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

Gibellini Vanadium Mine Project

Final Supplemental Environmental Report 1
Proposed Action and Project Alternatives

DOI-BLM-NVB0100
NVN 096259

Preparing Office
Battle Mountain District Office
50 Bastian Road
Battle Mountain, NV 89820

November 2021

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Executive Summary

Proposed Action

The Gibellini Vanadium Mine Project (Project) is a proposed vanadium mine project located along the eastern slope of the Fish Creek Mountains in Eureka County, Nevada, which would be developed and operated by the Nevada Vanadium Company (NVV). The Project would include the construction and operation of an open pit mine that would produce approximately 24 million tons of ore material containing 66,000 tons of vanadium and 168 tons of uranium over the mine life. Approximately 2 million tons of waste rock material would be mined during the life of the Project. The total mine life would consist of 1.5 years of construction, 7 years of operation, 4 years of active reclamation and closure, and up to 30 years of post-closure monitoring. NVV's proposed open pit mine would include the following new mine components:

- The open pit;
- Rock disposal area (RDA);
- Mine office and facilities;
- Crushing facilities and stockpile;
- Heap leach pad (HLP);
- Process facility;
- Various process and make-up water ponds;
- Borrow areas;
- Mine and access roads;
- Water and power supply lines; and
- Ancillary facilities.

The Project area consists of 6,456 acres of public land administered by the Bureau of Land Management (BLM) Battle Mountain District, Mount Lewis Field Office. BLM-administered land in the Project area is managed under the Shoshone-Eureka Resource Management Plan. Project-related activities would result in approximately 806 acres of surface disturbance on BLM-administered land. A total of 760 acres of disturbance would occur in the Project area boundary, consisting of mining infrastructure, communication, water pipelines, power lines, and roads. An additional 46 acres of disturbance would occur from exploration. Most of the surface disturbance would be reclaimed at the end of mine life. Surface disturbance associated with the pit (85 acres) would be permanent because it would not be reclaimed.

South Access Road Alternative

The South Access Road Alternative would consist of the same components as noted for the Proposed Action except the access road alignment would be to the south adjacent to the main power line that would be connected to the Pan Mine 69-kilovolt power line. This alternative would result in approximately 38 additional acres of surface disturbance compared to the Proposed Action. Total surface disturbance for the South Access Road Alternative would be 844 acres of public land.

Renewable Energy Alternative

The Renewable Energy Alternative would consist of the same overall activities as described for the Proposed Action except this alternative would include supporting the mine operations with a combination of renewable energy and a utility interconnection with future large-scale battery storage. This alternative would include the installation of enough solar electric photovoltaic capacity so the site would become a net generation facility with battery storage to perform peak smoothing and daily load management as well as providing a sustainable long-term power source servicing the remote electrical needs of southern Eureka County and Northern Nye County.

This alternative would result in approximately 33 additional acres of permanent surface disturbance compared to the Proposed Action because the solar facility would not be reclaimed at the end of the Project. Total surface disturbance for the Renewable Energy Alternative would include 839 acres of public land.

No Action Alternative

The development of new facilities that compose the Proposed Action would not be constructed under the No Action Alternative. Under this alternative, NVV would not engage in any of the proposed mining operations, but would be permitted to continue any previously authorized actions.

Alternatives Considered but Eliminated from Detailed Analysis

The alternatives considered but eliminated from detailed analysis include the Powerline Route Alternative, Original Pit Design Alternative, Heap Leach Pad Design Alternative, Heap Leach Pad Liner Design Alternative, Groundwater Pumping Stations Alternative, Northern Rock Disposal Area Design Alternative, Heap Leach Pad Cover Design Alternative, Open Pit Backfill Alternative, Water Treatment/Closure Options Alternative, and Heap Leach Draindown and Rinsing Options Alternative.

ACRONYMS AND ABBREVIATIONS

AMV	ammonium meta vanadate
ANFO	ammonium nitrate and fuel oil
ARMPA	Approved Resource Management Plan Amendment
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
AVC	American Vanadium Corporation
AWRMP	Adaptive Waste Rock Management Plan
BLM	Bureau of Land Management
BMP	best management practice
BMRR	Bureau of Mining Regulation and Reclamation
CCS	Conservation Credit System
CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
E-cell	evaporation cell
EIS	environmental impact statement
EPM	Environmental Protection Measure
ET	evapotranspiration
FLPMA	Federal Land Policy and Management Act
gpm	gallon per minute
HDPE	high-density polyethylene
HLP	heap leach pad
ILS	Intermediate Leach Solution
kV	kilovolt
mph	miles per hour
MSHA	Mine Safety and Health Administration
MW	megawatt

NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
NRS	Nevada Revised Statutes
NVV	Nevada Vanadium Company
PAG	Potentially Acid-Generating
PCS	petroleum-contaminated soil
PLS	Pregnant Leach Solution
Project	Gibellini Vanadium Mine Project
PSE	Process Solution Evaporation
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
RDA	rock disposal area
RMP	Resource Management Plan
SDU	sodium diuranate
SEC	Sagebrush Ecosystem Council
SER	Supplemental Environmental Report
SETT	Sagebrush Ecosystem Technical Team
SHWMP	Solid and Hazardous Waste Management Plan
SRB	sulfate-reducing bioreactor
SX	solvent extraction
V2O5	vanadium pentoxide
WOUS	waters of the U.S.

1.0 INTRODUCTION

This Supplemental Environmental Report (SER) was prepared in accordance with the National Environmental Policy Act (NEPA), 40 Code of Federal Regulations (CFR) Parts 1500–1508, 85 *Federal Register* 1684, and Nevada Instruction Memorandum 2020-022. The pre-planning and SER process integrates NEPA into early planning, emphasizes agency collaboration, and identifies significant environmental issues early in the planning process. It further represents a systematic, interdisciplinary approach to determine environmental impacts and recommends a course of action to resolve resource conflicts early. Moreover, the SER process embraces the future of NEPA pre-planning procedures by embracing proposed NEPA regulation Section 1501.9: Scoping which encourages pre-scoping to ensure efficient NEPA proceedings, and the guidance found in Nevada Instruction Memorandum 2020-022, which calls for a host of pre-planning activities that include: reviewing applications for completeness, developing a draft purpose and need, screening and identifying preliminary Project actions and their alternatives, identifying and drafting of the affected environment, identifying potential environmental impacts, identifying and collecting data and addressing resource concerns. In accordance with 40 CFR 1501.7 the final alternatives, scope of analysis, and issues to be addressed in the environmental impact statement (EIS) would be further informed by the results of the public scoping process.

This SER is intended to support Nevada Instruction Memorandum 2020-022 by integrating the Applicant-committed Environmental Protection Measures (EPMs) (Section 1.6) developed in the enhanced environmental baseline studies into the proposed vanadium mining activities with proposed operating, reclamation, and closure techniques to be used to avoid or minimize potential resource conflicts and fully comply with federal and state laws.

Nevada Vanadium Company's (NVV) Gibellini Vanadium Mine Project (Project) is a proposed vanadium mine project located along the eastern slope of the Fish Creek Mountains in Eureka County, Nevada (**Figure 1**). NVV proposes to construct and operate an open pit mining operation to mine approximately 24 million tons of ore material and recover 66,000 tons of vanadium and 168 tons for uranium over the mine life. The Project area has been prospected for vanadium and manganese since the 1940s when Union Carbide explored the area for vanadium to support United States steel production. Since then, vanadium has been recognized as a Critical Mineral due to its strategic importance in steel manufacturing, aerospace applications and grid scale energy storage. As there is currently no primary domestic production of vanadium, the U.S. is dependent on unreliable foreign sources of vanadium that create a strategic vulnerability for both its economy and military to adverse government action or other events that can disrupt the supply of this key mineral. The Project would produce nearly 10 million pounds of vanadium annually, which represents approximately 50 percent of the U.S. demand, making this Project a significant domestic contributor to satisfy this demand.

A Plan of Operations and Nevada Reclamation Permit Application was submitted to the Bureau of Land Management (BLM), Mount Lewis Field Office, and the Nevada Division of Environmental Protection (NDEP) Bureau of Mining Regulation and Reclamation (BMRR) on June 28, 2019, by NVV for the Project. A Plan of Operations Completeness Determination was issued by BLM on March 16, 2020. The Plan of Operations was submitted in accordance with BLM Surface Management Regulations 43 CFR 3809, as amended, and Nevada reclamation regulations at Nevada Administrative Code (NAC) 519A. This document is intended to support Secretarial Order 3355 by integrating the EPMs (Section 1.6 below) developed in the Enhanced Environmental Baseline Studies into the proposed vanadium mining activities with proposed operating, reclamation and closure techniques to be used to avoid and/or minimize potential resource conflicts and fully comply with federal and state laws. Revisions to the Plan of Operations were submitted to address comments provided by the BLM, NDEP, Nevada Department of Wildlife (NDOW), Eureka County, and the Nevada Sagebrush Ecosystem Technical Team (SETT) and incorporates updates to the mineral processing and closure strategies.

The Project is in the southern extent of the Fish Creek Range, entirely on federal land administered by the BLM, pursuant to unpatented mining claims in Eureka County, Nevada (Project area). The Project area includes 6,456 acres of BLM-administered land approximately 27 miles southeast of Eureka, Nevada (**Figure 1**). The Project area is accessed by traveling from Eureka approximately 10 miles south on U.S. Highway 50, turning south on County Road M-103 (Duckwater Road) for approximately 8 miles, and then turning southwest on Fish Creek Ranch Road for approximately 7 miles. The Project area is within the Mount Diablo Baseline and Meridian in Eureka County, Nevada, as described in **Table 1**.

Table 1. Project Area Legal Description

Township	Range	Section
15 North	52 East	1–3, 10–12, 15
15 North	53 East	6, 7
16 North	52 East	25, 26, 34–36
16 North	53 East	15, 20, 22, 25–27, 29–35

The total Project life consists of 1.5 years of construction, 7 years of operations, 4 years of active reclamation and closure, and up to 30 years of post-closure monitoring. Project-related activities would result in approximately 806 acres of surface disturbance on BLM-administered land. The Project area covers includes a total of 6,456 acres of BLM-administered land (**Figure 2**).

The BLM is serving as the lead agency for preparing the EIS in compliance with NEPA, the Council on Environmental Quality NEPA implementing regulations (40 CFR 1500–1508); the BLM's NEPA Handbook (H-1790-1); *Guidelines for Assessing and Documenting Cumulative Impacts* (BLM 1994); the Council on Environmental Quality's Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (CEQ 2005); Nevada State Office Instruction Memorandum NV-2010-014, Nevada BLM Rock Characterization and Water Resources Analysis Guidance for Mining Activities (January 2010); Nevada BLM State Office Instruction Memorandum NV-2008-032, Nevada BLM Water Resource Data and Analysis Policy for Mining Activities (April 2008); and other applicable guidance. NDOW, NDEP, Nevada SETT, Eureka County, U.S. Fish and Wildlife Service, and U.S. Environmental Protection Agency are serving as cooperating agencies for preparation and review of the EIS, as outlined in the Memorandum of Understanding.

Federal law encourages the development of federal mineral resources and requires reclamation of disturbed federal land, consistent with the Federal Land Policy and Management Act (FLPMA) and the Mining and Mineral Policy Act of 1970. Under these mining laws, the statutory right exists, guided by U.S. Department of the Interior regulations, to use federal land for the purpose of mineral prospecting, exploration, development, extraction, and other associated reasonable uses. The Department of the Interior regulations state that, "this statutory right carries with it the responsibility to assure that operations include adequate and responsible measures to prevent unnecessary or undue degradation of the federal land and to provide for reasonable reclamation" (43 CFR 3809.0-6). The 43 CFR 3809 surface management regulations were modified on October 31, 2001, and the definition of "unnecessary or undue degradation" at § 3809.5 was linked to the general and specific performance standards listed in § 3809.420. These performance standards establish sideboards for determining whether a proposed Plan of Operations complies with the unnecessary or undue degradation standard.

Figure 1. Project Location

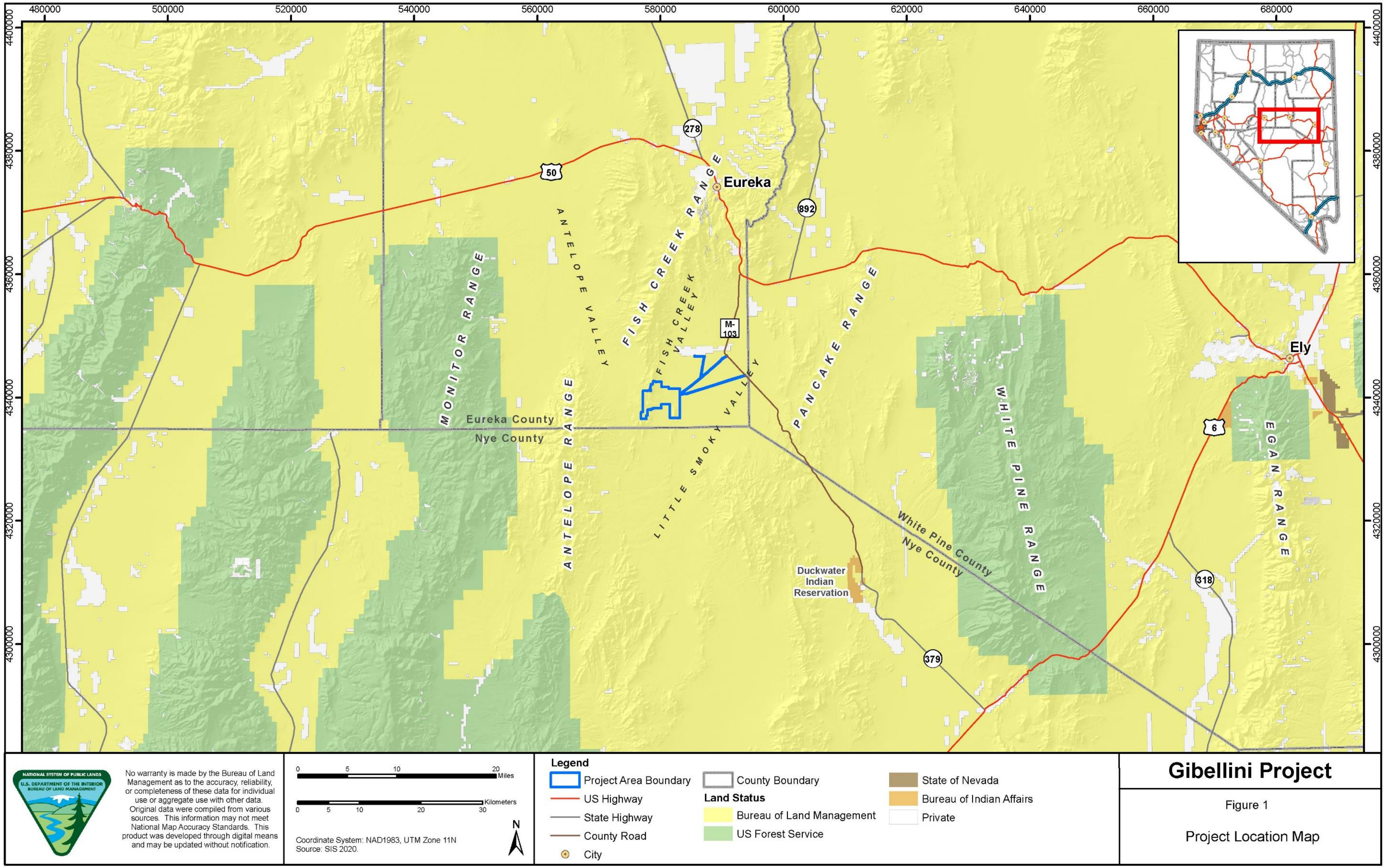
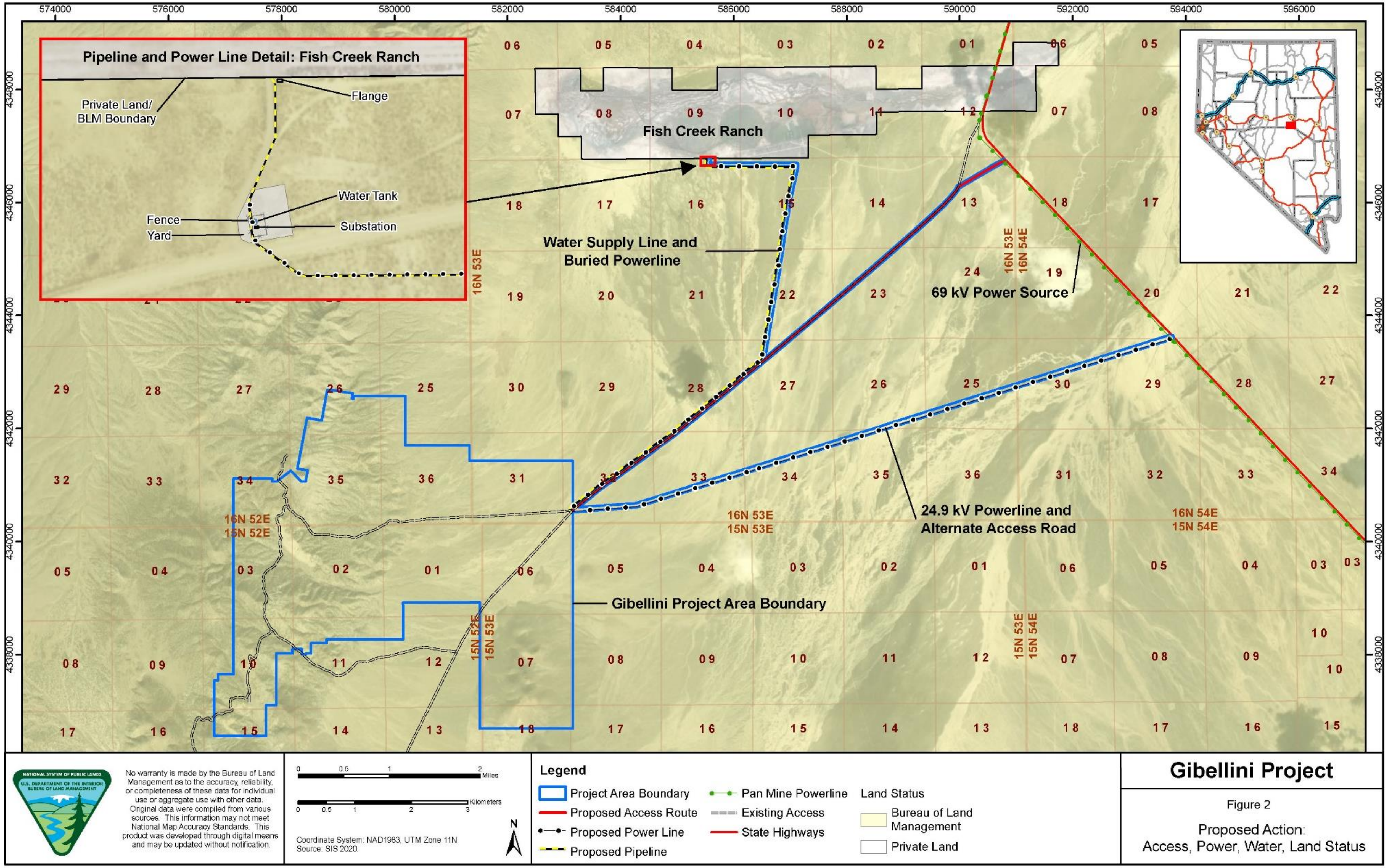


Figure 2. Proposed Action



Nevada reclamation laws govern private and public land in the State of Nevada based on the requirements set forth in Nevada Revised Statutes (NRS) 519A.100 et seq. These laws define reclamation as actions that would: " . . . shape, stabilize, revegetate or otherwise treat the land in order to return it to a safe, stable condition consistent with the establishment of a productive post-mining use of the land and the safe abandonment of a facility in a manner which ensures the public safety, as well as the encouragement of techniques which minimize the adverse visual effects."

1.1 History of the Project Area

The Project is within the Fish Creek Mining District, in the Fish Creek Range in the southeastern portion of Eureka County. The first claims in the district were located in the late 1800s by James Butler and Angelo Belli (Roberts et al. 1967). By the late 1800s and into the early 1900s, workings consisted of at least one adit and raise, a number of shafts, inclines, and winzes. Earliest production records from the U.S. Bureau of Mines Minerals yearbooks are from 1938 and 1955 showing gold, silver, and lead production values.

The claims associated with the Gibellini Mine were first located in 1942 by L.P. Gibellini of Eureka. The workings consisted of a shaft 37 feet deep, an adit 176 feet long, several shallow pits, and some trenches. The average grade of ore in the workings was about 9.5 percent manganese, 2.8 percent zinc, and 1.22 percent nickel (Roberts et al. 1967).

Exploration activities on the Gibellini property have included mapping, trenching, geochemical sampling from the 1940s to current time and include the following.

<u>Pre-1981 Activities</u>

- The Nevada Bureau of Mines drilled four drill holes at the Gibellini manganese-nickel mine in 1946. They also collected channel samples from the underground workings and assayed them for manganese, zinc, and nickel. Underground development was also conducted at the Gibellini Manganese-Nickel Mine.
- The Hogle Brothers continued developing the mine during the 1950s.
- Vanadium deposits in black shale south of the Gibellini Mine were explored by Union Carbide in 1958 to 1959. Union Carbide reportedly drilled up to 60 shallow rotary holes in 1956 at the Rich Hill (Bisoni) deposit.
- Devonian Age vanadium deposits in black shale were explored by the Siskon Company in 1960 to 1961. An open cut was made by bulldozers and churn drill holes were put down (Roberts et al. 1967).
- In 1964 and 1965, Terteling drilled 33 rotary drill holes totaling 5,695 feet.
- In 1969, Atlas drilled 77 rotary drill holes totaling 15,685 feet.
- A total of 52 drill holes totaling 10,556 feet were completed by Noranda at the Vanadium Hill (Gibellini) deposit from 1972 to 1973 to provide assay data for a vanadium resource estimate and to provide material for metallurgical testing. Noranda drilled a series of holes at the Rich Hill deposit, but the location and data for these holes are unknown. From 1972 through 1975, Noranda had the Colorado School of Mines Research Institute, Noranda Research Centre, and Hazen Research conducted metallurgical test work on surface and drill hole composite samples (Condon 1975). Recovery ranged from 65 percent to 98 percent with an average recovery of 74 percent vanadium pentoxide (V_2O_5) products.

Post-1981 and Pre-1990 Activities

- A total of 11 drill holes totaling 2,538 feet were completed in 1989 by Inter-Globe throughout the Vanadium Hill deposit to confirm grades reported by Noranda, Atlas, and Terteling, and to provide material for metallurgical testing. In August 1989, Inter-Globe mapped and sampled nine bulldozed trenches and seven backhoed pits throughout the Vanadium Hill deposit. The purpose of the program was to evaluate the near surface oxide mineralization. A total of 173, 5-foot horizontal and vertical channel samples were collected and assayed for vanadium.

Post-1990 Activities

- American Vanadium Corporation (AVC) acquired the claims in the Project area in March 2006. During 2006, AVC expanded the land position, mapped the surface geology, collected surface and underground geochemical samples, and conducted preliminary metallurgical test work under Notice NVN-08142. In 2007 and 2008, AVC conducted reverse-circulation and core drilling at Gibellini Hill, Rich Hill, and the historic Gibellini manganese-nickel mine, metallurgical test work, and a preliminary economic analysis on the Gibellini Hill deposit. All the notice level disturbance from AVC has been reclaimed and released except for 2 acres that have been added to the total Project surface disturbance.
- Prophecy Development Corporation acquired the claims in the Project area in 2017 and has consolidated the land position, collected surface geochemical samples, and developed a mining and production plan that is presented in the Plan of Operations.

Metallurgical Activities

- Extensive metallurgical research was carried out by the Colorado School of Mines Research Institute, Noranda Research Centre, and Hazen Research from 1972 to 1975 on various aspects of metallurgical test work on Gibellini mineralization (Condon 1975). AVC undertook test work from 2008–2011 at McClelland Laboratories.
- The Gibellini metallurgical test work spans material obtained by Noranda, to composites sample of core that was accumulated from earlier exploration core drilling, to confirmatory core drilling programs to trench samples leached at coarse sizes, to finally pilot programs where trench samples were taken across the deposit to make a composite of transition and oxide material that has a deposit-type break down of material (approximately 50 percent oxide/50 percent transition) from numerous trenches.
- The sample testing varied from bottle roll tests, to small diameter columns (approximately six to eight times the diameter to mineralized material size ratio) to large-diameter pilot columns. These columns used either single pass solution leaching or continuous solution recycling with batch wise or semi-continuous solvent extraction (SX) recovery of vanadium.
- Metallurgical test work and associated analytical procedures were performed by recognized testing facilities, and the tests performed were appropriate to the mineralization type and processing requirements.
- No processing factors were identified from the completed metallurgical test work that would have a significant effect on extraction.

1.2 Purpose and Need for Action

The purpose of the federal action is to respond to NVV's proposal to extract vanadium on 6,456 acres of BLM-administered land in Eureka County, Nevada, where it holds unpatented mining claims. The need for the federal action is established by the BLM's responsibilities under the FLPMA to respond to an applicant's request for approval of a Plan of Operations for applicants to exercise their rights under the General Mining Law of 1872. Additional aspects of the need of the federal action include the following:

1. to further the "Minerals" objective of the applicable BLM resource management plan, which is to "provide opportunity for exploration and development of locatable minerals, such as gold, silver, copper, lead, molybdenum, etc., consistent with the preservation of fragile and unique resources in areas identified as open to the operations of the mining laws;" and
2. "to provide for mining and reclamation of the Project area in a manner that is environmentally responsible and in compliance with federal mining laws, including preventing unnecessary and undue degradation of public lands, FLPMA, State of Nevada laws and regulations applicable to mine reclamation, and other applicable laws and regulations."

The BLM is responsible for administering mineral rights access on certain federal land as authorized by the General Mining Law of 1872. Under the law, qualified prospectors are entitled to reasonable access to mineral deposits on public land. In order to use public land managed by the BLM for locatable mineral exploration and development, persons must comply with FLPMA and the BLM's Surface Management Regulations, State of Nevada laws and regulations applicable to mine reclamation, and other applicable statutes and regulations.

1.3 Decision to Be Made

The BLM's Mount Lewis Field Office Manager would decide whether to approve the Project as described within the Plan of Operations as submitted (Proposed Action), approve a modified version of the plan (action alternatives), or reject the plan (No Action Alternative). This decision would be made through consideration of the results of an EIS analysis conducted under NEPA and other applicable federal, state, or local requirements.

1.4 Applicant's Objective

The Applicant's objective is to construct and operate an open pit mining operation to mine approximately 24 million tons of ore material and 2 million tons of waste rock over the 7-year life of the Project, and recover 66,000 tons of vanadium, and 168 tons of uranium on approximately 806 acres of surface disturbance within a 6,456-acre Project area on BLM-administered land.

1.5 Land Use Plan Conformance

1.5.1 Shoshone-Eureka Resource Management Plan

The Proposed Action and Alternatives are consistent with the BLM's Shoshone-Eureka Resource Management Plan (RMP), as amended, dated March 1986 (BLM 1986a, 1986b, 1987). The RMP guides land management activities in the Project area ecosystems. The RMP provides for protecting fragile and unique resources while not overly restricting the potential for the production of commodities from other resources. The RMP identifies eight management issues, and for each of the issues, outlines the objectives, short-term and long-term management actions, Standard Operating Procedures, and implementation measures. The primary RMP objectives that would apply to the Proposed Action are shown in **Table 2**.

Table 2. Primary Resource Management Plan Objectives for the Shoshone-Eureka Resource Area

RMP Management Issue	RMP Objectives
Wildlife Habitat Management	• Maintain and improve wildlife habitat while providing for other appropriate resource uses. • Provide habitat sufficient to allow big game populations to achieve reasonable numbers in the long term. • Improve and maintain habitat for state-listed sensitive species and federally listed threatened and endangered species.
Wild Horse Use	• Manage viable herds of sound, healthy, wild horses in a wild and free-roaming state. • Initially manage wild horse populations at existing numbers based on 1982 aerial counts and determine if this level of use can be maintained. • Manage wild horses within the areas that constituted their habitat when the Wild and Free-roaming Horse and Burro Act became law in 1971.
Livestock Grazing	• Initially manage livestock at existing levels and determine if such use can be maintained. • Establish a grazing management program designed to provide key forage plants with adequate rest from grazing during critical growth periods. • Achieve, through management of the livestock and wild horses, utilization levels consistent with those recommended by the 1981 Nevada Range Studies Task Group to allow more plants to complete growth cycles and to increase storage of reserves for future growth. • Increase vegetation production while protecting sensitive resources.
Woodland Products	• Manage suitable woodlands for optimum production of woodland products on a sustained-yield basis, while protecting sensitive resources. • Maintain, where necessary for management, those access routes currently servicing pinyon-juniper harvest areas. • Set aside certain historical pinyon-juniper woodland areas for non-commercial pine nut gathering by Nevada Native Americans and all other members of the public.
Riparian and Aquatic Habitat Management	• Improve priority riparian and stream habitat to "good" or "better" condition and prevent the decline of remaining areas. • Improve and maintain habitat for state-listed sensitive species and federally listed threatened and endangered species.
Watershed	• Reduce and prevent, to the extent possible, erosion throughout the resource area. • Identify and protect areas which are susceptible to erosion. • Maintain and/or improve present water quality and yield throughout the resource area.

