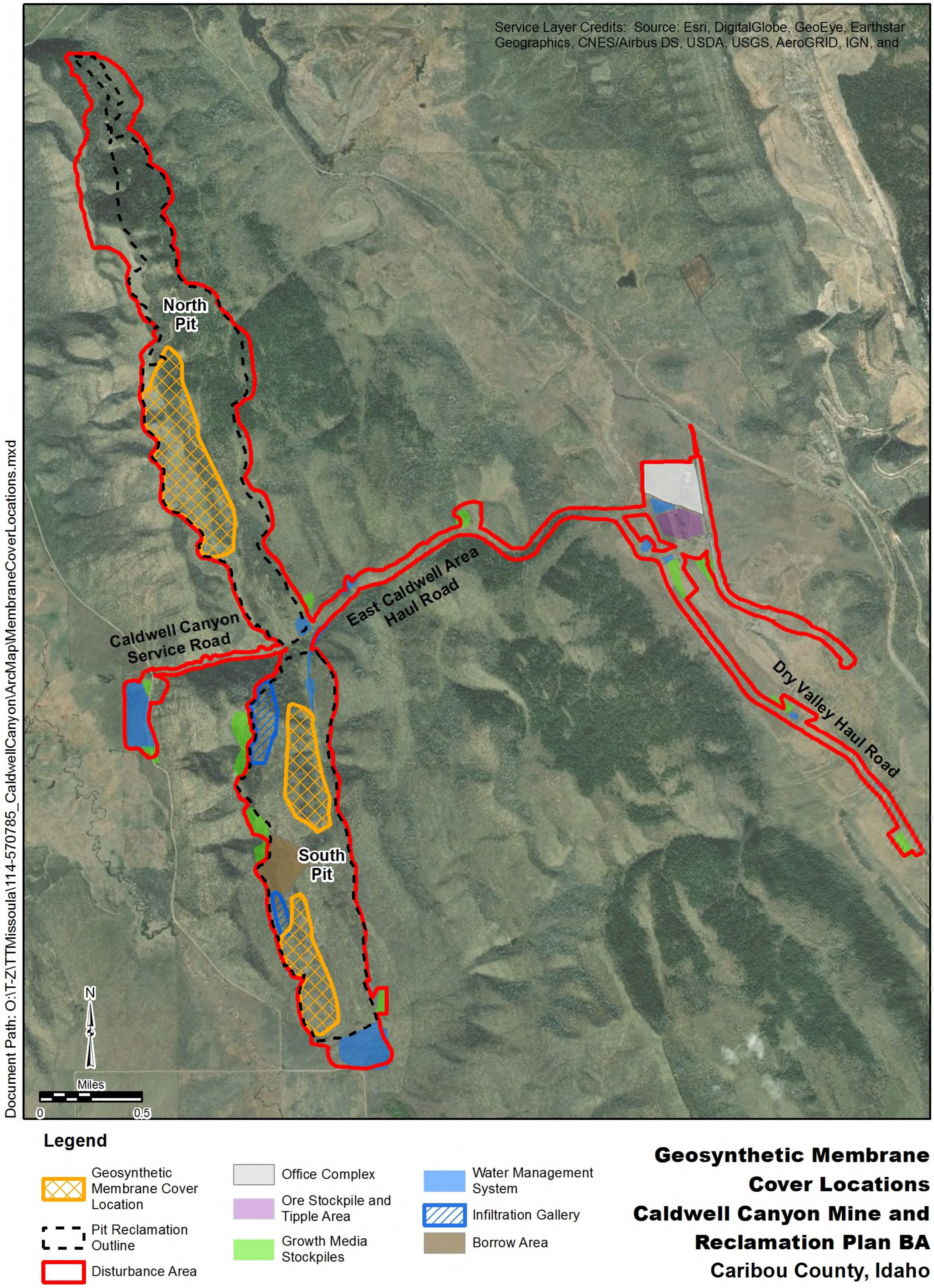


Figure 9. East Caldwell Area Mine Site Facilities

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

East Caldwell Area Mine Site Facilities
Caldwell Canyon Mine and
Reclamation Plan EIS
Caribou County, Idaho

1.4.9 Rail Loop at the Soda Springs Processing Plant

The rail spur at the East Caldwell Area and part of the Maybe Creek rail line would be upgraded and extended to accommodate a maximum of 130-car trains. New disturbance would total approximately 22 acres. A rail loop for unloading ore would be constructed at the Soda Springs processing plant. The rail loop, covering 118 acres, would be on private land and would tie into the existing Union Pacific rail line (Figure 10). The new disturbances associated with the rail line upgrades and rail loop are included in the disturbances shown in **Table 3**. Vegetation would be cleared, and rock and soil excavated. Growth media would be salvaged and temporarily stockpiled. After construction, the growth media would be placed along the fill slope face of the railbed and then seeded. The upgraded rail line and rail loop are not proposed to be reclaimed.

In addition to the EPMs and BMPs, on-site reclamation would occur concurrently with mining activities and would reduce the amount of time that wildlife habitat functionality would be absent from the Activity footprint, as described in **Section 1.4.11**. P4 Production would use concurrent reclamation, to the extent practical, over the mine life. Reclamation would revegetate all disturbed areas except for 130 acres of pit walls in the North Pit.

The BLM has reviewed the Activity against the requirements in the Pocatello Approved Resource Management Plan (ARMP) (BLM, 2012) which references the Idaho Standards for Rangeland Health (BLM, 1997) (Section 1.7 of the EIS). In addition to EPMs and BMPs, P4 Production has agreed to include the following additional measures as part of the Activity to ensure conformance.

- The Activity would include a noxious weed treatment plan that BLM would review for the effectiveness of proposed treatments on BLM-administered public lands (Action VE-2.1.4). If the treatment plan includes herbicide use, BLM will review for conformance with current policy (Action VE-2.1.5), and its effects on special status species (VR-2.1.6).
- Straw wattles and straw bales used on BLM-administered public lands and the National Forest lands would be state-certified noxious weed free (VE-2.1.11).
- Weed treatment would be in compliance with BLM PFO guidance (BLM, 2017b) and Idaho State Department of Agriculture regulations.
- Ongoing monitoring during operations would allow P4 and government agencies to assess the impacts of mining activity on protected species and its habitat.

1.4.10 Dry Valley MRP Modifications

Backfilling the reclaimed Dry Valley Mine Pit for disposal of overburden during Phase 1 of the Caldwell Canyon Mine is discussed in **Section 1.4.3.** The backfilling would require a modification to the current approved Dry Valley MRP. The Dry Valley MRP completed its ESA consultation in July 2000 with preparation of a BA and a concurrence letter from the USFWS (FWS #1-4-00-I-0053; File #1053.3101). Effects from the Activity on the Dry Valley MRP are disclosed in this BA. For ease of reference, the modifications required are listed here:

- Construct a Dry Valley Haul Road (**Figure 5**) within 12-18 months of Activity initiation, then reclaim within 2 years of completing the backfilling operations in Phase 1 (6- 6.5 years after Activity initiation). Reseed with the seed mix as described in Appendix A;
- Place backfill in Dry Valley Pit and construct cover on backfill (Figure 5Reseed with the seed mix as described in Appendix A;
- Construct, operate, and reclaim run-off containment ponds 1 and 2, sediment control pond 5, and water management pond 3 (**Figure 7**);
- Remove and reconstruct mine facilities at the East Caldwell Canyon Area (**Figure 9**); and
- Develop and subsequently reclaim growth media stockpiles (**Figure 12**).
- Environmental protection measures and best management practices from Caldwell Canyon would be included in the modified Dry Valley MRP.

