THE GRASSY MOUNTAIN MINE PROJECT

Revised Wildlife Protection Plan

Malheur County, Oregon

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INTRODUCTION

Calico Resources Group USA Corp. (Calico) intends to mine precious metals from the Grassy Mountain Mine Project (Project) located approximately 22 miles south-southwest of Vale in Malheur County, Oregon. As a part of its consolidated application for a chemical process mine, Calico must demonstrate the Project's compliance with standards for wildlife protection that are described in Oregon's Administrative Rules (OAR) 635-420-0030.

In general, the wildlife protection standards employed by the proposed mine will be designed to meet the objective of zero wildlife mortality, as directed by OAR 635-420-0030. Mason, Bruce & Girard, Inc. (MB&G) prepared this Wildlife Protection Plan (WPP) to describe how Grassy Mountain Mine will comply with the wildlife protection standards. Required content for the WPP is described in OAR 635-420-0020. This report is organized by the subsections of OAR 635-420-0020 which are highlighted with italicized text. Appendix A includes figures and site plans.

PROJECT DESCRIPTION

OAR 635-420-0020 (4)(a) Provide a site plan drawn to scale showing the location of all chemical processing solutions and associated wastewaters

Calico Resources USA Corporation (Calico), a wholly owned subsidiary of Paramount Gold Nevada Corporation (Paramount), owns and controls 100 percent of the mineral tenure of the unpatented mining claims, patented mining claims, and mining leases that comprise the Project. The Project consists of two claims groups that are situated near the western edge of the Snake River Plain in eastern Oregon, 22 miles south-southwest of the town of the city of Vale, Oregon, and about 70 miles west of Boise, Idaho. The Project location is shown in Figure 1 and the vicinity and access route with site plan is shown in Figure 2 (Appendix A).

Calico proposes to mine approximately 2.07 million short tons (US) (Mst) of mill-grade ore and 0.27 Mst of waste rock for a mine life of approximately 7.8 years; however, the Tailings Storage Facility (TSF) has been designed to expand and contain 3.64 Mst should additional reserves be identified. The material (both ore and waste) will be extracted from the underground mine using conventional underground mining techniques, including drilling, blasting, mucking, loading, and hauling at a rate of approximately 1,200 short tons per day (stpd), four days per week. Calico will use hydraulic loaders to load the ore and waste rock into the haul trucks. The haul trucks will transport the waste rock to the temporary waste rock storage facility (TWRSF) near the TSF and transport the ore to the Run of Mine (ROM) stockpile adjacent to the crushing and milling facilities. The ore will be crushed and leached in a carbon-in-leach (CIL) processing plant at a rate of 750 stpd, seven days per week. The leached tailings will then be pumped in a slurry to the TSF, with supernatant solution recovered and pumped back to the mill.

In general, the proposed mining and metal processing operations will consist of an underground mine and ore processing facilities, including a conventional mill and TSF, a TWRSF, and other support facilities. The Project will include the following major components:

- An underground mine, with Mine portal, decline, and ventilation shaft;
- TSF with Tailings Embankment, Tailings Impoundment, and Reclaim Pond;
- TWRSF;
- Process Plant Area, which includes the Process Plant building, control room, crushing facilities, conveyors, ore bins, control rooms, CIL processing plant, reagent storage building (including chemical and reagent storage), gold room, and Collection Pond;
- Infrastructure and ancillary facilities that include site main gate and guard house, administration office and change house, assay laboratory and sample preparation area, truck workshop and warehouse, wash pads, Process Plant workshop and warehouse, meteorological station, explosive magazines, parking areas, ore stockpiles, solid and liquid hazardous waste storage, and fuel storage and dispensing area;
- Roads, including upgrades to the Twin Springs and Cow Hollow Roads, and construction of the mine access, internal access, and mine haul roads;
- Yards and laydown areas;
- Growth media stockpiles;
- Water supply, including production wellfield, water pipeline, raw water storage tank, and potable water treatment plant;
- Power supply that includes a power substation, upgraded 34.5 kilovolt (kV) overland power transmission system, new 34.5 kV overland power transmission system, onsite power lines, and generators;
- Permanent and temporary stormwater diversion channels;
- Other areas, including the exploration areas, septic system, and perimeter fence;
- Quarry; and
- Reclamation borrow areas.

The Project will follow conventional underground mining and ore processing methods. The locations of proposed facilities are shown on Figure 2 (Appendix A). For the purposes of this report, the **Project Area** refers to the area of mining claims where the mine opening and above-ground facilities will be constructed.

MINING METHODOLOGY

OAR 635-420-0020 (4)(b) Describe the method which shall be used to apply chemical processing solutions to heap leach pads, and the measures which shall be taken to preclude ponding or other conditions which could lead to the ingestion of or exposure to chemical processing solutions by wildlife. These measures shall be selected based on factors which include, but are not limited to, the application rate of chemical processing solutions, and the characteristics of the ore;

This section describes how the project addresses the Standard for Wildlife Protection:

OAR 635-420-0030 (1) Chemical processing solutions shall be applied to heap leach pads by drip-irrigation systems or other methods which preclude ponding or other conditions which could result in the ingestion of or exposure to chemical processing solutions by wildlife.

Gold and silver from the Grassy Mountain Mine will be recovered using a conventional underground mining and chemical ore treatment process. The mining approach for the Project is described in detail in the technical feasibility study (Ausenco 2020). The process will not involve application of chemicals to heap leach pads. Water and chemical solutions used during the gold and silver recovery process will be entirely enclosed within vessels, tanks, equipment, piping, or other entirely enclosed spaces and inaccessible to wildlife with the exception of the TSF and the reclaim pond. As described in greater detail below, wastewaters will be treated and detoxified prior to being discharged to the TSF and reclaim pond. Inside the processing plant, ore from the mine will be successively crushed and ground to reach a fine particle size then treated using a Carbon-In-Leach (CIL) circuit that involves the addition of cyanide to the ore material. Gold and silver leached during the CIL circuit will be recovered with activated carbon, eluted, and finally precipitated using electrowinning in a secure portion of the facility. The precipitate will be dried using a mercury retort oven, then smelted in a furnace and poured as doré bars. Mercury collected during the smelting process will be shipped off-site for third party storage and further processing as described in the Waste Management Plan (Calico 2023a).

The tailings from the CIL circuit will be treated for cyanide destruction prior to being pumped outside the processing plant for storage in the TSF. Cyanide destruction will involve adding several chemicals to the tailings slurry including lime to buffer the pH, copper sulfate as a reaction catalyst, and sodium meta-bisulfate (SMBS) as a source of SO_2. The detoxified tailings slurry will be deposited in the TSF in a manner that will allow decant water to pool and be reclaimed for re-use in the processing plant. Chemistry of the tailings supernatant and access control measures are described in the sections below.

Chemical Processing Solutions and Associated Wastewater Containment

OAR 635-420-0020 (4)(c) Identify the chemical processing solutions and associated wastewaters which shall be contained or covered and fenced to preclude access by wildlife, and provide design drawings, construction specifications and other information necessary to demonstrate compliance with the standards in OAR 635-420-0040 and 635-420-0050. If alternatives to the materials or construction methods in 635-420-0040 and 635-420-0050 are proposed, information shall be provided to demonstrate that the proposed alternatives provide equivalent or better strength, durability and protection for wildlife;

This section describes how the project addresses the Standard for Wildlife Protection:

OAR 635-420-0030(2) Chemical processing solutions shall be contained, or shall be covered in accordance with OAR 635-420-0040 (Minimum Standards for Covering or Containment) and fenced in accordance with 635-420-0050 (Minimum Standards for Fencing) to preclude access by wildlife.

All above-ground facilities associated with the Grassy Mountain Mine Project Area will be enclosed with a perimeter fence (Figure 2, Appendix A). This fence will be constructed to meet the standards outlined in OAR 635-420-0050. The perimeter fence will be:

- At least 8 feet in height.
- Covered with a 0.5-inch mesh of galvanized hardware cloth on the fence's lower 30 inches above ground.

- Armored to exclude burrowing mammals (*e.g.* ground squirrels); the hardware cloth will extend at least 18 inches below the ground surface.
- If fencing is constructed from materials other than chain link or cyclone it will follow these additional minimum specifications:
    - Constructed using wooden posts not less than 11 feet 6 inches long or #133 studded "T" steel posts not less than ten feet long shall be used as line posts. When steel posts are used, every seventh post shall be wooden.
    - Wood posts shall have a top diameter of not less than five inches and shall be free from defect, decay or damage. They shall be treated for at least three feet at the base with a wood preservative to prevent decay or insect damage. Wood posts shall be sunk at least two feet six inches into the ground and set no more than one rod apart. Posts shall be securely braced at the corners, angles, and at intervals along the line.
    - The fence shall be constructed of 14.5 gauge woven wire with vertical stays every six inches and no less than 17 horizontal line wires. The bottom of the fence shall be at ground level. The wire shall be tightly stretched and firmly stapled with 1.5-inch staples at the rate of ten staples per post.

Except for liquids stored in two wastewater facilities described below, all raw chemicals and chemical solutions used in the mining process will be inaccessible to wildlife. Chemicals will be stored in self-contained areas inside the processing plant and will include:

- Lime
- Sodium cyanide
- Sodium hydroxide
- Sodium metabisulfate
- Copper sulfate
- Hydrochloric acid

The water within the watersheds where the mine facilities are located is classified into two categories, "contact" and "non-contact" water. Contact water is surface water or groundwater that has been exposed to excavated materials (*i.e.*, ore, tailings, and waste rock) or mining process facilities. Surface contact water will be collected for storage and reuse through a collection pond located within the Project Area near the process plant. Water collected in the collection pond will include meteoric water that comes into contact with the process plant site and infrastructure but is not involved in the mining process. The collection pond will be kept dry by a pump system that will return any captured surface contact water back into the process (Ausenco, 2020 and Golder, 2021).

