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

Permittee Name: **Columbus S.M., LLC**

Project Name: **Columbus Salt Marsh Project**

Permit Number: **NEV0098104**
Review Type/Year/Revision: **Renewal 2024, Fact Sheet Revision 00**

A. Location and General Description

Location: Columbus S.M. LLC (the Permittee) operates a mining and milling operation located on the northern edge of the Columbus Valley Playa in northwest Esmeralda County. The facility is located within the historic Columbus Marsh Mining District and occupies the site of the historic Argentum Mine and Mill. The site is approximately 45 miles southeast (by air) of the town of Hawthorne and 42 miles west (by air) of the town of Tonopah. The operation is located entirely on public land administered by BLM (Battle Mountain District) within Section 17, Township 3 North, Range 36 East, Mount Diablo Baseline & Meridian.

Access: From Hawthorne--proceed south on U.S. Route-95 (US-95) approximately 54 miles to the Argentum Mill access road, then proceed west 3.5 miles to the mill site. From Tonopah--proceed west on US-95/US-6, 38 miles to Coaldale Junction. Continue north on US-95, 11 miles to the Argentum Mill access road. Proceed west 3.5 miles on the access road to the mill site.

Characteristics: Clay is excavated from the surface of the Columbus Salt Marsh and either transported by truck to the Columbus process facility or slurried with water at the excavation site and pumped to the process facility where gravity and chemical separation methods are utilized to produce various grades of calcium carbonate and a gold-silver concentrate. Clay tailings are returned to the excavation area where they are partially dried and then returned to the mined areas as backfill. Decant process water recovered during the drying process is recycled repeatedly back into the beneficiation process. When the salinity of the recycled water increases to a concentration where it is no longer practical to recycle, the water is directed to a basin for evaporation and recovery of the salt compounds.

The mine and process facility are permitted to process up to 792,000 tons per year (tpy).

B. Synopsis

History: The earliest reference to the terms “Marsh” and “Salt Marsh” to describe the Columbus Valley Playa can be traced back to the early 1860’s, with the discovery of minor amounts of sodium salts encrusted on the muddy playa surface. It was believed at the time that a significant salt bed existed beneath the surface. In the early 1870’s, several boron-rich lenses, comprised primarily of ulexite ($NaCaB_5O_6(OH)_6 \cdot 5(H2O)$) with minor amounts of colemanite ($Ca_2B_6O_{11} \cdot 5H2O$) were discovered at shallow depths beneath the Columbus playa. These discoveries lead to construction of several small mills and the town of Columbus. By 1882, production had ceased due to the marginal quality of the Columbus deposit and the discovery of significantly richer borate deposits at Searles Lake and Death Valley in California. During the years 1912-1913, the U.S. Geological Survey (USGS) surveyed and drilled the Columbus area and ironically found no marsh, very little evidence of surface salt, none of the rich salt beds believed to be beneath the surface or even the highly concentrated salt brines that supposedly existed.

Mining: Clay sediments are mined from the playa in “panels” up to a permitted maximum rate of 2,400 tons per day (tpd) and 792,000 tpy. The clay sediments will be removed from the panels using a back hoe (or similar equipment) or a combination dredge-slurry system. Panel mining is sequenced to optimize concurrent backfill of partially dried tailings into the mine panel areas.

A total of 13 panels, comprising an area of approximately 80 acres, will be mined over a seven-year period. Panel lengths will vary due to the undulating edge of the playa, but a typical panel is nominally 200 feet wide at the surface, with a maximum depth of 40 feet, and pit wall slopes that range between one horizontal to one vertical (1H:1V) to 3H:1V.

The thin layer of granular surface soil above the clay will be stockpiled in the vicinity of the pit for redistribution after backfill of the pit using spent clay tailings. The artesian aquifer below the salt marsh is protected by maintaining a clay layer “seal” at least 100 feet thick above the aquifer. Total playa area affected by mining and processing is 380 acres, with 320 acres associated with mining and 60 acres associated with processing.

Within the area designated for clay excavation, an artesian well drilled by the Permittee was the only known borehole penetrating the artesian zone beneath the playa. However, a protocol has been developed to avoid operations within those areas where there is either surface water expression or a borehole has encountered artesian flow. The protocol includes actions such as ceasing operations within 200 feet of the borehole or the surface expression of any flow and submitting plans for review and approval to either plug the borehole pursuant to regulations or place a continuous berm around the surface expression of artesian flow within which no operations will be permitted. Refer to WPCP NEV0098104, Part I.G.3 for additional details.

