A. Location and General Description

Location: The Slaven Canyon Mine (SCM) Rapid Infiltration Basins (RIBs) are located in Lander County, approximately 15 miles southeast (by air) from the town of Battle Mountain, in the historic Bateman Canyon Mining District.

The RIBs and associated components are located within portions of Sections 13 and 14, Township 30 North, Range 46 East, Mount Diablo Baseline and Meridian. The total planned disturbance for the SCM and RIBs is approximately 162.1 acres of private land owned or leased by Baker Hughes Oilfield Operations, LLC, the current Permittee of record. Currently there are nine shallow pits, totaling 4.4 acres in area at the SCM site, three of which currently contain water.

The purpose of the SCM RIBs is to manage the dewatering water not consumed by the mining and crushing operations at the SCM site (refer to WPCP NEV2011105). The Permittee of record for the SCM RIBs is authorized to infiltrate up to 50,000 gallons per day (gpd) of dewatering water back into the local groundwater basin.

The SCM RIBs are designed to be constructed, operated, and closed without any discharge or release in excess of those standards established in regulation except for meteorological events which exceed the design storm event.

Site Access: To access SCM, proceed on Interstate-80 east from Winnemucca or west from Elko to Exit 233-- East Battle Mountain, SR-304. Proceed approximately 0.25 mile south on SR-304 to Hill Top Road. Continue east on Hill Top Road (Frontage Road) approximately 6.5 miles to Beacon Light Road. Turn southeast on Beacon Light Road and proceed approximately one mile to the junction of Slaven Canyon Road. Proceed south on Slaven Canyon Road approximately 8.5 miles to the mine site.

General Description: Barite ore is mined from two pits (Main and North) and hauled to a stockpile pad at the SCM site where it is crushed and loaded into trucks for transfer to the Argenta Mill (WPCP NEV0091045) for additional processing and bagging. The groundwater table was encountered during the initial stages of North Pit development. The Permittee manages the water by utilizing two RIBs located downgradient of the pits at the SCM site. The RIB conveyance system includes submersible pumps, generators, piping, two valve boxes (one for each pit),
a 10,000-gallon HDPE storage tank, and a water station for filling dust suppression trucks. The conveyance system is designed to operate year round.

B. Synopsis

**Geology:** The SCM RIB is located on fluvial deposits within the Shoshone Range. The fluvial material is comprised of sand, gravel and clay to a depth of at least 400 feet below ground surface (ft bgs). Depth to groundwater averages 20 to 30 ft bgs at 5,449 feet above mean sea level (amsl). The mine is located within a complex series of Ordovician and Devonian Slaven cherts, argillites and quartzites capped by basalt and andesite.

**Infiltration Rate:** The soil infiltration rate was determined in January 2011 using a constant head double-ring Infiltrometer test and generally following procedures outlined in ASTM D3385 - 09 “Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer”. The test was conducted three times, and the infiltration rate was determined to be 0.79 inches per hour. This value was then used in design of the RIBs and in the predictive modeling and mounding analysis. The results of testing indicate that the existing soil conditions would provide adequate infiltration capabilities for the RIBs, and therefore no sub-base preparation would be needed.

**Soil Attenuation:** An evaluation of the water quality test data generated from the soil attenuation tests indicate no excessive concentrations of metals in either the groundwater samples or in the water analyzed from the open pits. The proposed operation of the RIBs will allow for the discharging of water from either pit almost immediately as it accumulates, precluding the formation of acidic water and the dissolution of metals from the rock material in the pits. Therefore, mobilization of metals in the soils beneath the RIBs is not anticipated to be a problem at the mine site.

**RIB Predictive Modeling and Mounding Analysis:** A MODFLOW groundwater flow predictive model was run to evaluate the effects of RIB infiltration on groundwater elevations and gradients in the alluvium beneath the RIB area. The pit inflow predictive model run for the SCM facility (refer to WPCP NEV2011105 Fact Sheet), was used in the RIB modeling evaluation to determine whether the groundwater depression associated with the open pit could generate a cone of depression that extends beneath the RIB area with the potential for drawing the RIB discharge into the pit. Pit inflow data generated by the predictive model showed no flow reversal downgradient of the pit.

Sensitivity analyses were also performed using both higher and lower bedrock hydraulic conductivities. A bedrock hydraulic conductivity 5 times lower than the pumping test result indicates that the cone of depression could extend near the RIB area, but would not capture the RIB infiltration water which is within the alluvial aquifer, not bedrock.
The model scenario for the RIB infiltration evaluation includes pit water evacuation every morning for six days of the week. The discharge rate from the pit to the RIB is assumed to be 500 gallons per minute (gpm) based on the design pump to be installed in the pit bottom. The daily RIB discharge time period is based upon the volume of groundwater that would accumulate in the pit in a 24-hour day minus an assumed 10,000 gpd for dust suppression usage on workdays and the 500 gpm discharge rate.

