DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: Off-site Inspection

P030463148

FACILITY: ORVANA RESOURCES U S CORP		**SRN / ID:** P0304
LOCATION: IRONWOOD & WAKEFIELD TWPS, IRONWOOD		**DISTRICT:** Marquette
CITY: IRONWOOD		**COUNTY:** GOGEBIC
CONTACT:		**ACTIVITY DATE:** 06/08/2022
STAFF: Joe Scanlan	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** MINOR
SUBJECT:		
RESOLVED COMPLAINTS:		

SOURCE DESCRIPTION

The Copperwood Mine is owned by Highland Copper Company Inc. The Copperwood deposit is in Gogebic County in the Upper Peninsula of Michigan and is approximately 14 miles north of the town of Wakefield and 25 miles north-northeast of the town of Ironwood. The source is a proposed new underground copper and silver mine with associated ore milling and concentrate production, concentrate handling, and tailings disposal facilities. Based on a 2018 Feasibility Study, the life-of-mine is projected to be 10.7 years with an overall project life of 13 years. The production rate of the mine will be 6,600 mtpd of ore, with an average payable copper production of 28,000 mtpy.

HISTORY & GEOLOGY

Copperwood was discovered in 1956 and boasts the highest-grade of all known sediment-hosted copper deposits in the Upper Peninsula. It is geologically very similar to the White Pine deposit. In 1959, AMAX, who controlled the private mineral leases, decided not to proceed with the underground mine. In 2008, Orvana Minerals Corp. began delineation drilling and environmental baseline studies that led to engineering studies and a proposed mine plan. Highland Copper Company Inc. assumed ownership of the project in 2015.

The Copperwood deposit is buried by approximately 30 meters of unconsolidated glacial sediments. The ore sequence is a sheet-like, tabular body that is 2.3 meters thick on average; mineralization occurs exclusively as fine-grained chalcocite, a copper mineral that contains 79.8% copper. Chalcocite is the only ore mineral at Copperwood.

PROCESS DESCRIPTION

Underground Mine Operations

Underground ore mining will be done using conventional drill, blast, and mechanized room and pillar methods. Blasted ore will be placed into a hopper and a rolls/rock breaker and distributed onto belt conveyors for transport to the main mine conveyor. The main mine conveyor will transport ore to the surface for further handling and processing.

The mine will have six heaters, rated at 9 mm BTU/hr each, firing LPG.

The mine will be divided into an eastern part and a western part and will be developed over the 13-year life of the project.

Surface Ore Transfer and Use of Ore Bins/Reclaim Area

Ore produced underground will be placed on a main transfer belt conveyor to bring ore to the surface. At the surface, ore will go to the Transfer Tower (F001), where ore will either be directed to the Ore Stockpile or to the Ore Bins/Reclaim Area (F003). When the Process Plant is operating, ore leaving the Transfer Tower will go to one of four crushed ore bins for temporary storage prior to being transferred to the Process Plant. At the Ore Bins/Reclaim Area, ore will be stored in one of the bins before being fed through a crushed ore feeder to a belt conveyor for movement to the Process Plant.

Ore Stockpile

The Ore Stockpile will provide surge capacity and temporary storage of mined ore as it comes from the underground mine. During operations, some of the ore may be moved for temporary storage at this location. At the Transfer Tower, ore designated for the Ore Stockpile will be moved and deposited at a surge pile from a stacker conveyor located at the Ore Stockpile (F002). From the surge pile, ore will be moved using a front end loader (FEL) to the Ore Stockpile. As needed, the ore will be moved back into the ore processing circuit through use of the FEL. The FEL will deposit the ore into a chute located at the Transfer Tower.

Process Plant Operations

From the Ore Bins/Reclaim Area, ore will be transferred by belt conveyor to the grinding circuit at the Process Plant. The first step in the grinding circuit is the Semi-Autogenous Grinding (SAG) Mill. The grinding circuit will receive ore at a nominal top size of 203 millimeters (mm) with an 80% passing size of 150 mm with raw water added to achieve a desired slurry density. The SAG Mill will be in closed circuit with a screen and ball mill along with a cyclone cluster to achieve the desired initial grind size of 80% passing 45 mm for the flotation circuit. Once the ore enters the SAG Mill, it becomes a slurry and particulate emissions are minimal since the ore will be wet.

Chemical reagents will be added in the grinding and flotation circuits to recover a concentrated ore product. Rougher flotation is the first separation step between the copper bearing minerals in the ore and the host materials. The wet concentrate from the rougher flotation is directed to further grinding, while the tailings waste product becomes a portion of the final waste from the Process Plant for placement in the Tailings Disposal Facility (TDF).