Conveyance: The mined clay sediments are either transported by truck to the process facility or slurried with recycled water at the excavation site and then pumped to the process facility. Recycle process water added to the mined clay at a rate of 8,000 to 12,000 gallons per hour (gph), producing a clay slurry with a nominal solids content between 10 and 20 percent by weight.

The slurry conveyance system consists of a suction dredge, pump and approximately 2,150 feet of 8-inch diameter HDPE pipe for conveyance to the process facility. Protective berms have been installed along the length of the pipeline for the purpose of diverting slurry back to the mine area in the event of a pipe failure. Nominal flow rate of the slurry from the mine panels to the process plant is between 8,000 and 12,000 gph.

Process Facility: The historic Argentum Mill Building houses the beneficiation operation. The building site is divided into five distinct floor levels which contain various plant operations: Each level was constructed with concrete containment curbs. An evaluation of the concrete floors and containment berms was performed during 2007. Areas where the integrity of the concrete and/or containment appears to be inadequate were repaired, replaced, and/or upgraded as necessary. In addition, waterstops have been installed, and an acid resistant sealant has been applied over the concrete surfaces.

- Level 1 (e.g. top level) is located outside the building on the east side. This level includes the raw materials intake for the "Sand Ore". Materials are introduced to Level 2 via a conveyor fed on Level 1. Level 1 has no containment and no fluids are introduced into the raw materials.
- Level 2 is located inside the Mill Building, below Level 1, and includes the SWACO Screen Deck and Incline Tube Concentrators (ITC). At this level, raw materials are screened to minus ¼-inch and fed to a mixing process prior to any further processing. Level 2 contains the largest in-floor trench drain and floor drain. Upper Level 2 sits directly above Lower Level 2 and contains the Conveyor Intake Hopper, the two 100-gallon mixers, a 1,000-gallon process water tank, a 264-gallon water tank, and electrical panels. It is also at this level that the hydro-cyclone units will be placed. Total processing volume on this level (both upper and lower) is 2,500 gallons. The total containment volume for both the Upper and Lower Level 2 is 5,236 gallons.
- Level 3 currently contains no process equipment. This level is bermed to provide a containment capacity of 1,982 gallons.

Levels 2 and 3 are intended to contain only materials from either the salt marsh or the Surface Management Notice areas (mixed with water) and will contain no hazardous or toxic materials. Containment from these two levels will be piped to an external pump or containment tank. Any fluids captured in the containment tank(s), either from normal end of shift "wash down" of the equipment and floors, or breach from a process component, will then be periodically pumped to the settling pond for clarification and eventually returned to the mill.

- Level 4 is located in the center of the building and adjacent to the shop area. This level contains the Precious Metal Recovery Circuit (the Filter Press and Pregnant Solution Tanks). Although each Pregnant Solution Tank has a capacity of 3,000 gallons, only a fraction of each of these tanks is used during processing. The Pregnant Solution Tanks serve as holding tanks for the three-pass filtering process. The total maximum volume of processing fluids on this level at any one time is 2,400 gallons. The berms on this level can contain a maximum of 2,692 gallons.
- Level 5 (floor) contains six tanks for the leaching process. Each leach tank has a capacity of 700 gallons, of which only two tanks are currently being used. There is a

very large tank which sits to the north of all the leach tanks. This tank is currently not being used, but it will remain on Level 5 until it is eventually removed. Containment capacity on this level is approximately 9,973 gallons.

Levels 4 and 5 contain the acid leaching/calcium carbonate and precious metal recovery circuits. Both of these containments drain to a separate corrosion-resistant containment tank. Any spills and system washdown water flows to the Process Plant Central Collection Sump (CCS), where it is sampled and analyzed for Profile I constituents. Water that meets background water quality is pumped to the clay-lined Decant Water Pond (DWP). Water not meeting background is pumped to the clay-lined Saline Water Pond (SWP) for evaporation.

Process Scenarios: Two different gravity processing scenarios have been developed based on the type of ore or feed material encountered. Gravity Concentration Circuit-A (GC-A) processes sand-ore materials from the 5-acre Surface Management Areas. Gravity Concentration Circuit-B (GC-B) processes clay-ore from the mine panels.