Figure 10. Rail Spur

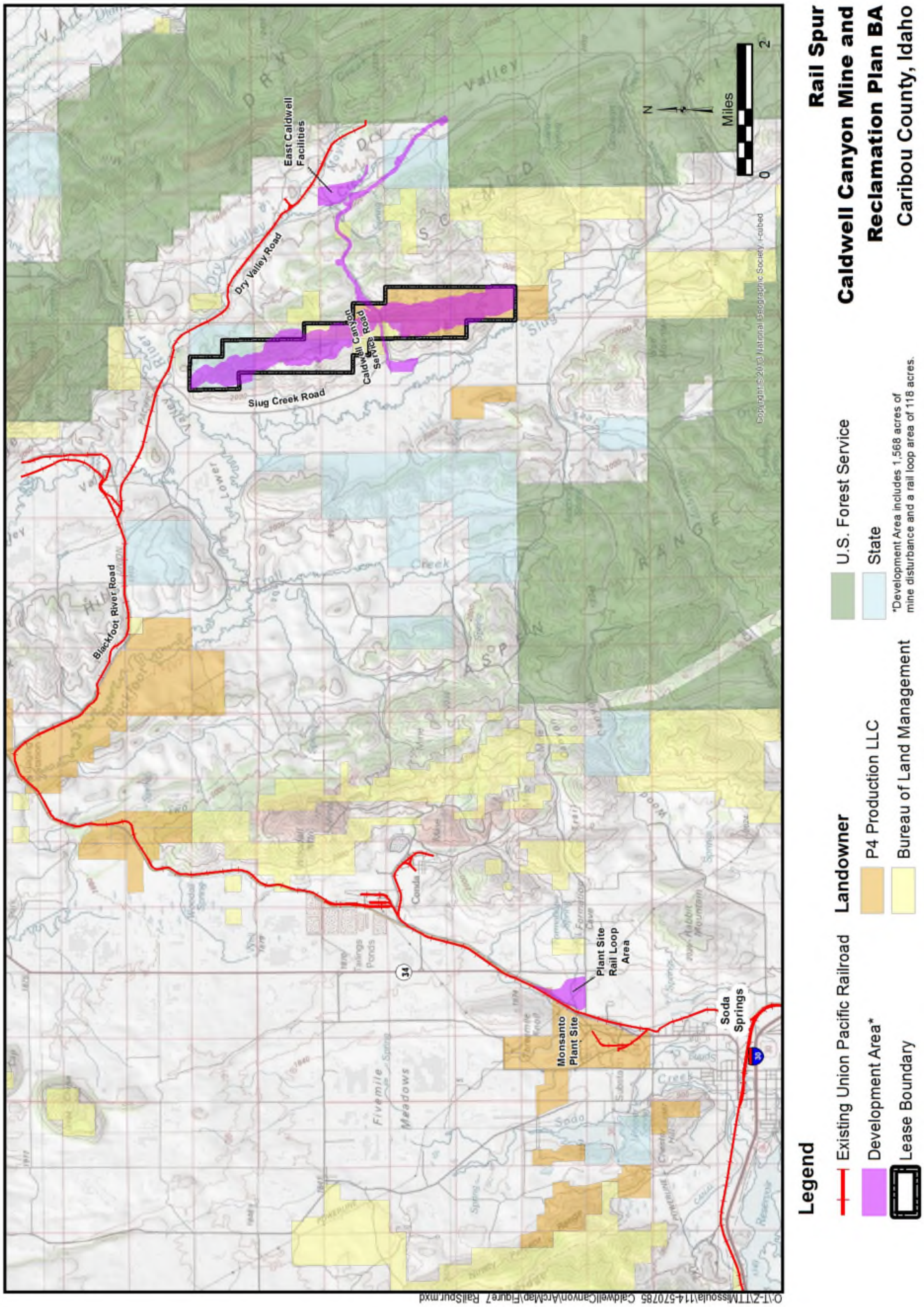
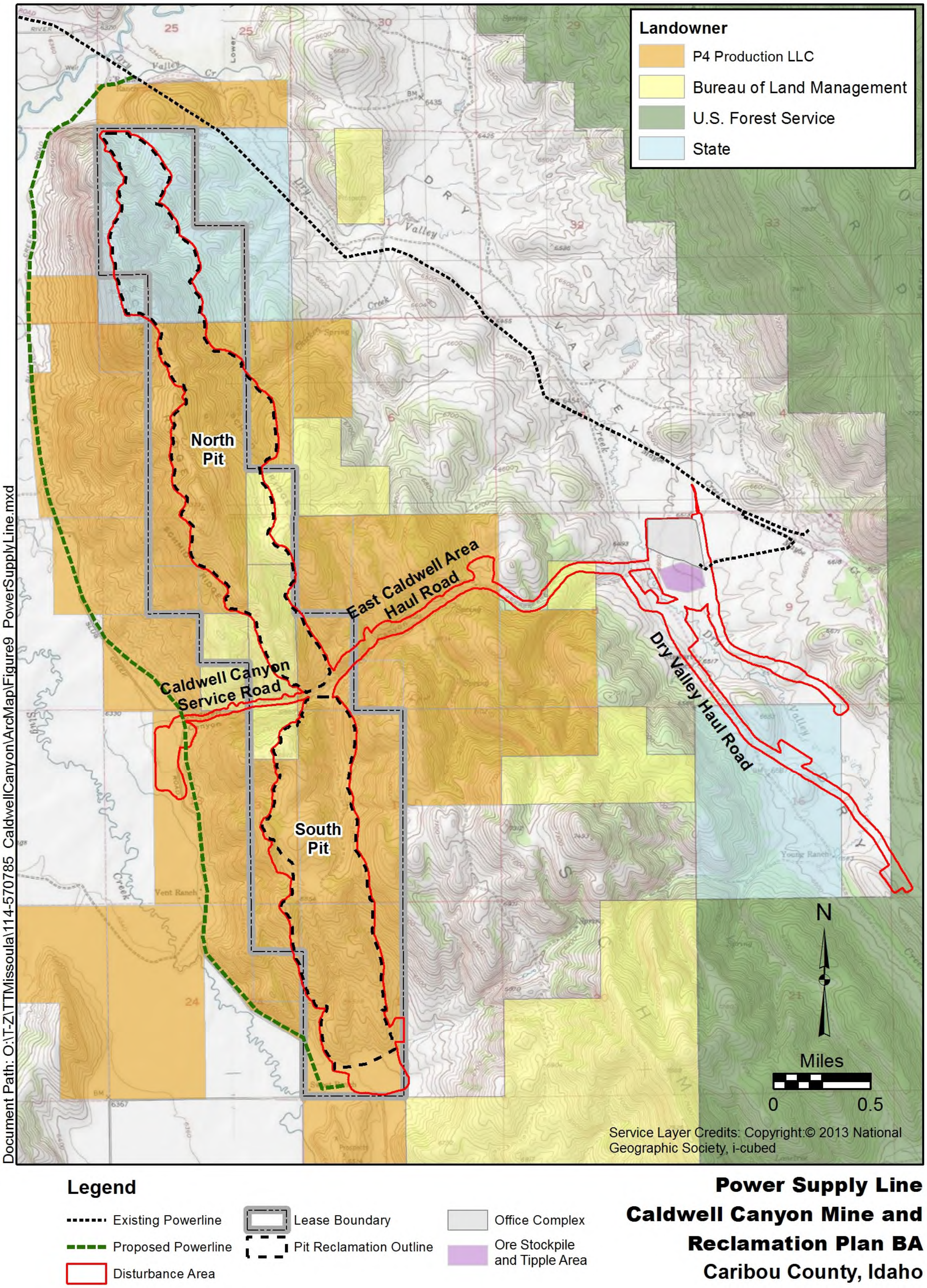


Figure 11. Power Supply Line



1.4.11 Environmental Protection Measures and Best Management Practices

The Activity includes implementation of EPMs and BMPs to ensure responsible mining operations and reduce adverse environmental impacts. Key components of the EPMs are described in the MRP (P4 Production, 2017) and BMPs are included in the POC application (P4 Production, 2016a). BMPs are summarized in Appendix B Section B.15 of the EIS. EPMs and BMPs applicable to potentially occurring ESA species include:

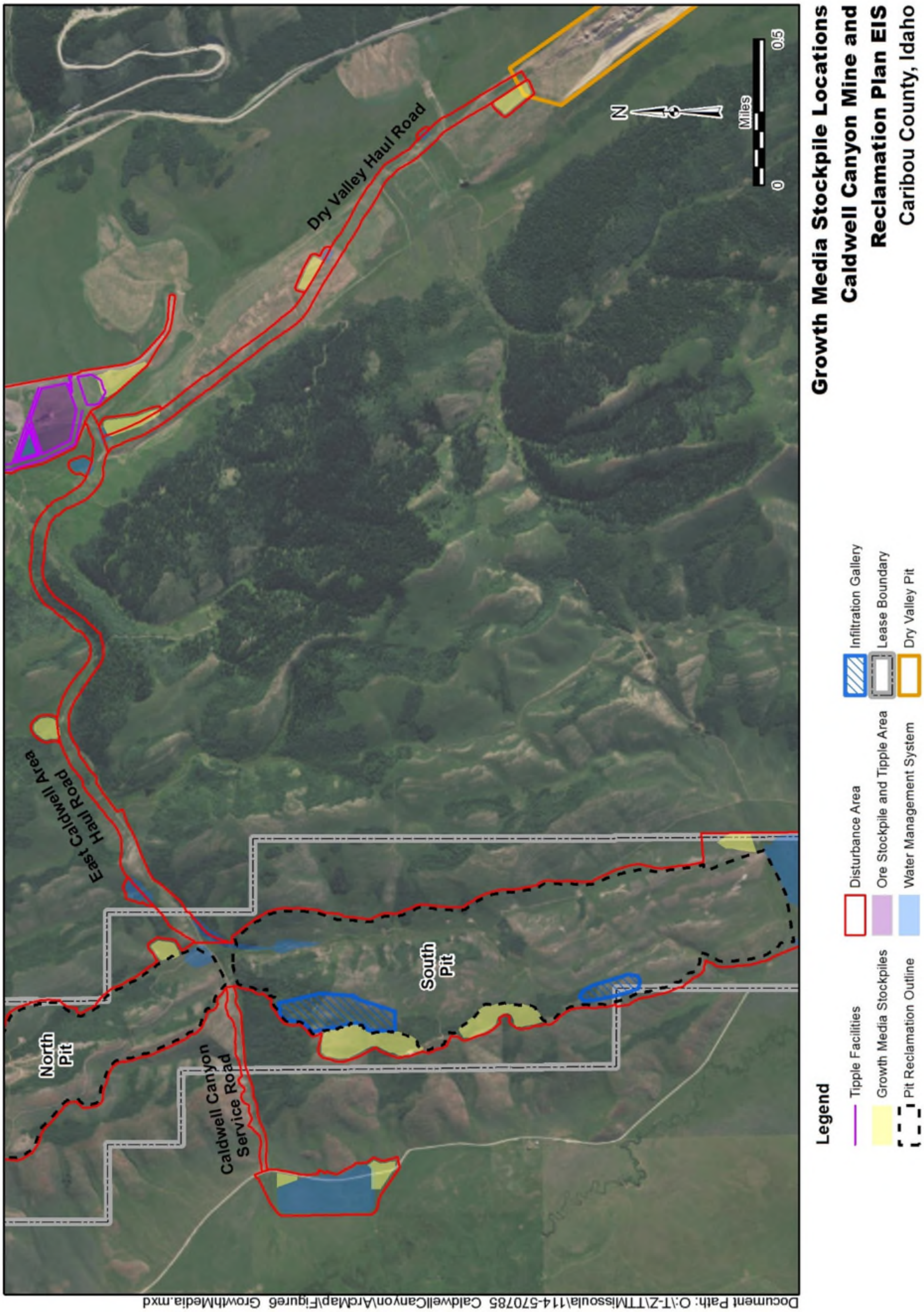
- The reclamation and closure plan focuses on re-establishment of wildlife habitat and livestock grazing once mining operations have ceased.
- P4 would fence the perimeter of the water management ponds to prevent wildlife and public access. The wildlife fence would be periodically inspected and maintained to ensure security and protect wildlife from entering the ponds.
- Water that collects in backfilled pit panels and water management ponds would be inspected daily. Idaho Department of Fish and Game (IDFG) and BLM would be contacted if wildlife use or mortality is observed to determine if mitigation is appropriate.
- Provide for development of vegetation meet post-closure land use goals of livestock grazing and wildlife habitat.
- Dust suppression would be conducted in accordance with a Dust Control Plan authorized by IDEQ.
- Hazardous materials and wastes would be stored and shipped in designated containers and in accordance with U.S. Department of Transportation regulations for hazardous materials, and as provided in IDAPA 58.01.05.007. Hazardous materials would be transported by regulated transporters primarily along State Highway 34 and Dry Valley Road from Soda Springs, Idaho to and from the mine facilities at the East Caldwell Area.
- A SWPPP would be developed to meet the requirements for authorization under a Multi-Sector General Permit under the National Pollutant Discharge Elimination System program. The SWPPP will define key components, structural BMPs, and other alternative sediment control measures such as silt fencing, straw wattles, and rock check dams, which would be employed as needed to control erosion and sedimentation from disturbed areas or recently reclaimed backfill.

1.4.12 Reclamation

Reclamation would progress along with mining. Active reclamation is expected to be completed within 2 years after mining is complete. Reclamation is designed to restore the site to beneficial post-mining multiple land uses, prevent undue or unnecessary degradation of the environment, and reclaim disturbed areas to conditions compatible with the surrounding landscape. Reclamation topography would mimic current topography but would not be identical to existing conditions. Portions of the North pit wall would not be reclaimed.

Reclamation practices would meet the objectives set by 43 CFR 3592.1 and Idaho’s Reclamation Plan Title 47, Chapter 15 – Idaho Code. The reclamation plan is intended to stabilize (protect from erosion) disturbed areas and to meet the final multiple land use goals of wildlife habitat, and grazing.

Figure 12. Growth Media Stockpile Locations



Reclamation Schedule

P4 Production would use concurrent reclamation, to the extent practical, over the mine life. **Table 4** presents the area of disturbance for proposed mine facilities by each mining phase and the anticipated reclamation schedule. The final Reclamation Plan would revegetate all disturbed areas except for 130 acres of pit walls in the North Pit.

Table 4. Reclamation Schedule and Acres Reclaimed

Phase	Mine Pits	Service and Haul Roads	Water Mgmt.	Ore Stockpile, Tipple Area	Growth Media Stockpiles	Mine Facilities East Caldwell Area	Rail Facilities East Caldwell Area	Total Acres[a]
Reclaimed Acres[b]								
Years 1-5	91	0	0	0	0	0	0	91
Years 6-10	163	0	0	0	0	0	0	163
Years 11-15	64	0	0	0	0	0	0	64
Years 16-20	141	0	0	0	0	0	0	141
Years 21-26	147	0	0	0	0	0	0	147
Years 26-31	100	0	0	0	0	0	0	100
Years 32-35	80	0	0	0	0	0	0	80
Year 36-41	187	85	64	34	22	42	22	456
Total Reclaimed								**1,242**

Source: Caldwell Canyon MRP Table 6-7. (P4 Production, 2017)

[a] Rounded to the nearest acre.

[b] Acreage does not account for 84 acres of internal buffer areas; 103 acres of buffer areas at margin of disturbance areas; or 130 acres reclaimed as pit walls in the North Pit.

During mining, soil from areas being disturbed would be salvaged and placed into stockpiles close to the disturbed areas for future placement or placed directly onto backfill and other mine-related disturbance areas that have been prepared for growth media placement. Direct placement of growth media (placement immediately following stripping) would be preferred, to the extent practical, to preserve native seed sources and existing microbial community in the growth media. The final site topography and revegetation efforts of reclaimed areas are designed to blend with the adjacent land (P4 Production, 2017).

The reclamation seed mix contain species that meet variable site characteristics of slope and aspect (Appendix A). The reclaimed habitat types would likely return as a native grassland/forb habitat type and/or an introduced grass habitat type, resulting in long-term loss of forested habitat types on the mine pits. Shrub species are also included in the seed mixes and would be potentially transplanted if seeding is unsuccessful. Shrubs are expected to establish root systems and gain height sufficient within approximately 10 years following successful establishment to be considered as reestablishing wildlife habitat. Shrubs would establish at varying percent cover over the long-term depending on site-specific conditions, ultimately resulting in big sagebrush/native grass, or mixed shrub habitat type. Aspen, Conifer, Conifer/Aspen, and Riparian/Wetland vegetation types would be permanently lost and converted to grasslands or shrubland types after reclamation. It is expected that species richness, diversity, and plant community structure would be permanently altered, particularly in the shrubland vegetation types (Big Sagebrush/Introduced Grass, Big Sagebrush/Native Grass, and Mixed Shrub), as reclamation would not return these areas to pre-mine conditions.

1.4.13 Activity Compliance

Compliance with applicable agency measures, standards, guidelines, goals, and objectives and actions from the Canada Lynx Conservation Assessment Strategy (Interagency Lynx Biology Team, 2013) and BLM Pocatello ARMP (BLM, 2012) is provided in **Table 5**.