Rougher concentrate will go to a regrind cyclone circuit, along with tailings from the second stage of cleaner floatation, for size classification. Oversized materials will be directed to a regrind mill. Undersized material meeting the desired final size of 80% passing 20 microns will be sent directly to the three-stage flotation circuit.

Cleaner flotation will consist of three stages of closed circuit cleaning to produce the highest possible copper grade in the ore concentrate without adversely affecting overall mass recovery of copper in the ore feed. The tailings waste product from the first cleaner scavenger stage of the cleaning circuit will be combined with the rougher flotation tailings to make the final waste product of the Process Plant for placement in the TDF.

Concentrate Production

Final concentrate from the cleaner flotation circuit will be pumped to a thickener where a flocculent solution will be added. Thickener overflow will be sent to the process water tank for re

-use and thickener underflow, at approximately 60% solids, will be pumped to a concentrate filter feed tank. Thickened concentrate will be pumped in batches to a concentrate filter press to remove water to produce concentrate with a moisture content of approximately 9%. A FEL will be used to remove concentrate from beneath the filter press and transfer it to a loadout hopper where it will be transferred to concentrate product haul trucks via a concentrate feeder and truck loading conveyor for shipment to an off-site transfer facility. This concentrate is the final product of the mine facility.

Reagents

Reagents are used in the milling process to separate the particles rich in target metals from those particles with low levels of target metals. Reagents will also be used as flocculants. Reagents will be mixed and then pumped as a liquid into the process. Except for Sodium Isobutyl Xanthate (C-3430), alkylaryl dithiophosphate (A-249), carboxymethyl Cellulose Sodium, hydrated lime, and flocculent, most reagents will be received in pre-mixed or liquid form and stored in the reagent area located at the northwest side of the Process Plant. Dry reagents will be handled in sacks, tote bags, or other covered containers and added directly into mixing tanks inside the building.

Process Plant Space Heaters

The facility will have LPG fired space heaters in the process plant. The total heat input rate for the heaters is estimated to be 1.452 mm BTU/hr. The heaters will not have stacks.

Emergency Generators

The facility will have three diesel-fired Cummins emergency generators that will be used to provide back-up power for the underground mine operations, tailings slurry pump, and concentrate and tailings thickeners. A 1,000 kW generator will be located near the mine portal; the other two 500 kW generators will be located near the Process Plant. Emission estimates are based on 500 hours of operation per year, but Copperwood plans to operate each generator for no more than 126 hours per year for emergency purposes.

TDF

The Process Plant will generate a tailings slurry (32% solids) from two steps of the operation; 61% will come from rougher tailings and 39% will come from the first cleaner scavenger. Rougher tailings contain approximately 88% silt and the first clean scavenger tailings contain approximately 99% silt. Tailings will be discharged from the Process Plant through a piping system to the TDF. The TDF will be constructed with coarse tailings in layers and stages and will be developed over the 13-year life of the project. The overall surface area of tailings within the TDF will be approximately 10,000,000 square feet at maximum development, with most of that footprint being within a pond. Of the exposed tailings surface area, approximately 75% will be wet beach area, while 25% will be a dry beach area (409,883 square feet).

EMISSION UNITS

EUMINEVENT: Three mine vents (Portal Mine Exhaust Vent, West Mine Exhaust Vent, and East Mine Exhaust Vent) to exhaust emissions produced by underground activities including propane fired mine heaters, drilling, blasting, and ore handling. Particulate matter generated by blasting

and ore handling operations in the mine will be controlled with dust suppression systems, such as water sprays.

EUOREHANDLING: Fugitive emissions from ore conveying activities, including ore transfer from the portal to transfer tower; surplus ore transfer to the ore stockpile; ore transfer within the ore bins/reclaim area including transfer of ore to the bins, transfer to ore feeders at the base of the ore bins, and transfer to the SAG mill conveyor for transfer to the process plant; and transfer points at the SAG mill prior to the material becoming a slurry. Emissions are controlled by enclosed transfer points on all equipment as well as water spray on the SAG mill transfer points.

EUCONCENTRATE: Concentrate handling operations inside the concentrate building including a storage pile, transfer of concentrate to a loadout hopper using a FEL and conveying concentrate to haul trucks.

EUREAGENTMIX: Indoor reagent mixing area for mixing wet and dry reagents in reagent mixing tanks.

