**DRAFT**

# MONITORING AND REPORTING PLAN

FOR

**CENTENNIAL M-1 PROPERTY**

DTSC Site Code 102370

Nevada County, California

April 2021

## 1 INTRODUCTION

This Monitoring and Reporting Plan (MRP) is to be incorporated into a future Remedial Design and Implementation Plan (RDIP) for cleanup of mine waste and contaminated soil at the Centennial M-1 Property in Nevada County, California. This MRP was prepared to address mitigation measures associated with environmental review of the Remedial Action Plan (RAP; NV5, January 25, 2021) for the Centennial M-1 Property.

The RAP describes procedures for excavation and on-site encapsulation of mine waste and contaminated soil containing elevated concentrations of metals (e.g., arsenic, lead, mercury) and potentially containing naturally-occurring asbestos (NOA). As set forth in the RAP, the mine waste and affected soil are to be placed in a designated consolidation area as engineered fill, away from surface water drainage courses, and capped with 48 inches of clean compacted fill borrowed from other portions of the site. The finished grade is to be sloped to promote surface water runoff, and erosion and drainage controls are to be constructed. The existing berm on the eastern boundary of the site will remain in place, and the existing culvert that diverts water beneath the berm will be extended to divert water beneath the consolidation area.

The consolidation area is located on the eastern boundary of the Site, which is immediately south of Centennial Drive and Idaho Maryland Road, and north of East Bennett Road, near the city limits of Grass Valley, Nevada County, California. The Encapsulation Area is to be restricted by a land use covenant (LUC). The boundary of the LUC is depicted on RAP Figure 5 and the design drawings in RAP Appendix H. The LUC encompasses 5.2 acres.

This MRP describes the general site characteristics and presents procedures for monitoring well installation, groundwater sample collection, laboratory analysis and reporting. Routine groundwater monitoring and reporting are required as part of the LUC to verify that groundwater quality is not impacted by the encapsulated mine waste and soil.

### 1.1 SITE CHARACTERISTICS

#### 1.1.1 Geology

Engeo (2007) describes the geologic formations beneath the site as Mesozoic and Paleozoic rocks of an ophiolitic melange assemblage, and describes geologic mapping of rock types at the site as andesite pyroclastic rock, ultramafic rock, massive diabase, diorite, and gabbroic rock.

According to the Engeo (2007) exploration and geologic data reviewed, the rocks have been slightly metamorphosed at low or medium grade.

Exploratory borings and excavations performed by Engeo (2007), IMMC (2005, 2004) and Vector (1993, 1990) typically encountered mine tailings and waste rock fill overlying a thin native soil profile and weathered bedrock. Tailings depths are typically less than 5 feet bgs. Tailings depths range up to approximately 12 feet bgs in the northeastern corner of the eastern tailings pond (near Centennial Drive) and up to approximately 20 feet bgs on the northern edge of the western tailings pond (near the Northern Berm).

Thicker deposits of tailings and waste rock are present in the Northern Berm (extending up to approximately 20 feet above the ground surface and forming the northern boundary of the western tailings pond) and in the Eastern Berm (extending up to approximately 25 feet above the ground surface, previously retaining water to the east of the site). The berms are generally comprised of waste rock, tailings and other undocumented fill.

Bedrock underlying the tailings was typically described as weathered gabbro and diabase. In general, the gabbro was weak and highly weathered while the diabase was generally strong and moderately weathered. Engeo (2007) encountered approximately 30 feet of loose to medium dense “tailings fill” in exploratory boring B10, which was advanced through the northern waste rock berm.

### 1.1.2 Soil Conditions

Engeo (2007) described the tailings as silt and sand with occasional gravel and clay. Background soil arsenic concentrations range up to approximately 18 milligrams per kilogram (mg/kg) at the site.

### 1.1.3 Hydrogeology

Local groundwater well completion reports are available on the California Department of Water Resources (DWR) Well Completion Report Map Application (DWR, 2019). The database reports that over 50 domestic and monitoring groundwater wells are on record within approximately 1 mile of the subject property. Reported well depths range from 11 to 550 feet below the ground surface (bgs). Static groundwater depths are reported as shallow as 3 feet bgs in shallow wells completed in permeable soil, but typical depths to usable groundwater are greater than 60 feet bgs within fractured bedrock.

Engeo (2007) encountered groundwater at a depth of 50 feet in exploratory boring B22, which was terminated at a depth of 50.5 feet bgs in weathered bedrock (the boring extended approximately 11 feet into the weathered metavolcanic rock). This water was likely perched on the weathered rock rather than being representative of the actual groundwater surface, which is commonly encountered at greater depth in fractured bedrock. Perched groundwater was encountered in exploratory excavations TP2 and TP18 at depths of 9 and 3 feet bgs, respectively. Groundwater was not encountered in other exploratory borings or excavations during the Engeo (2007) investigation.

Regionally, the site slopes to the northwest, with Wolf Creek flowing east to west across the northern portion of the site.