Non-contact water is surface water and stormwater that has not been in contact with any disturbed surface within the Project Area. Any non-contact water that mixes or comingles with contact water becomes contact water. As described in the Stormwater Pollution Control Plan (WSP USA, 2023), non-contact water will be collected and diverted around the mine facilities in a series of culverts. The culverts will discharge into natural drainages at points within the perimeter fence, restricting access by terrestrial wildlife. During wet periods, non-contact water will continue to flow offsite through the natural drainages below the discharge points. There is an existing cattle pond (Schwizer Reservoir) within the

Project Area that episodically collects snowmelt or stormwater runoff. This reservoir will be within the area surrounded by the perimeter fence and its berm will be dismantled during construction of the proposed road connecting the quarry to the mine facilities. It will not hold water and will not act as a wildlife attractant.

Contact water used in the mining operation will include water from underground dewatering operations and process water reclaimed from the TSF. Any additional makeup water will be recovered from the production wellfield, pumped and stored in a raw-water storage tank. Potable water will be sourced from the raw-water tank, treated, and stored in a potable-water storage tank.

Wastewaters Accessible to Wildlife

Contact water may be accessible to wildlife from two facilities during mining operations, the TSF and the reclaim pond. The Project will employ a combination of physical exclusion devices and wastewater treatment methods along with regular monitoring to protect wildlife from harm.

This section describes how the project addresses the Standard for Wildlife Protection:

OAR 635-420-0030(3) Associated wastewaters shall be maintained in a condition that is not harmful to wildlife or shall be covered in accordance with OAR 635-420-0040 (Minimum Standards for Covering or Containment) and fenced in accordance with 635-420-0050 (Minimum Standards for Fencing) to preclude access by wildlife.

OAR 635-420-0020 (4)(d)(A) A description of the chemical composition of the wastewaters;

The tailings geochemical report (SRK 2021) describes in detail the methods and results of laboratory testing of samples collected from the Project Area and application of a geochemical model used to predict the chemistry of the supernatant to be stored in the TSF and the reclaim pond. The geochemical modeling accounted for the effects of evaporation and dilution by precipitation on the supernatant pond water chemistry. In general, the supernatant is expected to have an alkaline pH due to pre-treatment with lime prior to deposition in the TSF. The results of the ecological risk analysis of the supernatant and reclaim water are discussed below.

OAR 635-420-0020 (4)(d)(B) A description of the methods which shall be used to maintain the wastewaters in a condition which is not harmful to wildlife;

Both the TSF and the reclaim pond will be located within the perimeter fence which is designed to prevent terrestrial wildlife from entering the Project Area. The reclaim pond will be separately surrounded with a fence that meets the same standards as the perimeter fence. The West Permanent Diversion Channel will also act as a physical barrier along the south side of the TSF (Appendix A, Figure 2).

If stage 3 is built the final TSF will occupy approximately 108 acres and is designed as a long-term, geotechnically-stable facility. The TSF and the reclaim pond are designed to function together as a zero-discharge facility to comply with OAR 340-043-0000, meaning the TSF and reclaim pond will be fully and continuously lined with a geomembrane extending across the basin of the impoundment and the embankments (Golder 2021). The TSF will be capable of storing a 500-year, 24-hour storm event with an

allowance for wave action to meet the requirements of a Low Hazard Dam. The TSF and the reclaim pond will not be connected to streams or other water features that support fish. Normal operations of the TSF will involve ongoing physical disturbances that are expected to prevent the establishment of aquatic plant or invertebrate populations.

In addition to the chemical processing solutions and wastewater containment systems associated with the chemical mining process, waste rock stored on the surface presents a potential source of exposure to acidic runoff. The waste rock from the mine is naturally acidic, and Calico proposes to temporarily store it in a geomembrane-lined temporary waste rock storage facility (TWRSF). A drainage system will be used to collect any water that comes into contact with the waste rock (*e.g.* rainfall) and it will gravity drain to the TSF. The TWRSF drainage system is designed so that its outfall can be managed separately from the TSF, if necessary.

All of the waste rock generated from the underground mining operations will be placed back underground as cemented rock fill. The TWRSF geomembrane lining system will be cut, removed, and disposed of off-site and the TWRSF drainage system will also be drained, removed, and disposed of off-site. The ground surface beneath the TWRSF will be regraded to promote natural drainage to the existing stormwater channel. A minimum of 12 inches of growth media will be placed over the regraded surface, scarified, and the area revegetated. The closure plan for the TSF involves evaporating fluids over a course of several years, applying a cover material and a synthetic liner, and finally revegetation. All other facilities will also be removed and the disturbed areas regraded, covered with growth media, and revegetated.

OAR 635-420-0020 (4)(d)(C) Current scientific data which is well-documented and verifiable to demonstrate that the chemical composition of the wastewaters will not be harmful to wildlife.

SLR completed a commonly accepted risk modelling method known as an Ecological Risk Assessment (ERA) following the EPA's Guidelines for Ecological Risk Assessment (EPA 1998) and the Guide for Performing Screening Ecological Risk Assessments at DOE Facilities (Sutter 1995) to assess the risk of the reclaim pond and supernatant waters to wildlife (SLR 2023; Appendix B). The analysis relied on conservative risk-based concentrations identified by the Oregon Department of Environmental Quality (DEQ) for bird and mammal species. The ERA assumed wildlife would be exposed to the wastewaters stored in the TSF and Reclaim Pond through long-term consumption of the supernatant waters by drinking. This exposure pathway is expected to be the most significant contact mechanism for wildlife. Not all species with risk-based concentrations identified by the DEQ would be expected to be within range of the vicinity of the proposed project. The subject avian and mammalian species used in the analysis were selected to represent local avian and mammalian fauna described in the Wildlife Resources Baseline Report (EMS 2020) because they display similar body size, behavior, and exposure conditions. Selected bird species included the American robin (*Turdus migratorius*), American kestrel (*Falco sparverius*), and Mexican spotted owl (*Strix occidentalis lucida*). Mammal species included the deer mouse (*Peromyscus maniculatus*), mountain cottontail (*Sylvilagus nuttallii*), montane shrew (*Sorex monticolus*), and gray fox (*Urocyon cinereoargenteus*).

The results of the ERA indicated long-term consumption of supernatant waters would not pose unacceptable risks from chemical exposure to the representative wildlife species. This result indicates

the mammalian and avian subject species are not likely to experience a biologically or statistically significant increase in the severity or frequency of adverse effects from accessing the wastewaters produced and stored following the assessed wastewater treatment and storage protocols.

Based on the results of the ERA, Grassy Mountain Mine will rely on the non-toxic status of the contact waters stored in the TSF and reclaim pond as the primary means of protecting wildlife from harm. Grassy Mountain Mine will perform regular sampling and testing of the contact waters stored in the TSF and reclaim pond to demonstrate the waters consistently remain non-toxic to wildlife species (see Tailings Chemical Monitoring Plan (Calico 2023b)).

Should an unlikely incident occur resulting in the failure of the cyanide destruction system any increase in cyanide concentration in the TSF and reclaim pond would be detected in the tailings chemical monitoring system. Project operators would immediately mitigate this situation by completing a common batch cyanide treatment process through the addition of hydrogen peroxide to the affected water body. The Environmental and Safety Superintendent (ESS) would also immediately deploy additional temporary wildlife deterrence measures such as air cannons, or mylar streamers to deter birds or bats from accessing the TSF. These would remain active until the cyanide concentrations dropped back below the monitoring threshold.

As a secondary means of protecting wildlife from harm, Grassy Mountain Mine will utilize physical exclusion or deterrent devices to reduce the likelihood that wildlife will access contact waters. Due to its large size and design, the TSF will rely on terrestrial wildlife exclusion offered by the perimeter fence. Because the TSF will be an open body of water, any wildlife accessing it from above (*e.g.* birds and bats) would not be expected to become entrapped or otherwise hindered from subsequently leaving its surface. To reduce the attractiveness of the Project Area in general and the open water of the TSF specifically, Grassy Mountain Mine will exclude birds and bats from potential nesting structures such as open pipes or vents by installing covers, mesh, or netting throughout the Project Area. Potential nesting sites will also be monitored during the nesting season to detect any failure of exclusion apparatus.

The reclaim pond is much smaller than the TSF and its design will allow the use of an additional and effective physical deterrent called Bird Deterrent Balls. These are plastic balls designed to partially fill with water and rest on the surface of the pool. The bird balls create a flexible, blanket-like cover, effectively preventing birds and bats from landing on the surface. Bird balls are a relatively recent method of wildlife deterrence and there is little scientific research available regarding their effectiveness; however, one study reported no bird mortalities following their deployment on an oil field wastewater facility (Ramirez 2010). This method is also recommended by the Federal Aviation Administration as an avian deterrent for waterbodies located on airports (Cleary and Dolbeer 2005). Grassy Mountain Mine will deploy the Bird Balls on the reclaim pond surface to deter access by birds and bats, but will monitor their effectiveness closely, including performing daily inspections as a part of the monitoring plan described in the Monitoring and Maintenance of Wildlife Protection Measures section, below.

