FACT SHEET
(Pursuant to Nevada Administrative Code [NAC] 445A.401)

Permittee Name: Gemfield Resources, LLC
Project Name: Gemfield Project
Permit Number: NEV2014112
Review Type/Year/Revision: New Permit 2019, Fact Sheet Revision 00

A. Location and General Description

Location: The Gemfield Project is located in west-central Esmeralda County, approximately one mile north of the town of Goldfield, Nevada, on private and public land, administered by the U.S. Department of the Interior, Bureau of Land Management (Tonopah Field Office), within Sections 14, 15, 22 - 27, 34, and 35, Township 2 South (T2S), Range 42 East (R42E), Mount Diablo Baseline and Meridian.

The Project is located within the Basin and Range Physiographic province, which is characterized by a series of generally north-trending mountain ranges separated by basins generally filled with lacustrine and alluvial sediments. The Project is situated within the Central Hydrogeographic Region within the Alkali Spring Valley hydrologic basin. Elevations in the Project area range from 5,450 feet above mean sea level (amsl) to 6,900 feet amsl. Vegetation at the site ranges from Baileys greasewood to a mix of desert shrubs with occasional Joshua trees.

The Project is within the Walker Lane Structural Belt that trends northwest, parallel to the State line between Nevada and California. The region surrounding the Project is underlain by Paleozoic marine sedimentary and metamorphic rocks which have been intruded or overlain by younger igneous rocks of Mesozoic and Tertiary age. Deposits in the Goldfield Mining District are structurally controlled, volcanic-hosted, epithermal gold deposits of the high-sulfidation, quartz-alunite type.

The Facility may be accessed by traveling approximately 1.4 miles north from Goldfield on U.S. Route 95 and turning right (east) onto the Facility access road. The site may also be accessed by traveling approximately 24.6 miles south from Tonopah on U.S. Route 95 and turning left (east) onto the Facility access road.

General Description: The Gemfield Project is anticipated to have a mine life of 10 years, with two years of post-mining leaching. The Facility is designed to mine, from a single open pit, gold ore at up to 3.3 million tons per year over the 10-year mine life. The crushed ore will be processed through leaching on a heap leach facility with an approximate capacity of 25 million tons. The gold bearing pregnant solution will be pumped from the Pregnant Pond to the single train of five carbon columns. The precious metals are absorbed onto the porous surface of the carbon and are pumped to an acid wash column and then transferred to a pressure stripping column where heated solution of cyanide and caustic soda is circulated to elute
(desorb) gold. Barren solution will report to the Barren Tank or the Barren Pond. Gold will be extracted from the loaded eluate by an electrowinning process and will subsequently be smelted onsite to produce dore bars for shipment to a third party refinery.

B. Synopsis

Brief History: Exploration activities that occurred from the early 1900’s through the 1990’s resulted in identification of three significant mineralized deposits in the district: Goldfield Main – the site of the majority of historic production; McMahon Ridge – also a historic producing area; and Gemfield – a “blind deposit” discovered in 1992 by Kennecott through the use of structural modeling and geophysical testing. Kennecott chose to sell the Gemfield property rather than to develop it.

In 1997, the Gemfield property was optioned by Hasbrouck Joint Venture (Owned 50:50 by Euro-Nevada Mining and Franco-Nevada Mining), which later acquired 100% ownership of the property (in 1999) through a cash purchase from Kennecott. The parties to the Hasbrouck JV were later merged into Franco Nevada, which was subsequently acquired by Newmont. In 2002, Romarco Nevada Goldfield (a wholly-owned subsidiary of Metallic Ventures) purchased the Gemfield Property from Newmont. The Gemfield property became an asset of International Minerals Corporation as part of its acquisition of the Metallic Ventures Gold group of companies in 2010. From 2010 to 2013, Metallic Goldfield, Inc., a subsidiary of International Minerals Corporation, expanded the known mineral resource of the Gemfield deposit through continued exploration drilling on the property. In December 2013, Hochschild Mining acquired International Minerals Corporation and sold its Nevada properties and other assets to form Chaparral Gold Corp, which was acquired by Gemfield Resources, LLC (GRL) in 2015. Gemfield Resources LLC owns or controls the patented and unpatented mining claims that make up the Gemfield Project area and is the Permittee for the Gemfield Project. Elko Mining Group LLC is the managing member of GRL.

The Project consists of 57 patented and 127 unpatented mining claims, either owned or controlled by the Permittee. Private land controlled by the Permittee covers 721.7 acres of the Project, while the remaining unpatented claims are on public land administered by the U.S. Department of the Interior, Bureau of Land Management, Tonopah Field Office and encompass about 1,214.2 acres.

Geology: The Goldfield Mining District is located in the southwest portion of the Basin and Range physiographic province. The district is within the Walker Lane Structural Belt that trends northwest parallel to the State line between Nevada and California. The region surrounding Goldfield is underlain by Paleozoic marine sedimentary and metamorphic rocks which have been intruded or overlain by younger igneous rocks of Mesozoic and Tertiary age. Mineralization in the region is interpreted to be spatially related to Tertiary intrusives, dominantly hosted in
Oligocene to Miocene volcanic rocks, and is primarily epithermal. Deposits in the Goldfield Mining District are structurally controlled, volcanic-hosted, epithermal gold deposits of the high-sulfidation, quartz-alunite type.