### 1.1.4 Constituents of Concern

Human health risk assessment for the site identified arsenic is the primary contributor to health hazard and cancer risk associated with routine exposure to the mine waste and affected soil. Mercury, cobalt and thallium also contribute significantly to health hazard in the case of routine exposure. Lead and other metals are present at concentrations that are higher than background concentrations.

# 2 MONITORING WELL INSTALLATION

Monitoring well locations are depicted on Figures 1 (conceptual layout) and 2 (encapsulation plan and aerial photograph) of this MRP. Construction details for proposed wells MW-CM-01, MW-CM-02 and MW-CM-03 are presented as Figures 3, 4 and 5, respectively, of this MRP. The well design is based on review of site lithology and anticipated groundwater elevations.

## 2.1 PERMITTING

The well driller is to obtain a permit from the Nevada County Environmental Health Department (NCEHD) for installation of the two monitoring wells. Pursuant to the requirements of the permit, NCEHD shall be notified of the well completion schedule with respect to NCEHD observation of sanitary seal placement.

## 2.2 SCHEDULING

The California Department of Toxic Substances Control (DTSC) and NCEHD are to be notified at least 48 hours prior to drilling to facilitate NCEHD observation of well seal placement. Well installation and development are expected to require approximately one week. Groundwater monitoring will be performed within two weeks of well installation, and a well installation report will be submitted to DTSC within four weeks of the initial groundwater monitoring event.

## 2.3 HEALTH AND SAFETY

NV5 prepared a Health and Safety Plan (HSP) for NV5 personnel working at the Site. The HSP is appended to the RAP. Contractors are responsible for preparing a safety plan for their employees and must comply with the provisions of the NV5 plan at a minimum.

## 2.4 UNDERGROUND UTILITIES

The will driller shall mark the proposed well locations in the field and contact Underground Service Alert (USA) a minimum of 48 hours prior to the proposed drilling. USA will notify local utility companies, who will mark underground utilities so that they can be avoided during drilling.

## 2.5 DRILLING AND WELL CONSTRUCTION

### 2.5.1 Drilling

Due to the likelihood of encountering shallow bedrock, the well borings are to be drilled by air rotary methods. An NV5 geologist will log subsurface conditions encountered during drilling.

First encountered groundwater is expected to occur within 40 feet bgs. Screened intervals are anticipated to be approximately 40 to 50 feet bgs. Total well depths are anticipated to be

approximately 50 feet below ground surface. Figures 3 through 5 of this MRP depict the proposed well construction details.

### 2.5.2 Decontamination and Waste Management

All down-hole drilling, development, monitoring and sampling equipment will be decontaminated prior to arriving on-site and will be pressure washed prior to use in another boring or well. All equipment will be decontaminated by pressure washing or washing with a solution of non-phosphate detergent and then rinsing with distilled water.

For wells that are located within the cleanup area, soil cuttings in the upper ten feet (including all cuttings resembling mine tailings and mine waste rock) are to be placed in 55-gallon drums, closed, and labeled as non-hazardous waste. Purge water and rinse water generated during drilling, well construction and development will be placed on the ground surface adjacent to the wells, at a location that will not be subject to concentrated surface water flow and will not be subject to erosion or sediment transport.

For wells that are located outside of the cleanup area, soil cuttings, purge water and rinse water generated during drilling, well construction and development will be placed on the ground surface adjacent to the wells, at a location that will not be subject to concentrated surface water flow and will not be subject to erosion or sediment transport.

### 2.5.3 Casing

Monitoring wells will be constructed using 4-inch diameter, schedule 40 polyvinyl chloride (PVC) casing with flush threaded joints. The screened interval will be constructed of 0.020-inch, machine-slotted well screen. The well screen will intersect the highest anticipated seasonal groundwater level, allowing for a sufficient surface sanitary seal thickness. The remainder of the well will be constructed of schedule 40 PVC blank casing.

### 2.5.4 Filter and Seal

The annular space between the casing and borehole will be filled from the bottom of the borehole to approximately 2 feet above the top of the screen with No. 3 or No. 2/12 sand filter pack. A minimum 3-foot thick bentonite pellet seal will be placed above the sand and will be hydrated with distilled water. Neat cement grout will be placed above the bentonite pellets to near the top of the well casing. The wellhead will be completed with a locking water-tight cap within a traffic-rated well vault set in concrete.

## 2.6 SURVEYING

Well surveying will include the top-of-casing elevation relative to mean sea level to an accuracy of 0.01 foot, and horizontal coordinates (latitude and longitude) in decimal degrees using methods that satisfy state regulations. Surveying will be performed by a California Registered Professional Land Surveyor.

## 2.7 DEVELOPMENT

A minimum of 72 hours after placement of the sanitary seal, the wells will be developed through surging and pumping to sort the sand filter pack and remove sediment prior to the initial sampling event. During development, field parameters (pH, temperature and

conductivity) of the purge water will be monitored and recorded. Purging will continue until at least ten well volumes are removed and the field parameters stabilize.

# 3 GROUNDWATER MONITORING

The three groundwater monitoring wells (MW-CM-01, MW-CM-02 and MW-CM-03) are to be monitored on a semiannual (twice yearly) basis. Groundwater monitoring includes depth measurement, purging, field parameter measurement, sampling, laboratory analysis and reporting.