Table 5. Compliance with Applicable Agency Measures, Standards, Guidelines, Goals, Objectives, and Actions

2013 Canada Lynx Conservation Assessment and Strategy	
Conservation Measure	**Activity**
Core Areas (chapter 5, pages 89-95)**:** Core areas are places where long-term persistence of Canada lynx and recent evidence of reproduction have been documented. Conservation measures have been developed for lynx core areas for the following resources/topics: • Delineate Lynx Analysis Units • Vegetation management • Wildland fire management • Habitat fragmentation • Recreation management • Minerals and energy development • Forest/backcountry roads and trails • Livestock grazing	The Action Area is outside of mapped Canada lynx core areas (USFWS, 2005) (Interagency Lynx Biology Team, 2013) (USFS, 2007). The closest core area is across the Wyoming state border, approximately 12 miles east of the Action Area. As such, conservation measures for core areas do not apply to the Activity and no impact would occur on the core areas.
Secondary/Peripheral Areas (chapter 5, page 95): Secondary/peripheral areas are located outside core areas and tend to be more patchy and less productive than core areas. Conservations measures have been established for vegetation management in secondary/peripheral areas and include: • Provide a mosaic of forest structure that includes dense early-successional coniferous and mixed-coniferous-deciduous stands, along with a component of mature multi-store conifer stands. Flexibility in amounts and arrangement of successional stages is acceptable if a mosaic can be sustained. • Design timber harvest, planting, and thinning to include some representation of young densely-stocked regenerating stands in the mosaic for snowshoe hare production areas.	The Action Area is outside of mapped Canada secondary/peripheral areas (USFWS, 2005) (Interagency Lynx Biology Team, 2013) (USFS, 2007). The closest secondary/peripheral area is approximately 15 miles north of the Action Area. As such, conservation measures for secondary/peripheral areas do not apply to the Activity and no impact would occur on the secondary/peripheral areas.
2012 BLM Pocatello ARMP	
Goal, Objective, or Action	**Activity**
Goal FW-2: Provide for the diversity of native and non-native species as part of an ecologically healthy system.	The Activity would be consistent with this goal because most of the disturbed areas would be reclaimed; however, species composition and habitat type structure would be different from pre-mine conditions. It is unlikely that the aspen habitat type would return following reclamation, as aspen primarily reproduces by root sprouting, and grubbing

2013 Canada Lynx Conservation Assessment and Strategy	
Conservation Measure	**Activity**
	and soil salvage on areas to be disturbed would remove the roots. The conifer/aspen habitat type would see a long-term loss. The reclamation seed mix is chosen to contain species that meet variable site characteristics of slope and aspect. The reclaimed habitat types would likely return as a native grassland/forbs habitat type and/or an introduced grass habitat type. Shrub species are included in the seed mixes and would be potentially transplanted if seeding is unsuccessful. Shrubs would establish at varying percent cover over the long-term depending on site-specific conditions, ultimately resulting in big sagebrush/native grass, or mixed shrub habitat type.
Objective FW-2.1: Maintain or improve native and desired non-native species habitat and the connectivity among habitats.	The Activity would be consistent with this objective because most of the disturbed areas would be reclaimed, as discussed for Goal FW-2 above. The Activity is not likely to significantly disrupt habitat connectivity over the long-term.
Goal SS-1: Manage special status species and their habitats to provide for their continued presence and conservation as part of an ecologically healthy system.	The Activity would be consistent with this goal because most of the disturbed areas would be reclaimed, as discussed for Goal FW-2 above. Baseline winter track and other baseline wildlife surveys (NewFields, 2017f) (NewFields, 2017d) (NewFields, 2015a) detected no evidence of Canada lynx.
Objective SS-1.1: Conserve, inventory, and monitor special status species.	Baseline winter track and other baseline wildlife surveys (NewFields, 2017f) (NewFields, 2017d) (NewFields, 2015a) detected no evidence of Canada lynx.
Action SS-1.1.1: USFWS will be consulted consistent with ESA requirements.	In addition to this BA, which is part of the consultation process, the BLM conducted scoping with USFWS through written correspondence during the draft EIS public scoping period. Additionally, the USFWS was provided the baseline survey reports and invited to review and comment on those reports.
Action SS-1.1.3: Appropriate actions, conservation measures, and guidelines that contribute to the continued presence and conservation of special status species will be considered.	Impacts to Canada lynx are anticipated to be discountable as they are very mobile species and likely to have only limited use of the Action Area, if at all. As such, EPMs specific to Canada lynx have not been necessary.
Objective SS-1.2: Maintain or improve the quality of listed species habitat by managing public land activities to support species recovery and the benefit of those species.	There would be permanent loss of approximately 569 acres of aspen and conifer/aspen habitat types. Those areas would be reclaimed, but as a different habitat type. All but 130 acres of total disturbance would be reclaimed as described for Goal FW-2 above. As such, Canada lynx recovery would not permanently affected
Action SS-1.2.1: Consistent with ESA requirements, the USFWS will be consulted regarding activities concerning listed species.	This BA is part of the consultation process with the USFWS.

2013 Canada Lynx Conservation Assessment and Strategy	
Conservation Measure	**Activity**
Action SS-1.2.2: Identified actions to maintain or improve listed species habitat will be modified through the ESA consultation process.	In addition to this BA, which is part of the consultation process, the BLM conducted scoping with USFWS through written correspondence during the draft EIS public scoping period. Additionally, the USFWS was provided the baseline survey reports and invited to review and comment on those reports.
Action SS-1.2.3: Seasonal restrictions will be implemented for listed species.	Seasonal restrictions are not planned for Canada lynx since the Action Area does not support resident Canada lynx (USFWS, 2017) and any use of the Action Area would be occasional and temporary in nature.

1.4.14 Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification or are associated with the Activity. Interdependent actions are those that have no independent utility apart from the action under consideration or because of the Activity. There are no interrelated or interdependent actions associated with the Activity.

2.0 EFFECTS ANALYSIS

2.1 CANADA LYNX

2.1.1 Status

The USFWS listed the Canada lynx as threatened in the contiguous U.S. in March 2000 (65 Federal Register [FR] 16053-16086). Designated critical habitat was most recently revised in September 2014 (79 FR 54781-54846), none is in southeast Idaho. The nearest designated critical habitat is 13 miles southeast of the Action Area at the Wyoming-Idaho border on the Bridger-Teton National Forest in Wyoming (USFWS, 2014). The only critical habitat in Idaho is approximately 45 square miles in the extreme northeast corner of Idaho (Canada–Idaho–Montana border; (IDFG, 2017)). Canada lynx is classified as a BLM Type 1 special status species because it is listed under the ESA, although it is not listed as occurring in the BLM's Pocatello field office (BLM, 2016).

2.1.2 Species Account

Canada lynx long legs and large feet make them highly adapted for hunting in deep snow, with snowshoe hares their primary prey. Without high densities of snowshoe hares, Canada lynx are unable to sustain viable populations, despite using many other prey (USFWS, 2018b). Snowshoe hare were documented during winter track baseline surveys within the Action Area and during baseline surveys for the adjacent proposed Husky 1 North Dry Ridge Mine which partially overlaps the east side of the Action Area (**Figure 4**) (NewFields, 2017d); (NewFields, 2017f); (Tetra Tech, 2014).

Canada lynx generally occur in boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth. When inactive or birthing, they occupy dens typically in hollow trees, under stumps, or in thick brush. Den sites are usually in mature or old growth with a high density of logs. Females produce one litter, averaging three to four kittens, every one to two years and the young stay with the mother until the next mating season or longer (NatureServe, 2018).

2.1.3 Distribution

Canada lynx are distributed throughout Alaska and Canada (except arctic islands), south through the Rocky Mountains, northern Great Lakes region, and northern New England (NatureServe, 2018). The reported annual home range sizes for Canada lynx in the contiguous United States ranges from 17 to 824 square miles (USFWS, 2017). The size of their home ranges varies depending on abundance of prey, gender and age, season, and the density of Canada lynx populations. The Canada lynx home range in the southern extent of their range is generally larger compared to those in the core of the range in Canada, indicating a reduction in food resources in the southern ranges (USFWS, 2018b). Canada lynx travel long distances when dispersing from natal home ranges, during exploratory movements, or during times when prey is scarce. Both adult and subadult Canada lynx are known to make long-distance movements during periods of prey scarcity, with recorded distances up to 600 miles (Ruediger, et al., 2000).