The Goldfield property hosts three currently-known gold deposits: Goldfield Main, McMahon Ridge, and Gemfield. Of these deposits, Gemfield is the only deposit included in the current mine plan.

The Gemfield deposit is located about 5,400 feet west of the Columbia Mountain fault and is hosted in the Sandstorm Rhyolite of Oligocene age which is composed of strongly flow-banded, often glassy, but generally devitrified, porphyritic rhyolite. This unit is generally overlain by the lower Miocene Milltown Andesite and semi-consolidated volcanic sediments and basalt of the Miocene Siebert Formation. The Sandstorm Rhyolite is underlain by the older Oligocene latite volcanic sequence (Kendall Tuff), Morena Rhyolite and the Jurassic granite intrusive.

Northeast trending normal structures, which contain most of the higher-grade mineralization, acted as “feeders” from which mineralization spread along shallow-dipping, flow contacts in the Sandstorm Rhyolite resulting in the lower grade, generally stratabound mineralization. Low-grade, disseminated mineralization occurs in a halo of silica and clay alteration around the more intensely silicified ledges. The mineralized envelope is constrained by the base and top of this formation, usually falling between the top of the Sandstorm Rhyolite and a vitrophyre that occurs near the base of the sequence. The stratabound character of mineralization in the Gemfield deposit is in part due to the impermeable nature of the basal vitrophyre of the Sandstorm Rhyolite.

Lava flows of the Sandstorm Rhyolite are almost always hydrothermally altered, including propylitic, argillic, and intense silicification. The widespread distribution of hydrothermal alteration in the rhyolite is due to the highly permeable character of portions of the flow-banded volcanic stratigraphy. Formations above and below the rhyolite are generally weakly altered and unmineralized.

The Gemfield deposit has a known strike length of approximately 2,400 feet and is 1,200 feet wide at its widest point. The depth of gold mineralization beneath barren alluvial cover varies from about 10 feet in the northeast part of the deposit where the Sandstorm Rhyolite has been removed by erosion, to a maximum depth of nearly 700 feet at the southwest margin of the deposit.

The Gemfield deposit is fault-bounded on at least three sides: east, west, and south. The bounding faults are clearly post-mineral, leaving currently unexplored down-dip extensions of mineralization to the northeast, southwest, and northwest sides of the deposit.
Metallurgical test work has consistently shown poor recoveries for non-oxide material at the Gemfield deposit; therefore, mining of the Gemfield deposit will be limited to the oxidized rhyolite.

**Mining:** The Gemfield Pit will be 3,500 feet in length and 3,300 feet in width at its longest and widest sections and will cover an area of approximately 160 acres. The pit will be mined to have approximate 40-foot benches that will extend to a maximum depth of approximately 525 feet below ground surface and produce an overall high wall slope (from horizontal) ranging from 40 to 45 degrees. The anticipated average life-of-mine stripping ratio for the project will be about 2:1 waste to ore, but this can change with varying economics.

Mining will be accomplished through conventional open pit mining methods (truck and shovel/loader) at a permitted rate of up to 3.3 million tons of ore per year, or approximately 8,250 tons per day. Rock will be drilled and blasted for excavation using ammonium nitrate and fuel oil or other appropriate blasting agents determined by rock characteristics. Peak ore and waste production is anticipated to be 25,000 tons per day.

Mined ore will be hauled by 50 to 100-ton rigid frame haul trucks to the primary crushers that will be located at the north end of the pit where it will be directly deposited into the primary crusher or temporarily stored adjacent to the primary crusher. The tertiary screen undersize (final product – 100% passing 1-inch) will be conveyed to an uncovered conical load-out pile adjacent to the heap leach pad (HLP). Pebble lime will be added at a predetermined rate to the stockpile feed conveyor. A remotely operated “clamshell” dump gate will reclaim crushed ore onto a load-out conveyor designed to fill haul trucks for transport to the HLP.

Due to designs for the crushing circuit and ore stockpile not being included with the provided application, the Division will require the submittal of an engineering design change prior to construction and operation of crushing facilities.

Run-of-mine waste rock will be transported by truck to the East WRDA, West WRDA, or South Overburden Stockpile depending on material type.

**Waste Rock Management Plan:** Mining is anticipated to generate approximately 50 million tons of waste rock and alluvial overburden, which will be placed in the East WRDA, West WRDA, or South Overburden Stockpile. The East WRDA, West WRDA, and South Overburden Stockpile have approximate capacities of 53.4, 4.2, and 8.8 million tons, respectively. The East WRDA will have a surface area of 182 acres and will be constructed atop the historic Goldfield Consolidated Mining Company (GCMC) tailings (discussed below) to a maximum height of 260 feet above the natural topography utilizing 40-foot lifts with an overall slope of 2.75 horizontal to 1 vertical (2.75H:1V). The West WRDA and South Overburden Stockpile will be constructed utilizing similar bench height and overall slopes as
the East WRDA, but will have a smaller surface areas (maximum 34.5 acres) and lower overall heights (maximum 135 feet).