EUHAULROADS (FGFUGITIVES): Fugitive emissions from vehicle traffic on the facility roadways, including front end loaders and concentrate haul trucks.

EUSTOCKPILE (FGFUGITIVES): Fugitive emissions from the outdoor ore stockpile.

EUTDF (FGFUGITIVES): Fugitive emissions from the tailings disposal facility.

EUGENERATOR1 (FGGENERATORS): 1,500 horsepower diesel fired emergency generator (SV-009) to provide backup power for the facility, located at the mine portal. This engine is subject to NSPS IIII and NESHAP ZZZZ.

EUGENERATOR2 (FGGENERATORS): 755 horsepower diesel fired emergency generator (SV-010) to provide backup power for the facility, located at the process plant area. This engine is subject to NSPS IIII and NESHAP ZZZZ.

EUGENERATOR3 (FGGENERATORS): 755 horsepower diesel fired emergency generator (SV-0011) to provide backup power for the facility, located at the process plant area. This engine is subject to NSPS IIII and NESHAP ZZZZ.

EUSPACEHTRS: Propane fired heaters to provide heat for facility buildings.

EMISSIONS

Copperwood based air emissions estimates on the fully developed mine at maximum operation, producing 7,260 tons of ore per day and 2,649,900 tons of ore per year (20 hours per day, 365 days per year), 20.9 tons per hour and 183,347 tons per year of concentrate (8,760 hours per year), maximum mine vent air flow rate of 850,000 cfm, a 13 acre ore stockpile filled at 6,600 tons per day, and a 316 acre tailings disposal facility (230 acres exposed to wind, 9.4 acres of dry beach area).

See the EGLE AQD evaluation form for 180-11A for in-depth potential to emit analyses of each specific emission unit/source. Permitted emissions for main mining emission units include PM

and visible emissions, with FGGENERATORS subject to NSPS IIII and NESHAP ZZZZ emission limits. FGFACILITY has a CO emission limit 98.4 tpy.

EMISSIONS REPORTING

No AQD permitted activity has taken place at the site at this time. Emissions reporting for individual EUs will be addressed in a future staff activity report.

REGULATORY ANALYSIS

The proposed source is a minor source for the Title V Renewable Operating Permit (ROP) program, the Prevention of Significant Deterioration (PSD) Program, and an area source of Hazardous Air Pollutants (HAPs). Note, a metallic mineral mine and processing facility is not a listed source category for ROP or PSD purposes, so fugitive emissions are not included in the potential to emit.

Air Quality Division Permit to Install 180-11 was issued July 17, 2012 and expired July 17, 2015 because the permittee did not begin construction within the required timeframe. The PTI was voided on July 28, 2015. PTI 180-11A was issued November 26, 2018 and is currently active.

Air quality impacts are expected during facility construction, operations, and reclamation. These include but are not limited to; particulate matter from vehicle travel, grading of soils for facility and mine development and materials handling (conveyors and ore stockpile). Combustion source emissions from the potential on site power plant (currently power via transmission lines is the planned source instead of an on-site power plant), underground blasts, mobile equipment, and heating equipment. Fugitive dust emissions are addressed in a fugitive dust control plan outlined in Appendix A of PTI 180-11A. The permit application and AQD evaluation document outline estimated potential emissions and dispersion modeling for full buildout of the operations phase.

A feasibility study indicated that an on-site natural gas power plant was the preferred power supply alternative for the project compared to the 2012 feasibility study plan for utility supplied power that required construction of a 25-mile transmission line. During initial discussions with the local utility provider, they indicated the timeline for a transmission line would be at least 48 months which was a bad fit with the preferred project timeline. The same utility provider also offered to provide natural gas service to the Copperwood Mine site that, in addition to fueling the on-site power plant, would have provided a fuel source for the updated mine ventilation system air heaters and space heating requirements for plant site buildings. After further consideration, the cost estimates for purchase and installation of the on-site natural gas power plant plus installation of the natural gas service pipeline had an adverse effect on the economics of the project. As a result, the permittee re-initiated transmission line discussions with the utility company and reached agreement on an accelerated completion date that falls in line with the current project schedule.

COMPLIANCE

Highland Copper Company Inc. is continuing to work on updating the Feasibility Study conducted in 2018. As of March 31, 2022, approximately 90% of the underlying engineering work was completed. The company is working to complete the updated Feasibility Study, including a development schedule, by June 2022. Construction is slated to commence in 2023.

Based on records and information reviewed, Highland Copper Company Inc. is in compliance with PTI 180-11A.

NAME _____ DATE 6-27-22 SUPERVISOR _____