The feed materials from the mine panels are clays and are dredged from the mine panels and pumped to the mill consisting of a slurry mixture of approximately 10 percent to 20 percent solids (by weight) to water. The water utilized will be clarified water recycled from the settling and reclamation water ponds. The feed material to the plant will be pumped via an 8-inch diameter high-density polyethylene (HDPE) slurry pipe to the existing main plant rake clarifier for slurry density adjustment. The clarifier will also serve as slurry feed storage and supply during the processing operation. Nominal flow rates of slurry from the mine panels to the thickener will be 8,000 to 12,000 gph.

The full capacity of the existing clarifier which holds and feeds processing materials is 142,000 gallons. Under the GC-A scenario, flows to the tank range from 3,300 to 4,200 gph. In the GC-B scenario, the slurry is piped from the mine panels to this clarifier. The slurry is thickened by the addition of a non-toxic leaching reagent at a rate of 2 to 3 percent by dry weight of feed and a non-toxic clay de-agglomerating agent such as sodium bicarbonate (baking soda) will be added at a rate of 4 to 10 parts per million (ppm). Thickened slurry from the bottom of the rake clarifier will be fed to the gravity concentration circuit within the plant. Slurry from the middle zone of the clarifier may be fed to the calcium carbonate circuit within the plant. Slurry from the top of the clarifier may be decanted to the central tailings sump for discharge to the water clarification ponds. Overflow rate from the clarifier will be 4,000 to 7,000 gph.

In the GC-A Circuit, minus ¼-inch “Sand-Ore” is fed into a mixer with water. Mixing occurs to scrape the head ore to provide better “surfacing” for processing. The ore/water mix is fed to the SWACO screen deck where plus 50 mesh ore is removed through a conveyance system. Minus-50 mesh and minus-80 mesh concentrates are screened through the SWACO deck and fed into the top of the incline tube concentrators. Water up-flow is provided to the bottom of the tubes via well water. Concentrates drop into the bottom tube reservoir. Valves are opened manually for collection of these concentrates.

Concentrates from the gravity concentration circuit will be hand-delivered to the concentrate leach circuit via 55-gallon drums. Concentrates will be dumped in the 700-gallon leach tanks where it will be mixed with a leach solution consisting of sodium hydroxide and thiosulfate. For every ton of ore concentrates, a range of 5 to 15 pounds of sodium hydroxide and 50 to 100 pounds of thiosulfate will be added. The dosing is still in research and development stages. An additional 248 gallons of treated reverse osmosis (RO) water will also be utilized for every ton of concentrates. The mixing tanks mix this ore-concentrate/leach solution mixture that is then filtered. The filter press decant solution is conveyed to the Resin Collection/Precious Metal Recovery Circuit and the tailings are conveyed to the mine backfill area.

In the GC-B Circuit, clay-ore removed from the mine panels is pumped as slurry (10 to 20 percent by weight) at a range of 600 to 2,400 pounds per hour. The resultant feed water rate is 300 to 1,200 gph. Wash water and fluidization water for these systems will come directly from the roadside well at a range of 4,320 to 4,800 gph. Tailings from the gravity concentration circuit are pumped to the Gravity Settling/Clarification Ponds (GSP-1 and GSP-2) for sedimentation.

Concentrates from the gravity concentration circuit will be dewatered via filter and processed in the precious metals recovery system. Various acids such as hydrochloric, sulfuric, and nitric will be used to leach the precious metals from the concentrates. The metals are loaded onto resins and sent to an off-site facility for recovery.

Tailings from GC-B Circuit containing either sodium thiosulfate or calcium thiosulfate pass through an inclined plate clarifier after the addition of a non-toxic polymer flocculating reagent at a rate of 3 to 12 ppm. Overflow from the incline plate clarifier which will consist of clarified water containing dissolved gold will be passed through a polishing filter and then through either activated carbon or ion exchange resin for capture.

The process facility is capable of producing pharmaceutical and technical grade calcium carbonate from feed generated from the thickener, hydrocyclones, or the spiral concentrators. The calcium carbonate circuit is operated on a batch basis and uses hydrochloric and/or nitric acid to produce the desired grade of calcium carbonate.

Batch operations consist of leaching, precipitation, filtration, and neutralization of 1,000-gallon batches of calcium carbonate feed, water consumption and discharge from this system is therefore minimal. All hazardous fluids and solids generated by this system are collected and removed for off-site disposal at a State-regulated facility. The calcium carbonate acid leach system and the gravity concentrate leach system are both housed on the lower level of the existing mill building with containment in excess of 120 percent of the volume of acid solution stored. This containment drains to the Acid Collection Tank (ACT) located on the exterior west side of the building. The ACT consists of a 1,500-gallon double-walled polyethylene tank.