The East WRDA and South Overburden Stockpile are adequate in capacity to manage the waste and overburden from the planned pit with a total capacity of 62.2 million tons. In the event shallower slopes or more stripping is required due to unforeseen conditions, the West WRDA may be used.

Based on the characterization program (discussed below) it is anticipated that approximately 98% of the waste rock will be non-potentially acid generating (PAG) with the remainder being PAG. During mining, blasthole samples will be collected and assayed to provide control for ore and waste segregation. The resulting information will be used to assign a material type to the blocks representing the active benches. Each block will be assigned a designation code based on classification of the material as ore, waste (PAG or non-PAG), or overburden. Site geologists will make a visual identification of PAG waste rock and compare their interpretation to the mine block model to ensure accurate routing and management.

When PAG material is encountered, it will be placed on a minimum nominal 20-foot thick non-PAG base and placed a minimum of 10-feet internal from any final regraded dump face. In the event that PAG material is exposed on the surface of the WRDF at closure, it will be covered by a minimum of 5 feet of non-PAG waste rock or alluvium.

Quantities and destinations of the waste rock will be recorded during operations, and these data will be tabulated monthly. Confirmatory sampling and analysis will be performed quarterly on a representative sample of each material type encountered during the quarter. Two 5-gallon buckets of representative blast hole cuttings will be composited and will be submitted for Acid-Base Accounting, utilizing the most recent version of the Nevada Modified Sobek Procedure, and for Meteoric Water Mobility Procedures with leachate analyzed for Division Profile I reference values. Results of these quarterly analysis will verify results of the characterization plan and drive modifications to the waste rock management plan as necessary to ensure protection of waters of the State.

**Gemfield Heap Leach Pad:** As discussed above, crushed ore material will be transported to the Gemfield HLP for processing. The Gemfield HLP is designed to meet the minimum design criteria pursuant to Nevada Administrative Code (NAC) 445A.434 and has a designed ore storage capacity of approximately 25 million tons. The HLP will have approximate dimensions of 3,150 feet north-south by 2,200 feet east-west and will cover an area of approximately 127 acres with 120.6 of those acres contributing to the HLP fluid management system. The maximum vertical heap height above the liner of 240 feet.
Construction activities for the Gemfield HLP will consist of clearing, excavating, and filling to achieve the required subgrade, construction of perimeter berms, placement of a low-permeability soil layer (LPSL), excavation of anchor trenches, installation of high density polyethylene (HDPE) geomembrane, filling of anchor trenches, placement of solution collection pipes, and the placement of overliner material.

A geotechnical site investigation of the HLP area displayed that the encountered materials were suitable to support the proposed leach pad. Once the subgrade materials in the base of the HLP are cleared of salvageable growth media and are excavated and filled, as necessary, to achieve the required subgrade grading, a LPSL will be placed on top of the subbase.

The LPSL will be placed in 6-inch loose lifts and moisture conditioned and compacted to 95% of the maximum dry density, as determined by American Society of Testing and Materials (ASTM) Method D1557. This LPSL, due to there being no proposed leak detection, is required to have a maximum recompacted in place coefficient of permeability of $1 \times 10^{-6}$ centimeters per second (cm/sec). A geotechnical site investigation of the LPSL source material displayed that, when compacted to design specifications, a permeability of $2.9 \times 10^{-7}$ cm/sec was attainable.

A smooth 80-mil HDPE liner will be deployed above the LPSL and will provide primary containment of process solutions. The 80-mil HDPE liner will be overlain by a solution collection system (discussed below) and a minimum of 2-feet of crushed ore material to provide hydraulic relief and liner protection during subsequent stacking operations. This general design also applies to areas such as incised drainages and sub-cell divider berms and channels, generally following the solution recovery piping above the synthetic primary liner.

The HLP will have a general east-northeast foundation grade and will be broken into six cells covering approximately 922,000 square feet each. Each cell will be separated by a 3-foot tall cell divider berm. Each cell will utilize a 12-inch diameter predated collector pipe at the berm, on the downstream edge, to provide separation between the cells and minimize hydraulic head in the area of the separator berm.

The solution collection and recovery system consists of a network of collection pipes, ditches, and channels designed to collect and transport pregnant solution to the pregnant pond. The network is constructed of 4-inch and 12-inch diameter perforated and solid walled HDPE pipelines. The 4-inch diameter perforated pipes will be placed oblique to the gradient in a herringbone configuration on 30-foot centers across the cell foundations with a minimum gradient of 4-5%. The 4-inch perforated pipelines will transfer pregnant solution to the 12-inch perforated collection pipes, which are located at the cell divider berms and the center of each cell. The perforated 12-inch diameter corrugated polyethylene tubing (CPT)
pipelines connect to the 12-inch diameter N-12 solid pipeline by routing solution into the solid walled pipeline through a boot in a 4-foot tall, HDEP-lined sandbag dam. The dam, which is constructed on top of the 80-mil HDPE liner, will force solution from the perforated pipeline to the solid-walled pipeline. The perforated 12-inch solution collection pipes are connected to the non-perforated 18-inch diameter CPT solution collection pipeline, which conveys pregnant solution to the pregnant pond.