Due to the drier forest habitats supporting lower densities of hares, the Action Area is not within one of the six geographic units designated as a distinct population segment that currently or recently supported resident Canada lynx (USFWS, 2017). The closest distinct population segment is about 12 miles east of the Action Area in Wyoming. Additionally, the Action Area is not within the Northern Rockies Lynx Planning Area (BLM, 2013), is not located within designated critical habitat (USFWS, 2014), and is not in a lynx linkage zone, (USFS, 2003). Linkage zones are areas that facilitate movements of Canada lynx beyond their home range, such as dispersal, breeding season movements or exploratory movements; these linkage zones may incorporate topographic features that tend to funnel animal movements and may encompass areas of non-lynx habitat (Interagency Lynx Biology Team, 2013). A linkage zone occurs on the Caribou National Forest northeast of the Action Area and another linkage zone south of the Action Area connects the Caribou National Forest to the Cache National Forest near the town of Georgetown, Idaho (USFS, 2003).

Canada lynx are not historically abundant in the Action Area and surrounding landscape. Within 40 miles of the Action Area, a total of 12 Canada lynx observations are known from the last 70 years (**Table 6**). Most observations (10 of the 12) are from 40 years ago or more. Recent observations from 2003 and 2005 have a verification status of “possible” which is an observation from a biological professional unsure of their identification, or from an individual of uncertain background. (IDFG, 2018).

Table 6. Canada Lynx Observations within 40 miles of the Action Area

Year	Verification[1]	Distance from Action Area (mi)	County	Description[2]
2005	Possible	1.35	Caribou	Feline female with two kittens
2003	Possible	24.13	Franklin	Tracks seen in snow, no photos taken
1979	Unreviewed	14.97	Caribou	Lynx trapped
1973	Unreviewed	9.08	Bear Lake	Lynx trapped
1972	Unreviewed	15.89	Bear Lake	Lynx trapped
1970	Unreviewed	2.47	Caribou	No description
1960	Unreviewed	14.01	Bear Lake	No description
1960	Unreviewed	10.43	Bear Lake	No description
1960	Unreviewed	2.88	Caribou	No description
1960	Unreviewed	4.42	Caribou	No description
1955	Unreviewed	20.4	Bonneville	Two lynx trapped
1947	Unreviewed	3.41	Caribou	Five lynx trapped

1 Verification is determined from a set of criteria assessing the observer background, the observers confidence they correctly identified the species, and the type of data collected to assign a category as follows (IDFG, 2018): **Verified**: Verified by third party via laboratory review, photo identification and/or museum specimen. **Trusted**: Observation from a biological professional or reputable source with a biological background and/or data quality standards in place. **Possible**: Observation from a biological professional unsure of their identification, or from an individual of uncertain

background. **Unreviewed**: Verification status review process has not yet occurred for this observation. **Review**: Observation is currently in review by biological professional to assign the appropriate verification status.

2 Description is a summary of the Species_Ac attribute from the Idaho Fish and Wildlife Information System database (IDFG, 2018).

No evidence of Canada lynx was detected during winter track surveys (NewFields, 2017d) (NewFields, 2017f) nor were they detected incidentally during any other baseline wildlife surveys within the Action Area (NewFields, 2015a). There was also no Canada lynx detected during winter track surveys on the next ridge to the east for the proposed Husky 1 North Dry Ridge Mine (Tetra Tech, 2014). Forest habitat in the Action Area is likely too patchy to support Canada lynx, although suitable foraging habitat is present (BLM, 2013).

Canada lynx observations in **Table 6** generally occur to the east and south of the Action Area on the periphery of the phosphate patch, where Canada lynx linkage areas are identified. Forested habitat dominates the landscape where Canada lynx observations have occurred and where linkage areas have been identified. Past and present disturbance from mining activities in the phosphate patch has reduced habitat suitability for Canada lynx, primarily through habitat fragmentation. Forested habitat typically occurs in areas of phosphorous rich ore and those habitats have been removed during mining and will be removed during future mining activities as depicted in **Figure 4**. Past forested habitat loss, combined with ongoing activities (e.g. noise, vibration, vehicular traffic, general human presence) throughout the phosphate patch, has likely resulted in some level of area avoidance by Canada lynx. The lack of any verified observations of Canada lynx adjacent to the Action Area is likely influenced by the loss of forest habitat and avoidance of human activity associated with mining and other ongoing activities.

2.1.4 Effects of the Activity

A verified Canada lynx observation has not occurred within 40 miles of the Action Area in 40 years. In 2005 [most recent observation] a female and two kittens were observed in August approximately 1.5 miles northwest of the Action Area. The verification status of this observation indicates that it was a potential misidentification of the more common bobcat (*Lynx rufus*). If the sighting was a Canada lynx, it is indicative that breeding habitat occurs nearby. However, the lack of mature or old growth stands, with a high density of logs within the Action Area, indicates a lack of denning habitat therein. The lack of both denning habitat and verified lynx observations indicates limited use and/or avoidance of the Action Area, and the phosphate patch in general. Effects from the Activity would be limited to individual Canada lynx that may occasionally disperse or forage through the Action Area.

Habitat types would be removed in phases as development of the mine pits progresses (mine pits, road improvements, etc.) over 40 years. Concurrent reclamation would allow pits that are mined through to be backfilled, re-contoured and reclaimed, per phase, increasing growth media viability and reducing the time in which habitat would be unavailable to wildlife. Total acres of each habitat type removed and percent of total acres affected are shown by mine phase in **Table 7**. Most of the habitat within the Action Area is sagebrush/native grassland (25.1 percent), while conifer/aspen is the second most common habitat type (14.2 percent; **Table 1**). Disturbed areas would be reclaimed, and reclamation monitoring would ensure that success standards are met. Most of the mine pits would be backfilled, reclaimed and contoured to grade, except for the 130 acres of the North Pit's pit wall. Post-reclamation vegetation species composition and habitat type structure would be different from pre-mine conditions.

After reclamation efforts during each phase, a grassland/herbaceous habitat type would be expected in the short-term (e.g. approximately 1-5 years). It is expected that viable seeds and root stock of existing plant species from the salvaged soil would survive in the growth media that is concurrently placed for reclamation. Shrubs would be seeded during reclamation as well, and potentially transplanted if seeding were determined unsuccessful during monitoring. A variety of shrubs species (e.g. bitterbrush, chokecherry, golden currant, mountain big sage, snowberry, Rocky Mountain maple, buffaloberry, serviceberry, ceanothus, and Wood's rose) would be expected establish over the mid-term (e.g. 5-30 years). Shrubs would establish at varying percent cover depending on site-specific conditions, ultimately resulting in big sagebrush/mixed-shrub dominated habitat type over the long term. The conifer and conifer/aspen habitat types in the disturbance areas would experience a long-term loss. Forested habitats would begin to be removed during construction (10 acres), while the majority of the forested habitat would be removed later in the mining phases from years 20 to 42 years.

A total of approximately 569 acres of forested habitat (aspen, conifer, and conifer/aspen) would be removed by the Activity (**Table 8**). Although some level of limited conifer re-establishment would be expected to pioneer into those portions of the pit(s) with earthen cover (no geosynthetic membrane cap), those trees would be expected to have a modified growth habit, where low growing, spindly individuals, and limited stand densities would be commonplace due to modified/unsuitable growth medium and underlying geological structure. The long-term loss of forested habitat would remove the most likely habitat that dispersing Canada lynx individuals could use. However, this long-term loss accounts for approximately nine percent of the forested habitat in the Action Area (569 acres removed out of more than 6,000 acres in the Action Area) and is not expected to deter Canada lynx individuals from dispersing through the Action Area.

Table 7. Total Acres Affected by Vegetation Type

Vegetation Type	Acres in Mine Pits[1]	Acres in Other Disturbance	Vegetation Type Acres Affected
Aspen	339	10.5	349.5
Big Sagebrush/Introduced Grass	23.8	19.1	42.9
Big Sagebrush/Native Grass	123.5	1.2	124.7
Conifer	77.5	0	77.5
Conifer/Aspen	132.2	9.9	142.1
Introduced Grass	0	272.5	272.5
Mixed Shrub	479.7	15.3	495.0
Native Grass/Forbs	40.3	1.0	41.3
Riparian/Wetland[2]	7.9	3.2	11.1
Mining Disturbance – Road	0	2.5	2.5
Total	**1,223.9**	**335.2**	**1,559.1**

1 Total acres include the haul road between the North and South pits and other small disturbance areas adjacent to the southern end of the South Pit. Footprint of North and South pits alone is 1,105 acres, as is indicated in the reclamation schedule (EIS Table B-5).