## 3.1 PREPARATORY ACTIVITIES

The following preparatory activities are to be performed prior to the monitoring event:

- The California Department of Toxic Substances Control (DTSC) and the Nevada County Department of Environmental Health (NCEHD) are to be notified at least 72 hours prior to the scheduled sampling event. The DTSC contact is Dean Wright (916-255-3591; Dean.Wright@dtsc.ca.gov), and the NCDEH contact is David Huff (530-256-1222; David.Huff@co.nevada.ca.us).
- Chain of custody documentation and sample labels are to be completed to the extent feasible (such as date, sampler names, site identification and sample identification) prior to field activities, especially during wet conditions.

## 3.2 EQUIPMENT AND SUPPLIES

Appropriate sampling equipment and supplies include:

- Gloves
- Boots
- First aid and safety equipment
- Field data sheets and/or notebook
- Sample labels and custody forms
- Sampling pump
- Sample containers
- Intermediate sample containers for filtration and field measurement
- Filters
- pH and conductivity meters
- Spare pH probe or cartridge
- pH electrode storage solution
- Buffer solutions (pH 4, 7, 10)
- Conductivity calibration solutions
- Decontamination vessels
- Wash bottle
- Deionized or distilled water
- Liquinox soap
- Coolers
- Wet ice
- Paper towels
- Tape measure
- Camera
- Extra batteries
- Waste container

## 3.3 RECORDKEEPING

Sampling activities are to be documented in a data sheet or notebook using indelible ink. If any changes are made to the record, the original notation will be crossed out with a single line and initialed. The following observations are to be recorded:

- Sample identification number and location;

- Date and time of sampling;
- Persons performing sampling;
- pH, conductivity, and temperature;
- Unusual sample conditions; and
- Field or sample conditions that may affect the sample quality.

## 3.4 FIELD QA/QC PROCEDURES

No equipment rinsate samples will be obtained, as single-use containers and equipment are to be used for sample collection. No field duplicate samples nor blank samples are proposed.

## 3.5 DATA VALIDATION

Data validation is to include:

- Comparison of total and dissolved concentrations for individual water samples;
- Verification that sample hold times were not exceeded; and
- Review of laboratory quality control reports.

Based on the results of the data validation procedures, the data are to be qualified or accepted without qualification.

## 3.6 GROUNDWATER SAMPLE COLLECTION AND HANDLING

Groundwater monitoring is to include measurement of groundwater elevations to the nearest 0.01 foot, purging of a minimum of three well volumes while monitoring field parameters for stabilization, and collection of groundwater samples for laboratory analysis using a submersible pump or bailer.

### 3.6.1 Depth Measurement

Prior to purging or sampling, and at least 48 hours after initial well development, groundwater depths will be measured to the nearest 0.01 foot using electronic sounding equipment. The depth measurements will be based on a surveyed datum at the top of the well casing. Groundwater depths will be recorded in the field and converted to elevations based on the survey data.

### 3.6.2 Purging

A submersible pump or bailer will be used to purge a minimum of three well volumes prior to sampling. Purge water pH, temperature and electrical conductivity will be monitored using appropriate field equipment. Purging will continue until the field parameters stabilize.

Field equipment will be calibrated with commercially available standards at the beginning of the sampling day and periodically during the monitoring event pursuant to the manufacturer's recommendations.

### 3.6.3 Sample Collection

After purging, water samples will be collected using a submersible pump or bailer. Personnel involved in the sampling processing and decontamination are to wear disposable, non-powdered gloves. New gloves are to be worn at each sampling location. Gloves are to be

discarded and replaced during sampling whenever glove cleanliness may have been compromised.

Samples will be collected in laboratory-supplied polyethylene containers. All containers are to be new containers provided by the laboratory. Water samples for unfiltered (total recoverable) analysis will be collected directly into the sample containers provided by the laboratory. Samples for filtered (dissolved) analysis will be filtered in the field using a disposable 0.45 micron membrane in-line filter, peristaltic pump and tubing. Filtered samples are to be obtained as follows:

- Remove the lid of the intermediate sampling container and place the intake end of the tubing in the container.
- Start the pump and pass approximately 100 to 200 milliliters (mL) of sample water through tubing/filter to precondition filter media, thus creating a uniform wetting across the filter and increasing the filter efficiency. Stop the pump and discard the rinse.
- Restart the pump and pass sample water through the tubing/filter to fill the laboratory-supplied, preservative-containing sample bottle.

Sample bottles are to be labeled according to the location, date, time of collection, preservatives added, if any, and if filtered or unfiltered. Samples are to be hand-delivered or shipped to the analytical laboratory under chain-of-custody documentation. The analytical laboratory is to be accredited by the California Department of Public Health (CDPH). Sample containers, preservatives, and holding times are summarized in the table below.