1.5.2 Eureka County Natural Resource and Land Use Plan

The Eureka County 1973 Master Plan, updated in 2000 and again in 2010, contains planning elements with goals and objectives to provide a long-term plan for the physical development of Eureka County and to provide mechanisms to address immediate growth management issues (Eureka County 2010). The Eureka County Master Plan 2010 includes a Natural Resources and Federal or State Land Use Element, which is an executable policy for natural resource management and land use on federal- and state-administered land in Eureka County (Eureka County 2010). The Natural Resource and Land Use Plan was expanded in response to the passing of Nevada Senate Bill 40. Senate Bill 40 is intended to give Nevada localities an opportunity to address federal land use management issues directly. This bill requires that "A Plan or statement of policy must be approved by the governing bodies of the county and cities affected by it, and by the governor before it is put into effect."

The Eureka County Natural Resource and Land Use Plan identifies goals, objectives, monitoring and evaluation for a number of high-priority primary resources. The primary resources that are applicable to the Proposed Action are summarized in **Table 3**.

Table 3. Applicable Goals for the Eureka County Natural Resource and Land Use Plan

Primary Resource	Goal
Soil, Vegetation, and Watersheds	To maintain or improve the soil, vegetation and watershed resources in a manner that perpetuates and sustains a diversity of uses while fully supporting the custom, culture, economic stability and viability of Eureka County and its individual citizens.
Forage and Livestock Grazing	Provide for landscape vegetation maintenance and improvement that will: 1) support restoration of suspended Animal Unit Months (AUMs); 2) support allocation of continuously available temporary non-renewable use as active preference; 3) support allocation of forage produced in excess of the original adjudicated amounts where greater amounts of forage are demonstrated to be present; 4) restore livestock numbers of individual ranches to at least the full levels at the time of grazing allotment adjudications; and 5) restore wildlife populations to those peak levels of the mid-1990s.
Water Quality, Riparian Areas, and Aquatic Habitats	Meet the requirements for water quality contained in the NAC Section 445, to the extent they can be met while complying with constitutional and statutory law as to vested water rights, maintain or improve riparian areas and aquatic habitat that represents a range of variability for functioning condition.
Wildlife and Wildlife Habitat	Maintain, improve or mitigate wildlife impacts to habitat in order to sustain viable and harvestable populations of big game and upland game species as well as wetland/riparian habitat for waterfowl, furbearers and a diversity of other game and nongame species.
Woodland Resources	Maintain or improve aspen and conifer tree health, vegetation diversity, wildlife and watershed values through active management of sites with the ecological potential for aspen, pinyon, or juniper woodlands and initiate thinning, removal, or other management measures.

1.5.3 Nevada and Northeastern California Sage-Grouse Approved Resource Management Plan Amendment

The Proposed Action is consistent with the Nevada and Northeastern California sage-grouse Approved Resource Management Plan Amendment (ARMPA), approved in 2015 (BLM 2015). The BLM prepared the ARMPA to identify and incorporate appropriate measures in existing land use plans. It is intended to conserve, enhance, and restore sage-grouse habitat by avoiding minimizing, or compensating for unavoidable impacts on sage-grouse habitat in the context of the BLM's multiple use and sustained yield mission under FLPMA (BLM 2015). The ARMPA identifies 12 program areas within which specific goals, objectives, and management actions for sage-grouse and its habitat are identified to protect and preserve sage-grouse and its habitat on BLM-administered land in Nevada. The ARMPA goals and objectives that would apply to the Proposed Action are shown in **Table 4**.

Table 4. Applicable Goals and Objectives from the ARMPA

Program Area	Goals and Objectives
Special Status Species	• Conserve, enhance, and restore the sagebrush ecosystem upon which sage-grouse populations depend in an effort to maintain and/or increase their abundance and distribution, in cooperation with other conservation partners. • Manage land resource uses to meet sage-grouse habitat objectives. • Maintain or improve connectivity between, to, and in Priority Habitat Management Areas (PHMAs) and General Habitat Management Areas (GHMAs) to promote movement and genetic diversity for sage-grouse population persistence and expansion. • Identify and implement sage-grouse conservation actions that can augment, enhance, or integrate program conservation measures established in agency and state land use and policy plans, to the extent consistent with applicable law.
Vegetation	• On public land, establish, maintain, and enhance a resistant and resilient sagebrush vegetative community and restore sagebrush vegetation communities to restore sage-grouse habitat. • Manage PHMAs and GHMAs for vegetation composition and structure, consistent with ecological site potential and to achieve sage-grouse habitat objectives. • Control invasive species infestations in sage-grouse habitat already compromised by invasion. • Manage riparian areas in PHMAs and GHMAs for vegetation composition and structure, consistent with ecological site potential and to achieve sage-grouse habitat objectives. • Manage upland habitat associated with riparian areas to promote cover relative to site potential to facilitate brood-rearing habitat. • Where riparian function has been compromised or lost, manage to restore riparian function and meet sage-grouse habitat objectives. • Use the landscape approach and promote landscape-scale, ecosystem-based actions to enhance resiliency and sustainability of PHMAs and GHMAs to climate stress. • In PHMAs and GHMAs, manage risks of sage-grouse habitat degradation or loss from landscape stressors of drought, invasive species, and wildfire exacerbated by climate change to maintain existing sage-grouse populations and habitats.
Fire and Fuels Management	• Sage-grouse habitat will be prioritized commensurate with property values and other critical or sensitive habitats to be protected, with the goal to restore, enhance, and maintain areas suitable for sage-grouse.

1.5.4 Greater Sage Grouse Goals and Objectives

The state of Nevada, under the advisement of the Sagebrush Ecosystem Council (SEC), began development of a state endorsed habitat exchange program. This program was developed by a scientific arm of the SEC called the SETT. The SETT began in 2015 to develop and adopt a habitat exchange program called the Conservation Credit System (CCS) in hopes of influencing the 2015 U.S. Fish and Wildlife Service listing decision for Greater sage-grouse. The CCS is a habitat exchange program specifically designed to address a net conservation gain for Greater sage-grouse habitat in Nevada. In 2016, the CCS was opened for enrollment.

On December 7, 2018, Governor Sandoval issued Executive Order 2018-32, which required the SEC to adopt regulations requiring compliance with the Nevada Sage-grouse Conservation Plan and the Nevada CCS for the conservation of the Greater sage-grouse and its habitat using compensatory mitigation for anthropogenic disturbances on state and federal land that cannot be avoided or further minimized as determined through the CCS. The order serves as direction to state agencies to work with their federal counterparts and Nevada stakeholders to implement mitigation strategies in accordance with the Nevada CCS. Subsequently, the SEC adopted permanent regulations requiring mitigation for impacts to Greater sage-grouse habitat on all public land that are the result of certain anthropogenic disturbances. The State's mitigation regulation was codified in NAC 232.400–232.480, which requires mitigation for disturbances to Greater sage-grouse habitat on public lands and requires the use of the CCS to fulfill those mitigation requirements. As stated in NRS 232.162, there is a mandate to "establish a program to mitigate damage to sagebrush ecosystems in this State by authorizing a system that awards credits to persons, federal and state agencies, local governments and nonprofit organizations to protect, enhance or restore sagebrush ecosystems." Additionally, NAC 232.00 through 232.480 requires mitigation of anthropogenic disturbances to sage grouse in Nevada.

The BLM has determined that FLPMA does not explicitly mandate or authorize the BLM to require public land users to implement compensatory mitigation as a condition of obtaining authorization for the use of BLM-administered land (IM 2019-018, Compensatory Mitigation, December 6, 2018). Consistent with that determination, compensatory mitigation must be voluntary unless required by other applicable laws, but the BLM recognizes that state authorities may also require compensatory mitigation.

1.5.5 Project Permits and Approvals

In addition to approval of the EIS, implementing the Proposed Action would require authorizing actions from other federal, state, and local agencies with jurisdiction over certain aspects of the Proposed Action. **Table 5** lists the required permits or approvals that would be obtained from the responsible regulatory agencies. NVV would be responsible for amending existing permits, and applying for and acquiring additional permits, as needed.

Table 5. Required Permits and Regulatory Authorizations

Permits and Authorizations	Regulatory Agency
Plan of Operations/Record of Decision	Bureau of Land Management
Explosives Permit	U.S. Department of the Treasury, Bureau of Alcohol, Tobacco, and Firearms
Surface Disturbance Permit and Class II Air Quality Operating Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Air Quality
Water Pollution Control Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Mining Reclamation Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Industrial Artificial Pond Permit	Nevada Department of Wildlife
Class III Waiver Landfill Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Solid Waste
General Discharge Permit (Stormwater)	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Water Pollution Control
Hazardous Materials Storage Permit	State of Nevada, Fire Marshall Division
Hazardous Waste Identification Number	United States Environmental Protection Agency
Septic Treatment Permit Sewage Disposal System Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Water Pollution Control
Potable Water System Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Safe Drinking Water

Permits and Authorizations	Regulatory Agency
Radioactive Materials License	Nevada Department of Health and Human Services, Nevada State Health Division, Radiological Health Section
Conservation Credit System Certification of Mitigation	Nevada Department of Conservation and Natural Resources, Division of State Lands, Sagebrush Ecosystem Council
Dam Safety Permit	State of Nevada Division of Water Resources
Local Permits	
County Road Use and Maintenance License and Agreement	Eureka County Public Works and Natural Resources Departments

1.5.6 Uranium Permitting Requirements

In September 2018, the Prophecy Development Corporation (parent company to NVV) developed a letter, which was sent to the U.S. Nuclear Regulatory Commission (NRC) informing them that "yellowcake" (i.e., uranium) would be produced during vanadium processing operations associated with the Project. The NRC confirmed that ore would not produce byproduct material because the ore would not be processed primarily for its source material content. The Project would produce vanadium as the primary product, and the sale of the extracted source material would be secondary by a significant margin. Therefore, byproduct material as defined by 42 U.S.C. 2014, would not be produced.

In addition, the NRC determined the uranium removal tank, drumming operation, and intermediate and associated equipment at the process plant would contain source material concentrations of uranium as defined in Section 2014(z) of Title 42. The portion of the process plant that would contain source material concentrations of uranium would include the uranium removal tank, drumming operation, and intermediate and associated equipment. The uranium concentration would exceed 0.05 percent by weight in the uranium removal tank and subsequent filter press and drumming operation.

Source material would be subject to NRC licensing under 10 CFR Part 40, "Domestic Licensing of Source Material." The NRC confirmed the uranium circuit that would be used for the Project would recover approximately 25 tons of such licensable source material per year. The NRC also confirmed that during the vanadium extraction process NVV would remove and concentrate uranium at a level above the 0.05 percent exemption threshold in 10 CFR 40.13(a), which would mean that a specific license to possess this material must be obtained from the NRC or an Agreement State. The NRC mentioned the processing plant would not be a uranium mill as defined in 10 CFR 40.4 and 10 CFR 40 Appendix A would not apply. The State of Nevada is an Agreement State and would regulate the type and quantity of material to be generated by the Project. Therefore, the State of Nevada, specifically the Nevada Department of Health and Human Services, Nevada State Health Division, Radiological Health Section, would be the appropriate licensing authority for the Project under the provisions of NAC 459. A Radioactive Materials License would be issued that contains requirements to monitor human health and the environment, minimize contamination of the facility and the environment, minimize the generation of radioactive waste, facilitate decommissioning to limit site and subsurface residual radioactivity, and prepare the property for unrestricted use to protect the public and not harm the environment.

Engineering or process controls would be used to control airborne radionuclide concentrations. The majority of operations would be "wet" and unlikely to generate airborne particulates. Water sprays and other dust control measures would be used as necessary including keeping materials wet to the extent possible, effective local ventilation and air pollution control equipment, and good housekeeping practices.

Radiation surveys and monitoring would be conducted in operational areas of the facility. Air sampling, including radon measurements, would include personal monitoring, area monitors, and monitoring at the site boundary. Respiratory protection would be required as needed.

Routine surveys for contamination would be conducted in the restricted area and in areas frequented by personnel working in the restricted area. Personnel would be monitored for external radiation dose and for the potential for intakes of radioactive material as applicable. Personnel, equipment, and vehicles existing the restricted area would be surveyed for contamination to prevent the spread of contamination.

1.5.7 Organization of the Supplemental Environmental Reports

A series of SERs have been prepared that describe the Proposed Action and Alternatives, including the existing environment affected by the Proposed Action and Alternatives, potential direct, indirect, and cumulative effects of the Proposed Action and Alternatives, and Applicant-committed EPMs that NVV would implement to avoid or reduce effects. The SERs for the Project are organized into 18 individual reports as described below.

This SER (SER-1) describes the Proposed Action, the purpose and need of the Proposed Action, land use plan conformance, the environmental review process, and permits and approvals that would be required. Also included is a description of the Proposed Action, identifying the location, types of activities that would occur, the duration and intensity of those activities, and practices and commitments to reduce potential effects to the environment. For additional detail, the reader is referred to NVV's Plan of Operations for supplemental information pertaining to the proposed activities.

SERs 2 to 18 describe effects of the Proposed Action to various human and environmental resources as identified in **Table 6**. These SERs summarize the following:

- Regulatory framework associated with the resource;
- The existing natural and human environment resources within the study area for each resource;
- The potential direct and indirect impacts;
- The cumulative impacts from the implementation of the Proposed Action and Alternative in combination with impacts contributed by other past, present, and reasonably foreseeable future actions; and
- Determination of significance of effects on the resource as a result of the Proposed Action.

Table 6. Supplemental Environmental Report Topics

Supplemental Environmental Report	Topics
SER 1 – Proposed Action and Project Alternatives	Introduction and location, the purpose and need, regulatory process, land use conformance, environmental review process, and required permits and approvals. Description of Proposed Action and Alternatives, with emphasis on location, the duration and intensity of activities, and practices and commitments to reduce potential effects to the environment.
SER 2 – Air Quality	Direct, indirect, and cumulative effects on air resources.

Supplemental Environmental Report	Topics
SER 3 – Cultural Resources	Direct, indirect, and cumulative effects on cultural resources, including the identification and protection of historical and cultural resources, including burial grounds and human remains.
SER 4 – Geology and Minerals	Direct, indirect, and cumulative effects on geology and mineral resources.
SER 5 – Grazing Management	Direct, indirect, and cumulative effects on grazing resources, including changes in vegetation community.
SER 6 – Hazardous Materials and Solid Waste	Direct, indirect, and cumulative effects on hazardous materials and solid waste, including transportation, storage, and handling of hazardous materials and proper disposal of solid waste.
SER 7 – Land Use and Realty	Direct, indirect, and cumulative effects on land use and realty.
SER 8 – Noise	Direct, indirect, and cumulative effects from noise.
SER 9 – Paleontological Resources	Direct, indirect, and cumulative effects on paleontological resources.
SER 10 – Recreation and Wilderness	Direct, indirect, and cumulative effects on recreational and wilderness resources, including public access, noise, and changes in habitat effecting game species.
SER 11 – Socioeconomics and Environmental Justice	Direct, indirect, and cumulative effects on socioeconomics and environmental justice, with emphasis on identifying effects to low income and minority populations.
SER 12 – Soil Resources	Direct, indirect, and cumulative effects on soil resources.
SER 13 – Transportation and Access	Direct, indirect, and cumulative effects on transportation and access.
SER 14 – Vegetation (including Wetlands and Riparian Zones)	Direct, indirect, and cumulative effects on vegetation resources, including wetlands and riparian zones.
SER 15 – Visual Resources	Direct, indirect, and cumulative effects on visual resources.
SER 16 – Water Resources and Geochemistry	Direct, indirect, and cumulative effects on water resources, including surface and groundwater and direct, indirect, and cumulative effects on geochemistry.
SER 17 – Wild Horses and Burros	Direct, indirect, and cumulative effects on wild horse resources.
SER 18 – Wildlife and Aquatic Resources	Direct, indirect, and cumulative effects on wildlife resources, with emphasis on special status species.

1.6 Applicant-Committed Environmental Protection Measures and Practices

NVV has committed to implement the following practices to prevent unnecessary and undue degradation during the Project life. These practices were derived from the general requirements established in the BLM’s surface management regulations at 43 CFR 3809 and NDEP BMRR mining reclamation regulations, as well as other water regulations and BLM guidance documents. These measures are informed by the Enhanced Baseline Reports that identified potential resource conflicts and measures that could be taken to avoid or minimize those resource conflicts and are to be considered part of the operating plan and procedures. General Applicant-committed EPMs include:

- Speed limits would be posted at 35 miles per hour (mph) on haul roads and 45 mph on access roads. When road conditions are poor, drivers would be required to travel at reduced speeds (below 25 mph) to ensure safe passage to and from the mine site.
- Speed limits within the open pit and inside fenced process areas would be based on site-specific safety requirements and would be set based on factors such as ramp slopes, ramp widths, and curve radius.
- New hire and annual refresher training for all employees and contractors would include wildlife and wild horse protection training that specifically addresses the commitment of NVV to implement the protection program and the need for all employees to avoid harassment and disturbance of wildlife and wild horses, especially during breeding seasons. NVV would work with NDOW and BLM in the development of training materials.

- Site-specific training would also include internal contact numbers for reporting sick or injured animals in the Project area, as well as reporting procedures to the BLM and NDOW for any wildlife and wild horse mortalities. NDOW Industrial Artificial Pond Permit requirements would include reporting by the next business day any mortalities of wildlife species.
- Fences would be constructed to BLM and NDOW standards. Surrounding the active mine area, the process pond area would be a continuous 8-foot-high woven wire fence, with no breaks, except for gates, that would be kept closed; and smooth or barbed wire would be used above the top horizontal portion of fencing to discourage perching.
- All lined ponds would be constructed with escape ramps consisting of textured liner to assist in a safe footing during egress, should any wildlife manage to gain access and inadvertently fall into one of the ponds.
- Leach lines on the heap leach pad (HLP) would be managed to preclude surface ponding on the heap surface that could attract avian or terrestrial resources to potentially toxic leach solutions.
- Hazardous material storage would include secondary containment to preclude contamination of surface or groundwater resources that animals could access.
- During all phases of the Project, all food, waste, and other trash would be placed in containers with lids or covers that can be closed to discourage scavenging by wildlife.
- NVV would prohibit employees, contractors, and sub-contractors from feeding wildlife or wild horses, or making food available for scavenging wildlife.
- All contract and full-time workers would be required to adhere to all Nevada driving laws as specified under the NRS, including, but not limited to: General Traffic Laws (NRS 484A); Rules of the Road (NRS 484B); Driving Under the Influence (NRS 484C); Equipment & Loads (NRS 484D); and Accidents (NRS 484E).
- NVV would provide vans or busses for transport of most employees to/from the site. Use of private vehicles on the mine site would be restricted. Limited senior staff of NVV may have company vehicles assigned to them.
- All orders of supplies and consumables would be made at the NVV purchasing office in Eureka. No solicitors would be permitted at the mine site. This practice would reduce the volume of vehicles to and from the mine during normal business hours.
- All shipping of petroleum products (gasoline and diesel fuels) and other hazardous chemicals to the site would be by an approved transport company on a regular schedule using a predetermined route and pilot guide vehicles (as per applicable U.S. Department of Transportation [DOT] regulations). All unloading and transfer would be by trained NVV personnel.
- Monitoring of the stability of the open pit would be performed in accordance with requirements under the Water Pollution Control Plan and Reclamation Permit and would include daily visual stability monitoring of the highwall and the crest area behind the highwall for any signs of movement. If any signs of instability are detected, the geotechnical engineers from AMEC (now Wood) would inspect the highwall and advise next steps that would be reported to the BLM and NDEP.
- To quantify the project specific impacts to grazing capacity, a production survey within the Project area would be conducted during the peak of the growing season as much of the area of the mine is of low grazing forage value and would not result in a measurable loss of actual animal unit months. NVV would conduct the production survey both prior to construction and post-reclamation to assist the permittee, BLM and Eureka County in the quantification of any forage potentially lost as well as improvements in range productivity following reclamation.

- NVV would develop a compensation agreement with the permittee and Eureka County to ensure no economic impact would occur either during operations or post closure. This compensation agreement would be based on the production survey within the fenced area precluded from grazing.
- NVV would work with Eureka County to develop uranium specific emergency response training materials and provide the training and materials to the Eureka and White Pine emergency response teams and the Nevada Highway Patrol officers. The materials would include facility drawings showing the location of all hazardous materials and the uranium product storage areas and procedures that would include notifications to the emergency response teams that would be made of the route and timing of the yellowcake shipments.

1.6.1 Air Quality

The Project would be operated to control both gaseous and particulate emissions and to meet all state and federal regulatory standards. Appropriate air quality permits would be obtained from the NDEP Bureau of Air Pollution Control. Specific Air Quality EPMs include:

- A Fugitive Dust Control Plan would be implemented for all mine operations and Project access roads. In general, the fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as lignin sulfate or magnesium chloride) where appropriate; and other dust control measures, as per accepted and reasonable industry practice. Also, disturbed areas would be seeded with an interim seed mix to minimize fugitive dust emissions from unvegetated surfaces where appropriate.
- The dust generated from the use of roads and excavation activities would be minimized to the extent reasonable and practicable by minimizing vehicular traffic, application of approved dust suppressants on gravel roads, including Eureka County gravel access roads, and using prudent vehicle speeds.
- Fugitive emissions in the process area would be controlled at the crusher and conveyor drop points through the use of dust collectors, enclosures and/or water sprays, where necessary. Other process areas requiring dust and/or emission controls would include the SX Plant, the various ancillary screening and sizing processes, agglomerator, refinery, generators, and the laboratory. The agglomerator is expected to be permitted as a zero-emissions unit due to the inherent nature of the agglomeration process (binding of fine materials with polymer). Appropriate emission control equipment would be installed and operated in accordance with an NDEP-issued Air Quality Operating Permit.
- Equipment and machinery would be maintained in good working condition to minimize emissions.

1.6.2 Water Resources

In order to protect water resources, process components would be designed, constructed, and operated in accordance with NDEP regulations and include engineered liner systems. The process facilities would be zero discharge, and the heap leach facility would have an engineered liner and leak detection systems in accordance with NAC 445A design criteria. Waste rock generated from mining of the pit has been evaluated for potential to generate acid and/or mobilize deleterious constituents that could degrade waters of the state. Based on the geochemical characterization program completed for the Project, the waste rock material would originate from the high carbonate acid neutralizing zones that would not be placed on the HLP due to their high acid consumption rate in the process. Given the oxidized nature of the ore, there is very low amount of material that is acid generating. Any acid-generating material would be directly placed on the lined HLP. The Adaptive

Waste Rock Management Plan (AWRMP) described the procedures for the identification, handling and management of Potentially Acid-Generating (PAG) waste rock to minimize potential oxidation and solute generation along with monitoring and reporting procedures.

A Water Management Plan has been developed in compliance with 43 CFR 3809.401(b)(2)(iii). The Water Management Plan identifies more specific control measures and monitoring requirements. The actual locations and numbers of sediment controls would be determined during final design and where appropriate during operations. In either case, the controls would be developed in accordance with the site-wide stormwater management plan and engineering design documents developed as part of the NDEP BMRR Water Pollution Control Permit application.

A survey to identify waters of the U.S. (WOUS), or areas where waters could be discharged into WOUS, was conducted within the Project area. No WOUS (as currently defined by the Clean Water Act and 40 CFR 230.3(s)) or areas where waters could be discharged into WOUS were identified (Three Parameters+ Natural Resource Consulting 2013; USACE 2014).

Groundwater Quality EPMs include:

- Mine processing components would be designed, constructed, and operated in accordance with NDEP regulations and include engineered liner systems.
- The process facilities would be zero-discharge, and the heap leach ponds would have an engineered liner and leak detection system in accordance with NAC 445A design criteria.
- NVV would sample groundwater on a quarterly basis from monitoring wells within the perimeter of the site's process facilities. Groundwater sampling would be conducted using NDEP and U.S. Environmental Protection Agency–approved sampling methodologies. Water purged from the well during sampling would be managed at the well head. All groundwater purged from wells within the process area would be managed within the process area.
- Water collected with sumps inside of the open pit would be restricted to be used for dust suppression only within the pit limits to minimize the potential for contaminants leached from the ore to be discharged outside of the pit.

Surface Water Quality EPMs include:

- Fish Creek Ranch owns certified water rights for Fish Creek Springs of 5,730 acre-feet per year, with 805 acre-feet per year of water from Fish Creek Springs to be transferred to NVV. The point of diversion would stay the same, but the place of use would be transferred to the Project area. Fish Creek Ranch would then remove 818 acres from cultivation to offset the 805 acre-feet per year used by the Project. The Project would lease, but not use, an additional 30 percent of spring water to offset loss of irrigation recharge for a total lease of 1,046.5 acre-feet per year to ensure no increase to the existing use of Fish Creek Springs and no decrease in recharge to downstream users.
- The pipe inlets would continue to be screened as they are for the irrigation supply. Mine water pump intake in the Fish Creek irrigation canal would be screened to ensure aquatic species are not drawn into the pumping system.

1.6.3 Cultural and Paleontological Resources

Avoidance is the BLM-preferred management response for preventing impacts to historic properties (a historic property is any prehistoric or historic site eligible to the National Register of Historic Places) or unevaluated cultural resources. If avoidance is not possible, or is not adequate to prevent adverse effects, NVV would undertake prescribed data recovery from such sites. Development of a treatment plan, data recovery, archaeological documentation, and report preparation would be based on the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation*, 48 CFR 44716 (September 29, 1983), as amended or replaced. If an unevaluated site could not be avoided, additional information would be gathered, and the site would be evaluated. If the site does not meet eligibility criteria, as defined by the Nevada State Historic Preservation Office, no further cultural work would be performed. If a site meets eligibility criteria, a data recovery plan or appropriate mitigation would be completed.

Cultural resource EPMs include:

- A treatment plan would be developed, and mitigation activities completed and approved by the BLM and Nevada State Historic Preservation Office prior to construction activities in the area of any eligible cultural sites.
- If previously unidentified cultural resources are discovered or an unanticipated impact situation occurs, all Project-related activities within 100 meters (or approximately 328 feet) of the discovery/impact would cease immediately, and NVV would secure the location to prevent vandalism or other damage and would notify the BLM Authorized Officer immediately.
- Cultural monitors from the Duckwater Tribe would be notified of cultural mitigation activities and Project construction activities with sufficient advanced notice to be on site during these activities.
- Pursuant to 43 CFR 10.4(g), NVV would notify the BLM authorized officer, by telephone, and with written confirmation, immediately upon the discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony (as defined in 43 CFR 10.2). Further pursuant to 43 CFR 10.4 (c) and (d), the operator would immediately stop all activities in the vicinity of the discovery and not commence again for 30 days or when notified to proceed by the BLM authorized officer.
- Any cultural resource discovered by the permit holder, or any person working on their behalf, during the course of activities on federal land would be immediately reported to the authorized officer by telephone, with written confirmation. The permit holder would suspend all operations in the immediate area of such discovery and protect it until an evaluation of the discovery can be made by the authorized officer. This evaluation would determine the significance of the discovery and what mitigation measures are necessary to allow activities to proceed. The holder is responsible for the cost of evaluation and mitigation. Operations may resume only upon written authorization to proceed from the authorized officer.

1.6.4 Erosion and Sediment Control

Best management practices (BMPs) would be used to limit erosion and reduce sediment in precipitation runoff from Project facilities and disturbed areas during construction, operations, and initial stages of reclamation.

Because there are no WOUS in or around the Project area (USACE 2014, 2020), NVV would not be specifically required to manage stormwater discharges in accordance with provisions set forth in the NDEP Stormwater General Permit NVR300000, and would not be required to submit a Stormwater Pollution Prevention Plan to the NDEP. However, as general corporate environmental policy, and good environmental stewardship, NVV would adhere to the policies and guidelines set forth in NVR300000 to ensure that appropriate stormwater BMPs would be employed in the Project area. As per NVR300000, BMPs for the Project would include "erosion and sediment controls, conveyance, stormwater diversions, and treatment structures, and any procedure or facility used to minimize the exposure of pollutants to stormwater or to remove pollutants from stormwater." A Stormwater Management Plan has been developed for the Project. BMPs would include, but would not be limited to:

- Erosion and sediment control structures such as diversions (e.g., runoff interceptor trenches, check dams, or swales), siltation or filter berms, filter or silt fences, filter strips, sediment barriers, and/or sediment basins;
- Collection and conveyance structures, such as rock lined ditches and/or swales;
- Vegetative soil stabilization practices such as seeding, mulching, and/or brush layering and matting;
- Non-vegetative soil stabilization practices such as rock and gravel mulches, jute and/or synthetic netting;
- Slope stabilization practices such as slope shaping, and the use of retaining structures and riprap;
- Infiltration systems such as infiltration trenches and/or basins;
- Following construction activities, areas such as cut and fill slopes and embankments and growth media/cover stockpiles would be seeded as soon as practicable and safe; and
- Concurrent reclamation would be maximized to the extent practicable to accelerate revegetation of disturbed areas. All sediment and erosion control measures would be routinely inspected, and maintenance/repairs performed, as needed.
- The dust generated from the use of roads and excavation activities would be minimized to the extent reasonable and practicable by minimizing vehicular traffic, application of approved dust suppressants on gravel roads and using prudent vehicle speeds.