2 Acres are a result of baseline mapping, which combined riparian with informally mapped wetland boundaries. Results reported below are from the formal delineation, which was completed using U.S. Army Corps of Engineers mapping methods.

Table 8. Acres of Disturbance by Habitat Type and Mine Phase

Habitat	Construction	Phase 1 (1 - 3 years)	Phase 2 (4-6 years)	Phase 3 (7-9 years)	Phase 4 (10-12 years)	Phase 5 (13-15 years)	Phase 6 (16-19 years)	Phase 7 (20-25 years)	Phase 8 (26-32 years)	Phase 9 (33-36 years)	Phase 10 (37-40 years)	Total
Aspen	11	14	2		24	27	52	58	44	44	75	349
Big Sagebrush/ Introduced Grass	19			24								43
Big Sagebrush/ Native Grass	1						52	49	20	3		125

Habitat	**Construction**	**Phase 1 (1 - 3 years)**	**Phase 2 (4-6 years)**	**Phase 3 (7-9 years)**	**Phase 4 (10-12 years)**	**Phase 5 (13-15 years)**	**Phase 6 (16-19 years)**	**Phase 7 (20-25 years)**	**Phase 8 (26-32 years)**	**Phase 9 (33-36 years)**	**Phase 10 (37-40 years)**	**Total**
Conifer and Conifer/Aspen	10							18	94	44	53	220
Introduced Grass	273											273
Mixed Shrub	15	73	97	62	76	72	20	45	10	6	20	495
Native Grasslands/ Forbs	1						11			25	5	41
Riparian/Wetland	3						6		2			11
Road	3											3
Total	335	87	98	86	100	98	141	170	169	122	153	1,559

Rounding acres by type and phase may cause slight differences in totals.

Habitat loss and modification would be expected to alter the prey base proximal to the Activity, especially over the long term. Lynx preferred prey, snowshoe hare, which were documented during baseline survey (NewFields, 2017d) (NewFields, 2017f), would experience the loss of preferred habitat (mountain shrub, conifer, and conifer/aspen habitat). In the short term, prey avoidance of a particular pit panel and its periphery would be expected. The long-term loss of forest habitats would be expected to reduce hare habitat suitability in reclaimed areas. Post-reclamation vegetative diversity and forage value and production would be reduced when compared to the pre-mine mosaic of forest and shrub habitat, thereby reducing forage quality for Canada lynx in reclaimed areas. The reduction in foraging habitat (snowshoe hare habitat) suitability in reclaimed areas is not expected to have an effect on the ability of the Action Area to support occasional Canada lynx dispersal events.

Backfill, geosynthetic membrane cap, reclamation vegetation species selection, as well as water management facilities, are expected to effectively limit bio-accumulation of selenium by vegetation and ultimately Canada lynx prey. BMPs for hazardous materials, waste transportation and storage, and fencing of water management ponds (Section 1.4.11) would eliminate the potential for Canada lynx exposure. Therefore, no effects to Canada lynx are expected from selenium exposure, hazardous materials and waste exposure, or drowning in water management ponds.

During the most active mining season from late spring through early winter, noise, vibration, and visual disturbances associated with mining would be at their height. Pit blasting and large haulage operations (truck and train) would be expected to only occur during summer months. Alternatively, during winter, regular ore haulage operations and pit development would not occur. Some level of tipple operation would occur year-round. Generally, vectors for disturbance with notable outputs include tipple facilities, ore haulage vehicles, and pit operations. Estimated noise outputs from typical mining equipment are described in the Final EIS Section 3.6.

Tipple facilities generally include sizer, maintenance building, loading tipple, vehicular pool, and generators and pumps. Ore haulage vehicles include a variety of large wheeled trucks, and the train and rail cars. Railroad use would occur twice daily, five days a week, seasonally (during summer-time operations). Locomotive engine, train-car, and rail-loop car maneuvering is expected to be one of the loudest disturbance vectors, albeit limited in duration. Conversely, haul trucks would be of a lesser peak decibel output, but a more prevalent (many trucks travelling between pit and tipple) and chronic vector. In addition to haul trucks, water management, dust abatement, and other mine traffic would also be a minor contributor to disturbance. Disturbance vectors in the pit areas include blasting operations, shovel/excavators, and water management pumps. Noise emitting features expected to be particularly impactful (largest conveyance distances, highest decibel levels, chronic/long term vectors) include the sizer, train, haul trucks and blasting operations. The crusher would be expected to run nearly year-round, or as material is stockpiled at the tipple; with the height of processing/crushing taking place during summer months. Alternatively, As material removal decreases elevation within the pit, noise conveyance distances would be expected to decrease because of topographical screening. Collectively, these disturbance vectors would likely cause Canada lynx to avoid the Activity. Canada lynx individuals that do not avoid the Activity would experience reduced habitat suitability and prey availability as described above. In addition, Canada lynx that do not avoid the Activity would be exposed to mine traffic.

Ore haulage vehicles and other mine traffic could strike a Canada lynx and result in injury or death. However, vehicles are large, relatively slow, noisy, emit light, and are expected to be easily noticed and avoided by Canada lynx. Reduced vehicular use in the Action Area during the winter period would similarly reduce the likelihood of collision-related injury or mortality. Under the Activity, roadway densities would be relatively low, with Dry Valley pit access planned for reclamation/abandonment early in the Activity schedule. Water management facilities – e.g. fenced water management ponds, head gates and culverts – would not be expected to pose a barrier to movement, as ponds would be fenced and fenced areas make up little acreage. Other water sources are nearby and include Slug Creek, Dry Valley Creek and the Blackfoot River, which provide alternative drinking water sources. Roads, railway, water management facilities, and mine features in general are not expected to yield any significant barrier to Canada lynx movement through the Action Area.

2.1.5 Cumulative Effects

The cumulative impacts analysis, as required under the ESA, includes future State or private activities, not involving Federal activities, that are reasonably certain to occur within the Action Area [50 CFR §402.02]. Actions on federal lands are addressed under each of their own separate Section 7 Consultation and collectively evaluated during the National Environmental Policy Act process, as necessary.

None of the reasonably foreseeable activities listed in **Table 2** occur within the Action Area. Local traffic (including recreational vehicles) and livestock grazing would continue in the Action Area similar to existing levels. Traffic and recreation create visual and audible disturbances and pose a collision risk to Canada lynx. Livestock grazing activities modify habitat and could have a minor effect on foraging habitat suitability in the Action Area. Continued livestock grazing and traffic and recreation activities would add cumulatively to the effects of the Activity on Canada lynx; however those effects are immeasurable.

2.1.6 Determination of Effects

The Action Area is not located within a distinct population segment that currently or recently supported resident lynx (USFWS, 2017), is not within a core area or secondary/peripheral area (USFWS, 2005) (Interagency Lynx Biology Team, 2013) (USFS, 2007), is not within the Northern Rockies Lynx Planning Area (BLM, 2013), is not located within designated critical habitat (USFWS, 2014), and is not in a Canada lynx linkage zone (USFS, 2003). Because the Action Area is outside of any areas identified for Canada lynx management and given the lack of recent verified Canada lynx observations, the phased modifications to habitat that remove Canada lynx preferred habitat and habitat for their primary prey base would be undetectable and have an insignificant effect on the species.

Even though there is a lack of recent verified observations of Canada lynx in the phosphate patch, there is potential for transient individuals to occur in the Action Area while traversing linkage zones on nearby Forest Service lands or during other dispersal events. These individuals would be exposed to habitat modification, visual and audible disturbances from mining equipment, and truck and train mine traffic within the Action Area. However, the wide-ranging nature of the Canada lynx and its capacity to avoid disturbance, in combination with expected occupancy being limited to transient individuals, the effects from the Activity on individual Canada lynx would be discountable as they are extremely unlikely to occur.

For these reasons, implementation of the Activity **may affect, but is not likely to adversely affect** the Canada lynx.