An Engineering Design Change (EDC) approved on 6 February 2014 authorized the installation and operation of a one-ton per hour Stutenroth Impact Mill to reduce gravity circuit particle feed size to minus 100-mesh.

The Stutenroth Impact Mill is operated in the following manner: Ore is introduced into the top of the impact mill and immediately diverts to the right side of the interior of the impact mill. The ore feeds through v-shaped steel plates where it is pulverized by a steel fan that violently impacts the ore against the v-shaped steel plates. The size fraction is reduced to approximately minus 100-mesh and impacted material exits through a portal on the bottom of the unit. Depending on the ore type, more than one pass may be required to achieve the desired minus 100-mesh material.

For process circuit flexibility, the Stutenroth Impact Mill can be operated either inside or outside the mill building:

Location 1 – Outside the mill building, on Level 2 (near the main bay door). When placed outside, no water is utilized in processing. Impacted material is stockpiled, loaded into a feed bin, and moved via conveyor belt into the gravity concentration circuit.

Location 2 – Inside containment area. Water feed to the mixer is re-routed to flow through the impact mill and the slurry would be pumped back to the mixer for standard processing. It is estimated that flow rates will remain at approximately 8 gallons per minute, but could increase or decrease slightly. Again, the impact mill will not retain any water as all water will flow through to the remaining processes in the gravity concentration circuit.

Precious Metal Recovery Circuit: Pregnant solution exits the filter press and is placed in a 248-gallon holding tank. From here, the solution is introduced through a resin collection process which consists of 3 passes. A Resin (Purolite™ A500) is placed in a 3-inch diameter column. On the first pass, pregnant solution from the 248-gallon holding tank is passed through "Holding Tank #1" and then through the resin column. "Holding Tank #2" then stores the first pass solution. On the second resin pass, the solution in 'Holding Tank #2" is passed through the same resin column again and this extracted solution is stored in "Holding Tank #1". The third resin pass pushes the 2nd-pass solution in "Holding Tank #1" through the resin column for a final pass, and stored in "Holding Tank #2".

Process Plant Water Consumption: Assuming the plant operates for 6 hours per day (1 hour startup and 1 hour shutdown for 8 hour shift), the operating plant can utilize as much as 35,000 to 72,000 gallons per day (gpd). These maximum flows are assuming processing under the GCB Circuit scenario. Makeup water to water lost by evaporation and entrainment in the settling solids within the water clarification ponds will be on the order of 25 percent; therefore, 9,000 to 18,000 gpd of fresh makeup water must be added to the system.

Pipelines: All pipelines (tailings, water reclaim, and saline) are constructed of HDPE and located on the playa surface in clay-lined ditches. All pipeline ditches drain to containment "ponds" excavated into the playa clay (permeability 1 x 10^{-8} centimeters per second (cm/s)) and have a minimum volume equal to three times the full pipe volume of the largest pipeline. Water in these pipeline ditch “ponds” is pumped to the settling and reclamation water ponds.

Gravity Settling/Clarification Ponds: Gravity circuit tailings are conveyed via pipeline to one of two clay lined settling ponds, GSP-1 and GSP-2 (permeability 1 x 10^{-8} cm/sec), with a freeboard of 2 feet. The slurry is discharged at the end of the pond to allow sufficient time for maximum solids/liquid separation. A flocculant may be added to promote settlement of the solids. Decant overflow from the first pond is discharged to a second pond for additional clarification and the clarified solution is returned to the process as make-up water. The solids are allowed to collect and then are eventually removed to the drying basins.

Tailings Drying Basins: Prior to backfilling, the clay tailings are dried to a moisture content not to exceed 45 percent by weight. The tailings are dried in a series of four shallow clay-lined bermed basins on the playa (approximate permeability 1 x 10^{-8} cm/sec) and operated with a minimum of 2 feet of freeboard.

Each basin is 800 feet by 135 feet by 2 feet deep and is operated to allow for alternating slurry deposition. The coarse (plus 10-mesh) slurry fraction from the vibrating screen is conveyed to the drying basins via an HDPE pipeline. The slurry is discharged at one end of each basin to achieve maximum solids/liquid separation. An approved flocculant may be added to promote the settlement of solids. On the opposite end of each basin, process fluid(s) will be decanted and pumped to the decant/recycle water pond. Once the material achieves the desired backfilling properties (i.e. a specific shear strength and moisture content), the solid and liquid fractions of the “dried” tailings are characterized, and depending on the results, are either returned to the mined panels as backfill material or collected and sent off-site to a permitted hazardous waste disposal facility.