Erosion and Sediment Control EPMs include:

- The surfaces of the growth media stockpiles would be shaped after construction with overall slopes of 3H:1V to minimize erosion;
- To further minimize wind and water erosion, the growth media stockpiles would be seeded after shaping with an interim seed mix developed in coordination with the BLM;
- Diversion channels and/or berms would be constructed around the growth media stockpiles, as needed, to prevent erosion from overland runoff; and
- BMPs, such as straw wattles or staked straw bales, would be used as necessary to contain sediment during precipitation events.

1.6.5 Waste Rock Management

Ore and waste rock analyses have shown that some of the rock has the potential to generate acid or mobilize constituents. Therefore, NVV has developed an AWRMP that describes the placement of the PAG waste rock materials on the fully lined HLP and all remaining high carbonate waste rock on the rock disposal area (RDA). Given the potential water holding capacity of the high carbonate waste rock, it is anticipated that some or all of this material would eventually be used as a resource to construct an evapotranspiration (ET) cover on the HLP at closure. The AWRMP provides additional detail on methods to segregate, manage, and monitor waste rock. SER 17 – Water Resources and Geochemistry has a more complete description of the AWRMP, which was included as part of the Plan of Operations.

1.6.6 Noxious Weeds, Invasive and Non-native Species

NVV recognizes the economic and environmental impact that can result from the establishment of noxious weeds and has committed to a proactive approach to weed control. A Noxious Weed Monitoring and Control Plan would be implemented during construction and mining operations in consultation with the BLM and Eureka County Weed District. The plan contains management strategies and provisions for annual monitoring and treatment. The results from annual monitoring would be the basis for updating the plan and developing annual treatment programs.

1.6.7 Safety and Fire Protection

The Project would operate in conformance with all Mine Safety and Health Administration (MSHA) safety regulations (30 CFR 1–199). Site access would be restricted to employees and authorized visitors. Fire protection equipment and a Fire Protection Plan would be established for the Project area in accordance with MSHA, State Fire Marshal, building codes, and commercial insurance standards. The primary focus of the Fire Protection Plan typically include engineering and administrative controls that would be developed to reduce the risk of fire and the safety measures that would be implemented to respond to a fire in a manner that first protects the health and safety of all people working at the mine and second to protect environmental impacts and third to protect the mines physical assets.

The fire suppression tank would contain at least 145,000 gallons of water for fire emergency and would be in the northwestern portion of the Project area near the truck shop. Water in the tank would have a separate plumbing system from the potable water tank and would be designated for fire suppression use only. Fire suppression would also be provided by the Eureka Volunteer Fire Department.

1.6.8 Hazardous Materials and Solid Waste

Hazardous materials and solid waste EPMs include:

- NVV would construct, operate, and close the Class III waivered industrial landfill in accordance with NAC 444.731 through 444.737. Signs would be installed at the landfill reminding employees of appropriate disposal practices.
- A Solid and Hazardous Waste Management Plan (SHWMP) would be developed that would include employee training on the appropriate landfill disposal practices such as the allowable wastes that can be placed in the landfill, management of used oil filters, oily rags, fluorescent light bulbs, aerosol cans, and other regulated substances. Any liquid waste would be specifically banned from disposal in the onsite landfill and would be managed under the SHWMP in full compliance with Resource Conservation and Recovery Act (RCRA) and NDEP regulations.
- Hazardous materials and wastes would be transported, stored, and used in accordance with federal, state, and local regulations. Employees would be trained in the proper transportation, storage, and use of hazardous materials and the management of solid and hazardous waste per the SHWMP. The Spill Contingency Plan has been developed, which provides the information required to manage spills both inside and outside of containment areas.
- All shipping of petroleum products (i.e., gasoline and diesel fuels) and other hazardous chemicals to the site would be by an approved transport company on a regular schedule using a predetermined route and pilot guide vehicles (as per applicable DOT regulations). All unloading and transfer would be by trained NVV personnel.

- The term “hazardous materials” is defined in 49 CFR 172.101; hazardous substances are defined in 40 CFR 302.4 and the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act Title III. Hazardous materials would be transported to the Project area by DOT regulated transporters and stored on site in DOT approved containers. Spill containment structures would be provided for storage containers. Hazardous waste would be managed in accordance with regulations identified in 40 CFR 262 Standards Applicable to Generators of Hazardous Waste.
- Hazardous materials and substances that may be transported, stored, and used by the Project in quantities less than the Threshold Planning Quantity designated by Superfund Amendments and Reauthorization Act Title III for emergency planning include blasting components, petroleum products, and small quantities of solvents for laboratory use. The only chemicals on site that would exceed the Threshold Planning Quantity are sulfuric acid and the vanadium product produced V_2O_5. Small quantities of other hazardous materials, such as materials that are contained in commercially produced paints, office products, and automotive maintenance products, would also be managed by mine personnel.
- Blasting components, including ammonium nitrate and fuel oil (ANFO), would be stored on site. Prill (without fuel oil) would be stored in a silo near the truck shop. Explosive agents, boosters, and blasting caps would be stored away from the plant site within a secured explosives storage area in a small draw approximately half-way up the main haul road between the HLP and the mine. All explosive materials would be stored in compliance with MSHA, Nevada State Mine Inspector’s regulations, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) and U.S. Department of Homeland Security requirements.
- Management of hazardous materials for the Project would comply with all applicable federal, state, and local requirements, including the inventorying and reporting requirements of Title III of Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Emergency Planning and Community Right to Know Act.
- All petroleum products and reagents would be stored in aboveground tanks within a secondary containment area capable of holding 110 percent of the volume of the largest vessel in the area. The Spill Contingency Plan is reviewed and updated regularly and whenever major changes are made in the management of these materials. Inspections, maintenance schedules and procedures are set forth in sections of the Spill Contingency Plan. All employees involved in the transport or use of petroleum products at the Project or involved in maintenance of petroleum storage and dispensing systems would receive training and instruction in the Spill Contingency Plan.
- Fuel and oil for diesel- and gas-powered equipment would be stored in aboveground, sealed tanks generally in the processing facilities area. The tanks would be installed in lined or concrete containments. The storage area would be surrounded by berms or containment walls designed to provide secondary containment capacity of 110 percent of the largest vessel in the containment in case of rupture. Surface piping would lead from each tank to the fuel dispensing area. The refueling hoses would be equipped with overflow prevention devices and secondary containment.
- Hazardous wastes would be managed in the designated 90-Day Storage Facility prior to their shipment to an offsite licensed disposal facility (per state and federal RCRA regulations). These materials may include waste paints and thinners. Spent cleaning solvents and used oils would be returned to recycling facilities. Used oil and lubricants would be collected and hauled off site by a buyer/contractor for recycling. Solvents would be collected by a contractor and recycled off site.

- Onsite equipment and supplies including bagged absorbent, booms, weirs, and tools would be readily available for timely deployment by trained NVV personnel, and applicable regulations posted conspicuously regarding reporting spills and emergency procedures.
- Designated personnel would be properly instructed in the operation and maintenance of equipment to prevent and clean-up spills. NVV's Environmental Manager would also be responsible for oil spill prevention and training employees with the spill prevention and response program and procedures.
- Uranium specific emergency response training materials would be developed, and training would be provided to the Eureka and White Pine emergency response teams. Other agencies that are part of the Mutual Aid agreement, including Nevada Highway Patrol, would be included in the training programs. Facility drawings would be included showing the location of all hazardous materials to ensure protection of emergency response teams. Procedures would include notifications to the emergency response teams regarding the route and timing of the yellowcake shipments.

1.6.9 Growth Media Salvage and Storage

Growth media storage EPMs include:

- Suitable growth media would be salvaged and stockpiled during the development of the mine open pit, and during construction of the RDA, heap leach facilities, and other mine facility areas. Growth media along linear disturbances (e.g., access roads) would be stockpiled in windrows to the side of the construction area for later use during reclamation.
- Growth media would be stockpiled within proposed disturbance areas. Stockpiles would be located where they would be optimally situated for post-mining reclamation. The surfaces of the stockpiles would be shaped after construction with slopes no steeper than 3.0H:1V to reduce erosion.
- To further minimize wind and water erosion, the growth media stockpiles would be seeded with an interim seed mix.
- Diversion channels or berms would be constructed around stockpiles as needed to prevent erosion from overland runoff. BMPs such as silt fences or staked straw bales would be used as necessary to contain sediment mobilized by direct precipitation.

1.6.10 Wildlife and Wild Horses

Wildlife and wild horse EPMs include:

- All artificial bodies of water that contain any chemical in solution at levels lethal to wildlife (e.g., barren and pregnant solution ponds) would be covered or contained in a manner that would prevent access by birds and bats in accordance with the NDOW Industrial Artificial Pond Permit.
- Underground openings would be secured with bat gates in a manner that would allow ingress and egress by bats, but not people. NVV would work with NDOW and Nevada Division of Minerals to install bat gates.
- Any chemical-laden fluids that are the result of any process and that are impounded in a pond that is too large to cover or contain (e.g., mill tailings ponds) would be rendered non-lethal to wildlife. The chemical concentration would be measured at a non-lethal level at the point where the fluid flows from a pipe into the pond or open conveyance system. Chemical neutralization and dilution are among methods that could be used to reduce chemical concentration.

- Process facilities including the warehouse/shop, office, laboratory, Adsorption-Desorption-Regeneration plant, crushing facilities, HLP, and ponds would be fenced to specifications outlined in the BLM Handbook 1741-1 (BLM 1989), as applicable. Solution ponds would be fenced, in accordance with the required NDOW Industrial Artificial Pond Permit, with 8-foot-high chain-link or field fencing.
- Primary ponds liners would be single-sided textured geomembrane with the textured side up to facilitate wildlife egress.
- Bird balls would also be used on the ponds to protect wildlife, where required.
- Operators would be trained to monitor the mining and process areas for the presence of larger wildlife, such as mule deer and pronghorn antelope. Mortality information would be collected and reported to the NDOW, as necessary.
- NVV would establish wildlife protection policies that prohibit feeding or harassment of wildlife within the Project area boundary. Harassment would include, but is not limited to, feeding, chasing, approaching, luring, calling or other actions that could result in habituating wildlife to approach human activity.
- New hire and annual refresher training for all employees and contractors would include wildlife and wild horse protection training that specifically addresses the commitment of NVV to implement the protection program and the need for all employees to avoid harassment and disturbance of wildlife and wild horses, especially during breeding seasons. NVV would work with NDOW and BLM in the development of training materials. Surface disturbance activities would follow the protection measures as described for migratory birds.
- Design features would be considered for buildings and other structures that minimize nest building by ravens.

1.6.11 Migratory Birds

The Migratory Bird Treaty Act provides protection of migratory birds, their nests, eggs, and young. Avian species protected under the Migratory Bird Treaty Act include species that migrate from breeding range to winter range, a list of species which includes most waterfowl and water-related birds (i.e., loons, grebes, pelicans, ducks and geese, herons, cranes, and shorebirds), raptors (i.e., falcons, hawks, vultures, and owls), doves, cuckoos, goatsuckers, swifts and hummingbirds, kingfishers, woodpeckers, and passerine birds (i.e., most “songbirds”).

- If surface disturbing activities are unavoidable during the avian breeding and nesting season (April 1 through July 31), NVV would commission a BLM-qualified avian biologist to survey in accordance with BLM policy to determine if nesting activity is occurring in the area of proposed disturbance. Surveys would be limited to the footprint of the area of disturbance and an additional buffer of at least 300 feet beyond the disturbance footprint. Surveys for migratory birds are only valid for 14 days. If the disturbance for the specific location does not occur within 14 days of the survey, another survey would be conducted. Surveys would be conducted in accordance with BLM policy for migratory bird nest clearance surveys.

1.6.12 Raptors

Most raptors are protected under the Migratory Bird Treaty Act. Therefore, the surveys proposed by NVV for migratory birds would also apply to some raptors and burrowing owls. Golden and bald eagles are protected under the Bald and Golden Eagle Protection Act that prohibits anyone, without a permit issued by the Secretary of the Interior, from “taking” bald or golden eagles, including their parts, nests, or eggs. Taking also includes “disturb” which means: “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.” The following EPMs are based on these requirements.

Additional EPMs specific to protecting raptors, including golden eagles and bald eagles, would include:

- Annual raptor surveys would be conducted for an area inclusive of the Project area and a two-mile radius beyond the Project area boundary for all raptors, and a 10-mile-radius for golden and bald eagles. The survey would be performed in accordance with the U.S. Fish and Wildlife Service’s *Interim Golden Eagle Technical Guidance* (Pagel et al. 2010). This guidance states that a Project should be surveyed at least twice for nesting raptors during the breeding season and that surveys should be conducted at least 30 days apart. Other migratory bird surveys would also be conducted, and raptors or their nests may be discovered during these surveys and appropriately protected.
- Disturbance activities would be avoided during the migratory bird nesting season (March 1 through July 31). The raptor nesting season is defined as March 1–July 31 in the Battle Mountain District, although golden eagle breeding season can occur from December through August. Raptor nest building activities or behavior of nesting raptors would be identified during annual surveys. NVV would establish a 1-mile activity buffer around golden eagle and some raptor nests and coordinate with the BLM biologist and the NDOW on appropriate avoidance distances for other raptors, as determined by the species identified. The 1-mile standard buffer for golden eagles may decrease, if in agreement with BLM and NDOW, if the nest is out of the line of sight of the construction activities. The avoidance measures would be in place until a BLM-qualified biologist has determined the young have fledged. The start and end dates of the seasonal restriction may be based on site-specific information, such as elevation and winter weather patterns, which affect breeding chronology. Surveys would be conducted in accordance with BLM policy for migratory bird nest clearance surveys.
- Standard raptor protection designs as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006, 2012) would be incorporated into the construction of power lines.

1.6.13 Big Game

Additional EPMs specific to protecting mule deer and pronghorn antelope would include:

- Established mule deer and antelope trails would be identified by BLM qualified biologists, and NDOW would be consulted for identification of big game crossing points. Warning signs would be posted at appropriate locations along the haul roads to warn drivers of crossing points.
- If needed, berms constructed along haul roads would include openings at major trails to encourage road crossing at these locations where signage can warn drivers. Berms would be constructed per MSHA regulations.

1.6.14 Greater Sage-grouse

Greater sage-grouse EPMs include:

- NVV would conduct lek attendance monitoring, following NDOW monitoring protocols, for the Fenstermaker Wash lek, which is the closest lek to the Project area. If the lek is found to be inactive or changes to the extent that it is shown to hit a trigger (as discussed in the 2015 ARMPA) over the course of this Project, mitigation measures would be implemented in consultation with the BLM and NDOW to reverse the downturn if it is determined that the change resulted from activities associated with the Project. NVV would conduct lek attendance monitoring during all active phases of the Project from construction through final reclamation.
- NVV would implement the Nevada CCS to mitigate habitat impacts from the Project to ensure an overall benefit for the species, while allowing for mine development.
- NVV would implement applicable Resource Design Features of the Nevada and Northeastern California Greater Sage-Grouse ARMPA, 2015. The applicable Resource Design Features include:
    - Limit all mine activities, including exploration activities, to ensure noise levels not exceed 10 decibels above ambient sound levels, as measured with appropriate noise monitoring equipment, at least 0.25 mile from active and pending leks, from 2 hours before to 2 hours after sunrise and sunset during the breeding season. Noise monitoring would be performed for a sufficient period to demonstrate conformance with the EPM.
    - During Project construction and operation, establish and post speed limits in Greater sage-grouse habitat to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.
    - Require dust abatement practices when authorizing use on roads.
    - Instruct all construction employees to avoid harassment and disturbance of wildlife, especially during the Greater sage-grouse breeding (e.g., courtship and nesting) season. In addition, pets shall not be permitted on site during construction.
    - To reduce predator perching in Greater sage-grouse habitat, limit the construction of vertical facilities and fences to the minimum number and amount needed and install anti-perch devices where applicable. Avian Power Line Interaction Committee design guidance would be incorporated to reduce risks of avian electrocution/collision. Fences would be constructed with reflectors to minimize the potential of greater sage-grouse collision.
    - Power line poles would be fit with anti-perch devices in Greater sage-grouse habitat.
- The irrigated field on Fish Creek Ranch that would have the irrigation water diverted for mine use would be planted with a seed mix beneficial to Greater sage-grouse to provide feed and vegetative cover.

1.6.15 Pygmy Rabbits and Burrowing Owls

The EPM for pygmy rabbits and burrowing owls is:

- Pygmy rabbit and burrowing owl pre-construction surveys would be conducted prior to ground-disturbing activities. If occupied burrows/colonies are encountered, consultation with the BLM and NDOW to determine the appropriate avoidance buffer. If removal of the burrow/colony is required, NVV would coordinate with the BLM and NDOW to determine the appropriate monitoring and management measures and mitigation to be implemented.

1.6.16 Survey Monuments

The EPM for survey monuments is:

- To the extent practicable, NVV would protect all survey monuments, witness corners, reference monuments, bearing trees, and line trees against unnecessary or undue destruction, obliteration or damage. If, in the course of operations, any monuments, corners, or accessories are destroyed, NVV would immediately report the matter to the authorized officer. Prior to obliteration, destruction, or damage during surface disturbing activities, NVV would contact the BLM to develop a plan for any necessary restoration or re-establishment activity of the affected monument in accordance with Nevada Instruction Memorandum No. NV-2007-003 and the NRS. NVV would bear the cost for the restoration or re-establishment activities including the fees for a Nevada Professional Land Surveyor.

1.6.17 Visual Resources

To protect visual resources, NVV would implement the following EPMs throughout the life of the Project:

- To protect visual resources, NVV would apply lighting mitigation measures that follow “Dark Sky” lighting practices throughout the life of the Project. Light fixtures would be placed at the lowest practical height and would be directed to the ground and/or work areas to avoid being cast skyward or over long distances;
- Berms required for haul roads may reduce vehicle lights emanating from haul roads and the pit areas that may be directed toward public roads during travel;
- All lighting, where practicable, would be located to avoid light pollution onto any adjacent land as viewed from a distance. All light fixtures would be hooded and shielded, face downward and be located within soffits and directed on to the operating site. Light fixtures would incorporate shields and/or louvers where possible and be full cut-off type;
- Buildings would be painted or stained to produce flat-toned, non-reflective surfaces and meet BLM visual resource management requirements. As per the BLM’s *Standard Environmental Color Guidelines* (BLM 2008) NVV anticipates painting the buildings a “Covert Green” color;
- The use of dimmers, timers, and motion sensors would be installed where appropriate; and
- Fugitive dust would be minimized in order to reduce “sky glow,” by reducing the light reflectance from the dust particles.

2.0 DESCRIPTIONS OF THE PROPOSED ACTION AND PRELIMINARY PROJECT ALTERNATIVES

This section describes and compares the alternatives considered for the Project based on the pre-planning process that evaluated Project actions and their alternatives from the review of baseline conditions and relative resource conflicts resulting from various alternatives developed to avoid or minimize those conflicts. It includes a description of each alternative considered. This chapter also presents the alternatives that were evaluated but eliminated from detailed study and provides a brief rationale for eliminating the alternative that defines the differences between each alternative.

2.1 Proposed Action

The Project would consist of constructing and operating an open pit mining operation and heap leach process facility to extract and recover vanadium in the Gibellini Mining District of Eureka County, Nevada (**Figure 1**). The Proposed Action includes a water, power and communications corridor extending approximately 6.5 miles from the Fish Creek Ranch to the Project area in Sections 15, 22, 27, and 31 through 34 of T16N, R53E (**Figure 2**). The existing 69-kilovolt (kV) power line for the Pan Mine would supply power to the Project. The Gibellini power line would extend to the Project area from a tie-in point along the Pan Mine power line in Section 20 of T16N, R54E. **Figure 2** shows the Project area, access routes, and land ownership. Surface disturbance would include both mining and exploration activities within the Project area, as well as surface disturbance authorized under previous notices. **Table 7** identifies the anticipated surface disturbance by facility as well as a compliance buffer area surrounding the surface disturbance areas associated with construction and maintenance activities.

Table 7. Proposed Action: Surface Disturbance by Facility and Associated Compliance Buffers

Activity	Pre-1981 Existing Surface Disturbance (acres)	Existing Notice Level Disturbance	Proposed Action Surface Disturbance (acres)	Buffer Area[1] (acres)
Pit	-	-	84.8	46.8
Heap Leach Pad	-	-	186.5	-
Rock Disposal Area	-	-	29.1	21.3
Process Ponds and Make-up Water Pond	-	-	14.4	-
Process Facility and Lab	-	-	2.6	2.8
Waste Rock Sedimentation Pond	-	-	0.2	--
Mine Facilities	-	-	0.7	-
Mine Facilities Retention Pond	-	-	0.4	-
Crushing Facility and Stockpile	-	-	5.1	-
Mine and Haul Roads	-	-	47.2	42.6
Access Roads	-	-	3.5	-
Office, Laydown, and Warehouse	-	-	0.7	7.0
Borrow Areas	-	-	91.8	78.8
Landfill Area	-	-	5.8	2.6
Stormwater Diversion Channels	-	-	69.8	-
Potable Water and Fire Suppression Tanks	-	-	0.1	-
Utility Corridor & Substation[2]	-	-	31.5	-
Growth Media Stockpiles	-	-	110.0	-
Explosives Area	-	-	0.1	1.1
Yards (Ancillary)[3]	-	-	73.1	-

Activity	Pre-1981 Existing Surface Disturbance (acres)	Existing Notice Level Disturbance	Proposed Action Surface Disturbance (acres)	Buffer Area[1] (acres)
Exploration[4]	104.5	-	46.0	-
Water and Monitoring Wells	-	2.4	2.4	-
Total	104.5	2.4	805.8	203.0

[1] Buffer areas are compliance areas surrounding facilities that are not intended to be disturbed but are to be evaluated in the EIS.
[2] The utility corridor is composed of the buried power line and water pipeline from the mine facilities to the Fish Creek Ranch.
[3] Yards are surface disturbance associated with the mining facilities that would be revegetated but do not require regrading during reclamation.
[4] Exploration disturbance is composed of access roads, drill pads, drill sumps and trenches.

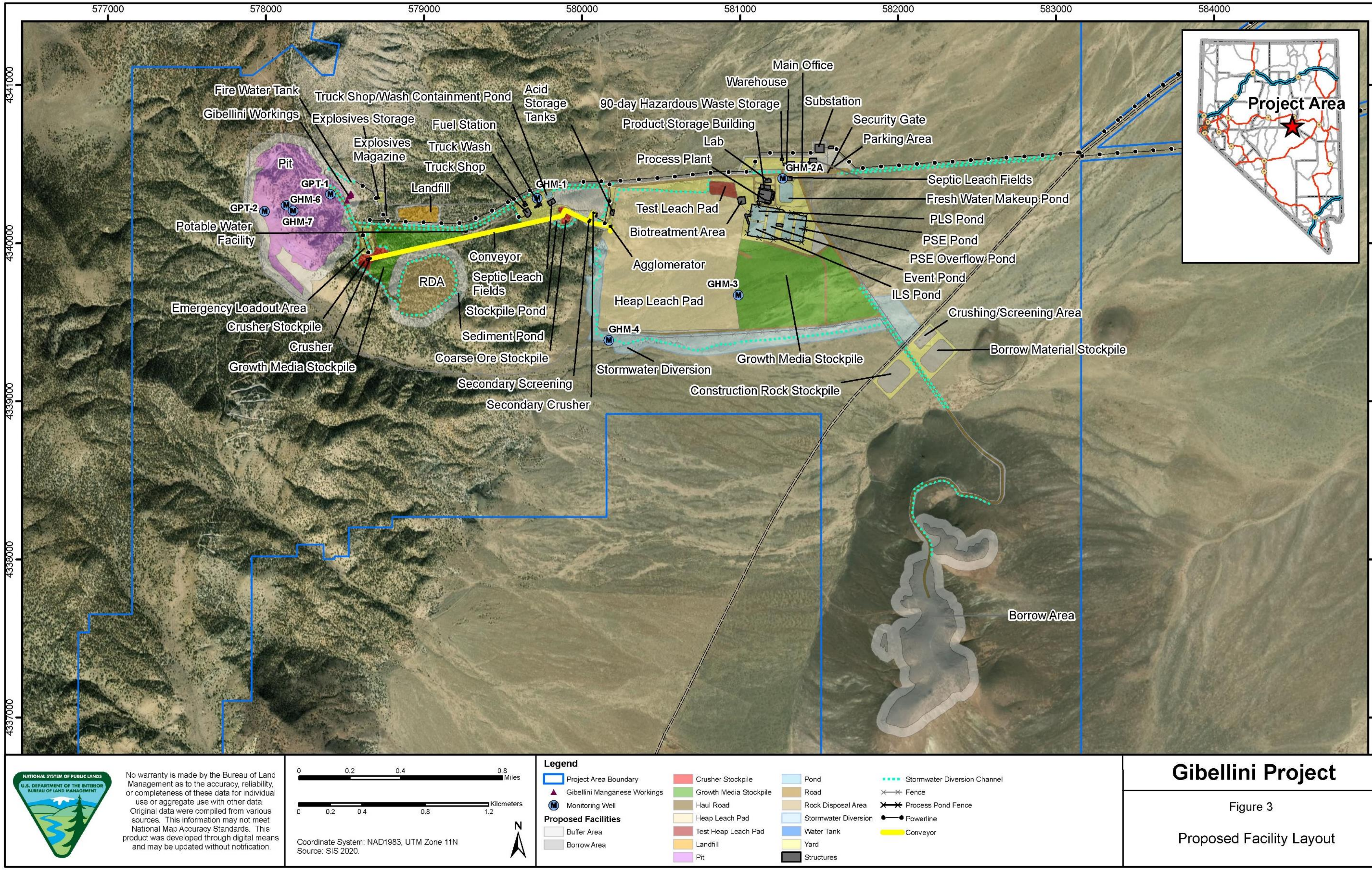
The Proposed Action (**Figure 3**) would include the following new mine components:

- The open pit;
- RDA;
- Mine office and facilities;
- Crushing facilities and stockpile;
- HLP;
- Process facility;
- Various process and make-up water ponds;
- Borrow areas;
- Mine and access roads;
- Water and power supply lines; and
- Ancillary facilities.

Under the Proposed Action, NVV would construct and operate an open pit mining operation to mine approximately 24 million tons of ore material and recover 66,000 tons of vanadium and 168 tons of uranium over the mine life. Approximately 2.0 million tons of waste rock material would be mined during the life of the Project. Mining and crushing would occur up to 24 hours per day, 7 days per week. NVV would employ up to 120 employees for the construction of the Project. During mine operations, there would be up to 120 employees with approximately 30 employees on site at any one time, including contractors.

Pending acquisition of the required permits and authorization, construction is anticipated to begin upon Plan of Operations approval, with a currently anticipated mine life of approximately 7 years. Reclamation and site closure activities would require approximately 4 years to complete. Post-closure monitoring is estimated to take up to an additional 30 years.

Figure 3. Proposed Facility Layout



This page intentionally left blank.

2.1.1 Open Pit Mining

The approximate dimensions of the pit would be 2,410 feet long (north to south) and 1,560 feet wide (east to west) (**Figure 4**). The maximum excavation depth would be approximately 280 feet below ground surface. Slope angles within the open pit would be dependent on rock strength, geologic structure, pit wall orientation, and additional operational considerations. NVV would mine 10- to 20-foot-high benches with a double-benched highwall safety catchment within the open pit. **Figure 4** illustrates the pit configuration (plan view) with the locations of two pit cross-sections. **Figure 5** and **Figure 6** illustrate cross-sections of the pit in addition to the geologic strata, ore zones, and groundwater levels.

Conventional open pit mining methods would be conducted using drilling and blasting to break up the rock. In-pit blasthole drilling would be completed with up to two Atlas Copco DM 45 series production drills (or equivalent). Blast holes would typically have a 6.75-inch diameter with bench heights of 10 and 20 feet. Blast hole drill spacing would range from 12 to 20 feet based on the material properties for each geologic unit encountered. Sub-drilling would be completed to an estimated depth of 3 feet with stemming columns of approximately 11 feet. Blasting would be scheduled at a consistent time, generally mid-day, and would be no more frequent than once per day. Revisions to these assumed parameters may be required as warranted by the availability of new geotechnical information and site conditions encountered in the field once the mine goes into operation.