2.2 NORTH AMERICAN WOLVERINE

2.2.1 Status

The North American wolverine is currently proposed for federal listing as a threatened species under the ESA and no critical habitat rules have been published for this species (USFWS, 2018c). The North American wolverine is listed as a BLM sensitive species within the Pocatello field office (BLM, 2016).

2.2.2 Species Account

Wolverines select areas to live with cold winters that receive enough snow to maintain a deep, persistent snowpack late into the spring. These requirements restrict them to high elevations habitats in the southern portion of their range, often in large contiguous tracts of coniferous forest habitat. Female wolverines have litters of one to five kits between February and April in natal dens excavated in stable, persistent snow with coverage greater than 5 feet deep. Wolverines are opportunistic feeders, primarily scavenging carrion, but will also prey on small animals and birds and eat fruits, berries, and insects (USFWS, 2018c).

2.2.3 Distribution

The current range for wolverines in the contiguous U.S. including northern and central Idaho, western Montana, western Wyoming, north-central Washington, and northeast Oregon, with some recent records from California and Colorado (IDFG, 2014). In general, wolverines have large home ranges, ranging from 38.5 to 348 square miles, depending on availability of food, gender, age, and differences in habitat (USFWS, 2018c). The availability and distribution of food is likely the primary factor in determining wolverine movements and home range size (75 FR 78030-78061). Wolverine home ranges in Idaho have been shown to vary from 148 up to 588 square miles (78 FR 7861-7890; 94,720 to 376,319 acres). Wolverines are known to travel long distances during dispersal events. A recent study showed a subadult male disperse from northwest Wyoming to northern Colorado and then to North Dakota, covering a straight-line distance of over 800 miles (Packila, et al., 2017).

In Idaho, wolverine habitat is limited to high elevations, typically 6,888 feet to 8,528 feet, with natal den sites occurring above 8,200 feet, (75 FR 78030-78061, 78 FR 7861-7890), often in large contiguous tracts of coniferous forest habitat (Copeland, et al., 2007) (Copeland, 1996). A study in central Idaho found that wolverines prefer elevations above 7,200 feet (Copeland, et al., 2007). In Idaho, wolverine summer habitat is primarily associated with high-elevation whitebark pine communities with steep slopes and course talus substrate (IDFG, 2014). Wolverines also use talus slopes for denning locations (75 FR 78030-78061). Although elevations within the Action Area overlap those of known use by wolverines, particularly at the upper portions of Schmidt Ridge, use is unlikely or very limited because no whitebark pine communities were identified within the Action Area. Moreover, the Action Area does not sustain sufficient snowpack for denning (BLM, 2013) and the elevation is below the typical threshold of 8,200 feet, typically used for denning. Furthermore, the Action Area is dominated by sagebrush/mountain shrub/native grassland cover types (25.1 percent) and co-dominated by conifer/aspen cover types (14.2 percent); indicating discontinuous forested cover.

In Idaho, there are numerous verified observations of wolverines throughout northern and central Idaho, however they are more sparsely documented through eastern Idaho (IDFG, 2014). Within 40 miles of the Action Area, 12 wolverine observations have occurred in the last 50 years, with 8 of the 12 having a verification status of trusted or verified (**Table 9**). Wolverines were not detected during winter track surveys specifically nor were they detected incidentally during any other baseline wildlife surveys (NewFields, 2017d) (NewFields, 2017f) (NewFields, 2017d). There was also no wolverine detected during baseline surveys at the neighboring proposed Husky 1 North Dry Ridge Mine (Tetra Tech, 2014).

Table 9. North American Wolverine Observations within 40 miles of the Action Area

Year	Verification[1]	Miles from Action Area	County	Description[2]
2014	Possible	26.0	Bear Lake	Ran across the road ahead of vehicle within the range of headlights
2012	Possible	8.0	Caribou	Observed on private property in Enoch Valley area
2008	Trusted	6.5	Caribou	Hair sample and photos of tracks; wolverine specialists confirmed tracks are wolverine
2006	Trusted	23.3	Bonneville	Ran across road in willows along a creek
2003	Possible	36.2	Bingham	East of Blackfoot, viewed from 50 feet
2001	Possible	13.0	Caribou	Wolverine eating carrion along roadside
2001	Trusted	17.6	Bonneville	No description
1993	Trusted	39.2	Franklin	Sighting and tracks
1992	Trusted	28.0	Bear Lake	No description
1992	Trusted	28.0	Bear Lake	Crossed road and was viewable crossing a creek and climbing a hill
1977	Verified	24.4	Bannock	Watched through binoculars for five minutes
1969	Trusted	33.0	Bonneville	Observed by IDFG during aerial survey

1 Verification is determined from a set of criteria assessing the observer background, the observers confidence they correctly identified the species, and the type of data collected to assign a category as follows (IDFG, 2018): **Verified**: Verified by third party via laboratory review, photo identification and/or museum specimen. **Trusted**: Observation from a biological professional or reputable source with a biological background and/or data quality standards in place. **Possible**: Observation from a biological professional unsure of their identification, or from an individual of uncertain background. **Unreviewed**: Verification status review process has not yet occurred for this observation. **Review**: Observation is currently in review by biological professional to assign the appropriate verification status.

2 Description is a summary of the Species_Ac attribute from the Idaho Fish and Wildlife Information System database (IDFG, 2018).

Predicted habitat generally corresponds with national forest lands adjacent to the Action Area (IDFG, 2014). South of the Action Area on the periphery of the phosphate patch, where forest habitat dominates the landscape, there is an identified dispersal corridor (high dispersal likelihood) running through western Wyoming into southeast Idaho and south into Utah (IDFG, 2014). In addition, areas to the east and northeast of the Action Area on the periphery of the phosphate patch are identified as predicted low use dispersal corridors (IDFG, 2014). These forested corridors are where numerous wolverine observations of trusted or verified status have been documented, both historical and recent.

Historical and recent disturbance in the phosphate patch has reduced habitat suitability for wolverine, primarily through habitat fragmentation. This reduced habitat suitability is reflected in the absence of predicted dispersal corridors through the phosphate patch. Forest habitat typically occurs in areas of phosphorous rich ore and those habitats have been removed during mining and will be removed during future mining activities as depicted in **Figure 4**. Past forested habitat loss, combined with ongoing activities (e.g. noise, vibration, vehicular traffic, general human presence) throughout the phosphate patch, has likely resulted in some level of area avoidance by wolverine..

2.2.4 Effects of the Activity

The effects on existing habitat, a description of the habitat expected to be restored following reclamation and mine closure, the effects of visual and audible disturbances associated with mining equipment, and potential for injury or mortality from collision with mining equipment are discussed under Canada lynx, Section 2.1.4. These effects are expected to be similar for wolverine.

The lack of both denning habitat (conifer forest and talus habitat at elevations above 8,200 ft with persistent snowpack) and wolverine observations in the Action Area indicates unlikely use of the Action Area. Effects of the Activity would be limited to individual wolverines that may occasionally disperse or forage through the Action Area. The limited use of the Action Area by wolverine that is expected, would likely occur during the winter when the mine is less active. During other times of year, when conditions exist for optimal mine activity, noise and vibration associated with mining would be expected to deter both mobile prey and wolverine individuals and reduce the likelihood of wolverine using the Action Area. During winter, regular ore haulage (truck and train) and pit development would not occur, due to soil moisture conditions. However, some level of tipple operation (noise and light disturbance) would occur year-round. Reduced vehicular use (train/truck haulage, and daily transportation) in the Action Area during the winter would have a low likelihood of resulting in collision related mortality for wolverine.

2.2.5 Cumulative Effects

Cumulative effects on wolverine would be the same as discussed for Canada lynx.

2.2.6 Determination of Effects

Wolverine breeding habitat was not identified within the Action Area due to the lack of sustained and sufficient snowpack (BLM, 2013) and its elevation being below the typical 8,200-foot elevation of natal den sites in Idaho. Effects are therefore expected to be limited to transient individuals, if present, and will not affect breeding pairs or remove denning habitat. For these reasons, implementation of the Activity **will not jeopardize the continued existence** of the wolverine.

However, if wolverine becomes listed prior to mine closure, a provisional effects determination is provided here. The Activity could disrupt movement through the Action Area because of habitat loss and modification, noise, human activity, and unlikely collisions with mining equipment. However, due to the wide-ranging nature of the wolverine capable of avoiding mining activities and use of the Action Area being limited to transient individuals, these effects would be discountable. For these reasons, implementation of the Activity **may affect, but is not likely to adversely affect** the wolverine.