MEASURES TO MINIMIZE VEHICULAR AND PUBLIC IMPACT ON WILDLIFE

This section describes how the project addresses the Standard for Wildlife Protection:

OAR 635-420-0030(5) Access to a chemical process mine by mine employees and the public shall be controlled to minimize harassment of wildlife and collisions between vehicles and wildlife. On publicly owned lands, these controls shall be developed in conjunction with, and shall be subject to the approval of, the applicable public land management agency.

Access to the Mine will typically be from Highway 20, south along Russell, Cow Hollow, and Twin Springs Roads to the Mine access road. The Grassy Mountain Mine Project Transportation Baseline Report (EMS 2018) describes the current condition and management status of these roads. Russell Road is approximately 2.0 miles of paved road and 0.8 miles of gravel road that is operated by the County, while the 4.1 miles of Cow Hollow Road is on private lands and 13.5 miles of Twin Springs Road is on undeveloped land administered by the Bureau of Land Management (BLM); both of these roads are gravel, and both are managed and maintained by the BLM. On the Project Area, the existing Mine access road is a dirt two-track trail. Calico will improve this to a new 2.6-mile-long gravel Mine access road connecting Twin Springs Road to the Mine, and this section of road will be managed and maintained by Calico. There will be no on-site housing facilities.

As stated in the CPA Section 2.18, Transportation, an emergency access route has been identified as a portion of Oregon State Route 201, and County-owned Mitchell Butte Road and Owyhee Avenue. Owyhee Avenue is part of the main access to Owyhee Reservoir, which is a popular destination for recreationists. The emergency access route would share approximately 4 miles of Owyhee Avenue with this type of recreation-focused traffic. Mine personnel would not be authorized to use this route except in the case of an emergency, as declared by the operation manager. No Project-related upgrades or modifications are planned along this route.

Vehicle travel associated with the mining operation will include primarily the commuting vehicles used by production staff, as well as delivery vehicles, and service vehicles. Approximately 100 employees are expected to commute daily to the mine; however, most personnel including the regular production staff will be required to commute to the Project Area in multi-passenger shuttle vehicles. Taking into account the use of shuttles, a mine traffic analysis performed by Mine Development Associates (Dyer 2018) estimated an average daily traffic of 21.3 round trips along the access route, ranging from 8 to 31 round trips per day.

OAR 635-420-0020 (4)(f)(A) The plan shall provide for permanent closures of new roads which were developed to provide access to or to serve the mining operation upon cessation of operations and shall provide for temporary closures of such roads during temporary or seasonal shutdowns;

The main access route to the Project Area will follow existing roads across approximately 17 miles of BLM land. These roads will be improved to support mine-related vehicle traffic, but no new access roads will be developed. Improved roads will meet a 35 mile per hour design speed. The mine is expected to operate year-round with no temporary or seasonal shutdowns. Following completion of the mining activities the mine entrance (adit) will be plugged, and all roads and facilities on the Project Area will be removed, regraded, covered with appropriate growth media and revegetated with native plant species.

OAR 635-420-0020 (4)(f)(B) The plan shall identify wildlife migration and movement corridors within the study area, and shall identify methods to avoid or minimize vehicular and public impacts on wildlife;

The Wildlife Resources Baseline Report (EMS 2020) describes upland vegetation communities typical of dryland habitats including intermountain semi-desert steppe and shrubland, intermountain semi-desert grassland, great basin-intermountain ruderal dry shrubland and grassland, and intermountain mesic tall sagebrush steppe and shrubland. The northern-most 0.3 miles of the main access route passes through irrigated agriculture. The northernmost 5 miles of the main access route also passes through Oregon Department of Fish and Wildlife (ODFW)-designated mule deer winter range (ODFW 2012).

During the winter months mule deer would be expected to utilize the winter range where it overlaps with the main access route and deer are also likely to access the irrigated croplands at the northern extent of the access route throughout the growing season. The Wildlife Resources Baseline Report (EMS 2020) noted incidental observations of other wide-ranging species including elk (*Cervus canadensis*) and pronghorn (*Antilocapra americana*). Migrating birds traveling along the Pacific Flyway migratory route are likely to pass over the Project Area, but the closest significant stopover habitat is Owyhee Lake approximately 6 miles to the east. In addition, ODFW Compass identifies the US Highway 20 corridor in the vicinity of Russell Road west of Vale, Oregon as a mid-level priority area for wildlife linkage which means the ability of some species to access the habitats on either side of the road in this corridor is relatively degraded by highway traffic (ODFW 2010).

The Project Area will be fenced, and the fencing will exclude terrestrial wildlife, effectively preventing mortality from vehicle strikes within the fenced area. In addition, employees will undergo an environmental training course developed for the Project by a qualified biologist and managed and administered by the Project's Environmental and Safety Superintendent (ESS). The course will cover topics such as trash control, adherence to speed limits, practicing heightened caution and awareness when operating vehicles during daily time periods of increased wildlife activity (*e.g.* dawn and dusk), reporting injured or dead wildlife, and other subjects.

OAR 635-420-0020 (4)(f)(C) Additional measures to avoid or minimize vehicular and public impact on wildlife shall be required if, in the judgment of the Department, such measures are necessary due to the number of employees, wildlife concentrations within the area, presence of threatened, endangered, or sensitive species, or other factors. These additional measures may include, but are not limited to:

OAR 635-420-0020 (4)(f)(C)(i) Measures for reducing traffic to and from the mines by mine employees, such as carpooling and vanpooling:

Approximately 100 employees are expected to work at the mine on a typical day from Monday through Thursday when underground and administrative operations will be underway. Friday through Sunday only the above-ground processing facilities will operate requiring significantly fewer employees. The Transportation Baseline Report (EMS 2018) indicates a daily bus or van shuttle service will be provided to transport workers from Vale, Oregon to the Project Area following the Access Road route. Mitchell Butte Road is part of the designated emergency access route and will not be used by employees as a regular commuting route. Employees will be required to use the shuttle service when regularly commuting to the Project Area, except for shift foremen, the Plant Superintendent, and other specifically authorized personnel. The extra vehicles were included in the traffic estimate provided by Dyer (2018).

OAR 635-420-0020 (4)(f)(C)(ii) Speed limits on access roads;

All employees of the mine will be instructed to watch for wildlife, especially when travelling within 1 hour of sunrise and 1 hour of sunset; high activity periods for many species. Employees will also be required to travel no faster than 25 miles per hour while on the Project Area within the perimeter fence.

OAR 635-420-0020 (4)(f)(C)(iii) Limitations on the use of access roads by the public;

The Project Area surrounding the mine will be fenced and gated, limiting public access. The main access route to the Project Area is public and restrictions of public access to Russell Road, Cow Hollow Road, or Twin Springs Road are not proposed by this Project.

OAR 635-420-0020 (4)(f)(C)(iv) Limitations on the use of access roads by employees for purposes other than access to the mine during working hours.

The main access route to the Project location uses existing public roads managed primarily by the BLM. The Project does not propose any access controls due to the public status of the route.

OAR 635-420-0020 (4)(f)(D) Any controls or limitations on publicly owned roads or lands shall be subject to the approval of the appropriate public agency with regulatory authority.

No controls or limitations of access to or use of publicly owned roads are proposed as part of this Project.

ELECTRICAL POWER LINES AND TRANSMISSION FACILITIES

The WPP requirements listed under OAR 635-420-0020 address all the Standards for Wildlife Protection listed under OAR 635-420-0030 except the standard associated with electrical power lines and other transmission facilities:

OAR 635-420-0030 (4) Electrical power lines and other transmission facilities shall be designed and constructed to prevent electrocution hazard to wild birds by incorporating features such as armless poles, vertical separation of wires, pole extensions perches or line insulators. Designs shall be consistent with the specifications contained in "Suggested Practices for Raptor Protection on Powerlines" (Raptor Research Report No. 4, Raptor Research Foundation, Inc., 1981) or with equivalent specifications approved by the Department.

This section describes how the project addresses the Standard for Wildlife Protection OAR 635-420-0030(4).

The Grassy Mountain Mine will require a new 34.5kV distribution line. The Calico-Grassy Mountain 34.5kV Line report (Nugent 2021) described the proposed power infrastructure and avian protection measures associated with the proposed powerlines. The approximately 25-mile-long line will originate at the Idaho Power Hope substation near Vale, Oregon. Approximately 6 miles of line will travel along an existing Idaho Power transmission and distribution route which has been designated as the upgraded transmission line. The remainder will require a new transmission line that will be installed along the main access route. Both the retrofitted infrastructure along the existing lines and the newly constructed transmission lines will meet Idaho Power's Zone 3 standard for avian protection from electrocution. The

Zone 3 standard meets the suggested practices of the Avian Power Line Interaction Committee (APLIC) and the design protects all species of birds including eagles from the risk of electrocution. In addition, to reduce the risk of corvid predation on greater sage-grouse, new power poles located within 10 kilometers of sage-grouse habitat will be fitted with deterrent structures (*e.g.* Triangular Avian Perch and Nest Diverters), as recommended by ODFW (ODFW 2019). The specific designs of triangular and spike bird diverters and anti-nesting deflectors for power poles are described in Appendix B of Nugent (2021).

MONITORING AND MAINTENANCE OF WILDLIFE PROTECTION MEASURES

OAR 635-420-0020 (4)(e) A program for ongoing and constant monitoring and maintenance of wildlife protection measures, including a schedule of activities and the job title of the person or persons responsible for the monitoring program.