Blasting components, including ammonium nitrate and diesel fuel, would be stored onsite in bins and tanks, respectively. The primary mine consumables include ANFO, the blasting agent; and diesel fuel. Utilizing a powder factor of 0.25 pounds per ton for blasting soft rock, annual ANFO usage would be approximately 400 tons per year. Explosives would be stored and used in accordance with MSHA, ATF, and Department of Homeland Security requirements, as well as any other applicable federal, state, or local statutes and regulations.

Ore and waste would be moved with loaders into 40- to 50-ton haul trucks with the ore conveyed via over-land conveyors to the HLP from the crusher. The average mine production during the 7-year mine life would be approximately 3.3 million tons of ore and waste per year. The Project would include mining approximately 24 million tons of ore material containing 66,000 tons of vanadium and 168 tons of uranium over the mine life. Approximately 2.0 million tons of waste rock material would be mined during the life of the Project.

2.1.2 Heap Leach Pad

The HLP would leach crushed and polymer-agglomerated vanadium ore from the pit. The rectangularly shaped HLP would be approximately 2,850 feet by 2,500 feet. The HLP would be developed in two phases. Phase 1 would cover approximately 3.5 million square feet and Phase 2 would cover approximately 3.6 million square feet. Based on 0.5-inch minus crushed material and using a tonnage factor of 23.5 cubic feet per ton (90 pounds per cubic foot), Phases 1 and 2 would accommodate approximately 30 million tons of ore placed to an ultimate height of 150 feet. Each Phase would be sized to accommodate approximately 15 million tons of crushed ore. **Figure 4** provides a detailed view of the heap leach facility and vertical cross-sections through the HLP. A representative cross-section of the Phase 1 and Phase 2 portions of the HLP is illustrated on **Figure 7** and a cross-section of the geologic strata that occurs in the HLP area is illustrated on **Figure 8**.

Lifts of leach material would be placed by a radial stacker to an approximate height of 15 feet. Setbacks have been incorporated into the stacking plan at each lift level to achieve a 3-foot horizontal to 1-foot vertical (3H:1V) overall slope. Due to the friable nature of the ore, agglomeration is critical to the percolation characteristics of the leach materials. Low ground pressure dozers and other small process equipment would be used to place ore. The barren solution application rate would be approximately 0.0025 gallon per minute (gpm) per square foot. Solution would be applied over a large enough area to maintain an operational flow rate of approximately 1,500 gpm through the system.

Heap Leach Pad Design

The design concept for the HLP liner includes a composite lining system consisting of the use of geosynthetic clay liner, native clayey soils, imported clayey soils and/or bentonite augment soils overlain by an 80-mil high-density polyethylene (HDPE) geomembrane liner. The HDPE geomembrane liner would be covered with a 3-foot-thick cushioning/drainage layer of liner cover material called an overliner. An integrated piping network (underdrain piping) has been included in the HLP design to enhance solution recovery and limit heads on the liner system. Overliner material would consist of crushed and/or screened suitable borrow material to serve as a drainage layer immediately over the HDPE liner.

The location for the HLP was selected to minimize earthwork cuts and fills and allow for the preservation of some of the surficial soils that would be used for growth media and closure cover material. A small knoll rock outcrop in the Phase 1 portion of the HLP would require removal prior to the construction of the HLP. Removal of this knoll would require drilling and blasting. Due to the carbonate nature of the rock formation composing the knoll, this material would be suitable for use as part of an ET cover layer for facility closure. Carbonate material would help to neutralize residual pH of the acid leached ore at the end of the life of the mine. Therefore, the material removed from the knoll would be stockpiled east of the HLP for future use as a cover material.

Surface water hydrologic and hydraulic calculations would be performed to establish design peak flows, runoff volumes, channel and underdrain capacities, minimum channel dimensions and slopes required to pass the design peak flows from the onsite storm events and solution applications. The facility layout and offsite runoff diversion system route runoff around the heap leach facility. Therefore, stormwater considerations would be dictated by precipitation falling directly on the facilities.

In addition to the Phase 1 and 2 HLP, a 3-acre “test HLP” would be constructed in the same manner as the HLP, except that it would be limited to 40,000 tons of material with a maximum height of 40 feet. It would be constructed to provide improved understanding of the hydrogeochemical dynamics of the acid heap leach process without waiting until closure of mine operations. By designing, constructing, and operating a test HLP identical to, but at a smaller scale than, the operational HLP, it would be possible to gain accurate estimates of process fluid and water flow through the heap and the resulting water quality in the draindown during all phases of mining (Espell pers. comm.).

Figure 4. Pit and Heap Leach Pad Cross-section Plan

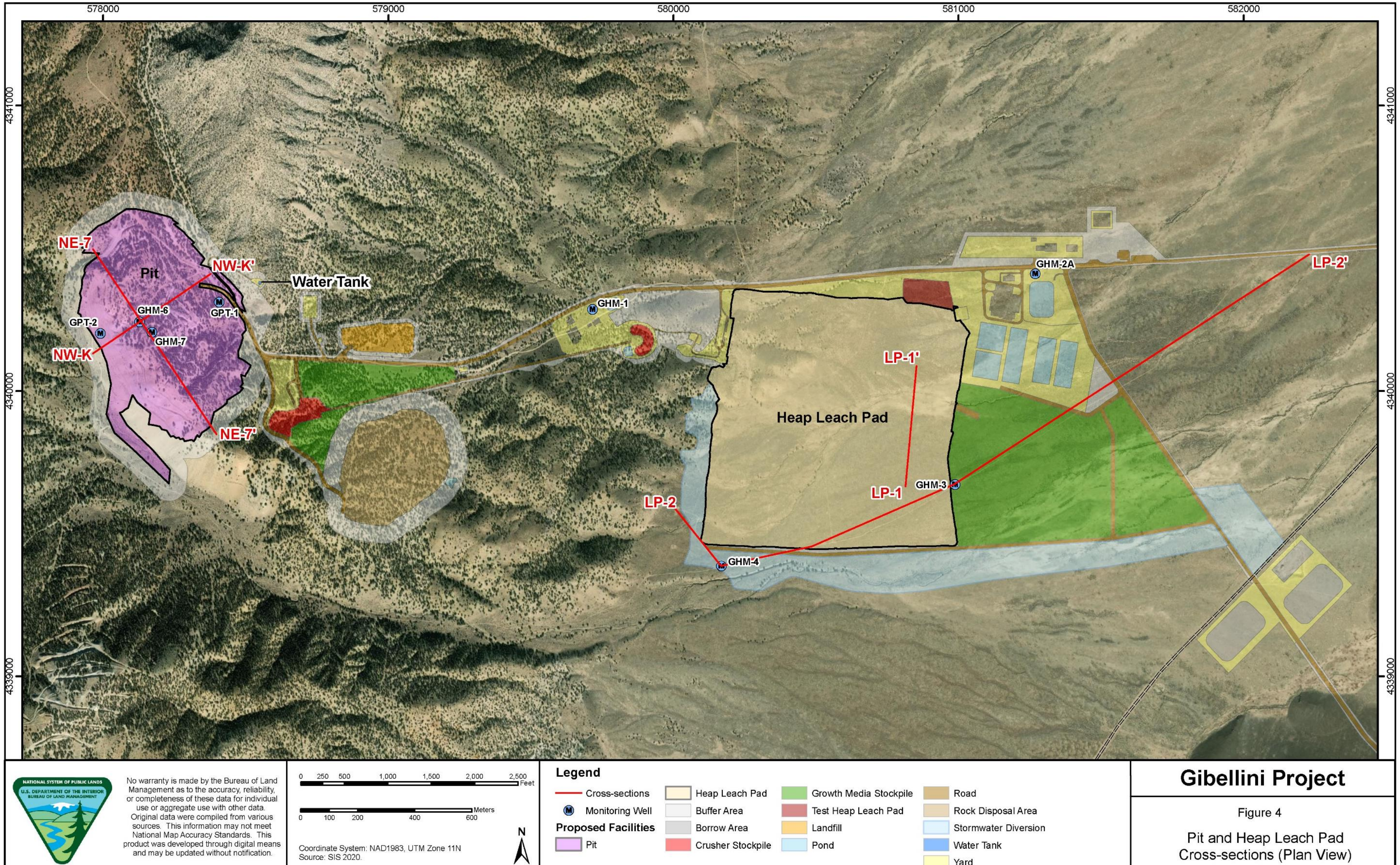


Figure 5. Pit Cross-section NE-7 to NE-7'

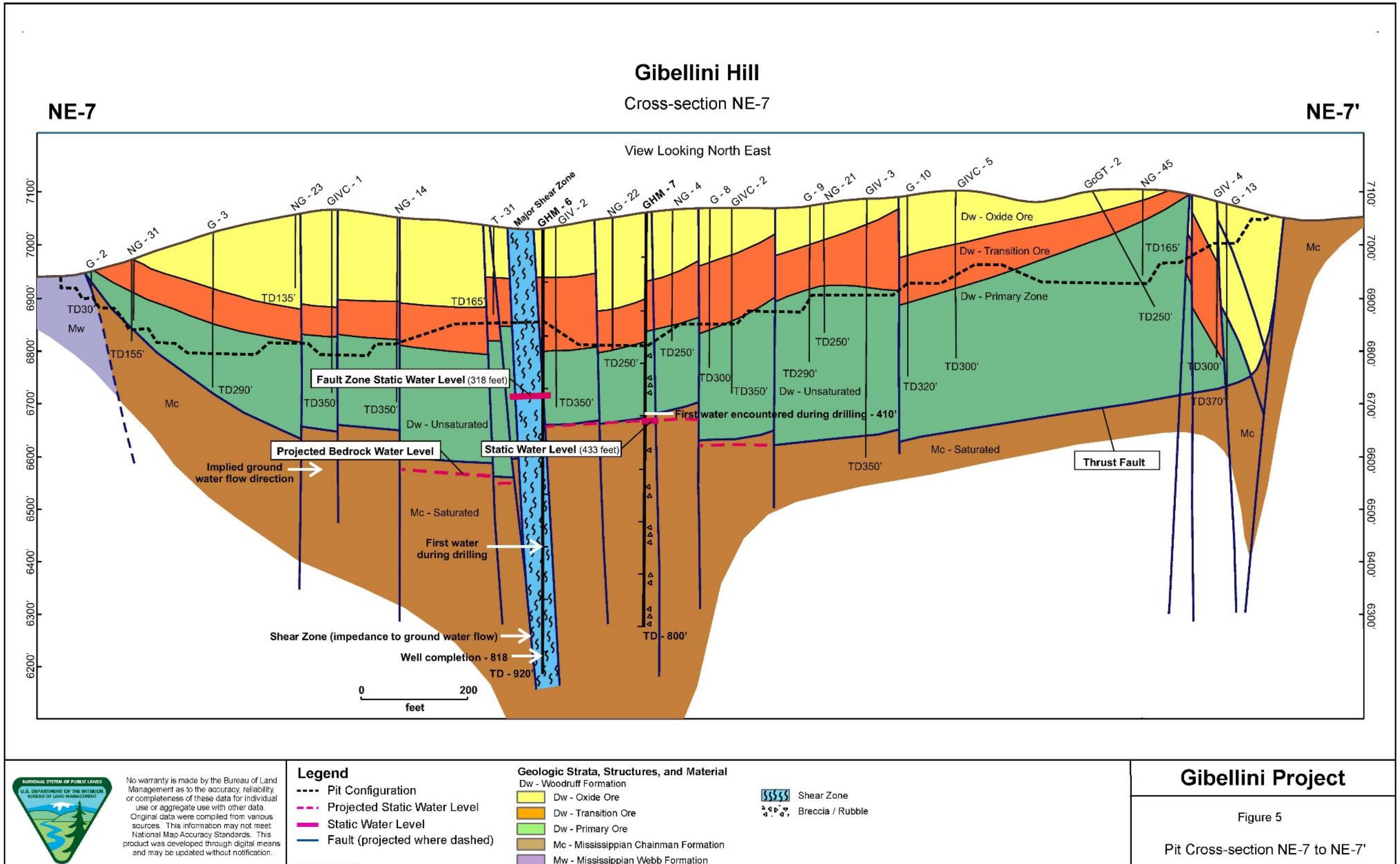


Figure 6. Pit Cross-section NW-K to NW-K'

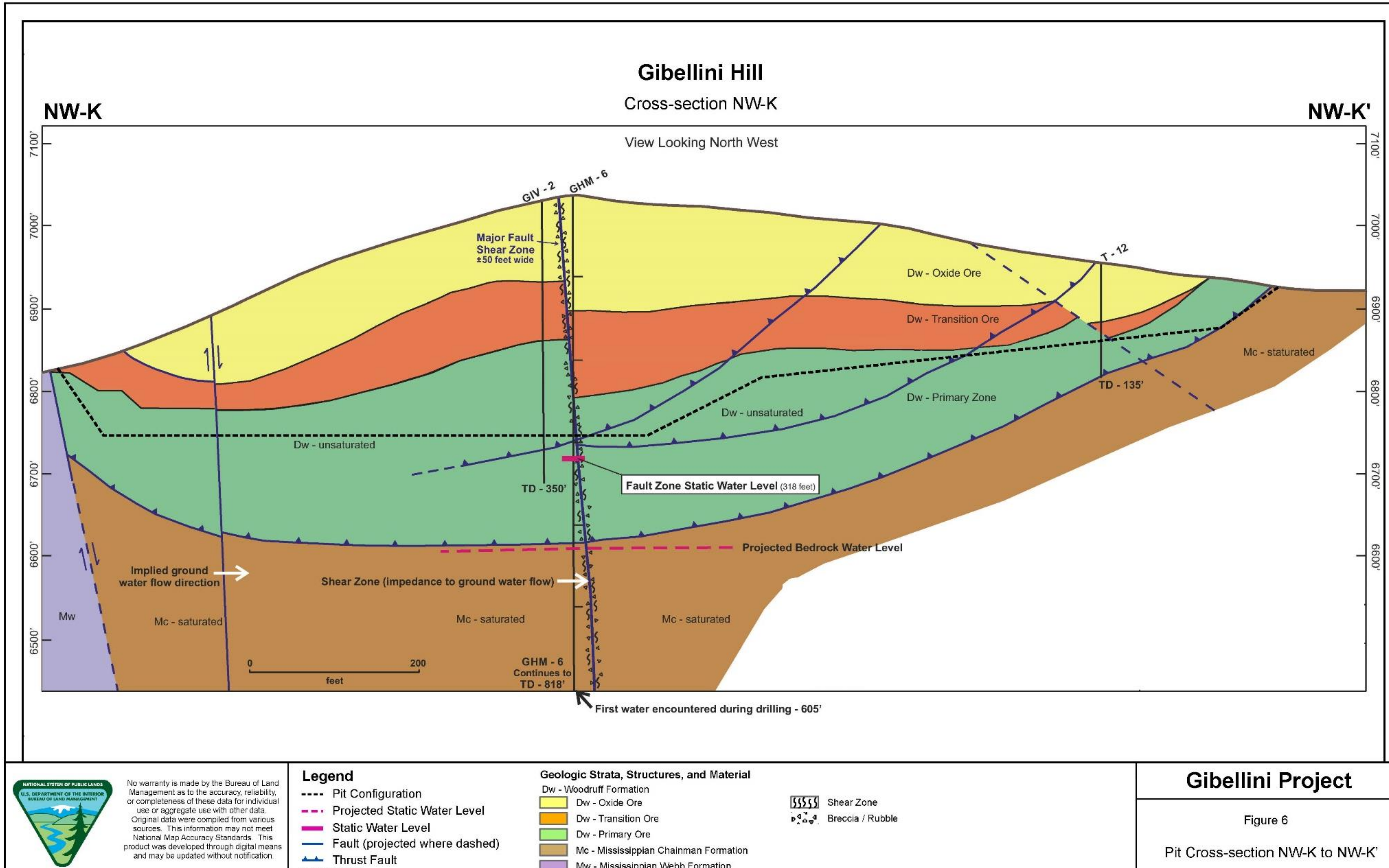


Figure 7. Heap Leach Pad Cross-section LP-1 to LP-1'

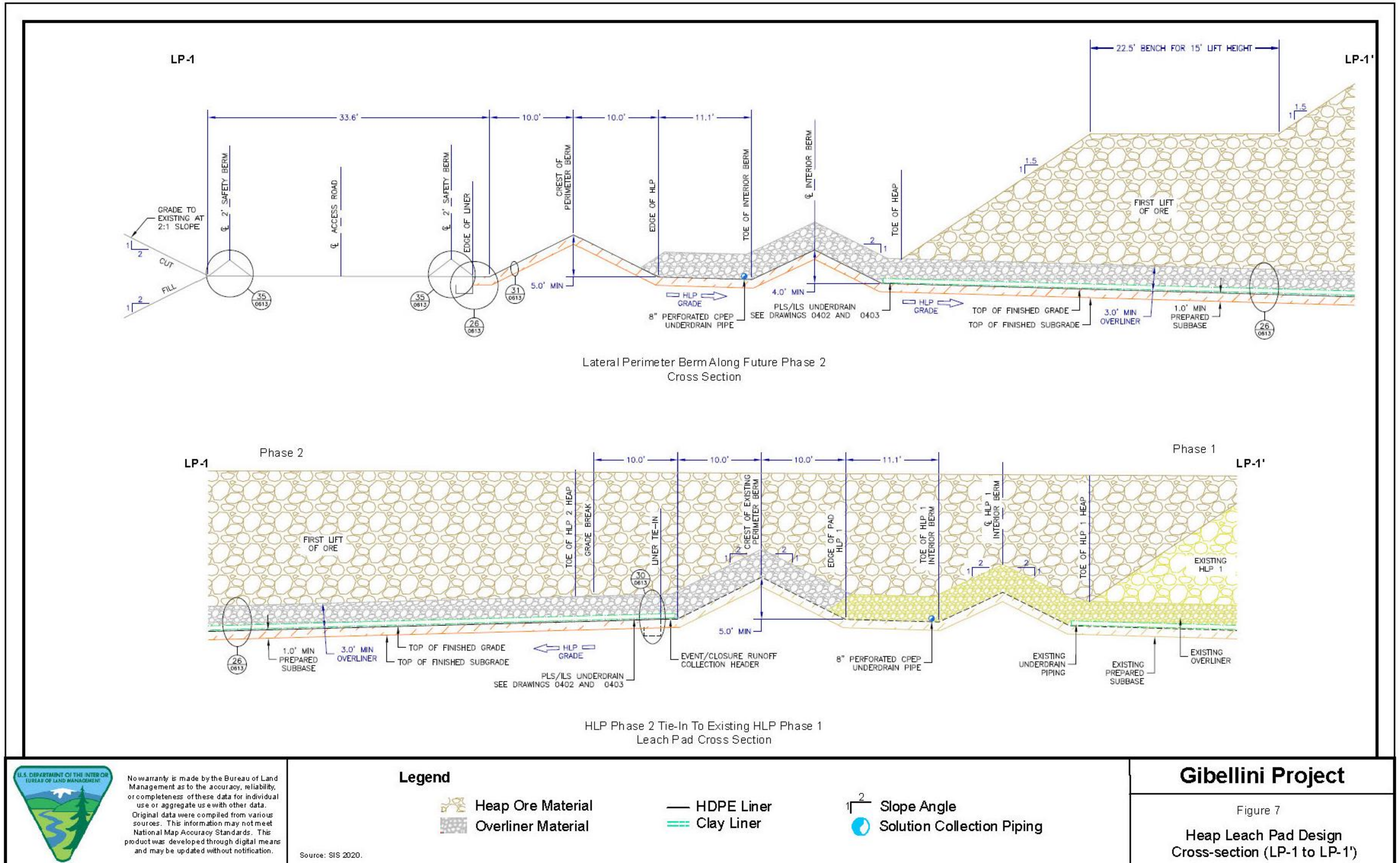
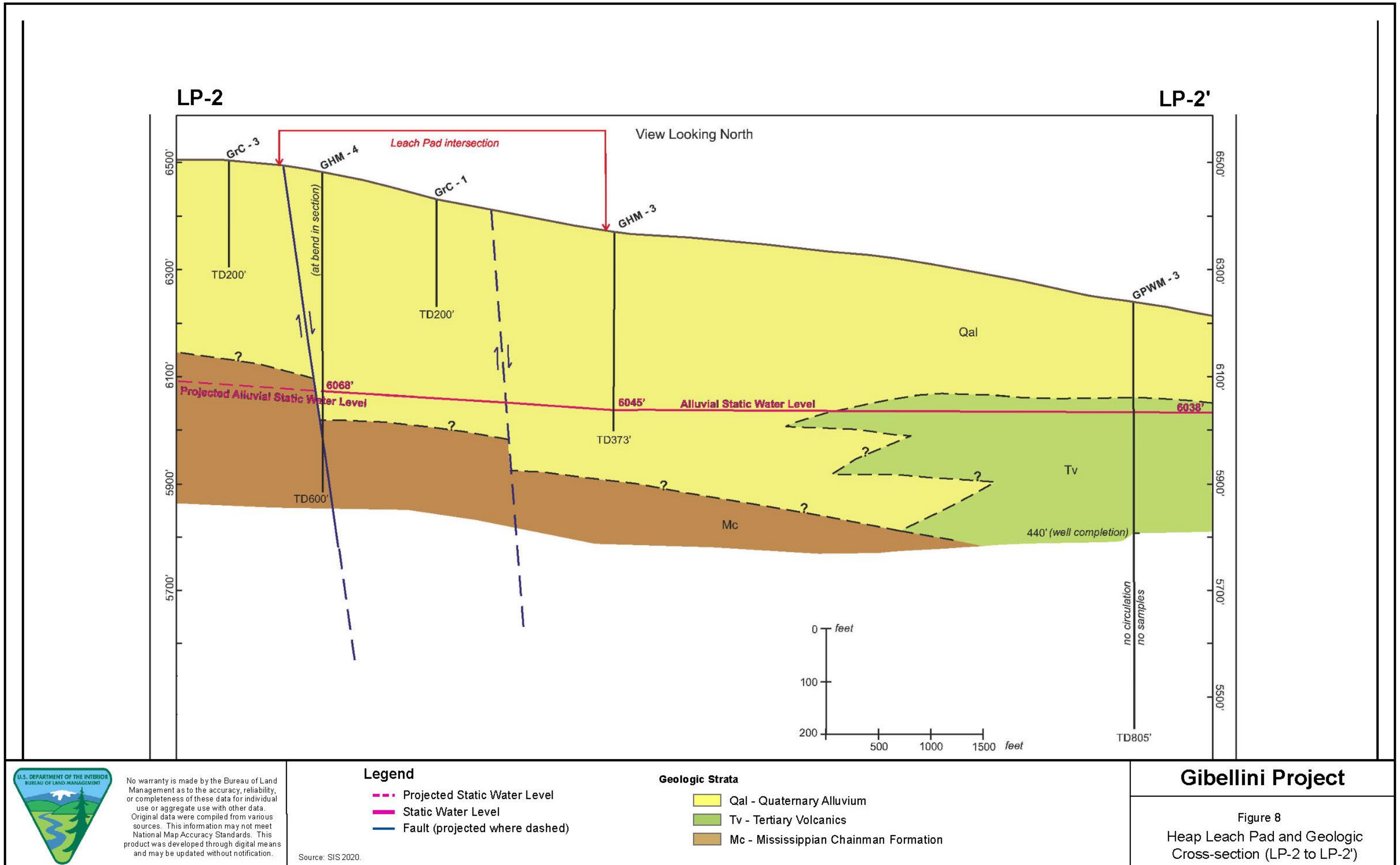


Figure 8. Heap Leach Pad Cross-section LP-2 to LP-2’



This page intentionally left blank.

Heap Leach Pad Stability

The slope stability analyses were performed using the computer program SLIDE Version 8.024 by Rocscience. The ore material would generally be friable and polymer agglomerated. The agglomeration process would consist of the application of a polymer binder that would bind the finer particles to the larger particles so that the resulting material consists of individual particles that are of higher strength and permeability. Considering the crushed ore product and 15-foot-high lifts planned for the heap leach materials, only minor segregation of the material would be expected during placement. Given the predominantly granular nature of the heap leach material, perched zones of fluids within the heaps were not considered in the analyses. The facility design incorporated a full underdrain system of granular overliner material and a network of underdrain pipes. This type of drainage system has proven to be successful at many other heap leach facilities in the region.

As is typical for geomembrane-lined HLPs, the results of the analyses indicate that the translational failure surfaces along the geomembrane liner interface are the most critical (lowest factors of safety). The results of the slope stability analyses indicate that acceptable minimum factors of safety (1.3 static, 1.1 pseudostatic under the operational basis earthquake and over 1.0 under the maximum credible earthquake used to model closure conditions) would be achieved in all cases (NewFields 2019a). The minimum pseudostatic factors of safety were all above 1.0. Seismic hazard analyses were completed to determine the operational basis earthquake and the maximum credible earthquake.

2.1.3 Rock Disposal Area

The RDA would be southeast of the open pit, was designed to accommodate approximately 2.5 million tons of waste rock during the entire life of mine, and would be built in two phases. The first phase would include 250,000 tons of waste rock and would be an end dump lift to create a buttress for the life of mine facility. The second phase would be built on top of the base of the first phase in lifts to an elevation of 6,810 feet. Each lift would be set back such that the crest-to-crest slope angle would match the final reclamation slope angle of 3H:1V to minimize regraded volumes. Non-PAG waste rock would be hauled directly from the pit to the RDA, and PAG waste rock would be placed on the lined HLP. The PAG waste rock would be comingled with the ore by using the primary crusher, after which it would be agglomerated and stacked on the HLP with the ore. **Figure 9** illustrates a vertical cross-section of the RDA.

RDA Design

The RDA has been designed to accommodate a maximum capacity of 2.5 million tons of waste rock. The waste rock material is friable and would be hauled in 40- to 50-ton trucks and end dumped to create a slope no steeper than 3H:1V. NVV would construct an unlined RDA based on the AWRMP provided as Appendix E in the Plan of Operations. The base of the RDA would be prepared by removing surface vegetation and salvaging available growth media, which would be hauled to and deposited in growth media stockpile areas. The excavated surface would be prepared by moisture conditioning and truck compaction. Berms and/or channels would be constructed around the RDA to direct stormwater runoff around the facility. Runoff from the RDA would be directed into a sediment pond that would be discharged into the natural drainage east of the RDA.

RDA Stability

The stability analysis was performed utilizing the computer program SLIDE Version 8.024 using Spencer's methods of analysis (NewFields 2019b). A translational (two-dimensional cylindrical) failure mode was considered for the predominantly granular waste rock and native granular soils. To determine the most critical failure surfaces shallow, intermediate and deep failure surfaces were evaluated for static loading conditions. A search was performed to find the most critical failure surface for each failure mode. Minimum acceptable safety factors of 1.3 and 1.1 were used for static and pseudo-static loading conditions. The results of the program indicated that based on the existing soil properties, suitable factors of safety were met. Static factors of safety were 1.7 and 1.8 for block and circular failures, respectively, and pseudostatic factors of safety were 1.1 and 1.2 for block and circular failures, respectively.

2.1.4 Ore Processing

NVV would construct a processing area that would contain a processing facility, ancillary facilities, process offices and laboratory, septic tank and leach field, and a pond system. The pond system would include the Pregnant Leach Solution (PLS) Pond, an Intermediate Leach Solution (ILS) Pond; and an Event Pond; and evaporation ponds including a Process Solution Evaporation (PSE) Pond and a PSE Overflow Pond. The ILS pond would serve as a secondary PLS pond or a way to perform leaching in series when both phases of the HLP are being used for leaching. The PSE ponds would provide a double-lined area to store excess process solutions to maintain a steady influent to the SX circuit. All five ponds have been designed to connect via overflow weirs to provide for emergency containment. **Figure 10** illustrates the overall process flow diagram.

The processing facility would contain all processing (leaching) activities. The reagent tanks would be designed and constructed on a sealed, cement slab with secondary containment and a steel building cover supported by a steel frame. The secondary containment would be designed to contain 110 percent of the volume of the largest tank or container within the area of containment (per NDEP 445A.350–447 regulations). Each containment area has been designed based on these criteria. The detailed engineering design has been included in the Water Pollution Control Permit Application, which was filed with the NDEP.

The process office and laboratory building would contain personnel offices and a laboratory to conduct analytical activities relevant to mining and processing activities. The buried septic tank and leach field would be east of the process office building. The process area septic system and leach field would be engineered, constructed, and operated in accordance with the Bureau of Water Pollution Control regulations NAC 445A.810 through 445A.925, for onsite sewage disposal systems. Once engineered and designed, an application for this system would be submitted under separate cover to the NDEP.