**Table 3.6.3 – Groundwater**
**Sample Containers, Preservation Methods and Hold Times**

| Parameter | Sample Container | Filtration/Preservation | Hold Time |
|---|---|---|---|
| **Laboratory Analysis** | | | |
| Total arsenic, lead, mercury, nickel and thallium | 250 mL polyethylene | unfiltered, nitric acid, 4°C | 180 days |
| Dissolved arsenic, lead and nickel | 250 mL polyethylene | filtered, nitric acid, 4°C | 180 days |
| **Field Analysis** | | | |
| pH, Electrical Conductivity and Temperature | polyethylene | unfiltered, unpreserved | analyze at time of collection |

Notes:
C = Celsius
mL = milliliter

### 3.6.4 Laboratory Analysis

Analytes, methods and target method detection limits are summarized in the following table.

**Table 3.6.4 – Groundwater**
**Sample Parameters, Methods and Detection Limits**

| Parameter | EPA Method | Target MDL (mg/L) |
|---|---|---|
| **Metals** | | |
| Arsenic, total and dissolved | 6020B | 0.0002 |
| Lead, total and dissolved | 6020B | 0.0001 |
| Mercury, total and dissolved | 7470A | 0.00005 |
| Nickel, total and dissolved | 6010 | 0.008 |
| Thallium, total and dissolved | 6020B | 0.001 |
| **Field Parameters** | | |
| pH | M150.1-Electrometric | 0.1 su |
| Conductivity | M120.1-Meter | 1 µmho/cm |

Notes:
EPA = United States Environmental Protection Agency
MDL = method detection limit
mg/L = milligram per liter
su = standard pH units
µmho/cm = micromho per centimeter

### 3.6.5 Field Analysis

Field parameters (pH, electrical conductivity and temperature) are to be measured from a separate bottle of unfiltered sample. Meter calibration and operation procedures shall be performed per the manufacturer's instructions. The meters are to be calibrated at least once per day, prior to use. Calibration is to be verified at least three times during a full day of sampling by using standard pH buffer solutions and conductivity reference solutions. Electrical conductivity measurement is not to be performed after pH measurement for the same sample because pH measurement may affect conductivity.

## 3.7 REPORTING

Reports documenting the well installation and semi-annual monitoring results are to be prepared by a licensed professional engineer or geologist who is experienced with environmental monitoring. The reports shall include:

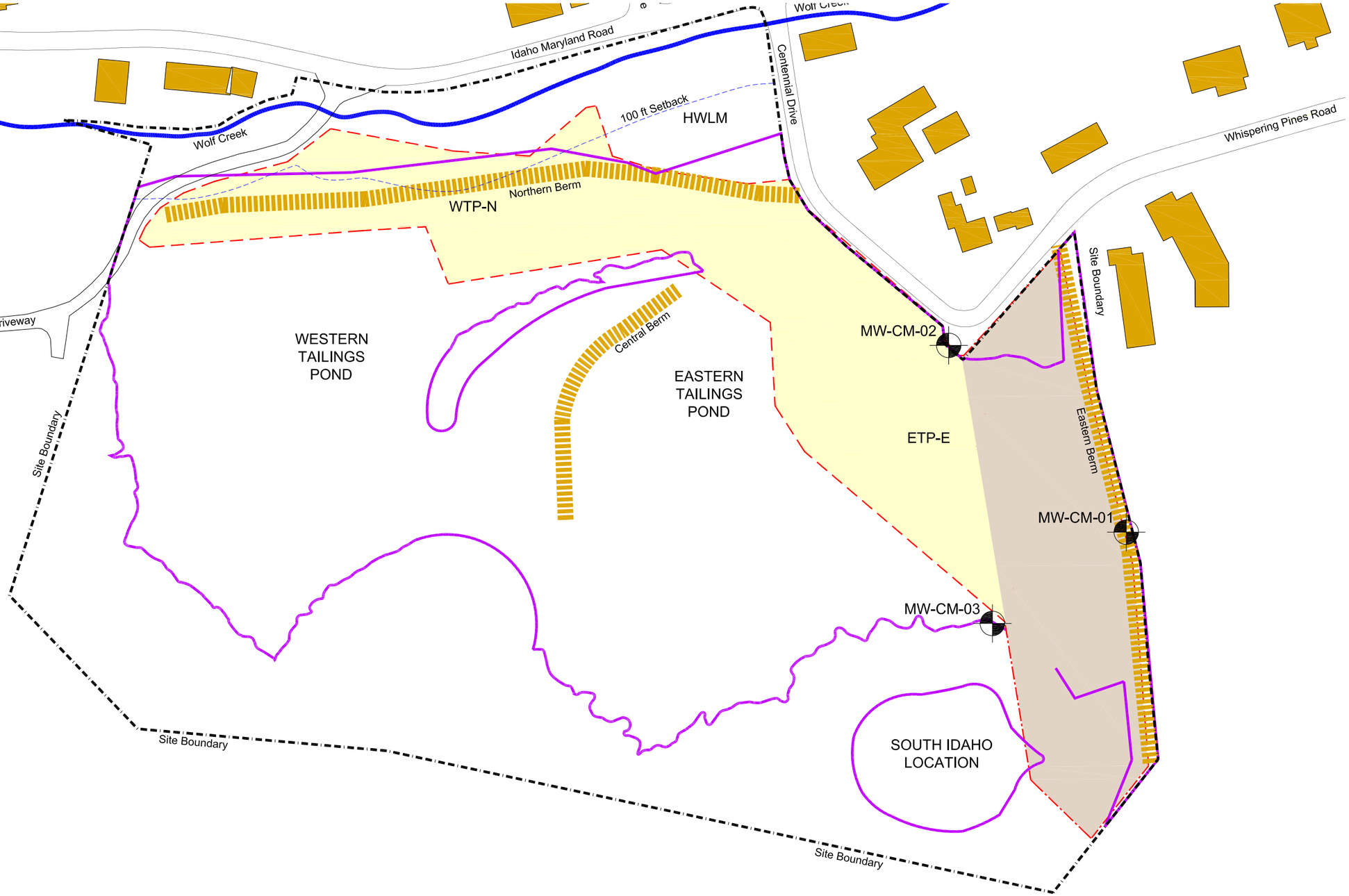
- Well locations, boring logs and construction details;
- Survey data;
- Tabulated analytical results and laboratory reports; and
- Results of data evaluation.