The ESS will be responsible for monitoring and maintaining the wildlife protection measures described in this report. The ESS will be tasked with applying for and maintaining a current Wildlife Scientific Taking Permit (STP) from ODFW and will follow all monitoring and reporting requirements of the permit which typically includes preparation and submittal of monitoring reports to ODFW. The ESS will also work with ODFW to resolve issues or failures of protection measures observed during the operation and closure phases of the mine. Per OAR 635-420-0070, the ESS will be responsible for preparing the monitoring report on a quarterly basis that will follow the requirements specified in OAR 635-420-0070 (1) through (3).

The quarterly monitoring report will include:

- Results of regular sampling and testing of the contact waters stored in the TSF and reclaim pond to demonstrate they consistently remain non-toxic to wildlife species that might come into contact with them. Monitoring will include at least quarterly repetition of the ecological risk assessment (SLR 2023) for likely wildlife receptors (see Tailings Chemical Monitoring Plan (Calico 2023b)).
    - As detailed in the Tailings Chemical Monitoring Plan (Calico 2023b) and the ecological risk assessment (SLR 2023) the following variables will be monitored within the TSF and reclaim pond (Table 1):

Table 1. TSF and reclaim pond analytes to be monitored for toxicity to wildlife.

Analyte[1]	Wildlife-specific Ecological Screening Level[2]	
	Birds (mg/L)	Mammals (mg/L)
Cyanide	1.6	3,000
Aluminum (Al)	4,500	86
Arsenic (As)	52	5.6
Copper (Cu)	130	33
Chromium (Cr)	71	630
Molybdenum (Mo)	NE	NE
Vanadium (V)	45	18
Antimony (Sb)	NE	2.3
Lead (Pb)	640	16
Nickel (Ni)	160	3
Iron (Fe)	NE	NE
Manganese (Mn)	24,000	700
Mercury (Hg)	0.78	63
Alkalinity	NE	NE
pH	NE	NE

[1] List of monitored analytes from Tailings Chemical Monitoring Plan (Calico 2023b)

[2] Drinking water conservative exposure point concentration screening levels as cited in Table 1 of Ecological Risk Assessment (SLR 2023)

- Additional water quality characteristics including temperature, dissolved oxygen (DO), salinity/ electrical conductivity will also be monitored and reported quarterly.
- If the tailings chemical monitoring system indicates any thresholds for wildlife toxicity have been exceeded in the TSF and reclaim pond the Project operators would implement remediation actions including:
  - Cyanide will be monitored continuously (Calico 2023b). In the event of a cyanide exceedance: Project operators would complete a common batch cyanide treatment process through the addition of hydrogen peroxide to the affected water body.
    - The ESS would deploy temporary wildlife deterrence measures such as air cannons, or mylar streamers to deter birds or bats from accessing the TSF.
    - Deterrence measures would remain active until the cyanide concentrations dropped back below the monitoring threshold.
  - Acid Base Accounting (ABA) described in the Tailings Chemical Monitoring Plan will be completed weekly (Calico 2023b). The amount of lime added will be adjusted based on the ABA test results to maintain the targeted baseline geochemical properties of the Project tailings.
- Notify ODFW's representative on the Project Coordinating Committee and the Technical Review Team by the beginning of the next business day of any event where TSF or reclaim pond waters exceed wildlife toxicity thresholds.

- Results of monthly inspection of the perimeter fence to detect and repair any damage to the fence or evidence of under-burrowing by larger species (*e.g.* badger).
- Results of quarterly inspections of stormwater drainage facilities for evidence of wildlife use (*e.g.* tracks, scat), or any incidental observations of wildlife using these structures.
- Results of daily, during project initiation, and later on, weekly observational monitoring completed by qualified personnel of the TSF and reclaim pond for presence of fish, aquatic invertebrates, algae, or aquatic vegetation.
    - Coordinate with ODFW's representative on the Project Coordinating Committee and the Technical Review Team and USFWS if observations are made of fish, invertebrates, algae, or aquatic vegetation in the same location over more than three quarters. After agency coordination, ESS shall implement control measures such as:
        - Aquatic vegetation removal and control
        - Installation of additional deterrent measures
- Results of annual noise monitoring (fourth quarter report only).
- Power Lines – Perching and nesting deterrence structures installed on power poles will be inspected at least once every 3 years to identify needed repairs. Results of inspection will be included in the following quarterly report. In addition, power poles will be monitored by qualified personnel annually during the appropriate nesting season for evidence of any nesting by potential avian predators including raptors, corvids, and eagles. If a nest is detected, the qualified monitor will notify the ESS who will coordinate with ODFW within one business day to determine an appropriate response. Results of nest monitoring will be included in the following quarterly monitoring report.
- Results of annual monitoring of nest exclusion devices on structures associated with the facility. Monitoring will be completed by qualified personnel during the nesting season of targeted species (e.g. corvids and bats). If a nest is detected, the qualified monitor will notify the ESS who will coordinate with ODFW within one business day to determine an appropriate response. Results of nest monitoring will be included in the following quarterly monitoring report.
- Record of any wildlife mortality events.
    - Employees will be required to report any wildlife fatalities to the ESS.
    - The TSF and reclaim pond as well as enclosed contact water tanks will be monitored daily by trained individuals on a routine schedule to determine the condition of any wildlife exclusion tools and to detect any wildlife mortalities.
- Record of any exceedance of toxicity threshold in the TSF or reclaim pond, and description of immediate response such as the addition of hydrogen peroxide to the affected water body.
    - Record of any temporary wildlife deterrence measures temporarily deployed after the incident.
- Record of any discussions with ODFW and any adaptive measures implemented during the year to address wildlife protection issues.

In addition to the quarterly frequency of the monitoring report, per OAR 635-420-0070 (4) the ESS will be responsible for more frequent reporting to ODFW's representative on the Project Coordinating Committee and the Technical Review Team for specific types of incidents including:

- Beginning of next business day notification of the designated ODFW representative by telephone of any wildlife injuries or mortalities involving:
    - Injuries or mortalities which may be associated with exposure to chemical processing solutions or associated wastewater
    - Injuries or mortalities which may be associated with wildlife protective measures
    - Injuries or mortalities of state or federally listed threatened or endangered species or state sensitive species
    - Event where TSF or reclaim pond exceeds wildlife toxicity thresholds

Finally, per OAR 635-420-0080(3) Calico shall notify ODFW at least 30 days prior to completion of construction of the Grassy Mountain Mine to allow inspection by ODFW which will happen within 10 days of mine completion. Calico will not commence the use of chemical processing solutions until after notification by ODFW that the inspection has been completed. Throughout the life of the permit, ODFW will complete inspections on at least a semi-annual basis.

CONTINGENCY PLAN

OAR 635-420-0020 (4)(g) A contingency plan to rectify any failures of wildlife protection measures, or to provide additional wildlife protection if necessary during periods of migration, including a description of hazing programs or other temporary or emergency measures which shall be instituted.

The wildlife protection standards employed by the proposed mine are expected to meet the objective of zero wildlife mortality, as directed by OAR 635-420-0030. The ESS will implement the monitoring plan to assess effectiveness of the measures presented herein. If the ESS detects failure of any wildlife protection measures, appropriate measures will be taken to amend the protection measures. Adjustments to the measures described in this plan will be made in consultation with ODFW, but could include adaptive management actions such as:

- Adjustments to the perimeter fence to repair any points of failure or to increase effectiveness.
- Installation of additional wildlife exclusion devices such as over-head netting systems to deter wildlife from accessing any structures that could serve as nesting or roosting locations.
- Installation of additional or alternative wildlife hazing tools.
- Installation of anti-perching devices on potential perching areas such as buildings or posts.

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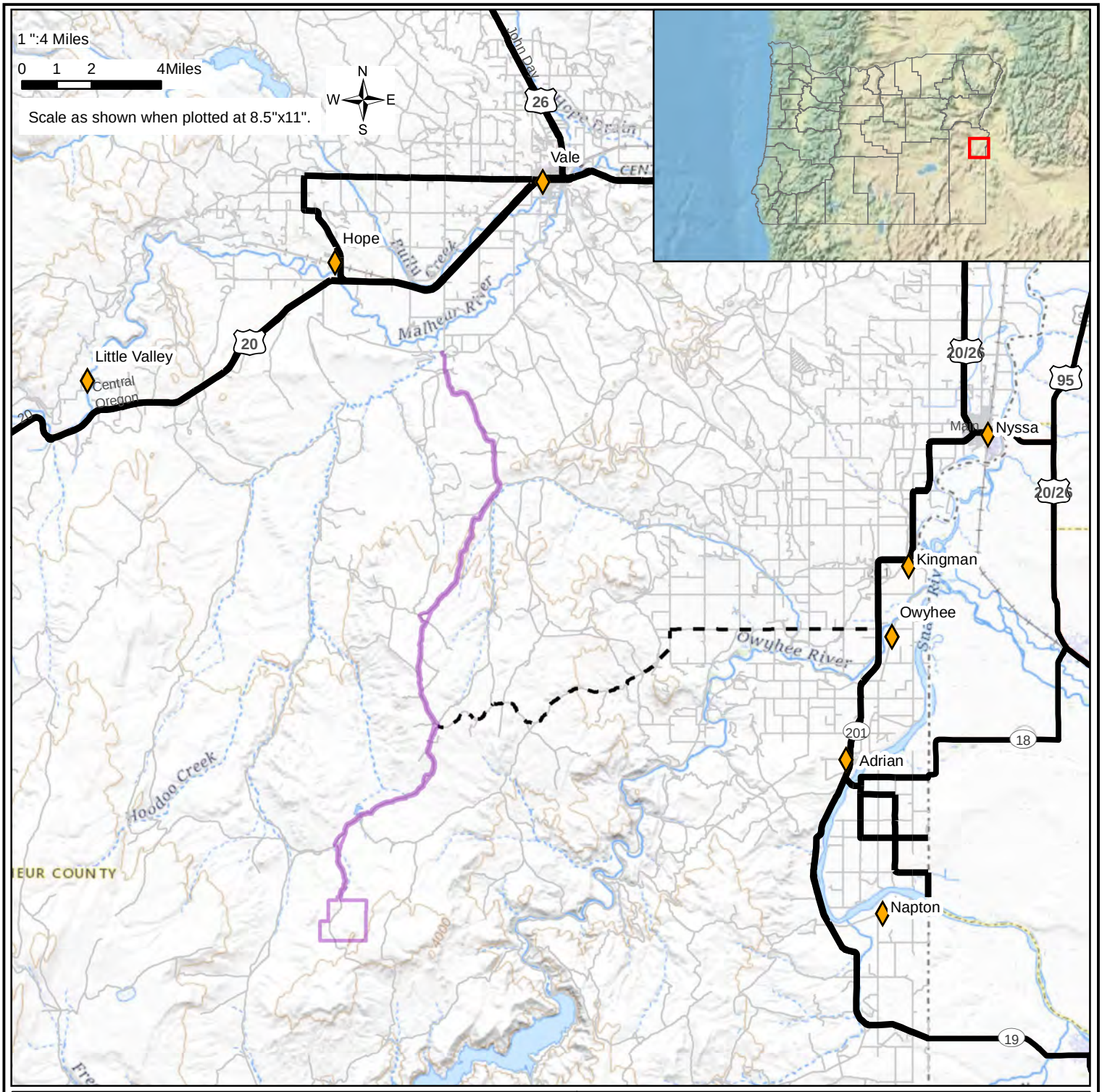
APPENDIX A