Decant Water Pond and Saline Water Pond: The Decant Water Pond (DWP) is approximately 150 feet by 150 feet by 4 feet deep. The Saline Water Pond (SWP) is approximately 400 feet by 100 feet by 4 feet deep. Both ponds are clay-lined with a permeability of approximately 1 x 10^{-8} cm/sec.

Water from the DWP containing low salt concentrations, is recycled back to the Process Plant for use as make-up water. When the salt concentration reaches a level where it can no longer be recycled back into the process, it is pumped to the SWP and allowed to evaporate. The salt precipitate is removed, characterized and depending on the characterization results, either backfilled or disposed of in a clay-lined facility. Construction of additional saline ponds, if necessary, will require modifications of the WPCP. In addition, because of the high salt concentrations in the saline pond, the installation of bird netting is required to protect avian life.

Ancillary Facilities: Additional facilities include a laboratory, shop and office. In the laboratory, small amounts of chemicals are utilized and are stored and disposed of pursuant to federal, state and local requirements. The primary production well is located northeast of the plant site.

Facilities have been designed to contain the 25-year, 24-hour storm event volume and appropriate measures (i.e. diversion) will be taken to divert the peak flows resulting from the 100-year, 24-hour storm. Specifically, measures include a proposal to construct a v-ditch along the road to divert run-off flow resulting from a 45-acre area upgradient of the process plant and, provide two-foot high berms around playa process ponds. Precipitation that accumulates in the mined panels is allowed to evaporate, or is pumped to the tailings drying basins or decant water pond.

C. Receiving Water Characteristics

The Columbus Salt Marsh is defined as a closed hydrologic basin. Artesian conditions exist throughout the marsh and are known to exist within the proposed mine area. Exploratory drilling in the mine area indicates that the confined artesian aquifer is approximately 140 feet below ground surface (bgs) with the clay gradually tapering toward the alluvial material on the perimeter of the marsh. The Artesian well in the mine area produces a shut-in pressure of 8 psi. Two other holes, each drilled to 100 feet, encountered nothing but low permeability clay soils. Fifteen test pits, excavated to a depth of approximately 15 feet bgs each encountered highly plastic, low permeability clay throughout the proposed mine area, with minor amounts of fine sand and a remolded permeability of 3.8×10^{-8} cm/sec.

All groundwater reporting to wells located around the marsh is saline and is non-potable. It does not meet the Profile I reference values. Groundwater quality becomes increasingly saline toward the center of the playa and salt encrustations are present on the playa surface due to the evaporation of the artesian water. Annual precipitation is 4.5 inches and pan evaporation for this area is over 100 inches per year.

There are no streams, springs, or seeps within one mile of the proposed project and all surface water is ephemeral. Artesian water does emanate from a cased drill hole penetrating the groundwater aquifer.

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, any affected 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 renewed Permit.

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

See Part I of the Permit.

G. Rationale for Permit Requirements

The facility is located in an area where annual evaporation is greater than annual precipitation. The presence of a thick layer of low permeability clay between the playa surface and artesian zone is well documented and the clay exceeds the thickness and permeability criteria for process fluid containment pursuant to NAC 445A.434. In addition, the existence of artesian conditions throughout the marsh counteracts downward movement of fluid from the facility, thus preventing migration to the artesian aquifer. A limited amount of very saline water (120,000 ppm TDS) in the pore spaces of the playa clay may come into contact with process solids/liquid.

The groundwater beneath and adjacent to the Columbus Salt Marsh does not serve as a source of drinking water and is considered to be a non-economically viable source of drinking water. The production well, located to the northeast of the proposed process plant, exceeds the Profile I criteria for chloride, fluoride, sulfate and TDS. The Artesian well, located in the area to be mined (southwest of the proposed process plant), exceeds the Profile I reference values for arsenic, chloride, fluoride, manganese, sulfate and TDS. However, the quality of the artesian aquifer is better than the process solution and solids characterization.

Therefore, the facility must operate under a standard of performance that authorizes no discharge(s) except for excess accumulations that are a result of a storm event beyond that required by design for containment. The primary emphasis for identification of process fluids will be placed primarily on routine inspection of process facilities and proper management of process materials and fluids. Monitoring shall be in accordance with Permit conditions.

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 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 Blvd., Suite 234, Reno, Nevada 89502-7147, (775) 861-6300, for additional information.

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