Predictive modeling results indicate that a groundwater mound will develop beneath the RIB, but surface seeps will not occur.

**Rib Design and Operation:** The SCM RIB design is based on the following field and laboratory testing parameters and predictive modeling results discussed previously:

- RIB infiltration rate 0.79 inches per hour
- Open pit inflow rate 26.6 gpm
- Groundwater elevation beneath the proposed RIBs 5,449 feet amsl
- Depth to groundwater beneath the proposed RIBs between 20 and 30 feet below ground surface (feet bgs)
- Depth to bedrock beneath the RIBs 60 feet
- Characterization results indicate no potential to mobilize constituents, especially nitrate
- Assuming a basin depth of 6 feet and 3H:1V inside slopes, the basins require an infiltration surface area (bottom footprint) of approximately 6,224 square feet and a volumetric capacity of 431,226 gallons. Berms have been constructed around the RIBs to manage stormwater runoff. The dewatering water enters each RIB by a 6-inch diameter pipe from the water tank. The pipe is buried, and rip rap is installed at the pipe outlet to dissipate the energy of the inflow.
- The RIBs are designed to operate independently of each other. Construction of the RIBs began concurrently with the mining of the North Pit and was completed before mining operations reached groundwater. Growth media generated during construction was used for berm and embankment construction and excess topsoil was stockpiled for reclamation.

When mining reached the groundwater table at an elevation of approximately 5,449 feet above mean sea level (feet amsl), dewatering operations began. The open pits are dewatered every morning, six days a week using 500 gpm pumps. The time required for dewatering and the locations of the pumps varies and is dependent on the depth of mining and the pit mined. A 1,000-gallon sump has been excavated in
the pit floor for pump placement and the floor of the bench is slightly sloped to
direct any water to the sump. There is no oil/water separator device proposed for
installation, however an absorption cloth is placed in the intake pool where water
enters each pump.

After mining of each bench is complete, the pumps and associated piping are
removed, a new sump is excavated, and the pumps and piping are reinstalled. The
North Pit was mined first, followed by the Main Pit, and this process will be
repeated throughout operations as each bench below the static water level is
progressively mined.

Six-inch diameter HDPE pipe connect the dewatering pumps to the valve boxes.
The pipe is placed in a 2-foot wide by 2-foot deep trench and covered with a one-
foot layer of sand followed by a one-foot layer of topsoil. A minimum downward
grade of 1 percent from the mine towards the RIBs has also been established. The
valve boxes will be constructed by excavating 3-foot by 3-foot by 3-foot deep pits
into the existing ground and installing pre-cast concrete boxes. The valve boxes
house a piping connection to connect the pit piping to the infiltration area piping.

Dewatering water from the valve boxes is then pumped to a 10,000-gallon HDPE
storage tank located in the yard area which serves as a combination sedimentation
collection and holding tank for filling water trucks used for dust control and if
needed, for firefighting. The inflow, outflow, and overflow pipes are 6-inch
diameter PVC. The storage tank outflow and overflow is designed to lead to the
water station, and the overflow is piped to the RIBs. Sediment collected in the RIBs
is removed periodically, characterized and disposed of accordingly.

**Stormwater Diversion:** Stormwater diversion structures have been constructed
where needed around the periphery of the RIBs to intercept runoff and to direct
meteoric run-off around the facility resulting from a 100-year, 24-hour storm event.
The structures are constructed in accordance with the Division’s Handbook of Best
Management Practices (BMPs). Ditches have also been constructed to intercept and
divert runoff around the waste rock pile, the yard area, and all roads.

**Petroleum Contaminated Soils:** The Permittee does not manage petroleum
contaminated soils (PCS) at the SCM RIB site. In the event of a spill, the
contaminated soil is excavated, placed in DOT-approved containers and transported
to an off-site facility authorized to receive such material.

C. **Receiving Water Characteristics**

**Groundwater:** In general, the groundwater flows parallel to Slaven Canyon Creek
and north within the valley alluvium that is present over the valley floor.
Groundwater originating from the east and west sides of Slaven Canyon flows
through the upper fractured rock zone toward the valley and eventually merges with
the groundwater within the Slaven Canyon alluvium. Approximately 0.3 miles
north of the northern edge of the SCM project boundary, groundwater emerges from a spring (SP-1) and continues as surface water in Slaven Canyon Creek. The surface water in the creek disappears near the mouth of Slaven Canyon approximately 2.5 miles north into the Reese River Valley alluvial sediments.