Location Map, Vicinity and Access route with Site Plan



Legend

- PoO Boundary
- Emergency Access Road
- Roads

Notes:

1. Figure references 1983 UTM zone 11N datum.
2. Road and highway system were referenced from the Bureau of land Managment.
3. PoO boundary provided by others.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Figure:

Location Map

SLR / CALICO RESOURCES	Date: November, 2021		Figure: 1
	Project No: 108.02203.00001		
	By: MS	Chk'd: TM	

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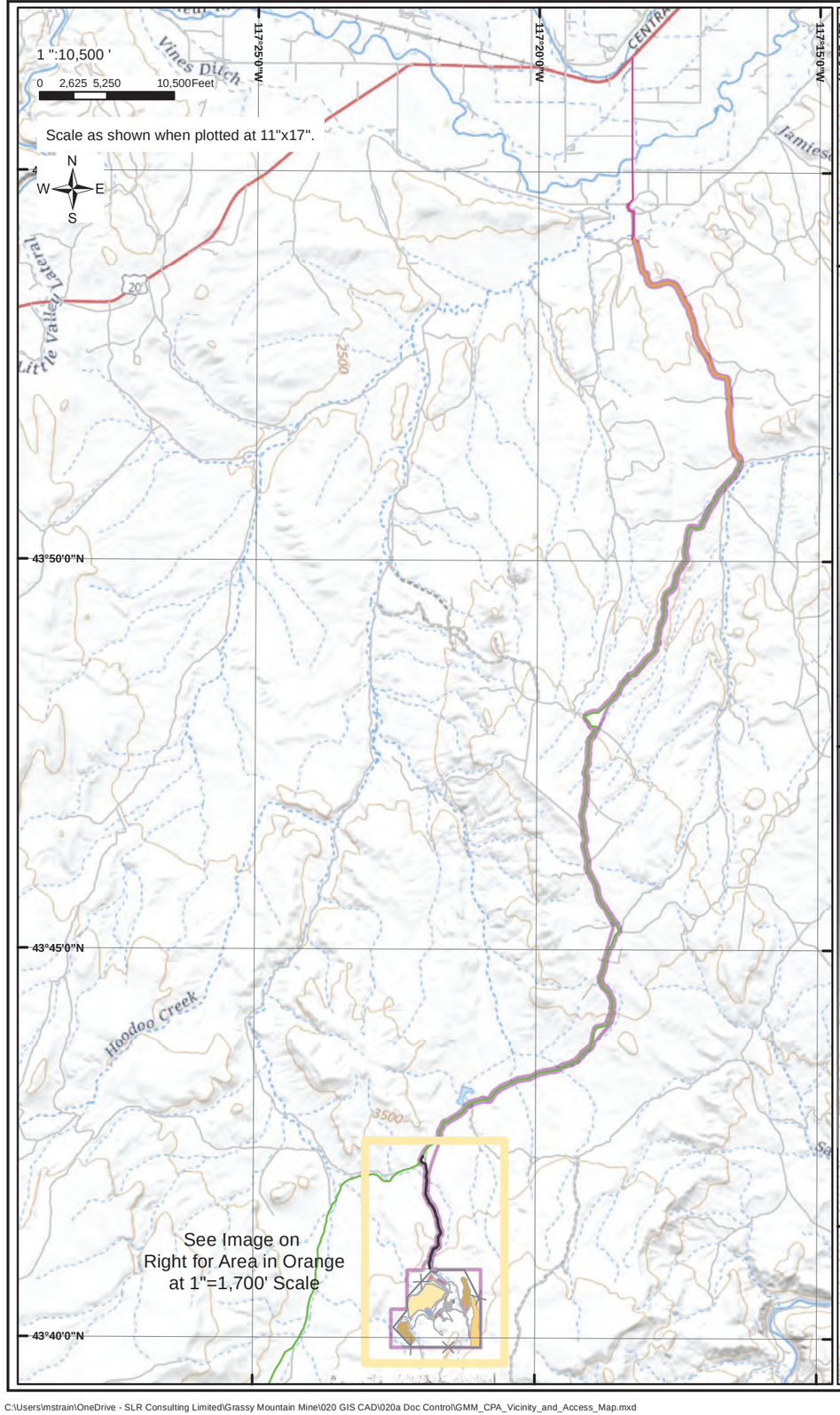

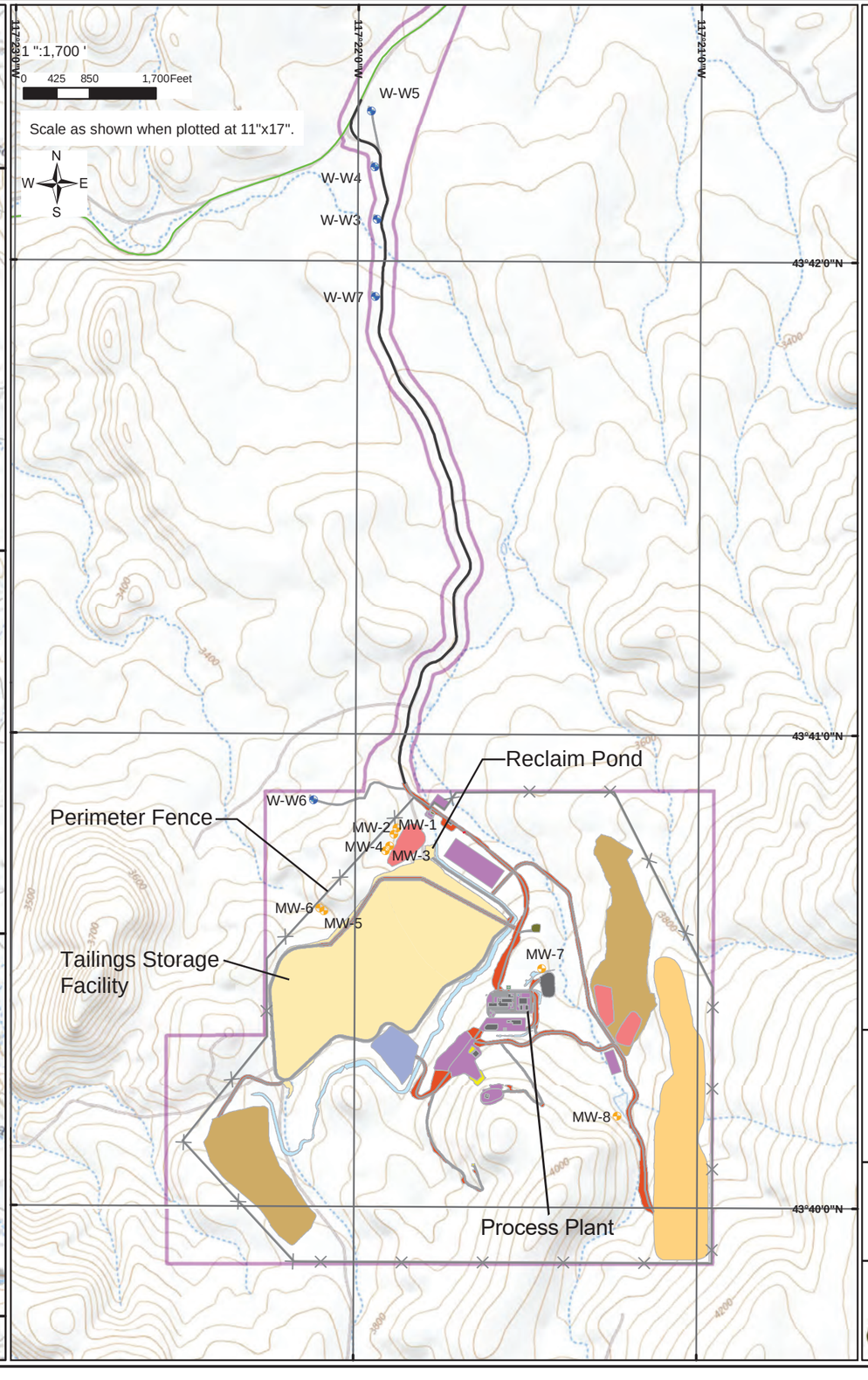

Legend

- PoO Boundary
- Fence Line
- Production Well
- Monitoring Well
- Russell Road (2.75 Miles)
- Cow Hollow Road (4.05 Miles)
- Twin Springs Road (13.46 Miles)
- Mine Access Road (2.48 Miles)
- Roads
- Quarry
- Reclamation Borrow Areas
- Growth Media Stockpile
- Yard
- Underground Mine
- Process Plant
- Temporary Waste Rock Dump Storage Facility
- Tailings Storage Facility
- Water Supply
- Roads
- West Permanent Diversion Channel
- Power Supply
- Other Areas

Notes:
1. Figure references 1983 UTM zone 11N datum.
2. Road and highway system was referenced from the Bureau of land Management.
3. Topography, facility layout, and PoO boundary provided by others.