Figure 9. Rock Disposal Area Cross-section

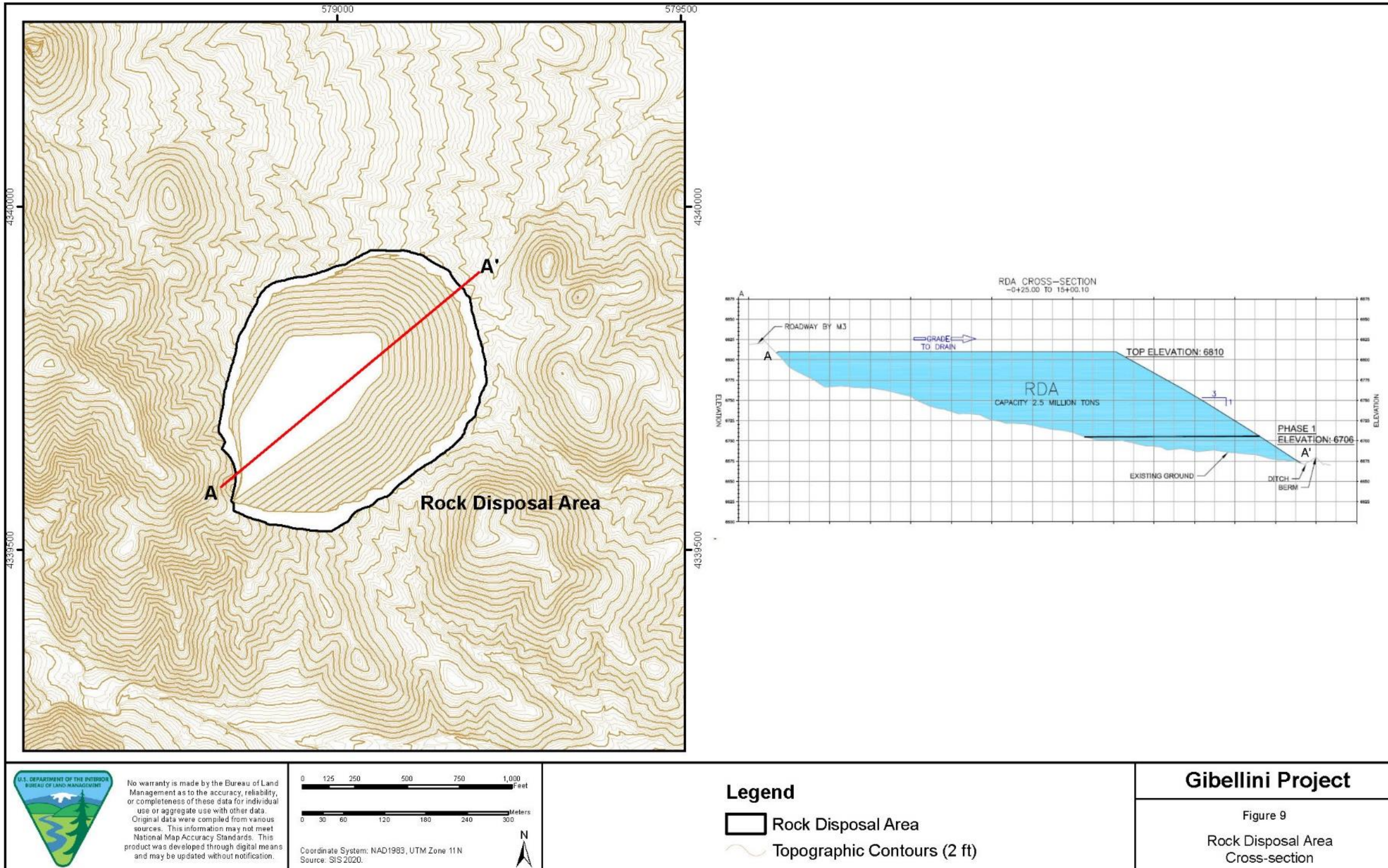
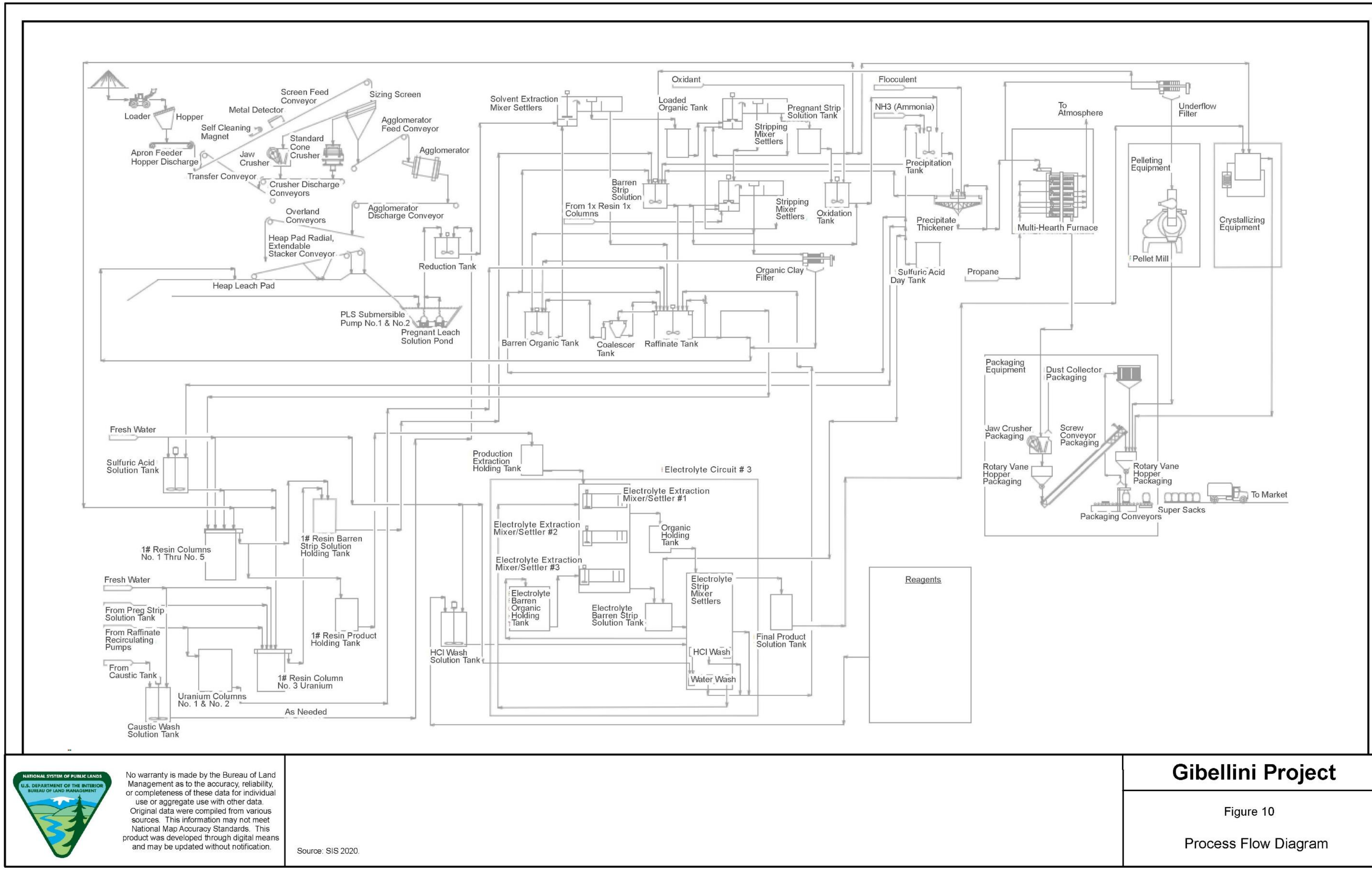


Figure 10. Process Flow Diagram



Crushing and Stockpiling

Mined ore would be transported by truck to the primary crusher facility. The ore would be dumped directly into the feed hopper for the jaw crusher, where it would be crushed to a size 80 percent passing 2 inches. The crushed material would be transported by a covered conveyor to the coarse ore stockpile. The coarse ore stockpile would have a reclaim feeder in a tunnel underneath the stockpile to feed the secondary screening and crushing plant. The secondary cone crusher would reduce the ore to a particle size ranging from 0.5 inch to 1.5 inches and would subsequently pass over a screen where undersized material would be fed via conveyor to the agglomeration drum. Oversized material would return to the secondary crusher. The agglomerated material would be transferred onto the HLP via the heap conveyor stacking system. Ore would be stacked on the heap by a series of portable grasshopper conveyors followed by an indexing conveyor and radial stacker.

Agglomeration and Leach Pad

The crushed ore would be sent to a 10,000-ton-per-day capacity drum agglomerator where the ore, concentrated sulfuric acid, polymer binder, and water (either freshwater make-up or rinsate from Phase 1) would be blended together with an acid addition rate of approximately 70 pounds per ton of ore. An acid tank and pumping system would be used in tandem with the polymer binder fresh make-up water and storage system. The agglomerated ore would be discharged onto a belt where the material would be conveyed through an overland conveyor and a series of portable conveyors to a radial stacker. The ore would be placed directly on the pad via the radial stacker. The radial stacker would have an extendable section, which would decrease the number of times the stacker would need to be repositioned. The heap stacking lift height would be 15 feet with a maximum overall heap height of 150 feet. Once sufficient material had been stacked, distribution piping would be set up and from those distribution headers. Individual drip lines would be set up to distribute solution on the heap. A leach solution would be applied to the material at a rate of 0.0025 gpm per square foot via drip emitters. The leach solution would percolate through the stacked material until it reached the composite lining system at the base of the HLP.

Heap Leaching

The ore from the stacker would be placed on the HLP and allowed to stand (cure) for a minimum of 24 hours. Once sufficient material had been stacked, distribution piping would be set up and from those distribution headers, individual drip lines would distribute leach solution.

The vanadium would be leached out of the ore by the sulfuric acid as it percolates through the stacked material. Minor amounts of uranium would also be leached into the solution. The uranium is a contaminant in the vanadium products and would need to be removed ahead of vanadium recovery. Even though the uranium concentrations in the ore would be very low, the process for concentrating vanadium would also concentrate the minor amounts of uranium in the ore. Removal of the uranium would ensure that uranium would not be further concentrated in the process and would not present any future requirements at closure.

PLS and ILS would be collected and transported to the pond system in pipelines placed in trapezoidal-shaped lined secondary containment channels. The channel lining system would consist of an 80-mil HDPE textured geomembrane liner placed on a prepared subgrade. The PLS and ILS would be pumped from the PLS Pond and ILS Pond, respectively, to the process building for vanadium recovery.

The ILS circuit would be used when there would be a transition from one phase to the next phase. Once the ore on the preceding phase had been completely leached, the ILS system would be shut down until the next transition.

Rinsing of the completed Phase 1 portion of the HLP would occur concurrently with active leaching of the Phase 2 portion of the HLP where the sulfuric acid leachate would be recovered. After the cessation of mining and active leaching activities, both heaps would be allowed to drain and active volume reduction of the fluid inventory from the heaps would begin. Regrading of both heaps to the final reclamation slopes of 3H:1V would occur with the north- and south-facing interior slopes of Phases 1 and 2 being graded further to fill the gap between the Phases 1 and 2 to provide drainage of the top surface of the heaps to the ponds. The entire top surface of the regraded pad would then be lined with an 80-ml HDPE liner to use as an evaporation surface during the active water reduction phase. The evaporation system would consist of a network of mechanical water evaporators set in approximately 2 feet of gravel over the 91 acres of HDPE-lined top surface of the HLP. Active management of solution reduction activities would occur for approximately 3.1 years. During the active solution reduction phase, a water treatment system would be utilized that would first use lime treatment to raise the pH to 4.5 S.U. followed by a sulfate-reducing bioreactor (SRB) biological treatment system to reduce contaminants so that draindown could be evaporated in the evaporation cells (E-cells) during the active fluid management and during the semi-passive fluid management phase. The SRB biological treatment approach is being used as a polishing step,[1] during which salts and sulfates would be removed, at the final heap draindown stage that would enhance the evaporation rate and longevity of the E-cells. During the active fluid management phase, a split stream of approximately 30 gpm of draindown solution would be treated through the SRB and then blended back into the draindown collection ponds, which would eliminate evapoconcentration of salts during the active fluid reduction phase. This treatment system would then treat all the draindown during the semi-passive period of final draindown. Conversion of existing process ponds and evaporation ponds to E-cells is anticipated to occur during the last year of the active solution reduction phase followed by an additional 30 years of semi-passive treatment and evaporation of the final heap draindown in the E-cells. The active fluid reduction phase would occur until the draindown flow is less than 24 gpm, at which point the E-cells would evaporate all the draindown flow. At this point, the active evaporation system on the surface of the HLP would be removed and an 80-mil HDPE liner would be placed over the gravel covered HDPE liner to encapsulate the salts collected in the evaporation gravels. Three feet of soil cover would then be placed over the entire regraded HLP (Phases 1 and 2). An estimated 30-year post-closure management and monitoring period would be assumed for the Project during the semi-passive water reduction phase.

A site-specific analysis of E-cell evaporation rate was performed using nearby pan evaporation data; from that analysis, the E-cells are conservatively assumed to evaporate water at a rate of 2.0 gpm per acre. The total E-cell surface area is 11.9 acres, resulting in an E-cell treatment capacity of 23.8 gpm. The heap draindown would be treated prior to entering the E-cells so that, in the event of overtopping

[1] Based on these reactions the following secondary reactions (sulfate reduction to sulfide is the primary reaction) would occur: (1) Metals such as iron, zinc, copper, lead, cobalt, mercury and arsenic are removed by the sulfides formed from sulfate reduction. These metal sulfides are very insoluble and very stable. (2) Selenium and vanadium can be reduced to their zero valent metal state. (3) Uranium and manganese are removed as carbonate minerals from the bicarbonate produced in the reaction.

of the E-cells, the treated water would be at or near water quality standards so ecological risks would be minimal. The ponds and later E-cells would overflow from the PLS Pond to the ILS Pond to the Event Pond to the PSE Pond; therefore, the total capacity can be summed, equaling 34.1 million gallons of capacity before addition of sand/gravel for conversion to an E-cell. Assuming 30-percent porosity of the sand and gravel material added to the E-cell, the total E-cell solution capacity would be 10.2 million gallons. The Event Pond capacity (8.48 million gallons) was designed to contain the runoff and infiltration from a 100-year, 24-hour storm event plus direct precipitation falling on the pond. Therefore, the 10.2-million-gallon capacity of the E-cells should be sufficient for the 100-year, 24-hour storm event. **Figure 11** shows the solution management plan phases from operations through closure.

Process Ponds and Evaporation Ponds

The process ponds would work together as a system with process and stormwater being contained in the pond system. Under normal operating conditions, solution would discharge directly from the HLP through a piping network that discharges into either the PLS Pond or the ILS Pond depending upon solution grade. Solution would be pumped directly from each pond into the processing plant. During events that may interrupt processing conditions, such as a power loss or storm event, solution would fill the PLS Pond and the ILS Pond. Once the maximum solution capacity of these ponds had been reached, spillways connected to these ponds would then convey and discharge the solution into the Event Pond.

A spillway would also connect the Event Pond to the PSE Pond that in turn would discharge solution into the PSE Overflow Pond to provide extra containment flexibility. It is anticipated that a minimum water ballast would be maintained in the PLS Pond and ILS Pond and the remaining maximum operating inventory may be split between the PLS Pond and the ILS Pond in varying percentages at the discretion of NVV.

The selected design requirements for the pond system include process solution storage for ballast/operating inventory and solution storage for a 48-hour power outage divided between the PLS Pond and ILS Pond with a return flow rate of 1,500 gpm. In order to achieve a return flow rate of 1,500 gpm, solution would be applied at 1,650 gpm to account for an anticipated solution loss of 10 percent due to evaporation and ore adsorption. The design solution application rate would be 0.0025 gpm per square foot.

The lining system for the ponds would consist of an 80-mil HDPE primary liner, an 80-mil HDPE secondary liner, and a geonet drainage layer. Each pond would have an independent leak detection system consisting of a lined sump constructed at the lowest point in the pond bottom and monitored using an inclined riser consisting of an HDPE pipe, which would allow for operational flexibility should it become necessary to perform routine maintenance and repairs to the ponds and pumps. Because the ponds work as a system, as long as the total operational inventory has not been exceeded in the process pond system, all design requirements would be met.

The design includes the use of ballast water to protect the PLS Pond and ILS Pond liner system from wind uplift. Sand tubes or other appropriate ballast would be used for the Event Pond and evaporation ponds, although an allowance for the accumulation of meteoric water has been incorporated into the design of these ponds.

The solution in the process ponds would be covered with bird balls to prevent exposure, and an 8-foot-tall woven wire or chain-link fence would be constructed around the pond area to prevent wildlife access, in accordance with NVV's Artificial Pond Permit.

Solvent Extraction Process

The SX process would include the extraction of vanadium from the PLS into organic extractants from which the metals can be concentrated. Uranium must be first removed from the PLS to avoid contamination of the recovered vanadium. Therefore, the SX process would consist of two SX circuits: the first circuit would utilize Di-(2-ethylhexyl) phosphoric acid to extract uranium, and the second circuit would utilize the SX organic phase to extract vanadium.

Uranium Recovery

The first SX circuit would be the uranium recovery circuit. The uranium would be recovered from the process by treating the organic before it would be returned to the extraction circuit. This circuit contains four stages of extraction mixer/settlers, one cleaner cell, and two stages of uranium-stripping cells.

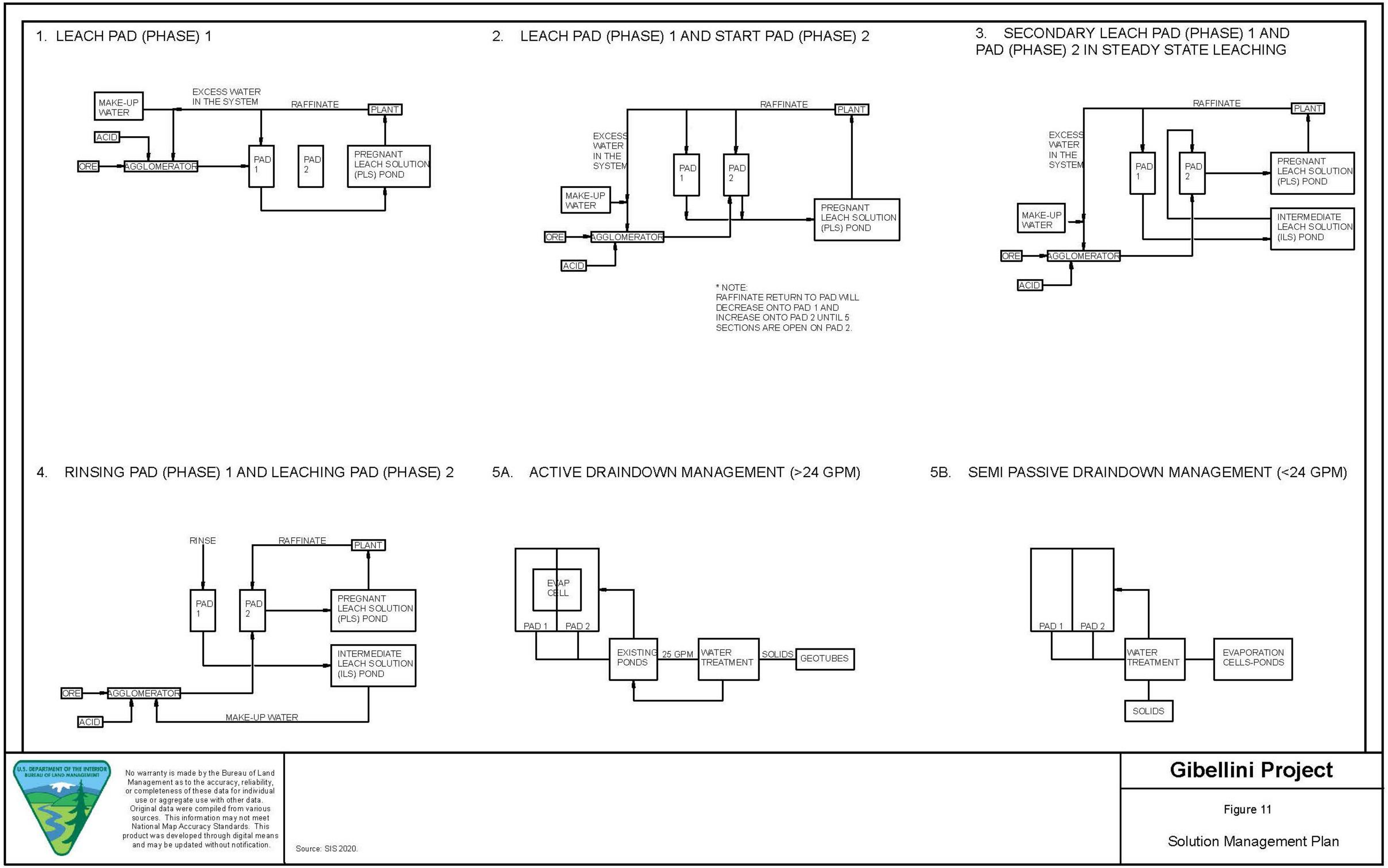
The uranium-loaded organic would be cleaned by stripping impurities out of the organic using hydrochloric acid. The uranium would be extracted from the organic phase solution using sodium carbonate to produce a clean uranium concentrate. The barren organic would be scrubbed with sulfuric acid prior to being returned to the last cell of the uranium recovery circuit, and the vanadium-bearing aqueous solution would advance to the vanadium SX circuit. The concentrated uranium would then report to the sodium diuranate (SDU) precipitation stage.

Sodium Diuranate Production and Uranium Product Production

The SDU circuit would be fed uranium-rich liquor from the carbonate strip in the uranium recovery SX circuit for the SDU precipitation stage. SDU precipitation would be conducted in a series of agitated tanks with the addition of caustic (sodium hydroxide) solution. The SDU precipitate would be thickened and filtered in preparation for purification by re-dissolving with concentrated (6M) sulfuric acid in a series of agitated tanks. The uranium purity would then be further enhanced in a fluid-bed precipitation unit to which both hydrogen peroxide and caustic soda would be added followed by filtration, filter pressing, and drum packaging of the yellowcake product. Only in the SDU circuit would the uranium concentration exceed the regulatory threshold for permitting by the Nevada Division of Health. A separate permit from the Nevada Division of Health would be issued for this portion of the process.

The uranium extraction process would occur in a room devoted to that purpose. The uranium would be filtered from the treated organic (treated with 15 percent ammonium carbonate), the uranium would be retained in the filter, and the organic and ammonium carbonate solution would be sent to a tank. The cake from the filter press would be emptied into a hopper and the recovered uranium would be packaged in 55-gallon drums as "wet yellowcake" (more than 0.05 percent atomic mass unit by weight; more than 15 percent moisture) and would be ready for transfer. Approximately 50,000 pounds of uranium would be produced annually. Normal access to the room would be through an interior door from a change room equipped with personal protective equipment, radiation surveying equipment, and decontamination supplies. Alternate access would be through an exterior door for forklift access to allow for loading of yellowcake drums onto trucks for shipment.

Figure 11. Solution Management Plan



This page intentionally left blank.

The uranium extraction room would be equipped with a sump that pumps collected fluids back to the filter press for recovery of the uranium. The sump would not have an exterior discharge and all associated equipment would be above the sealed concrete floor to facilitate decontamination and eventual decommissioning.

Although the normal process would only utilize uranium in solution or as wet filter cake, it is possible that any leaks or spills may dry out and lead to dispersible uranium. The normal process would be to promptly wash down leaks or spills to the sump for recycling to the filter press, thereby minimizing the potential for dry airborne contamination. The ventilation system for the room would have a filtered exhaust to prevent the spread of airborne uranium and would be maintained at a slight negative pressure except during truck-loading operations to prevent the spread of any potential airborne contaminants. Any stack emission points would be included in the NDEP Class II Air Quality Permit.

The uranium would be placed into transport containers and shipped by truck to the end user. The frequency of uranium shipment would be approximately every 2 months to minimize onsite storage.

Vanadium Recovery

The vanadium in the treated PLS from the uranium circuit would pass into the SX circuit for uranium-free vanadium recovery into the organic phase. The vanadium recovery SX circuit would be similar to the uranium circuit in that it would have four extraction mixer/settlers, two strip cells, and one conditioning cell. When the solutions separate in the last settler, the water phase would be sent to the raffinate tank (tailing from the SX).

The raffinate from the tank would be re-acidified and sent back to the HLP where it would restart the leaching cycle. The raffinate tank would be equipped with a skimmer that reclaims any oil phase that became entrained within the raffinate solution.

Vanadium Products Production

The vanadium from the strip circuit would be treated with ammonia and the initial vanadium product (ammonium polyvanadate) would be produced. This product would be thickened and centrifuged before it would be calcined into V_2O_5. That V_2O_5 would then be packaged and sent to the end user.

To produce ammonium meta vanadate (AMV), the ammonium polyvanadate would be dissolved in caustic and the vanadium would be reprecipitated with ammonia to produce AMV. The final solids would be washed and thickened so they can be filtered to remove the water. The AMV would then be dried at about 400 degrees Celsius to eliminate any residual moisture prior to bagging the AMV in super sacs for shipment. The solution from the thickener would be sent back to the strip circuit where vanadium would be loaded again.

The final products that would be produced include AMV, V_2O_5, and high-purity V_2O_5. Storage of the final solid vanadium products would be in super sacs in the product storage building, which would be connected on the north side of the process building. The vanadium would be inventoried when 100 tons had been accumulated (approximately 8 days). The vanadium would then be loaded onto flatbed tractor trailers (approximately five) and shipped to the railhead to be transported to the end user.

2.1.5 Ancillary Facilities

Class III Waivered Landfill

Industrial solid waste would be generated during construction and operations. NVV would apply for a Class III waivered landfill permit within the Project area through the Solid Waste Branch of the NDEP. The landfill would be approximately 6 acres in size and constructed north of the RDA, as shown on **Figure 3**. The Class III waivered landfill site would comply with the standards for location, design, construction, operation, and maintenance set forth in NAC 444.733 to 444.747. Solid wastes generated by the offices, shop, mine, and process departments would be collected in dumpsters near the point of generation. The landfill would accept materials in accordance with the Class III waivered designation and a sign would be posted outside the area listing the materials that would be accepted or not accepted. A training program would be implemented to inform employees of their responsibilities in proper waste disposal procedures associated with the Class III waivered landfill, which would include but not be limited to:

- Disposal of hazardous wastes, liquid wastes, and petroleum products would be separated from solid wastes.
- Used antifreeze would be collected and stored in a “Used Antifreeze” tank at the truck shop. Used antifreeze would be sent to a recycling facility via a contract trucking company licensed to haul spent fluids.
- Used oil would be collected and stored in a “Used Oil” tank at the truck shop. Used oil would be tested to determine its status prior to shipping to a recycling facility or other appropriate destination.
- Used aerosol cans would be emptied in satellite accumulation can-puncturing devices in the shop and mill building, core shed, mine operations building, and other areas where aerosol cans are used extensively.
- Used haul truck tires would be placed in specific locations within the RDA and buried. Only one layer of tires would be placed at the base of the interior portion of each bench so they would not be exposed during regrading of the dump during reclamation. Tire placement would maintain a minimum setback of 100 feet from the crest of the dump lift to ensure the tires are not exposed.
- Used oil filters would be drained prior to being crushed and disposed at the landfill. Alternatively, used oil filters may be recycled.
- Used containers that held reagents or petroleum products can be disposed if fully drained and crushed.

The landfill would be inspected daily and would be compacted or covered with soil as necessary to prohibit trash from blowing outside the area and prevent other vectors from accessing the refuse. A fence would be installed around the landfill to secure the area.

2.1.6 Electrical Generation and Power Supply

Power Usage

The anticipated electrical load for the Project would be as follows:

- Connected load: 3.8 megawatts (MW);

- Average load: 3.0 MW; and
- Power factor: 95 percent.

Power Supply

The Project would connect with the 69-kV power line that currently provides power to the Pan Mine. The 24.9-kV Gibellini power line would extend approximately 13 miles to the Project area from a tie-in point along the Pan Mine power line in Section 20 of T16N, R54E (**Figure 2**). A segment of the power line would be buried (approximately 3 miles). The power supply for the water pumps near the Fish Creek Ranch would be provided by the incoming 24.9-kV power line to the mine site.

Main Substation

The main substation would be within the fenced portion of the Project area, north of the access road and main office. This substation would be accessed by Mt. Wheeler Power Company personnel via a gated access road into the substation. A wooden pole distribution line within the Project area would connect the following areas:

- Process building;
- Administration offices;
- Crushing, agglomeration and acid storage/distribution area;
- Heap leach conveying and stacking;
- Mine facility area;
- Powder silo; and
- Water distribution pump-house.

All electrical equipment, motors, control panels, field devices, relays control system components and cabling systems would be approved for the environmental and hazardous conditions in which the equipment would be installed. All oil-filled electrical equipment (e.g., transformers, switch gear) would be certified polychlorinated biphenyl–free before being brought on site.

Emergency Power System

Site emergency power would be provided through a standby power generator rated for the maximum power required in the event of a utility power failure. The control of the emergency power loads would be through the process control system, which would automatically start and stop loads to keep process pumps operating to prevent spill and overflows, keep tanks properly agitated, and run the equipment such as fans for safe ventilation.