A minimum of 2 feet of crushed ore will be placed as an overliner drainage layer and a liner cover to protect the synthetic liner and pipe network during subsequent stacking operations. The ore overliner will be crushed to a nominal 1.5-inch minus that will result in a material with 100% passing the 2-inch screen. Permeability testing was performed on a sample of the overliner material and the results displayed that the overliner material would provide effective hydraulic relief at the proposed maximum HLP elevation of 240-feet above the liner surface. Liner integrity testing displayed that the liner would remain effective and undamaged, with the selected overliner material, up to a HLP height of approximately 350 feet above the liner surface.

The Gemfield HLP will be loaded at an average daily loading rate of approximately 8,250 tons with actual day-to-day loading rates varying. The pad will be stacked in 25-foot lifts, utilizing haul trucks and dozers, to a maximum height of 5,680 feet above mean sea level or a maximum height of 240-feet above the liner surface. The open slope on each lift will be stacked at the angle of repose and utilize a setback of 37.5 feet on each lift to produce an overall heap slope of approximately 3H:1V.

Based on static and pseudostatic stability analyses (horizontal seismic acceleration of 0.135 times the gravitational acceleration force [0.135g] for design) and deformation analysis, an 80-mil HDPE smooth primary liner was acceptable for use on the foundation of the HLP. Other engineering considerations such as settlement analyses were conducted to ascertain positive gradients on the fluid management system. The final pad design resulted in worst-case factors-of-safety of 1.86 (static) and 1.15 (pseudostatic).

Stormwater that does not infiltrate into the Gemfield HLP will be handled by the perimeter channel formed between the toe of the heap and the perimeter berm. This will form a 27-foot wide, 3-foot deep open channel that will have an effective channel width of 17.5 feet after the installation of the solution delivery pipeline and pipe protection berm. Based on the calculated maximum 100-year, 24-hour flow rate of 42 cubic feet per second, the channels surrounding the HLP are adequately sized to effectively manage the 100-year, 24-hour storm event flows and route the flows to the Process Ponds.

**Process Ponds:** The Pregnant Pond and Barren Ponds have been designed to handle the operating solution capacity and the stormwater accumulations from the 100-
year, 24-hour event, while maintaining a freeboard of 2 feet. Both ponds will be square in design and have approximate dimension of 330 feet squared at the surface. The ponds will be 20 feet deep and will utilize side slopes of 3H:1V from the crest of the ponds to the floor of the ponds. This will provide for a maximum capacity (5,418 feet above mean seal level [amsl]) of 22.16 million gallons and a maximum operating capacity of 19.02 million gallons to the 2-foot freeboard elevation (5,416 amsl).

The Pregnant Pond and the Barren Pond were designed to have dead storage capacities of 8 feet (3.29 million gallons) and 4 feet (1.48 million gallons), respectively. This dead storage capacity assumes that the Pregnant Pond pump needs to operate at full capacity all of the time and the Barren Pond is only used for overflow and can be pumped at a lower flow rate. The lower pumping rate allows for the pump to run with a lower head above the intake resulting in less dead storage. In addition, both the Pregnant Pond and Barren Pond were designed to have maximum operating storage levels, including dead storage, of 12.5 feet (5.78 million gallons) and 8 feet (3.29 million gallons), respectively.

Above the maximum operating storage level is the available capacity to contain the runoff generated by a 100-year, 24-hour event. For the stormwater calculations, it was assumed that all precipitation from the design storm event (2.85 inches) falling within the 127-acre HLP (including collection channels) and the 5-acre lined process ponds would report to the ponds. This results in a required stormwater capacity of approximately 9.72 million gallons, which is provided by the process ponds that have a design capacity of approximately 9.95 million gallons below the 2-foot freeboard elevation while the ponds are at their maximum operating storage level.

The Pregnant Pond and Barren Pond are hydraulically linked by a double synthetically lined channel (80-mil primary and 60-mil secondary HDPE liners) that is hydraulically connected to the Barren Pond leak collection and recovery system (LCRS) sump (discussed below). The channel between the Pregnant and Barren Ponds is 4 feet deep with a bottom width of 10 feet and 3H:1V side slopes to the crest of the pond. The potential peak flow rate resulting from a 100-year, 24-hour event with the operational draindown rate of 2,800 gallons per minute, would result in a maximum flow rate of 48 cfs. When passing 48 cfs, the flow depth within the lined channel would be approximately 0.6 feet, leaving a freeboard of 3.4 feet below the pond crest.

In accordance with NAC 445A.435, the Pregnant and Barren Ponds will be double-lined and leak-detected. The ponds will be lined with an 80-mil HDPE primary liner that overlays a 60-mil HDPE liner with geonet placed between the liners for the rapid transfer of any fluids escaping primary containment to the LCRS sump. The LCRS sump will be constructed within the floor of the pond between the 80-mil HDPE primary and 60-mil HDPE secondary liners. The LCRS sump will be filled
with drainage gravel that is wrapped in geotextile and will provide an approximate capacity of 2,127 gallons. An 8-inch diameter perforated HDPE SDR 17 pipeline will be installed within the sump, between the primary and secondary liners, and daylight at the crest of the ponds for inspection and solution removal.