Site/Report:

Calico Resources USA Corp.
Grassy Mountain Mine

Consolidated Permit Application

Figure:

Vicinity and Access Map

SLR / CALICO RESOURCES	Date: November, 2021	Figure: 2
	Project No: 108.02203.00001	
	By: MS	Chk'd: TM

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APPENDIX B

Grassy Mountain Mine Project Ecological Risk Assessment

GRASSY MOUNTAIN MINE PROJECT

Ecological Risk Assessment for Proposed Tailings Storage Facility

Prepared for:

Calico Resources USA Corp.

August 2023

Grassy Mountain Mine Project
Ecological Risk Assessment for Proposed Tailings Storage Facility

Prepared for:
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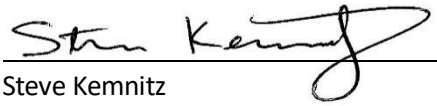
665 Anderson Street
Winnemucca, Nevada 89445

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.



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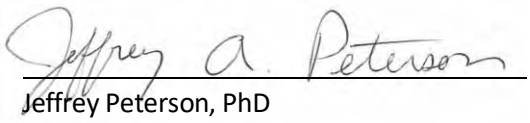

Jeffrey Peterson, PhD
Principal Scientist

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TABLE

Table 1 Ecological Screening Evaluation

ACRONYMS

Calico	Calico Resources USA Corp.
CSM	Conceptual Site Model
CPA	Consolidated Permit Application
DEQ	Department of Environmental Quality
EPC	Exposure Point Concentration
ESL	ecological screening level
ERA	Ecological Risk Assessment
HI	hazard index
HQ	hazard quotient
LANL	Los Alamos National Laboratory
mg/L	milligrams per liter
OAR	Oregon Administrative Rule
Project	Grassy Mountain Mine Project
SLR	SLR International Corporation
T&E	threatened or endangered
TRV	toxicity reference value
TSF	Tailings Storage Facility
TWRSF	Temporary Waste Rock Storage Facility
USEPA	United States Environmental Protection Agency
WAD	Weak Acid Dissociable

1. INTRODUCTION

SLR International Corporation (SLR) has prepared this Ecological Risk Assessment (ERA) on behalf of Calico Resources USA Corp. (Calico) for the proposed Grassy Mountain Mine Project (Project) in Oregon. Calico proposes to construct an underground mine and precious metal processing facilities at a site in eastern Oregon, approximately 22 miles south-southwest of Vale, Oregon. In addition to the underground mine, the proposed mining and processing operation will include a conventional Mill, Tailings Storage Facility (TSF), Temporary Waste Rock Storage Facility (TWRSF), as well as other support facilities.

The TSF will contain supernatant that has partitioned from the tailings slurry from the processing plant and overlies the finely ground ore solids (i.e., the tailings). The supernatant water contains residual inorganic chemicals from processing the ore. Although fencing and other types of barriers will be used to prevent wildlife (birds and mammals) from contacting water in the TSF, this ERA assumes that wildlife may consume supernatant over an extended period of time. This ERA characterizes potential risks that chemicals in supernatant may pose to wildlife. Results of the ERA will be used to guide potential ecological risk management actions.

1.1 TAILINGS STORAGE FACILITY

Calico proposes to extract ore and waste rock from an underground mine using conventional mining techniques (e.g., drilling, blasting, mucking, loading, and hauling). Mined ore will be transported, stockpiled, crushed, and then leached in a carbon-in-leach processing plant. Leached tailings will be pumped as a slurry to the TSF. Material in the TSF will be allowed to settle, and the supernatant solution in the pond will be recovered and recycled back to the Mill circuit for processing more ore. The proposed TSF is designed to have zero discharge. It will have geomembrane-lined primary and secondary containment, along with a leachate collection system and a leak detection systems.

There is also a Reclaim Pond associated with the TSF. The Reclaim Pond is also a double-lined containment facility. The Reclaim Pond collects water that drains from the leachate collection system in the TSF, and from the TSF leak detection system and the TWRSF (also a double-lined containment facility, although it does not store water). The leachate collection system is a layer of drain rock and piping between the underlying liner system and the overlying tailings mass that is designed to minimize the hydraulic head on the liner system. Reclaim Pond water is estimated to have approximately the same chemistry as supernatant pond water, and water that collects in the pond is recycled to the Mill like the supernatant water. The volume of water in the Reclaim Pond is much smaller than the volume of the supernatant pond.

Tailings slurry from the carbon-in-leach processing plant will be treated for cyanide destruction prior to being pumped to the TSF. Chemicals that will be added to tailings to degrade cyanide will include lime, copper sulfate, and sodium metabisulfate. The TSF will allow for the natural degradation of remaining cyanide through exposure to ultraviolet sunlight and natural microbiota that metabolize cyanide.

Concentrations of weak acid dissociable (WAD) cyanide in tailings from the circuit will be reduced from approximately 200 milligrams per liter (mg/L) to a target level of less than 15 mg/L, which is below the

not-to-exceed regulatory limit of 30 mg/L. The tailings will be treated such that residual WAD cyanide concentration in the liquid component of Project tailings comply with relevant Oregon Administrative Rules (OARs) (Ausenco, 2022, 2023).

Laboratory testing has demonstrated that the detoxification process can achieve a level of 1 mg/L or less. However, it is typically not possible or practicable for the operations-scale process to achieve the same levels of performance as what can be achieved in the laboratory. Therefore, during startup, the cyanide detoxification circuit will be optimized to establish if there is a practicable level for discharge to the tailings pond that is less than 15 mg/L. Operational monitoring described in the *Tailings Chemical Monitoring Plan* (Calico, 2023; CPA Appendix D2) describes the initial startup monitoring and optimization of cyanide treatment for the tailings and also for maintaining levels of cyanide in the supernatant pond that are protective of wildlife including birds and bats that may use the supernatant pond as a source of drinking water so the WAD cyanide level is 1 mg/L or less.

1.2 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

To promote efficiency, ERAs are typically performed in a tiered manner (DEQ, 2001). Tiered evaluations start with a conservative, relatively simple screening level assessment. If the results of the screening assessment identify potential concerns, then a more detailed, realistic, and complex higher-tiered evaluation can be performed as needed.

This screening assessment is an initial tier that characterizes potential risks by comparing chemical concentrations in water with conservative screening-level values. Specifically, chemical concentrations in supernatant water are compared to risk-based screening levels protective of birds and mammals that may have long-term exposure to water through drinking. If concentrations are below screening levels, it can be inferred with high confidence that chemicals are unlikely to cause unacceptable risks to birds or mammals. Alternatively, chemicals present in the environment at concentrations above screening levels are likely to require additional evaluation.

1.3 REPORT ORGANIZATION

This ERA is organized as follows:

- Section 2 presents the exposure assessment describing the process by which ecological receptors may be exposed to chemicals in the environment. This section includes the Conceptual Site Model (CSM) describing ecological (wildlife) exposure scenarios and Exposure Point Concentrations (EPCs), which are conservative estimates of the chemical concentrations in water that wildlife may contact.
- Section 3 presents the screening-level risk evaluation. This section includes a description of risk-based screening levels protective of wildlife, risk characterization methods, and screening-level risk results.
- Section 4 presents an evaluation of important uncertainties in the ERA.
- Section 5 presents ERA conclusions.

2. EXPOSURE ASSESSMENT

The exposure assessment describes the process by which ecological receptors may contact chemicals in the environment. The exposure assessment includes a CSM that identifies the ecological receptors that may contact an environmental medium and the pathways by which chemicals may enter the body of a receptor. Other aspects of the exposure assessment include estimates of concentrations or doses that a receptor may experience, chemical contact rates (e.g., drinking water ingestion rates), exposure frequency and duration, and other factors that influence the amount of chemical an organism may uptake. The CSM and estimates of the concentrations that receptors may contact in supernatant water are described below.

2.1 CONCEPTUAL SITE MODEL

The CSM describes potential chemical sources, release mechanisms, environmental transport processes, exposure routes, and receptors. According to United States Environmental Protection Agency (USEPA) risk assessment guidance (USEPA, 1989), a complete exposure pathway consists of four necessary elements: (1) a source and mechanism of chemical release to the environment, (2) an environmental retention or transport medium for a released chemical, (3) a point of potential contact with the impacted medium (referred to as the exposure point), and (4) an exposure route (e.g., water ingestion) at the exposure point. If any of these four components are not present, then a potential exposure pathway is considered incomplete and is not evaluated further. If all four components are present, a pathway is considered potentially complete.