Uninterruptable power supplies would be used to provide backup power to critical control systems. This equipment would be sized to permit operations to shut down and back up the computer and control systems, to facilitate startup on restoration of normal utility power. Emergency battery power packs would supply backup power to the fire alarm system and emergency egress lighting fixtures.

2.1.7 Explosives Storage Area

The explosives storage area (powder silo) would be north of the RDA and associated containment pond (**Figure 3**). Access to the explosives storage area would be strictly limited to designated personnel. Explosive agents would be purchased, transported, stored, and used in accordance with

ATF, Department of Homeland Security provisions, and MSHA regulations. Explosive agents, boosters, and blasting caps would be stored within a secured area. Signs would be posted clearly defining the area and hazards associated with the area. Explosives and any explosive related materials would be kept in ATF-approved standard explosives magazine and secured with fencing around the area.

2.1.8 Hazardous Waste and Petroleum-Contaminated Soil Storage Area

NVV would construct a storage building inside a fenced area with a concrete containment pad at the mine building facility location and designate it as the 90-day hazardous waste storage facility in accordance with the RCRA and NDEP Bureau of Waste Management (**Figure 3**).

NVV would obtain a Hazardous Waste Identification Number from the U.S. Environmental Protection Agency although the mine is anticipated to be in the "small quantity generator" category as defined by the agency. NVV would develop a SHWMP identifying all wastes generated at the site and their appropriate means of sampling, management, and disposal. The 90-day hazardous waste storage area would be constructed north of the warehouse area in the northwest corner of the warehouse and laydown area. The building would be constructed with a concrete pad with containment stem walls and a ramp to assist the loading and unloading of drums. A chain-link fence would encompass the area to ensure security. Proper signs would be posted for the area in accordance with RCRA, which would include, but not be limited to, emergency personnel contact information, chemical hazards present, and spill cleanup procedures. An emergency spill kit would be present for personnel to safely manage spills accordingly.

NVV would build and manage a petroleum-contaminated soil (PCS) storage area per the *Guidance for Mine Site Petroleum-Contaminated Soil (PCS) Management Plans* (NDEP 2009). The storage facility would consist of a sloped, concrete pad with stem walls to allow for storage of the PCS until the material has been shipped off site to a permitted disposal facility. Roll-off bins would be placed near the mine facility shop area and, once bins are full, the contractor would replace the bin and haul away the PCS to the PCS storage area in accordance with the PCS management plan. NVV would post proper signs around the bins regarding the types of materials stored, which may be placed into the roll-off bins. Signs would also be placed on the bins indicating their contents.

2.1.9 Fencing

Fences would be constructed around 413 acres of the process facility and associated ponds, HLP, RDA, and other areas to prevent access by livestock, wildlife, wild horses, and the public. Fences would be constructed according to BLM fencing standards per BLM Handbook 1741-1. In areas where a higher level of security would be needed, chain-link fences would be constructed.

2.1.10 Borrow Areas

Rhyolite Hill Borrow Area

Rhyolite material, which would be used for overliner, riprap, roads, and infrastructure, was identified from outcrops approximately 1 mile southeast of the Project area (**Figure 3**). The borrow source area would be in Section 7, T15N, R53E. The road to the borrow source area would cross Fish Creek Road in Section 6, T15N, R53E. Access to the borrow source area would be from a haul road (Rhyolite Haul Road), which would connect the main access road to the borrow source area. Borrow material would be drilled and blasted, then hauled to the borrow pit stockpile where it would be screened and/or crushed screened and subsequently stored in the borrow pit crushed rock stockpile (**Figure 3**).

The proposed maximum highwall for the borrow area would be 40 feet and the slope angle would be 35 degrees or less. The material resource estimate for the borrow pit includes sufficient material to provide crushed material for roads, platforms, laydown areas, and the HLP. With proper mining, the borrow pit would be expected to yield over 3 million cubic yards of usable material (NewFields 2019c). Borrow material not suitable for overliner material, road surfacing material or riprap would be stockpiled for future ET cover material.

Evapotranspiration Cover Borrow Area

Final closure of the HLP would include the installation of an ET cover with a design thickness of 3 feet. The final ET cover design is described in the Design of Soil Covers Technical Report. The ET cover material would be composed of hydrologically suitable materials that have the capacity to store and release water through ET. Initial test work has shown that several sources of ET cover material would be available on site including soils and alluvial materials stripped from the HLP and process facility areas prior to construction, blasted rock from the knoll within the surface disturbance areas prior to HLP construction, and carbonate waste rock. Based on material testing completed in the borrow areas, the cleared and excavated material would consist of sandy silt or silty sand with gravel. Initial hydrologic modeling has been completed to determine that approximately 975,000 loose cubic yards of ET material would be required to cover the HLP, based on a 3-foot ET cover thickness. ET cover stockpiles are illustrated as growth media stockpiles in **Figure 3**.

2.1.11 Stockpiles

Growth Media

During ground clearing and grubbing operations, an average depth of 12 inches of growth media would be stripped, salvaged, and stockpiled. Growth media stockpiles would be placed in designated areas within the Project area to the nearest associated mine component. The stockpile associated with the RDA would be placed southeast of the facility and downslope of the stormwater diversion structures. Growth media stockpiles would be sized to accommodate the amount of growth media obtained from nearby surface disturbance areas associated with various mine components. Growth media would be hauled and placed in growth media stockpiles, which would range in height from 40 to 80 feet. Growth media stockpiles would have 3H:1V slopes instead of the natural angle of repose (1.5H:1V) slopes. **Figure 3** illustrates the proposed locations for the growth media stockpiles. A total of 1,789,300 cubic yards of growth media would be needed for reclamation and 1,892,500 cubic yards would be available within the Project area, which would be salvaged and stockpiled. The greatest amount of growth media would be required to provide 3 feet of ET cover on the HLP, which would require 975,000 cubic yards of growth media.

Ore Stockpile

A compacted, soil-lined, temporary coarse ore stockpile would be constructed west of the HLP area. The crusher coarse ore stockpile would include approximately 64,000 tons of primary crushed material. Stormwater diversion channels would divert surface water run-on from the ore stockpile while runoff from direct precipitation would be conveyed into the compacted, soil-lined pond north of the stockpile pad. Existing ground underneath the stockpile would be cleared and grubbed of 12 inches of growth media and then lined with a 12-inch soil liner prior to construction of the structural fill.

Structural fill material would be excavated from the surrounding area and compacted in lifts to form the base of the stockpile. Four feet of overliner rock would be placed on the finished grade to protect the liner, minimize rutting, and control dust.

An emergency loadout area would be developed between the primary crusher and overland conveyor, which would only be used if the overland conveyor is down for maintenance and the coarse ore stockpile has been depleted. Any water runoff from the stockpile area would be pumped to the pond near the coarse ore stockpile or the lined HLP area.

2.1.12 Stormwater Diversion and Management

Stormwater diversion channels would divert stormwater away from the Project facilities. The locations of these diversion channels are shown in **Figure 3**. Cross-sections of the stormwater diversion channels are shown on **Figure 12**.

Surface water hydrologic and hydraulic calculations were performed by NewFields and were documented in the report titled *Climate Data and Surface Water Hydrology* (NewFields 2019d) and included in Appendix Q of the Plan of Operations. The hydrologic modeling program HEC-HMS version 4.2.1, developed by the U.S. Army Corps of Engineers (USACE 2017), was used to evaluate design peak discharges for the 500-year recurrence interval (NDEP Closure Standard). Resulting peak discharges for the 500-year, 24-hour storm event were then used to determine stormwater diversion channel dimensions using Manning's formula for open channel flow.

NewFields used the National Oceanic and Atmospheric Administration Atlas 14-point precipitation data to identify the 500-year, 24-hour precipitation amount for the Project area to be 3.06 inches, based on the centroid of the HLP.

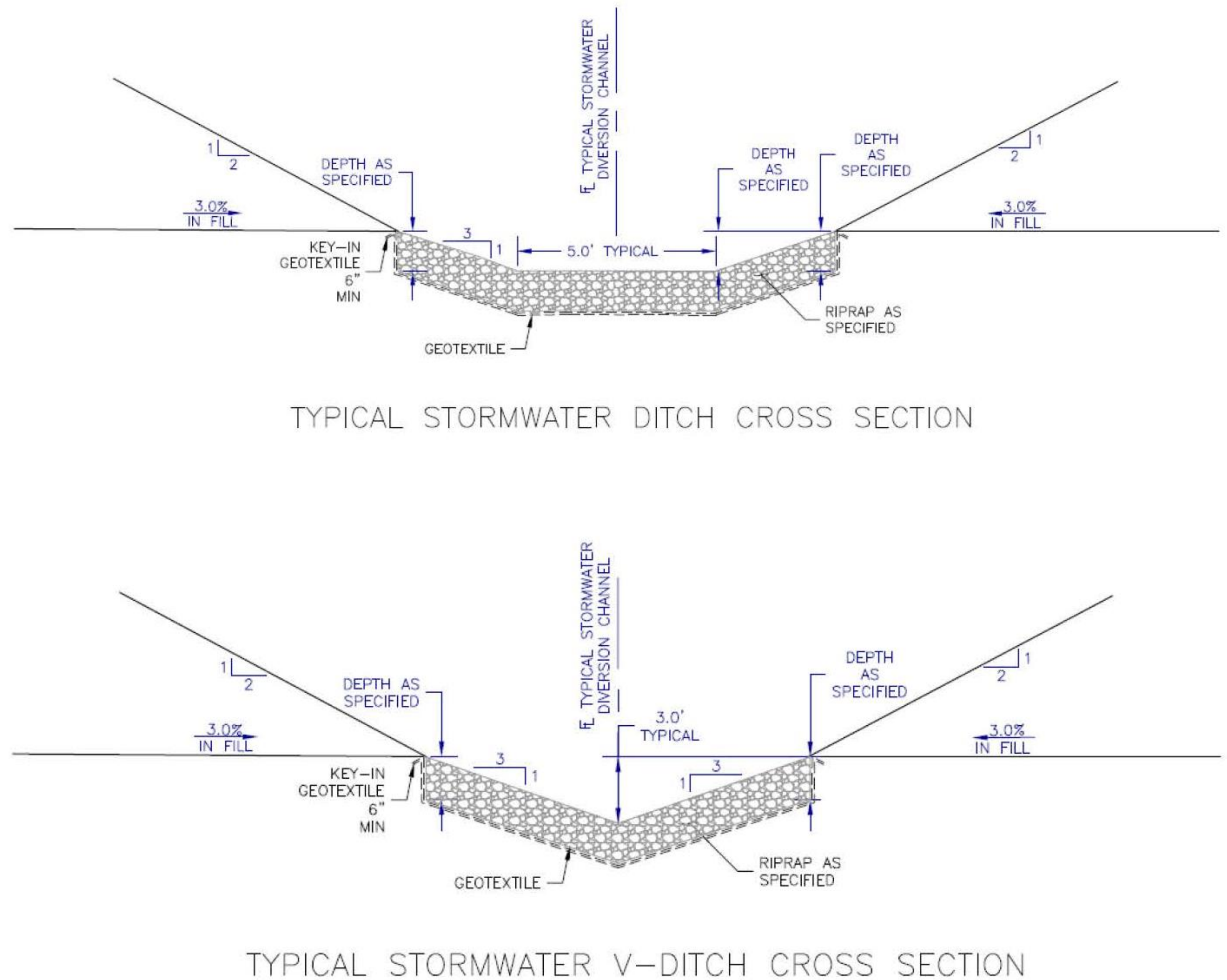
Channel Design

Hydraulic elements designed as part of this Project include channels (ditches) and culverts. Culverts and channels were designed under steady state conditions using the Federal Highway Administration programs. These programs calculate the normal depth for a given structure and typically results in conservative values.

Hydrologic and hydraulic calculations were performed to establish design peak flows and runoff volumes from up-gradient watersheds that would be diverted around the HLP. Stormwater diversion channels were designed to transport flow around the facility and discharge into natural drainage courses. The stormwater diversion channels associated with the construction of the HLP facility were designed to accommodate the peak flow from a 500-year, 24-hour storm event.

Conceptually, the diversion channels would consist of V-ditches or flat-bottomed trapezoidal channels with 3H:1V side slopes (maximum) with 0.5 feet of freeboard during peak design flow conditions. Sediment controls, including riprap, sediment ponds, detention basins, and energy dissipation structures, have been incorporated into the facility design, as appropriate.

Figure 12. Stormwater Diversion Channel Cross-sections



U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

Source: SIS 2020.

Gibellini Project

Figure 12

Stormwater Diversion Channel Cross-sections

This page intentionally left blank.

2.1.13 Sediment Basins

Sediment basins would be constructed in locations that would capture runoff and sediment during precipitation events within the Project area. The location of these basins is shown on **Figure 3**.

2.1.14 Ponds

The Project would include the construction of the following ponds:

- Fresh Water/Make-up Water Pond;
- Coarse Ore Stockpile Pond;
- RDA Sediment Pond;
- Truck Shop/Wash Containment Pond;
- PLS Pond;
- ILS Pond;
- Event Pond;
- PSE Pond; and
- PSE Overflow Pond.

NVV would apply for Industrial Artificial Pond Permits from the NDOW. Chain-link fencing would be constructed around the process ponds to prevent wildlife access. All ponds that contain solutions potentially lethal to volant wildlife would be fenced and covered with bird balls to prevent exposure.

Any pond or individual ponds that would be connected via spillways with a capacity of 20 acre-feet above the natural ground surface or with a maximum embankment height of 20 feet or more would require a dam safety permit administered through the Nevada Division of Water Resources.

Fresh Water/Make-up Water Pond

A make-up water pond used to store freshwater for use in leaching activities and for construction water and dust control would be constructed northeast and downslope of the HLP. The pond has been designed to store approximately 8,000,000 gallons of freshwater. The pond would be single-lined with an 80-mil HDPE liner.

RDA Sediment Pond

The RDA would have a sediment pond constructed east of the facility, which would allow monitoring of any stormwater runoff from the RDA in accordance with the AWRMP. In addition, this pond would minimize potential sediment loads from discharging into natural drainages.

Truck Shop/Wash Containment Pond

The Truck Shop/Wash Containment Pond would be east of the truck wash, emergency generator pad, and hazardous waste containment. This pond would be lined and would collect any runoff from the truck shop pad and/or any water contaminated with hydrocarbons. Water in the Truck Shop/Wash Containment Pond would be treated using an oil skimmer, oil-water separator, and water filter and then reused in the truck wash. The design of the truck wash system would be included in the Engineering Design Report of the NDEP Water Pollution Control Permit application.

Process Ponds and Evaporation Ponds

Ore processing facilities associated with the Project have been designed as zero-discharge facilities: all fluids introduced into the facilities would be contained or evaporated. The pond system would consist of process ponds including the PLS Pond, an ILS Pond, and an Event Pond; and evaporation ponds including a PSE Pond and a PSE Overflow Pond.

The pond system would be east of the HLP. The PLS Pond and ILS Pond capacities were based on a 48-hour power loss event with a nominal leach solution return rate of 1,500 gpm split between the two ponds. These ponds have been designed to accommodate an operating inventory of 5 to 8 feet; direct precipitation from a 100-year, 24-hour storm event; and maintain 3 feet of freeboard. The Event Pond has been designed to contain the runoff and infiltration from a 100-year, 24-hour storm event, plus direct precipitation falling on the pond surface, plus 3 feet of freeboard. The two evaporation ponds would each have half the capacity of the event pond. Rather than building these ponds at closure, NVV would construct them for operations to provide additional emergency storage for the process solutions to ensure containment under the most severe conditions. During both operations and at closure, water would flow from the ponds to the PLS Pond, ILS Pond, Event Pond, and finally to the two evaporation ponds.

The ponds would be double-lined with 80-mil HDPE geomembrane liner with an intermediate geonet drainage layer. Any potential leakage in the primary liner would flow to a depressed sump at the low point in the pond bottom, which would be monitored using an inclined riser consisting of an HDPE pipe. This leak detection system would eliminate pipe penetrations through the pond lining system.

2.1.15 Mine Facilities and Offices

The main office building would be a pre-engineered building installed on a concrete foundation. The main office building has been designed to accommodate approximately 20 staff personnel. A parking lot has been designed to accommodate employees, contractors, and visitor vehicles in addition to mine shipments via tractor trailers. An unmanned electric gate would be installed with a scale house to provide entry into the mine site. Traffic control signs and road berms would be placed immediately inside the entry gate to switch vehicles to left-hand traffic control. In addition, a ready line would be energized and would include parking for heavy equipment.

A fenced yard area associated with the warehouse would be used to store and manage larger or bulk shipments of materials, parts, and equipment. Good housekeeping practices would be maintained in this outer area, including but not limited to the following practices: use of pallets to keep materials and equipment off the ground, ample space between aisles in the yard, proper signs for designated areas, and designated parking areas for warehouse equipment within the yard.

2.1.16 Septic Systems

Three septic systems and associated leach fields would be constructed in the Project area. A septic system would be constructed east of the process office building, northeast of the office complex, and east of the mine shop facilities. The septic systems would be engineered, constructed, and operated according to Bureau of Water Pollution Control regulations at NAC 445A.810 through 445A.925 for onsite sewage disposal systems. Once engineered and designed, an application for this system would be submitted under separate cover to the NDEP.

2.1.17 Fuel Storage and Dispensing Station

A fuel facility to accommodate the haul trucks, large mobile equipment, and light-duty vehicles would be designed and constructed within the mine facility area. Two 10,000-gallon aboveground storage tanks would be used to store diesel fuel, and two 2,000-gallon aboveground storage tanks would be used to store regular unleaded gasoline and on-road diesel. All the tanks would have secondary containment engineered to contain 110 percent of the largest tank’s capacity. The containment would include a sump to collect spilled materials. The fueling pad for light vehicles would be constructed with a concrete pad and sloped to a secondary containment area to capture any spills. The large mobile equipment fueling pad would be a concrete pad, which would slope to the secondary containment, designed to capture any spills associated with fueling activities.

2.1.18 Truck Shop, Warehouse, and Truck Wash

The truck shop would be constructed with two large repair bays for heavy equipment and one smaller bay for light vehicles. One overhead crane would service both heavy equipment repair bays. An area would also be designated for lube oil storage and other lubricants necessary for shop facilities. Proper health and safety signs would be posted for these areas. Bulk quantities of fuels and reagents would be stored in primary (tanks, tote bins, barrels) and secondary containment to prevent releases to the environment. The secondary containment would hold at least 110 percent of the largest container or volume of containers in series. Used oil and coolant would also be stored at the maintenance building in lined containment. A licensed contractor would confirm characterization of the spent materials and either recycle or dispose in accordance with state and federal regulations. Used coolant and oil would not be mixed. Used containers would be disposed or recycled according to federal, state, and local regulations. Flammable cabinets would also be used for storage of aerosol cans containing hazardous components.

The warehouse would be constructed west of the main office along the main access road. A fenced yard area would be part of the warehouse facility to manage larger or bulk shipments of materials, parts, and equipment. Good housekeeping practices would be maintained in this outer area, including but not limited to the following practices: use of pallets to keep materials and equipment off the ground, ample space between aisles in the yard, proper signs for designated areas, and designated parking areas for warehouse equipment within the yard.

The wash bay would be a separate facility that would be constructed north of the shop building. The source water for the single vehicle wash bay would be from the freshwater pond northeast of the process plant. Water in the truck shop/wash containment pond would be treated using an oil skimmer, oil-water separator, and water filter and then reused in the trick wash. A 2,000-square-foot concrete slab would be constructed north of the truck shop for heavy equipment tire changes. A thick, concrete slab would be constructed to accommodate the bearing pressure from haul trucks and the bearing pressure of jack stands.

2.1.19 Water Needs and Uses

Water Usage

The estimated water use for the Project would be approximately 500 gpm 24 hours per day, 365 days per year for mine use. There would be some seasonal variability to mine water consumption mainly due to evaporative losses from road watering and process solution ponds during the summer season. Peak water requirements would occur during the summer when both water for mine dust suppression and construction would be required. An 8.0-million-gallon make-up water pond would be constructed within the Project area for use during peak usage periods.

Water Supply and Pipeline

Water for the Project would be supplied by the Fish Creek Ranch and pumped from a 15,000-gallon buried water transfer tank immediately south of the ranch to the Project area via a water pipeline. The pipeline would be within the proposed north-south power line alignment corridor for approximately 6.25 miles to the Project area (**Figure 2**).

Prior to digging a trench for the pipeline, the top 6 to 12 inches of growth media would be stripped and windrowed on one side of the pipeline trench and the remaining soil would be excavated from the trench and placed on the other side of the trench. Once the pipe has been installed, the trench would be backfilled to the ground surface, and growth media would then be spread back over the trench. The pipeline would terminate immediately inside the Project area boundary and would fill the 8.0-million-gallon mine make-up water pond. Pipeline construction would occur within a 20-foot-wide corridor, which also would include the power line alignment. The construction corridor would be utilized for the movement of construction vehicles, storage, and pipeline fusing operations. A Water Management Plan (Appendix L of the Plan of Operations) has been developed, which describes the proposed diversion and pipeline for the Project water supply.

2.1.20 Access and Other Roads

Haul, Secondary, and Mine Roads

Roadways are designed to minimize disturbance and balance cut and fill volumes, all while minimizing steep grades and sharp curves. All roads would be kept to a maximum 10-percent grade with cut and fill volumes balanced based on allowing for the top 1 foot of material within the footprint of the roads to be stripped and hauled to growth media stockpiles located strategically around the site. All haul and light vehicle roads would be unpaved.

One-Way Light Vehicle Roads

One-way light vehicle roads would be used by light vehicle/light support equipment for construction/ maintenance purposes. They would be seldomly used, low speed (less than 30 mph), and rarely maintained by the mine personnel. These roads would have an operating width of 12 feet and a shoulder width of 5 to 6 feet. These roads would be used for access to areas such as the fire water tank and coarse ore conveyor, and for maintenance of site utilities (i.e., power lines and waterlines), stormwater diversion channels, and ponds. In specific areas, such as along the coarse ore conveyor that runs from the Primary Crusher to the Coarse Ore Stockpile, the one-way road would have designated pullouts every couple hundred feet in order to allow traffic to pass any maintenance vehicles working on the conveyor. **Figure 13** provides a typical cross-section view of the main access road to the Project area.

Two-Way Light Vehicle Roads

Two-way light vehicle roads would be constructed and used as the primary roads for light vehicle/light support equipment travel within the Project area. The roads would be used to access primary infrastructures and be heavily traveled by mine personnel. Travel speeds would approach up to 30 mph. These types of roads are considered critical to the mining operation and therefore would be constructed with sub-base/wearing course to minimize downtime due to maintenance. Thicknesses of sub-base/wearing course would vary from 1 to 2 feet, dependent on vehicle usage. These roads would have an operating width of 24 feet and a shoulder width of 5 to 6 feet. The crusher access road, acid tank access road, mine facility roads, process facility roads, and prill silo road would be constructed as two-way light vehicle roads. These roads would be designed to meet rural county standards.

The Proposed Action would upgrade Eureka County Road M-104 (**Figure 2**). The turn-off alignment onto M-104 from Fish Creek Road was moved south from the existing intersection to avoid a cultural resource site at the intersection of Fish Creek Road and M-104.

Mine Haul Roads

A mining contractor would construct the mine haul roads and associated infrastructure with a 40- to 100-ton class loader/truck fleet. The running width of the haul roads would be approximately 40 to 50 feet with an additional 9- to 15-foot-wide shoulder on either side of the road to account for safety berms and drainageways. The main haul road connecting the pit to the crusher (main haul road), temporary haul road, mine facility haul road, and Rhyolite Hill Borrow Area road would be constructed to meet MSHA haul road standards.

2.1.21 Work Force

NVV would utilize either their own work force or hire contractors for mine construction, operation, reclamation, and post-closure activities. The combined manpower for mine operation would be approximately 113 employees, composed of seven contractors and 106 staff. NVV would prefer to hire staff from towns in the Project region. **Table 8** identifies the anticipated workforce.

Table 8. Mining Personnel

Description	Number of Personnel
Mine Superintendent	1
Shift Supervisor	4
Mining Engineer	1
Geologist	1
Surveyor	1
Maintenance Supervisor	1
Drilling and Blasting[1]	7
Loading	4
Hauling	12
Roads & Dumps	8
Mechanics and Electricians	22
Maintenance Labor	4
Total Mining Personnel	66

[1] Blasting would be completed by a contractor typically using a three-man blasting crew.

The mine would operate on two 10-hour or 12-hour shifts per day, 365 days per year. The mine would require a total of 113 staff distributed over three to four shifts with approximately 30 staff on the day shift and 20 staff on the night shift. The number of staff would vary based on the mining schedule and haulage requirements. Processing manpower would include crusher, agglomerator, and conveyor operators; SX Plant workers; and laboratory managers and technicians (**Table 9**). A total of 34 staff would be needed for processing operations. An additional six staff would provide general and administrative support to the mine (**Table 10**). The combined manpower for mine operation would be approximately 113 employees, composed of seven contractors and 106 staff. NVV would prefer to hire staff from towns in the Project region.

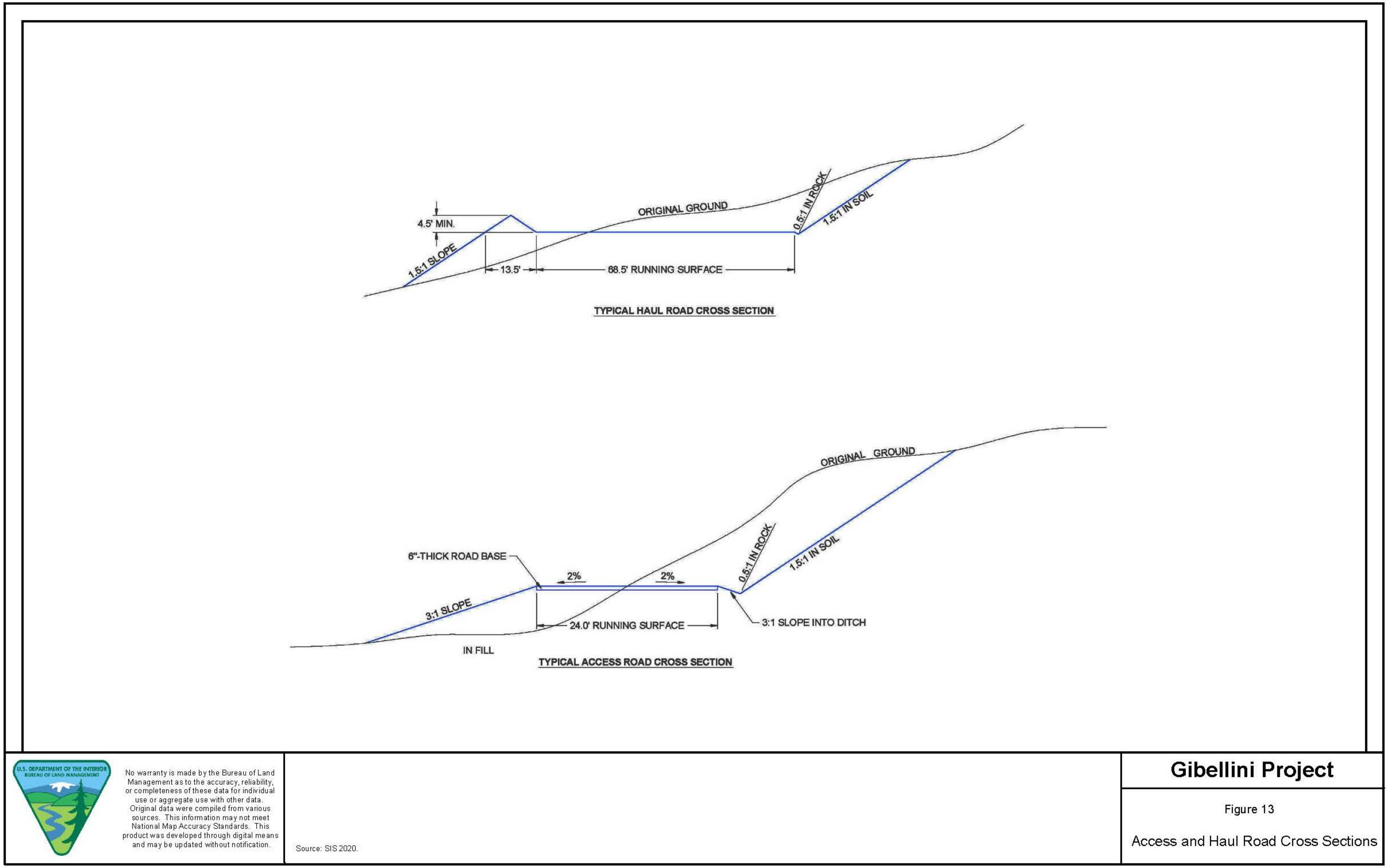
Table 9. Processing Staff

Unit	Number of Personnel
Plant Superintendent	1
Metallurgist	1
Shift Foreman	4
Clerk	1
Crushing and Agglomeration	8
Heap	2
SX	8
Assay Laboratory	3
Maintenance	6
Total	34

Table 10. General and Administrative Personnel

Description	Number of Personnel
General Manager	1
Accountant	1
Purchasing Agent	1
Environmental Manager	1
Safety Manager	1
Clerk	1
Total	6

Figure 13. Haul Road and Access Road Cross-sections



This page intentionally left blank.