Pregnant solution from the HLP will report to the Pregnant Pond via the main collector pipeline and will be pumped to the carbon circuit (discussed below). All solution pumped to the carbon circuit and the process building will flow by gravity to the Barren Tank within the plant, where solution will be pumped back to the HLP. Only during extreme events will solution flow from the Pregnant Pond, the Barren Tank, or the process facility to the Barren Pond. Therefore, a stormwater pond is not currently proposed for the Gemfield Project.

Process Circuit: The solution flow rate to the Gemfield HLP is approximately 2,800 gpm and results in a net application rate of 0.005 gpm per square foot. The ratio of primary and secondary leaching depends on ore grades, leach pad and lift geometry, and leach kinetics. Fresh water additions to the system to make up for evaporation and ore moisture retention are made at the pregnant pond.

The process circuit begins with barren sodium cyanide solution, fed from the carbon plants, that is applied to the heap leach pad ore. As the sodium cyanide solution percolates through the ore, it dissolves and washes out gold and other precious metals that it contacts. As the metal bearing solution reaches the 80-mil HDPE liner beneath the ore, the solution travels horizontally and is collected in perforated collection pipes (as described above).

The Gemfield Project will utilize an absorption, desorption, and refining (ADR) plant, located on the northern edge of the HLP, to process the pregnant solution and produce gold doré. Pregnant solution will be pumped from the Pregnant Pond to the single train of five up-flow carbon columns. Solution will be pumped to the uppermost vessel that will subsequently gravity feed the remaining cells. Solution is fed from the bottom of the columns and up through the bed of activated carbon, which provides contact between the carbon and cyanide metal complexes. The precious metals are absorbed onto the porous surface of the carbon and are periodically moved from the furthest downgradient vessel to the highest vessel. Barren solution will gravity feed to the 15,600-gallon Barren Solution Tank where the solution can be dosed with sodium cyanide and recirculated to the HLP.

The loaded carbon is then pumped to an acid wash column, acid washed, rinsed with fresh water, and then transferred to a pressure stripping column where heated solution of cyanide and caustic soda is circulated to elute (desorb) gold. At the end of the stripping, carbon is rinsed with fresh water after which it will be thermally regenerated in a gas-fired rotary kiln and reintroduced into the carbon absorption circuit.
Gold will be extracted from the loaded eluate by electrowinning and deposited on stainless steel wool cathodes in the high pH solution and caustic soda. The cathodes are rinsed off and the resulting metal sludge will be filtered and dried to produce a filter cake. The filter cake will be refined in a furnace on-site to produce dore bars for shipment to a third party refinery.

The ADR Plant and Refinery will be constructed within reinforced and sealed concrete floor slabs and stemwalls with embedded flexible water stops at construction joints. Floors are sloped towards concrete sumps that will be cast-in-place. Building and sump capacities, as applicable, are designed to contain at least 110% of the maximum potential release volume either independently or with hydraulic connections that allow flow to cascade into larger capacity components. Any released solution will ultimately be pumped to the Carbon Column.

**Stormwater Diversions:** Stormwater control systems for the Project include diversion channels and berms, inlet channels, sediment basins, and a retention basin to protect process and non-process facilities from the effects of upstream storm runoff. The primary diversion structures at the site consist of the “East” and “West” stormwater diversions. An interim west diversion channel will be constructed for the 6 to 9 months between the anticipated start-up of ore processing and completion of the West diversion channel construction.

Hydrologic modeling was performed based on watershed delineation, design storm events and precipitation losses. Watersheds upstream of process and non-process components were delineated by photogrammetric surveys and precipitation data for design storm events was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Once the upgradient watersheds were delineated, the precipitation losses were determined by utilizing the National Resources Conservation Service Soil Conservation Service Curve Number method. A weighted average curve number was determined for each subarea. This subarea curve number was utilized to transfer excess precipitation into an outflow hydrograph what was subsequently utilized to determine the peak flows that had to be handled by the Interim West, West, and East diversion channels.

The hydrologic model results displayed that maximum flows resulting from the 100-year, 24-hour event, would produce maximum flows of 975 cubic feet per second (cfs), 1,679 cfs, and 3,251 cfs, respectively. To protect the diversion channels from erosion, riprap will be installed and sized utilizing the “Bed Shear Stress” method to determine a median riprap size. These calculated riprap sizes range from a 3-inch to 12-inch in median size.

For design purposes, the East Diversion channel was divided into the East and Northeast Channel sections. The East Diversion Channel, due to a portion of this diversion being routed through a portion of the Goldfield Consolidated Milling Company Tailings (discussed below), is designed as a synthetically-lined channel.
to minimize contact of stormwater with the tails. The East Channel will be synthetically lined with smooth 80-mil HDPE liner that will be placed atop recompacted subgrade. The 80-mil HDPE liner is overlain by 12-oz non-woven geotextile and covered with riprap as determined by the “Bed Shear Stress” method. The North Eastern Channel will be constructed of compacted native materials and covered with riprap as determined by the hydraulic analysis.

**Characterization:** A characterization program was performed on representative samples of the five primary rock types within the Gemfield Pit area. The determined rock types consisted of oxidized and non-oxidized Siebert (46% and 5% of total waste rock, respectively), oxidized Mira Basalt (3%), oxidized Milltown Andesite (9%), oxidized and non-oxidized Sandstorm Rhyolite (31% and 1%, respectively), and non-oxidized Vitrophyre (approximately 1%) formations. The Sandstorm Rhyolite (host of the mineralization associated with the Gemfield deposit) shows pervasive hydrothermal alteration and alteration that include silicic, argillic, and (less commonly) propylitic, and is attributed to the highly permeable character of the flow-banded volcanic stratigraphy. Formations above and below the rhyolite are unaltered to weakly altered and unmineralized. As a result, alteration type was not used to delineate material types in the characterization plan.