Chemical sources include the parent ore materials from which metals leach into water, along with chemicals in the treatments that promote leaching from ore materials. Although many of the chemicals leached to water are recovered during processing, some are present in the material discharged to the TSF. These are the chemicals that ultimately reside in the supernatant within the TSF, which is the retention medium.

The TSF and Reclaim Pond will be engineered features designed to temporarily manage materials used in proposed mining operations. When mining operations end, these features will be appropriately decommissioned. By design, the TSF and Reclaim Pond will not be operated in a manner that would promote the establishment of natural or semi-natural aquatic ecosystems. For example, the TSF and Reclaim Pond will be intensively managed and frequently disturbed. Tailings will be regularly discharged into the TSF, and water from the supernatant pool and other areas of the TSF will be regularly extracted via pumping and delivered back to the Process Plant for reuse. These regular disturbances to media within the engineered TSF are likely to preclude development of a semi-natural aquatic system.

The TSF and Reclaim Pond will not be connected to natural surface waters, and fish or other wholly aquatic organisms will not be able to colonize these features through water. Although it is possible that the volant life stage of invertebrates with a separate aquatic life stage (e.g., mosquitos) could fly into the pond, due to frequent disturbance and other factors, the TSF is unlikely to represent good breeding habitat for aquatic insects. Similarly, seeds of aquatic plants could potentially migrate into the TSF, but again,

disturbances to media within the TSF are likely to prevent the establishment of a semi-natural aquatic plant community.

The TSF (including the Reclaim Pond located at the toe of the TSF embankment) will be located within an enclosure with fencing 8 feet in height and armoring extending 18 inches above and below the ground surface to exclude wildlife, including burrowing mammals (MB&G, 2023). Despite these wildlife exclusion features, this CSM assumes that local birds and mammals will be able to access the TSF. Appendix E of the *Wildlife Resources Baseline Report* (EMS, 2020; CPA Appendix B22) lists the wildlife observed during field studies near the site. This list includes 62 birds, 26 mammals, 11 reptiles, and 1 amphibian. It is assumed that birds such as the horned lark (*Eremophila alpestris*) or western meadowlark (*Sturnella neglecta*), and local small mammals such as the western deer mouse (*Peromyscus sonoriensis*) or Belding's ground squirrel (*Urocitellus beldingi*), may access the TSF. Furthermore, it is assumed that birds and mammals may use supernatant in the TSF as a source of drinking water and have chronic (long-term) exposure to chemicals in water through ingestion. Although it is likely that wildlife drinking supernatant would also have dermal contact with water, this exposure route is considered insignificant relative to water ingestion. It should be noted that DEQ ERA guidance (DEQ, 2001) and guidance from other institutions (LANL, 2023) do not report models that estimate dermal uptake of chemicals in water by wildlife. Similarly, potential inhalation exposure to chemicals that volatilize from water into overlying air is considered insignificant relative to drinking exposures. The TSF and Reclaim Pond are unlikely to support significant populations of aquatic plants and invertebrates. As a result, birds and mammals that may drink from the TSF are not expected to forage on aquatic organisms from these features, and dietary exposure to chemicals is expected to be minimal.

2.2 EXPOSURE POINT CONCENTRATIONS

Ecological receptors do not constrain exposure to activities to a single sample location, and instead move over the environment and are likely to be exposed at a variety of locations within an exposure unit. The EPC is an estimate of the average chemical concentration in an environmental medium that a receptor may contact on a long-term basis (USEPA, 1989). In this case, the EPC represents the average concentration of a chemical in water throughout the TSF that wildlife may contact on a chronic basis (e.g., over 6 months). With the exception of total cyanide, the EPC for each chemical was set at the maximum estimated concentration in supernatant reported in the SRK (2021) tailings geochemical modeling report.

SRK (2021) used a geochemical model to estimate concentrations of chemicals in supernatant of the TSF They modeled concentrations expected under wet, dry, and average conditions during three different phases of mining operations. The geochemical model used by SRK considered the effects of evaporation and precipitation on supernatant pond water chemistry. SRK (2021) performed a sensitivity analysis on the geochemical model where certain assumptions used in the base model were relaxed, and they found few significant effects on estimated supernatant chemical concentrations. Supernatant chemical concentration estimates in Table 4-1 of SRK (2021) were used in this ERA. To be conservative, the maximum estimated concentration during any season or mining operation phase was used as the EPC for a chemical.

As mentioned previously, tailings are treated to degrade cyanide before they are pumped to the TSF. The geochemical model uses input data for tailings water quality that is based on testing results from a

metallurgical laboratory to develop the cyanide detoxification process. The cyanide levels achieved by detoxification in laboratory testing are unlikely to be realized in full-scale processes during operations. However, the initial target treatment level for discharges to the TSF is 15 mg/L with a commitment to optimize treatment to the lowest practicable level achievable (less than 15 mg/L) during startup of operations.

Further, because the detoxification test results represent tailings water that is discharged into the TSF, these results do not account for degradation of cyanide by sunlight and microbial action that occurs in the supernatant pond. The geochemical model developed by SRK is not capable of simulating the degradation of cyanide by sunlight and microbial action. Therefore, the EPC for cyanide used in this screening risk assessment is an average concentration of 1 mg/L that was selected as a practicably and reasonably achievable level for the processes and conditions present at the Grassy Mountain Mine based on professional experience and data from other mines.

During the startup period, the processes and water management procedures will be optimized to achieve an average cyanide concentration that is protective of wildlife, as described in Section 1.1 above.

3. SCREENING-LEVEL ECOLOGICAL RISK EVALUATION

This screening-level ERA compares EPCs representing the maximum estimated chemical concentrations in supernatant water (with the exception of cyanide, which was set at 1 mg/L as described above) to risk-based screening levels protective of birds and mammals. If the EPC for a chemical is below a conservative screening level, it can be inferred that exposure to the chemical in water is unlikely to cause unacceptable risks to ecological receptors. Ecological screening levels and screening-level risk estimates are described below.

3.1 RISK-BASED SCREENING LEVELS

Ecological screening levels (ESLs) developed by Los Alamos National Laboratory (LANL, 2023) to protect of bird and mammal populations exposed to chemicals in water through ingestion were used in this screening-level risk evaluation. The ESLs were calculated assuming that birds and mammals have a reasonable maximum exposure (i.e., high exposure but not unreasonable) to chemicals in water through drinking. Data from chronic toxicity studies (i.e., exposure encompassing the majority of the test organism's lifespan or a critical life stage) where effects on test organism mortality, reproduction, or growth were measured are used to develop the toxicity reference values (TRVs) used in ESL derivations (LANL, 2023).

LANL (2023) developed ecological screening values for indicator species representative of three common bird and mammal feeding guilds: herbivores, invertivores, and carnivores. Indicator species were relatively small-bodied members of a guild. Small-bodied birds and mammals have relatively high food and water ingestion rates (when normalized by body mass), and screening values for indicator species are intended to be protective of other members of the guild. The bird ESL selected was the lowest of the drinking water values developed by LANL (2023) based on low-effect levels. In all cases, the lowest ESL was for the violet-green swallow (*Tachycineta thalassina*) indicator species, which is a relatively small-bodied aerial insectivore. Similarly, the selected mammal ESL was the lowest LANL (2023) drinking water value for mammal indicator species, and in all cases it was the value for the montane shrew (*Sorex monticolus*). The montane shrew is a small-bodied invertivore. Although some of the indicator species evaluated by LANL (2023) are unlikely to be present near the TSF (e.g., Mexican spotted owl), they have similar body sizes, behaviors, and exposure conditions to birds or mammals observed near the site that may contact supernatant water in the TSF (see Appendix E of EMS, 2020). ESLs for the bird and mammal indicator species evaluated by LANL (2023) represent conservative, but relevant, ecological screening values for species that may be present near the TSF.

The Oregon cleanup rules specify the protection of individual organisms of species listed as threatened or endangered (T&E) under state or federal laws established to protect T&E species (e.g., Endangered Species Acts). For species not listed as T&E species, populations, not necessarily each individual, must be protected. None of the Oregon bird or mammal species listed as threatened or endangered (https://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp) are likely to be present near the site. As a result, the LANL (2023) ESLs based on low-effect levels protective of bird and mammal populations were used as ecological screening values.

3.2 RISK CHARACTERIZATION APPROACH

As mentioned above, this ERA assumes that wildlife (birds and mammals) may have long-term exposure to the maximum estimated chemical concentrations in supernatant water via drinking. For each chemical, a hazard quotient (HQ) is calculated as follows for both birds and mammals:

$$HQ = \frac{EPC}{RBC}$$

The hazard index (HI), an estimate of the cumulative risks associated with exposure to multiple chemicals, is estimated as the sum of chemical-specific HQs for both birds and mammals. This cumulative risk estimate conservatively assumes that the toxicity of all chemicals are additive. The HI is estimated as follows:

$$HI = \sum HQ$$

The DEQ acceptable risk level for ecological receptors in an HI<1.

3.3 RESULTS

Table 1 presents ESLs, EPCs, HQs, and HIs for both birds and mammals that may be exposed to supernatant water in the TSF. The largest HQ is for birds exposed to total cyanide (HQ=0.6), and this HQ is over an order of magnitude higher than the next highest HQ. As a result, chemicals other than cyanide are unlikely to pose unacceptable risks to wildlife. Using a total cyanide EPC of 1 mg/L, the HIs for birds (0.7) and mammals (0.2) are less than the target acceptable risk level of one. Based on results of this screening-level ecological risk evaluation, chemicals in supernatant water are not expected to pose unacceptable risks to wildlife.