2.1.22 Exploration Operations

NVV is currently conducting exploration activities to identify new resources or expand existing reserves within the Project area under previous authorizations. Current exploration and mineral evaluations have been focused within and on federally administered land that has been the subject of mineral exploration and development activities dating back to the 1940s. Additional exploration surface disturbance would occur for the Project and would generally include construction of access roads, drill pads, sumps, trenches, surface sampling, bulk sampling, and staging areas. Exploration methods would include both reverse circulation and core drilling, with minor trenching also planned. Exploration activities may also include monitor well installation. Future exploration would include drilling activities within the Project claim area (not including the linear access road, power line, or utility corridor), as illustrated in **Figure 2**.

Exact locations of the exploration disturbance have not yet been determined. A total of 46 acres of exploration surface disturbance would occur: 23 acres of road disturbance (50,000 linear feet of drill road with an average surface disturbance width of 20 feet), 22 acres of drill site disturbance (300 drill pads with an average surface disturbance area of 40 feet by 80 feet), and approximately 1 acre of surface trenching (3,000 linear feet of trench with a surface disturbance width of 15 feet). Placement of drill holes would be guided by reserve requirements, geotechnical studies, and geochemical sampling. The roads and pads would be sited to avoid any identified cultural resources. If additional disturbance for exploration activities would be necessary, an amendment to the Plan of Operations and revision to the reclamation bond cost would be prepared and submitted to the BLM for review and approval. NVV would provide the BLM and NDEP with annual documentation of surface disturbance locations for the exploration activities and any completed concurrent reclamation as required by NRS 519A on or before April 15 of the following year.

2.1.23 Reclamation

Reclamation of disturbed areas would be completed in accordance with BLM and NDEP regulations. The purpose of 43 CFR 3809, Surface Management, is to prevent unnecessary or undue degradation of public land by operations authorized by the mining laws. Anyone intending to develop mineral resources on public land must prevent unnecessary or undue degradation of the land and reclaim disturbed areas. This subpart establishes procedures and standards to ensure that operators and mining claimants meet this responsibility and provide for the maximum possible coordination with appropriate state agencies to avoid duplication and to ensure that operators prevent unnecessary or undue degradation of public land by operations authorized by the mining laws. The State of Nevada requires that a reclamation plan be developed for any new mining Projects and for expansions of existing operations (NAC 519A). The State also requires decontamination the area of any residual radiation beyond background levels and a return to unrestricted use pursuant to NAC 459.3178.

The reclamation measures to be utilized by NVV for the Project are described in the following sections. The intent is to reclaim areas within the Project area to a beneficial post-mining land use, prevent unnecessary degradation of the environment, and reclaim disturbed areas to ensure visual and functional compatibility with surrounding areas. The proposed post-reclamation land use is intended to allow for continued use of the Project area for livestock grazing, wildlife, and recreational use.

Final reclamation of the Project area would occur at the end the Project although every effort would be made to identify concurrent reclamation opportunities during the life of the operation. Reclamation would begin within the Project area when the surface disturbance has been deemed inactive and would no longer be used. Revegetated areas would be monitored for erosional stability and revegetation success, during the spring or fall, for a minimum of 3 years until attainment of the revegetation success criteria has been met (BLM 2016). Reclamation activities would be coordinated with the BLM and BMRR, as necessary.

Reclamation of Heap Leach Pad and Ponds

Heap Leach Pad

The HLP would be constructed in two phases (Phases 1 and 2) on one common liner so that concurrent closure would begin immediately after vanadium recovery ceased in the Phase 1 area and the Phase 2 area is being actively leached. Sequential heap closure steps would include rinsing of the Phase 1 area to recover acid for active leach of the Phase 2 area, regrading of Phase 1 and 2 areas to a 3:1 slope after completion of active leach on the Phase 2 area, construction of lined evaporation surface on the top surface of Phase 1 and 2 areas, solution volume reduction, 3-foot-thick cover placement, and long-term draindown solution management (**Figure 14**).

Operational and Concurrent Closure Phases

The HLP would have six distinct operational and concurrent closure stages (**Figure 11**):

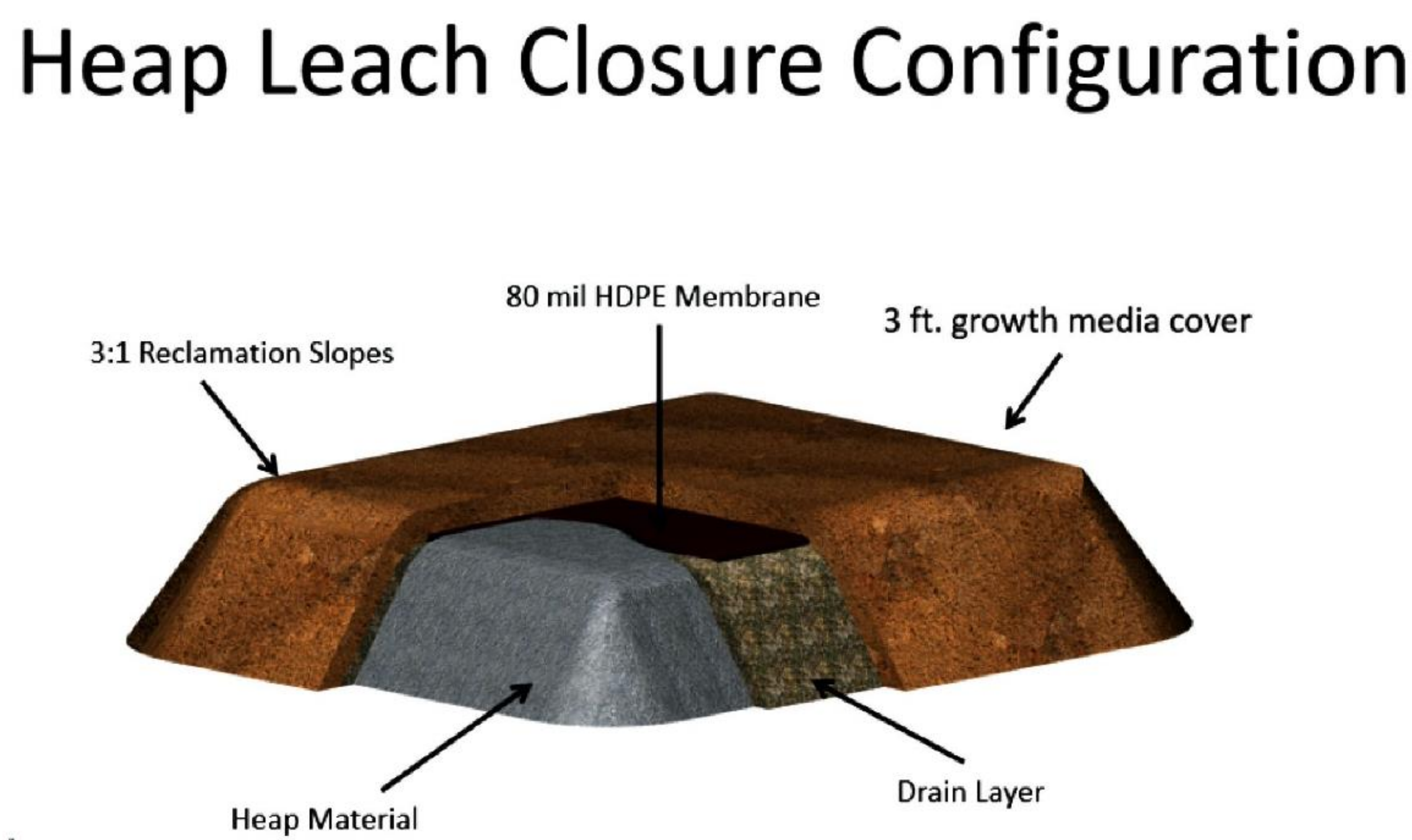
Stage 1: Phase 1 Area Active Leaching. The crushed ore would be sent to a drum agglomerator, where the ore, concentrated sulfuric acid, polymer binder, and freshwater would be blended and then conveyed to the Phase 1 area. Raffinate from the process plant would be pumped to the pad for active leaching and collected in the PLS pond to be sent to the process plant. This phase would continue until the Phase 1 area had reached capacity.

Stage 2: Phase 1 Active Leach and Begin Stacking Phase 2. The stacking of crushed ore in the Phase 2 area of the HLP would begin as soon as the Phase 1 area is stacked to its full capacity. The initial leaching of the Phase 2 area would overlap with final leaching of the Phase 1 area.

Stage 3: Phase 1 Area Secondary Leaching and Phase 2 Area Active Leaching. Secondary leaching of the Phase 1 area would occur during stacking and leaching of the Phase 2 area. New ore would be combined with make-up water from the freshwater supply and sulfuric acid in the agglomerator, which would then be conveyed to the Phase 2 area. The raffinate from the process plant would be pumped up and distributed to the Phase 1 area for completing the secondary leaching process. The solution collected from Phase 1 area would come from the ILS Pond where it would then be pumped up to the Phase 2 area. The solution from the Phase 2 area would be collected in the PLS pond and sent to the process plant. This phase would continue until the economic recovery of vanadium had been completed in Phase 1 area.

Stage 4: Rinsing of the Phase 1 area and Acid Recovery for Active Leaching of the Phase 2 area. Make-up water from the freshwater supply would be pumped to the Phase 1 area to rinse the heap and recover the contained acid and any residual vanadium. The rinsate that would drain from the Phase 1 area would then be pumped up to the agglomerator for make-up water needed with the new ore and combined with the sulfuric acid. The ore would be stacked on the Phase 2 area and leached with the raffinate from the process plant. The solution from the Phase 2 area would be collected in the PLS pond and sent to the process plant. Rinsing of the Phase 1 area would continue until active and secondary leaching of the Phase 2 area had been completed.

Figure 14. Heap Leach Pad Closure Configuration



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Source: Nevada Vanadium 2020

Gibellini Project

Figure 14

Heap Leach Pad Closure Configuration

This page intentionally left blank.

Stage 5A: Draindown of Phase 1 and 2 areas with Active Fluid Reduction. After the cessation of active leaching activities, both heaps would be allowed to drain and active volume reduction of the fluid inventory from the heaps would begin. Regrading of both heaps to the final reclamation slopes of 3H:1V would occur with the north- and south-facing interior slopes of the Phase 1 and 2 areas being graded further to fill the gap between the areas to provide drainage of the top surface of the heaps to the ponds. During regrading, the spent heap leach material would be graded over the liner in the solution collection channel and the regraded toe would intersect with the inner berm of the solution collection channel. This would protect the liner from additional reclamation activities but also ensure full containment of the draindown solutions. The entire top surface of the regraded Phase 1 and 2 areas would then be lined with an 80-ml HDPE liner to use as an evaporation surface during the active water-reduction phase. The evaporation system would utilize the process piping network to pump draindown solution to a network of mechanical water evaporators set in approximately 2 feet of gravel over the 91 acres of HDPE-lined top surface of the HLP. The evaporation pad would be bermed along the perimeter of the HLP with a drainage channel to be constructed on the downhill side that would allow excess water to drain directly back to the process solution ponds.

Active management of solution-reduction activities would occur for approximately 3 years as determined using the Heap Leach Draindown Estimator model. During the active solution-reduction phase, a water treatment system would be installed, which would consist of a combination of lime addition to raise the pH to 4.5 followed by an SRB biological treatment system to reduce contaminants so that the water from the biological treatment cell could be managed in the E-cells during the active and semi-passive fluid-management phases. The SRB biological treatment approach would be used as a polishing step, during which salts and sulfates would be removed, at the final heap draindown stage that would enhance the evaporation rate and longevity of the E-cells. During the active fluid-management phase, a split stream of approximately 30 gpm of draindown solution would be treated and then blended back into the draindown collection in the process ponds. This process would eliminate evapoconcentration of salts during the active fluid-reduction phase. This treatment system would then treat all the draindown solution during the semi-passive period of final draindown. Conversion of existing process ponds and evaporation ponds to E-cells would occur during the last year of the active solution-reduction phase. The active fluid-reduction phase would take approximately 3.1 years to complete using the Heap Leach Draindown Estimator model and would occur until the draindown flow would be less than 24 gpm, at which the E-cells would evaporate all the draindown flow. The SX recovery circuit would be modified to facilitate alkaline addition (lime or limestone) to the collected process solution and the separation of neutralization solids.

Stage 5B: Semi-Passive Treatment Phase of Heap Draindown and Final Cover Placement. When the draindown flow rate decreases to 24 gpm, which is estimated to occur in approximately 3.1 years, the lime and biological treatment system would be run as a semi-passive treatment system using gravity flow through the plant with the treated draindown discharged to the E-cells for evaporation. The E-cell system would be constructed in the Primary PLS Pond, ILS Pond, Event Pond, PSE Pond, and PSE Overflow Pond. Each pond would be designed and constructed to meet NDEP process water pond construction requirements, including double 80-ml HDPE liners and leak detection. To facilitate management and prevent open water surfaces in the E-cell system, the ponds would be backfilled with selected sands and gravels. Spillways constructed between the ponds would allow the water from the first pond to rise to a maximum height within the cell to allow for optimum upward capillary movement and evaporation while preventing surface expression of free water. The overflow through the spillway system would allow flow into the next cell, and similarly into the third, fourth, and fifth cells (as needed). At this point the active evaporation system on the top surface of the

HLP would be closed and an 80-ml HDPE liner would be placed over the gravel-covered HDPE liner to encapsulate the salts collected in the evaporation gravels. Three feet of soil cover would then be placed over the entire regraded HLP (Phase 1 and 2 areas). The cover material would be composed of growth media in addition to borrowed material within the Cover Borrow/Stockpile Area and carbonate waste rock from the pit. Test pit logs prepared during exploration of the property indicated that surface materials that would be removed and stockpiled during construction would consist of silty sand or sandy silt with gravel.

Ponds

Two evaporation ponds would be constructed in addition to the process ponds that include the PLS Pond, ILS Pond, and Event Pond. Each of the two evaporation ponds would have 50 percent of the capacity of the Event Pond. It is anticipated that the five ponds would be converted to E-cells at closure. The conversion of the ponds to E-cells would occur during active fluid management, after draindown had been reduced to less than 200 gpm. At this time, draindown would be managed in the converted process ponds until draindown reaches 10 gpm, at which time the evaporation ponds would also be converted to E-cells.

The process ponds have been designed with an HDPE apron on the uphill side of the pond to accommodate the ultraviolet stabilized GeoTubes that would filter the treatment solids (gypsum sludge) from the treated process water that would drain to the ponds. The treatment solids would be characterized at closure to determine the disposal method. Previous test work has indicated that the solids would be capable of disposal in the ponds following the draindown-reduction phase and the solids would be reclaimed with the ponds and covered.

During both operations and at closure, the PLS Pond and ILS Pond would be connected via a spillway and each would overflow into the Event Pond that subsequently overflows into the PSE Pond. The PSE Pond would overflow into the PSE Overflow Pond. Prior to E-cell conversion, representative samples of solids remaining in each pond at closure would be obtained to determine the chemical characteristics of the pond solids. Depending on the results of the characterization testing, the solids would be removed or would be left in place prior to backfilling each pond with appropriately sited ET-cover material.

Reclamation of Open Pit

The slope angles of the open pit walls would not allow soil replacement and revegetation due to access logistics and safety concerns. Operational and post-closure open pit slope configuration would be dictated by several parameters that include the geometry of the ore body, geologic and geotechnical characteristics of the host rock, equipment constraints, and safe operating practices. Entry and exit ramps into the pit would be barricaded using large boulders or berms to prevent public access. The pit floor would be graded to the pit drain in the southwest corner to prevent any ponding and subsequent infiltration of meteoric water. A safety berm would be placed around the perimeter of the open pit to prevent entry. Surface disturbance around the pit perimeter would be revegetated.

According to the recent Update to Surface Water and Groundwater Quality Baseline Report (Schlumberger Water Services 2014), the elevation of the bedrock water table in the pit would be approximately 6,630 feet above mean sea level, as measured in groundwater monitoring well GHM-7. The pit bottom (elevation of 6,740 feet above mean sea level) would be approximately 109 feet above the groundwater table thereby avoiding the potential formation of a pit lake after mining.

2.1.24 Reclamation of Rock Disposal Area and Stormwater Diversions

Rock Disposal Area

The RDA would be constructed in two phases due to the very low volume of waste rock generated during the first 4 years of mining. The Phase 1 portion of the RDA would include 250,000 tons of waste rock and the Phase 2 portion of the RDA would include 2.25 million tons of waste rock. The Phase 1 portion of the RDA would be built as a buttress for the final facility and would be constructed at the final reclamation slope of 3H:1V to allow for concurrent reclamation.

As each successive lift of the RDA is completed, the face would be regraded. Once regraded, the lift would be covered with approximately 12 inches of growth media. The area would be subsequently seeded with the seed mixture selected from **Table 11**.

An AWRMP has been developed for the Project, which specifies that all PAG material would be deposited in the lined HLP and all remaining high-carbonate waste rock would be deposited in the RDA. As such, the full buildout of the RDA (Phases 1 and 2) is illustrated on **Figure 3**. It is anticipated the actual post-reclamation size of the RDA would be substantially smaller than the area illustrated on **Figure 3**.

Rock Disposal Area Growth Media Placement and Cover Requirements

As described in the AWRMP, the PAG waste rock would be agglomerated with the ore and placed on the lined HLP. The remaining waste rock that could not be placed on the HLP due to its high calcium carbonate content would be placed in the RDA and reclaimed. Because PAG rock would not be stored in the RDA, the function of the cover would be for revegetation purposes only. The RDA would be regraded to a 3H:1V slope and covered with 12 inches of growth media and revegetated.

Final Gradient Stability

In 2019, NewFields performed slope stability analyses on the RDA (NewFields 2019b) using industry practices and experience from similar projects. To determine the most critical failure surfaces, shallow, intermediate, and deep failure surfaces were evaluated for static loading conditions. A search was performed to find the most critical failure surface for each failure mode. A minimum acceptable safety factor of 1.3 and 1.1 was used for static and pseudo-static loading conditions. The results of the program indicated that, based on the existing soil properties, the required factors of safety were met. The results of the analyses indicate the RDA would be stable with a 3H:1V slope under static and seismic loading conditions during mine operation and closure.

2.1.25 Stormwater Diversion

Stormwater ditches and channels would remain in place where possible. Runoff from the RDA would occur following precipitation events; however, regraded slope angle, revegetation (including growth media placement), and BMPs would be used to minimize erosion and reduce sediment in runoff. Silt fences, sediment traps, or other BMPs would be installed as needed to prevent migration of eroded material until reclaimed slopes and exposed surfaces have demonstrated erosional stability.

Table 11. Reclamation Seed Mix

No.	Common Name	Scientific Name	Preferred Variety	PLS / lb.	PLS lbs./ac	PLS / ft^2	% PLS by Seeds/ft^2	Comment
1	Crested wheatgrass	*Agropyron cristatum*	*Ephraim*	200,000	0.20	0.9	1.8	Nonnative: erosion control
2	Bluebunch wheatgrass	*Agropyron spicatum*	*P7*	117,000	2.50	6.7	13.5	Native: excellent performer
3	Galleta	*Hilaria jamesii*	*Viva*	159,000	1.00	3.7	7.3	Native: warm season
4	Great Basin wildrye	*Elymus cinereus*	*Mangar*	95,000	2.00	4.4	8.7	Native: proven performer
5	Indian ricegrass	*Oryzopsis hymenoides*	*Nezpar*	141,000	2.00	6.5	13.0	Native: proven performer
6	Sand dropseed	*Sporobolus cryptandrus*	--	5,298,000	0.10	12.2	24.4	Native: warm season
7	Sandberg bluegrass	*Poa sandbergii*	--	925,000	0.20	4.2	8.5	Native: adapted to skeletal soils
8	Bottlebrush squirreltail	*Sitanion hystrix*	--	192,000	0.50	2.2	4.4	Native: occasional performer
				Subtotal	**8.50**	**40.8**	**81.6**	**--**
9	Lewis flax	*Linum lewisii*	*Appar*	285,000	0.25	1.6	3.3	Native: proven performer
10	Small burnet	*Sanguisorba minor*	*Delar*	55,000	0.50	0.6	1.3	Proven performer
11	Forage kochia	*Kochia prostrata*	*VNS*	407,700	0.10	0.9	1.9	Proven performer, limit amount
12	Palmer penstemon	*Penstemon palmeri*	*VNS*	610,000	0.10	1.4	2.8	Native: proven performer
				Subtotal	**0.95**	**4.6**	**9.3**	**--**
13	Winterfat	*Ceratoides lanata*	*VNS*	111,000	0.25	0.6	1.3	Performs occasionally
14	Fourwing saltbush	*Atriplex canescens*	*VNS*	52,000	0.75	0.9	1.8	Native: excellent performer
15	Wyoming big sagebrush	*Artemisia tridentata* spp. *wyomingensis*	*VNS*	2,500,000	0.05	2.9	5.7	Performs under correct conditions
16	Antelope bitterbrush	*Purshia tridentata*	*VNS*	15,000	0.50	0.2	0.3	Good forage, occ. performer
				Subtotal	**1.55**	**4.6**	**9.1**	**--**
				Total	**11.00**	**50.0**	**100.0**	**--**

Source: NVV 2020.
Note: The 11.00 lbs./ac mix was designed for drill or broadcast seeding. If hydroseeding methods would be used, the rate would be increased two times, and the seed would be placed prior to mulch application (i.e., no mixing of seed and mulch).
ft^2 = square feet; lbs./ac = pounds per acre; N/A = not applicable

2.1.26 Post-Mining Land Use

Pre-mining land uses occurring in the Project area include mineral exploration and development, livestock grazing, wildlife habitat, and dispersed recreation. Following closure, the Project area would support the multiple land uses of livestock grazing, wildlife habitat, and recreation. NVV would work with federal and state agencies and local governments to evaluate alternative land uses that could provide long-term socioeconomic benefits from the mine infrastructure including the renewable energy facility. Post-closure land uses would be in conformance with the BLM Battle Mountain RMP and Eureka County zoning ordinances. The objectives of the reclamation program would be:

- To provide a stable post-mining landform that supports defined land uses;
- To minimize erosion damage and protect water resources through control of water runoff and stabilization of components;
- To establish post-reclamation surface soil conditions conducive to the regeneration of a stable plant community through stripping, stockpiling, and reapplication of soil material;
- To revegetate disturbed areas with a diverse mixture of plant species in order to establish long-term productive plant communities compatible with existing land uses; and
- To maintain public safety by stabilizing all reclaimed slopes.

2.1.27 Drill Hole Plugging

All drill holes would be plugged in accordance with NAC 534.4369 through 534.4371. Drill holes would be plugged immediately after obtaining all necessary data from the drill hole. A drill hole may be left open for a period of time following the initial drilling if it is anticipated that the hole may be re-entered to drill deeper or to use down-hole geophysical techniques. Any drill holes that would need to be left open for additional data collection would be filled from the bottom of the hole with slurried bentonite as the drill rods are being raised. This would ensure no contaminants enter the drill hole, but it could be re-entered for deeper drilling. Upon final drill hole closure, a 20-foot-thick cement plug would be placed at the surface. Drill holes developed as part of a monitoring program would be plugged and abandoned following completion of monitoring activities upon approval of the BLM and NDEP. The bond cost estimate would be calculated for the maximum of six drill holes that would be open at any time to ensure adequate funds are available to plug and abandon all drill holes. In the annual summary report, NVV would identify which drill holes were left open and the reason for this action.

2.1.28 Regrading and Reshaping

The final grading plan for the Project area was designed to minimize the visual impacts of the surface disturbance areas and to provide long-term stability and revegetation that meets the post-mining land use objectives. The post-mining topography is illustrated on **Figure 15**. Slopes would be regraded with standard mine mobile equipment (e.g., dozers, trucks, loaders, scrapers) to blend with surrounding topography, interrupt straight-line features, and facilitate revegetation, where practical. Where feasible, large components, such as the RDA landforms, may be rounded with variable slope angles to mimic nearby topography. All regraded slopes would be flattened to 3H:1V or flatter. The RDA and HLP would be constructed in lifts where the setback of each lift would be sufficient to allow the crest-to-crest angle to be a 3H:1V angle or less. Growth media and ET cover stockpiles would be graded to 3H:1V or flatter slopes during interim reclamation to ensure revegetation of the slopes to reduce surface erosion. The open pit would not be reclaimed and would remain as a depression in the landscape.

During final mine closure, all buildings and structures would be dismantled and materials would be salvaged or removed to the proposed landfill or other authorized landfill. Concrete foundations and slabs would be broken using a track-hoe mounted hydraulic hammer or similar methods and buried in place under approximately 3 feet of material in such a manner to prevent ponding and to allow vegetative growth. After demolition and salvage operations are complete, the disturbed areas would be covered with approximately 12 inches of growth media and revegetated.

2.1.29 Revegetation

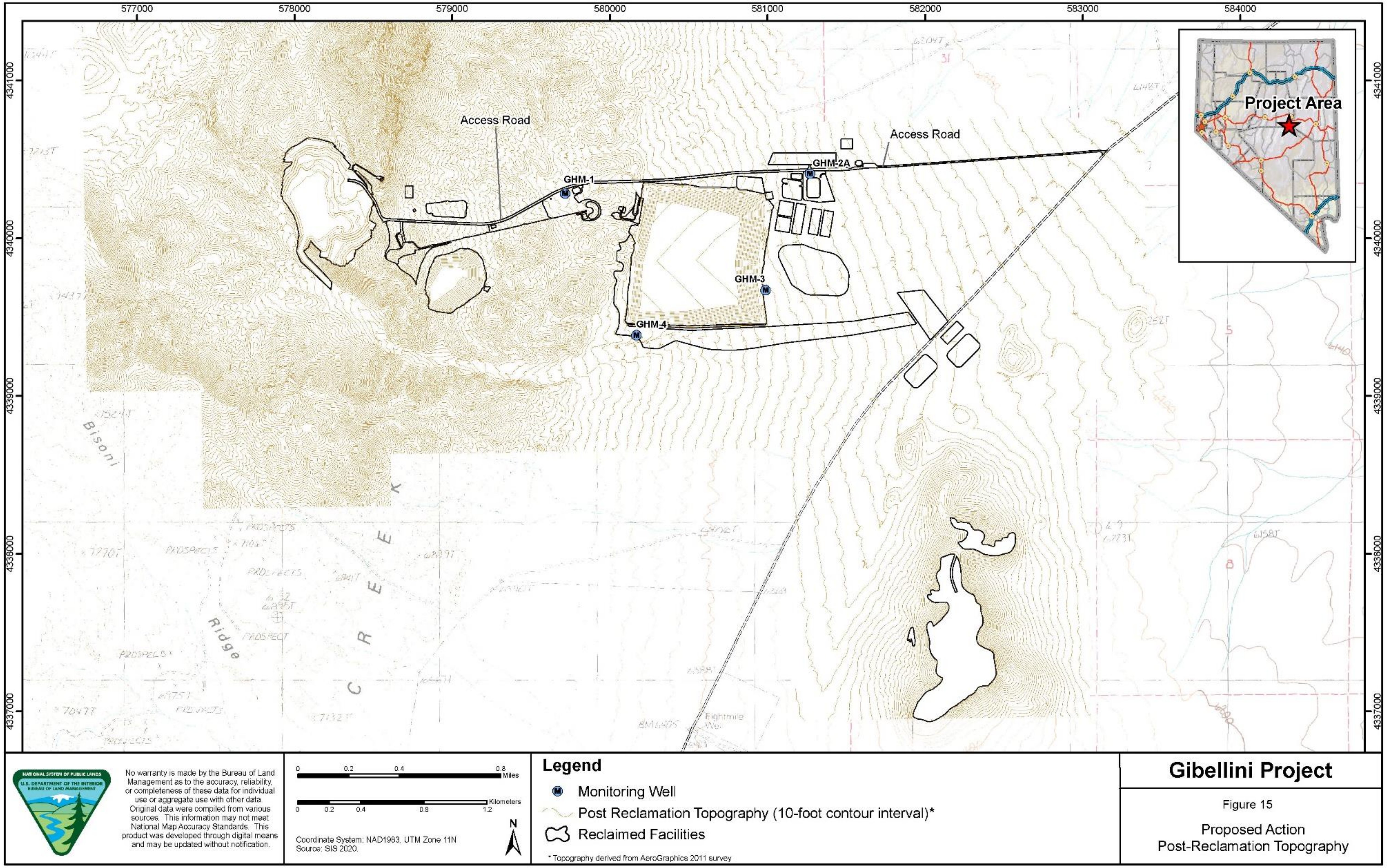
Reclamation would occur concurrently during mine construction and operations and following completion of all mining operations. Reclamation activities would include recontouring, seedbed preparation, and reseeding. For concurrent reclamation, revegetation would occur in areas where activities are no longer conducted or in areas that have been designated as “inactive.”