Geochemical analysis of the identified rock types consisted of both static and kinetic testing. Static testing consisted of analysis of samples for multi-element content, Acid Base Accounting (ABA), utilizing the Original and Nevada Modified Sobek Procedure, Net Acid Generating (NAG) testing, and Meteoric Water Mobility Procedures (MWMPs) that had leachate analyzed for Profile I constituents. Kinetic testing of various rock types that had uncertain acid generation and metal leaching potentials, or that could potentially impact future pit lake quality were further analyzed utilizing Humidity Cell Tests (HCTs).

ABA analysis was performed on 164 samples from the Gemfield Deposit in order to assess the balance of acid generating minerals and acid neutralizing minerals. Based on the U.S. Bureau of Land Management criteria for PAG and non-PAG materials, approximately 16% of the samples are classified as non-PAG with 66% and 17% of the materials being classified with uncertain acid generation potential and as PAG, respectively. MWMP results for Profile I analysis concluded that the waste rock has the potential to leach aluminum, arsenic, beryllium, iron, manganese, mercury, selenium, and sulfate in excess of Profile I reference values and to produces leachate with a pH lower than 6.5. The results of these tests determined which samples would be carried forward for additional characterization utilizing kinetic testing.

Kinetic testing was performed on two oxidized Siebert, one non-oxidized Siebert, four oxidized sandstorm rhyolite, two non-oxidized Sandstorm Rhyolite, and one non-oxidized Vitrophyre samples. The results of the kinetic testing display that the waste rock materials at the Gemfield Project have the potential to release antimony,
Characterization of the Goldfield Colombia Tails: Approximately 4 million tons of tailings were generated by the Goldfield Consolidated Mill during the 1920’s and 1930’s using a ball mill with mercury amalgamation and cyanide leaching. The mill tailings from the GCMC were discharged by gravity and deposited on the flat areas below the mill within the proposed footprint of the East WRDA.

The GCMC tailings range in thickness from 0 to 40 feet and cover an area of approximately 125 acres. Erosion of these tailings has been occurring for almost 100 years, as evidenced by the presence of tailings in the drainage to the north of the project boundary. Although some residual gold remains in the tailings, reprocessing of the tails is not considered economic and is therefore not proposed with the Project.

The characterization program for the tailings consisted of Rotosonic boreholes (both deep and shallow) drilled within the tailings and outside of the tailings to determine the underlying geologic units and collect samples for geochemical and geotechnical characterization. Sample collection consisted of sampling the tailings and collecting underlying samples on 1-, 2-, 3-, and 5-foot intervals depending on depth and borehole type. Sample collection also consisted of discrete samples collected every 2.5 feet within each borehole for field measurements and X-Ray Fluorescence (XRF) to provide a field evaluation of relative changes in key parameters throughout the borehole. MWMP analysis for Profile I constituent release was performed on samples of alluvium and underlying Siebert material to assess the potential for metal mobilization and release from the lithological units underlying the GCMC tailings. In addition, multi-element analysis was performed to compare key constituents to the tailings material and assist in the determination of the extent of contamination from the GCMC tailings.

The results of this characterization program display that the GCMC tailings materials are acid generating (pH of 2.5 to 5) and have the ability to leach aluminum, antimony, arsenic, beryllium, cadmium, chromium, copper, fluoride, iron, lead, manganese, selenium, sulfate, thallium, total dissolved solids, and zinc in excess of Division Profile I reference values.

The investigations of the subsurface displayed that constituent concentrations typically reduced to background levels within 2 feet of the base the historic tailings.
This also coupled with a marked increase in pH, demonstrates that the majority of the constituents are not readily mobilized from the tailings into the underlying alluvium.

Even though the characterization displays that the tailings with elevated constituents are generally sequestered within the alluvium, covering of the historic tailings with non-PAG waste rock is seen as beneficial to minimize the potential of meteoric infiltration and to minimize surface erosion of the tailings and subsequent transport downgradient of the site.

**Hydrogeological Investigation and Numerical Groundwater Flow Model:** To determine the hydrogeological character of the Goldfield Mining District, a hydraulic testing program was performed based on interpretations from drilling results and preliminary surveys of the hydrogeology in the area. The hydraulic testing program consisted of three relatively long-term, multiple well tests, and 46 short-term, single well tests conducted on boreholes, 2- and 4-inch monitoring wells, and packer isolated core holes. In addition, recharge rates from meteoric infiltration in the Big Wash and anthropogenic sources were evaluated. These investigations were then utilized to prepare a numerical groundwater flow model and subsequently determine the hydraulic nature of the area.

The numerical groundwater flow model was developed utilizing a 3-D geologic block model input into the finite-difference code Visual MODFLOW-SURFACT. The numerical groundwater flow model was then calibrated against historic and current groundwater elevations, and displayed the model was calibrated reasonably well to existing site conditions.