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Appendix A Complete Reclamation Seed Mix

Table A-1. Species for Use in Reclamation Seed Mixes

					Seed Mix Lists and Preference^5		
Group & Common Name *(Scientific Name)*	**PLS seeds/lb^1**	**GRSG Habitat^2**	**Grass Root Form^3**	**Upland Adaptation^4**	**Primary**	**Channel and Stabilization**	**Wetland/ Wet Meadow**
Cover/Nurse Crop							
Quickguard *(Triticum aestivum x Secale cereale)*	13,000				cover	cover	
Graminoids							
Alpine timothy *(Phleum alpinum)*	1,000,000		BG	C	3	2	2
American mannagrass *(Glyceria grandis)*	1,280,000		Rhiz				2
Baltic rush *(Juncus arcticus ssp. Littoralis)*	10,900,000		Rhiz				1
Basin wildrye *(Leymus cinereus)*	130,000	X	BG		1	2	
Beardless bluebunch wheatgrass *(Pseudoroegneria spicata ssp inermus)*	117,000	X	BG		1		
Big bluegrass *(Poa secunda ssp ampla)*	882,000	X	BG		3		
Bluebunch wheatgrass *(Pseudoregneria spicata)*	140,000	X	BG	W	2		
Bluejoint reedgrass *(Calamagrostis canadensis)*	2,270,000		Rhiz				1
Broadleaf cattail *(Typha latifolia)*	10,000,000		Rhiz				2
Canby bluegrass *(Poa secunda ssp. canbyi)*	926,000		BG		3		
Common spikerush *(Eleocharis palustris)*	620,000		Rhiz				2
Fowl mannagrass *(Glyceria striata)*	180,000		Rhiz				2
Hardstem bulrush *(Schoenoplectus acutus)*	377,000		Rhiz				1
Idaho fescue *(Festuca idahoensis)*	450,000	X	BG	C	1		
Intermediate wheatgrass *(Thinopyrum Intermedium)*	88,000		Rhiz		1	1	
Kentucky bluegrass *(Poa pratensis)*	2,177,000		Rhiz			1	
Mountain brome *(Bromus marginatus)*	64,000		BG		1		
Orchardgrass *(Dactylis glomerata)*	427,200		Rhiz		1	2	

					Seed Mix Lists and Preference[5]		
Group & Common Name *(Scientific Name)*	**PLS seeds/lb[1]**	**GRSG Habitat[2]**	**Grass Root Form[3]**	**Upland Adaptation[4]**	**Primary**	**Channel and Stabilization**	**Wetland/ Wet Meadow**
Pubescent wheatgrass *(Thinopyrum intermedium ssp barbulatum)*	100,000		Rhiz		3	1	
Sandberg bluegrass *(Poa secunda)*	1,047,000		BG	W	2		
Sheep fescue *(Festuca ovina)*	680,000	X	BG		2		
Tall fescue *(Festuca arundinacea)*	227,000		Rhiz	W	2		
Timothy *(Phleum Pratense)*	1,300,000		BG	C	2	2	2
Tufted hairgrass *(Deschampsia cespitosa)*	1,500,000		BG				1
Western wheatgrass *(Pascopyrum smithii)*	110,000		Rhiz			2	2
Forbs							
Arrowleaf balsamroot *(Balsamorhiza sagittata)*	55,000				2		
Aspen fleabane *(Erigeron speciosus)*	1,600,000				2		
Blanket flower *(Gaillardia aristata)*	132,000	X			1		
Common woolly sunflower *(Eriophyllum lanatum)*	810,000				2		
Common yarrow *(Achillea millefolium)*	2,770,000	X		W	2		
Fernleaf Biscuitroot *(Lomatium dissectum)*	45,000	X			2		
Hoary tansyaster *(Machaeranthera canescens)*	1,300,000	X		W	2		
Lewis flax *(Linum lewisii)*	170,000				2		
Littleflower penstemon *(Penstemon procerus)*	900,000			W	1		
Mule-ears *(Wyethia amplexicaulis)*	28,000				3		
Northern sweetvetch *(Hedysarum boreale)*	46,000	X		W	1		
Parsnipflower buckwheat *(Eriogonum heracleoides)*	135,700	X		W	1		
Purple coneflower *(Echinacea purpurea)*	117,000				3		

					Seed Mix Lists and Preference[5]		
Group & Common Name *(Scientific Name)*	**PLS seeds/lb[1]**	**GRSG Habitat[2]**	**Grass Root Form[3]**	**Upland Adaptation[4]**	**Primary**	**Channel and Stabilization**	**Wetland/ Wet Meadow**
Red clover *(Trifolium pratense)*	275,000	X			1		
Rocky Mountain beeplant *(Cleome serrulata)*	65,900				2	1	
Rocky Mountain iris *(Iris missouriensis)*	21,000				3		
Rocky Mountain penstemon *(Penstemon strictus)*	592,000				1		
Sainfoin *(Onobrychis viciifolia)*	30,000				2		
Scarlet gilia *(Ipomopsis aggregata)*	357,000				2		
Scarlet globemallow *(Sphaeralcea coccinea)*	500,000	X			3		
Sticky purple geranium *(Geranium viscosissimum)*	52,000			C	1	2	
Strawberry clover *(Trifolium fragiferum)*	300,000	X				1	1
Sulphur-flower buckwheat *(Eriogonum umbellatum)*	209,000	X		W	2		
Tapertip hawksbeard *(Crepis acuminata)*	165,000	X		W	1		
Western coneflower *(Rudbeckia occidentalis)*	345,000			C	2		
Western sweetroot *(Osmorhiza occidentalis)*	29,800			C	2		
Western yarrow *(Achillea millefolium var. occidentalis)*	2,770,000	X		W	1		
White clover *(Trifolium repens)*	850,000	X				1	1
White sagebrush *(Artemisia ludoviciana)*	4,500,000	X			2		
Woolypod milkvetch *(Astragalus purshii)*	120,000	X		W	2		
Yellow evening primrose *(Oenothera flava)*	700,000				2		
Sub-Shrubs							
Creeping barberry *(Mahonia repens)*	54,000				3	2	

					Seed Mix Lists and Preference[5]		
Group & Common Name *(Scientific Name)*	PLS seeds/lb[1]	GRSG Habitat[2]	Grass Root Form[3]	Upland Adaptation[4]	Primary	Channel and Stabilization	Wetland/ Wet Meadow
Prairie sagewort *(Artemisia frigida)*	4,536,000	X			2		
Shrubs							
Antelope bitterbrush *(Purshia tridentata)*	15,000	X		W	1		
Chokecherry *(Prunus virginiana)*	4,800			C	3	2	2
Golden currant *(Ribes aureum)*	356,200			C	2		
Mountain big sagebrush *(Artemisia tridentata vaseyana)*	2,500,000	X			1	2	
Mountain snowberry *(Symphoricarpos oreophilus)*	54,700	X		C	1	2	
Rocky Mountain maple *(Acer glabrum)*	13,400			C	3		
Rubber rabbitbrush *(Ericameria nauseosa)*	400,000	X			2	2	
Russet buffaloberry *(Shepherdia Canadensis)*	59,215				3		
Saskatoon serviceberry *(Amelanchier alnifolia)*	25,800			C	3		2
Snowbrush ceanothus *(Ceanothus velutinus)*	124,275			C	3		
Woods' rose *(Rosa woodsii)*	45,300				3		
Yellow rabbitbrush *(Chrysothamnus viscidiflorus)*	782,000	X		W	1		

Source: Caldwell Canyon MRP Table 6-4 (P4 Production, 2017)

1 Seeds per pound (lb) of pure live seed (PLS).

2 Species providing beneficial forage or cover (forbs, shrubs, or subshrubs) or cover only (bunchgrasses) for greater sage-grouse (GRSG).

3 Grass root forms include rhizomatous grasses (rhiz.) or bunchgrasses (bg).

4 Adaptation for relatively warm / dry (W) or cool / moist (C) sites likely to occur in areas receiving the Primary Seed Mix.

5 Lower numbers indicate preference for inclusion in a mix during initial reclamation, where available. Higher numbers (lower preference) use is discretionary considering site conditions, availability, and historical success. Species without a preference noted would not be included in a mix. Mixes would be developed as discussed in the MRP.