Reclaimed surfaces would be revegetated to control runoff, reduce erosion, provide forage for wildlife and livestock, and reduce visual impacts. Seed would be applied with either a rangeland drill or a mechanical broadcaster and harrow, depending upon equipment accessibility. Seedbed preparation and seeding would occur in the fall and following grading and growth media application over reclaimed areas.

The revegetation seed mixture and application rates are shown in **Table 11**. A variety of plant species would be selected. This mixture would be appropriate for the elevation and precipitation regime of the Project area and would provide forage and cover species similar to pre-disturbance conditions, thereby facilitating the post-mining land uses of livestock grazing, wildlife habitat, and recreation. In addition, several taxa have been added to the seed mix to provide erosion protection. All taxa have been selected for this site based on their requisite needs (e.g., soils, precipitation). Furthermore, this reclamation seed mixture has been designed for use in all surface disturbance areas rather than using area-/soil-specific mixes. Changes or adjustments to the seed mixture or application rates would occur in consultation with the BLM and BMRR.

Seeding activities would be timed to take advantage of optimal climatic periods and would be coordinated with other reclamation activities. In general, earthwork and drainage control would be completed in summers or early fall. Seedbed preparation would generally be completed in the fall, either concurrently with or immediately prior to seeding. Seeds would be sown in late fall to take advantage of winter and spring precipitation and optimum spring germination conditions. Early spring seeding may be utilized for areas that could not be seeded in the fall. Seeding would not be completed when the ground is frozen or snow covered.

Figure 15. Post-Reclamation Topography



This page intentionally left blank.

2.1.30 Reclamation Monitoring

Reclamation monitoring would provide a multitude of both technical and economic benefits, especially if monitoring is implemented for concurrent reclamation. The Monitoring Plan (Appendix F of the Plan of Operations) provides detailed information regarding NVV's proposed reclamation monitoring and bond relinquishment plans.

Quantitative reclamation monitoring to measure compliance with the revegetation success criteria would begin during the first growing season after concurrent and/or final reclamation had been completed and would continue or until the reclamation success criteria had been achieved. Qualitative monitoring of key indicators of site stability would continue, and the reclamation performance guidelines would apply during this time. The bond release criteria would be applied to the data collected in the third year following reclamation. Monitoring data from previous years would be used to determine the management needs. Revegetation success would be determined based on the *Nevada Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management, and the United States Forest Service* (BLM 2016).

NVV would submit an annual report on or before April 15th of each year to the BLM and NDEP for the preceding calendar year. The annual report would contain descriptions of the reclamation activities completed during the previous year. The annual report would also include a summary of areas reclaimed and a discussion of the general vegetation performance, surface erosion status, slope stability status, and corrective actions completed and/or proposed. An independent contractor would be retained to provide berm and sign maintenance, site inspections, and any other necessary monitoring for the period of reclamation responsibility. Post-mining groundwater quality would be monitored according to the requirements established by the NDEP upon approval of the final permanent closure plan to the water pollution control permit, with the goal of demonstrating non-degradation of groundwater quality.

2.1.31 Facilities Not Reclaimed

The open pit would not be reclaimed. As determined by the BLM, roads on public land suitable for public access or that continue to provide public access consistent with pre-mining conditions would not be reclaimed at closure. NVV would continue to use the access road from County Road M-103 (Duckwater Road) to access the Project area for monitoring and other purposes. NVV would remove the fences associated with mining activities at the end of reclamation and closure of each mine component.

2.2 South Access Road Alternative

The South Access Road Alternative would include the same mine components as described for the Proposed Action, except the access road would be constructed in a different location. This alternative access road would be approximately 7 miles long and extend from County Road M-103 (Duckwater Road) to the Project area (**Figure 16**). The access road would be constructed parallel to the power line corridor, as described for the Proposed Action, and would be constructed in accordance with Eureka County road specifications, which require sufficient sub-base and wearing course to accommodate both heavy and light vehicle access. The running width of the access road would be constructed with a 40-foot-wide running surface and up to 5-foot-wide shoulders due to the relatively flat terrain.

Overall, this alternative would result in approximately 38 additional acres of surface disturbance relative to the Proposed Action. Total surface disturbance would include 844 acres of BLM-administered land (**Table 12**). Post-reclamation topography would be similar to under the Proposed Action, except the access road would be in a different location and would not be reclaimed.

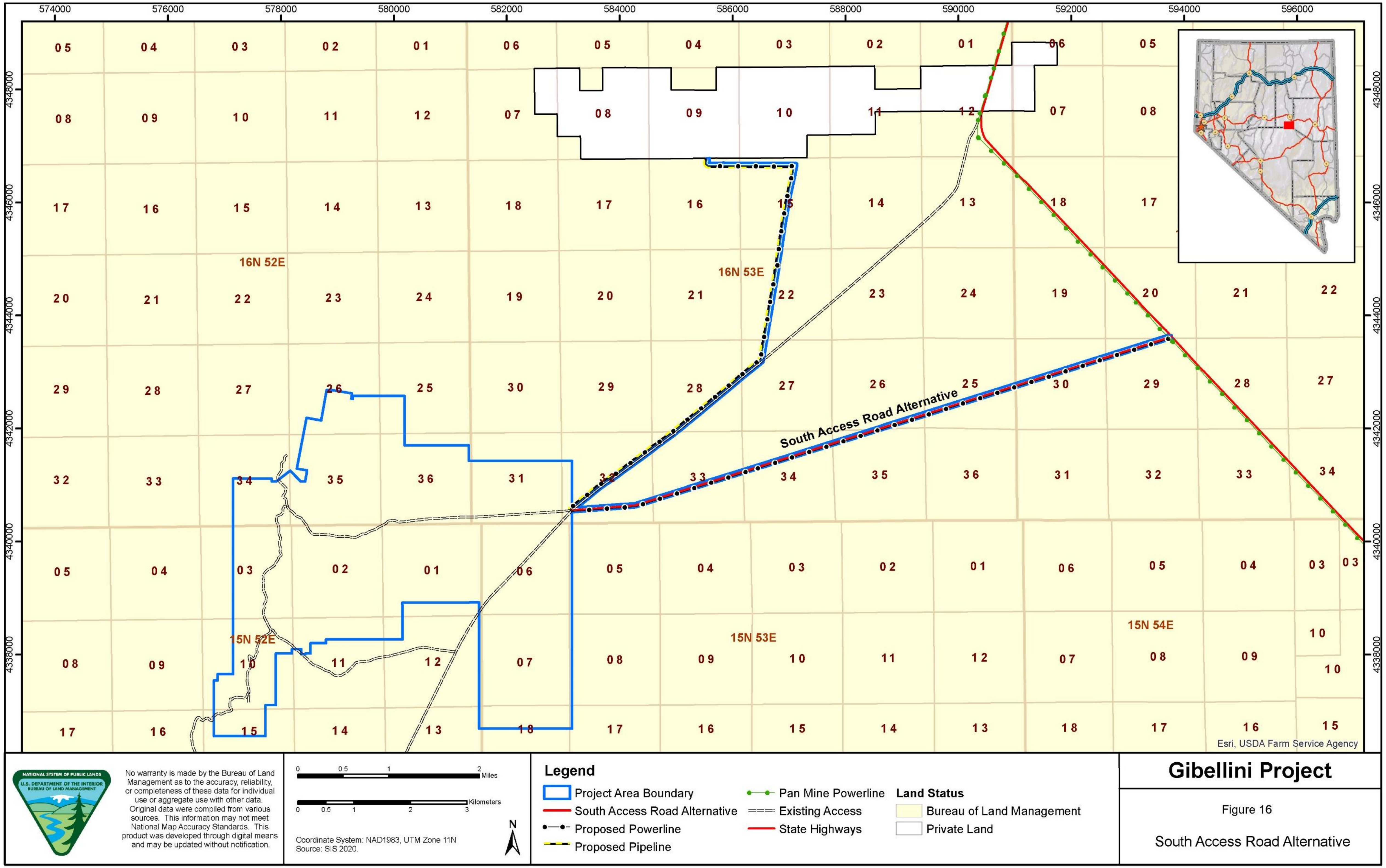
This alternative was developed to minimize environmental impacts by minimizing potential resource conflicts with Greater sage-grouse populations that utilize water in and vegetation along Fish Creek as habitat, as well as avoiding a cultural resource site near the intersection of Fish Creek Road and Duckwater Road.

Table 12. South Access Road Alternative: Surface Disturbance by Facility and Associated Compliance Buffers

Activity	Pre-1981 Existing Surface Disturbance (acres)	Existing Notice Level Disturbance	Proposed Surface Disturbance South Access Alternative (acres)	Buffer Area[1] (acres)
Pit	-	-	84.8	46.8
Heap Leach Pad	-	-	186.5	-
Rock Disposal Area	-	-	29.1	21.3
Process Ponds and Make-up Water Pond	-	-	14.4	-
Process Facility and Lab	-	-	2.6	2.8
Waste Rock Sedimentation Pond	-	-	0.2	-
Mine Facilities	-	-	0.7	
Mine Facilities Retention Pond	-	-	0.4	-
Crushing Facility and Stockpile	-	-	5.1	-
Mine and Haul Roads	-	-	47.2	42.6
Access Roads			41.7	-
Office, Laydown, and Warehouse	-	-	0.7	7.0
Borrow Areas	-	-	91.8	78.8
Landfill Area	-	-	5.8	2.6
Storm Water Diversion Channels	-	-	69.8	-
Potable Water and Fire Suppression Tanks	-	-	0.1	-
Utility Corridor and Substation[2]	-	-	31.5	-
Growth Media Stockpiles	-	-	110.0	-
Explosives Area			0.1	1.1
Yards (Ancillary)[3]	-	-	73.1	-
Exploration[4]	104.5	-	46.0	-
Water and Monitoring Wells	-	2.4	2.4	-
Total	104.5	2.4	844.0	203.0

[1] Buffer areas are compliance areas surrounding facilities that are not intended to be disturbed but are to be evaluated in the EIS.
[2] The utility corridor is composed of the buried power line and water pipeline from the mine facilities to the Fish Creek Ranch.
[3] Yards are surface disturbance associated with the mining facilities that would be revegetated but do not require regrading during reclamation.
[4] Exploration disturbance is composed of access roads, drill pads, drill sumps, and trenches.

Figure 16. South Access Road Alternative



This page intentionally left blank.

2.3 Renewable Energy Alternative

As an alternative to the Proposed Action, which only includes use of a power line from the existing 69-kV distribution line from Mt. Wheeler Power, this alternative would include supporting the mine operations with a combination of renewable energy and a utility interconnection with future large-scale battery storage. This alternative was developed in response to the need of additional power generation in this part of Eureka and Nye Counties and would be built with the intention of providing this energy production facility as a long-term, post-mining resource to the local communities. This alternative would include the installation of enough solar electric photovoltaic (PV) capacity so the site would become a net generation facility with battery storage to perform peak smoothing and daily load management and provide a sustainable long-term power source servicing the remote electrical needs of southern Eureka County and northern Nye County. Total surface disturbance associated with this alternative would be 839 acres, which includes an additional 33 acres of surface disturbance than the Proposed Action.

Onsite power generation would be achieved with the use of solar electric PV and future battery storage. The field of PV panels and the battery storage would be constructed on a 33-acre site immediately north of the process area and main office (**Figure 17**). The site would be cleared of vegetation and leveled, and gravel would be applied to minimize soil erosion, weed establishment, particulate emissions, and dust accumulation on the solar panels. The solar facilities would consist of 6 MW of solar electric PV generation and a future battery that would deliver 2 MW at any given time with 10 MW-hour storage capability.

All regulatory requirements for battery containment would be met. Additionally, a key characteristic of the vanadium redox flow battery that would be used is that it has no risk of “thermal runaway” compared to solid-state batteries. Thermal runaway, which causes a fire in a battery, is an inherent risk of solid-state batteries.

The anticipated electrical load for the Gibellini mine site would be 2.5 MW for the connected load, 1.6 MW for the average load, and a 95 percent power factor. The utility connection would supply power on demand to the mining facility to compensate for any power deficit by the renewable energy generation and storage system while the solar electric PV system is transitioning to full operation.

Based on the preliminary design of the solar electric PV system, the system would be constructed in 1-MW Alternative Capacity blocks using two 500-kilowatt SMA 500CP inverters. Two inverters would connect to a local step-up transformer that would increase the voltage from the inverter output to 24.9 kV. The transformers would be connected via daisy chain with underground medium-voltage cable and protected by breakers in the switchgear. Detailed design may take advantage of new technology and use higher-efficiency modules and larger inverters. **Table 13** identifies the estimated power production from the solar electric PV system.

Table 13. Estimated Power Produced from 6-Megawatt Solar PV Resource

Timeframe	Average Hours	Power Produced by 6 MW of Solar kVAh
January	744	867,834
February	672	932,580
March	744	1,104,840
April	720	1,281,852
May	744	1,239,678
June	720	1,311,552
July	744	1,293,732

Timeframe	Average Hours	Power Produced by 6 MW of Solar kVAh
August	744	1,255,122
September	720	1,198,098
October	744	1,131,570
November	720	951,588
December	744	887,436
1 Year	8,760	13,455,882

kVAh = kilovolt amps per hour

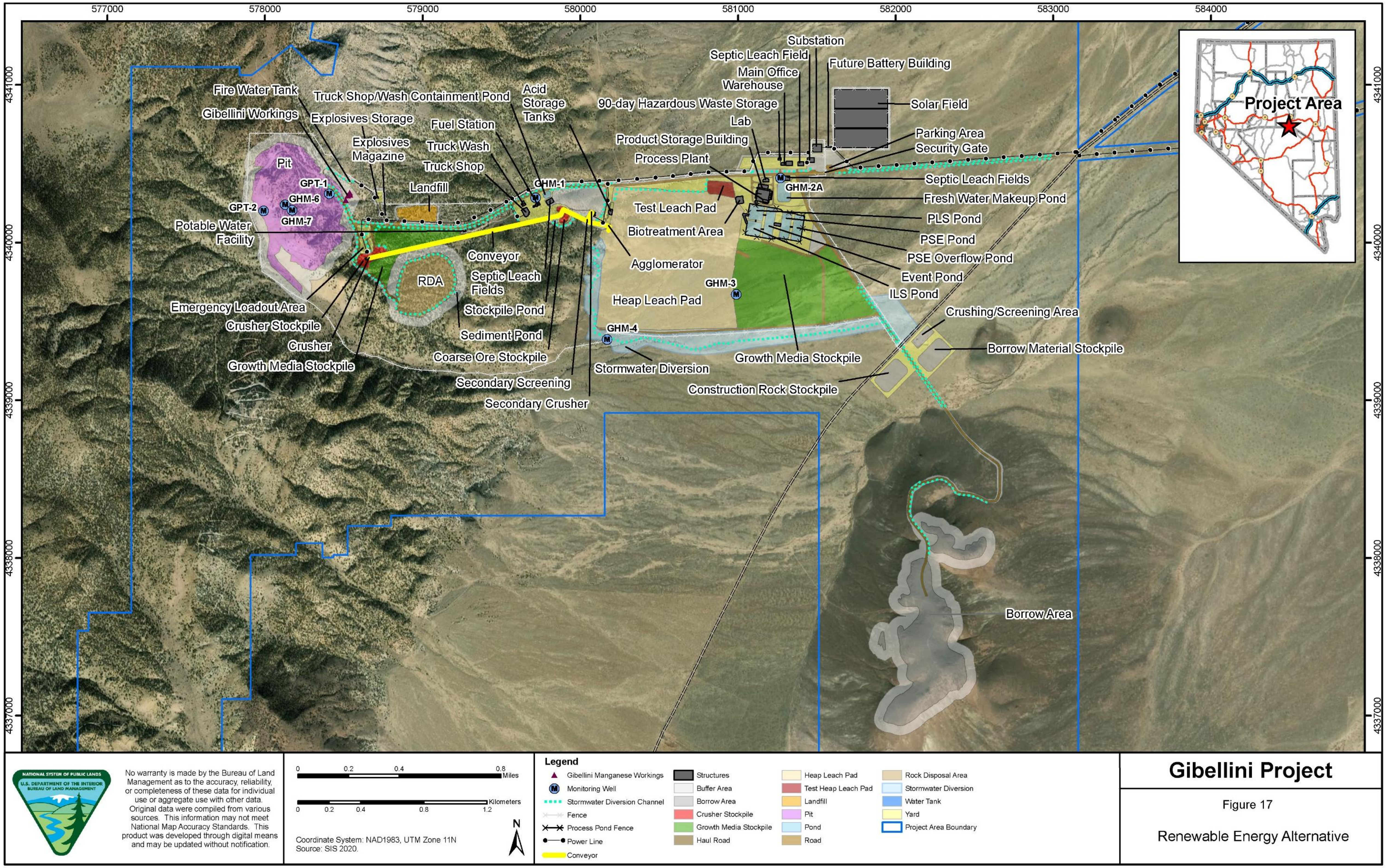
2.3.1 Utility Connection

The incoming power would be supplied by a three-phase overhead 69-kV line from Mt. Wheeler Power. This new 69-kV line would originate at a tap location on an existing 69-kV line on Strawberry Road north of U.S. Highway 50; the existing 69-kV line currently terminates at the Pan Mine. The connection to this existing line would be made approximately 3 miles south of the Fish Creek Ranch. The new substation would be on the mine site property and would be a 69 kV-/24.9-kV substation with a base transformer rating between 5 and 10 megavolt-amperes. There would be a separate 24.9-kV automatic voltage control NVV substation that would support plant operations and renewable energy production. NVV would have unrestricted access to 24.9-kV switchgear and controls in the 24.9-kV substation.

2.4 No Action Alternative

Under the No Action Alternative, the Plan of Operations would not be authorized by the BLM, and the activities described in the Proposed Action would not occur. Mineral resources would remain undeveloped, and the construction and operation of the proposed mining and associated facilities would not occur.

Figure 17. Renewable Energy Alternative



This page intentionally left blank.

2.5 Alternatives Considered but Not Included in Proposed Action

In accordance with 40 CFR 1502.14(a), agencies are required to describe the alternatives considered but eliminated from detailed study and to provide a brief rationale for eliminating the alternative. Alternatives for the development of the Proposed Action are summarized in **Table 14**.

Table 14. Summary of Alternatives Considered but Not Included in Proposed Action

Alternative	Discussion and Rationale for Dismissal
Powerline Route	A preliminary power line route included a corridor from south end of the Fish Creek Ranch, following the existing site access road to the Project area. Following cultural and archaeological surveys of the Project area, a significant cultural site was found in the area. This power line route was also reviewed by the SETT, who determined that the Greater sage-grouse using surface water at the ranch could be affected by the overhead power lines. As a result, the Powerline Route Alternative was eliminated from analysis.
Original Pit Design	The original plan for the open pit extended to a maximum depth of 294 feet below the ground elevation at the collar of monitoring well GHM-7. However, groundwater was first identified in a fault zone approximately 605 feet below ground surface, and the static water level in the monitoring well rose to an elevation potentially above the pit floor. As a result, the Original Pit Design Alternative was eliminated. The revised pit design maintains the maximum depth of the pit floor approximately 24 feet above the highest water level recorded in the fault zone and 109 feet above the projected static water level.
Heap Leach Pad Design	The 2012 design for the HLP was to construct one single leach pad capable of storing 30 million tons of ore. After reviewing options for closing the HLP, it was determined that if the proposed HLP was redesigned as two independent leach pads, the first pad (Pad 1) could be rinsed using the freshwater/make-up water supply to recover the acid for use during active leach of the second pad (Pad 2). As a result, the 2012 HLP design was eliminated.
Heap Leach Pad Liner Design	Use of a double geomembrane liner system for the HLP with an intermediate drainage layer was reviewed for the Project. However, using geonet as a drainage layer is not a viable option because the low interface shear strength of liner/geonet/ liner would adversely affect the stability of the HLP and loads imposed by the heap would reduce the transmissivity of the geonet. A double-liner system separated by a granular intermediate fill would be needed to provide stability and promote leachate collection. The geotechnical investigations completed to date did not identify any sources of suitable granular fill materials. Overliner (i.e., drainage media) would be manufactured at a crushing and screening plant. Similarly, relatively permeable granular fill consisting of sand and gravel would need to be manufactured and/or transported to the site for use as the intermediate granular fill. Additionally, in the proposed composite lining system, the underlying clayey soil or geosynthetic clay liner in contact with the geomembrane reduces the leakage through defects because of the low permeability of the underlying clayey soil in contact with the geomembrane seals defects in the geomembrane. This is the principal advantage of a composite lining system when compared to single-liner systems or double-liner systems with an intermediate leak detection layer. The significant reduction in leakage through liner defects in composite lining systems is well documented.
Groundwater Pumping Stations	The Proposed Action requires a water supply of approximately 500 gpm. Two options were reviewed for the water supply: a groundwater pumping option and a surface water supply from the irrigation water system at the Fish Creek Ranch that is fed by surface springs. These two options were reviewed with Eureka County and the Fish Creek Ranch water supply was preferred by Eureka County to ensure no net loss of water in the basin. As a result, the groundwater pumping station was eliminated.

Alternative	Discussion and Rationale for Dismissal
Northern Rock Disposal Area Design	Two waste RDA locations were identified: the southern option and the northern option. Development of the Enhanced Baseline Reports for visual resources indicated that the southern option located the waste RDA behind a tall topographic feature such that it would not be visible from the access roads or the Fish Creek Ranch. The southern option also allows the waste RDA to be constructed in phases so that the dump can be concurrently reclaimed and vegetation can be established earlier. As a result, the northern waste RDA alternative was eliminated from further consideration.
Heap Leach Pad Cover Design	Three options were developed in the 2012 Plan of Operations for the final HLP cover: (1) a two-layer cover consisting of a base HDPE liner overlain by a 3-foot-thick soil cover; (2) a hybrid cover that would consist of a base HDPE liner over the top surface of the HLP with a 3-foot-thick soil cover over the entire HLP, including the top surface; and (3) a singe-layer 3-foot-thick soil cover over the entire HLP. The hybrid cover design provided greater stability than option 1 with very similar performance in limiting infiltration of meteoric water. This option also provided the greatest area to develop a 91-acre active E-cell for reducing the draindown process water inventory at closure. As a result, the first and third HLP cover design options were eliminated.
Open Pit Backfill	Two options were evaluated for final closure of the open pit: a backfill option and a no backfill option. The backfill option was reviewed as both a full backfill and a partial backfill if needed to further reduce infiltration through the bottom of the pit. The review indicated that the mine plan could be revised to limit the pit depth to a 6,740-foot elevation, with the pit floor sloped to a gravity drain. By choosing this pit design option for the Proposed Action, the need for additional measures to reduce infiltration into the pit floor was eliminated. The revised mine plan also leaves a significant resource of primary vanadium ore in the pit that could be minable if future vanadium prices are higher or the metallurgical process is modified to increase the recovery from the primary zone. The no backfill option does not sterilize the remaining ore zone and leaves future mining of this resource available. As a result, the option of backfill of the pit at mine closure was eliminated.
Water Treatment/ Closure Options	The original closure plan included the installation of the water treatment plant at the end of the leaching operations and prior to closure of the HLP. In response to comments on the Plan of Operations, an alternative was developed to build a test heap and the closure water treatment system during the initial facility construction so the full closure process can be tested and optimized during operations. This alternative was incorporated into the Plan of Operations and the initial plan to build these facilities at closure was eliminated.
Heap Leach Draindown and Rinsing Options	A no-rinse alternative was first considered where the heap would be built in one phase that would be fully leached and then allowed to draindown at closure. A water treatment plant would have been installed to manage 24 gpm of these draindown solutions (the maximum capacity of the E-cells) and then be evaporated in E-cells converted from the process ponds. The excess draindown water would have then been recirculated back to the heap. This alternative was replaced by the two-phase leach pad design that allows concurrent rinsing of the previously leached phase of the pad, reduces the draindown time by eliminating recirculation to the leach pad, and improves final draindown water quality that reduces final treatment costs. This alternative also allows recovery of the sulfuric acid from the leached phase of the pad to be reused in the active leach cell, reducing the amount of acid required to be transported to the facility.

3.0 REFERENCES

Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practice for Avian Protection on Power Lines: The State of the Art in 2006*. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

———. 2012. *Reducing Avian Collisions with Power Lines: The State of the Art in 2012*. Edison Electric Institute and APLIC. Washington, D.C.

Bureau of Land Management (BLM). 1986a. *Shoshone-Eureka Resource Management Plan*. U.S. Department of the Interior, Bureau of Land Management, Battle Mountain District, Battle Mountain, Nevada.

———. 1986b. *Shoshone-Eureka Resource Area Record of Decision*. U.S. Department of the Interior, Bureau of Land Management, Battle Mountain District, Battle Mountain, Nevada. Available: https://eplanning.blm.gov/epl-front-office/projects/lup/77513/103648/126944/1986_Shoshone-Eureka_RMP_Record_of_Decision.pdf. Accessed March 2020.

———. 1987. *Shoshone-Eureka RMP Amendment*. U.S. Department of the Interior, Bureau of Land Management, Battle Mountain District, Battle Mountain, Nevada.

———. 1989. Fencing. Handbook 1741-1.

———. 1994. *Guidelines for Assessing and Documenting Cumulative Impacts*. April. Available: https://www.ntc.blm.gov/krc/uploads/194/5%20-%20BLM%20Cumulative%20impact%20Guide%201994.pdf.

———. 2008. *Standard Environmental Color Guidelines*.

———. 2015. *Nevada and Northeastern California Greater Sage-Grouse Record of Decision and Approved Resource Management Plan Amendment*.

———. 2016. *Nevada Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management and the United States Forest Service*. Revised September 2016.

———. 2018. Instruction Memorandum (IM) 2019-018, Compensatory Mitigation, December 6, 2018.

———. 2019. *Nevada and Northeastern California Sage-grouse Record of Decision and Approved Resource Management Plan Amendment*. March 2019.

Council of Environmental Quality (CEQ). 2005. *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*. Executive Office of the President, Council on Environmental Quality, Washington, D.C. June 2005.

Condon. 1975. *Summary of Results, Gibellini Project, Eureka County, Nevada*. Noranda Exploration Inc. Internal Report. 1975.

Espell, R. 2020. Project Manager, Nevada Vanadium Company. Verbal Communication to SWCA Environmental Consultants. March 18.

Eureka County. 2010. Eureka County. 2010. *Eureka County Master Plan 2010*. Available: http://www.co.eureka.nv.us/PDF/Master_Plan_Final%20_2010.pdf. Accessed March 11, 2020.

Nevada Division of Environmental Protection (NDEP). 2009. Guidance for Mine-Site Petroleum-Contaminated Soil (PCS) Management Plans - Revision 1. January 2009.

NewFields MDTS, LLC (NewFields). 2019a. Nevada Vanadium Company. Heap Leach Facility Slope Stability Analyses, GIB-0372001-HLF-EM-0007_0. June 21, 2019.

———. 2019b. Nevada Vanadium Company. Rock Disposal Area Slope Stability Analyses, GIB-0372001-HLF-EM-0009_0. June 21, 2019.

———. 2019c. Nevada Vanadium Company. Rhyolite Hill Borrow Area, GIB-0372001-HLF-EM-0005_0. June 25, 2019.

———. 2019d. Nevada Vanadium Company. Climate Data and Surface Water Hydrology, GIB-0372001-HLF-EM-0003_0. June 14, 2019.

Pagel, J. E., D. M. Whittington, and G. T. Allen. 2010. *Interim Golden Eagle Inventory and Monitoring Protocols; Other Recommendations in Support of Golden Eagle Management and Permit Issuance*. U.S. Fish and Wildlife Service Division of Migratory Bird Management.

Roberts R. J., K. M. Montgomery, and R. E. Lehner. 1967. *Geology and Mineral Resources of Eureka County, Nevada*. Nevada Bureau of Mines and Geology, Bulletin 64, 1967.

Schlumberger Water Services, Inc. 2014. *Update to Surface Water and Groundwater Quality Baseline Report for American Vanadium US, Inc. Gibellini Project*. July 14, 2014.

Three Parameters+ Natural Resource Consulting. *Preliminary Jurisdictional Determination, American Vanadium Gibellini Mine Project*. November 2013.

U.S. Army Corps of Engineers. 2014. Gipson, Jason A. “Regulatory Division (SPK-2013-01103).” Received by Mr. Ron Espell, 1325 J Street, 2 Apr. 2014, Sacramento, CA.

———. 2017. Hydrologic Modeling System (HEC-HMS) 4.2.1. March 2017.

———. 2020. Gipson, Jason A. “Regulatory Division (SPK-2013-01103).” Received by Mr. Ron Espell, 1325 J Street, 8 Jan. 2020, Sacramento, CA.