The groundwater numerical flow model was then coupled with the pit lake water balance through the application of the MODFLOW Lake Package LAK2. The LAK2 package accounts for the storage in the lake, evaporation from the lake surface, precipitation that falls in the lake catchment area, and groundwater inflow, as these parameters change over time.

Predictions of post-mining conditions indicate that two separate pit lakes will form within the western and eastern ultimate pit lobes. The maximum depth of the lakes will be approximately 79 feet (5,239 feet amsl) in the eastern lobe and 57 feet (5,137 feet amsl) in the western lobe. The eastern and western pit lakes will reach their maximum depths approximately 35 and 33 years after the cessation of mining, respectively. Both pits lakes are predicted to function as terminal sinks with no outflow to surrounding groundwater.

**Predicted Pit Lake Water Quality:** At the end of mining, the Gemfield pit will be mined down to a pit floor elevation of 5,080 feet amsl, or a maximum depth of 525 feet below the existing ground surface. As discussed above, two separate pit lakes will form in the eastern and western lobes of the Gemfield Pit. To determine the pit
lake chemistry, the proportional surface areas of the main lithologies that will be exposed in the final pit wall were calculated based on the 3D geologic block model. Based on the determined lithologies, fracture density, and thickness of the fracture zone, a reactive mass was determined. This reactive mass was then coupled with humidity cell data and information from the pit lakes water balance to calculate the average release of constituents from each determined lithology and subsequently the overall pit lakes chemistry at varying time steps.

Both the eastern and western lobes of the Gemfield Pit are predicted to be moderately alkaline, with pH values ranging from 8.0 to 8.3 with sodium and sulfate major ion signatures. The alkaline conditions of the pit lake waters are attributable to the alkalinity of the inflowing groundwater. Despite these moderately alkaline conditions, concentrations of fluoride, mercury, molybdenum, sodium, antimony, selenium, uranium, and total dissolved solids are expected to exceed Division Profile III reference values.

Due to the predicted exceedances, it was determined that the rapid infilling of the pit with water from the Goldfield water supply would benefit the overall water quality. Rapid filling of the pit would have the effect of quickly submerging the lower pit walls and benches to limit exposure of sulfide minerals to oxygen and reduce the potential metals leaching from the pit walls. Modeling results of this scenario display that there would be an overall decrease in the concentrations of fluoride, mercury, molybdenum, sodium, antimony, selenium, uranium, and total dissolved solids, but these constituents would still be in excess of Division Profile III reference values.

**Screening Level Ecological Risk Assessment:** Due to constituent concentrations exceeding the Division’s Profile III reference values, a screening level ecological risk assessment (SLERA) was performed to ensure that the requirements of NAC 445A.429 were satisfied. NAC 445A.429 requires that bodies of water which are a result of mines penetrating the water table must not create an impoundment which has the potential to degrade groundwater or adversely affect human, terrestrial, or avian life.

Parameters that exceeded the Divisions Profile III reference values were further analyzed. This analysis focused on an evaluation of mammalian and avian species known to inhabit the region and behavioral and physiological variances that could increase or decrease the consumption of water from the pit lakes during their life cycles.

The results of the SLERA, utilizing predicted chemistries for the natural infilling and rapid infilling scenarios, indicate that harmful effects cannot be ruled out for select receptor species for antimony. Due to this determination, the Division has placed a Schedule of Compliance Item in the Permit that requires the submittal of a mitigation plan/study within a year of the Permit becoming effective. Once an
Effective mitigation plan has been determined, the tentative plan for permanent closure and subsequently the reclamation cost estimate will be modified, as necessary.

**Ancillary Facilities:** Ancillary facilities consist of diesel and gasoline storage and fueling facilities, truck shop, warehouse, administrative building, and laboratory. Fueling facilities and the truck shop will be constructed with reinforced concrete slabs and stem walls, collections sumps, and waterstops to ensure that waters of the State are protected. Other ancillary facilities will utilize appropriate containment to ensure that waters of the State are protected.

**Tentative Plan for Permanent Closure:** Upon the completion of mining, waste rock storage facilities will be re-contoured to mimic natural topography and be sloped to 2.5H:1V to 3H:1V to allow for minimal meteoric water infiltration. Following re-contouring, suitable growth media will be placed (as needed) and seeded in accordance with the reclamation plan. The alluvium/growth media soil cover is intended to be non-erosive, or, for segments that do undergo erosions, able to self-armor in a way that halts erosion before waste rock is exposed or free drainage is compromised.

Once leaching operations at the Gemfield Mine have concluded, the solution will be allowed to drain down to an equilibrium condition where fluids can be managed passively. Make up water additions to the process circuit would cease and process solution would be recirculated back to the HLP. Process solution would be applied through the existing application system or actively evaporated to reduce the HLP and pond solution inventory. Once the fluid levels reach a level where passive management is possible, the HLP will be regraded to 3H:1V within the containment of the lined system and covered with a minimum of 2.5 feet of growth media (pending final approval of the Final Plan for Permanent Closure) and seeded. Once drain down flows have proven steady, the existing Pregnant Pond and potentially the Barren Pond would be converted into evaporation cell(s) to passively manage draindown flows.