4. UNCERTAINTY EVALUATION

Uncertainty is inherent in many aspects of risk assessment, especially the assessment of risks to multiple ecological risk receptors with varying behaviors and sensitivities. A semi-quantitative approach for evaluating uncertainty is described below. The approach involves listing identifiable uncertainties associated with the parameters used to calculate risks, then gauging both the magnitude and direction of potential bias (i.e., over- or underestimation of actual risk) for each type of uncertainty.

Risk estimates are calculated by combining site data, assumptions about how ecological receptors may be exposed to chemicals, and toxicity data. The primary uncertainties in this risk assessment can be grouped into the following main categories:

- Exposure assessment
- Toxicity assessment
- Combinations of sources of uncertainty

In general, when substantial uncertainty was associated with a variable used in modeling or risk estimation, conservative approximations that err on the side of risk overestimation were employed in this ERA. As a result, risks are likely to be overestimated. The uncertainties in each of the above categories are discussed in greater detail below.

4.1 EXPOSURE ASSESSMENT

The exposure assessment includes a number of assumptions with varying degrees of uncertainty. Uncertainties can arise from the types of ecological receptors evaluated, chemical intake assumptions, and the concentrations of chemicals in water.

This ERA focused on evaluating potential risks to birds and mammals. It is possible that some other organisms such as amphibians, reptiles, invertebrates, and perhaps some plants can contact water in the TSF. There will be no pathways by which fish and other wholly aquatic organisms can colonize the pond. Screening levels protective of wildlife are better developed than those protective of amphibians, reptiles, and aquatic plants, and uncertainties in risk estimates for birds and mammals are typically lower than those for other types of ecological receptors. The lack of a formal evaluation of risks for some organisms will result in an underestimation of some ecological risks.

The LANL (2023) screening levels were developed assuming birds and mammals are only exposed to chemicals in water through drinking. Other potential exposure routes that were not quantitatively evaluated include dermal exposure to chemicals in water and inhalation of vapors in outdoor air. Dietary exposure to chemicals that accumulate in the tissues of aquatic organisms is relevant for most natural surface water features, but the TSF is unlikely to support populations of aquatic plants and invertebrates that would represent a significant food resource for wildlife. Also, cyanide (the chemical with the greatest potential to pose unacceptable risks) does not bioaccumulate in aquatic systems (ATSDR, 2006). Therefore, potential dietary exposures are expected to be insignificant. Exposure routes other than drinking are expected to contribute a minor amount of exposure relative to drinking exposures. Omission

of exposure routes such as potential dermal exposure to chemicals in water can lead to underestimation of risks.

The EPCs used in risk estimates are intended to represent the average concentrations of chemicals in water of the TSF that an organism may experience on a long-term basis. With the exception of cyanide, geochemical modeling was used to estimate EPCs. Although there is uncertainty in estimated EPCs based on the geochemical model, most EPCs were well below relevant ESLs. Potential errors in modeling EPCs are not expected to have a significant effect on risk estimates and can lead to either overestimation or underestimation of risks. The EPC for cyanide is based on an initial evaluation of practicable technologies to reduce cyanide in the TSF. There is considerable uncertainty in the cyanide EPC and risks will be underestimated if treatment technologies do not achieve the estimated target EPC of 1 mg/L total cyanide over long-term bird exposure durations (e.g., over six months).

LANL (2023) developed ESLs for indicator species selected to represent various guilds of birds and mammals with similar potential exposures. An attempt was made to select an indicator species that is likely to have higher potential exposures relative to other members in the guild (typically small-bodied animals). Assumed chemical intake rates (e.g., drinking rates normalized by body weight) for indicator species are likely to be conservative and will generally overestimate risks to other bird and mammal guild members that drink from the TSF. Similarly, the assumed exposure duration (i.e., exposure encompassing the majority of the test organism's lifespan) is likely to overestimate actual exposure durations.

4.2 TOXICITY ASSESSMENT

The availability and quality of toxicological data used to develop TRVs is an important source of uncertainty in ecological risk estimates. Extrapolation of toxicological data from short-term studies to estimate effects of long-term exposures, and from high dose exposures to estimate low dose effects are all important sources of uncertainty. Conservative multipliers known as uncertainty factors are used to account for uncertainties associated with the above types of dose extrapolations. Uncertainty factors are typically biased to prevent underestimating potential toxicity. For the cyanide bird TRV (primary ecological risk driver), LANL (2023) extrapolated a chronic low-effect TRV from an acute study that reported the oral dose causing 50% mortality in American kestrels (*Falco sparverius*). The resultant bird ESLs are likely to overestimate potential cyanide toxicity. For example, the lowest bird ESL used in this screening-level ERA of 1.6 mg/L is over an order of magnitude lower than bird screening levels based on empirical observations of bird mortality in TSFs with varying cyanide concentrations (Donato et al., 2007).

4.3 COMBINATIONS OF SOURCES OF UNCERTAINTY

Many of the uncertainties from the sources discussed above are compounded in the derivation of a single risk estimate. In many cases, bias is used to manage uncertainty by selecting exposure factor values and TRVs that are likely to overestimate exposures and toxicity. Multiple conservative exposure/toxicity assumptions are combined resulting risk estimates that are almost certain to overestimate actual risks, but the degree of risk overestimation is unknown.

5. CONCLUSION

Based on the results of this conservative screening-level risk evaluation, chemicals in supernatant water of the TSF are not expected to pose unacceptable risks to wildlife. Given the conservative nature of this risk assessment, additional more detailed and accurate ecological risk evaluations do not appear to be warranted.

Birds drinking supernatant pond water containing cyanide appears to represent the greatest potential risk to wildlife based on the results of this ERA. As outlined in Section 2 of this report, the EPC for cyanide (i.e., 1 mg/L) was developed based on professional experience and data from other mines that indicate this concentration is practicable and achievable for the conditions and processes at the Grassy Mountain Mine. Because of this particular uncertainty, however, an optimization procedure to attain the lowest practicable level of cyanide in the supernatant pond has been developed. The optimization procedure is described in t*he Tailings Chemical Monitoring Plan* (Calico, 2023; CPA Appendix D2), and is designed to rapidly establish and achieve cyanide concentrations that are protective of wildlife at the site.

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TABLE

Table 1
Ecological Screening Evaluation
Grassy Mountain Mine Project

Analyte	Ecological Screening Levels[1]		Predicted Supernatant Pond Concentration[2]	Hazard Quotient (HQ)	
	Birds (mg/L)	Mammals (mg/L)	Maximum (mg/L)	Bird HQ	Mammal HQ
Alkalinity	NE	NE	42.5	--	--
Aluminum	4,500	86	0.344	7.6E-05	4.0E-03
Antimony	NE	2.3	0.054	--	2.3E-02
Arsenic	52	5.6	0.217	4.2E-03	3.9E-02
Barium	760	8.8	0.038	5.0E-05	4.3E-03
Beryllium	NE	29	0.0005	--	1.7E-05
Boron	770	1,200	0.018	2.3E-05	1.5E-05
Cadmium	82	17	0.0006	7.3E-06	3.5E-05
Calcium	NE	NE	153	--	--
Chloride	NE	NE	7.59	--	--
Chromium (total)	71	630	0.002	2.8E-05	3.2E-06
Cobalt	2	2.2	0.099	5.0E-02	4.5E-02
Copper	130	33	2.40	1.8E-02	7.3E-02
Cyanide (total)[3]	1.6	3,000	1	6.3E-01	3.3E-04
Fluoride	500	210	0.295	5.9E-04	1.4E-03
Iron	NE	NE	0.0008	--	--
Lead	640	16	0.0007	1.1E-06	4.4E-05
Lithium	NE	NE	0.062	--	--
Magnesium	NE	NE	3.01	--	--
Manganese	24,000	700	0.918	3.8E-05	1.3E-03
Mercury (inorganic)	0.78	63	0.007	9.0E-03	1.1E-04
Molybdenum	NE	NE	0.049	--	--
Nickel	160	3	0.002	1.3E-05	6.7E-04
Nitrate	NE	NE	1.00	--	--
pH	NE	NE	8.00	--	--
Phosphorous	NE	NE	0.008	--	--
Potassium	NE	NE	21.8	--	--
Selenium	6.1	1.4	0.026	4.3E-03	1.9E-02
Silver	220	850	0.0003	1.4E-06	3.5E-07
Sodium	NE	NE	256	--	--
Strontium	NE	1,100	0.386	--	3.5E-04
Sulfate	NE	NE	883	--	--
Thallium	14	0.31	0.002	1.4E-04	6.5E-03
Tin	NE	NE	0.028	--	--
Uranium	3,200	67	0.008	2.5E-06	1.2E-04
Vanadium	45	18	0.001	2.2E-05	5.6E-05
Zinc	4,900	5,600	0.099	2.0E-05	1.8E-05
Hazard Index (HI)				7.1E-01	2.2E-01

Notes:

1 Lowest bird and mammal drinking water ecological screening levels (ESL) based on a low effect level.
From: Los Alamos National Laboratory ECORISK Database (Release 4.3). https://www.intellusnm.com/

2 With exception of cyanide, maximum estimated concentration in Table 4-1,
SRK Consulting, 2021, Technical Memorandum, Re: Ecological Risk Assessment:
Numerical Prediction of Tailings, Supernatant Pond and Reclaim Pond Chemistry
for the Grassy Mountain Project, December 7.

3 Total cyanide EPC is based on an intial evaluation of practicable technologies to manage cyanide.

NE = Not Established (i.e., no screening value)

HQ = Maximum Concentration/Screening Level

HI = Sum of chemical-specific HQs