Reports are to be submitted routinely to DTSC as specified in the land use covenant (LUC).

## 3.8 MAINTENANCE

The groundwater monitoring wells are to be maintained in proper working order. The ground surface shall drain away from the wellheads to prevent potential surface contamination.

F:\1 Projects\5279 Idaho-Maryland Mine\04 RAP - Centennial M-1 Property\02c Initial Study Comments April 2021\DRAFT Monitoring and Reporting Plan\5279.04 Monitoring and Reporting Plan.doc




NOTES

FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY.

LEGEND

- SITE BOUNDARY
- MW-CM-01 MONITORING WELL LOCATION
- WETLANDS AND STREAMS
- STRUCTURE
- MINE TAILINGS BOUNDARY
- HISTORICAL BERM
- EXCAVATION BOUNDARY FOR ON-SITE CONSOLIDATION
- MINE WASTE CONSOLIDATION AREA
- ETP-E EASTERN TAILINGS POND, EAST PORTION
- WTP-N WESTERN TAILINGS PONT, WEST PORTION
- HWLM HAP WARNKE LUMBER MILL

N

0 FEET 200

SCALE

BASE MAP FROM RISE GRASS VALLEY, INC.

NV5

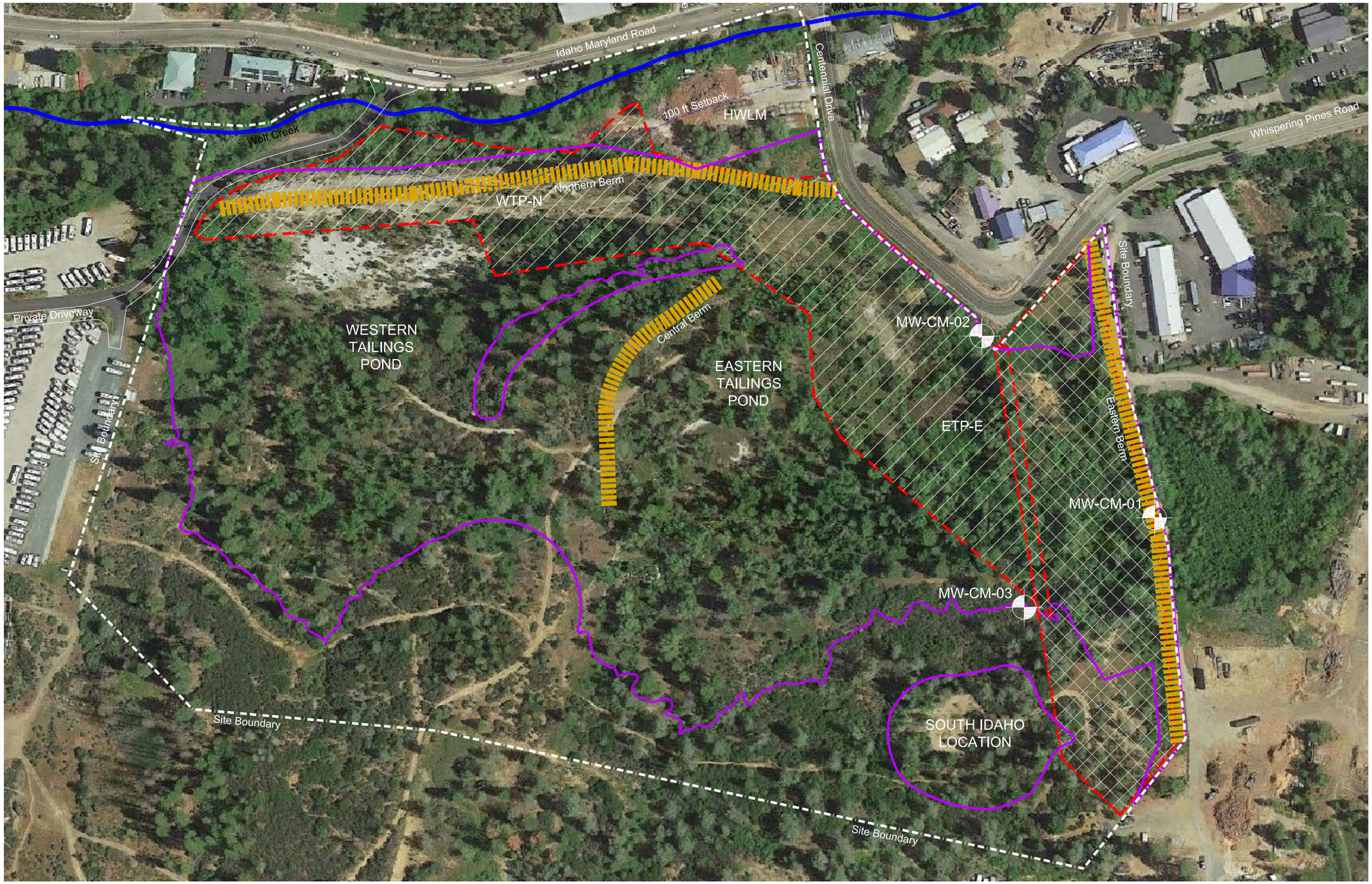
PROPOSED GROUNDWATER MONITORING WELL LOCATIONS

# CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

| | |
|---|---|
| SITE CODE: | 102370 |
| CHECKED BY: | MUIR |
| NV5 PROJECT: | 5279.04 |
| DATE: | APRIL 2021 |

FIGURE 1




## NOTES

FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY.

## LEGEND

- SITE BOUNDARY
- MW-CM-01 — MONITORING WELL LOCATION
- WETLANDS AND STREAMS
- STRUCTURE
- MINE TAILINGS BOUNDARY
- HISTORICAL BERM
- EXCAVATION BOUNDARY FOR ON-SITE CONSOLIDATION
- MINE WASTE CONSOLIDATION AREA
- ETP-E — EASTERN TAILINGS POND, EAST PORTION
- WTP-N — WESTERN TAILINGS PONT, WEST PORTION
- HWLM — HAP WARNKE LUMBER MILL

N

0 FEET 200

SCALE

BASE MAP FROM RISE GRASS VALLEY, INC.

NV5

PROPOSED GROUNDWATER MONITORING WELL LOCATIONS - AERIAL PHOTOGRAPH

# CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

| | |
|---|---|
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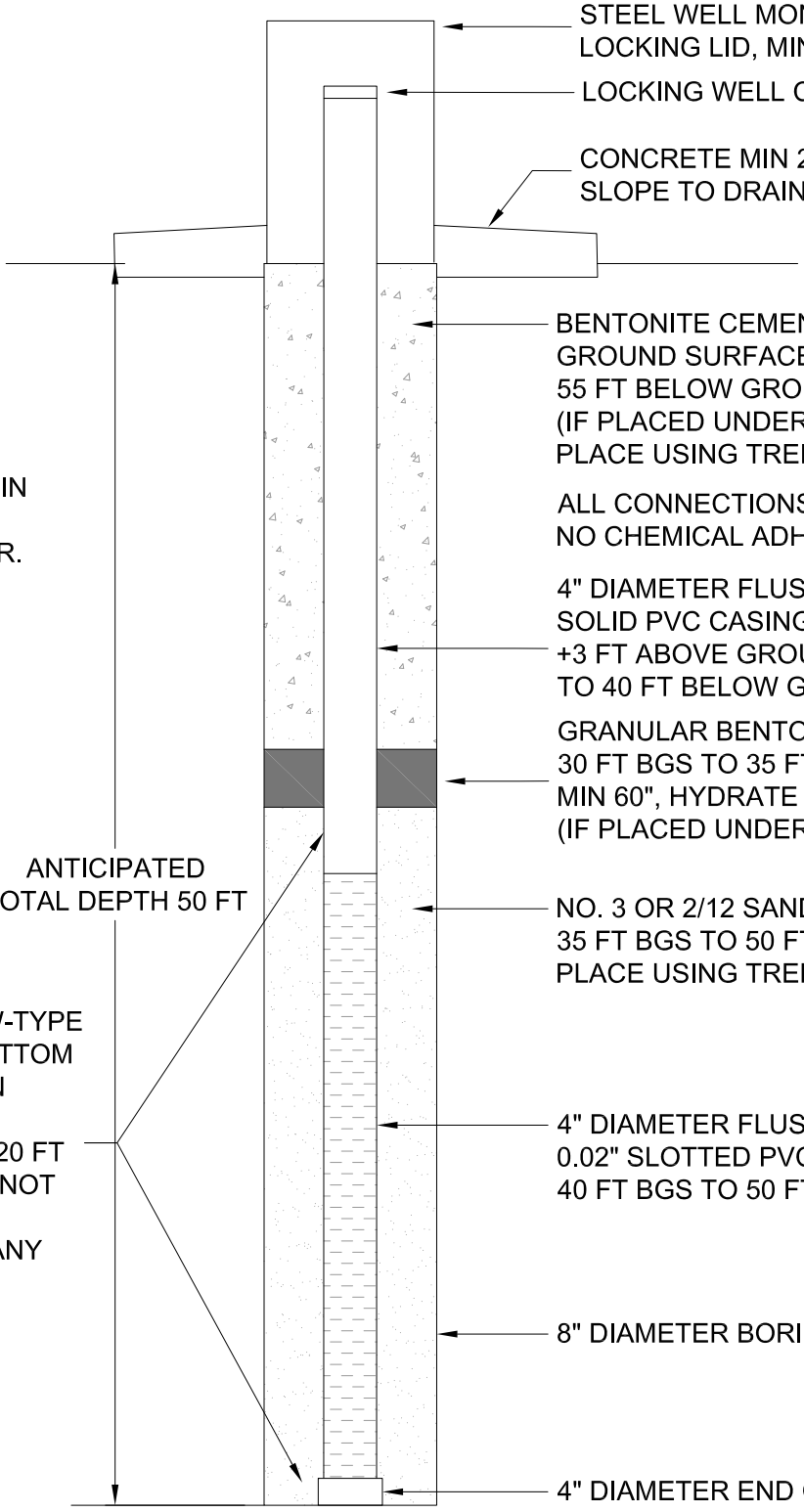
| CHECKED BY: | MUIR |
| NV5 PROJECT: | 5279.05 |
| DATE: | APRIL 2021 |