A total of five groundwater monitoring wells (MW-1 through MW-5) have been installed and water quality sampled to provide a baseline assessment of the water quality at the SCM. Groundwater monitoring well baseline data is presented in Table 1.

**Table 1: Groundwater Monitoring Well Baseline Data.**

<table>
<thead>
<tr>
<th>Monitoring Well</th>
<th>Groundwater Elevation (feet amsl)</th>
<th>Groundwater Depth (feet bgs)</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW-1</td>
<td>5,475.3</td>
<td>32.1</td>
<td>Downgradient of the RIBs</td>
<td>Aluminum, iron, and manganese exceed Profile I reference values.</td>
</tr>
<tr>
<td>MW-2</td>
<td>5,410.18</td>
<td>63.83</td>
<td>Downgradient of the RIBs</td>
<td>Iron and manganese exceed Profile I reference values.</td>
</tr>
<tr>
<td>MW-3</td>
<td>5,670.00</td>
<td>68.7</td>
<td>Upgradient of the RIBs</td>
<td>No Profile I exceedances.</td>
</tr>
<tr>
<td>MW-4</td>
<td>5,425.00</td>
<td>36.24</td>
<td>Upgradient of the RIBs</td>
<td>Aluminum exceeds Profile I reference values.</td>
</tr>
<tr>
<td>MW-5</td>
<td>5,400.00</td>
<td>33.98</td>
<td>Downgradient of the RIBs</td>
<td>Aluminum, iron, manganese, and arsenic exceed Profile I reference values.</td>
</tr>
</tbody>
</table>

**Surface Water:** There is one creek (Slaven Canyon Creek) and three historic pit lakes (identified as OP-1 through OP-3) within one mile of the SCM. An unnamed
Dry wash is located within Slaven Canyon and flows north through the western boundary of Section 13.

A spring (SP-1) located approximately 0.3 miles north and outside of the SCM operational area boundary is considered to be the confluence of Slaven Canyon Creek. In January 2011, flow from SP-1 was measured at a rate of approximately 1.5 gpm. A summary of the baseline surface water quality analytical results for the spring and creek indicate the water quality to be good, with no exceedance of any NDEP Profile I reference value. The creek meets the aquatic life, irrigation, and livestock watering standards pursuant to NAC 445A.144.

Water collected in the historic pits tends to remain throughout most of the year and is of sufficient quantity and quality that it has been used by a local rancher for livestock watering for the past 30 years. Surface water baseline data is presented in Table 2.

**Table 2: Surface Water Monitoring Site Baseline Data.**

<table>
<thead>
<tr>
<th>Surface Water Monitoring Site and Elevation (feet)</th>
<th>Volume (gallons)</th>
<th>Depth (feet)</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP-1 5,432 feet amsl</td>
<td>619,210</td>
<td>8</td>
<td>Upgradient of the RIBs</td>
<td>Aluminum concentrations and pH are slightly above the Profile I reference values. There are no aluminum or pH livestock watering standards defined in NAC 445A.144.</td>
</tr>
<tr>
<td>OP-2 5,483 feet amsl</td>
<td>521,440</td>
<td>8</td>
<td>Upgradient of the RIBs</td>
<td>Arsenic, manganese and pH are slightly above the Profile I reference values. Arsenic and manganese meet the livestock watering standards pursuant to NAC 445A.144.</td>
</tr>
</tbody>
</table>
### Surface Water Monitoring Site and Elevation (feet)

<table>
<thead>
<tr>
<th>Surface Water Monitoring Site</th>
<th>Volume (gallons)</th>
<th>Depth (feet)</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP-3</td>
<td>1,108,060</td>
<td>8</td>
<td>OP-3 lies within the proposed footprint of the North Pit and will be consumed by mining.</td>
<td>Manganese, sulfate and TDS are above the Profile I reference values. Manganese meets the livestock watering standards pursuant to NAC 445A.144, however there are no sulfate or TDS livestock watering standards defined in the NAC.</td>
</tr>
<tr>
<td>5,552 feet amsl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slaven Canyon Creek/SP-1</td>
<td>N/A</td>
<td>&lt;2</td>
<td>Downgradient of the RIBs</td>
<td>No exceedance of the Profile I reference values. The creek meets the aquatic life, irrigation, and livestock watering standards pursuant to NAC 445A.144.</td>
</tr>
<tr>
<td>5,320 feet amsl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 renewed 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 a required routine monitoring schedule. 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 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.

Prepared by: Michelle Griffin
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Revision 00: Permit Renewal 2017.