**C. Receiving Water Characteristics**

The Project is located within the Basin and Range Physiographic province, which is characterized by a series of generally north-trending mountain ranges separated by basins generally filled with lacustrine and alluvial sediments. The Project is situated within the Central Hydrogeographic Region within the Alkali Spring Valley hydrologic basin (NDWR Administrative Ground Water Basin 142). Elevations in the Project area range from 5,450 feet above mean sea level (amsl) to 6,900 feet amsl. The Project area receives approximately 6.06 inches of precipitation annually primarily from snow and summer thunderstorms. Evaporation at the site is 57.2 inches per year.
There are no seeps or springs within a one-mile radius of the Project area. There are 13 regional springs and seeps either upgradient or cross-gradient of the Project. Drainages identified with the survey area for the Project are intrastate isolated waters with no apparent interstate or foreign commerce connection and as such, are not currently considered waters of the U.S.

Groundwater elevations across the Project show a gradient from southeast to northwest, indicating that groundwater is currently flowing from the area of the topographic divide towards the Alkali Springs playa. Groundwater elevations across the Project area range from 40 feet in the southeast to 500 feet in the northwest.

Monitoring wells are installed around the facility process components to detect any potential groundwater degradation from the site. Monitoring wells will consist of MW-22 and MW-29 (downgradient of the HLP and process ponds), MW-27 (downgradient of East WRDA and upgradient of HLP), MW-28 (within the footprint of historic tails), and MW-26 (upgradient of entire site). Due to the generally north northwesterly flow direction, the Division required that additional wells be installed downgradient of the HLP and process ponds, and the Gemfield Pit. These wells will be submitted as an engineering design change and the wells will be required to collect three quarters of groundwater data prior to commissioning the upgradient process components.

Groundwater from monitoring wells and unscreened boreholes in the area of the project is generally characterized by a neutral to slightly alkaline pH (6.88 – 8.18 standard units) with TDS (510 to 2,500 mg/L) in excess of Division Profile I reference values. Arsenic was elevated above the NDEP reference value of 0.01 mg/L in MW-27 and MW-28. Elevated manganese was noted in monitoring well MW-26 and selenium was elevated in MW-28. Sulfate was measured above the NDEP reference value of 500 mg/L in MW-26. Prior to Facility operation, a minimum of three additional quarters of background data will be collected to ensure that existing background groundwater quality has been accurately characterized.

D. Procedures for Public Comment

The Notice of the Division’s intent to issue a Permit authorizing the facility to construct, operate and close, subject to the conditions within the Permit, is being published on the Division website: https://ndep.nv.gov/posts/category/land. The Notice is being mailed to interested persons on the Bureau of Mining Regulation and Reclamation mailing list. Anyone wishing to comment on the proposed Permit can do so in writing within a period of 30 days following the date the public notice is posted to the Division website. The comment period can be extended at the discretion of the Administrator. All written comments received during the comment period will be retained and considered in the final determination.
A public hearing on the proposed determination can be requested by the applicant, any affected State or intrastate agency, or any interested agency, person or group of persons. The request must be filed within the comment period and must indicate the interest of the person filing the request and the reasons why a hearing is warranted.

Any public hearing determined by the Administrator to be held must be conducted in the geographical area of the proposed discharge or any other area the Administrator determines to be appropriate. All public hearings must be conducted in accordance with NAC 445A.403 through NAC 445A.406.

E. Proposed Determination

The Division has made the tentative determination to issue the new Permit.

F. Proposed Limitations, Schedule of Compliance, Monitoring, Special Conditions

See Section I of the Permit.

G. Rationale for Permit Requirements

The facility is located in an area where annual evaporation is greater than annual precipitation. Therefore, it must operate under a standard of performance which authorizes no discharge(s) except for those accumulations resulting from a storm event beyond that required by design for containment.

The primary method for identification of escaping process solution will be placed on required routine monitoring of leak detection systems as well as routinely sampling downgradient monitoring well(s). Specific monitoring requirements can be found in the Water Pollution Control Permit.

H. Federal Migratory Bird Treaty Act

Under the Federal Migratory Bird Treaty Act, 16 U.S. Code 701-718, it is unlawful to kill migratory birds without license or permit, and no permits are issued to take migratory birds using toxic ponds. The Federal list of migratory birds (50 Code of Federal Regulations 10, 15 April 1985) includes nearly every bird species found in the State of Nevada. The U.S. Fish and Wildlife Service (the Service) is authorized to enforce the prevention of migratory bird mortalities at ponds and tailings impoundments. Compliance with State permits may not be adequate to ensure protection of migratory birds for compliance with provisions of Federal statutes to protect wildlife.
Open waters attract migratory waterfowl and other avian species. High mortality rates of birds have resulted from contact with toxic ponds at operations utilizing toxic substances. The Service is aware of two approaches that are available to prevent migratory bird mortality: 1) physical isolation of toxic water bodies through barriers (e.g., by covering with netting), and 2) chemical detoxification. These approaches may be facilitated by minimizing the extent of the toxic water. Methods which attempt to make uncovered ponds unattractive to wildlife are not always effective. Contact the U.S. Fish and Wildlife Service at 1340 Financial Boulevard, Suite 234, Reno, Nevada 89502-7147, (775) 861-6300, for additional information.

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