FIGURE 2




N|V|5

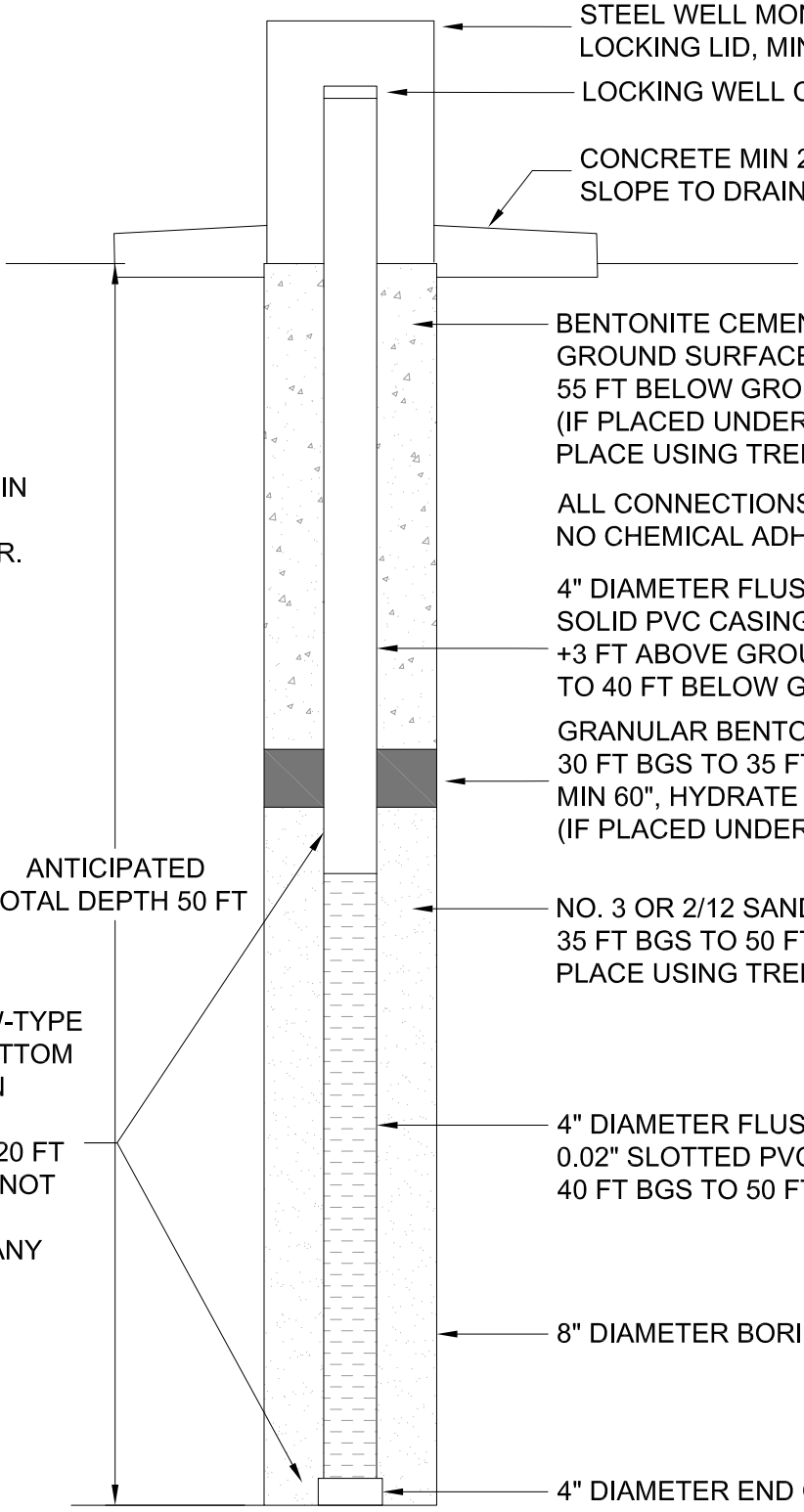
DETAIL FOR PROPOSED MONITORING WELL MW-CM-01

CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

| | |
|---|---|
| SITE CODE: | 102370 |
| CHECKED BY: | MUIR |
| H&K PROJECT: | 5279.04 |
| DATE: | APRIL 2021 |

FIGURE
3




N|V|5

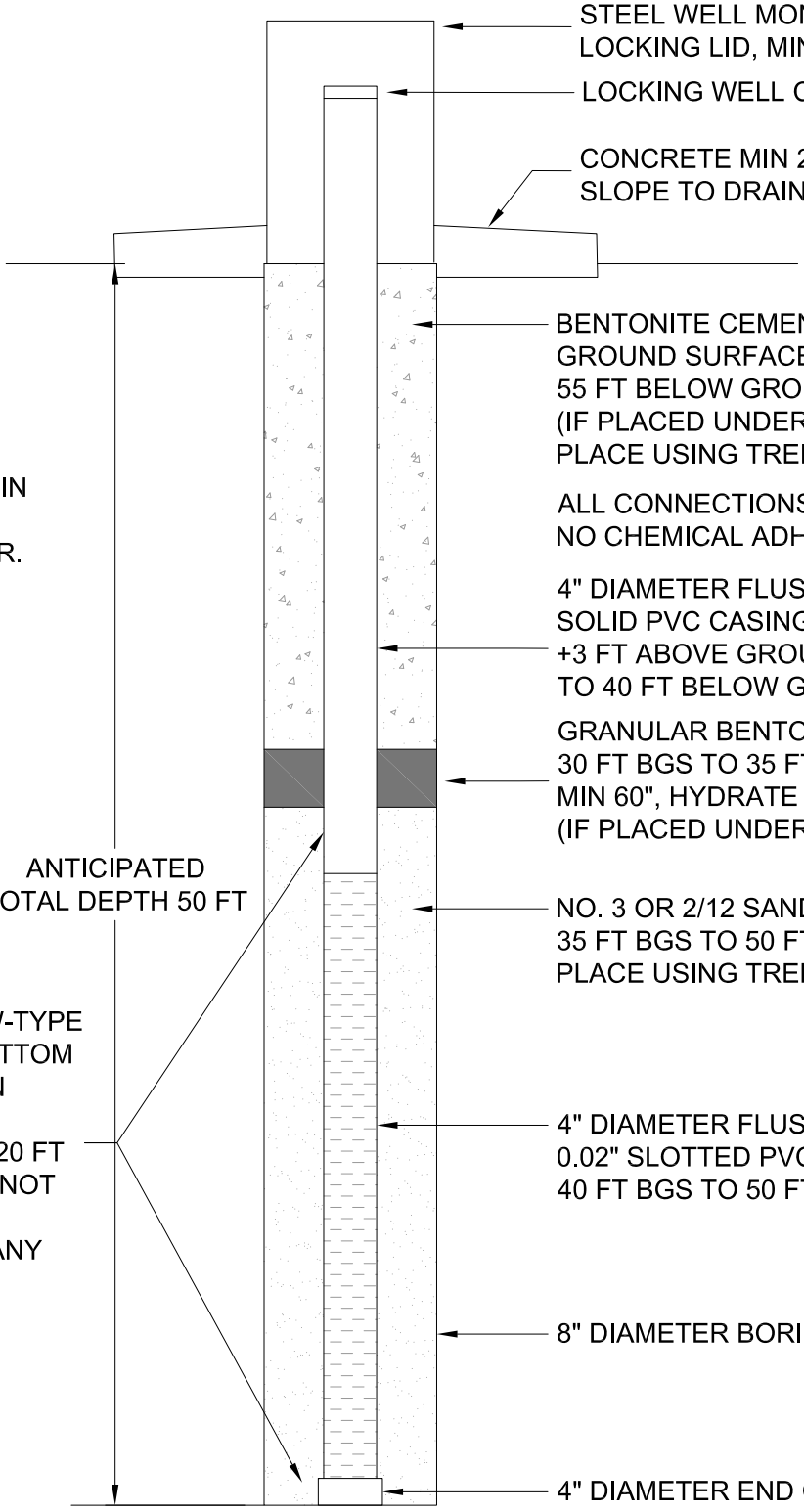
DETAIL FOR PROPOSED MONITORING WELL MW-CM-02

CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

| | |
|---|---|
| SITE CODE: | 102370 |
| CHECKED BY: | MUIR |
| H&K PROJECT: | 5279.04 |
| DATE: | APRIL 2021 |

FIGURE
4




DETAIL FOR PROPOSED MONITORING WELL MW-CM-03

# CENTENNIAL M-1 PROPERTY

GRASS VALLEY, CALIFORNIA

| | |
|---|---|
| SITE CODE: | 102370 |
| CHECKED BY: | MUIR |
| H&K PROJECT: | 5279.04 |
| DATE: | APRIL 2021 |

FIGURE
5